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## **EDUCATION FOR LIFE, NOT JUST FOR A LIVING**

**Dr Poonam Gaur**

Associate Professor, School Of Education, Lingaya's Vidyapeeth, Faridabad

According to Allan— **“Education is a process which moves the person from darkness to light.”**

### **ABSTRACT**

NEP 2020 highlights the aim of education system to develop good human beings with integrity of thoughts and actions. Life oriented education will act as a tool to think independently. Here, writer expressed her feelings on the Role of Education for the society.

**KEY POINTS:** Integrity, thoughts, actions, life oriented

### **INTRODUCTION**

NEP 1986 also gives emphasis on the effective teaching and learning with the recommendation that “All the teachers will teach and all students study.”

According to NEP 2020-- the aim of education should be development of higher order skills among the students for better understanding of content and to adjust with the life.

In our present Education System, students learn the content without understanding, they just memorize for good academic record without proper knowledge of content. Therefore, role of teacher becomes very important as a facilitator to cultivate the tree of knowledge among the students through vibrant system of education.

### **SYSTEMATIC REVIEW**

- Education and life satisfaction: Perception or Reality, research done by Carolina and Di Maro, University college of London, 2008, and concluded that educational quality perceptions issue for the welfare of individuals.
- Education and Quality of life, research done by Robert and Jason, University of Manitoba, 2012 and concluded about positive effects of educational attainment on emotional wellbeing, physical health, personal safety.
- Importance of Education, article written by Al-Shuaibi, Salalah college of Technology, 2014 and described that Education develops personality and thoughts of the people and prepares them for life experiences.

**This article contributed towards the accountability of Education for people.**

# **EFFECTIVENESS OF ENVIRONMENTAL CONSERVATION ON HUMAN LIFE**

**Dr Poonam Gaur**

Associate Professor, Lingaya's  
Vidyapeeth

## EFFECTIVENESS OF ENVIRONMENTAL CONSERVATION ON HUMAN LIFE

Dr Poonam Gaur,  
Associate Professor, Lingaya's Vidyapeeth

### ABSTRACT

Environmental sustainability, or the long-term management and preservation of the planet's natural resources and ecosystems, is becoming more widely acknowledged as a societal concern influenced by human conduct at all spheres of social interaction, from communities to whole countries. A more nuanced understanding of the ways that both individual and group level processes can affect conservation efforts is now being incorporated into psychological perspectives on conservation, which traditionally focused on individual determinants of proenvironmental behavior (such as personal environmental concern). Research on social norms and identity-based influences, in particular, indicates that social perceptions, such as beliefs about what behaviors are typical and socially valued, can be stronger motivators of conservation behavior than financial incentives, pro-environmental appeals, or the simplicity of pro-environmental actions.

### 1. INTRODUCTION

#### 1.1 OVERVIEW

In many OECD nations, political attention has historically been placed on environmental concerns with a focus on health. Environmental risk factors have a very diverse and intricate effect on health, both in terms of their severity and clinical importance. For instance, the impacts of environmental deterioration on human health might vary from psychological issues brought on by noise to cancer deaths brought on by air pollution. The main effects of environmental deterioration on human health are described in this chapter, along with an estimate of the resulting health loss. Environmental policy may be more effectively designed if the economic consequences of health losses caused by the environment are better understood.

#### 1.1.1 Impacts of environmental degradation on human health

A population's health is influenced by a variety of elements, including its nutrition, cleanliness, socioeconomic standing, literacy, and way of life. In the OECD areas, life expectancy has increased dramatically as a consequence of these variables, which have altered significantly over the economic transformations that have defined modern civilization. Recent research indicates that improved working conditions, rising GDP, and higher health spending per capita were the main factors influencing life expectancy in OECD areas from 1970 to 1992. They do, however, also suggest that throughout the same time span, air pollution's detrimental effect on human health grew in OECD nations (Or, 2000). The numerous factors that have an impact

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**PILOT STUDY FOR EFFECTIVENESS OF STORY TELLING AS  
PEDAGOGY FOR PRE-SERVICE TEACHERS OF B.Ed.**

**Dr Poonam Gaur,**

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**Mr Deepak**

**Assistant professor, lingaya's vidyapeeth**

**ABSTRACT**

*Teaching is an interaction between teachers and taught which can be effective through advance planning and effective participation of students. Positive attitude of teachers towards maximum participation of their students make their teaching –learning process interesting. Maximum participation is possible only through efficient pedagogy. Pedagogy is a skill /an art/a way of meaningful teaching i.e. how the teacher delivers the content to the class. Aim of effective pedagogy is to develop logical thinking, creative skills and positive attitude among students. Pedagogy enables the students to apply their classroom learning in their daily lives. In this research paper, researchers will try to find out the storytelling as an effective pedagogy for Pre- service trainees of B.Ed.from Lingaya's Vidyapeeth.This research study is qualitative and quantitative in nature. Questionnaire will develop to know the effectiveness of storytelling from B.Ed. first year and second year trainees. This research paper will focus on the connection between*

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### **Effectiveness Of School Field Trip For Secondary School Students**

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Ph.D. Research scholar

Department of Education (CIE) University of Delhi

#### **Abstract**

School field trip are part of experiential learning and first-hand experience of the real world where students have own concepts about school field trip field trips are one of the most crucial things teachers can offer their pupils since they not only broaden their knowledge and experiences but also help them to better understand the environment in which they live. Although field trips that stress hands-on, real-world, and practical applications of learning have been proven to be effective by research, instructors still face a challenge in demonstrating student learning because the current trend in education tends to place a heavy emphasis on assessments. Students learn through experiential learning or hands-on learning. Students participate in this sort of learning with their own concepts, ideas, and knowledge. Through hands-on learning, students make various observations. In this study researcher will try to find out effectiveness of school field trip for secondary school.

**KEY WORDS:** Experiential learning, Field visit, First- hand experience, Real world, Practical application of learning.

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**PILOT STUDY: MULTIDISCIPLINARY APPROACH ACT AS A BRIDGE BETWEEN  
DIFFERENT ACADEMIC SUBJECT**

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**ABSTRACT**

Instruction is an interactive process between teachers and learners which requires advance preparation and efficient contribution of students. Encouraging approach of teachers towards teaching-learning process helps for maximum participation of students. Maximum participation is also possible when students are able to understand the content. Effective Pedagogy with Multidisciplinary approach will act as a meaningful tool for the teachers to deliver the content in the class. Multidisciplinary approach involves two or more academic areas to learn the particular content. Aim of Multidisciplinary Approach is to develop logical thinking, deeper understanding and knowledge of content among teachers and students both. Learning through multidisciplinary approach enables the students to apply their classroom learning in their daily lives through problem Solving Strategies. In this research paper, researchers will try to conclude the effectiveness of Multidisciplinary Approach as a bridge between different academic subjects for Pre-service trainees of B.Ed. from Lingaya's Vidyapeeth. This research study is qualitative and quantitative in nature. Opinionnaire will develop to know the effectiveness of MULTIDISCIPLINARY APPROACH from B.Ed. first year and second year trainees. Researchers will conclude the importance of multidisciplinary approach and encourage the trainees to consider this approach to connect with learners.

**KEY WORDS-** Instruction, multidisciplinary, logical, Problem solving

**INTRODUCTION**

Instruction is an interaction for sharing knowledge and talent between two or more persons. Positive attitude of the teacher towards teaching profession and teaching approach adopted by the teacher towards the subject information decided quality of learning. The main idea of learning is to communicate useful change in behavior of students to make information more significant and applicable.

In-service teachers and Pupil teachers (pre-service teachers) can involve in the progress of the social order by teaching children through Multidisciplinary Approach. In Multi-disciplinary approach similar theme is studied through integration of more than one discipline. This Approach can be used to teach ethics, beliefs, and skills to learners. Multi-disciplinary Approach can be used in instruction by pupil teachers to make teaching-learning process effective. This approach prepared the learners as well as pupil teachers for their future with inspired and reasonable thinking.

So, it is more important to understand the efficiency of Multi-disciplinary Approach to teach students by teacher trainees in teaching profession to make understanding more inspiring and pleasing for students.

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### **Social Competencies among Tea-Garden Children in Assam**

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Research Scholar

Department of Education (CIE), University of Delhi, Delhi-110007

#### **Abstract**

This paper focuses on the social competencies of children living in tea gardens in Assam, India. The study aims to examine the social skills of these children and how their social competencies are influenced by their environment. The study is based on a qualitative research design, employing semi-structured interviews and observation methods. The findings suggest that the tea-garden children display a range of social competencies, including communication, empathy, cooperation, and conflict resolution. These competencies are influenced by factors such as family dynamics, education, and peer relationships. The study also highlights the challenges faced by these children, including poverty, lack of access to quality education, and exposure to harmful practices such as child labor. Overall, the study

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**An exploratory study on Multidisciplinary dimension of social worker role in education to  
Improve the Quality Education in India**

Dr. Pallavi Gangwar

Langaya's Vidyapeeth  
NSS Programme coordinator

**Abstract**

Education, directly and indirectly, gives learners or young people the opportunity to develop their social skills at school or in after-school level, learners interact with other learners/people, building their relationships with friends, teachers and other students of different ages and cultures, and help them to improving their lives.

Education refers to the discipline that is concerned with methods of teaching and learning in schools or school-like environments, as opposed to various non-formal and informal means of socialization. If we

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*Teaching is an interaction between teachers and taught which can be effective through advance planning and effective participation of students. Positive attitude of teachers towards maximum participation of their students make their teaching –learning process interesting. Maximum participation is possible only through efficient pedagogy. Pedagogy is a skill /an art/a way of meaningful teaching i.e. how the teacher delivers the content to the class. Aim of effective pedagogy is to develop logical thinking, creative skills and positive attitude among students. Pedagogy enables the students to apply their classroom learning in their daily lives. In this research paper, researchers will try to find out the storytelling as an effective pedagogy for Pre- service trainees of B.Ed.from Lingaya's Vidyapeeth.This research study is qualitative and quantitative in nature. Questionnaire will develop to know the effectiveness of storytelling from B.Ed. first year and second year trainees. This research paper will focus on the connection between*

*teaching and storytelling. Researchers will conclude the importance of storytelling and encourage the trainees to consider storytelling as one of the pedagogical device to connect with learners.*

**KEY WORDS-** *Interaction, Pedagogy, logical, creative, storytelling, teaching*

## **1. INTRODUCTION**

Teaching is a process of sharing knowledge, understanding and skill between two or more persons. The excellence of education depends on the devotion of the teacher towards the subject information. The main purpose of education is to bring constructive transform in performance of students to make knowledge more meaningful.

A Teacher training institute helps in framing the outlook of student teachers towards teaching occupation. Pupil teachers can contribute to the development of the nation and the society by teaching children through innovative pedagogy/techniques. Storytelling is one of the effective pedagogies for sharing and expressing the experiences. It can be used as method to teach values, ethics, skills to learners. Storytelling can be used in teaching practice by pupil teachers to make teaching-learning process interactive. Storytelling pedagogy equipped the learners with creative and logical thinking in comfortable school atmosphere.

So, it is more important to understand the effectiveness of storytelling as an innovative pedagogy by teacher trainees in teaching profession to develop their educational toolbox to make knowledge more motivating and appealing for students.

The aim of this study is to examine efficiency of storytelling as an pioneering pedagogy for pre-service teachers of B.Ed. Such a study is essential to increase an understanding of how to use interactive strategies to bring positive outcomes rather than harmful.

## **2. REVIEW OF RELATED LITERATURE**

Several studies have been conducted to assess the influence of STORYTELLING in teaching profession as a strategy to create interactive atmosphere.

- ‘STORY AS A PEDAGOGYA: REFLECTIVE COMMENTARY’, research done by Glesne, Professor, University of Vermont, and Marleen, Professor, School of Education, University of Wisconsin, 2018 and concluded that teachers can use stories as a form of activism.
- ‘A PEDAGOGICAL POWER OF STORYTELLING’, research done by R. Eric, Boise State University and Karen, Spelman College, 2019 and emphasized to motivate the teachers to consider storytelling as one of their pedagogical tactics to connect with learners for positive learning outcome.

- ‘STORYTELLING---IMPACT OF TEACHING GRAMMER THROUGH ACTIVITIES TO IRAQI PUPILS AND ATTITUDE OF TEACHER TOWARDS ACTIVITIES’,research done by Bushra Saadoon,University of Baghdad,2020 and concluded that storytelling is an effective strategy for meaningful learning process.
- ‘TEACHING WITHIN A STORY:UNDERSTANDING STORIFICATION OF PEDAGOGY’,research completed by Aura,Hassan,Hamari,University of Tampere,Finland,2021 and findings suggested that storytelling equipped the students with moral values of story and enhanced their academic performance also.
- ‘HOW STORYTELLING CAN WORK AS A PEDAGOGY TO FACILITATE CHILDREN’S ENGLISH AS A FOREIGN LANGUAGE LEARNING’, research completed by Nguyen and Phillips,2022 and concluded that integration of storytelling in school curriculum has extensive benefit in language development. There is a need to examine STORYTELLING-AS A PEDAGOGICAL TOOL for pupil teachers in teaching profession because of qualitative improvement in TEACHING –LEARNING PROCESS as suggested by NEP2020 also regarding learner oriented strategies to develop higher order skills among learners.

#### **STATEMENT OF THE PROBLEM**

Using Stories by Pupil Teachers as a Pedagogical Tool in course enhance students learning.

#### **3. OBJECTIVES OF THE STUDY**

- To judge Storytelling as an influential pedagogy in classrooms.
- To assess the usefulness of Storytelling for pupil teachers in their teaching profession to enhance knowledge of learners.

#### **4. DELIMITATION OF THE STUDY**

- The study was delimited to Lingaya’s Vidyapeeth,Faridabad,only.
- The study was delimited only to B.Ed.trainees of first and second years of School of Education.

#### **5. METHODOLOGY**

- The research method is qualitative and quantitative 25in nature.

#### **5.1 POPULATION**

- 25 pupil teachers from B.Ed.first and second years of Lingaya’sVidyapeeth,Faridabad involved as population.

#### **5.2SAMPLE SIZE**

Purposive sampling was used with 25 B.Ed.trainees of first and second years. The sample size remains restricted to 25 B.Ed. trainees of Lingaya's Vidyapeeth.

### **5.3 TOOL USED**

In the present study, researchers developed questionnaire to assess the effectiveness of storytelling. Statements of the questionnaire were developed after discussions with experts of education from Educational Institutions and School of Education, Lingaya's Vidyapeeth. Based on the experts comment on the items 'content and face validity 15 statements were retained. Therefore, to assess the utility of storytelling for student teachers in teaching profession, questionnaire with five points marking developed by researchers was used as a tool and this scale was standardized after administration on B.Ed.trainees.

The Questionnaire contains five point Likert scale with 15 statements. All The statements were given options using five point (5) Likert scale type of responses, namely: Strongly Agree=5; Agree=4; Undecided=3; Disagree=2; Strongly disagree =1. The ten aspects/domains dealt in the questionnaire are---

- VOCABULARY INCREASE,
- PERSONALITY DEVELOPMENT ,
- EFFECTIVE AID,
- FEELING OF CONNECTION TO GOD AND CULTURAL UNDERSTANDING,
- COMMUNICATION AND SOCIAL SKILLS.

The pupil teacher responded by choosing the alternative against the serial number of the questionnaire statement in the sheet. Though no time limit was assigned for recording responses on the Performa, pupil teachers were asked to complete it as soon as possible.

### **5.4 Collection of Data**

For the collection of data, questionnaire was administered to the pupil-teachers through personal contact. General instructions about the scale were given to the pupil-teachers and the purpose was also explained to them. Responses of Pupil teachers were gathered on the spot for data analysis.

### **5.5 Statistical Technique Used**

The data was analyzed by using statistical techniques –percentage.

## **6. RESULTS AND DISCUSSION**

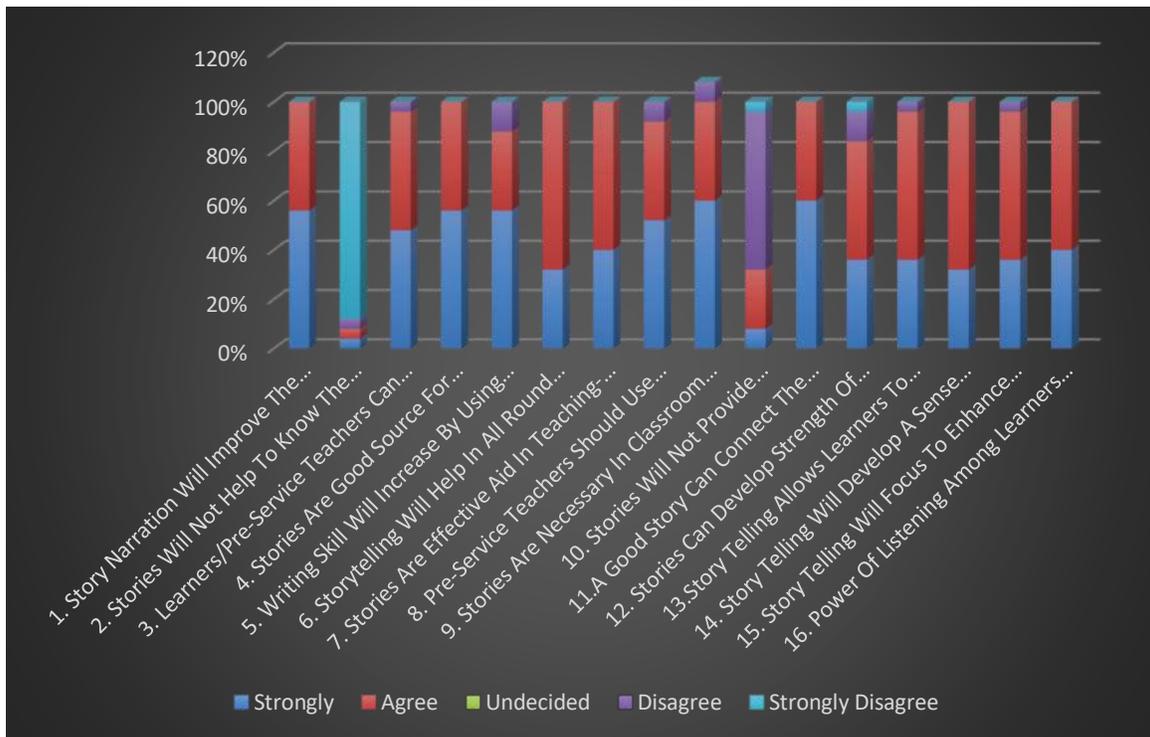
### **Analysis and Interpretation of Data**

## QUESTIONNAIRE

Domain	Statements	Sa Strongly Agree	A Agree	U Undecided	D Disagree	Sd Strongly Disagree
Vocabulary Increase	1. Story Narration Will Improve The Language.	56%	44%	---	---	----
	2. Stories Will Not Help To Know The Meaning Of New Words.	4%	4%	-----	4%	88%
	3. Learners/Pre-Service Teachers Can Use The Words Mentioned In The Story To Connect Them With Story.	48%	48%	---	4%	---
Personality Development	4. Stories Are Good Source For Imagination Of Ideas.	56%	44%	----	-----	-----
	5. Writing Skill Will Increase By Using Imaginative Ideas.	56%	32%	----	12%	----
	6. Storytelling Will Help In All Round Development Of Personality Of The Learners.	32%	68%	----	----	----
Effective Aid	7. Stories Are Effective Aid In Teaching-Learning Process To Increase Enthusiasm.	40%	60%	----	----	----
	8. Pre-Service Teachers Should Use Stories During The Lesson As A	52%	40%	----	8%	---

	Positive And Interactive Alternative Method Of Teaching And Knowledge Sharing.					
	9. Stories Are Necessary In Classroom For Learners To Improve The Right-Brain Imagination.	60%	40%	-----	---	---
	10. Stories Will Not Provide Opportunities To Students For Fun.	8%	24%	---	64%	4%
Feeling Of Connection To God And Cultural Understanding	10.A Good Story Can Connect The Learners With The Belief That God Is Always Around Them.	60%	40%	-----	-----	---
	11. Stories Can Develop Strength Of Unity Among The Learners In All Over The World Regardless Of Colour Or Religion.	36%	48%	---	12%	4%
	12.Story Telling Allows Learners To Understand And To Appreciate Different Traditions Of Countries And With In Country(India)	36%	60%	-----	4%	----
	13. Story Telling Will Develop A Sense Of Empathy Among Learners.	32%	68%	-----	---	---

Communication And Social Skills	14. Story Telling Will Focus To Enhance Communication Skills Through Expression Of Thoughts And Feelings.	36%	60%	----	4%	---
	15. Power Of Listening Among Learners Will Increase.	40%	60%	-----	-----	-----



From the table and pie chart, it can be observed that storytelling is an effective pedagogy for pre-service teachers of B.Ed----

- To IMPROVE THE LANGUAGE.
- To KNOW THE MEANING OF NEW WORDS.
- To USE THE WORDS MENTIONED IN THE STORY TO CONNECT THEMSELVES WITH STORY.

- As GOOD SOURCE FOR IMAGINATION OF IDEAS.
- To increase WRITING SKILL BY USING IMAGINATIVE IDEAS.
- To HELP IN ALL ROUND DEVELOPMENT OF PERSONALITY OF THE LEARNERS
- As EFFECTIVE AID IN TEACHING-LEARNING PROCESS TO INCREASE ENTHUSIASM
- AS A POSITIVE AND INTERACTIVE ALTERNATIVE METHOD OF TEACHING AND KNOWLEDGE SHARING.
- CLASSROOM FOR LEARNERS TO IMPROVE THE RIGHT-BRAIN IMAGINATION.
- To CAN CONNECT THE LEARNERS WITH THE BELIEF THAT GOD IS ALWAYS AROUND THEM.
- DEVELOP STRENGTH OF UNITY AMONG THE LEARNERS IN ALL OVER THE WORLD REGARDLESS OF COLOUR OR RELIGION
- WILL DEVELOP A SENSE OF EMPATHY AMONG LEARNERS.
- WILL DEVELOP A SENSE OF EMPATHY AMONG LEARNERS.
- TO ENHANCE COMMUNICATION SKILLS THROUGH EXPRESSION OF THOUGHTS AND FEELINGS.
- LISTENING AMONG LEARNERS WILL INCREASE.

## 7. SUGGESTIONS AND RECOMMENDATIONS

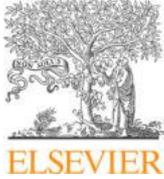
Similar study can be done for all the pupil teachers of B.Ed programs across Faridabad or even it can be undertaken in different states of India.

## 8. CONCLUSION

It was found that storytelling is an effective pedagogy for student teachers in their teacher training programme. As we all know NEP 2020 given emphasis on activity based learning at all the levels. Art Integrated learning approach helps to prove it. That is why ,we can say storytelling is one of the form of it.

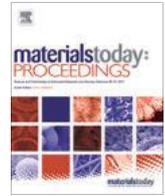
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## Use of coir fiber and analysis of geotechnical properties of soil

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## ABSTRACT

This paper presents the study on the construction of pavement layers to be spread over subgrade soil starts with the calculation of the power of the subgrade and the traffic volume to be transported. The design of the different pavement layers depends very much on the strength of the sub-grade soil they are to be laid over. The power of a subgrade is expressed mainly in terms of CBR (California Bearing Ratio). Weaker sub-grade essentially needs thicker layers when stronger sub-grade works along with thinner layers of pavement. Normally CBR testing is a simple and well accepted process conducted on soil samples to determine subgrade intensity. For an engineer to understand the exact CBR strength of the sub-grade strength becomes absolutely essential. However, several other measurements are also taken into account for determining the power of the subgrade.

The use of waste material and natural fibers to boost soil quality is beneficial, because they are inexpensive, accessible locally and Ecological. The stabilizing effect of Natural Fiber (coconut coir) on soil properties was observed in this research. On the last the use of surplus material and fiber has seen a huge growth over the decade. Hence, an attempt has been made in this analysis to test the rise in subgrade intensity by supplying Coir Fiber in different layers. In this CBR study, different variations of parent sub-grade soil with Coir Fiber were performed. From the laboratory study it was observed that coir fiber's overall efficiency is higher. The CBR value of the parent subgrade soil was also found to increase as the number of coir fiber layers increased.

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Selection and peer-review under responsibility of the scientific committee of the International Conference on Futuristic Research in Engineering Smart Materials.

## 1. Introduction

Soil is the vital component of this ecosystem and all the necessities of life such as milk, household and clothes are provided by the soil. Soil functions include biomass transformations (productivity), water partitioning and reservoirs [1]. Black Cotton soils have high swelling potential and are one of India's main soil deposits as a result of the increase in moisture content [2]. India's wide geographical area is (3,287,264 km<sup>2</sup>) and India's population is (138 million approx.) demanding the massive road system. Soil is inexpensive construction material and readily usable. Road building enforces heavy pressure on constrained capital such as suitable soil, stone aggregates, and binders, etc. Soil stabilization is the production that increases soil's physical properties, such as shear strength, bearing potential and can be achieved by using controlled compaction or deposition of suitable admixtures such as cement, lime, clay, fly ash or by providing geotextiles, geosynthetics etc.

[3] Soil stabilization is a common method used by engineers and designers to enhance the properties of soil with different stabilizers. Engineers are continually faced with sustaining and improving facilities for pavements with minimal financial capital. Outmoded concrete planning and maintenance methods allow high-quality material for building requirements to be self-actualized. Premium content is not usable in certain parts of the world or is short of quantity. Because of these constraints, engineers are often forced to seek alternative designs using deficient materials, commercial building aids and advanced design practices. Concrete or tarmac paving cannot be constructed on poor soil, since it can easily be broken on hard soil pavements. The layer should have an appropriate load-carrying capacity as underneath the sub-grade pavement. This will have to replace the whole pavement segment and to be correct, the condition of the embankment affected by lack of strength or uniformity. The embankment must be built as solid, durable, uniform and cost-efficient as possible. The most econom-

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ical embankment is the one that maintains its life cycle by using modern technologies to help ensure sufficient strength, rigidity and uniformity.

Earlier fibers were used in soil strengthening process. Although the devices were not completely expected, roots of plants and straws were used to cob walls and render soil brick to improve the property. In the other hand, modern geotechnical engineering has mastered the use of strengthening the soil with isolated fibers which in geotechnical projects is still a comparatively recent technique.

Coir fiber is available at large scale in India which have very good property as pavement material having light weight, have ability to increase subgrade strength and can increase the life span of pavement compared to traditional method of pavement construction.

Coir fiber is part of a category of stable simple fibers [4]. It is a viable essential commodity obtained from coconut coating [5]. The coir fiber is stretchy enough to fold without breaking, and clenches a curl as though it were fluttering eternally. Soil coir fiber can be used as defective material in the stabilization cycle due to its spiral and long spike fibers [6]. The short cushion fibers were removed from the long fibers and later became waste in the coir fiber industry and this fiber waste is used in soil stabilization and can thus be disposed of efficiently. The application of fibers has had a major impact on soil and coir mixture development behavior. Reducing consolidation of clay soil settlement is caused by the addition of unsystematically distributed polypropylene fibers [7]. Because of the length of the fibers which imparts an insignificant effect on the soil characteristics, fiber content proved to be more influential and effective. Fiber inclusion results in plasticity decrease and hydraulic conductivity increase. This research has following objectives:

- To estimate the CBR strength of parent subgrade soil by placing one or more layers of coconut coir fiber at different depths.
- To understand the efficiency of coir fibre as pavement material.
- To obtain the most efficient depth for placement of coconut coir fiber.

## 2. Materials & methods

The entire research is performed in the Geotech Lab of the Lingaya's Vidyapeeth on subgrade soil, i.e. an analysis of the CBR content of subgrade soil by various layers of coconut coir fiber at different stages. Experiments have been performed to classify various soil properties, such as Index Properties i.e. Liquid Limit, Fluid Limit, Plasticity Index & specific Gravity [8]. Later on, heavy compaction experiments were accompanied to determine the optimum moisture level and the resulting overall dry pressure. The CBR experiments were then performed on a particular mixture of coconut coir fiber.

### 2.1. Material used

Subgrade Soil and coconut coir fiber are mainly used for experimental investigations [9]. Properties listed below:

#### A. Subgrade Soil

The subgrade soil used in the laboratory for analysis is obtained from the roadside of Lingaya's Vidyapeeth, Faridabad. The engineering properties of subgrade soil are going to be calculated in the laboratory in compliance with the Indian Standard Code IS 2720.

#### B. Coconut Coir Fiber (Fig. 1)



Fig. 1. Coconut Coir Fiber.

Coir is obtained from locally available coconut shells that are washed. Brown colored Coir fibers derived from coconut husks are seen in Fig. The fabrics are strong and durable. The fiber content used in this experiment is of 0%, 0.25%, 0.50%, 0.75% and 1% of 20 mm and added in discrete manner. Physical & Chemical properties of Coir Fiber is given in Table 1 & Table 2.

## 3. Experimental program

[11] CBR is the percentage of force per unit area needed to penetrate a soil mass with a standard 50 mm diameter circular plunger at a rate of 1.25 mm/min to that necessary for the equivalent penetration into a standard material. Typically, the ratio is calculated for the 2.5- and 5-mm penetration. If the ratio at 5 mm is consistently higher than at 2.5 mm, then the ratio at 5 mm is issued. The table below shows the standard loads adopted for the standard material with a C.B.R. value of 100% for different penetrations.

### 3.1. Preparation of test specimen

Remoulded specimen: The test sample should pass IS sieve of 19 mm and be held on IS sieve of 4.75 mm. For a remoulding the dry density shall be either the field density or the amount of the average dry density determined by the compaction test (Heavy Compaction Test as per IS 2720 (Part-8)-1983, for Railway Formation [12]). If the case might be, the water content used for compaction must be the optimal water quality or the field humidity. Complex compaction: A typical soil sample weighing around 4.5 kg or more for fine-grained soil and 5.5 kg or more for granular soil should be collected and thoroughly mixed with water. When the soil is to be compacted to the highest dry density at the optimum moisture content, the exact mass of the soil required shall be taken and the necessary quantity of water applied so that the soil sample water content is equal to the optimum moisture content calculated. The extension collar and base plate are attached to the mold. The spacer disk is placed over the base. Filter paper is placed on the spacer disk. Add Lubricating Oil to the mold inside. Through gentle compaction seal the soil mix in the mold. That is to say, compress the soil by 2.60 kg rammer in 3 layers of 55 blows to each layer. Then add the reinforcing material i.e. coconut coir fiber according to various variations in between different layers.

Table 1  
Chemical Properties of Coir Fiber [10].

Chemical Properties	Composition
Lignin	45.84%
Cellulose	43.44%
Hemi-cellulose	00.25%
Pectin's Related Compound	03.33%
Water Soluble	05.25%
Ash	02.22%

**Table 2**  
Physical Properties of Coir Fiber [10].

Physical Properties	Value
Length in inches	6–8
Density (g/cc)	1.40
Tenacity (g/Text)	10.0
Breaking Elongation %	30
Diameter in mm	0.1 to 1.5
The rigidity of Modulus (dyne/cm2)	1.8924
Swelling in Water (Diameter)	5%
Moisture at 65% RH	10.50

Remove the extension collar and carefully trim the compacted soil, using a straight edge, to the top of the mold. Any holes formed by removal of the coarse material on the surface of the compacted soil shall be filled with the substance of smaller size. Remove the perforated base plate, Spacer disk, and filter paper and record mold mass and compressed soil specimen. Place a filter paper into the mold over the specimen. Place annular weights at the nearest 5.0 kg to create a surcharge proportional to the base material weight and pavement.

3.2. Various combinations of subgrade soil with coir fiber

Table 3

4. Results and discussion

4.1. General

This study's key objective was to reduce the pavement thickness and increasing the efficiency of pavement systems by using coir fiber as reinforcement material. We are conducting a laboratory investigation on the parent subgrade soil to achieve this objective. In the initial stage of the laboratory analysis, we examine the index properties of parent subgrade soil (liquid limit, plastic limit, plasticity index, specific gravity, etc.). We measured the CBR value of parent subgrade soil without reinforcement after the initial analysis, and then analyzed the efficiency of parent subgrade soil by supplying coir fiber at various heights and combinations. The property of soil is given in Table 4 & the test result without reinforcement on parent soil is given in Table 5. The CBR method was used to compare the efficiency of soil strengthened with subgrade parent soil whose data is given in Table 6.

4.2. Properties of parent subgrade soil

**Table 3**  
Various combination of parent subgrade with coir fiber.

S. No.	Combination	No. of Layer	Fiber Content %
1.	CBR Test without Reinforcement	-	0
2.	Soil with coir fiber at a Depth of 42.43 mm (H/3) from Top.	01	0.25
3.	Soil with coir fiber in the Middle of mold specimen i.e., 63.65 mm (H/2) from Bottom.	01	0.50
4.	Soil with coir fiber at a Height of 42.43 mm (H/3) from Bottom.	01	0.75
5.	Soil with coir fiber at a Height of 42.43 mm (H/2) from Bottom & at a Depth 42.43 mm (h/2) from Top.	02	01

**Table 4**  
Index Property.

Index Property	Experimental Value
Liquid Limit	53.29%
Plastic Limit	34.01%
Plasticity Index	20.1%
Specific Gravity	2.6
Optimum Moisture Content	%

4.3. Result of CBR test

Test-01 CBR Test on parent soil, without reinforcement. The CBR test result is depicted in Table 5.

**Table 5**  
Test without Reinforcement on Parent soil.

Test Report			
CALIFORNIA BEARING RATIO (CBR) TEST (IS: 2720 PART 16/ASTM 1883-99)			
OMC	17.5%		
MOISTURE CONTENT		DRY DENSITY	
Container #	08	Wt. of the Mould (g)	3884
Wt. of Container (g)	25	Wt. of the Mould + Compacted Soil (g)	8352
Wt. of Container + Wet Soil (g)	85	Volume of Mould	2283.30
Wt. of Container + Dry Soil (g)	73	Bulk Unit Wt. (g/cc)	1.956
Moisture Content (%)	25	Dry Unit Wt. (g/cc)	1.621

4.4. Graphs of tests & results

- This test was performed on non-reinforced parent soil with 0% coir fibre and the CBR value at 2.50 mm was 13.026% and 18.267% at 5.00 mm (Fig. 2).
- This test was conducted on 0.25% "Coir fibre" parent subgrade soil in 01 layer at a depth of 42.43 mm (H/3) from the surface and 2.50 mm CBR value was 18.686% and 23.538% at 5.00 mm (Fig. 3).
- This test was conducted on 0.50% "Coir Fibre" parent subgrade soil in 01 layer supported in the centre (H/2) of the mould specimen, i.e. 63.65 mm from the bottom and 2.50 mm CBR was 10.690% and 14.074% at 5.00 mm (Fig. 4).
- This test was conducted on 0.75% "Coir Fibre" parent subgrade soil in 01 layer at a height of 42.43 mm (H/3) from the bottom and CBR at 2.50 mm was 8.534% and 11.379% at 5.00 mm (Fig. 5).
- This test was Conducted on parent subgrade soil with 1% "Coir Fibre" in 02 layer at a height of 42.43 mm (H/3) from the bottom and a depth of 42.43 mm (H/3) from the top and CBR at 2.50 mm was 16.171% and 20.034% at 5.00 mm (Fig. 6).

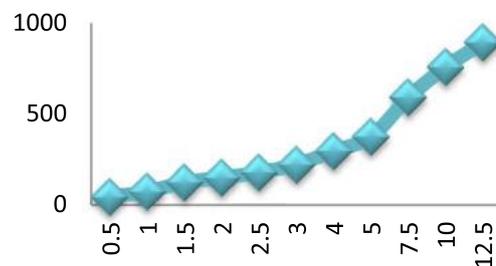


Fig. 2. CBR test without reinforcement.

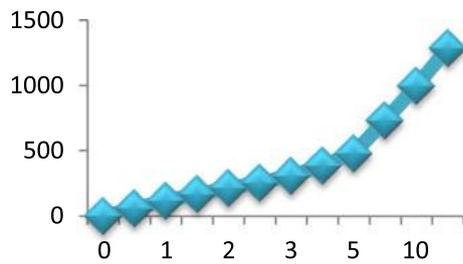


Fig. 3. Soil with 0.25% "Coir Fiber" in O1 Layer at a depth of 42.43 mm (H/3) from top.

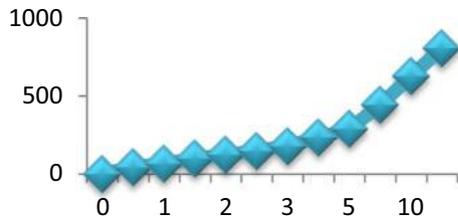


Fig. 4. Soil with 0.50% "Coir Fiber" in O1 layer provided in the middle (H/2) of mold specimen i.e., 63.65 mm from bottom.

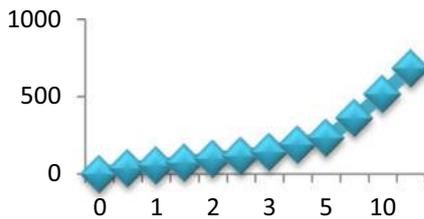


Fig. 5. Soil with 0.75% "Coir Fibre" in O1 layer at a height of 42.43 mm (H/3) from bottom.

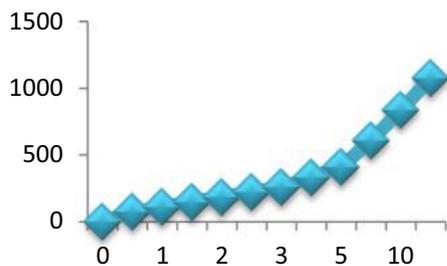


Fig. 6. Soil with 1% "Coir Fibre" in O2 layers at a height of 42.43 mm (H/3) from bottom & at a depth of 42.43 mm (H/3) from top.

Result indicates Coir Fibre's average efficiency was higher. Reinforcement at depth (H/3) from top and (H/2) from top with coir fibre gives better output. Further it was found that the Coir Fibre efficiency improves as we increase the number of layers of reinforcement, because the more layer of reinforcement, there is better binding with subgrade which helps subgrade to gain better strength.

Table 6  
CBR Test Data.

CBR TEST DATA			
CBR TEST NUMBER	01	FIBER CONTENT (%)	0%
TYPE OF CBR TEST	CBR test without reinforcement	PENETRATION RATE	1.25 mm/min
SURCHARGE WEIGHT(Kg)	05	PROVING RING CONSTANT (Kg/Div.)	6.154
WEIGHT OF ORIGINAL SAMPLE (Kg)	5.5	Observed unit of Dial Gauge	Proving Ring Reading (unitx5) (Div.)
Penetration (mm)	00	00	00
	0.5	1.3	07
	01	2.4	11.7
	1.5	3.9	20
	02	4.7	24
	2.5	5.6	29
	03	08	36
	04	9.5	48
	05	13	61
	7.5	20	96
	10	24.6	123
	12.5	29	145
CBR OF SPECIMEN AT 2.50 mm (STANDER 1370 KG) BY GRAPH		13.026%	
CBR OF SPECIMEN AT 5.00 mm (STANDER 2055 KG) BY GRAPH			

### 5. Conclusions

After the results, this research was concluded as followed with justifying the objective achievements:

- When Coir Fiber's number of layers increased, it was found that the parent subgrade soil's CBR value was increased which is our first objective.
- Coir fiber is a surplus material that can be used for lightweight and solid pavements in a sub-base.
- Coir Fiber is used to increase the subgrade Strength and therefore enhances the life of the pavement, which is our second objective.
- It has been observed that better performance is given when we provide Coir Fiber at height (H/3) from the bottom, which is our third objective.

### Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

### Acknowledgements

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# Effect of Jute Fibres on Engineering Properties of Lime Treated Black Cotton Soil

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**Abstract--** Expansive soil are those soil, which have high swelling and shrinkage characteristics and CBR value and shear strength. Hence, there is need for improvement of these properties. At present construction is managed by using granular or lime stabilized soils. The concept of reinforcing soil masses with natural fibres like coir fibre, banana fibre, sisal fibre etc. is a relatively new development to improve the properties of soil. The use of natural and artificial fibres is a suitable method for homogeneous soil reinforcing. The present study attempts to investigate the effect of Jute fibres on engineering and strength properties of lime treated black cotton soil. The properties of stabilized soil such as shrinkage limit, unconfined compressive strength and California bearing ratio were evaluated and their variations with content of jute fibres are evaluated. Soil samples containing 0%, 1%, 2% to 5% of jute fibre were prepared and index properties were evaluated as per relevant IS code of practise. The test results showed significant decrease in the expansive behaviour of the black cotton soil. The shrinkage limit increases from 13.75% to 28.68% if black cotton soil is mixed with 5% lime and jute fibres from 0% to 5% by weight of black cotton soil. There is significant increase in California bearing ratio and unconfined compressive strength.

**Keywords:** black cotton soil, stabilization, jute fibres, index properties.

## I. INTRODUCTION

Innovative methods of soil stabilization are in great demand all over the world. The term soil stabilisation is used for the techniques which improve the index properties and other engineering characteristic of expansive soils. In India expansive soil cover about  $0.8 \times 10^6$  km<sup>2</sup> area which is approximately one-fifth of its surface area. This soils cover about 51.8 million hectares of the land area. They are predominant in the states of Andhra Pradesh, Gujarat, Karnataka, Madhya Pradesh, Maharashtra and in parts of Tamil Nadu and Uttar Pradesh. These soils contain montmorillonite mineral; due to this they swell and shrink excessively when they are wet and dry state. Such tendency of soil is due to the presence of fine clay particles which swell, when they come in contact with water, resulting in alternate swelling and shrinking of soil due to which differential settlement of structure takes place. Expansive soils can be stabilised by the addition of a small percentage, by weight, of lime, that is, it enhances many of the engineering properties of the soil. This produces an

improved construction material and so the technique has been used for many construction purposes, notably in highway, railroad and airport construction to improve subgrades and sub-bases.

## II. EXPERIMENTAL PROGRAMME

The black cotton soil used in the present investigation was collected from Bilheri area of Jabalpur.

The properties of Black Cotton Soil are as under

Fines ( $-75\mu$ ) = 88.73%

Specific Gravity = 2.6

Liquid limit = 51.75%

Plastic Limit = 24.85

Plasticity Index = 16.9%

Shrinkage Limit = 8.66

Differential Free Swell = 66.04%

Optimum water Content = 22.1%

Maximum Dry Density = 1.61 g/cc

California Bearing Ratio = 1.8

In the present study jute thread is collected from grain market Jabalpur. The length of the jute thread is 5cms uniformly selected.

The black cotton soil was mixed with 5% lime and soaked for a period of 4 days. After oven drying the lime and soil mixture was again mixed with different percentage of jute thread. The mix specifications are as under

(a) CL0F0 - Clay with 0% lime and 0% jute fibres.

(a) CL5F0 - Clay with 5% lime and 0% jute fibres.

(b) CL5F1 - Clay with 5% lime and 1% jute fibres.

(c) CL5F2 - Clay with 5% lime and 2% jute fibres.

(d) CL5F3 - Clay with 5% lime and 3% jute fibres

(e) CL5F4 - Clay with 5% lime and 4% jute fibres

(f) CL5F5 - Clay with 5% lime and 5% jute fibres

The consistency limits (liquid limit and plastic limit) tests were conducted as per IS: 2720 the differential free swell tests were also conducted as per IS 2720 (Part XL) 1977.

Test Performed	CL 5F0	CL5 F1	CL 5F2	CL 5F3	CL 5F4	CL5 F5
1..Liquid Limit(%)	40.05					
2. Plastic limit(%)	22.95					
3. Shrinkage limit(%)	13.75	16.34	19.63	23.08	26.44	28.68
4. Plasticity Index(%)	17.395					
5. Differential free swell(%)	10.86					
6. Modified procter test						
(a)OMC(%)	16.20	16.9	17.5	18.2	18.8	19.6
(b)MDD(g/cc)	1.68	1.67	1.65	1.63	1.61	1.58
7.C.B.R.(%)	3.10	3.27	3.72	4.18	4.60	4.95
8.Unconfined compression test(Kg/cm <sup>2</sup> )	1.18	1.24	1.29	1.38	1.46	1.54

### III. RESULTS AND DISCUSSION

The test results are summarized in Table 1.

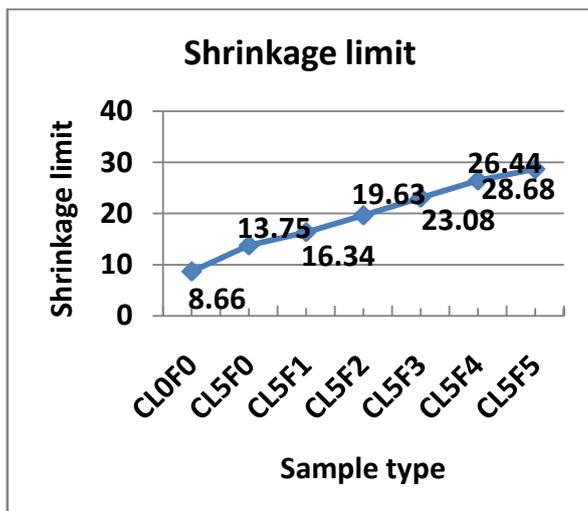


Fig 1 – Variation of shrinkage limit

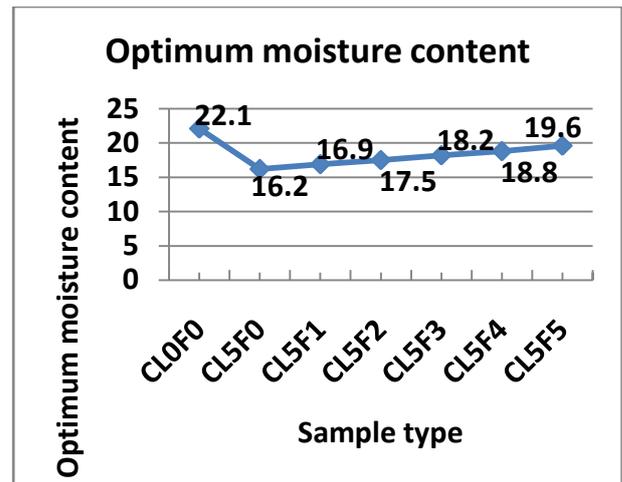


Fig. 2 –Variation in optimum moisture content

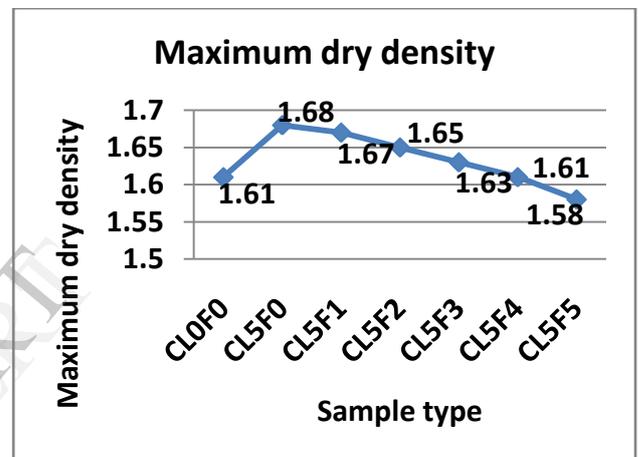


Fig. 3 – Variation in maximum dry density

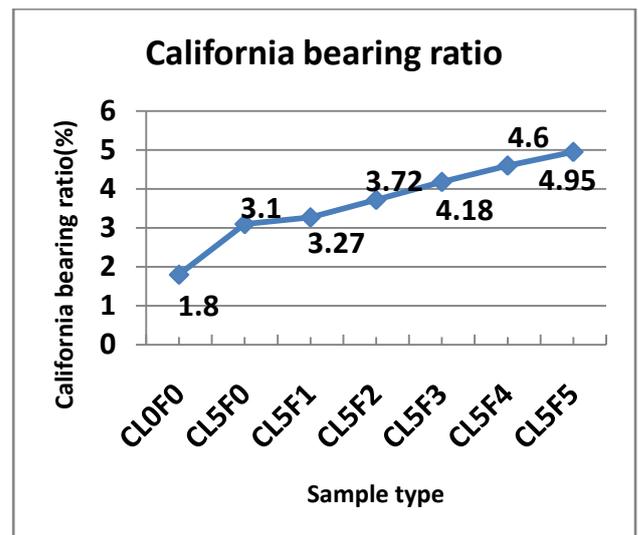


Fig. 4 – Variation in C.B.R. value

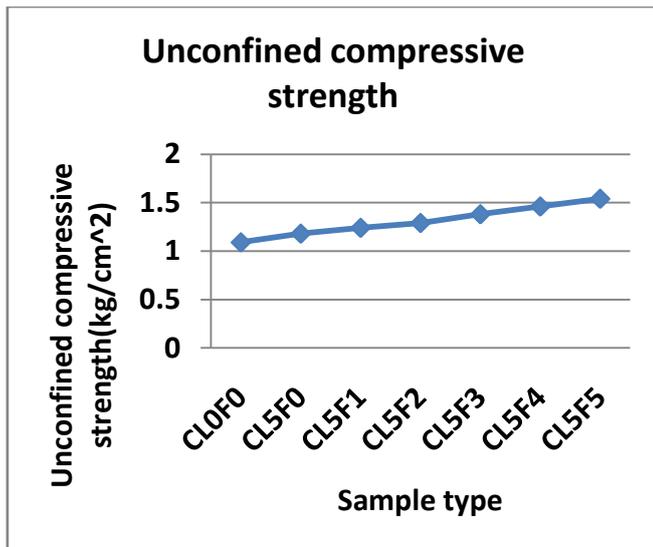


Fig. 5 – Variation of Unconfined compressive strength

#### IV. CONCLUSIONS

From the series of tests conducted on black cotton soil mixed with lime and jute fibres, the following conclusions are drawn :

1. The shrinkage limit values increases from 13.75% to 28.68% with increase in the jute fibres percentage (fig.1).
2. The Optimum moisture content values increases from 16.20 to 19.60. The Maximum dry density are also decreased from 1.68 to 1.58 (fig.2 & fig.3).
3. There is significant increase in California bearing ratio and unconfined compressive strength values. The C.B.R. increases from 3.10% to 4.95% and unconfined compressive strength from 1.09 kg/cm<sup>2</sup> to 1.35 kg/cm<sup>2</sup>. The variation is presented in figure 4 and 5.
4. From the test results it can be concluded that the addition of jute fibres to lime stabilized BC soil decreases its swelling behaviour and increase the C.B.R. and unconfined compressive strength properties.

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# A New Sort of Study upon Devices Life Span Advancement Techniques with Wireless Sensor Communities

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## Abstract

In the previous years, Wireless Sensor Networks (WSNs) have increased expanding consideration from both the clients and scientists. It is utilized as a part of different fields which incorporate ecological, social insurance, military and other business applications. Sensor hubs are battery fueled so vitality imperatives on hubs are extremely strict. At the point when battery gets released, sensor hub will get detached from remaining system. This outcomes in connection disappointment and information misfortune. In a few applications battery substitution is likewise impractical. Consequently, vitality proficient strategies ought to be outlined which will upgrade lifetime of system and precise information exchange. In this paper, diverse wellsprings of vitality dissemination are recorded trailed by vitality effective systems to improve lifetime of the system.

### Keywords:

*Remote sensor systems, vitality productive strategies, lifetime of system.*

## 1. Introduction

The Advancement in remote correspondence prompts create remote sensor systems (WSN). It comprises of little gadgets. These gadgets gather data by organizing with one another. These modest gadgets are called as sensor hub which comprises of CPU (for information handling), memory (for information stockpiling), battery (for vitality) and handset (for accepting and sending signs or information starting with one hub then onto the next).

The span of every sensor hub fluctuates with application prerequisite. For instance, sensor hubs are infinitesimally little in military applications. The expense relies on parameters such as memory size, handling rate

and battery [1]. Remote sensor systems are utilized as a part of business and mechanical zones like living space observing, ecological checking, human services, reconnaissance and procedure checking. We can likewise utilize it to screen an action, for example, physical and ecological conditions, for example, temperature, weight, sound and pass their information to the sink which is the base station (called sink). A sensor hub incorporates three fundamental segments which are as per the following:

- a) A detecting subsystem for information securing from the physical encompassing environment.
- b) A preparing subsystem for nearby information handling and capacity.
- c) A remote correspondence subsystem for information transmission.

The battery source supplies vitality required by the gadget to perform assignments. Be that as it may, it comprises of restricted vitality asset. It turns out to be extremely hard to revive the battery, since hubs might be set in unfriendly or unconventional environment. Among the arrangement of potential situations, applications with observing errand advantage from this innovation as WSNs permit an information obtaining at scales and resolutions that are hard to accomplish with past methods.

Lifetime of a sensor system ought to be sufficiently long to satisfy application necessity. Outside force supply demonstrates a non-consistent conduct so

vitality cradle is required. In this way, vitality protection assumes key part in configuration of frameworks taking into account remote sensor systems.

A WSN comprises of various sensor hubs spread over a little or substantial land region. Every sensor hub has remote correspondence ability and noteworthy insight for sign handling and systems administration of the information. AWSN can be set in remote geological areas [2]. It requires least measure of setup and organization costs. In WSNs the hubs demonstration both as hosts and as switches.

They work in a self-sorting out and adjusting way. Commonplace WSNs correspond specifically with a brought together controller or a satellite, in this manner correspondence between the sensor and controllers depends on a solitary jump. In future, a WSN could be an accumulation of independent hubs that correspond with one another by shaping a multi-bounce system. The utilization of WSN is expanding step by step and in the meantime confronting issue of vitality imperatives as far as short battery lifetime.

Each hub relies on upon the battery hotspot for different exercises; this has turning into a noteworthy issue in remote sensor systems. On the off chance that anybody hub among every one of the hubs gets fizzled, the whole framework gets intruded. Each sensor hub can be in dynamic, rest and sit still modes. In dynamic state, accepting and transmission of information is done. Out of gear mode, the hubs expend same measure of vitality as in dynamic mode. While in rest mode, hubs make radio to shutdown to spare the vitality. The accompanying steps can be thought about to spare vitality created by correspondence in WSNs [3].

- a) Schedule the different conditions of hubs (i.e., transmitting, accepting, sit or rest).
- b) Change in transmission range between the detecting hubs.
- c) Use of effective steering and information gathering systems.
- d) Avoid the treatment of undesirable information as in catching procedure.

By and large, (e.g., Observation applications), it is impractical to supplant the battery source which is depleted of vitality. Numerous analysts are attempting to discover force mindful conventions for remote sensor systems with a specific end goal to overcome vitality effectiveness issues. Conventions ought to give ongoing backing as they are connected in regions where information is detected, handled and transmitted. On the off chance that a convention has a quick and solid in responses to changes in system, it is said to have constant backing. The postponement in transmission of information from sensor hubs to sink ought to be less, which transforms into quick reaction.

## 2. CHALLENGES IN THE NETWORK DESIGN AND ROUTING ISSUES

A few elements ought to be thought about while outlining a system and directing conventions. A few confinements of system assets influence WSNs, for instance, vitality, focal handling unit, data transmission and capacity [4][5]. The difficulties in outline of sensor systems include taking after fundamental aspects[4][5][6]:

### 2.1 Sensor Deployment

While planning of directing conventions, one needs to deal with the areas of the sensors. A large portion of the conventions accept that the sensors are in worked of GPS recipients or utilize some limitation strategies to think about sensor positions.

### 2.2 Limited Energy Capacity

Since batteries are utilized as a force source as a part of sensor hubs, they have constrained vitality limit. In front line, as it is unrealistic to revive batteries and access the sensors, vitality requirements on sensors are tight. At the point when vitality of the sensor achieves characterized limit, it won't ready to work appropriately. Thus, drawn out system lifetime can be accomplished by planning vitality proficient steering conventions for sensors.

### 2.2 Data Aggregation

Enhanced information exchange and in addition vitality effectiveness can be accomplished by utilizing information conglomeration method. The retransmissions of comparable bundles will be altogether

diminished which helps in minimizing the repetitive information.

#### 2.4 Various Sensing Application Requirements

There are various applications in which sensor systems are utilized. A solitary system convention can't fulfill the prerequisites of all applications. Subsequently directing conventions ought to have the capacity to in precise information conveyance and sink can accumulate all data about physical wonder on time.

#### 2.5 Scalability

In WSN, systems might be of various sizes and such systems might contain sensors with various limits and deviated joins between them. In such cases steering conventions ought to scale with these parts of system.

#### 2.6 Vitality

Vitality preservation can be accomplished at

- a) **Device level:** By proper determination and design of equipment.
- b) **Network level:** By selecting specialized routines and conventions.

The sensor hub comprises of handling unit, detecting unit, handset unit and force unit [7]. Preparing unit can read information of sensor furthermore perform a few counts and make a parcel prepared to move in the channel. Sensor changes over vitality starting with one frame then onto the next structure. Fundamentally it goes about as a transducer which changes over vitality into simple or computerized signal. Sensors can be prominent in view of sort of vitality they distinguish or exchange to the framework. Common sensor hub can be worked with various sorts of sensors. Some of them need a lot of vitality than others.

### 3. REASONS OF ENERGY WASTAGE

In WSNs, vitality is scattered by sensors while detecting, preparing, transmitting or accepting information to satisfy the mission required by the application. Information sensing so as to obtain is finished subsystem. The vitality can be spared if information from transducer can be minimized. Correspondence framework is an insatiable wellspring of vitality scattering. Extraordinary measure of vitality is squandered in states that are futile from the application perspective[8].

#### 3.1 Collision

At the point when a hub gets more than one parcel in the meantime, impact will happens between these bundles. All bundles that cause the crash ought to be tossed. Also, retransmission of these bundles is required.

#### 3.2 Overhearing

At the point when a sender transmits a bundle, every neighboring hub in its transmission range get the parcel regardless of the possibility that it is not bound for them. In this way the vitality is squandered when a hub gets parcels which are not proposed to be gotten.

#### 3.3 Idle Listening

It is one of the significant wellsprings of vitality wastage. Vitality scattering happens when a hub is listening to an unmoving direct keeping in mind the end goal to get conceivable movement.

#### 3.4 Interference

The hubs situated between transmission extent and obstruction range gets a bundle however can't decipher it. A forementioned reasons give us general thought regarding vitality scattering sources. As system lifetime gets to be essential variable for assessing WSN, vitality protection methods ought to be intended to upgrade the system lifetime.

### 4. ORDER OF ENERGY EFFICIENT TECHNIQUES

Vitality effective strategies can be characterized in five principle classes specifically, information diminishment, convention overhead decrease, vitality productive directing, obligation cycling and topology control.

#### 4.1 Data Reduction

It primarily concentrates on diminishing the measure of information delivered, prepared and transmitted. Information pressure and information collection utilizes information diminishment method.

#### 4.2 Protocol Overhead Reduction

This method is utilized to expand convention proficiency by diminishing the overhead. Streamlined flooding is likewise used to decrease the overhead.

Transmission times of messages are chosen relying on the dependability of the system, or on the separation to the wellspring of the transmitted data.

### 4.3 Energy Efficient Routing

Directing conventions ought to be planned in a manner that system lifetime ought to be expanded and vitality devoured by end-to-end transmission ought to be minimized. Hubs with low lingering vitality ought to be kept away from. A few conventions use land directions of hubs to construct a course toward the destination. Others construct an order of hubs to improve directing and decrease overhead. Information driven conventions send information to just hubs which are intrigued to keep away from pointless transmissions.

### 4.4 Topology Control

It alters transmission control and keeps up system network. It will diminish vitality utilization.

## 5 GENERAL APPROACHES FOR ENERGY SAVING

Diverse routines can be utilized to diminish vitality utilization in remote sensor systems (WSN, for example,

### 5.1 System Partitioning

Sensor hubs in WSN have constrained measure of vitality as they are battery fueled. The sensor hubs might be conveyed in unforgiving natural conditions relying on the application prerequisite. Hub disappointment is tranquil normal in barrier applications where issue of vindictive treating; ecological corruption can influence execution of hubs.

Because of which system topology might get to be disengaged. Because of disappointment of set of hubs, a subset of hubs that have not fizzled likewise gets to be isolated from rest of the system. This is called as "cut" in a system which brings about loss of bundle information. The method is utilized which separates the sensor hubs into N sets to accomplish the maximal lifetime change. Framework apportioning can be utilized to diminish vitality utilization in the system.

### 5.2 Dynamic Voltage Scaling

To add to a vitality productive framework is one of the difficulties in remote sensor systems. It is a method to

decrease vitality utilization by differing the CPU recurrence. Changing the CPU recurrence can influence time keeping usefulness of sensor stages. In [9], creator expressed diminishment of vitality utilization in remote sensor systems by means of element voltage scaling while lessening effect of CPU recurrence exchanging on time synchronization. Dynamic voltage scaling (DVS) and element voltage and recurrence scaling (DVFS) strategies have been broadly used to diminish vitality dispersal continuously and occasion driven frame works.

### 5.3 Energy Efficient MAC Protocols

Remote sensor system is an appealing decision for different applications as no wired system is included. Different remote systems are not as vitality compelled as remote sensor systems. As different systems can be connected to mains supply or furnished with batteries that are rechargeable and replaceable. One of the prime wellsprings of vitality exhaustion in WSN can be controlled by medium access control (MAC) protocols[10]. MAC conventions can be named controlled access(CA), random access(RA), slotted access(SA), hybrid protocols(HP).

### 5.4 Energy Aware Routing

Vitality mindful information driven directing convention (EAD) [11] is circulated steering convention, which frames a virtual spine involved dynamic sensors that are in charge of in-system information handling and activity handing-off. EAD methodology is vitality mindful and valuable expanding system lifetime.

### 5.5 Duty Cycling

The best vitality saving operation is to put the radio handset in low power mode i.e. rest mode at whatever point correspondence between hubs is a bit much. The radio ought to be exchanged off when there is no information to exchange or to get and ought to be made dynamic when an information parcel gets to be prepared [12]. The exchanging in the middle of dynamic and rest mode can spare vitality usage. Along these lines, hubs substitute in the middle of dynamic and rest periods.

### 5.6 Network Coding

System coding is utilized to upgrade a system's throughput, productivity and versatility [13].This procedure enhances the limit of a system with better utilization of data transmission. The hubs of the remote

system take a few parcels and send them together for transmission to achieve greatest conceivable data stream. Middle hubs encode information bundles got from neighboring hubs. Fundamentally this system is utilized to lessen movement in bottleneck zone or territory close to the sink. The hubs in bottleneck zone are inclined to drain their energies immediately called as vitality entire issue in WSN.

At whatever point a hub goes into the bottleneck zone, system coding layer keeps up got line and a detected line. At whatever point it gets a parcel a hub put the bundle in got line. Encoded (XOR) parcel is produced by bundles from detected line and got line. On the off chance that got bundle is as of now handled then it is disposed of by the hub. In the event that the hub is not an encoder hub, it goes about as hand-off hub and transmit parcel to the sink. Obligation cycle and system coding method can be consolidated to utilize the system assets viably.

## 6. CONCLUSION

Vitality sparing in remote sensor systems have pulled in a considerable measure of consideration in the late years. It is one of the basic viewpoints for WSNs. The overview is done about vital ways to deal with vitality protection in remote sensor systems. Vitality monitoring system correspondence methods turn out to be more vital. This paper is review about what are the systems that are utilized as a part of the remote sensor systems for upgrading the life time of systems. It set forward both development methods and some of past strategies .Important procedures are condensed yet at the same time a few improvements are required.

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# Vitality Efficiency Info Gathering using Shortest Route in WSN's

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**Abstract**—A remote sensor system (WSN) is a remote system comprising of spatially dispersed self-sufficient gadgets utilizing sensors to screen physical or natural conditions. A WSN framework consolidates a portal that gives remote network back to the wired world and dispersed hubs. Vitality utilization and constrained battery life is the primary issue in remote correspondence particularly in remote sensor system. In this manner as of late vitality productivity is getting more consideration in remote sensor system. To enhance the battery life of sensor hubs we permit the sink to move in sensor system. For better sink versatility, the development example of the sink ought to be chosen, with the goal that sink can take after the way and accumulate the information all the more effectively additionally in less time. Sink Trail and Sink Trails, two vitality proficient proactive information reporting conventions are utilized to choose the most brief way for sink portability.

**Index Terms**— Sinks, Sink Trail, Sink Trails, Data get-together, and Sensor Nodes.

## I. INTRODUCTION

A remote sensor system (WSN) is a remote system comprising of spatially conveyed self-governing gadgets utilizing sensors to screen physical or ecological conditions. A WSN framework joins a door that gives remote network back to the wired world and dispersed hubs. Engineers have made WSN applications for zones including social insurance, utilities, and remote checking. In social insurance, remote gadgets make less obtrusive patient checking and medicinal services conceivable. For utilities, for example, the power network, streetlights, and water municipals, remote sensors offer a lower-cost technique for gathering framework wellbeing information to lessen vitality use and better oversee assets. Remote checking covers an extensive variety of utilizations where remote frameworks can supplement wired frameworks by diminishing wiring costs and permitting new sorts of estimation applications. Remote checking applications include:

- Environmental observing of air, water, and soil
- Structural observing for structures and extensions

- Industrial machine observing
- Process observing
- Asset following

Remote sensor systems comprise of individual hubs that can collaborate with the earth by detecting or controlling physical parameters. These hubs need to work together to satisfy their undertakings. The hubs are interlinked together and by utilizing remote connections every hub can impart and team up with each other. The sensor field constitutes sensor hubs.

Normally, a sensor hub can perform undertakings like calculation of information, stockpiling of information, correspondence of information and detecting/incitation of information. A fundamental sensor hub commonly includes five primary segments and they are to be specific controller, memory, sensors and actuators, specialized gadget and force supply. A controller is to process all the applicable information, fit for executing self-assertive code. Memory is utilized to store projects and middle information. Sensors and actuators are the real interface to the physical world. These gadgets watch or control physical parameters of nature. The specialized gadget sends and gets data over a remote channel. Lastly, the force supply is important to give vitality.

In remote sensor systems, power utilization proficiency is a standout amongst the most imperative configuration contemplations. In this manner, these interlaced parts need to work and adjust the exchange offs between as little vitality utilization as could be expected under the circumstances furthermore the need to satisfy their assignments. On the off chance that the sensor hubs and sink both are static then more vitality is required by the sensor hubs to pass on the vitality towards the sink hubs. Along these lines to diminish the force utilization of sensor hubs scientists incorporates the idea of sink portability. Sinks are permitted to move in the system and assemble the data from the sensor hub and procedure over it. Accordingly, Sensor hubs does not require to cost vitality to exchange the information toward sink hubs.

At the point when the idea of portable sink is presenting, the sink can be a robot, vehicle or creatures which are furnished with radio gadgets are utilized which are send into the system and straightforwardly speak with the sensor hubs which results in streamlined information transmission way and lessens the vitality utilization. Sink versatility decreases the vitality utilization; it presents new difficulties in sensor system applications. At the point when the sink is permitted to move in the system, way ought to be trailed by the sink with the goal that it can work all the more viably. For the better development of the sink in the system, course should be found, on which sink can move productively and accumulate the information in least time.

A few calculations have been proposed to discover the upgraded course, for example, on-interest directing, separation vector steering, land steering and so on when geological directing is utilized the drawback as a part of that is, it accepts that the topographical area of the considerable number of hubs are known. Numerous specialists concentrate on arranging a portable sink's moving direction ahead of time to advance the system execution. Be that as it may, in numerous applications predefined direction is not pertinent. So, without predefining the direction we permit the moveable sink to habitually declare the area data all through the system.

Sink Trail, a proactive information reporting convention is utilized as a part of sensor system where the sink moves consistently in the system, in moderately low speed and accumulate the information. At specific separation after same time of interim sink hubs telecast the control knead in much lower recurrence than it customarily required in existing information gathering convention. The position where the message is telecast is called as "impressions".

This impression is considered as virtual point of interest. Utilizing this virtual historic point sensor hub can without much of a stretch recognize its jump tally separation from the milestone. These jump check separations consolidated speak to the sensor hub's direction in the coherent direction space built by the portable sink. By utilizing the destination directions and its own directions, every sensor hub chooses the following jump with the improved separation.

Hence the convention finds the streamlined way without utilization of GPS or any predefined milestone. This convention decreases the unpredictability of the directing calculation and additionally builds the battery life time of the sensor hubs.

## II. RELATED WORK

Wired system concentrates on amplifying the end-to-end throughput and minimizing the deferral. In any case, vitality utilization and constrained battery life is the fundamental issue in remote correspondence particularly in remote sensor system. In this manner as of late vitality productivity is getting more consideration in remote

sensor system. In view of the versatility example of the portable hub's information gathering plan is separated into two classifications.

*A. Wild Mobility*

In Uncontrollable Mobility, the versatile authority moves haphazardly. In proposed to utilize an exceptional kind of portable hubs as sending specialists is utilized to encourage network among static sensors and transport information with irregular portability. In portable hubs are not permitted to choose straight course to accumulate the data in the system. Batalin et al. set proposed a framework NIMs, where portable authorities can just move along altered links amongst trees and guarantee that they can be energized at whatever time amid the development. A known component of these methodologies is high security and dependability, and the framework upkeep is basic. In any case, they normally do not have the deftness and can't be versatile to the sensor dispersion and natural flow.

*B. Controlled portability*

Controlled versatility is the second classification in which the portable gatherers move anyplace in the system uninhibitedly and its direction will be plan to move proficiently in the system. To expand the battery life of the sensor hubs, visit arranging calculations is utilized for accomplishing a short information gathering visit and to transfer every one of the information inside a solitary bounce. While these methodologies minimize the vitality utilization by totally evading multi jump transfers, they may bring about long information gathering inactivity particularly in an extensive scale sensor system. Information gathering plan is proposed in that mutually considers the full use of simultaneous information transferring and visit length minimization. In the plan, various sensors can at the same time transfer information bundles to the versatile gatherer in a solitary jump, which effectively abbreviates information transferring time. Effective information gathering turning into a more imperative as of late, for which numerous plans are proposed by specialists. These plans are classified in three sections, productive hand-off steering , various leveled base, and portable information gathering.

*C. Examination of information social event plans*

In surveying-based methodology portability of sink is controllable where the way of movement is not choosing. In single-bounce information gathering (SHDG), a portable authority stops at some chose sensor hubs to gather information such that solitary jump information transferring from every sensor to the versatile gatherer can be ensured. In controlled portable component plan (CME), a versatile authority crosses the predefined track and gathers information from the sensors close-by with multihop transfers.

TABLE I: EXAMINATION OF INFORMATION SOCIAL EVENT PLANS

	<b>Polling Based Approach</b>	<b>Single Hop Data Gathering</b>	<b>Controlled Element Data Gathering Scheme</b>
<b>Pattern of motion</b>	Can move anywhere, Controllable	Can move anywhere, Controllable	Path is decided, uncontrollable
<b>Locations for data gathering</b>	Movable sink stops at selected sensor nodes and gather data	Movable sink stops at subset of sensor nodes and gather the data in single hop	Pausing locations are not predefined
<b>Moving path</b>	Starts from sink visit each node at least once	Starts from the sink cover all the locations in transmission range	Moves on predefined path

*D. Various leveled Infrastructure*

In progressive base WSN is gathered into bunches, where in every group one group head is pick which is in charge of the information exchange from on one sink to another. Be that as it may, in progressive foundation

bunch head expends more vitality than other sensor hubs. Since every sensor hub perhaps get to be group head every hub ought to be capable for approaching and active movement. It expands the general expense of the system. It might build overhead because of incessant data trade among sensors.

#### *E. Portable Data Gathering*

When static various leveled system is utilized numerous issues are happened amid information gathering. To conquer this issue versatile information gathering plan has been proposed. In this plan portable gatherers are utilized which interfaces the static sensors. The portable authorities, called information donkeys, are proposed in, which accumulate the information from close-by sensors store its and last process it. Despite the fact that it decreases the vitality utilization of the sensor hubs, its moving direction is not controllable and parcel deferral is not unsurprising. In a vitality proficient item following plan is proposed in which the quantity of following sensors is minimized through direction expectation. Here the portable operators are stay in contact of sensor hubs constantly which are closer to the article which we need to track. As the portability of the haphazardly moving item is not unsurprising and not controllable, most extreme bundle postponement are not garneted. In this manner for the sensor hubs conveyed in the urban ranges, transports or prepares go about as versatile base stations.

Presently the moving way and time is unsurprising. In spite of the fact that the portable information gathering plan diminishes the vitality utilization in remote sensor system, information gathering inactivity is expansions. The plan essentially centered around minimizing the moving direction however did not consider the information transferring time. These perceptions propose to outline a plan which minimize the aggregate information gathering time which incorporates moving time of the information authorities and additionally information transferring time of sensor system. Along these lines the joint methodology of versatility and space- division numerous entrance (SDMA) system is proposed in.

#### *F. Versatility and Space-division Multiple Access (SDMA) Technique*

In this method portable gatherers go about as versatile base station and surveys every sensor while navigating its transmission range. Every sensor hub specifically sends data towards portable gatherers with no transfer so that the lifetime of sensors can be drawn out. SDMA procedure is additionally connected to information gathering by outfitting the versatile authority with two receiving wires. With SDMA, two unmistakable good sensors may effectively make simultaneous information transferring to the versatile gatherers. At the point when the idea of sink versatility is presented it additionally presented new difficulties. Numerous methodologies and conventions are proposed by the specialists to diminish the control overhead in the system presented by sink versatility.

### III. PROPOSED WORK

#### *A. Sink Trail Protocol*

Consider a huge scale, consistently dispersed sensor system sent in an outside region where the hubs in the system speak with each other utilizing radio connections. All hubs in sensor system are associated with each other. We accept that when the procedure information accumulation begins sensor hubs will wake up means they are in alert state. To accumulate the information from the system versatile sinks are utilized which are occasionally send as a part of system. As vitality supply of versatile sinks can be supplanted or energized effortlessly, they are accepted to have boundless force. At the point when versatile sink enters in the system it ends just when enough information is accumulated or there is no information to assemble.

The Sink Trail convention is proposed for sensor hubs to proactively report their information back to one of the portable sinks. In Sink Trail Protocol amid the information gathering sink moves in the given system in low speed and focus on the reporting information bundle. Portable sink stops at some spots for brief length of time, show the message to entire system and begins advancing. The focuses where the sink stops are called as trail focuses and the telecast message are called as trail messages. There is no any predefined example is trailed by this trail focuses. Trail messages created by the sink contain the arrangement number and the bounce check of sink. The time interims between two Trail focuses are known as "move".

#### *B. Calculation for portable sink technique*

1. Initialization
2.  $Msgseq \leftarrow 0$
3.  $msghop \leftarrow 0$
4. step size parameter K

5. moving techniques
6. while not get enough information do
7. go to next trail point
8. msgseq←msgseq+1
9. stops eventually and show message
10. same time listen for information parcel
11. end while
12. stop

In sink Trail convention predefined points of interest are not utilized as a part of spot of predefined milestones coherent directions are utilized. To speak to the legitimate direction, sink references are utilized.

Every hubs keep up the trail reference and utilized amid the information sending. Two stages are utilized as a part of Sink Trail Protocol. Coherent direction space development is the primary stage. In this stage as indicated by versatile sink's trail messages sensor hubs redesign their trail references. Destination Identification is the second period of Sink Trail. Rather than planning a portable sink's development, it permits a versatile sink to suddenly stop at advantageous areas as per current field circumstances or fancied moving ways. These trail focuses in Sink Trail, are impressions of a versatile sink, and they give significant data to following the present area of a portable sink.

#### *C. Effect of number of portable sinks in system*

In sensor system number of versatile sinks influences the general framework execution. At the point when different portable sinks are utilized as a part of system, a few consistent direction spaces are built simultaneously and information bundles are sent to the destination reference utilizing the briefest way as a part of any direction space. As the quantity of portable sinks expands it diminishes the normal course length furthermore decreases the aggregate vitality utilization. In any case, more portable sinks likewise present heavier weights for trail message television and steering data support. Far and away more terrible, various number of versatile sinks in a system bother control activity clog and correspondence delays, which will thus bring about higher parcel misfortune and retransmission rate.

#### IV. CONCLUSION

In this paper different part of information social affairs plans, for example, uncontrolled portability, controlled versatility, proficient transfer steering, various leveled framework is talked about, besides concise idea of Sink Trail convention is portrayed for vitality productive information gathering where effect of numerous sinks in system is depicted .

Sink Trail utilizes sensible directions to choose separates, and sets up information reporting way by eagerly selecting the briefest way to the destination reference. It likewise comprises wanted elements of topographical directing without requiring GPS gadgets or additional historic points introduced.

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# Requirement Gathering and Classification: An Engineering Perspective



Thakur Ritesh Bankat Singh, S.V.A.V. Prasad, Malla Reddy Jogannagari, Tapsi Nagpal

**Abstract:** *Gathering the requirement is the vital steps for every successful quality software. Requirement Engineering is the key role for gathering the requirement. The good quality software development require useful data requirement. In recent Software Engineering achieve the data centric with the involvement of big data, artificial intelligence (AI) and machine learning. The most of data gathered from different sources with the evolution of technology, social media and other sources. There are many factors while gathering the requirement to produce the product with good quality. This Paper highlights and extends the research scope of existing requirement engineering to meet the new challenges of requirement clusterization and increase the productivity of product in regards to customer requirement. There is need of applying classification and clustering technique to form requirement clusterization.*

**Keywords:** *Requirement Analysis, Classification, Clustering, Requirement Engineering, Requirement Elicitation.*

## I. INTRODUCTION

Requirement Engineering is a important phase of software development life cycle. The purpose of requirement engineering is deal between the client and developer. The collection of full and consonant requirements can lead the quality of software product and can fulfill the user requirements. The requirement engineering is a tough exercise that considers the product requirement demands from the number of viewpoints, roles and responsibilities [2]. The proper execution of requirement engineering will have direct effect on the product quality of the software.. In this paper, we highlight the role of requirement engineering and its activities in the development of quality software product. Requirement engineering is the incremental process.

It is the systematic technique for requirement elicitation, requirement analysis, requirement specification, requirement management .Traditionally, the requirement engineering is performed in the first phase of the software development life cycle [1]. The requirement engineering has dominant impact on the software product. The irrelevant or noise requirement present in a initial stage will be continued to the next stages of product implementation. Identification and modification of error at initial stage is more easier than the later stage in terms of time and cost.

Because of this requirement engineering is the important phase to reduce the errors at the initial stage of the good quality software development. There are many factors while gathering the requirement to produce the Software with good quality. There is a need of applying classification and clustering technique to segregate the requirements of same type. This Paper extends the research scope of existing requirement engineering to meet the new challenges of requirement clusterization and increase the productivity of product in regards to customer requirement. In this we form the cluster of same requirements based on number of requirements' received from the different users.

During the software development the quality of software project is decided in terms of requirement elicitation and requirement managing process.

Research paper provides comprehensive view of the role of requirement gathering in the requirement Engineering. The different sections in the paper are as follows. The Section II focused on the literature review of requirement engineering. Section III describes the taxonomy of requirement engineering. section IV describes various challenges & issues. Section V contains conclusion.

## II. LITERATURE REVIEW

In the field of requirement engineering number of researches share their knowledge as follows J Malla Reddy, et al [1], discussed about the requirement engineering concept Huma Hayat Khan, et al [2], discussed the factor generating the risk in the mean time of requirement engineering process in paradigm of Global software development. The work is useful for the people with less experience working in the global software development. Dr. Rajinder Singh [3]. conducted the survey on different software development organizations. He analyzed with evidence how quality of software product co-related with the reengineering process Swarnalatha. K.S, et al [4] proposed the dynamic framework for requirements engineering process model to produce better requirements for any software. The successful implementation of proposed requirement engineering process can have a good impact on the production of quality and quantitative software product.

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## Requirement Gathering and Classification: An Engineering Perspective

Dr. Rajinder Singh [5] reviewed crucial processes used in requirement engineering role is the software development with practical survey conducted on Indian companies and evaluated results for better software product.

Haron, et al [6] described the role of people, process and technology during software project requirement. He conducted survey on IT Industry of Malaysia and find out 79.7% of IT Managers are in the requirement engineering process performing the roles of Project leaders and project managers. Dharendra Pandey, et al [7], presented the paper on requirement engineering and its influence on quality software development. In this I studied different classification methods for requirement engineering.

Abhijit Chakraborty et al [8], Implementing an effective method on requirement engineering the example of health care system. Saima Amber, et al [9], presented research paper on determination of risks in the requirement analysis process with framework model. In this comparison of model is shown on the basis of risk identification techniques. Dharendra Pandey, et al [10], described the basic fundamentals and dimensions of requirement engineering process and provide the idea on software requirement specification.

### III. ISSUES AND SOLUTION FOR REQUIREMENT GATHERING

Requirement gathering is a crucial part of any project. It will become a challenging attempt to achieve it. Knowledge expert role is to gathering the requirement. There are some common problems while gathering requirements. Every problem will have some solution in same way there are some suggestion to overcome from the problem while gathering the requirement. The good requirement always makes the software project successful.

#### A. Undocumented Processes

There is poor documentation or no documentation in many organizations about the existing processes. Here requirement gathering become a two step process. Firstly area of information of existing process and then identifying area for improvement and enhance optimization.

To confirm requirements are full and correct, its important to identify main stakeholders and subject knowledge experts and contact with them directly.

#### B. Conflicting Requirements

The business analyst will play the crucial role in document all the requirements. The ideas of the entire stakeholder will never be same and it leads to conflicting requirements. Business analyst identifies inconsistent requests and let stakeholders decide on priorities.

Business analyst has to listen stake holder's opinion and have some recommendations about what should be prioritized. The opinion of stakeholder will be crucial while gathering the requirement.

#### C. Lack of Access to End Users

Sometimes end users were too busy in their daily routine task and unable to participate in requirement gathering process. Absence of end users may lead to a few reasons and requires appropriate resolution.

Business analyst will play the crucial role. Defining groups and finding the most suitable end users in each group. Doing as much research as possible prior to the engagement

will help to make conversation more structured and insightful.

#### D. Validating And Tracing Requirement

Requirement gathered are listed should be cross checked before starting the implementation. It avoids the irrelevant requirement. Tracing the requirement will play the vital role. There should be forward as well as backward traceability.

#### E. Stakeholder Design

Stakeholders or end user have the need to utter how the system should work rather than providing details about what the system should do.

Hearing to stakeholders about possible solution can be perceptive but may also redirect actual problems and better solution designs.

#### F. Communication Issues

This includes language difference, unclear assumptions, and wrong vocabulary that lead to misunderstand between stakeholders and a business analyst.

The best solution to overcome from this is to establish two way communications.

### IV. REQUIREMENT ENGINEERING PROCESS

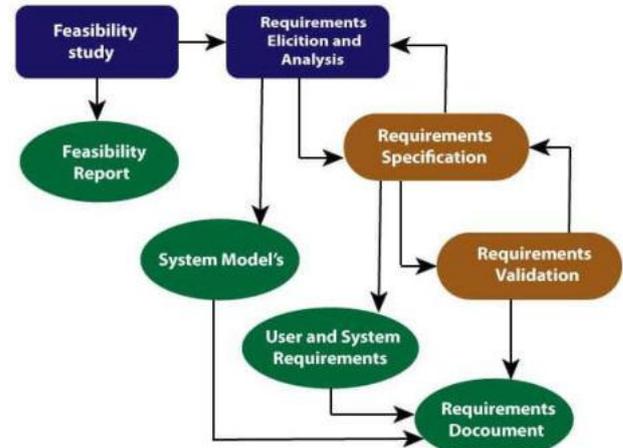
Requirement engineering process consist of four steps they are

Feasibility Study

Requirement Elicitation and analysis

Software requirement specification

Software requirement validation



Requirement Engineering Process

#### A. Feasibility Study

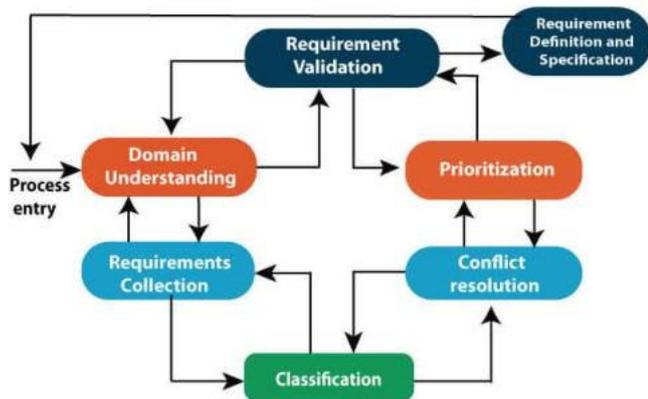
The feasibility study is used make the reasons for creating the software that satisfy the user requirement. It should be flexible to change and consistent to established the standards. There are three types of feasibility study. They are Technical Feasibility, Operational Feasibility, Economic Feasibility, Technical Feasibility determines the latest technologies which are required to gather the customer requirement within the time and budget.

Operational feasibility examines the range in which the required software performs a series of level to solve business problems and customer requirements. Economic feasibility deals with the financial analysis of the organization. It decides whether the necessary software can generate financial profits for companies.

**B. Requirement Elicitation and Analysis**

In this requirement are recognized with the help of stakeholder, customers and existing system. In this gathering of requirement is done. Analysis of requirement begins with requirement elicitation. The requirements are analyzed to find the missing, incomplete, inconsistencies. Problems of Elicitation and Analysis Only right people must involve gathering all requirements. Sometime stakeholders don't know what they required. Knowledge experts can involve gathering the requirements. Sometimes requirement is not specified in the detailed manner. Conflict requirements arise due to different opinion. During analysis process requirement can change.

**Elicitation and Analysis Process**



**C. Software requirement specification:**

Requirements are collected from the different sources. A document is prepared by the software analyst after the requirements collected is known as software requirement specification. The requirements received from the stakeholder are in natural language. It is the job of the analyst to translate the requirement in the technical language. It will help to the development team to understand technical language very easily. ER diagrams, data flow diagrams, data dictionaries will be used. E-R diagram is a detailed logical representation of the data for the organization. It mainly consists of data entities, relationship and their associate attributes. Data flow diagrams represent the flow of data through a system. DFD'S are mostly used for modeling the requirements. Data Dictionaries are repositories to store information about all data items defined in DFDs. It should ensure that the stakeholder and developers uses the same definition and methods at the requirement stage.

**D. Software Requirement Validation**

It is the process of checking that requirements defined for development, define the system that the customer really needs. Requirement validation performs to check issues related to requirements. Some of the requirement validation techniques are Automated consistency analysis Prototyping Test Case generation Requirement inspection A complete Software Requirement Specification should be:

-Clear

- Consistent
- Correct
- Modifiable
- Verifiable
- Traceable

**V. CONCLUSION**

From above study, it is concluded that requirement gathering is the crucial steps in software project. The Various factors that contribute to the requirement engineering process based on the knowledge of requirement engineer and commitment of stakeholder. Requirement gathering can be used for software development process to produce a quality product.

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## Requirement Gathering and Classification: An Engineering Perspective



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## **Analysis of the Genome Sequence for the Purpose of Understanding the Causes and Treatments of Bipolar Disorder and Related Disorders**

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**Abstract:** In cases of bipolar disorder (BD), genetic factors have only been shown to contribute to a minor portion of the condition's heritability. Because of this, people have been looking into sub-phenotypes of BD, such as treatment response, in an effort to narrow the heterogeneity of BD. Using a variety of methods, the researchers in this study conducted a series of experiments with the goal of identifying molecular signatures that are related to bipolar disorder (BD), the response to lithium medication, and other subclinical traits in a cohort of individuals who have BD. First, we investigated the connection between lithium response and essential candidate genes already known to influence lithium response in other populations. In the second step of the process, a global and CpG island DNA methylation profiling was carried out with the goal of locating genomic loci that had distinct methylation patterns in lithium responders as opposed to non-responders. Third, a genome-wide copy number variation (CNV) study was done to find and describe CNVs that are linked to BD symptoms and how well lithium works. Finally, the results of an untargeted plasma metabolomic profiling showed that patients with bipolar disorder, both those who responded to lithium treatment and those who did not, had different amounts of a number of different metabolite species. The study's results support the idea that BD is most likely caused by the dynamic dysregulation of a large number of gene regulatory networks, proteins, and metabolic pathways, which is a sign of complex problems in the system.

**Keywords:** BP; DSM; WHO; CNV; ANOVA.

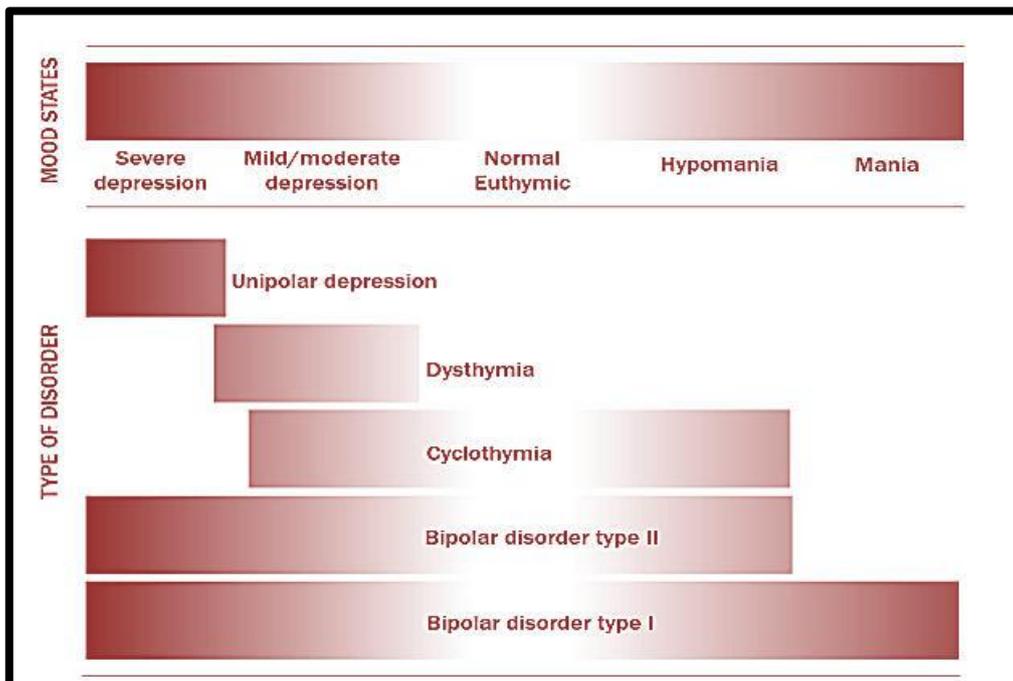
### **1. Introduction:**

Formerly called manic-depressive disease, bipolar affective disorder is a neuropsychiatric condition currently categorized as a mood disorder. Patterns of aberrant and extreme mood swings, from periods of depression to heightened mood, which is called mania, characterize this medical disease for which this diagnostic word is used. There is a wide variety of manifestations of bipolar disorder (BD) [1]. Treatment success is condition-specific and can occur in tandem with other psychiatric disorders. Without treatment, BD can have devastating effects on not just the quality of life of those who suffer from it but also their loved ones and the larger community [2]. Psychosis, both manic and

depressive, can occur in the most severe forms of BD, which is coupled with cognitive and behavioral issues. The disease is extremely problematic from a public health perspective because it leads to increased suicide mortality and requires recurrent hospitalization [3].

**1.1. Nosology, Symptoms, and Clinical Course of BD:**

Psychiatric conditions that fall under the umbrella of "bipolar disorder" are quite varied. Clinical studies that tracked patients over time in the late 20th century revealed a striking diversity of phenotypes among the affected group. Mania without depression, dysthymia, cyclothymia, and mania type I and II are all part of the bipolar spectrum. Figure 1 depicts some of the most common types of mood disorders and the symptoms associated with them [4]. BD is a chronic condition that can progress in a variety of ways throughout the course of a person's lifetime. The initial manifestation of BD might manifest as either manic or hypomanic symptoms, depressive ones, or a combination of the three. The initial episode of bipolar disorder is typically manic for men, while the first episode of depression is equally common in both sexes [5]. More than ten affective episodes may occur in a patient's lifetime if BD is left untreated. Most people with bipolar disorder have typical 'euthymic' intervals between manic and depressive episodes, during which they revert to a more or less normal mental state. In people with bipolar disorder, the duration of both manic and depressive episodes, as well as periods of remission (euthymia), varies widely. Manic episodes tend to be shorter in duration than those of depression or mania [6].



**Figure 1: Characteristics of mood states in different types of mood disorders.**

It has been estimated that the average duration of a manic episode is six weeks. It takes eleven weeks on average for a major depressive episode and seventeen weeks for a mixed episode. The time between episodes is shorter in later

seasons compared to the first three. After the first three episodes, both the number of episodes and their length begin to reduce and increase gradually [7]. Rapid cycling describes patients who have more than four episodes of disturbed mood per year. Females with BD are more likely to experience rapid cycling, which affects 5-20% of adult females. Some people with BD have a regular, predictable pattern of episode recurrence, with shifts from depression to mania or mania to depression, whereas others have no such pattern [8]. The long-term effects of BD-I in a South Indian community were assessed in a recent survey. Mania is the most common and often the initial manifestation of bipolar disorder (85% of cases) [9].

Affective episodes, most frequently mania, accounted for 11% of patient lifetimes on average. The average length of a depressive or manic episode was two months, and the average length of time until a relapse was 21 months [10-11]. Similarly, a cohort from north-east India and research conducted in a rural Indian community both found that BD often manifested itself through episodes of recurring mania.

## **1.2 The Diagnostic Procedure**

The diagnosis of BD, like that of other psychiatric diseases, is based on a thorough evaluation of the patient's psychological and behavioural health due to the lack of appropriate clinical laboratory tests. When diagnosing a patient with a mental disorder, psychiatrists follow established diagnostic interview methods that take into account the patient's history, personality, social and functional limitations, and other factors [12]. To rule out physical causes of psychiatric symptoms, it is occasionally necessary to perform a physical examination and review the patient's medical history. All diagnosable mental and behavioural illnesses are listed in chapter V of the tenth revision of the ICD (International Classification of Diseases). Diagnostic criteria for BD and related symptoms are detailed in the International Classification of Diseases, 10th Revision (ICD-10) (<http://apps.who.int/classifications/icd/>). The American Psychiatric Association's (APA) Diagnostic and Statistical Manual of Mental Disorders (DSM) is the gold standard for psychiatric diagnosis. Every few years, the International Classification of Diseases (ICD) and the Diagnostic and Statistical Manual of Mental Disorders (DSM) are updated or altered to reflect the latest research findings in the field of psychiatry. The following sections outline the key criteria used in the DSM-IV-TR to diagnose BD in clinical practice [12]

## **1.3. Genetics:**

Many different clinical observations have been made in BD, but the most consistent one is that BD is passed down via families. This is why a large portion of current studies aim to identify risk factors for the condition, such as specific genes or chromosomal locations [13]. Genetic research in the 21st century has made great progress in understanding the biology of BD, even though the specific genes or chromosomal locations causing this condition are still obscure. Multiple physiological mechanisms and alterations in CNS structure and function have been related to genetic predispositions to BD. Additional features of BD that are compatible with epigenetic dysregulation include discordance in monozygotic twins, parent-of-origin effects (POEs), late age of onset, and a varied illness course [14]. Epigenetic processes have been the focus of recent research into BD. The literature review in this thesis provides additional information on the genetics and epigenetics of BD [15].

## **2. Related work:**

Research conducted on families, twins, and adoptees over the past several decades has been crucial in elucidating the heritable nature of BD. It has been calculated via studies of families that the relative risk of BD among first-degree relatives is approximately 10%, or ten times that of the general population [16]. There is a 2-fold increase in the incidence of unipolar depression in first-degree relatives. In families with a history of bipolar disorder, unipolar depression is more prevalent due to its high population incidence. Moreover, schizoaffective disorder and schizophrenia were also found to occur at elevated rates in bipolar families. Diverse families have different histories, making it difficult to generalize about the transmission of BD. The true nature of heredity is further muddled by the existence of other psychiatric diseases in families where BD is present [17].

If one twin has BD, there is a 70-85% chance that the other does as well; for dizygotic twins, the risk is 15-25%. Taking into account these variations, BD has one of the highest estimated heritabilities among all psychiatric diseases, at 70–85 percent. As a result, environmental impacts, such as psychological factors, account for some of the risk (15-20%), meaning that it is not entirely genetic [18]. Research on adopted people with BD has found that their adoptive families tend to have fewer members with the disorder than their biological families. These findings provide more proof that BD is a genetically predisposed psychiatric disorder.

Candidate genes for neuropsychiatric diseases are those that code for critical enzymes in neurotransmitter metabolism [19]. The enzyme catechol-O-methyltransferase (COMT) is involved in the breakdown of the neurotransmitter catecholamines. The amino acid valine 158 is replaced by methionine as a result of the single-nucleotide polymorphism (SNP) rs4680 (A/G), also called Val158Met, in the COMT gene [20-22]. It has been found that the Val allele variant catabolizes dopamine at a rate roughly four times faster than its Met equivalent. Dopaminergic neuronal activity and synaptic dopamine levels are both raised when the Met allele slows down the pace at which dopamine is broken down. Both schizophrenia and BD, in which there is an excess of dopamine in the brain, have been linked to the Met allele. Several other COMT polymorphisms, including Val158Met, have been associated with pharmacological response, especially to second-generation antipsychotics that target the dopaminergic system [23]. Serotonin and other serotonin-related neurotransmitters are synthesized in part by the enzymes tyrosine hydroxylase (TH) and tryptophan hydroxylase (TPH1 and TPH2). Multiple studies have linked genetic variations in these genes to BD and schizophrenia. Evidence for BD has also been found in the genes D-amino acid oxidase (DAO), D-amino acid oxidase activator (DAOA), and monoamine oxidase A (MAOA). The vast majority of antipsychotic medicines work by blocking the effects of certain neurotransmitters at their receptors. Multiple studies have looked into the possible significance of neurotransmitter receptor genes in BD's genesis and therapeutic response. Multiple studies corroborated the findings in favor of the dopamine DRD3 and DRD4 receptors and the serotonin HTR2A and HTR2C receptors [24-27]. Furthermore, recent research has indicated a substantial relationship between BD and genetic variations in NMDA glutamate receptors and numerous types of GABA receptors. One of lithium's best-studied targets is glycogen synthase kinase 3 (GSK3). Although early reports suggested a positive relationship between SNPs in this gene and BD, several contradictory studies have since been published [28].

### **2.1. Psychotic Symptoms:**

Some people with BD also have psychotic symptoms of schizophrenia, such as delusions and hallucinations. The psychotic episode may accompany mania or depression. Throughout the course of their illness, more than half of BD patients will have a psychotic episode at some point. The most typical sign of psychosis is grandiose delusions, but others include hallucinations, inconsistent moods, and cognitive instability [29]. Patients with BD who also exhibit psychotic symptoms may constitute a distinct subtype of the condition, one that shares common etiological roots and genetic vulnerability with schizophrenia. The genetic analysis of psychotic BD is gaining attention as multiple studies demonstrate that psychotic characteristics tend to cluster in BD families [30]. Several chromosomal areas have been linked to potential psychotic BD susceptibility genes by linkage studies. COMT has been linked to this condition in candidate gene association studies.

### **2.2. Family History:**

One of the most reliable predictors of increased risk for BD is a family history of mood disorders. Family studies of BD have shown that a child with even one parent who also suffers from a mood illness has a 10-25% chance of developing the same condition. It nearly doubles if both parents are affected. Children are more likely to contract an illness if they have a large number of affected relatives [31-33]. First-degree relatives, as opposed to more distant relatives, carry a higher risk. Patients with BD who have a high prevalence of psychiatric illness in their families likely have a heavier burden from one or more causative genetic variations. Patients with BD, whether they have a family history or not, are just at the start of a comprehensive genetic analysis.

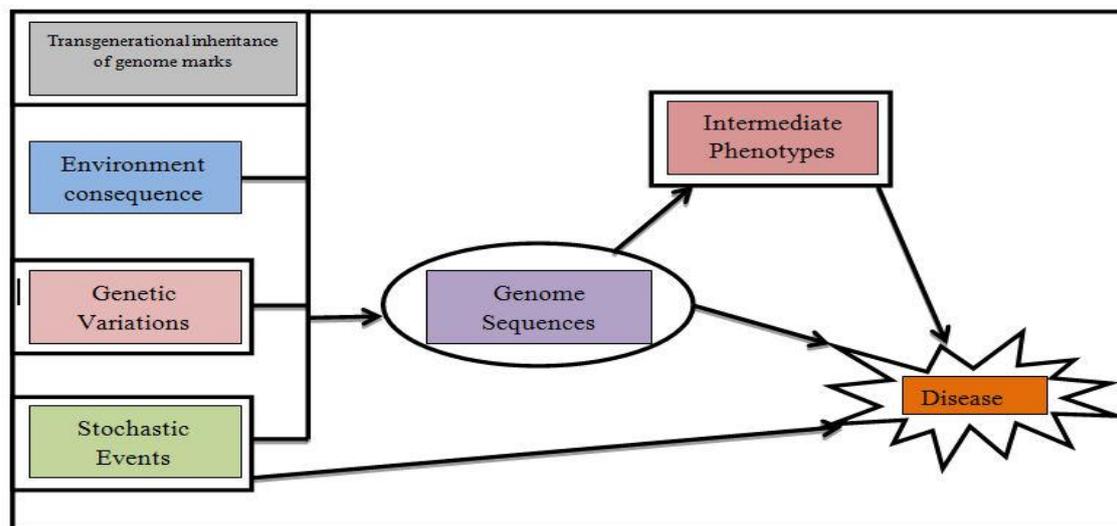
### **2.3. Genomic Structural Variations:**

Population and medical geneticists have focused extensively over the past few decades on identifying and mapping variants in the human genome. Short genetic variants and structural variants make up the bulk of human genomic variability [34]. Common polymorphisms and point mutations are examples of the short-range genetic variants that make up the vast majority of the human genome. This category also contains repeat polymorphisms with a length of less than one kilobase (STRs, short tandem repeats), as well as shorter insertions and deletions.

VNTRs (variable-length polymorphic tRNA-derived nucleotide repeats; di, tri, tetra, etc. Genomic variants that affect regions of DNA larger than one kilobase (kb) are classified as structural variations (SVs). SVs can range in size from very small to microscopic and encompass a wide variety of alterations, including copy [35]. Changes in copy number, including additions, deletions, switches, and transpositions.

Copy number variation refers to the quantitative difference between the copy number of DNA at a given genomic region of size greater than 1 kb and a reference genome of choice and can take the form of gain (insertion, duplication/amplification), loss (deletion), or null genotype (CNV). A common nuclear variation in copy number, polymorphisms are mutations that occur at a rate of more than 1% in any given population (CNP) [36]. Segmental duplications are regions of DNA larger than 1 kb that is repeated several times in the genome with higher than 90% sequence identity. Approximately, duplications the extent of segmental duplications varies from 1 to 14 percent across the 24 chromosomes, making up 4 percent of the human genome. CNVs can come in many forms, from simple

duplications and deletions to more complicated inversions and translocations, depending on the method by which they were created [37]. Changes in copy number can influence gene expression in ways apart from gene dosage and long-term effects on global gene expression, including reshaping chromatin structure and affecting the function of gene regulatory and enhancer elements.



**Figure 2: Inter-relationships among the epigenetic modification and other causal factors in complex psychiatric disorders.**

DNA obtained from peripheral leukocytes or post-mortem brain tissue was employed for the majority of the earliest epigenetic investigations in neuropsychiatric illnesses, which mostly focused on the examination of epigenetic marks in specific candidate genes. DNA methylation variations in catechol-O-methyltransferase (COMT) and reelin (RELN) have been linked to BD and schizophrenia in studies using methylation-specific polymerase chain reactions [38]. These results were not confirmed, however, by subsequent research utilizing more sensitive quantitative approaches such as bisulfite pyro-sequencing. An increased concentration of SAM and increased levels of DNMT1 gene expression were found in the brains of people with schizophrenia and BD. They also discovered that reelin and GAD67 gene mRNAs were down-regulated in cortical GABAergic neurons due to elevated promoter methylation. Down-regulation of DNMT1 and DNMT3A mRNA was later shown to be upregulated in peripheral blood cells [39-40]. No major alterations in global methylation were found in brain samples or peripheral leukocytes, despite the finding of DNMT up-regulation in psychosis.

### **3. The objective of this research:**

This research was set up so that scientists could get a good grasp on how numerous genetic events contribute to the phenotype of lithium receptivity in people with BD. This was done on the premise that evidence for the additional study could be found in the integration of many genetic abnormalities, as is possible in complex illnesses like BD. Because of this, the following are our detailed goals.

Genome-wide aCGH strategy to identify and validate genomic regions/genes with copy number variation (CNVs) in individuals with BD, and to correlate such CNVs with the lithium response phenotype and clinical subtypes of BD. Analysis of plasma metabolites in a group of bipolar disorder patients defined by their level of responsiveness to lithium.

#### **4. Proposed Algorithm:**

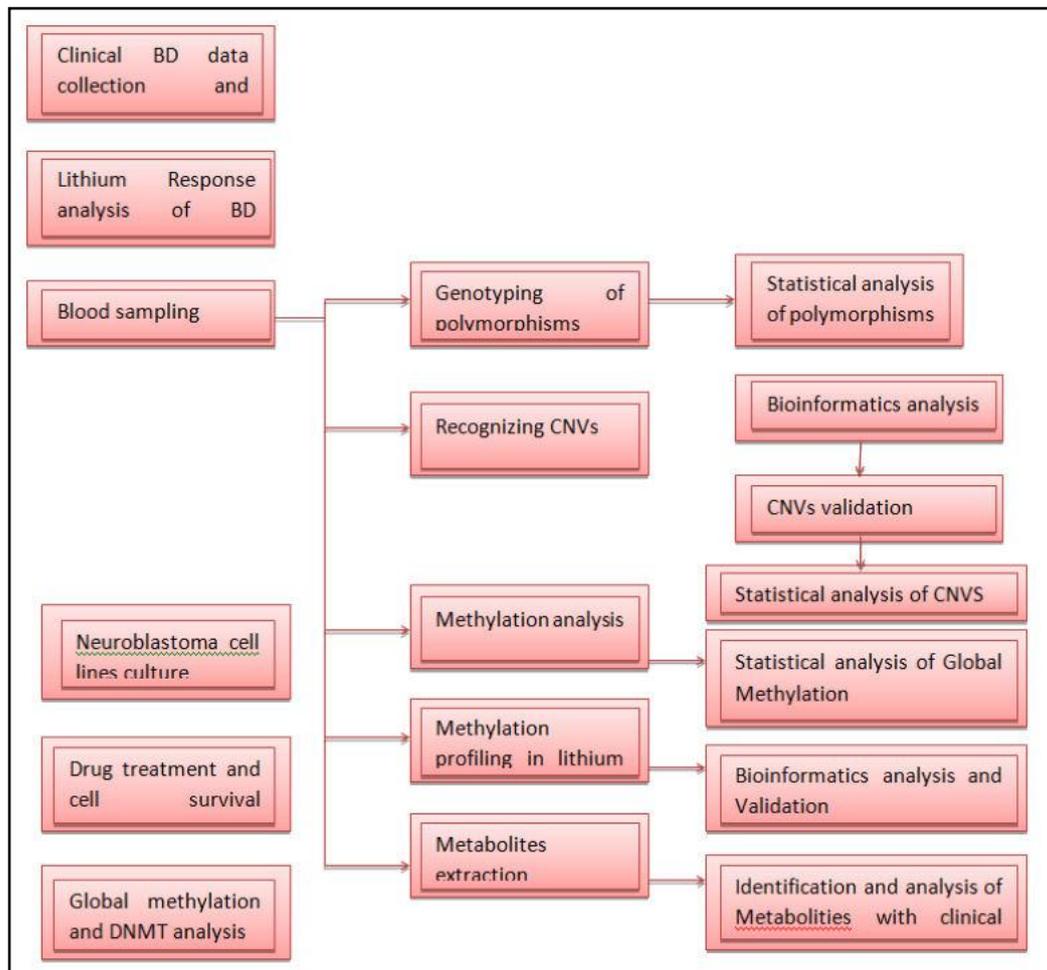
The proposed flow diagram is shown below in figure 3.

##### **4.1. Bipolar Disorder cases:**

After a thorough mental health evaluation, review of case records from hospital outpatient departments, and in-person interview, a diagnosis of BD was made using the DSM IV-TR criteria (boxes 1, 2, 3, and 4). The psychiatrists evaluated and diagnosed all of the patients. Specifically, a young psychiatrist first assessed the patients and meticulously recorded their mental and clinical histories. A prominent psychiatrist oversaw the final assessment and treatment plan. Individuals were selected on the basis that they had BD as their primary illness, the one that caused the most substantial discomfort or dysfunction, and so led them to seek therapy. The vast majority of BD patients (98.5%) were classified as having type I BD. Head trauma, major physical or neurological illness, substance use disorders, and mental retardation were also ruled out because of their correlation to neuropsychological impairment but were not included. We excluded patients who had been diagnosed with multiple Axis-I diseases.

##### **4.2. Lithium Response Analysis:**

Psychiatrists looked back at their patients' clinical symptoms while they were on long-term lithium medication to determine how well it was working. Throughout the acute stages of their illness, patients were seen once every week and once every three months during remission. Patients who experienced a recurrence of major depression or mania following a euthymic period of at least six months were diagnosed with a new episode and given additional care (hospitalization, medication change if necessary) and treatment based on the clinician's assessment of the situation. Minor depressive episodes and other subclinical presentations were not considered new recurrences. Our routine clinical treatment intervention and monitoring of the patient's illness progression was provided to all patients. There was no use of ECT or other psychiatric treatments. Following the best guess approach, we interviewed patients, family members, and previous health professionals and obtained records to learn as much as we could about their sickness before they contacted our center. For the therapeutic benefit of lithium medication to be evaluated, a minimum follow-up period of two years was recommended. Calculating plasma lithium levels in the clinical biochemistry lab was used to evaluate KH patients' adherence to lithium therapy. Levels of lithium in the plasma were monitored at least once every three months, and values between 0.6 and 1.2 mmol/L were regarded as having therapeutic value.



**Figure 3: The proposed flow- diagram.**

### 4.3. Genotyping of polymorphisms:

The samples were genotyped for the single-nucleotide polymorphism (SNP) rs25531 within the 5-HTTLPR, which is a 44-bp insertion-deletion polymorphism. We employed a PCR test to analyze rs25531 for both ins/del polymorphism and genotype. A pair of primers (forward: 5'-GCCAGCACCTAACCCCTAAT-3'; reverse: 5'-AGGGGATCCTGGGAGAG3') were chosen to amplify a 249 bp area surrounding the insertion, as was previously described. In a 25 ul reaction containing 1X PCR buffer, 100 ng of each primer, 1 unit of Taq DNA polymerase, and 100 M of each dNTP, the target sequence was amplified from 100 ng of genomic DNA. Initial denaturation at 95 degrees Celsius for 5 minutes was followed by 35 cycles at 95 degrees Celsius for 30 seconds, 60 degrees Celsius for 45 seconds, and 72 degrees Celsius for 1 minute. Electrophoresis on a 1.5% agarose gel stained with ethidium bromide and having a DNA ladder of 100 bp allowed for the separation of the amplification products. Two types of alleles, S (206 base pairs) and L, were identified (249 bp). The MspI restriction endonuclease (CCGG) uses the SNP as part of a recognition site, cutting the site when the G nucleotide is present but leaving it uncut when the A nucleotide is present. Overnight MspI digestion of PCR results provides a 249 bp fragment (uncut LA allele), two pieces of 148 bp and 101

bp (cut LG allele), or a 206 bp fragment (S allele). Protein fragments were isolated on ethidium bromide-stained 2% agarose gels. Sanger sequencing was used to confirm the rs25531 genotypes of a subset of samples.

#### **4.4. Identification of CNVs by array CGH analysis:**

Agilent feature extraction software was used to examine microarray pictures (protocol CGH-v4 91). Based on the array format, a microarray image-aligned grid template was chosen. The interactive adjust-corners algorithm uses an array of dark spots to optimize grid alignment. Cookie-cutter algorithm is used to detect spots and calculate local background intensities surrounding each spot for background removal. Outlier pixels were separated from designated pixel populations. Featured pixels were saturated. Each spot's pixel intensities' mean, median, and standard deviation were calculated. The error was calculated for each characteristic using a universal model. Multiplicative detrending removes non-systematic array intensity distribution. A dye normalization curve fit determined differences in red and green channel intensities induced by labelling and/or fluorescence emission. The log<sub>2</sub> ratio of red and green intensities was then calculated. Detecting genomic copy number abnormalities requires measuring array log ratio noise. Calculating the robust standard deviation of log ratio differences between consecutive probes (dLRsd) along all chromosomes gives a reasonable assessment of noise. Signal intensities, background noise, and the signal-to-noise ratio were used to determine the best hybridization and washing settings.

The feature extraction data file was imported into Agilent's CGH module. CNV increases and losses were discovered using the conventional ADM-2 technique. This technique detects all anomalous intervals in a given sample with consistently high or low log ratios. Log<sub>2</sub> ratios in at least two consecutive array probe signals were used to identify CNVs. Aberration zones are represented as a sample-colored bar graph. The ADM-2 algorithm with 6 thresholds discovered aberrant areas. Centralization method set at 6.0 and 10 bins. The minimum average log ratio for a region is 0.25, and the minimum number of probes in an aberrant interval is 3. CNV areas were visualized in genomic and chromosomal views along with log ratios.

#### **4.5. Bioinformatic Analysis:**

From the Genomic software workbench, we exported a list of CNV regions and associated metadata. Galaxy genome browser capabilities allowed for a combined study of CNV regions found in both responders and non-responders.

The CNV areas shared by responders and non-responders were divided into those that overlapped and those that did not, creating two distinct groups. Each group's shared and distinct areas were compared to the CNVs found in the general population and stored in the DGV database. The overlapped and separate CNV regions were shown in Venn diagrams. In addition, the coding genes (RefSeq), segmental duplications, repetitive elements, and CpG islands in the hg19 assembly were all mapped to CNVs. DAVID bioinformatics resources were used for the gene ontology analysis. Data from the Genetic Association Database (GAD), the CNVD database, Decipher, and BDgene were used to look for evidence of illness association in gene mapping inside the discovered CNV areas.

#### **4.6. CNVs validation and statistical analysis:**

The real-time polymerase chain reaction has surpassed other methods for detecting and quantifying DNA and RNA in recent years. One common technique for identifying CNVs is real-time quantitative polymerase chain reaction (RT-

qPCR). At the end of each PCR cycle, the amount of DNA is quantified using fluorescent dyes that produce a rising fluorescent signal in direct proportion to the number of PCR amplicons created. While in the exponential phase, enough amplified DNA product builds up to provide a fluorescent signal. The CT represents the critical cycle in which this occurs. CT values are inversely proportional to the initial amount (in copies) of template present in a reaction because they are measured during the exponential phase when the reaction components are not constrained. By comparing the CT value of the unknown sample to that of a reference sample with a known copy number, it is possible to get an estimate of the copy number of the unknown sample.

#### **4.7. Methylation statistical analysis:**

Agilent's e-array database was queried for the probe sequence descriptions. The DMRs' whole sequences were mapped and annotated in the galactic genome browser. Promoters, CGIs, genes, coding and non-coding sections, distance from the transcription start site (TSS), untranslated regions (UTRs), and other genomic components were mapped to the DMRs. EpiExplorer was used to compare data from the ENCODE research on different human tissues and cell types with the DMRs.

The extent of methylation variation at individual gene promoters was determined by downloading promoter sequences from the DBTSS and mapping them to the DMRs. The methylation difference in a given genomic region was visualized using UCSC genome graphs. Genes serving as DMRs were subjected to functional analyses with KEGG and DAVID bioinformatics tools, including gene ontology, pathway enrichment, and disease connection. Tissue-specific gene expression data from the GEO library was then compared to the DMR-related genes. Based on their levels of expression in the body's blood tissue, hypermethylated and hypomethylated genes were separated.

#### **5. Result and Discussion:**

Based on the response criteria, 63 of the 203 BD patients enrolled in the current trial were designated, lithium responders. Clinical subjects were gathered from a single large mental healthcare center to ensure homogeneity in diagnostic procedures and lithium response evaluation. Thirty-one patients did not fulfill all inclusion criteria and, as a result, could not be assigned to a separate response group. Major factors contributing to excluding such patients for the assessment of lithium response included discontinuation of lithium before two years due to poor tolerance, side effects, intervening contraindications, poor therapeutic adherence to lithium, and inadequate information regarding the treatment outcome.

We compared demographic and clinical variables between the two groups to assess how they might have affected the subjects' lithium response outcomes in BD. Clinical and demographic data of bipolar disorder patients, lithium responders, non-responders, and controls were described using frequencies and percentages. In order to determine if there was a statistically significant relationship between the categorical variables, a Fisher's exact test was performed, whereas t test was used for the continuous data. Patients had been suffering from the disease for a mean of 14 years and had suffered through a total of three abnormal mood episodes. Among these patients, manic episodes were the most common and contributed to the vast majority of hospital hospitalizations. Both the frequency of episodes and the prevalence of psychotic characteristics were greater in lithium non-responders than in responders (mean difference =

0.12, 95% CI 0.09 to 0.33). No statistically significant variations in allele or genotype frequencies were found when comparing STin2 VNTR and 5-HTTLPR for all the clinical variables (table 1).

The  $X^2$  and P-values are calculated by following formula.

$$X^2 = \frac{1}{m} (A_{i,k} - \bar{A}_k)^2 \quad (1)$$

Where,  $A_{i,k}$  is data and  $\bar{A}_k$  bar is centre value of data.

$$P - value = 10. \log_{10} \frac{Max_i}{\sqrt{MSE}} \quad (2)$$

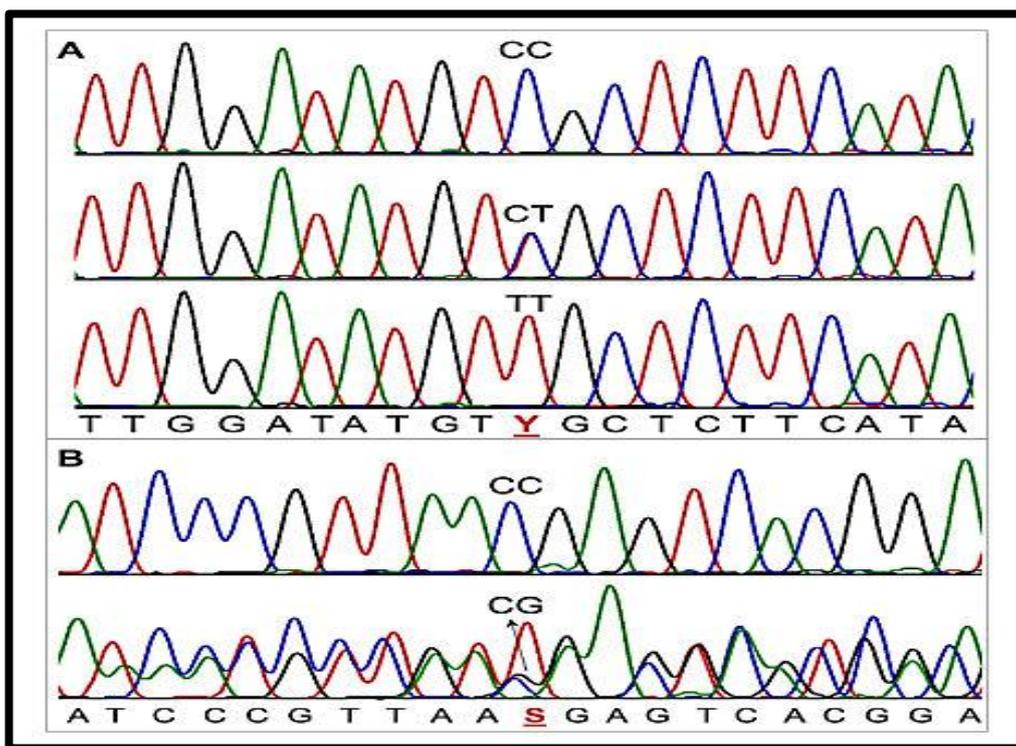
**Table 1: Comparison of STin2 VNTR and 5-HTTLPR for different clinical variables.**

Clinical Covariate	Clusters	HTTLPR Alleles			VNTR alleles	X <sup>2</sup> Value	P-Value
		S	L <sub>A</sub>	L <sub>G</sub>			
<b>Gender</b>	Males (65)	0.63	0.25	0.10	0.71	0.98	0.91
	Females (57)	0.60	0.27	0.12	0.66		
<b>Age at onset of BD</b>	Early (39)	0.61	0.24	0.14	0.69	3.81	0.87
	Intermediate (67)	0.60	0.28	0.11	0.67		
	Late (16)	0.71	0.21	0.06	0.78		
<b>Psychotic features</b>	Present (54)	0.56	0.27	0.15	0.64	6.01	0.19
	Absent (68)	0.66	0.25	0.08	0.72		
<b>Thyroid abnormalities</b>	Present (23)	0.54	0.28	0.17	0.67	2.48	0.64
	Absent (99)	0.64	0.25	0.10	0.69		
<b>Suicide attempts</b>	Attempted (16)	0.71	0.15	0.12	0.71	2.27	0.68
	Not attempted (106)	0.60	0.27	0.11	0.68		
<b>Family history of psychiatric disorders</b>	Present (73)	0.60	0.26	0.13	0.67	1.38	0.84
	Absent (49)	0.65	0.25	0.09	0.71		
<b>Psychosocial factors</b>	Present (26)	0.67	0.26	0.05	0.73	2.60	0.62
	Absent (96)	0.60	0.26	0.13	0.68		

Genetic association studies on SLC6A4 polymorphisms and lithium responsiveness have been published, albeit with mixed results. These studies are predicated on the idea that the total activity and integrity of the serotonergic system are crucial for the action of lithium. S/S genotype has been linked to poor response to lithium in bipolar disorder and unipolar depression; however, the research is limited. Lithium prophylaxis has been demonstrated to be more effective in patients with the S/S genotype than in those with other genotypes, according to other research. An SNP (rs25531

A/G) within the 5-HTTLPR insertion has recently been found to be functionally triallelic, resulting in two variants of the L allele, LG and LA. Other results imply that rs25531 is located upstream of the 5-HTTLPR gene, but its precise mapping is still up for debate.

We have looked into the GADL1 SNPs rs17026688 and rs17026651 for any potential relationship with lithium responsiveness in BD. In our lab, a tetra-ARMS-based assay was used to identify the variant alleles. Allele-representative samples were Sanger sequence-verified, and those samples were used as positive controls in future PCR runs. Finally, the tetra-ARMS-determined genotypes were shown to be consistent with the genotypes of many randomly selected samples after validation through Sanger sequencing.



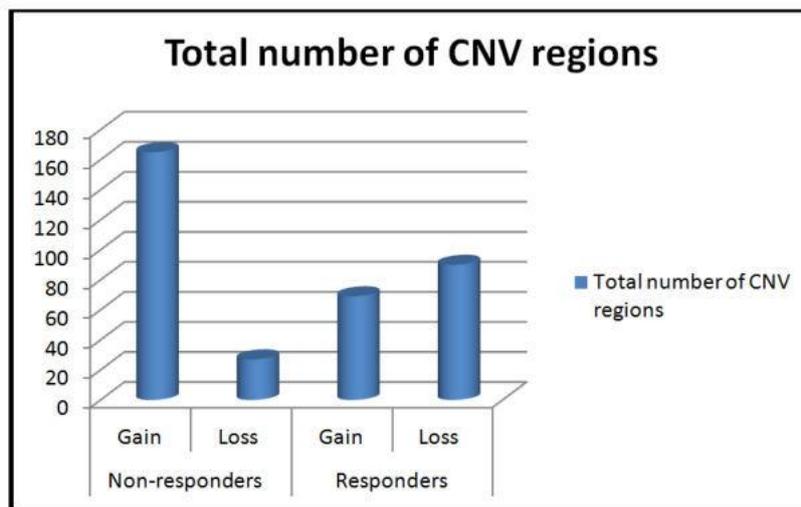
**Figure 4: Sanger sequencing electropherograms of samples representing different genotypes.**

CNV Identification: Agilent 244k (two-color) microarray aCGH analysis was used to determine genomic copy number gains and losses in BD lithium responders and non-responders. Two pools of samples, one from respondents and one from non-respondents, were hybridized into an array, and the third pool of DNA from a shared control group was used as a reference (R vs. C and NR vs. C). The Agilent 244k aCGH platform has 8.9 kb of total median probe spacing, 7.4 kb in coding areas, and 236,381 unique human genomic sequences annotated against NCBI Build 36 (UCSC hg18).

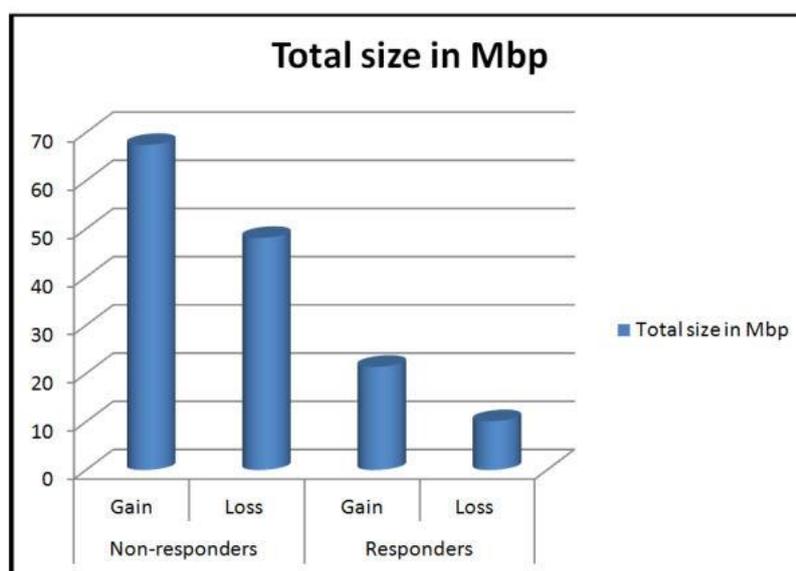
**Table 2: CNVRs Count identified in the aCGH analysis**

Group	CNV Types	Total number of CNV regions	Total size in Mbp

Non-responders	Gain	165	67.43
	Loss	27	48.15
Responders	Gain	69	21.392
	Loss	90	10.12



**Figure 5: Total number of CNV regions for Responder and Non-responder type CNVs.**



**Figure 6: Total size in Mbp for Responder and Non-responder type CNVs.**

We analysed the genomic intervals of CNVs in responders and non-responders to identify the distinct regions affected in each group. Results showed that both responders and non-responders shared 34 CNV areas (31 gains and 3 losses). It's possible that the areas related to BD, rather than the lithium response, are represented by these frequent CNVs. We

also tested the opposite, with CNV losses in non-responders vs growth in responders. We did not, however, uncover any CNVs of this common but opposite type.

## **6. Conclusion and Future Scope:**

### **6.1. Conclusion:**

Dynamic dysregulation of numerous gene regulatory pathways, proteins, and metabolic networks, reflecting complex perturbations of the system, is likely to result in neuropsychiatric illnesses like BD. Multiple methods were employed in this study to discover molecular markers linked with bipolar disorder, lithium responsiveness, and other subclinical traits in a group of BD patients from India. Patients diagnosed with primary BD had their responses to lithium medication retrospectively classified, yielding 103 non-responders and 62 responders.

Subjects with BD were classified according to a set of subclinical symptoms, including the presence of psychosis, a familial history of psychiatric disorders, suicidal behavior, etc. When comparing clinical features, the rate of suicidal behavior was much higher in lithium non-responders than in responders. Multiple studies have pointed to the widespread presence of CNVs in the human genome, raising the possibility that they play a significant role in neuropsychiatric illness susceptibility. Most genome-wide CNV investigations in BD have found no evidence of a greater CNV burden in BD patients than in healthy controls. Concurrent nucleotide variants (CNVs) may represent a unique genetic determinant for susceptibility to illnesses with a more prominent neurodevelopmental component than BD. It was found in our study that the frequency of CNVs larger than 1 Mb was substantially higher in non-responders than in responders. Our examination of CNV distribution and average size suggests that lithium non-responders have a higher CNV burden than responders. This study lends credence to the theory that individuals who do not respond to lithium have a more severe type of BD with deeper neurological and/or neurodevelopmental roots.

### **6.2. Future Scope:**

The results provided in this paper represent one of the first attempts to throw light on the potential involvement of CNVs and epigenetic variables in BD, its subclinical manifestations, and the lithium response, although more research is needed to identify the actual function of the molecular markers revealed. Because of our limited knowledge of the inheritance process at work in complex illnesses and the nature of biological variation that might lead to disease, studying the aetiology of psychiatric disorders remains a difficult research subject. The ever-improving state of the art in high-throughput DNA sequencing technologies holds great hope for the discovery of new genetic variations linked to psychiatric disorders. The discovery of the genetic basis of psychiatric diseases is hoped to benefit greatly from large-scale whole-genome sequencing.

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## PREVENTING MEASURES IN BIPOLAR DISORDER VIA MACHINE LEARNING

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**Abstract:** The technical advancement in recent days has made a drastic increase in the amount of data generated from the physical, cyber, and human world. The collection of data at a huge scale makes sense only if the data is actionable and can also be used for making decisions. Data mining provides needed assistance at this stage by inspecting the relationship in the data and offers needed insights to the data owners. Moreover, the significant insights obtained are shared with third parties for further analysis. In this situation, numerous varieties of information is processed and the integration of machine learning with big data technology has made prominent aspect in the identification of bipolar disorder. It is a complex genetic disorder characterized by episodes of mania and depression. It affects 1% of the population worldwide. It is a major under-addressed public health problem which causes a significant burden on caregivers. High heritability and familial relative risk indicate the role of genetics in the etiology of the disorder. In this research, data is handled using an improved auto encoder and deep neural network. The feature selection is accomplished using ISAE and classification is accomplished using DNN. The proposed approach outperforms the existing state of art techniques.

**Keywords:** Bipolar disorder, big data, EMR, Registries, Claims, Patient Monitoring

### 1. Introduction

Bipolar disorder is a severe mood disorder with a lifetime prevalence of 1% in both males and females [1, 2]. It is characterised by recurrent episodes of dysregulated moods and is associated with high morbidity and suicide risk. Life time risk of an unrelated member of general population is 0.5 to 1.5%, that in first degree relative of bipolar disorder (BD) is 5-10% and that in monozygotic co-twin is 40-70% [3, 4]. It is a leading cause of global disability and its treatment is unsatisfactory. Family, twin, and adoption studies have provided strong evidence for the significant involvement of genes in predisposition to BD [5].

Estimates of heritability is as high as 89% and 93% in twin studies from hospital register in the UK and population register in Finland respectively [6]. However, the genetic basis for the disorder remains obscure [7-11]. It has been suggested that environmental stressors may trigger mood episodes [12] though they are more likely to be involved in the precipitation of the first episodes, but less with subsequent episodes [13].

Antioxidants suppress the process of oxidation that eventually led to the formation of free radicals. These free radicals are generated through lipid peroxidation. At higher concentration, free radicals from oxygen (reactive oxygen species - ROS) can damage the integrity of various biomolecules including DNA [14] and promote the activation of autophagy, apoptosis, and necrosis [15]. Oxidative stress has been implicated in the pathogenesis of neuropsychiatric diseases [16] as the brain has

greater vulnerability to oxidative damage.

Big Data offers a huge value and has recognized as being impelling force behind the innovation of technology and economic progression. Emerging approaches likely smart grid, e-health system, social network etc, provides exceptional utilities by examining the data for obtaining better understanding and services. An issue related to privacy is faced during the communication, transmission, mining and aggregation process. The sophisticated mining approaches may increasingly efficient and can expose the underlying data. The privacy related issues had established viable elucidations to fulfil the necessities of privacy.

The intent is to construct trade-off among utility and privacy which means effective use of these services while averting exposure or inference of private information during data analytic process. In the past few years, researchers have retorted to the issues and projected various approaches [17]. While the privacy related research is still quickly establishing, it is significant to discuss the privacy related aspects to preserve the privacy of the data in the era of big data. This informative chapter offers a various facet of privacy in big data analytical process [18].

Big Data is a ubiquitous technology with the emergence of social network, outsourced cloud computing, Internet of Things (IoT) and data transmission generated huge data that witnessed the enormous growth in the data. The data generation is observed in name of huge volume, elevated velocity and diversified data variety [19]. The exceptional usage of networking among smart objects and the intelligent computational platform accords the Big Data but pretences towards privacy where the location of privacy, transaction and behaviour are recorded digitally [20, 21]. Nowadays, Hospitals maintaining patient medical records digitally and it contains personal medical data that increases the privacy concerns [22]. Most of the developed companies are utilizing Big Data to observe the workforce by tracking the performance and the productivity of the employees [23]. The issues faced in hospital and companies revealed the gap among the regulatory policies (convention), Big Data and the necessities of new policies to address the complete concerns of privacy [24, 25-33].

Evaluating the term of big data conceptually from privacy perspective is inadequate to understand privacy comprehensively in big data domain. Hence, if 7 V's of big data can be evaluated from privacy perspective, a better understanding of big data can be presented. As presented in Figure 1, Volume, Velocity, Variety, Veracity, Value, Variability and Vulnerability are considered and evaluated from privacy perspective in Table 1.

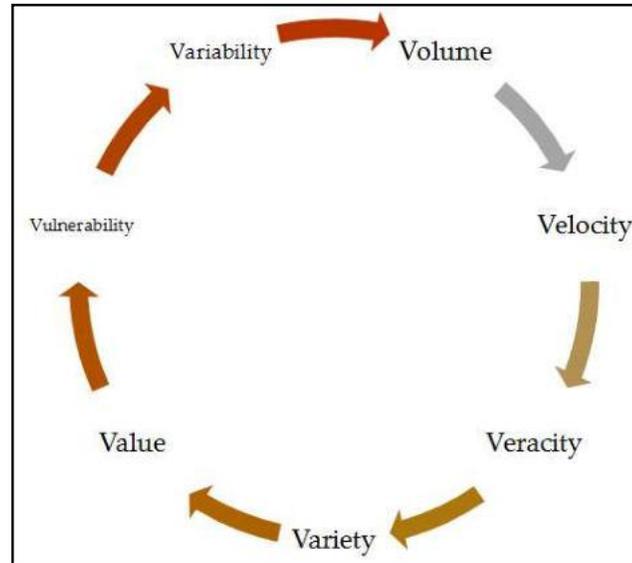


Figure 4. 7V's of Big Data

Table 2 Privacy Perspective of 7V's of Big Data

V's of Big Data	View of Privacy Insights
Volume	The raise in the count of the data records is directly proportional to the raise of the volume of data. The increase of data volume results in the decreasing of privacy threats and increases the utility data.
Velocity	The lifetime of data utility is more effective and the process of stream, batch as well as real time is accompanied in terms of high utility.
Variety	The combined form of diversified data is utilized to enhance the processing of big data analytics and processing. Thereby, the privacy issues are decreased with the data utility rate.
Veracity	The more reliable and accurate data available with high level of utility rate. The integrity of the data is devastated by the entrusted data source. Accurate data offers meaningful and high rate of utility.
Value	High utility value achieves best potential rate whereas data value plays significant role in preserving the privacy.
Variability	Most of the inconsistencies of the data namely extreme values, outlier and negative accurate analysis were rectified. Variability is one of the important concerns in the privacy domain.

Vulnerability	Big data is holds several personal information and it needs privacy preserving approaches in order to prevent the data from exposure to the unknown or any third parties.
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## 2. Classification of Bipolar Disorder

This section discusses about the classification of bipolar disorder using improved stacked auto encoder and deep neural network. The overall proposed methodology is illustrated in Figure 1.

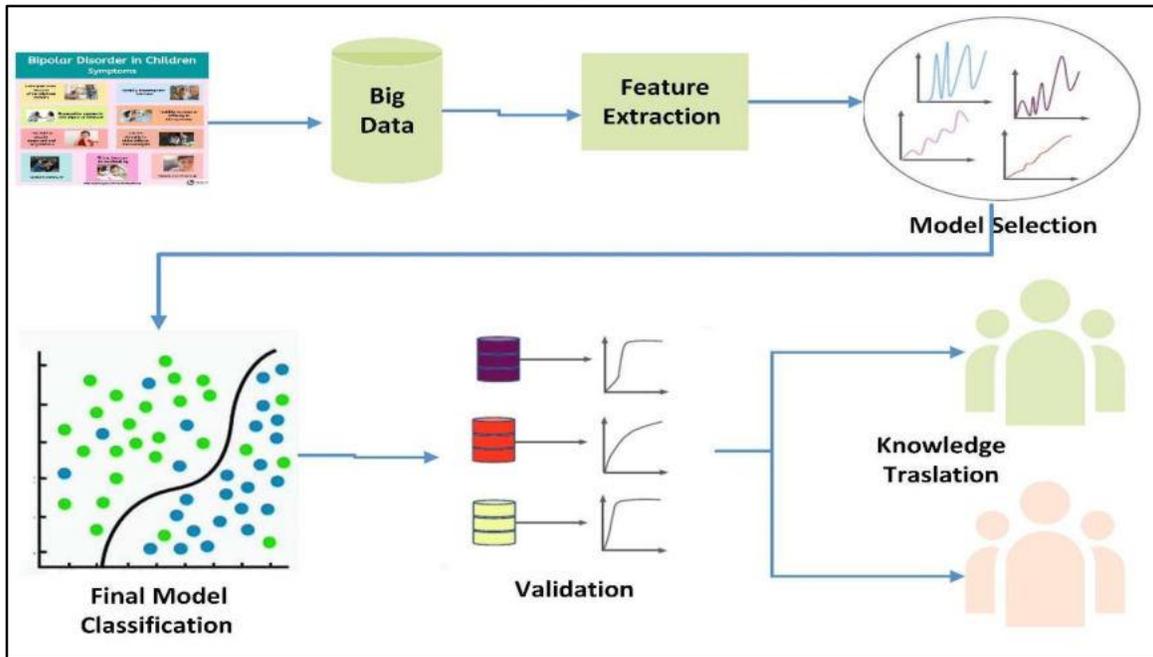


Figure 1. Overall Proposed Methodology

Auto encoders are used to build improved stacked autoencoders (SAE). In a neural network, the hidden layer of every auto-encoder is linked to the hidden layer of the following auto-encoder. The hidden layer of the first auto-encoder should be the input to the second one during the training phase. The improved stacked encoder is given in Figure 2.

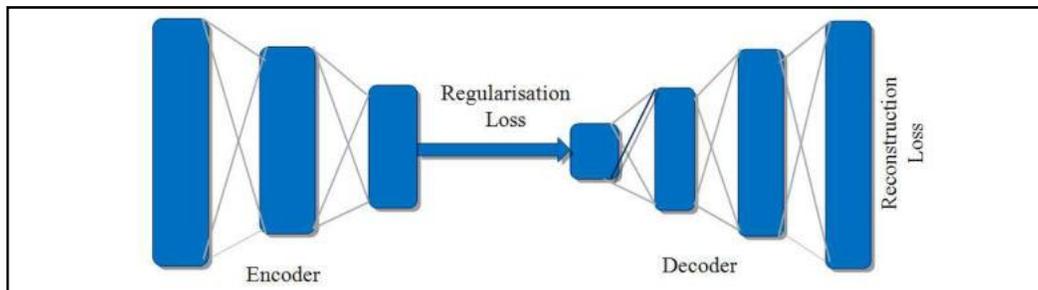


Figure 2. Improved Stacked Auto Encoder

New representations utilizing the improved SAE is constructed by piling them on upper edge of older ones. The high-level properties of the datadata are included in the eventual hidden layer output after

rebuilding. The qualities of an item in the object field determine how conductivity is distributed. To calculate the conductance distribution, the layer of logistic regression is employed. Figure 2 indicates the structure of improved stacked auto encoder.

The DNN receives the normalised data choices as input. The symbol for selected data is denoted by  $S = \{SG(1), SG(2), \dots, SG(A)\}$ , where A stands for the amount of training sets and  $SG(l) \in [0,1]^a$  is the count of normalised data. In a set of randomly selected data sequences, the letter a denotes the presence of an undetermined count of data values. Distribution sample for internal connectivity is  $(S = \{\sigma(1), \sigma(2), \dots, \sigma(a)\})$ , where  $\sigma(l) \in [0,1]^n$  and n indicate the possibility of every class. The bias matrices, vectors, and weight are seeded via unsupervised layer-by-layer training. The DNN is assigned with the responsibility of processing the data with the rate  $S = \{SG(1), SG(2), \dots, SG(A)\}$ .

The whole method is elucidated below: It's crucial to learn the initial hidden layer by utilising the outcomes of the preceding one. Until all hidden levels are revealed, the similar process is repeated. After the process of feature selection using ISAE, classification is done using Deep Neural Network. During the supervised fine-tuning step, the pre-trained model parameters from a DNN's last hidden layer are input into a model of logistic regression to activate the whole DNN. An authentic representative group of the conductivity distribution serves as the inspiration for the network's name. The back-propagation algorithm used in the top-down method of optimising network parameters is based on the principle of gradient improvement. Dropout may be used to improve a model by lowering overfitting and making it more generalizable. Through every training program, 0.5% of the network's hidden units are arbitrarily removed from the network.

Neuronal coadaptation can be made easier, leading to the development of a more robust network. When trained on big datasets, the dropout layer works superbly. Equations (2) and (3) are affected by dropout, as can be observed in a standard auto-encoder.

$$y_i = f(\sum_{j=1}^a w_{ij} \text{Bernoulli}(p) \times x_j + b_i) \text{-----}(2)$$

$$z_i = f(\sum_{j=1}^a w_{ij}^T \text{Bernoulli}(p) \times x_j + b'_i) \text{-----}(3)$$

A randomized vector either of zero or one with a frequency of p equivalent to 0.5 is produced by the Bernoulli() operator.

During the process of training weights are updated in every iteration that improve the features of the encoder output. The proposed framework is trained for limiting both the reconstruction and regularisation loss that is given in equation 4.

$$\min_{\theta, \emptyset} \beta F_{rec} = \min \frac{1}{2} \sum_{i=1}^n \|x_i - g_{\emptyset}(f_{\theta}(x_i))\|^2 \text{-----}(4)$$

where the encoder and decoder parameters are indicated by  $\theta$  and  $\emptyset$ , respectively. The hyper parameter  $\beta$  stabilises significance of losses to the reconstruction of data. Equation (4) established

the term Frec, which is then minimised to maximise the resemblance among the input and output data and enhance the latent space description.

SVM employs kernel trick to identify new features for conversion from low dimensional feature space to higher dimensional feature space. In the application of SVM classifier, the parameters should be tuned to reduce the tuning time and to overcome the over-fitting problem. SVM builds a model using a set of labelled training samples and classifies the new samples on the basis of distance to the hyper plane. Training of the samples is performed by minimizing the error function EF as presented in Equation 1

$$EF = \frac{1}{2}w^T w + c \sum_{i=1}^N \varepsilon_i \text{ -----(5)}$$

with the constraints  $y_i(w^T \phi(x_i) + b) \geq 1 - \varepsilon_i$  and  $\varepsilon_i \geq 0, i = 1,2,3,4, \dots \dots N$

C and b are constants; w is the vector of coefficients and  $\varepsilon_i$  denotes the factor for managing the non-separable input data. Index i is used to label the N training cases. Proper choice of C will avoid over-fitting problems.

The categorization between malignant and non-cancerous samples will become poorer if  $\beta$  is high and the data reconstruction term dominates. However, if this term is set too low, the hidden space's features won't be properly optimised and the reconstructive losses will be minimal. As a result, the latent characteristics will be drastically varied from the input data, which lowering the generalization ability as well as accuracy. Consequently, the hyperparameter  $\beta$  have to be adjusted properly.

### 3. Result and Discussion

This section illustrates the numerical outcomes of the existing and proposed methodology. The existing approaches namely SVM, and CNN are compared with the proposed ISAE. These approaches are investigated using the classification accuracy.

Accuracy: Accuracy refers to how close the determined value from the classified occurrences is to the true value. The representation of quantitative bias and persistent flaws is known as accuracy. It is also the recognition (both TP and TN values) amongst number of the assessed classes, as well as the estimation's similarity to the true value. Variation between the outcome and genuine resulting values occurs when the lowest accuracy occurs. It's the proportion of successful fall detection to the number of information examined. The rate of accuracy is given n Figure 3 and Table 2. It's calculated as follows:

$$\text{Accuracy} = \frac{TP+TN}{TP+TN+FP+FN} \text{ -----(6)}$$

**Table 1. Comparison of Accuracy**

Iteration Count	SVM	CNN	ISAE
50	83	87	93

100	86	89	95
150	88	90	96
200	89	91	97

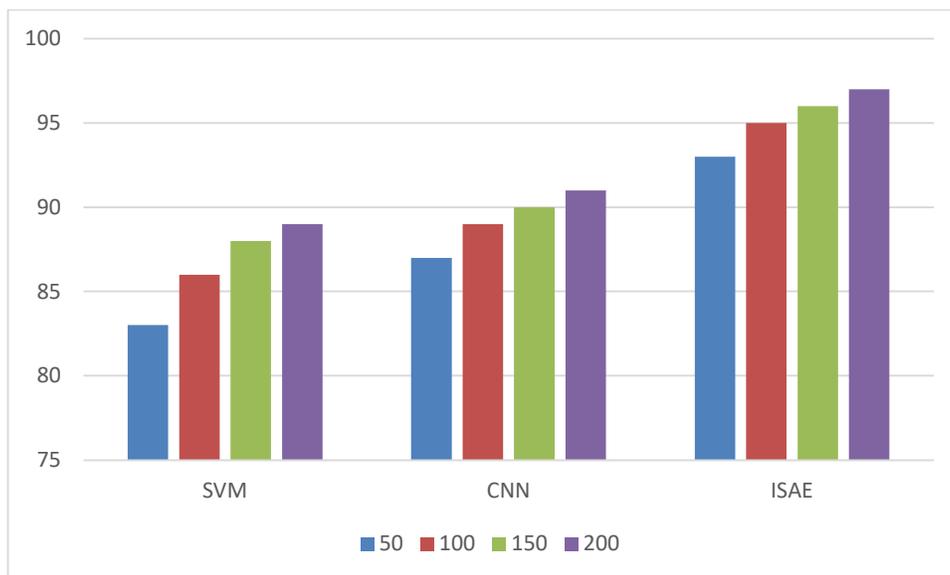


Figure 3. Comparison of Accuracy

#### 4. Conclusions

By examining the relationships in the data and giving the data owners the necessary insights, data mining delivers the necessary support at this point. Also shared with outside parties for additional investigation are the major discoveries that were discovered. Numerous different types of information are processed in this condition, and the integration of big data and machine learning technology has become a crucial factor in the recognition of bipolar illness. It is a complicated hereditary condition that is characterised by manic and depressive periods. 1% of the world's population is impacted by it. It is a serious under-resolved public health issue that places a heavy strain on caretakers. High heritability and familial relative risk show that genetics play a part in the disorder's genesis. In this study, a deep neural network and an enhanced auto encoder are used to manage data. DNN and ISAE are used for feature selection and classification, respectively. The suggested method performs better than current state-of-the-art methods. The proposed approach attains 97% accuracy and outperforms SVM and CNN. In future, the approach can be extended with artificial intelligence based algorithms for attaining effective accuracy.

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# Academic Performance Prediction Using Imbalance Classification Methods: A Study

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**Abstract:** *An issue of classification may arise when learning classifiers use skewed or imbalanced datasets. In case of an imbalanced dataset, the majority of examples are with one class whereas the other class which is normally considered as the most important class, is however signified by a minor share of instances. By using this type of data, the outcome of machine-learning models would be ineffective. There is a term (High training reliability) used to define preconceptions in between one instance against all other illustrations of the class. In this paper, most important methods used to solve the class imbalance problem i.e. data-level, algorithm-level, hybrid, cost-sensitive learning, deep learning etc. including their advantages and limitations are discussed in detail. Performance and efficiency of classifiers are evaluated using a numerous evaluation metrics such as Accuracy, Precision, Recall, F-Measure.*

**Keywords:** *Cost Sensitive Learning, Evaluation Metrics, Imbalanced Classification, Machine Learning, Predictive Model, Resampling.*

## 1. INTRODUCTION

Imbalanced classification is an important problem in the domain of data mining and machine learning. Since the last few years, researchers are giving more attention towards the imbalanced data and its classification. Traditional classification techniques are used to perform a balanced sample distribution approach across classes due to which, the majority of the classes perform unfavourably. Generally, the overall classification error can be reduced by the use of classifiers but in case of an imbalanced dataset these classifiers would reveal more classification errors with respect to the examples of minority classes (Barua & Murase, n.d.). In the era of big data, the nature of imbalance learning can be better understood by using machine learning and data



mining [1]. It has been observed that finding rare events in Machine learning and data mining groups is a prediction task. As rare events are scant in nature, therefore the prediction task suffers due to the absence of balanced data [2]. The structure of larger datasets (big data) is complex and distinctive. As a result, the disparity of the lower classes is a big problem. Spam detection, software defect prediction and fraud detection are very common examples of unbalanced datasets in the real-world [3].

In an online transaction, electronic fraud detection is a significantly challenging problem due to the imbalancing of classes. Fraudsters have done so many attemptations for closely cloning a legitimate transaction to avoid scrutiny. In this era of big data, differentiation of legitimate and illegal transactions is very difficult due to the overlapping of huge amounts of data. Overlapping problems in machine learning-based fraud transaction detection methods have less attention than the imbalanced classification problems [4]. The philosophy behind it is that the imbalanced data is skewed in favour of the instances of majority class with high training accuracy. The solution to this issue is data creation from the minority class that has the best chance of success [5].

### **1.1 Class Imbalance Problem**

In classification, learning classifiers from skewed or unbalanced datasets leads to a serious problem. In this case, the majority of instances belong to one class. It is due to the other class (minor class) which encompasses the more significant characteristics has a lower number of instances. It is observed from the previous research that traditional classifiers generally categorize all data into the majority class and leave the class with the lowest importance which is unsuited to handle imbalanced learning tasks [6].

When some classes are splendidly belittled, statistical and machine learning techniques are inclined to encounter issues. In spite of being learned, cases of the rare classes are lost amongst the others. As a result, unknown rare cases are misclassified by the resulting classifiers and data could be misrepresented by descriptive models. The learning task becomes significantly more difficult if a small class is hardy to identify due to its other features. Other classes may be significantly overlapped by a small class.

In this paper, various techniques are discussed used to handle the imbalanced data sets used in binary as well as in multi classification problems and also anticipate a relative study of the nearly all accepted methods with their advantages and shortcomings. The remaining portions of the paper are as follows: A few important methods of class-imbalance learning (Literature Review) is discussed in section 2. Existing methods are elucidated in section 3. Essential evaluation metrics are explained in section 4. Finally, the conclusion is given in section 5

## **2. Literature Review**

Contemporary research challenges associated with imbalanced data learning that have roots in application areas of the real-world and also investigate various facets of imbalanced learning, like streaming of mining of data, classification, regression, clustering and big data analytics



has been discussed by the author in this paper. By doing this, an error-free overview of new challenges in the above-mentioned fields can be estimated [7].

An open-source toolbox of python which is known as imbalanced-learn proposes a large variety of solutions to handle the issues related to imbalanced dataset that usually emerges in machine learning and pattern recognition [8]. To balance the imbalance dataset in an artificial manner, sampling techniques like the synthetic minority oversampling technique (SMOTE) have been used so that this training dataset can be used by classifiers to build the model.

To reconcile the restraints of SMOTE's for nonlinear problems, a weighted kernel-based SMOTE (WK-SMOTE) model that oversamples the feature space of the support vector machine (SVM) classifier is implemented [9]. On the basis of chromosomal theory of inheritance, the MAHAKIL synthetic oversampling method is introduced for imbalanced software defect datasets [10].

To address the class-imbalance issue in the identification of breast cancer, on the basis of sample selection an algorithm named RK-SVM algorithm was proposed Noise and borderline issues are brought on by SMOTE's blind oversampling. Hussein et al., 2019 proposed the A-SMOTE or advanced SMOTE which works on the basis of distance between original minority class samples and the newly introduced minority class examples.

There was no sufficient solution by a high-class imbalance, random under sampling using conventional binary classifiers for the fraud detection problem. A plan was developed for early prediction of turnover intention of new college graduates by the establishment of a predictive model using public data and machine learning [11]. Data of minority class data can be remodelled into a realistic data distribution if it is sparse for **Generative Adversarial Network (GAN)** (Sharma et al., 2022). An effectual model using ensemble classification (Logit Boost + Random Forest) was built to predict academic performance of students at lower secondary level [12].

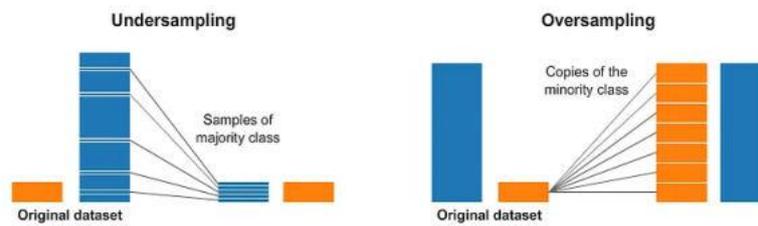
### **3. Approaches to Handle Imbalanced Dataset**

To handle an imbalanced dataset, techniques can be classified into three categories:

- i) Data level Approach
- ii) Algorithm level Approach
- iii) Hybrid (Ensemble) Approach

#### **3.1 Data Level Approach**

This approach/technique is also known as the resampling method. To make the changes in the training set's distribution, this approach is very useful as it keeps the algorithm's overall structure, including the loss function and optimizer, uninterrupted. This approach is also useful to alter the dataset in order to make popular learning algorithms [13]. Instances of minority and majority classes could be balanced using this method. Two most popular methods of data level approach are under sampling and oversampling techniques of resampling methods. Diagrammatic representation of the resampling method is given in the figure 1.



a) Under sampling Technique

b) Oversampling Technique

Fig.1 Resampling Methods

To equalize the count of the majority and minority occurrences, a portion of majority class instances is deleted from the training dataset using under sampling methods. For this, instances of the majority class are removed one by one until the size of the two classes is nearly equal as shown in Fig. 1 (a).

An oversampling method/technique increases the number of instances of minority class until the size of both classes becomes almost equal as shown in Fig. 1(b).

The problem of class imbalance can be reduced up to some extent with the help of some existing approaches like under sampling and oversampling, but each one has its own considerable restraints. Under sampling leads to loss of instances/samples of majority class having meaningful/valuable data while a considerable amount of computational time is entailed by an oversampling method. In a fraud detection model, it is difficult to apply the fusion of these two methods.

Under sampling and Oversampling techniques-based algorithms have their own advantages and disadvantages. So, it is always suggested to use an ensemble/hybrid resampling algorithm which integrates both oversampling and under sampling. It gives you truly accurate results in data processing. There must be a large minimization of imbalancing the samples while diminishing the proportion of majority samples and uprising the number of minority samples,

To make predictions about students at secondary level, an integrated ensemble model comprising features like students' demographic, family, social and academic attributes is developed in this paper. To assess a student at an initial stage, this model is highly beneficial. Out of various models i.e., single, ensemble, and fusion based ensemble classifiers developed in this paper, a model built up with LogitBoost and Random Forest (RF) proves the best model to predict students. [13].

### 3.2 Algorithm-level Approach

To handle the imbalance classification, a new method is used in this study which utilizes a single-class classifier technique to apprehend the properties of the minority class. An innovative hybrid sampling/boosting method i.e. (RUSBoost algorithm) described by (Seiffert et al., 2010) is used in place of SMOTE Boost for learning from skewed training data. To classify noisy label-imbalanced data, a new technique on the basis of bagging of Xgboost



classifiers is proposed by [14]. To combine weighted ensemble classification with a method to handle the issue of class imbalance, Weighted Ensemble with One-Class Classification along with Oversampling and Instance Selection (WECOI) was proposed by [15].

### 3.3 Hybrid (Ensemble Approach)

Combination of resampling and ensemble learning techniques are used by hybrid ensemble methods. For this, a comprehensive review of ensemble learning methods was used for imbalanced classification. In ensemble learning, multiple classifiers are integrated to enhance the performance of the model. Since blending is a complex process which takes more time to train the model. Cost-sensitive learning confirms accurate classification of the minority class by various algorithms and also does not affect its computation time and complexity.

The main aim of cost-sensitive learning is to minimize the total cost by computing misclassification cost. Cost-insensitive learning is different from cost-sensitive learning because the former type of learning handles misclassifications uniquely, i.e., the classification cost to predict a sick patient vs healthy is disparate from the classification cost of predicting a healthy patient vs. sick. Thus, the error rate could be minimized and numerous misclassification errors could be neglected by using cost-insensitive learning. Moreover, it is also assumed by cost-insensitive classifiers that all misclassification costs are equal.

### 4. Evaluation Metrics

Confusion Matrix is an important parameter to check the performance of a model built for the solution of binary classification as given in Table 4. A negative label ( $y_i=0$ ) is used to mark the majority class while a positive label ( $y_i=1$ ) is used to mark the minority class.

Table 4. Confusion Matrix for binary classification

		Actual	
		Positive	Negative
Predicted	Positive	True Positive	False Positive
	Negative	False Negative	True Negative

We used False Positives (FP), False Negatives (FN), Precision (P), Recall (R), Accuracy and F1 Score as base metrics for the purpose of evaluation.

$$\text{Precision} = \text{True Positive} / \text{Total Positives} = \text{TP} / (\text{TP} + \text{FP}) \tag{1}$$

$$\text{Recall} = \text{True Positive} / (\text{True Positive} + \text{False Negative}) = \text{TP} / (\text{TP} + \text{FN}) \tag{2}$$

$$\text{F1 Score} = 2 * \text{Precision} * \text{Recall} / (\text{Precision} + \text{Recall}) \tag{3}$$



$$\text{Accuracy} = (\text{True Positive} + \text{True Negative}) / \text{Total Values} = \text{TP} + \text{TN} / (\text{TP} + \text{FP} + \text{TN} + \text{FN}) \quad (4)$$

Area under the Precision-Recall Curve is a single statistic that encapsulates the precision recall (PR) curve. It is a useful metric for the prediction's success when the classes are imbalanced. Precision Recall (PR) curves are used as a replacement for receiver operating characteristic (ROC) as it presents the veracious image of performance of an imbalanced dataset.

To make a comparative analysis of various studies, area under the curve (AUC) is used. To get the high score in prediction, each of the four confusion matrix categories (true positive, true negative, false positive, false negative) must be predicted accurately and the same is dependent upon the size of positive and negative values in the dataset.

A special metric Matthews correlation coefficient (MCC) is a statistical statistic used to check the performance of the model. If the value of coefficient is +1, model is in perfect state whereas coefficient=-1 shows that the model is not valid or it is completely failed.

A detailed meaning of all metrics for model evaluation is given in Table 2.

Table 2: Evaluation Metrics and their description

<b>Metric</b>	<b>Description</b>
Precision	It determines how good the classifier is in detecting fraudulent cases.
Recall	It evaluates the quality of a qualifier.
Accuracy	It measures the efficiency of the algorithm.
F-Measure	It qualifies the quality of a classifier for the rare classes
AUC	It represents the area that exists under a ROC curve
ROC	It is used for evaluating the trade-offs between true positive and false positive error rates in the case of classification algorithms

## 5. CONCLUSION & FUTURE SCOPE

Most pioneered approaches used to solve the problem of imbalance classification are discussed and evaluated in this paper. Every technique/approach has its own benefits as well as limitations. There are numerous methods such as data level, algorithm-level, hybrid learning, context sensitive learning, deep learning etc. Out of all these methods, data-level methods such as oversampling, under sampling, and hybrids are used on a training set of data. By using under sampling techniques, there is a problem of underfitting as this technique incurs the loss of information whereas there is an issue of model overfitting by using an oversampling approach.



Although hybrid approaches are more effective than resampling, their computation cost is very high and they are also complex in nature. Apart from these, one-class learning and ensemble learning can be used at the classifier level (Bagging and Boosting algorithms).

In the future, advanced techniques such as deep learning and cost-sensitive learning techniques can be used to handle issues of class imbalances in more complex and big datasets. To measure the accuracy and performance of the model, numerous evaluation metrics could be used.

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Review

# Development of Carbon Nanotube (CNT)-Reinforced Mg Alloys: Fabrication Routes and Mechanical Properties

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**Abstract:** Properties such as superior specific strength, being imponderous, and the ability to reprocess are the key features that have drawn attention to magnesium. In the last few years, applications such as automotive, aerospace, and medical applications have been seeking light-weight equipment, and light-weight materials are required for making them. These demands were matched by developing metal matrix composites with magnesium as a base and reinforced with carbon nanotubes (CNTs), grapheme nanoplatelets (GNPs), or ceramic nanoparticles. CNTs have been adopted for developing high-strength metal matrix composites (MMCs) because of their delicately superior thermal conductivity, surface-to-volume ratio, and tensile strength, but lower density. In developing high-performance light-weight magnesium-based MMCs, a small number of CNTs result in refined properties. However, making Mg-based MMCs has specific challenges, such as achieving uniform reinforcement distribution, which directly relates to the processing parameters. The composition of CNT, CNT sizes, their uniform distribution, Mg-CNT interfacial bonding, and their in-between alignment are the characteristic deciding factors of Mg-CNT MMCs. The current review article studies the modern methods to develop Mg-CNT MMCs, specifications of the developed MMCs, and their vital applications in various fields. This review focuses on sifting and summarizing the most relevant studies carried out on the methods to develop Mg-CNT metal matrix composites. The article consists of the approach to subdue the tangled situations in highlighting the Mg-CNT composites as imminent fabrication material that is applicable in aerospace, medical, and automotive fields.

**Keywords:** Mg-CNT; magnesium; carbon nanotubes; composite; fabrication process; mechanical properties; corrosion behavior



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## 1. Introduction

In the current scenario, light in weight and high strength are the prime features of the materials used in aerospace, medical, and automotive applications. The property of magnesium that enables it to be used in vital applications is its density of 1.738 g/cm<sup>3</sup>, which is nearly two-thirds of aluminum, making it the lightest structural material. In addition, some other properties, such as the ability to reprocess, its appreciable damping character, treatable machinability, good electromagnetic shielding, and plenteousness, make Mg an adequate selection among all other materials [1–3]. Due to these properties, the abovementioned applications have adopted magnesium as a prime material [4–6]. However, corrosion resistant strength and mechanical strength are the properties in which magnesium is inferior to aluminum. Mg alloys consists hexagonally closed packed crystal structure (HCP) and atomic packing in HCP does not allow slipping to occur easily, due to this Mg

alloys offers restrictions in deformation at normal temperature conditions. The strength of Mg alloys can be further increased by reinforcing them with metallic particulates, ceramic particulates, and carbon fiber reinforcing agents [7–9]. Recently, as Mg-based composites have attracted attention, their mechanical and electric properties are being enhanced to a higher level by incorporating reinforcing agents, such as carbon nanotubes (CNTs) and graphene nanoplatelets (GNPs). This has evolved into a wide research area [10–12]. The exclusive optical, electrical, thermal and mechanical characteristics and the enhanced surface area and aspect ratio make CNTs a superior candidate for vital application areas [13, 14]. Studies have revealed that CNTs contain diamond and graphite characteristics. It has been said that due to their possession of high conductivity with regard to thermal as well as electric behavior, they are as formable as graphite and hard as diamond [15]. Studies have confirmed that the CNT-reinforced composites have significantly improved characteristics due to their high modulus and strength of CNTs. Photovoltaic cells, fuel cells [16], energy depository products [17], physical properties detectors and responding devices, amplification devices, electron escape process guns, energy source inverters [17, 18], medicine distribution systems [19], and biological sensors [20] are the various other fields of applications of CNTs. Conclusively, a new research area in the field of material science has been explored by incorporating nanotechnology in developing metal matrix nanocomposites (MMNCs).

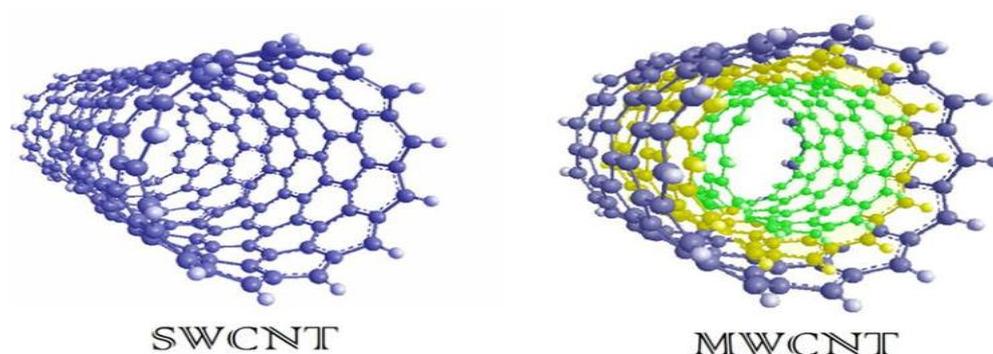
Recently, many studies have been carried out on developing metal matrix composites (MMCs) reinforced with CNTs, especially aluminum and copper particulates [20–22]. In addition, in depth work has already been carried out on CNTs reinforced with polymer matrix nanocomposites (PMNCs), and various advantageous outcomes have already been drawn [23–25]. The application of carbon nanoparticles in the metal matrix is still a hot cake in research due to the challenges in its homogeneous distribution [23,26,27] and inferior wettability. This poor wettability in CNT arises due to its considerable surface tension difference from metals. This difference is responsible for the development of weak interfacial bonding between the metal matrix and the CNT. Studies have shown that in polymer matrix nanocomposites, the constituents interact at the molecular level and highly refine the composite's properties. However, this phenomenon has not yet been studied in the metal matrix composites composed of CNTs. Several investigations have been carried out using various fabrication processes to conquer the issue of uniform distribution of carbon constituents in the metal matrix [28–33].

Hence, the generation of lumps of nano-reinforcement and permeability in the synthesis and fabrication process are the areas that need to be resolved for CNTs to be considered as a prime choice for developing MMCs. The earlier gravity casting method was found unsatisfactory due to the low yield point of the developed nanocomposites. This low yield point is caused by its high permeability. However, these permeability levels can be reduced by techniques such as squeeze casting. The distribution of reinforcing particles and reduction in the formation of lumps are factors of the development techniques that are adopted to develop the metal matrix nanocomposites (MMNCs) [34]. These development techniques can be categorized generally as liquid state and solid-state techniques. Casting under the liquid state category and powder metallurgy under solid state are two techniques that are utilized in developing particle-reinforced magnesium-based composites. Several investigations have been performed to develop magnesium-based composites and to study their characteristic behavior using the powder metallurgy route [14,30–36]. The powder metallurgy process is a chain of various processes, creating the uniform mixture of fine powders of constituents, compacting the uniform constituent's mixture, and finally sintering the compacted shape. The steps mentioned above are executed to enhance the density of the composites by minimizing the porosity level. The properties of the composites, such as poor ability to machine, appreciably low fracture toughness, and inferior tendency to deform easily, can be overcome easily by reducing the size of the reinforcement from the particle to nano level and as a result, the characteristics are refined. These appreciable enhancements in mechanical characteristics are due to grain refinement and

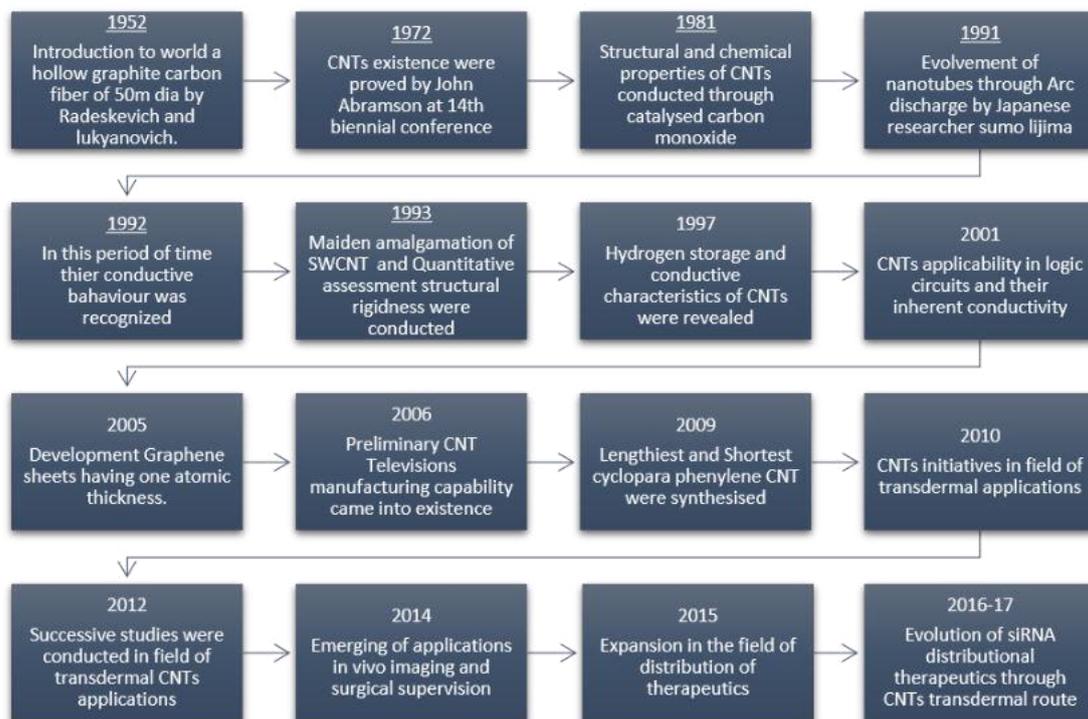
Orowan strengthening. The attention-catching factor of metal matrix nanocomposites (MMNCs) is their creep resistive property even at high temperature conditions, and this property becomes more anticipatory in the magnesium-based MMNCs. Several studies have been carried out on strengthening Mg/CNT composites to refine their mechanical characteristics [33,37,38]. Emerging of various innovative fields of application of nanotechnology in recent time, have contributed to a significantly reasonable decrease in the cost of CNTs [39]. As a result, CNT nano particles are currently available as chief reinforcing agents for developing Mg-based nanocomposites at reasonable prices. The current review article is a summary of the studies that have been conducted about the objectives of refining the mechanical, corrosion, and tribological characteristics. This article also involves the development-related suggestions/findings of authors in their respective research towards the development of Mg/CNT composite materials.

## 2. Carbon Nanotubes (CNTs)

At the beginning of the 1990s, during the study of spherical carbon molecules in electric arc equipment, Japanese scientist Sumino Iijima unintentionally found the existence of coaxial nanotubes of carbon molecules [40]. The mentioned carbon atom layer, graphene, was loped in a cylindrical shape for developing CNTs. These coaxial tubes were called multi-walled carbon nanotubes (MWCNTs) [41]. Later, Iijima and Ichihashi and their teammates, based on the above findings, further investigated and successfully found refined single-walled carbon nanotubes (SWCNTs) [42]. The configurations of carbon atoms in SWCNTs and MWCNTs are depicted in Figure 1. The techniques adopted by Iijima et al. for developing MWCNTs, consisting of diameters up to 100 nm, were further utilized with minor adjustments to develop the SWCNTs. The SWCNTs were designed by transforming the single graphene sheet to a cylinder-shaped tube (0.4 to 2.5 nm diameter) by rolling and they were extensively adopted due to their outstanding electrical, optical, physical and chemical characteristics. The property of SWCNTs that empowers them to carry numerous molecules in  $\pi$ - $\pi$  piling connections is due to their well-defined walls, possessing extremely high surface areas [43]. Rather than being straight, these nanotubes curled and coiled towards inside, having the diameter of about 1 nm [43,44]. CNTs has evolved into the most widely explored nanostructured materials, due to the availability of their extremely unique characteristics, such as high flexibility, enhanced strength, sp<sup>2</sup> hybridized carbons, and the capability to align those atoms in rope-like structures [45–49]. Figure 2 shows the historical evolvement of CNTs, which involves the wide developments that were achieved during its journey. Since 2010, some extraordinary notable applications of CNTs have evolved [20].



**Figure 1.** Structural morphology of CNT [50].



**Figure 2.** Evolution of CNTs at various stages and their major developments in several applications with respect to period of time.

The axial dimensions of CNT are in microns and in radial direction they are in nano size. As a one-dimensional nanomaterial, their surface area ranges from 50 to 1315 m<sup>2</sup>/g. The property that makes CNT a low weight nanomaterial is its lower density of about 1.3 g/cm<sup>3</sup>. The aspect ratio of CNT is much more refined compared to conventional fiber materials, ranging from 100 to 1000. The most stable carbon–carbon covalent bonds can assume the strength of CNT in their carbon loops, which possess heat conductivity of nearly 3000 W/mK. This much high thermal conductivity of CNT is analogous to the thermal conductivity of diamond. CNT holds some unique mechanical, thermal and electrical characteristics, along with a lower density, which plays a role in the development of strengthened MMNC. Studies has been executed to find the rigidity, strength and density of the CNT relative to the values of steel. It has already been stated by some researchers in their respective investigations that the density of CNT is extremely low. In a relative study of CNT with steel, the density was approximately one-sixth of that of steel, the strength was found to be approximately 100 times higher and Young’s modulus was approximately 1 TPa. This Young’s modulus is analogous to diamond and is the maximum value among all the carbon allotropes [51]. These unique characteristics of CNT have evolved due to the carbon–carbon (C-C) bond that they possess with a sp<sup>2</sup> hybridized nature [15,17,18]. By containing higher stiffness as compared to diamond, CNTs also have appreciable formability because of their locked and muffled configurations [52]. As a result, the CNTs can deform their structure to a small angle ring shape when subjected to external stresses and can regain their previous shape after the removal of stresses. Stone–Wales defects are a kind of defect studied in CNTs, which has become advantageous for them with regard to deformation beyond the elastic range. Due to this defect, CNTs have developed the capability to bear 40% of the applied tensile strain without undergoing brittle failure [53]. Electrolysis, chemical vapor deposition, arc evaporation, laser ablation, and flame synthesis are the various CNT development techniques. The techniques that are adopted the most for the production of CNTs are the vacuum depositing method, metal depositing through dispersal of arc and photoablation [54]. The above-mentioned unique characteristics of CNTs make them suitable for use in various fields of applications.

### 3. Carbon Nanotube-Reinforced Mg Composites

In recent times, it has been observed that rigorous and vital investigations have been conducted to decrease the weight of the materials used in various applications without compromising their strength. These investigations are specially carried out for the materials used in automobile and aerospace applications [55]. The density of magnesium has been found to be even lower than aluminum and titanium. The characteristics of magnesium that restrict its use in industrial applications are its inferior ductility and lower strength. These inferior characteristics of Mg are due to its hexagonally closely packed (HCP) crystal structure [54,55]. Because of the mentioned restrictions with magnesium, it is required to improve the characteristics of magnesium to enhance its use in various applications by adding reinforcing agents through different process routes. For increasing the strength and other characteristics of pure magnesium, involvement of nanoscale reinforcing agents, such as GNPs, Al<sub>2</sub>O<sub>3</sub>, SiC, and CNTs, in Mg matrices have been performed [28,56,57]. The low density and attractive strength of CNT make them an attractive selection among other reinforcing agents reinforced in the Mg matrix [5,6]. Highly stiff and strengthened MMCs may develop through the addition of CNTs in Mg matrices. The characteristics such as high ultimate strength (approximately 30 GPa) and great Young's modulus, of developed MMCs enhances by these CNTs addition [11,14,58–60].

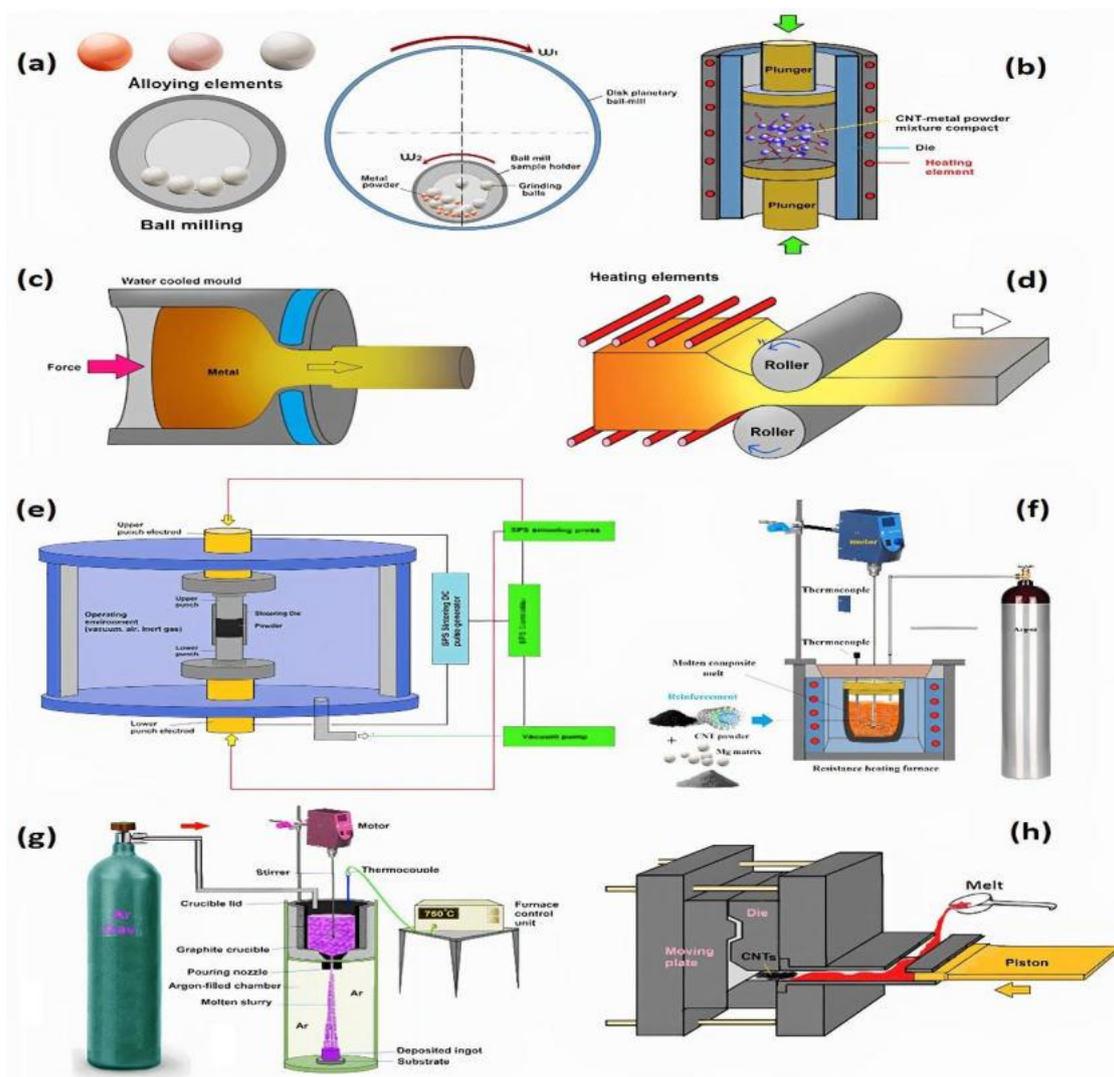
Furthermore, CNTs have also emerged as a reinforcing agent to improve the characteristics of Mg alloys, such as AZ81 [61] and AZ31 [59–62], monolithic Mg [11], and Mg-6AL [63]. However, MMCs developed through reinforcing CNTs do not possess mechanical properties that are as refined as when they are reinforced with nano-platelets (GNPs). This deficiency in the properties of MMCs developed with CNTs is due to the inferior reinforcement bonding with the Mg matrix material. This inferior bonding is due to CNT's inferior wettability in Mg matrix material. Utilization of Mg and its alloys in various fields of applications is poor due to the different inferior characteristics that they possess, such as poor anti-corrosive strength, less formability, and inferior mechanical characteristics. The poor anti-corrosive characteristic of Mg and its alloys is due to their lower standard electrode potential (−2.36 V), resulting in interaction with other elements, enhancing corrosion in Mg [59,60,62,63]. Hence, the frequency of corrosion deposition in monolithic Mg becomes unexpectedly unstable at the ppm level, due to the amalgamation of contaminations of Fe, Cu, or Ni [64]. CNTs have been introduced into the matrix of Mg material to enhance the characteristics of Mg and its alloys. However, the effect of this amalgamation of CNTs on the inferior anti-corrosive characteristic of Mg has not been thoroughly studied [65]. Possibly, attractive changes in the corrosive behavior of Mg material could emerge by reinforcing CNT particles because of its unique electrical characteristics relative to all its allotropes. The corrosive behavioral changes in the Mg alloy AZ31, when subjected to the CNT reinforcing agents, were studied by Fukuda et al. [66].

Furthermore, potential surface investigations, immersion, and polarization examinations of CNT-reinforced AZ31 were performed to obtain accurate results on the corrosion behavior changes [67,68]. The study mentioned the above-concluded remarkable changes in corrosion behavior of MMC due to the galvanic corrosion development in-between the Mg matrix and the CNTs. For further refinement of the characteristics of MMCs reinforced with CNTs, the uniform distribution of CNTs in the Mg matrix is needed. Numerous approaches have been implemented to achieve a more uniform distribution of CNTs.

### 4. Fabrication Routes to Fabricate Mg-CNTs Composites

Magnesium-based MMCs reinforced with CNT material have been developed by incorporating numerous development routes [31,35,36,53,55]. Among all the development routes of Mg/CNT MMC, the most acceptable method is powder metallurgy. Figure 3 depicts various development routes that have been incorporated to develop Mg/CNT MMCs [11,15]. Even in numerous routes, the uniform distribution of CNT particles in the Mg matrix is still a tedious job because of the clustering of CNT particles. This clustering is due to the poor wettability of CNT. The poor wettability of CNT is also responsible

for inferior bonding between CNTs and Mg matrix material. Inferior bonding alters the load transfer between CNTs and the Mg matrix [59,66]. Numerous process routes have been adopted to develop Mg/CNT MMCs to achieve uniform distributions; they can be categorized as follows: liquid distribution routes (ultrasonic curing and mechanical stirring, gemini dispersant), apparent physical reformation (ball milling (BM)), friction stir welding (FSW), applying glazing material (such as Si [69], Ni [70], and MgO [71]) to CNTs to enhance their wettability, doping of CNTs and hybridization of CNTs with other materials (such as hybrid Al-CNT reinforcement [72]). The investigations have concluded that CNTs' distribution in the Mg matrix with the stir casting process route is extremely non-homogeneous because of the lower wettability of CNT particles in a molten matrix of Mg [14,34]. However, outstanding distribution of CNTs has been observed in some development routes, such as ball milling. However, they harm the apparent physical structure of reinforced CNTs, resulting in lower strength of MMCs.



**Figure 3.** Various fabrication methods associated with powder metallurgical route: (a) powder metallurgy-ball milling [15,50], (b) direct current sintering [50], (c) extrusion based on hot working [50], (d) rolling based on hot working [50], (e) pulsed electric current sintering (PECS) [50], (f) stirring based casting (SC) [50], (g) deposition of disintegrated melt (DDM) [11,50], and (h) die casting featured with high pressure [15,50].

#### 4.1. Powder Metallurgy (PM)

Many investigations have been carried out to develop Mg/CNTs through the powder metallurgy route [30,57,71–73]. The general powder metallurgy route involves the following steps: obtaining a mixture of Mg and CNT particles by mechanical alloying or grinding, compression of the developed mixture through sintering. Some other processes for obtaining more refined characteristics are also performed with regard to further sintering, such as hot and cold pressing and spark plasma sintering. The investigations that have been carried out so far to develop the Mg/CNT MMCs majorly abide by specific post-processing of deformation, such as extrusion and rolling. These investigations were focused on obtaining a uniform distribution of CNT in the Mg matrix by developing good bonding between CNT and Mg, irrespective of the process route phases. These phases and their respective characteristic parameters are discussed in the following sections.

##### 4.1.1. Ball Milling (BM)

The process of producing powders of composite materials and blending them to obtain a uniform mixture is known as mechanical alloying [74,75]. For the development of Mg/CNT MMCs, researchers have performed numerous investigations with the adoption of significant modifications in their process routes to encounter the issues discussed in the above section. Zou et al. [74] have investigated the effects on MMC, developed with various compositions of CNT and varying porosities in the Mg matrix. The process route that they adopted for developing MMCs was powder metallurgy, which comprised processes of mixing, compressing, and sintering powder material. First, powdered Mg and CNTs were mixed to obtain a uniform mix; furthermore, this mix was compressed in a true shape die and lastly, the compressed and compacted shape of the powder mixture was sintered in a furnace to obtain the final strengthened product. Li et al. [76] also developed Mg/CNT MMCs with the same powder metallurgy route, but they followed certain specific process restrictions in the process. Thornby J. et al. [77] fabricated Mg-based composite material reinforced with 0, 0.25, 0.5, and 0.75 vol.% of CNTs through the PM route. The prime objective of the study was to analyze the creep-deformational analysis of the fabricated composites with nano-indentation. The matrix material was blended with reinforcing agents through a ball milling machine for 2 h at 200 rpm; the produced blend was compacted, followed by sintering in hybrid microwave at 640 °C for 15 min and left for 1 h for further soaking to 400 °C in a constant temperature-maintained oven. For producing the fabricated material in billet form, it was extruded at 350 °C with the extrusion ratio 20:25:1. For analyzing the creep deformation, a two-step test was adopted by incorporating a shielded environment of Ar gas. In the primary stage, any of the three 0.5, 5, or 50 /s loading rates at any of 298, 373, 473 and 573 K temperature were applied to each of the sample to a maximum loading of 50 MN. In the secondary stage, the duration for which the indentation load was consistently applied was 120 s, and then the deformational behavioral data were documented. Fewer micro-cracks and grain modifications were observed in the microstructural investigation relative to pure Mg, which promoted the improvement in material ductileness. It was observed that the dimensions of indentation at elevated temperature conditions did not deviated by much extent; this is due to the agglomeration of the large number of developed dislocations. The variation in the modulus of elasticity for different compositions was observed to be limited at 373 K, although it was found to be reductive until the vol.% of the CNTs was raised to 0.5 and abruptly increased at 0.75 vol.% of the CNTs. The creep deformation characteristics of the fabricated composites were observed as the only function of the testing temperature and were unaffected by the loading rate of the CNTs. Habibi et al. [72] have developed Mg-based MMC by using Al and CNT nanoparticle hybrid reinforcement. The process route that they adopted was PM and the Al content in the hybrid reinforcement that they used was approximately 1 wt.%. Their process was initiated with the mixing of Mg powder with hybrid reinforcing nanoparticles by adopting ball milling. This uniform mix was then compressed in die to create an initial bond between the discrete powder particles under a pressure of 97 bars.

These compressed and compacted geometries were heated/sintered in an advanced oven, which had a two-way sintering feature. For fusing the powders into one another, the molded shape of the powder was heated to their melting point temperatures, and finally, the sintered material was extruded. Their study found the satisfactory distribution of hybrid reinforcing agents up to 1 wt.% of Al and further increasing the composition of Al showed the agglomeration of the reinforcing agents. Goh et al. [31] also adopted the PM process route for developing Mg/CNT MMC. Their study found an appreciable adherence among the reinforcing agent CNT and the matrix material Mg. However, this adherence between the particles was completely mechanical, and no chemical binding was involved.

#### 4.1.2. Ball Milling (BM) Followed by Direct Current Sintering

Due to time, the powder metallurgy process route has evolved by adopting certain modifications in its processes, for example, the conventional sintering of PM was replaced by hot press sintering (HPS) [71,73]. The study followed the mentioned modification in PM and has shown remarkable improvement in the hardness, bending strength and compressive strength of the developed Mg/CNT MMC. The process of hot press sintering is basically the sintering of powder mix along with compression, which endorses the changes in their microstructure due the development of linkages in CNTs [71,78]. Endu et al. [79] proposed in their study that the anticorrosive nature of MMNC could be boosted by adding certain reinforcing agents in the Mg matrix. In their study, they developed composites by using AZ91 as the matrix material and MWCNTs as the reinforcing agent through the PM route. Their process of development of MMNCs began with grating the AZ91D alloy into a fine powder by processing the AZ91D alloy through a ball miller with argon shielding. Furthermore, this grated powder was mixed with the reinforcing agent MWCNT in the same ball miller. The uniform mixture of the matrix and reinforcing material then underwent hot pressure sintering (HPS). The hot sintered part was further extruded, and certain post processes, such as solution curing and aging, were performed. These post processes are performed for further enhancement of the anticorrosive nature of the MMNCs. Ding, Y. et al. [73] developed MMNCs by grating pure Mg by employing a high energy ball milling (HEBM) setup, which provided argon shielding. During this ball milling, a controlling agent (stearic acid) was added. These milled, pure Mg granulates were further mixed with CNTs of 1 vol.% through the previously used HEBM. This uniform mix of CNTs and Mg further underwent HPS to be sintered. Li, Q. et al. [78] introduced CNTs into Mg matrix material in an enhanced composition of 2 wt.%. The process of development of MMNC included the dry powder mixing of Mg and CNT. The mixtures produced were sintered in a vacuum environment using HPS; a compacting pressure of 50 MPa for 30 min was utilized, along with sintering at 600 °C. For the final touch to the samples, hot isostatic pressing (HIP) was performed at 600 °C for a duration of 60 min. The researchers concluded that the above-mentioned processes result in regular distribution of reinforcing agents in the Mg matrix.

#### 4.1.3. Pulsed Electric Current Sintering (PECS)

Researchers have further modified the PM process that was adopted to develop CNT-reinforced Mg composites, in which sintering was replaced by pulsed electric current sintering (PECS) [57,64,77]. The application of sparks in the PECS sintering process involves pressure, electric field diffusion, and heating. In PECS, the methodology adopted for rapid heating of the powder mix is carried out by passing the AC supply through the die containing the powder mixture of the matrix and reinforcing agent [78–81]. Due to this, the powder contained in the die has a high density and low porosity in the sintered part. The applicability of PECS was assumed by the fact that even in a short period of PECS sintering, the chances of agglomeration of CNT particles in Mg matrix were lowered significantly. Adopting the PECS technique reduces the chances of agglomeration and reduces the need for post-processing material formation [14].

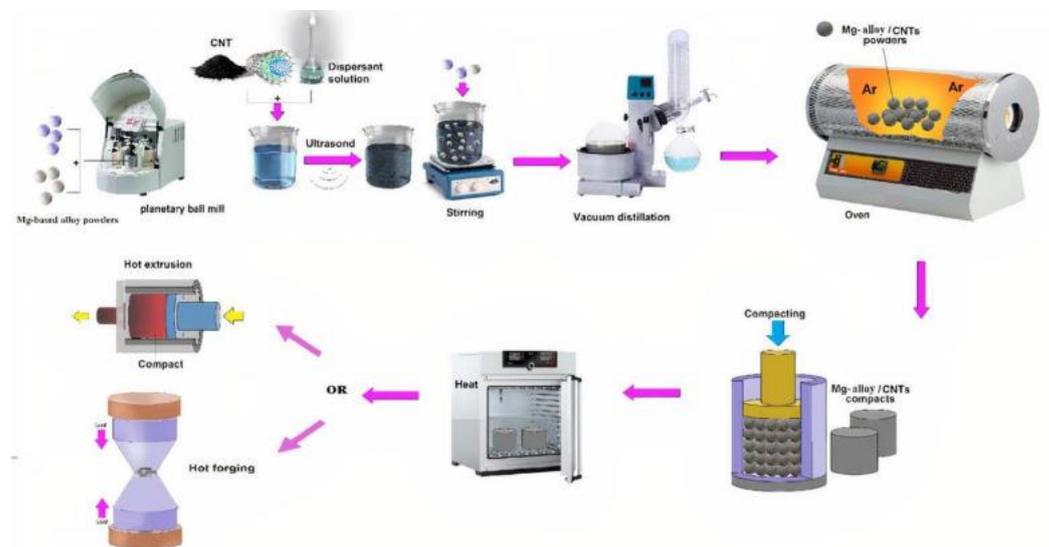
#### 4.2. Semi-Powder Metallurgy (SPM)

The research above has proven that grating the powder of Mg and producing a homogenous mix with CNTs using the ball mill is tedious. The tediousness of the ball milling process is because the process depends on various processing factors; also, the processing through cluster balls produces heat that may result in the fusion of Mg powder. Additionally, the ball milling process also ruptures the geometry and unique structure of the CNTs, which results in less strengthened composite development. To overcome these issues, semi powder metallurgy (SPM) came into existence to develop MMNCs. Here, in the SPM technique, a liquid solvent is utilized rather than planetary clustering in ball milling for developing the mix of the matrix material and reinforcing agent [28,79,80,82]. A study and its associated investigations revealed that an appreciable amount of local pressure of approximately 50 MPa was generated due to ultrasonic cavitation [83,84]. This noticeable amount of local pressure enhanced the mechanical properties of the developed composite by achieving refined distribution of CNTs in the Mg matrix. Abazari S. et al. [85] fabricated Mg-3Zn/CNTs composites through the semi powder metallurgy route. The process was initiated by developing the Mg-3Zn alloy through the ball milling process in a shielding environment of Ar gas. Before introducing the reinforcing CNTs to the matrix material, they were acidic and treated with sulfuric and nitric acids. To observe the effect of CNTs on the properties of the fabricated composites, samples were created with 0, 0.2, 0.4 and 0.8 wt.% of CNTs. The Mg-3Zn alloy was magnetically stirred with ethanol for 1 h at 600 rpm; simultaneously, MWCNTs associated with functional groups were separated in ethanol by ultrasonication for 1 h. A droplet of definite solution of CNTs was introduced to the powder suspension in ethanol at 600 rpm for 3 h. Furthermore, this mix was dehydrated in the vacuumed furnace at 344 K for 24 h. The dry mixture was compacted under a pressure of 650 MPa, sintered at 874 K for 2 h, and at the last extrusion based on hot working was performed. The researchers concluded that semi-powder metallurgy and extrusion were efficient process routes. The microstructures improved due to the presence of functional groups associated with CNTs, which raised the nucleation sites and enhanced the strengths of the load transfer mechanisms found to be responsible.

##### 4.2.1. Gemini Dispersant

The objective of loading the Mg matrix material with CNT reinforcing agents faces hurdles due to the clustering of the CNT particles in the Mg matrix in the process of developing the mix, which results in the degradation of unique features of CNTs, due to the generation of weak bonding between CNT and Mg particles [59,66]. The issue mentioned above can be overcome, and for obtaining the desired uniform distribution, the method of reform in covalent and non-covalent bonding is utilized and the process of doing so is termed as chemical reformation [82,83,86,87]. This chemical reformation method efficiently executes the uniform distribution of CNTs; however, this also alters the CNTs' internal structure by inducing a covalent bonding surface through chemical and physical oxidation [86]. In recent times, researchers have investigated the use of new dispersants named gemini in respective investigations and the results has shown appealing characteristics [84,85,88,89]. The gemini dispersant constitutes two identical amphiphiles. These amphiphiles are integrated with one another through a chemical bond. Aromatic rings, hydrophilic groups, and hydrophilic chains develop these amphiphiles. The even distributions of CNTs are possible with the gemini dispersant due to the phenomena of generation of  $\pi$ - $\pi$  assembling and also as a result of the tendency of gemini to be adsorbed on the CNTs' surfaces [64,80,86–89]. The gemini dispersant's hydrophobic and lipophilic nature also generates uniform distribution [90]. Hou et al. [91] developed Mg/CNT MMNCs by incorporating the gemini dispersant in the mix and the dispersants they utilized were of ionic characteristics. The researchers concluded in their study that, by using the mentioned dispersant, they achieved a more refined distribution of CNTs, even with CNT's untouched unique structure. From the purity of the developed MMNCs, these dispersants can be extracted through annealing. To obtain the desired dispersal of the CNT particles

throughout the matrix of Mg, the investigators dissolved MWCNTs in the die ionized water and ionic gemini dispersant. The authors observed in their study that the reason behind the refined distribution of the CNTs in the Mg matrix was due to the formation of negative charge in the MWCNTs developed by the DSDM route. The generated negative charge raises the intermediate particle repulsion in MWCNTs in DSDM water solution. Even more refined distribution and less agglomeration were observed in enhancing the surface potential of MWCNTs [91]. Furthermore, the powdered forms of Mg and Al were added to the MWCNT mix with a steady rate, along with moderate ethanol and to obtain a perfect mix, stirring was performed for 20 min. Vacuum distillations were performed for drying the stirred Mg-Al-MWCNT mixture. The removal of dispersant from the MWCNT mix was performed through the annealing process in an argon shielding environment. The annealed mix was placed under compression, heat-treatment, and extrusion, resulting in the development of MWCNT's outstanding characteristics [55]. Figure 4 depicts the characteristic defining steps in the development of Mg/CNT composites through the gemini dispersant.



**Figure 4.** Processes included in the gemini dispersant for fabricating Mg-CNT composites [50].

#### 4.2.2. Development of CNT's Surface Functional Groups

The development of the Mg/CNT composites is vulnerable to the agglomeration of CNTs and generation of their clusters, which occurs due to CNTs' possession of certain unique characteristics, such as their enhanced L/D ratio, extraordinary Van der Waals force, and immense specific surface area. This clustering of CNTs in the Mg matrix is responsible for the generation of porous composites [92]. For overcoming the disadvantages of CNTs, function groups such as hydroxyls ( $-OH$ ) and carboxyl ( $-COOH$ ) carbonyls ( $>C=O$ ) can be generated on their surfaces. The uniform distributions of CNTs were also achieved by applying sound energy to agitate the CNTs in an anhydrous ethanol solution. The process of doing so is called sonication of CNT particles, which also leads to eradicating the contamination from CNT's surfaces [70], [75]. Rashad et al. [82], in the attempt to develop a hybrid composite, produced a slurry of powders in an Mg-3Al-1Zn composition in ethanol. Furthermore, this slurry was added to 1.5 wt.% CNTs, which were layered with nickel. The additions were executed through mechanical stirring at 1500 rpm for a duration of 2 h. Finally, vacuum filtration was performed, and the composite powder was compressed in an SS die. Fatih Aydin et al. [93] developed MWCNT-reinforced Mg composites through a process route that started with preparing the material powder through SPM, extraction and sonication using ultrasonic waves in ethanol; for distribution of CNTs, mechanical stirring was used and lastly, extrusion through dies was performed.

#### 4.3. Extrusion Based on Hot Working

The deformation of material through cold working processes results in work-hardening of the materials. The Mg/CNT composites are deformed through hot extrusion to overcome this issue. However, the hot extrusion process is optimal only when the amount of composite material fabricated through the PM route is in a large quantity. During the development of Mg/CNT composites, the generation of carbides has been observed at the interface of the Mg matrix and CNTs when the working temperature rises above 500 °C; this leads to lower composite strength [94]. The hot extrusion step in the process route may overcome the issue mentioned above. Shimizu et al. [95] developed AZ91D alloy-based composites using MWCNT as a reinforcing agent in different wt.% compositions, ranging from 0.5 to 5 wt.%. The process route that they adopted involved ball milling, vacuum-operated HPS, and hot extrusion. In their observations, they stated that until the 1 wt.% was reached, they observed proper CNT distribution. Once it raised above 5 wt.%, they observed clusters of CNTs in the mix. In addition, they summarized that the strength of the fabricated composite was enhanced due to the lying of the shorter and in line CNTs on the outermost surface of the Mg particles, which offered restricted deformation; hence, the strength of the composite was raised. Harun Mindivana et al. [96] fabricated Mg-6Al/CNT composites and their observation was based on variations in the composition of CNTs, which were 0.5, 1, 2, and 4 wt.%. The fabrication process consisted of ball milling, cold compacting, and hot extrusion. The generated composites after hot extrusion underwent microstructural study. It was concluded that the CNTs were uniformly distributed over the Mg chips and added that this distribution of CNTs suffers from the increments in CNTs' wt.%. In their study, Han et al. [59] summarized that the CNTs in Mg matrix material enhance the development of twinning and also deteriorate the basal consistency in Mg-based nanocomposites processed through hot extrusion.

#### 4.4. Metal Fusion and Solidifying Technique

Plenteous attempts have been carried out to develop CNT-reinforced metal matrix composites through the melting and solidification technique. The melting and solidification route incorporates high-temperature conditions, which may affect the characteristics of CNTs and involve chemical reactions at CNT-matrix interfaces. It has been advised to include this process route in low-temperature working conditions. Furthermore, the uniform distribution of CNTs in the metal matrix through mechanical stirring is a tedious job; due to surface tension, CNTs are generally agglomerated with each other and develop in bunches. Mg's low melting point temperature enables the incorporation of the melting and solidification route for reinforcing the Mg matrix with CNTs [14,88,93].

##### 4.4.1. Stir Casting (SC)

The fabrication of Mg/CNT composites can also be performed through the stir casting route. However, the process of stir casting possesses certain restrictions, such as the clustering of CNT particles and oxidation of molten Mg. In addition to the issues mentioned above, the mechanical stirring in stir casting damages the unique crystallographic characteristics of CNTs, resulting in inferior mechanical characteristics of the Mg/CNT composites. The issue of clustering of CNTs in the stir casting route may be overcome by modulation and controlling the various parameters of the stir casting technique [97]. The oxidation of molten Mg can be prevented by maintaining the vacuum in the stirring container [91,94,98]. In recent times, numerous investigations have been carried out, intending to optimize the process parameters of the stir casting technique for obtaining the uniform distribution of CNT particles by overcoming the above-mentioned issues. Gupta M. et al. [99] experimented with fabricating the Mg matrix composite reinforced with different reinforcements, such as ceramic nanoparticles, metallic and CNTs. The objective of the experiment was to study the variance in mechanical characteristics of the fabricated composites [93–96,100]. The microstructural porosity in the Mg/CNT composites fabricated through the stir casting route was comparatively lower; this has been concluded by the study conducted by Tun, K.S. et al. [101]. Kumar et al. [102] fabricated AZ91D-based composite material by insertion

of MWCNTs. The process route that they adopted was stir casting. In the outcome of the study, they concluded that uniform distributions of CNTs in the AZ91D matrix were observed with well-fabricated microstructures. Selvamani et al. [103] employed the semi-automatic stir casting route in their AZ91D/MWCNT fabrication process. The amount of MWCNT reinforcement that they dispersed in the Mg alloy matrix was from 2 to 4 wt.%. As a result of the study, they found that CNT particles were dispersed in the eutectic matrix and the developed composite consisted of a dendritic structure of lower porous nature in comparison to the pure Mg alloy [103]. Abbas et al. [36] conducted an experiment to decrease the porous nature of the fabricated composites through the stir casting route by increasing the amount of CNTs dispensed in the Mg matrix. Different wt.% of MWCNTs were added in the AZ31 matrix in their composite fabrication process. This increment in mass density effectively enhanced the mobilization and compaction of metal atoms. The continuous stirring caused grains to be refined and shearing of the particles in the molten mix. Consequently, the porous nature of the composites was reduced. Additionally, they summarized the factors that influence the porous nature of the composites, which were reinforcement distribution, appreciable wettability, and effective linkages. Hong Yuan et al. [104] adopted a unique and innovative technique for developing ZM1 alloy-based CNT-reinforced MMCs. A ZM1 matrix material was prepared separately, with 3.50, 5.50, 0.50–1.00, 0.10 and 0.01 wt.% of Zn, Zr, Cu, Ni, Mg and impurities, respectively. Instead of feeding the reinforcing material in the matrix, primarily, they were pre-dispersed in Zn powder through liquid mixing and mechanical alloying. In liquid mixing, 1000 mL of ethanol was added with 10.0 g CNTs and ultrasonication was performed. Later, simultaneous sonication along with stirring were carried out after adding 3.0 g of powdered Zn to develop CNT-Zn heterogeneous solution. In the secondary stage of mechanical alloying, for obtaining the CNT-Zn mix, 10.0 g of CNTs, 3.0 g of Zn and 1.0 g of stearic acids were blended and then ball milled at 100 rpm for 4 h. For obtaining the solid pieces of CNT-Zn, the mixes obtained in both stages were further compressed through a hydraulic pressing machine. Finally, these solid CNT-Zn pieces were fed in (1.0 wt.%) as reinforcing agents in separately prepared 3.0 kg ZM1 Mg alloys through mechanical stirring. Sample testing revealed appreciable modifications in the dispersion of the reinforcing material, leading to enhanced mechanical characteristics, in addition to the fact that the fracture modes were also transformed from brittle to ductile.

#### 4.4.2. Deposition of Disintegrated Melt (DDM)

The DDM route of fabrication of composites has been adopted generally for those fabricated with reinforcing nano-sized particles. The method involves the heating of Mg above the superheated temperature of 750 °C, which contains the provision of argon shielding. A mechanical stirrer is provided to disperse the reinforcing agents uniformly throughout. The heating pot has a bottom nozzle for pouring out the molten material, which also has the provision of disintegration with argon jets. Lastly, the poured-out material is extruded. Chan et al. [11] employed an innovative electromagnetic concept to stir the Mg/CNT molten mix. The molten pot used in the fabrication had inducting coils at the outer surface; these coils induced the magnetic field that enabled the molten mix to be stirred. Furthermore, the molten mix was heated to 700 °C in an environmentally shielded manner. Lastly, the composite slurry was poured into the die for developing the composites. Paramsothy et al. [105] conducted their experiment of developing a composite through the dispersion of CNT particles into the ZK60A matrix. The process of development was carried out through deposition of the disintegrated melt route, trailed by hot extrusion. The vibrant accumulation of composite slurry on the substrate through hot extrusion, material shielding through argon gas, and least gravity-associated segregation, due to proper selection of the stirring factors, resulted in the uniform distribution of the CNT particles.

#### 4.5. Friction Stir Processing (FSP)

FSP is a solid phase processing approach that generates an adequate grained microstructure. Analogous to friction stir welding (FSW), a rotating tool, is adopted in the process to rotate at the substrate surface. This generates the required deformation resulting from the fine and uniaxial grains on the friction plastic deformation surface. This process of development of fine and uniaxial grains is termed as dynamic recrystallization. FSP is a productive technique that is generally employed to fabricate the composites. However, it has been employed for dynamic recrystallization of the substrate surface. The outcome found by researchers in the process of Mg/CNT composite fabrication through FSP involves the welding zones of CNT and matrix material [32,101,106]. Sharma et al. [107] fabricated composites by introducing nano-sized MWCNTs and graphene as the reinforcing material to the rolled matrix material plates of AZ31B through FSP. The process constraints were as follows: axial load of 5.4 kN, transitional velocity of tool of 40 mm/min, and 2° tool inclination. The composites were fabricated with 1000, 1200 and 1400 rpm rotational tool speeds. The characteristic investigations of the developed samples revealed that tensile and compressive strength of the fabricated composites increased by enhancing the reinforcing material distribution, which was achieved through enhancing the rotational tool speed. In addition, they observed a drop in the tensile strength in the case of the hybrid composite. They concluded that the mechanical characteristics of the fabricated composites were satisfactory at a toll rotational speed of 1400 rpm. Jamshidijam, M. [108] fabricated AZ31-based composite material reinforced with MWCNTs through FSP. The FSP process involved adequately grained rigid interfacial bonding between the matrix alloy AZ31 and reinforcing agents MWCNTs, resulting in hardened surface composites. Morisada et al. [33] employed the process of FSP to develop Mg/CNT composites. The method of composite development was initiated by creating an indent in a solid piece of the matrix material Mg alloy and that indent was filled by the reinforcing agent CNTs. Then, a revolving tool was projected in the groove for distribution and bonding of the CNTs with the Mg material. The revolving tools were employed to rotate at 1500 rpm, providing the desired frictional force to produce intermetallic bonding. They concluded from their findings that the size of grains was reduced by the process; however, the grains were refined and proper distribution of the CNTs was observed in the Mg matrix. Additionally, it was concluded that the distribution of CNTs was found to be more uniform with a lower rotational speed of the tool, but that resulted in increased process duration. Huang et al. [109] employed the stir casting route followed by FSP for fabrication of Mg-6Zn-based composites reinforced with CNTs. The researchers found in their investigations that the mechanical characteristics of the fabricated composites were enhanced due to the development of appreciable intermetallic bonding and refined grains.

#### 4.6. Spread Dispersion (SD)/Rolling Process

Spread dispersion/rolling process is an innovative route to fabricate Mg matrix composites by developing a layered micro-nano configuration. Xiang et al. [75] employed the SD/rolling process route to fabricate Mg/CNT-laminated composites. For obtaining the layered micro-nano configuration, they were the first to employ the method of electrophoretic deposition (EPD) for combining the CNTs with 50 µm Mg foils. The tests were oriented towards characteristic identification and revealed no clustering of the CNTs or proper dispersion of the CNT particles. They added that the characteristics of the layered configured composites can be customized by adopting variable thicknesses of Mg foils. Furthermore, the deposition time is the most important factor in deciding the thickness of the CNT layer. The process of fabrication ended with hot rolling of the stacked Mg foils, which resulted in the reduction in the total thickness by up to 60%. The researchers also investigated dislocation/slip vector movement in the fabricated composites; their observations and findings reported the presence of blockages in dislocation movement in the fabricated composite. The presence of these dislocation blockages resulted in a highly strengthened composite compared to the composites fabricated through conventional routes. Figure 5.

illustrates the process route of fabrication of Mg/CNTs through the layered micro-nano configuration [75].

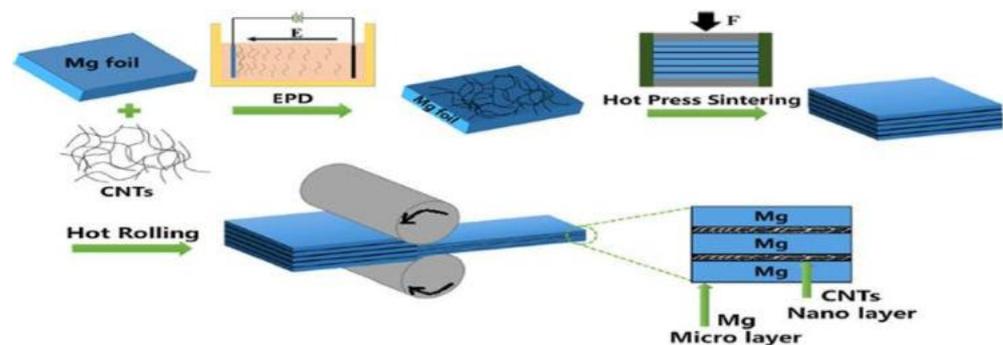


Figure 5. Fabrication of layered micro-nano configuration of CNT-reinforced composites [75].

## 5. Mechanisms Responsible for Strengthening of Nano-Composites

The fabrication of metal matrix nanocomposites (MMNCs) through any of the routes mentioned above is commonly employed to enhance their mechanical characteristics, such as strength and stiffness, relative to the pure matrix material. These composite characteristics are accomplished by effectively transferring the working stress from the matrix material to the reinforcing agents, i.e., CNTs. Interfacial bonding of the CNTs and matrix material, homogenous dispersion of the CNTs in the matrix material, and aspect ratio are the chief deciding factors of the characteristics of a fabricated composite [110]. It has been observed that the observation of a crack at interfacial bonding between the reinforcement and matrix materials affects the composite's toughness, and the ductility of the composite will be the factor of moderation of uttermost stresses near the interface [111]. Additionally, fabricated composites' characteristics are highly altered through the process route employed in fabrication [11]. Four mechanisms have been suggested for understanding and gauging the strengthening effect in the fabricated composites, which are discussed further.

### 5.1. Load Transfer

Nardon and Prewo [112] have stated that the load transfer is the most acceptable mechanism. Following this mechanism, the interfacial bonding created in the fabricated composite enables the matrix material to transfer the applied stresses from the matrix material to the reinforcing agent. This will enhance the composite strength to bear the stresses. Although, for transferring the stresses and strengthening the composite, there should be an appropriate aspect ratio associated with the nano reinforcing materials [107–109,113–115]. Consequently, employing a reinforcing agent of greater hardness will be more effective in stress transfer and may strengthen the composite. The shear model [116] is widely accepted for analyzing the concept of load transfer mechanism. The perception made in the shear lag model is that a 3-D fiber will be considered as a 1-D object during the analysis. The shear model is also employed for analyzing the consequences of the presence of broken fiber in a metal matrix with various complexities [117]. Li P. et al. [118] conducted a study for developing AZ91D-based composites by introducing CNT-Mg<sub>2</sub>Sip as the reinforcing material through the in-situ process route. At the initial stage, the CNTs were oxidized through magnetic stirring in a 1:3 acidic mixture of concentrated H<sub>2</sub>SO<sub>4</sub> and HNO<sub>3</sub>. The CNTs underwent acidic treatment with powdered AZ91D and were mechanically stirred in a C<sub>2</sub>H<sub>5</sub>OH solution for 2 h. The developed precipitated particles were dehydrated in a vacuum furnace at 60 °C for 10 h. These dehydrated particles and powdered Sip underwent ball milling in atmospheric shielding of Ar gas to develop 0.3 vol%CNTs-0.37 vol%Sip/AZ91D composite powders. This powdered CNT-Sip/Mg form was hot compacted at 200 °C in a vacuum environment. The compacted bar of the material was reheated in a capillary furnace at 585 °C for 60 min. Finally, the desired composite was developed by pouring the partial solid into a preheated mold under the pressure of 224 MPa. The same procedure was followed for the fabrication of

0.75 vol%CNTs-0.75 vol%Mg2Sip/AZ91D, 1.5 vol%CNTs/AZ91D, 1.5 vol%Mg2Sip/AZ91D and 3 vol%Mg2Sip/AZ91D. The results concluded that load transfer and thermal incongruity were the prime strengthening mechanisms in the developed composites. The most feasible mechanical characteristics among all the compositions fabricated were found for 0.3CNTs-1.2Mg2Sip/AZ91D.

### 5.2. Orowan Mechanism

Composite material undergoes plastic deformation beyond its yield limit. Plastic deformation of composites is due to crystallographic movement of dislocations; this plastic deformation consists of the Orowan mechanism [119]. The phenomenon of generation of residual dislocation loops near to the dispersed CNT particles in Mg matrix, occurs through the succeeding slip bends and sidestepping of the integrated agent's in compliance with the Orowan mechanism. Thus, the generation of the residual loops consecutively strengthened the work material; hence, the dispersion of reinforcing agents in the metal matrix occurs in the developed composite [34,36,55,70,73,74,103]. Earlier studies have summarized that in order to analyze the Orowan mechanism in a fabricated composite, it is required to have interparticle spaces among the reinforcing agents. Additionally, it was concluded that appreciably strengthened composites were developed when cylindrically shaped reinforcing agents were incorporated instead of spherical ones [120]. For the composites that are fabricated through reinforcing the particles of comparatively smaller and shorter shapes, the Orowan mechanism plays a major role [121].

### 5.3. Thermal Incongruity

The thermal incongruity mechanism emerges when the generation of the enhanced dense dislocation site emerges around the reinforcing agents. This emergence is due to the appreciable variation in the coefficient of thermal expansion (CTE) between the reinforcing agent and matrix material. The presence of variation in CTE between the reinforcing agent and matrix causes the composite to undergo thermal changes, resulting in the generation of thermal and internal stresses. Due to the developed thermal variation, the dislocations are generated around the reinforcing agents to lower the stored energy. The dislocation density present in a composite is related to the thermal strain present in composites. These developed dislocations are the measuring parameters for the level of strengthening produced in the fabricated composites. Strengthening of the composite is enhanced with the enhancement in the density of dislocations [115,116,122]. Multiple strengthening mechanisms [60] due to the dispersion of CNTs in the metal matrix may be characterized according to the following equation:

$$\sigma_c = \sigma_{mt} + \Delta\sigma_L + \Delta\sigma_T + \Delta\sigma_{Orowan} \quad (1)$$

In the above equation,  $\sigma_{cm}$  and  $\sigma_{mt}$  are the composite strength and matrix strengths, respectively,  $\Delta\sigma_L$ ,  $\Delta\sigma_T$ ,  $\Delta\sigma_{Orowan}$  are the quantum enhancement in strength due to the mechanisms related to the transfer of the load, thermal incongruity, and Orowan.

### 5.4. Grain-Boundary Strengthening

Grain-boundary strengthening is also a member of the group of mechanisms that plays a chief role in strengthening the fabricated metal-based CNT-reinforced composites. Unlike all the other mechanisms mentioned above, the grain-boundary strengthening mechanism deals with the compressive strength of the composite. The mechanism is initiated through the refining of grains and results in enriched compressive strength of the composite. It has been experimentally observed that the grain-boundary strengthening befall during the composite development process routes involves refining the grain sizes [53,66,69,103,117]. It has also been observed that different process routes adopted to fabricate the CNT-reinforced composites result in dissimilar grain-boundary strengthening coefficients [123–125]. During the fabrication process of the composites, the reinforcing mechanism based on particle size is expected to occur by simple reinforcing principles based on stress transmission,

such as “rule of mixture”. Compared to conventional reinforcing agents, such as SiC, the high aspect ratio property of CNTs enables the fabrication of the composite, which may contain minor voids to lock the dislocation movement, even with lower wt.% of the CNTs. The deformations through these composites are only possible if either the dislocation bypasses the hindrance created by the Orowan mechanism or with the shearing of CNTs. The characteristic feature of CNTs such as the smaller diameter and stress concentration at the head, contribute to the dislocation growth which results in the yielding.

Furthermore, a significant rise in resistance to creeping in the fabricated composite may be realized, as a result of the difficulty regarding the dislocation climb [126]. “Crack divergence”, “CNT’s linking” and “CNT’s bug-out” are the general Mg/CNT composite strengthening mechanisms. At the moment of failure in CNT-reinforced Mg-based composites, many CNTs pull out from the matrix. The pulling out of the CNTs lowers the crack propagation speed by overcoming the stresses at the crack tip. In addition, CNTs pulling out results in generated interfaces that require external work that must be carried out. Thus, crack propagation consumes surplus energy. When these bridged CNT composites are subjected to external stresses, the stresses generated on the crack surface are compressive. These compressive stresses develop near the crack surface, restricting further crack enhancement; consequently, the toughness of the composite rises. Xiang et al. [75] employed a layered micro-nano configuration to fabricate Mg/CNT composites. The study aimed to investigate the fractured format in fabricated Mg/CNT composites. Compared to pure Mg, in which a localized strain was observed, the fractured surface of the Mg/CNT composites was found to be smooth. The Mg/CNTs underwent advanced strain hardening and showed a substantial modification in even cleavage to a rough, jagged fractured surface. This progressive rate of strain hardening results in even more uniform deformation. CNT’s layers restrict the crack propagation; consequently, the CNT layers refine the toughness of the composite.

## 6. Mechanical Properties of Developed Composites Depending on the Production Process

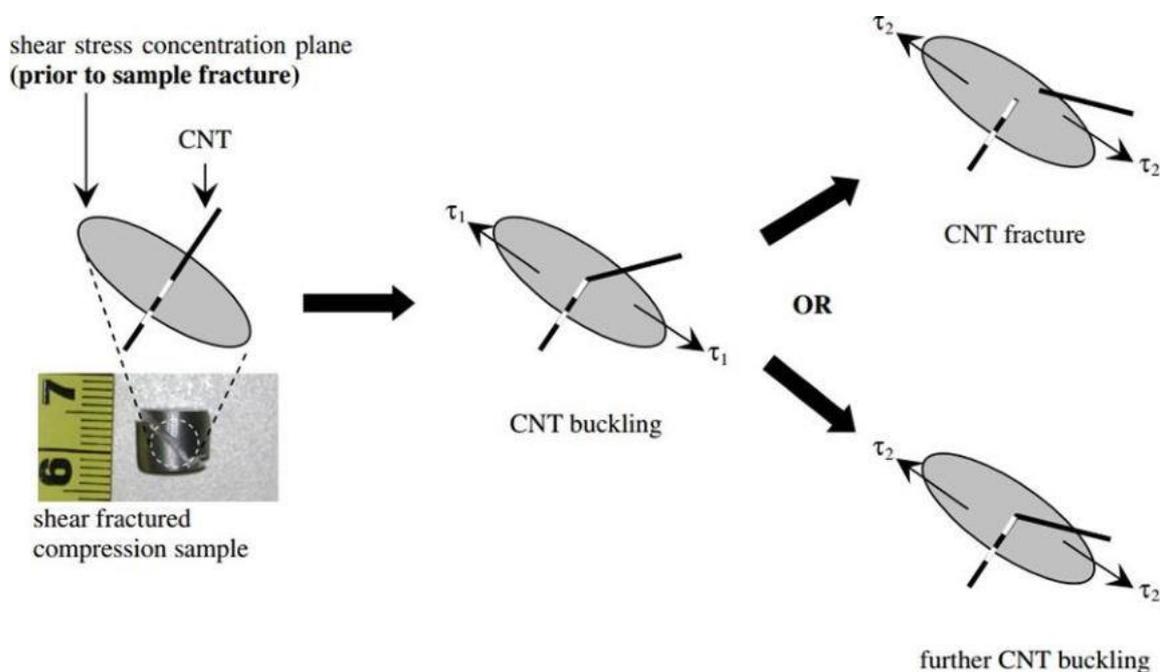
Various studies have been carried out to investigate the mechanical properties concerned with fabricated Mg/CNT composites. The investigated mechanical properties obtained in Mg/CNT composites fabricated through different process routes are summarized in Table 1. Ding et al. [73] conducted an experiment to evaluate the mechanical characteristics related to Mg-based, CNT-reinforced composites fabricated through the powder metallurgy route. The fabrication process illustrated that the refinement of Mg powder could be achieved by ball milling before the dispersion of CNTs, which enabled CNTs to be uniformly dispersed in the matrix material. Furthermore, the sintering of Mg/CNTs was executed. The grain sizes of the sintered composite observed through optical microscopy were found to be approximately 2–25  $\mu\text{m}$ . No considerable refinement in the grain size was observed in the sintered samples after ball milling (2–18  $\mu\text{m}$ ). The fabricated composite was further tested for the evaluation of mechanical properties. The results of these tests were concluded as follows: malleability of 11% was observed, compression strengths were found 504 MPa, and yield strengths were 454 MPa, respectively. Li et al. [35] developed Mg-MWCNT composites by employing a process route that consisted of two basic steps. The first step was executed for the pre-distribution of MWCNTs on matrix material Mg chips through a distributing block polymer. In a further step, the Mg chips containing the MWCNTs finely distributed on their surface were converted into molten form. This heating process of Mg chips was followed by stirring. Furthermore, this molten Mg alloy/MWCNT composite mix was solidified after it was poured into the mold. The sample analysis ensured that the addition of only 0.1 wt.% MWCNTs resulted in the outstanding rise of 36% in CYS and UCS. The investigators further concluded that the Mg matrix material’s deformability was enhanced due to thermal incongruity, load transfer, and Orowan strengthening mechanisms. In addition, they added that the CNT’s distribution in the base Mg matrix material effectively offered obstacles in crack propagation. Yuan et al. [71] initiated their study to evaluate the mechanical characteristics of the AZ91/CNT composites coated with

MgO. Their experimental outcomes highlighted the enriched mechanical characteristics. The researchers concluded that the causes of enrichment were the Orowan mechanism, thermal mismatch, grain size modifications, and stress transfer mechanism. Zeng et al. [127] employed a manual stirring process route of distribution of MWCNTs in the AZ31 matrix. The MWCNTs that they utilized as reinforcing agents had 30 nm diameters and lengths of 1–10  $\mu\text{m}$ . As an outcome of the experiment, they found extraordinary improvement in hardness, tensile strength, and Young's modulus when the AZ31 matrices were loaded with 1 wt.% MWCNTs. They concluded that when the loading of MWCNTs rises from 1 wt.%, this resulted in the alteration of the tensile characteristics due to the development of clusters of MWCNTs in the AZ31 matrix. Hou et al. [55] developed MWCNT-reinforced Mg-9Al-based composites. Their experiment revealed the alterations in length from micron to nano size of the  $\text{Mg}_{17}\text{Al}_{12}$  phase. During the study of Mg-9Al/MWCNT composites, it was found that the addition of 0.4 wt.% of MWCNTs resulted in a UTS value of 355 MPa and elongation of 15%, which represents 18% and 150% enhancement, respectively, compared to pure Mg. Proper dispersal of the nano-sized  $\text{Mg}_{17}\text{Al}_{12}$  phase and appreciable inter-metallic bonding between the matrix and reinforcement were the responsible phenomena for the enhancement in the characteristics, according to the researchers. Goh et al. [31] employed the powder metallurgy route to develop Mg/MWCNT composites. For the MWCNTs, they adopted a diameter of 20 nm, and these reinforcing agents were added in different compositions from 0.06 to 0.3 wt.%. The fabrication proceeded by blending the MWCNTs and Mg powder, followed by sintering and hot extrusion. Regarding the study outcomes, they concluded that the addition of maximum wt.% in the adopted range, i.e., 0.3 wt.%, generated clusters in the matrix material.

Furthermore, they added that by increasing the wt.% of the CNTs, the yield strength and deformability of the composites rises. However, negligible impact was found on the composite's UTS value by enhancing the wt.% of the CNTs. Shimizu et al. [95] carried out their study by fabricating AZ91D-based MWCNT-reinforced composites through the PM route. The route included ball mill, HPS, and extrusion processes. Their study was focused on refining the distribution of reinforcing MWCNT particles. They reported that the maximum yield strength (YS) and ultimate tensile strength (UTS) were observed with reinforcing 1 wt.% of the MWCNTs. They found proper distribution of the CNTs over the Mg matrix particles. Consequently, these generated restrictions in the deformations, and thus strengthened the composite material. Liu et al. [128] experimented with developing Mg-based composites reinforced with MWCNTs with a loading of 1.5 wt.%. The MWCNTs that they employed were 20–40 nm in diameter and 1–5  $\mu\text{m}$  in length. The process route that they followed was mechanical stirring, with the incorporation of the high-intensity ultrasonic process. They reported that yield strength (YS), ultimate tensile strength (UTS) and elongation of the Mg matrix material were enriched by the dispersion of 1.5 wt.% MWCNTs as a reinforcing agent.

Sun, F. et al. [129] employed the CVD method to develop MWCNT-reinforced Mg-based composites. The CVD technique was performed at 480 °C by incorporating a Co/Mg catalyst and acetylene gas. The process was initiated with argon-shielded ball milling of the matrix material dispersed with MWCNTs in the range of 1.8, 2.4, and 3 wt.%, for 400 rpm for 2 h. The ball milled mixture was further sintered at 580 °C for 2 h and lastly extruded in a heated form. During observations, it was reported that the tensile strength of the matrix Mg was enhanced to 285 MPa with increments in the reinforcing agent up to 2.4 wt.%. This increment in tensile strength was about 45% of the pure Mg Matrix, which was 220 MPa. Increasing the composition of MWCNTs further up to 3 wt.% resulted in the clustering of the reinforcements. The matrix material Mg possesses HCP crystal geometry, which was the hindrance that Mg provided in tensile deformation. With the dispersion of MWCNTs and further extrusion, the prismatic and cross-slip dislocations vectors activated in the Mg matrix enhanced the composite's deformability. Goh C.S. et al. [88,93] developed Mg/MWCNT composites by employing deposition of disintegrated melt and extrusion, incorporating variable wt.% reinforcing MWCNTs. In the study mentioned above, they

concluded that with MWCNT incorporation of 0.3 and 1.3 wt.%, the tensile elongation, UTS and YS of the matrix material improved. Upon further increment of the reinforcement to 1.6 and 2 wt.%, the clustering of the MWCNTs was observed in the Mg matrix, and consequently reduced the tensile strength, deformability, and YS. It has also been reported that the fabrication of Mg/MWCNTs with MWCNTs consisting of length less than 100  $\mu\text{m}$ , diameter of 20 nm and inferior loading lower than 1.3 wt.%, this resulted in the enhanced tensile deformability of the composites. The instigation of prismatic slipping and advancement in basal slipping resulted in this enhancement in deformability [97]. Figure 6 illustrates the CNTs that sheared and buckled under compressive loading. The shearing and buckling of the CNTs generated is due to the inhomogeneity of the tensile yield strength (TYS) or compressive yield strength CYS [105]. The buckling of CNTs occurs when these dispersed CNTs within the matrix material undergo fracture after experiencing compressive deformation.



**Figure 6.** Compressive shearing and buckling of CNTs in ZK60A-based nano-composite ( $\tau_2$ ,  $\tau_1$  are in-plane stresses of shear nature, where  $\tau_2 > \tau_1$ ) [105].

Paramsothy, M. et al. [105] fabricated ZK60A matrix-based composites reinforced with CNTs of 40–70 nm outer diameter and an aspect ratio of about 100. They stated through their study that the dispersion of 1 vol.% of CNTs in the ZK60A matrix resulted in an improvement in UCS by about 5% and decrement in CYS of about 14%, compared to unreinforced ZK60A. With the same dispersion value of CNTs, the compressive strength (CS) of the developed composites was found to be inferior at any given strain value, compared with unreinforced ZK60A. Figure 6 illustrates the causes of this decrement in CS, which could be because of the adverse effects of (i) inferior intermetallic phase dilution in the fabricated composite or (ii) the phenomena of the generation of buckling in reinforced CNTs in the ZK60A matrix. The researchers have further stated that fabrication of the ZK60A/CNT composites was performed by employing CNTs with an aspect ratio of about 100. When the fabricated composites were subjected to compressive deformation, buckling of the CNTs was reported and consequently, they fractured within the matrix material [123,124,130,131]. The above-mentioned buckling in CNTs can also be carried out even more smoothly by enhancing the width to height ratio of the CNTs being used, which as a result lowers the limits of the characteristics concerning to reinforcement [100,125].

**Table 1.** Summarized investigated mechanical properties obtained in Mg/CNT composites fabricated through different process routes.

Sample(s)	Fabrication Method(s)	Young's Modulus (GPa)	Tensile Properties			Compressive Properties			Hardness	Ref.
			0.2%TYS (MPa)	UTS (MPa)	Elongation (%)	CYS (MPa)	UCS (MPa)	Failure Strain (%)		
Mg-1Al	SPM + VS + HTE	ET:12.7 ± 0 EC:5.1 ± 0.2	156 ± 3	201 ± 3	6.8 ± 0.4	100 ± 3	378 ± 7	17 ± 0.4	49 ± 3	[29]
Mg-1Al-0.60 GNPs	SPM + VS + HTE	ET: 17.1 ± 0.2 EC: 7.5 ± 0.6	202 ± 7	263 ± 6	4.1 ± 0.7	228 ± 4	405 ± 4	12 ± 0.4	62 ± 3	[29]
Mg-1Al-0.60 CNTs	SPM + VS + HTE	ET: 15.5 ± 0.2 EC: 6.6 ± 0.3	211 ± 4	286 ± 3	11 ± 0.2	236 ± 3	422 ± 3	12.3 ± 0.3	60 ± 6	[29]
Mg-6Zn-0.5 CNT	BM + ultrasonic treatment + SC		91	193	-	-	-	-	-	[30]
Mg-1Al-0.60 (1.5) (CNT + GNPs)	SPM + VS + HTE	ET: 15.2 ± 0.3 EC: 6.8 ± 0.3	184 ± 5	232 ± 5	16.1 ± 0.3	166 ± 5	398 ± 4	16 ± 0.3	57 ± 4	[29]
Mg (98.5% purity)	MBM + CP + HTE		126 ± 4	203 ± 9	8 ± 1	-	-	-	47 ± 1	[31]
Mg-0.06 CNTs	MBM + CP + HTE		131 ± 3	201 ± 3	13 ± 1	-	-	-	45 ± 1	[31]
Mg-0.18 CNTs	MBM + CP + HTE		136 ± 5	204 ± 6	13 ± 2	-	-	-	47 ± 0	[31]
Mg-0.30 CNTs	MBM + CP + HTE		147 ± 4	212 ± 5	7 ± 1	-	-	-	46 ± 1	[31]
AZ91	SI	4.8 ± 2	82 ± 4	204 ± 6	-	-	-	-	81	[32]
AZ91-5 MWCNTs	SI	1.2 ± 2	212 ± 11	242 ± 9	-	-	-	-	151	[32]
AZ91-5 (Si-MWCNTs)	SI	1.3 ± 2	251 ± 11	294 ± 9	-	-	-	-	159	[32]
AZ91-0.1 MWCNTs	SC	-	-	-	-	160 ± 4.7	414	23.6	-	[35]
AZ31-0.1 MWCNTs	SC + aged	-	-	-	-	-	-	-	-	[36]
AZ31-0.5 MWCNTs	SC + aged	-	-	-	-	-	-	-	-	[36]
AZ31-1 MWCNTs	SC + aged	-	-	-	-	-	-	-	-	[36]
AZ31-1 CNTs	BM + extrusion + welding		185 ± 5.7	271 ± 7.3	7 ± 1.6				65 ± 3.5	[37]
Mg-9Al	SPM + HTE		234 ± 3	300 ± 4	5 ± 1				80.2 ± 2.6	[55]
Mg-9Al-0.2 MWCNTs	SPM + HTE		240 ± 3	345 ± 3	15 ± 1				91.4 ± 1.8	[55]
Mg-9Al 0.4 MWCNTs	SPM + HTE		247 ± 4	354 ± 6	14 ± 3				94.1 ± 2.6	[55]
Mg-9Al-0.6 MWCNTs	SPM + HTE		232 ± 3	328 ± 2	12 ± 1				89.3 ± 4.7	[55]
AZ31	PM + extrusion		196 ± 5.1	284 ± 2.8	14.4 ± 1.4	161 ± 6.2	361 ± 3.4	16.2 ± 1.6	59 ± 3.1	[57]
AZ31-0.3 GNP	PM + extrusion		172 ± 6.3	274 ± 5.8	21.8 ± 2.7	160 ± 4.6	396 ± 5.4	16.1 ± 1.7	70 ± 2.3	[57]
AZ31-0.3 CNT	PM + extrusion		211 ± 2.7	311 ± 5.2	13.2 ± 3.1	241 ± 5.6	458 ± 6.1	14.1 ± 1.2	79 ± 2.7	[57]
Mg-0.08 CNTs	PM + PECS + HTE		186	237	16.2					[59]
AZ81	DMD + HTE		224	335	7.7	154 ± 16	486 ± 13	17.1 ± 0.2	118 ± 2	[62]
AZ81-1.5 CNTs	DMD + HTE		279	391	12.7	127 ± 18	487 ± 11	16.2 ± 1.6	115 ± 7	[62]
AZ91	SPM + HTE		166 ± 5.0	213 ± 6.0	6.8 ± 0.2				72.1 ± 2.0	[71]
AZ91-1 CNT	SPM + HTE		172 ± 4.2	226 ± 5.2	8.4 ± 0.2				79.1 ± 2.1	[71]
AZ91-2 CNT	SPM + HTE		196 ± 4.4	262 ± 5.4	8.6 ± 0.1				87.2 ± 1.6	[71]
AZ91-3 CNT	SPM + HTE		252 ± 3.6	300 ± 4.4	9.2 ± 0.2				94.2 ± 2.1	[71]
AZ91-4 CNT	SPM + HTE		188 ± 3.4	247 ± 3.8	8.4 ± 0.2				84.1 ± 1.7	[71]
AZ91-5 CNT	SPM + HTE		153 ± 4.6	227 ± 5.5	7.6 ± 0.1				80.1 ± 1.6	[71]
AZ91-1(MgO-CNT)	SPM + HTE		191 ± 3.5	261 ± 4.1	7.5 ± 0.2				80.1 ± 1.6	[71]
AZ91-2(MgO-CNT)	SPM + HTE		211 ± 5.1	293 ± 6.1	8.1 ± 0.1				89.4 ± 1.1	[71]
AZ91-3(MgO-CNT)	SPM + HTE		283 ± 4.5	330 ± 5.1	8.4 ± 0.2				96.3 ± 1.1	[71]
AZ91-4(MgO-CNT)	SPM + HTE		205 ± 3.6	271 ± 4.7	8.1 ± 0.2				86.4 ± 1.1	[71]
AZ91-5(MgO-CNT)	SPM + HTE		174 ± 5.6	254 ± 5.1	7.3 ± 0.1				83.4 ± 1.4	[71]
Mg	PM + HTE					104 ± 09	238 ± 14	19.7 ± 1.6	42 ± 4	[72]
Mg-0.5Al-0.18 CNT	PM + HTE					121 ± 08	356 ± 13	11.1 ± 1.4	51 ± 3	[72]
Mg-1Al-0.18 CNT	PM + HTE					131 ± 03	420 ± 14	12.4 ± 1.2	57 ± 4	[72]
Mg-1.50Al-0.18 CNT	PM + HTE					142 ± 06	420 ± 10	11.1 ± 1.6	61 ± 3	[72]
Pure Mg	BM + HPS		137	165	72.2					[73]
Mg-(Ni-CNTs)	BM + HPS		0.43	453	502	10.4	503			[73]
Mg-0.05 CNT with 20% overall porosity	PM		71.4 ± 19.3							[74]
Mg-0.05 CNT with 30% overall porosity	PM		47 ± 19							[74]
Mg-0.05 CNT with 40% overall porosity	PM		19 ± 9							[74]
Mg-1 CNT with 20% overall porosity	PM		87.2 ± 25.7							[74]
Mg-1 CNT with 30% overall porosity	PM		51.6 ± 19.4							[74]
Mg-1 CNT with 40% overall porosity	PM		24.4 ± 10.6							[74]
Mg-0.05 CNTs	EPD + HPS + HR		114 ± 4.1	151 ± 4.6	4.7 ± 0.8					[75]

Table 1. Cont.

Sample(s)	Fabrication Method(s)	Young's Modulus (GPa)	Tensile Properties			Compressive Properties			Hardness	Ref.
			0.2%TYS (MPa)	UTS (MPa)	Elongation (%)	CYS (MPa)	UCS (MPa)	Failure Strain (%)		
Mg-0.10 CNTs	EPD + HPS + HR		142 ± 7.7	173 ± 2.7	5.6 ± 0.8				[75]	
Mg-2 wt.% CNTs	BM + HPS	38.7 ± 0.6	87	141	2				[78]	
Mg-6Al-0.5 CNT	MBM + CP + HTE						−161	−41	[96]	
Mg-6Al-1 CNT	MBM + CP + HTE						−141	−37	[96]	
Mg-6Al-2 CNT	MBM + CP + HTE						−106	−35	[96]	
Mg-6Al-4 CNT	MBM + CP + HTE						−77	−27	[96]	
AZ91D	SC		203	263				73	[102]	
AZ91D-2 CNT	SC		215.13	288.22				78.48	[102]	
AZ91D-3 CNT	SC		227.24	295.46				82.77	[102]	
AZ91D-4 CNT	SC		221.19	292.36				91.87	[102]	
AZ91D-2 CNT	SC			291.2				81.21	[103]	
AZ91D-3 CNT	SC			301.457				86.92	[103]	
AZ91D-4 CNT	SC			294.67				92.3	[103]	
ZK60A	DMD		161 ± 3.2	267 ± 2	6.7 ± 0.4	126 ± 10	521 ± 10	19.4 ± 0.8	138 ± 7	[105]
ZK60A-1.0 CNT	DMD		179 ± 5	294 ± 7	15.2 ± 0.6	111 ± 6	544 ± 2	33.6 ± 6.4	113 ± 7	[105]
Mg-6Zn	As-cast		71 ± 3.4	128 ± 2.5	8.2 ± 2.0				54 ± 5.9	[109]
Mg-6Zn	FSP		135 ± 4.7	280 ± 4.1	18.8 ± 1.2				68 ± 3.7	[109]
Mg-6Zn-1.0 CNTs	MBM + SC + FSP		170 ± 2.1	331 ± 5.4	15.1 ± 1.3				82 ± 7.1	[109]
Mg (98.5% purity)	BM + MS + HTE		125 ± 2	172 ± 4	7.7 ± 0.2				37 ± 2	[110]
Mg-0.3 CNTs	BM + MS + HTE		117 ± 3	161 ± 6	5.5 ± 0.3				35 ± 2	[110]
Mg-0.3 (Ni-CNTs)	BM + MS + HTE		205 ± 3	236 ± 2	6.3 ± 0.2				53 ± 2	[110]
Mg-3Al-1Zn	SPM	44.2	148	247	15.22				47.33 ± 3.4	[132]
Mg-3Al-1Zn -0.5 CNTs	SPM	50.1	161	268	15.93				57.31 ± 4.4	[132]
Mg-3Al-1Zn -1.0 CNTs	SPM	55.3	185	295	21.58				60.35 ± 2.1	[132]
Mg-3Al-1Zn -1.5 CNTs	SPM	52.3	177	261	21.38				60.87 ± 3.2	[132]

Li et al. [68] employed CNTs with diameters of 40–60 nm and lengths of 2 µm to fabricate Mg/CNT composites. It was observed through the testing that the CNTs' distributions were dependent on the degree of solidification. Through the observations, they stated that with an inferior degree of solidification, CNTs were found to be projected out of the solidification front and clustered besides the grain boundaries. Furthermore, at a higher degree of solidification, appreciable CNT-matrix interface bonding was observed, resulted in improved UTS and YS of the fabricated composite. Park et al. [32] fabricated composites using AZ91 matrix material reinforced through Si-coated MWCNTs with diameters of 5–10 nm and lengths of 0.5–10 µm.

The microstructural study depicted the formation of a uniform structure and consequently, the mechanical characteristics of the fabricated AZ91-based composite reinforced with MWCNTs were improved. Nai et al. [110] employed Ni coating on reinforced CNTs with the diametric specification of 10–20 nm for fabricating composites in Mg matrices. The generation of Mg<sub>2</sub>Ni intermetallic phases in the fabricated composite was observed as the consequence of employing Ni coating on CNTs, which resulted in the improved distribution of CNTs (Ni coated) and strengthening of the linkages was observed between the CNTs and matrix. Conclusively, they stated that the mechanical characteristics, such as micro-hardness, universal tensile strength, and yield strength, of the fabricated composite were improved by 41%, 39%, and 64%, respectively, compared to the unreinforced Mg material. Corrosion resistivity in composite material is also a major issue, which has attracted the focus of various researchers to investigate that area of study. The studies discussed above did not focus on the resistance offered by the fabricated composites to corrosion. In a further section of this article, the consequences of the dispersion of CNTs on the corrosion behavior of Mg matrix material are discussed.

## 7. Corrosion Properties

Magnesium is a prime material used in automotive, aerospace, and medical lightweight applications. Nevertheless, the low corrosion resistivity of magnesium material provides hurdles regarding its adaptability in various other applications, and this also degrades the

life cycle of the servicing period. Several studies have been conducted so far regarding the enhancement of the mechanical characteristics of developed composites [88,91,93]. However, no such in-depth studies have been conducted yet for observing the corrosion characteristics. The tendency of Mg to become easily corrosive in various environments is due to the development of a substandard magnesium oxide or magnesium hydroxide layer of low ordinary electrode voltage ( $-2.36$  V) [130–132]. The MMCs fabricated by incorporating the particulate reinforcements of ceramics or carbon fibers are found to have low anti-corrosive properties, when subjected to environments containing chloride ions. These chloride ions affect the matrix and the reinforcing material interfaces, leading to fissure and pitting corrosion [133]. It has been also observed that the rate of corrosion on Mg-based MMCs was found to be enhanced due to the presence of Cu [134],  $\text{Al}_2\text{O}_3$  [135], Mo [130] and SiC [131] reinforcing materials. Corrosion behavior of MMCs composed of CNTs as reinforcing agents lies in their matrix material, along with the process route adopted for their fabrication. In the case of Mg as a matrix material, it has been observed that the presence of CNTs as reinforcing material enhances the corrosion behavior [63,130,131]. This enhancement in corrosion behavior is due to the formation of galvanic couples between the reinforcing material CNTs and the matrix material Mg, resulting from their large in-between variation in standard electrode potentials. Additionally, it has been observed that the presence of intermetallic phases, such as  $\beta\text{-Mg}_{17}\text{Al}_{12}$ , Al–Mn and Al–Mn–Fe in Mg alloys, behaves as cathode terminals to promote micro-galvanic corrosion at the anodic Mg-based matrix [88,132–139]. As CNTs possesses high electrode potential, their reinforcement in Mg to develop composites, also enhances the galvanic corrosion in developed MMCs.

The electrical characteristics of CNTs are diverse in comparison to other carbon allotropes. Because of this, the behavior of Mg matrix material could be divergent when reinforced with CNTs [11]. Endo et al. [79] proposed that the rate of corrosion could be reduced by separating the oxide layers from the Mg matrix by MWCNTs, which leads to decelerating the corrosive layer formation. The researchers examined a pure AZ91D Mg alloy, fabricated AZ91D/CNT composites in salt water, and observed the development of rigid oxide layers at the Mg-alloy matrix material grain boundaries. They concluded that surface protective layers were found to be reinforced through CNTs and possess water shielding characteristics. The researchers in their investigation did not report on the relevance of galvanic corrosion between Mg and CNTs; additionally, it was not clearly explained if development of the oxide layers could boost the overall anti-corrosive nature of the Mg matrix. The rate of corrosion of MMCs could be degraded by developing passive layers on the fabricated composite surfaces [11]. Furthermore, the study performed to fabricate Mg/CNT composites did not revealed the development of such passive behavior in inhibiting further corrosion [140–145]. The microstructural study of fabricated Mg/CNT composites revealed that a major percentage of CNTs were stacked near to primary particle boundary, the fabricated composite's surface was locally damaged and severe galvanic corrosion occurred in the CNT's vicinity [136,137]. Fukuda et al. [66] fabricated an AZ31B Mg alloy-based MMC, by incorporating the MWCNTs as the reinforcing agents through the PECS route. To study the corrosion characteristics of the fabricated composites, the researchers performed an immersion and polarization test by subjecting it to NaCl. Because of the appreciable amount of the potential difference between the matrix and reinforcing material in the NaCl solution, similar conditions to the galvanic cell were developed. Furthermore, the anticorrosive characteristics of AZ31B degraded due to the large number of corrosive byproducts stacked in the CNTs' vicinity. The pH value of the solution in which the fabricated composites were dipped was enhanced comparatively to the AZ31B pure alloy. Monolithic Mg underwent progressive chemical reactions with aqueous solutions and these are as follows [138–140,146,147]:





$\text{Mg}(\text{OH})_2$  was not developed adequately enough to restrict the further corrosion of the fabricated composites in a corrosive environment. According to the above-mentioned reactions, the magnesium fusion enhances the solution's pH value. Furthermore, the  $\text{Mg}(\text{OH})_2$  layer could be converted into  $\text{MgCl}_2$  salt due to the presence of  $\text{Cl}^{-}$  ions, resulting in an increment in Mg dissolution according to the following chemical reaction:



Aung et al. [65] developed Mg-based CNT-reinforced composites and subjected them to NaCl solution in order to observe the corrosive characteristics through the mass loss due to the immersion test, hydrogen evolution measurement, and polarization curves. It was reported that the corrosive characteristics of the fabricated composites were enhanced, as compared to unreinforced Mg. The reason for this enhancement is the development of intermediate corrosion, sandwiched between Mg and CNTs of galvanic nature. Saikrishna N. et al. [148] conducted experimental work to develop Mg/MWCNT composites through FSP. Unadulterated 10 mm thick Mg sheets of size  $100 \times 80 \times 10 \text{ mm}^3$  were prepared for the process. Before execution of the FSP process, dual zig-zag blind holes in multiple rows were developed on the Mg plates to fill with the MWCNTs. To prevent the reinforcing particles from ejecting out from the holes, a pin-less FSP tool with a revolving speed of 1400 rpm and a travel speed of 25 mm/min was adopted to execute the process. Sample investigations concluded that the presence of CNTs improved the micro-hardness of the fabricated composite relative to unadulterated Mg. However, the fabricated composites' corrosion behavior was sacrificed, leading to enhanced galvanic corrosion. Turhan et al. [137], Aung et al. [65], and Li et al. [138] also concluded in their studies that reinforcing the Mg matrix with CNTs results in lower anticorrosive strength of the fabricated composites, due to the generation of galvanic couples. Table 2 depicts the corrosion characteristics of the fabricated Mg/CNT composites. Funatsu et al. [149] attempted to examine the corrosion behavior of developed AZ61B-based CNT-reinforced composites through the PM route. In the experimentation, they employed thermal treatment of 823 K for the duration of 10 h while introducing Al atoms into the fabricated composites, resulting in an accumulation of Al atoms adjacent to the CNTs' surface. The presence of Al atoms in CNTs' vicinity was reported to lower the potential difference between the matrix and reinforced material. The researchers further performed an immersion test on the fabricated composite to examine the effect on the corrosion rate by immersion in NaCl solution and reported that the rate was lowered down to 30% of the composite in which Al atoms were not introduced. Say Y. et al. [150] fabricated AZ61 and AZ91 matrix material-based composites by introducing CVD's prepared CNTs as the reinforcing agent through the PM process route. For producing the CNTs through CVD, the substrate used was p-type Si wafer. Before preparing the substrate, the furnace capillary was washed 5 times in a vacuum of 10<sup>-3</sup> Torr and further heated along with Ar gas. The developed CNTs in 0.1, 0.2 and 0.5 wt.% were added with a predefined exact ratio of powdered matrix material and ethanol solution. This mix was further ball milled at 200 rpm for a duration of 90 min. The prepared ball milled mixture was compacted in die of 12 mm diameter at 500 MPa and sintered at 500 °C for 2 h. Characteristic identification concluded that the increments of wt.% of the CNTs sacrificed the strength of the fabricated composite in both matrix materials. The corrosion resistive capability of the fabricated composites with higher wt.% CNTs was also found to be degraded, as compared to 0.1 and 0.2 wt.%. For both matrix alloys, the highest corrosive currents were reported for the samples containing 0.5 wt.% of CNT. Aydin et al. [93] fabricated Mg/MWCNT composites through the PM route and performed plasma electrolytic oxidation (PEO) to develop the coating on the fabricated composites. Furthermore, they examined the fabricated composites through potential-dynamic corrosion tests. They reported that the corrosion rate of the coated material decreased by 1.6 times that of the uncoated composite. Davaari M. et al. [151]

studied the corrosion behavior of the fabricated AZ31B-H24 Mg alloy-based composite reinforced with PEO/PCL-coated MWCNTs. Initially, the specimens of the base material of 15 mm × 15 mm × 2.5 mm were prepared and microstructural study was performed after polishing and etching. A jacketed electrochemical cell with continuous electrolyte stirring adoption was adopted for the PEO coating for 10 min with enforced voltage amplitudes of + 405/ −25 V for 60 s and output current density restricted to 100 mA/cm<sup>2</sup>. Similarly, the PEO process was also performed for 5 g/L of MWCNTs containing electrolytes. The counter electrode employed for the process was a cylindrical mesh of SS 316. The coated specimens were cleaned with water and isopropanol and dehydrated in lukewarm airflow. For detecting the uncoated, PEO coated and PEO-MWCNTs, the employed acronyms were BM, PEO and PCT, respectively. PEO and PCT were sealed using either a thinner or dual PCL layer. Investigations concluded that thrusting pitting corrosion in the PEO samples was due to successively generated stress, agglomeration of the corrosive byproducts and undercoating corrosion. The PCT coating developed on the samples delayed the undercoating corrosion by 48 h. Sealing of the PCL layer resulted in appreciable enhancement of the corrosive resistive strength by 15%, in comparison to PCT.

**Table 2.** Examined corrosion characteristics of fabricated CNT-reinforced magnesium nanocomposites.

Samples	Reinforcement	Processing Route	Reinforcement Particle Size	Corrosion Medium	I <sub>corr.</sub> (μA·cm <sup>-2</sup> )	E <sub>corr.</sub> (V vs. SCE)	Corrosion Rate (mm/year)			R <sub>p</sub> (Ω·cm <sup>2</sup> )	Ref.
							Non-Polarized		Polarized		
							Immersion Time (h)	HE or WL	PDP		
Mg	CNT (0.3 wt.%)	DMD	Average diameter: 20 nm and length: less than 100 μm	3.5 wt.% NaCl	57	−1.56	-	-	-	-	[63]
	CNT (1.3 wt.%)				571	−1.51	-	-	-		
Mg	MWCNTs (0.5 wt.%)	SPM	-	3.5 wt.% NaCl	578.2 μA	−1.541	-	-	24.60 mm/year	-	[93]
Mg	MWCNTs (0.5 wt.%)	SPM + PEO	-		129.6 μA	−1.399	-	-	14.76 mm/year	-	
Mg-0.5 MWCNT	GNP	SPM + PEO (coating with graphene addition)	-	-	100.9 μA	−1.421	-	-	14.47 mm/year	-	
Mg-6Al	CNT (4 wt.%)	MBM + CP + HTE	Average diameter: 9.5 nm; average length: 1.5 μm	3.5% NaCl	4	−1.53	-	-	-	-	[96]
Mg	MWCNTs (0.1 wt.%)—Dispersed during melt stirring process (0 h)	MS	-	3.5% NaCl	97	−1.616	-	-	4.4 mm/year	367	[137]
	MWCNTs (0.1 wt.%)—Dispersed during melt stirring process (6 h)		-		279	−1.519	-	-	12.6 mm/year	331	
AZ91	MWCNTs (1 wt.%)	MS	-	3.5% NaCl	-	-	-	-	4–8 gm <sup>-2</sup> day <sup>-1</sup>	-	[138]
	MWCNTs (5 wt.%)		-		-	-	-	-	18–23 gm <sup>-2</sup> day <sup>-1</sup>	-	
AZ31	-	DMD	-	SBF	93.71	−1.543	1	2.177 mm/year	-	-	[152]
	-		-		44.21	−1.440	23	1.018 mm/year	-	-	
AZ31	CNT (1 wt.%)	DMD	-	SBF	212.44	−1.401	337	4.907 mm/year	-	-	[152]
	-		-		87.63	−1.501	1	2.012 mm/year	-	-	
AZ91	GNPs (0.5 wt.%)	SPM	Diameter: 5 and 8 nm; surface area: 750 m <sup>2</sup> /g	3.5 wt.% NaCl	324.901 μA	−1.447	-	-	4.11 mm/year	-	[153]
	MWCNT (0.5 wt.%)		Diameter: 8 nm; surface area: 250 m <sup>2</sup> /g		387.430 μA	−1.490	-	-	4.91 mm/year	-	
	C60 (0.5 wt.%)		Average thickness: 1–2 nm		211.136 μA	−1.507	-	-	2.69 mm/year	-	

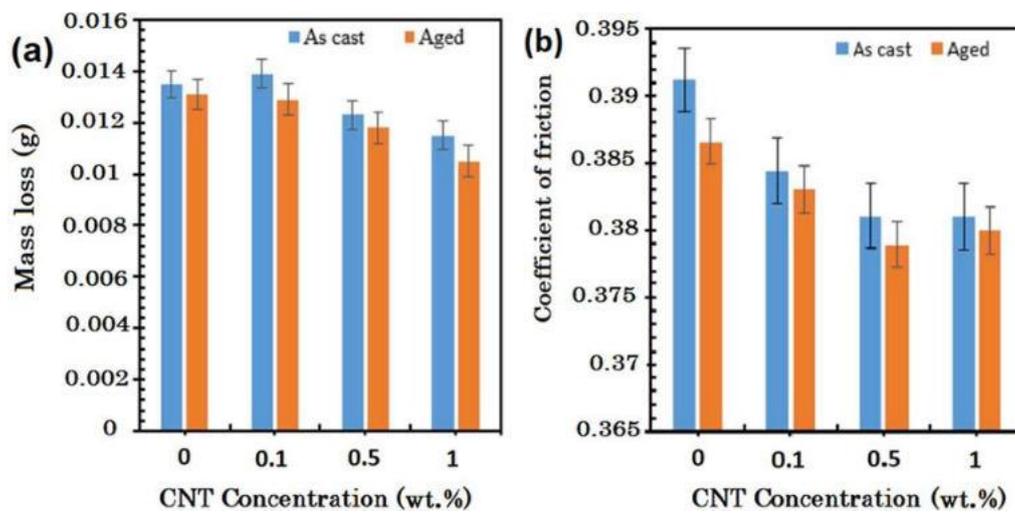
## 8. Wear and Friction Properties

Mg-based composites have been recognized as one of the prime selections among the lightweight materials, with applications in aerospace, automotive, and biomedical fields.

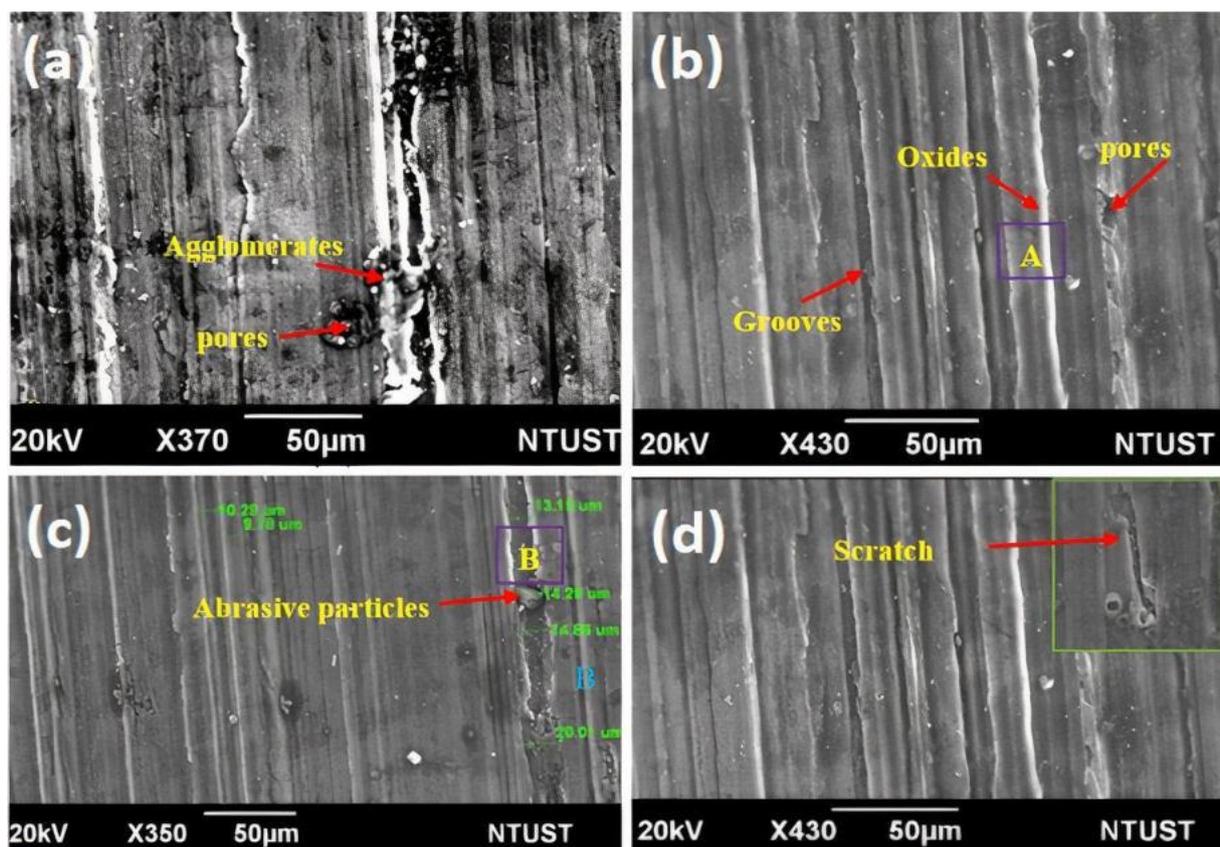
The superior properties of Mg, such as the ability to reprocess, appreciable damp character, treatable machinability, good electromagnetic shielding, and plenteousness, makes Mg an adequate selection among all the other materials. However, the specific properties of Mg that make it an inferior choice for tribological applications include remarkably low hardness and wear resistance. The hardness and wear resistivity of the Mg-based composites can be altered according to the fabrication route that is adopted for their fabrication, even though the coefficient of friction and wear resistivity of the fabricated composites may be enhanced by introducing ceramic as the reinforcing agent in the Mg matrix [11]. It has been reported that composites composed of Mg matrix and CNTs as reinforcing agents have commendable self-lubricating and mechanical characteristics, low coefficient of friction, and high wear resistance [11,143–145,154,155]. Recently, CNTs have emerged as an attractive reinforcing material that can be used for reinforcing Mg. Numerous investigations have been performed to examine the effect of CNTs on composites regarding their mechanical and corrosion properties. Additionally, some studies have been conducted to evaluate the wear characteristics of Mg-CNT nanocomposites.

Jamshidijam et al. [108] developed metal matrix composites by adding the MWCNT reinforcement into AZ31 Mg matrix material through the FSP route. They conducted a relative study between reinforced and unreinforced MMCs on their respective wear resistive capabilities. As a result, they reported an outstanding improvement in mechanical characteristics in MMCs due to the presence of MWCNTs as a reinforcing agent. They argued that this improvement occurred due to the grain's structural improvement, appreciable interfacial bonding between AZ31 and MWCNTs, and uniform dispersion of the reinforcing particles in the matrix material. Selvamani et al. [103] employed a stir casting fabrication route to fabricate AZ91D-based composites reinforced with CNTs. The MMCs were reinforced by loading 2, 3, and 4 wt.% of CNTs in order to examine the changes in the mechanical properties of the developed composites. They reported that the MMC samples that contained 3 wt.% showed extraordinary wear resistive nature, compared to unreinforced AZ91D. In addition to the mentioned phenomena, they experienced enhancement in the tensile strength of the same 3 wt.% sample, which was verified by their ductile mode fracture. They reported extraordinary hardness values with further enhancement of the wt.% of the CNTs up to 4. Mindivan et al. [96] argued that uneven fragments and dragged out CNTs from fabricated Mg6Al-CNTs at the matrix–reinforcement interface could enhance the lubricating behavior. They also concluded that even high wt.% CNT loading may result in inferior wear resistive characteristics, if unsatisfactory interfacial linking is present among the chip layers.

Abbas et al. [36] fabricated AZ31-based composites reinforced with MWCNTs through the stir casting route, which was further processed through precipitation hardening for the duration of 10 h. The study was focused on examining the wear characteristics of the fabricated composites. The results of the respective study were graphically depicted in the form of bars, designated for the loss of mass and coefficient of friction, in contradiction to the increasing values of wt.% of the CNTs, as shown in Figure 7. Conclusively, the researchers argued that increments in the CNT wt.% decreased the wear-out weight loss of the composites. The researchers also stated that two factors were responsible for this decrement in weight loss. First, the increment in wt.% in CNTs enhanced the strength and hardness. Second, the self-lubricating characteristic of CNTs, which lowered the coefficient of friction, led to material loss. Abbas A. et al. [36] performed a study to reveal the wear characteristics of fabricated AZ31-CNT composites. In order to reveal the effects of CNTs on the fabricated composites and their wear behavior, CNTs were introduced in different wt.% in the AZ31 matrix. The manufactured composite part's worn-out surfaces were studied through scanning electron microscopy (SEM) to obtain knowledge related to their erosion, oxidation, abrasion and permanent deformation patterns. Figure 8. depicts the worn-out surfaces of the SEM micrographs in non-wet sliding conditions.



**Figure 7.** Plots pertaining to the variation in (a) mass loss due to wear, and (b) coefficient of friction in contradiction to CNTs' concentration in AZ31-based CNT-reinforced composites in dry friction situations [36].



**Figure 8.** Pictorial observations of external worn-out structure of AZ31-based CNT-reinforced composites through SEM composed with CNTs wt.% of (a) 1.0, (b) 0.5, (c) 0.1, and (d) 0, in dry circumstances [36].

Figure 8a depicts the SEM micrograph of the fabricated composites comprising 1 wt.% of CNTs. The micrograph clearly highlights the plenteous worn-out depression as well as the marks; most of them are tending towards the sliding direction. This abrasive nature of these wt.% CNTs raised due to clustering of the CNTs, which performed as plowing

agent in the fabricated composites for promoting abrasion. As a result, the clustered zone of CNTs promoted to occur the phenomenon of 3-body abrasion. According to the 3-body abrasion phenomenon, a hard element stuck between two surfaces could lead to abrasion of one or both surfaces [108]. The 3-body abrasion could happen along with the wear-out and abrasion phenomenon [156]. Figure 8b depicts the micrograph of the fabricated composites comprising CNTs of 0.5 wt.%. The wear-out characteristics pertaining to oxidation could be read using the micrograph. The wear-out characteristics of the composites are highly affected by the thickness of the oxidation layer that developed. It has been reported that the wear rate of the composites was lowered due to the presence of a thicker oxidation layer, which prevents the surfaces from sliding, and hence consecutively generated an inferior wear environment [157]. Figure 8c depicts the SEM micrograph of the fabricated composite containing 0.5 wt.% of CNTs. Generated networks of major voids that developed on the wear-out surface can be easily observed from the micrograph. These major voids are the leftovers of shearing of the surface through the propagation of cracks, generated by the application of dynamic forces. The wear characteristics were also revealed by the heating of the surfaces that they are in contact with. This heating could lead the asperities to become soft, restricting them from adhering to the counterpart surface. The repeated continuous sliding motion enabled the asperities to gather at the contact surface, which led to nucleation, resulting in the erosion of the contact surfaces in a layered form. This type of wear mechanism, which is initiated without the generation of wear cracks damages, the surfaces more severely and is known as plastic wear. Figure 8d. depicts the SEM micrograph of the unreinforced AZ31 matrix material. The significance of the plastic wear can be observed through the micrograph. At elevated loading conditions, these layered wear characteristics become responsible for permanent deformation of the surfaces [158]. The tendency of the wear-out mechanism is to support permanent deformation, enhanced in the conditions of high surface roughness [159]. This permanent deformation phenomenon was forced to occur through the heat generation between the counter steel plate and fabricated composite sample and consequently, the permanent distortion of the surface is enabled towards the direction of sliding [160]. It has been observed that large uneven irregularities separated from part were deformed severely and extruded towards the sliding direction [36]. The anti-wear characteristics and the coefficient of friction of the fabricated composites was drastically enhanced through the presence of CNTs in their vicinity. Most of the studies performed so far that concern the wear characteristics of the fabricated composites have revealed the behavioral effect on the composites through different compositions of CNTs, but one must obtain more knowledge in order to establish the association of wear behavior of fabricated composites to their respective CNT loading.

## 9. Conclusions

The current article highlights the reputations of the factors that influence the conventional routes for fabricating Mg-based composites reinforced with CNTs, their potential, challenges, and scope for future developments. Their exclusive optical, electrical, thermal, and mechanical characteristics, as well as their enhanced surface area and aspect ratio, make CNTs a superior candidate for reinforcing metal matrices as a way of enriching their properties, such as self-lubrication characteristics, overall lightweight nature, and superior strength. These enriched properties in the fabricated composites could be achieved if the fabrication process could allocate the reinforcing agent uniformly. Throughout the article, knowledge has been gathered on the significance of several factors that play a role in various Mg/CNTs fabrication routes, along with various strengthening mechanisms, corrosion behavior, and wear properties and the following conclusions are suggested:

1. Due to various obstacles in the fabrication route of CNT-reinforced metal matrix composites (MMCs), inadequate studies have been accomplished in the mentioned domain. Only the fabrication routes pertaining to PM and stirring casting have been comprehensively studied.

2. The mechanical characteristics of fabricated Mg/CNT-reinforced composites that have been debated and observed demonstrate that they are broadly altered through the process route adopted to fabricate the composites. Additionally, uniform allocation of CNTs, specifications concerned with CNTs, wt.% of CNTs in matrix material, CNTs' orientation with matrix material and their in-between interfacial bonding could be the responsible factors for enhancing the mechanical characteristics by an appreciable amount.
3. With regard to enhancing the strength of the composites to bear stresses, the load transfer mechanism is expected to happen at the interfaces of the Mg matrix and CNTs in fabricated composites. As a result, the composite will enable the transfer of the stresses to reinforce CNTs more adequately. The interfacial bonding is crucial due to poor wettability between CNTs and the Mg matrix, which arises due to their considerable surface tension difference. This difference in the surface tension prevents the Mg matrix material from being coated with CNTs. This interfacial bonding could be strengthened by enhancing the wettability by incorporating Cu, Ni, or Cr as the coating material for CNTs.
4. The mechanism through which the composites were reinforced with CNTs in the Mg matrix that undergoes corrosion is the micro-scale galvanic phenomenon in sodium chloride solution. The CNTs present in the Mg matrix behaved appreciably as cathodes; as a result, increasing the wt.% of CNTs in the Mg matrix could decrease the corrosion resistivity of the fabricated composite.
5. The coefficient of friction and wear resistivity of the fabricated composites could be altered according to the fabrication route adopted for fabricating them. Incorporating increased wt.% of CNTs in the Mg matrix could lead to enhanced self-lubrication characteristics, refined mechanical characteristics, low coefficient of friction, and high wear resistance.

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## GREEN MANUFACTURING: AN INSIGHT

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**ABSTRACT-** It has been observed recently that sustainable development is the primary goal for any manufacturing industry globally. Green manufacturing is indeed needed because of its long term advantages such as low carbon emission or wastes by better production design and durability of the product. Green manufacturing not only provides unlimited opportunities for long term development but also eliminates the unpredicted risks involved at strategic level for manufacturing. The main objective of this study is to study the recent trends in green manufacturing. This article is emphasizes on the literature review related to green manufacturing and overall past research results and the identification of challenges in this methodology.

**Keyword:** Green manufacturing, sustainable, emissions, greenhouse gases.

### INTRODUCTION

There are two important challenges in the 21st century identified as deficiency of resources and environmental shift. It was also shown by Keeling curve that there is rapid increase of CO<sub>2</sub> as compared to previous limit of emission of the polluting gases which will eventually result in increases greenhouse phenomenon [1]. Secondly as per national geographic source, there is sea level withdrawal which poses a threat to high density regions such as New York, Miami and Shanghai [2]. Another change we are facing is the increase in world population up to 100 billion at the end of this century [3]. This problem will be further worsened by the upliftment of living

standards in the developing countries. Productivity is merely not the criteria for success rate of the country, as there will be more requirements of facilities such car and fuel which will result in more emissions. In today's era, the industrialized countries enjoy affluent products such as

energy, food and other daily requirements but there are no preparatory efforts in order to eliminate the adverse effects of the environment by the regulating bodies such as local governing bodies and international organizations.

Therefore there are chances that there will be disasters to the human lives in the upcoming decade [4]. Therefore sustainable manufacturing is gaining more and more grounds these days. If we look at the current consumption of the world in terms of energy then the major portion of the energy is consumed by the industry (33%), temperature control in the building results in consumption of 28% - 39%. Other adverse effect by the energy consumption results in production of waste/ toxic material which negatively impacts the environment. Several studies have also been conducted in green product innovation and low carbon matters [5-14].

## 2. Methodology of Green Evolution

There are different abstracts available for evaluation of recent technologies such as Hype cycle which was published by Gartner Group which has given an insight of the emerging technologies and additionally it also shows the development stages and its pace in the trend [8]. There various assumptions taken into consideration such as trigger of innovation, inflated expectation peak, trough of disillusionment, slope of enlightenment and finally the plateau of productivity as shown in Figure 1. In the plateau region, the innovative technology matures and its profitable margins are determined. For example if we consider rapid prototype as case study in field of additive manufacturing which came into existence in 1980's. The rapid prototyping (RP) was at the peak at 2013 and even the laymen knew the technology due to the popularity but later on due the adverse effects of RP, the expectations were not met but eventually RP will still be in demand. There several examples of technologies which did not reach the maturity phase due the various adverse effects.

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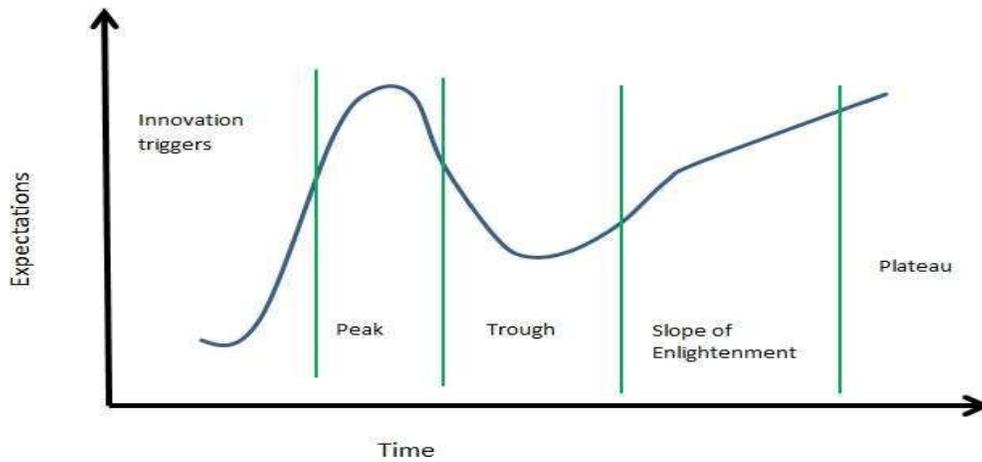


Figure 1. Hype Cycle

Recent study shows a comparison of average impact factors in engineering field related to environment and fuels technology and it has been observed that nowadays more journal papers related to greener technology is available as compared to research related to fields of manufacturing engineering and mechanical engineering as shown in Figure 2. The combination of manufacturing technologies and energy-environment technology provides adequate synergy effect for the green technology and also for the initiation of new engineering research journals covering those areas which are not yet discovered by the existing journals.

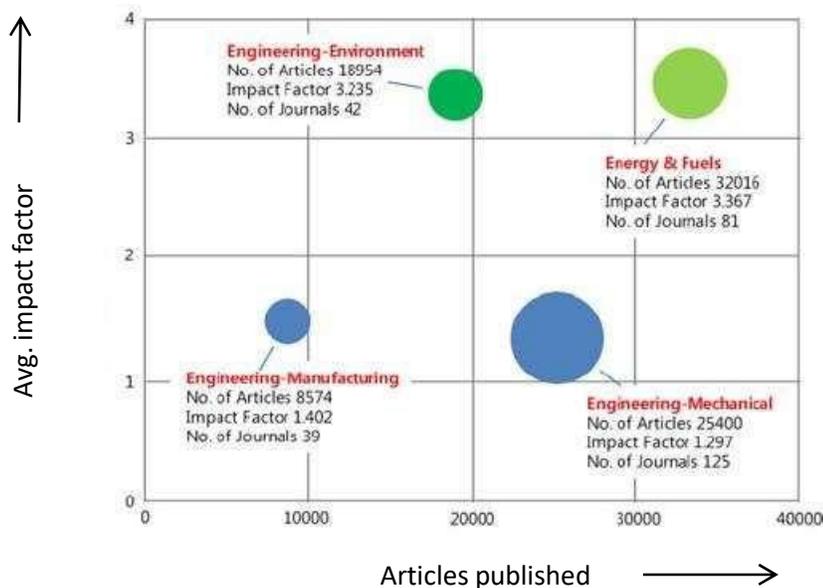


Figure 2. Comparative studies for different fields [15]

Establishment of sustainable methods as a key challenge when it comes to economic activity because it involves energy and climatic issues. Innovations in patterns of material flows for the least effect of ecological footprint of human economic activity are shown in Figure 3.

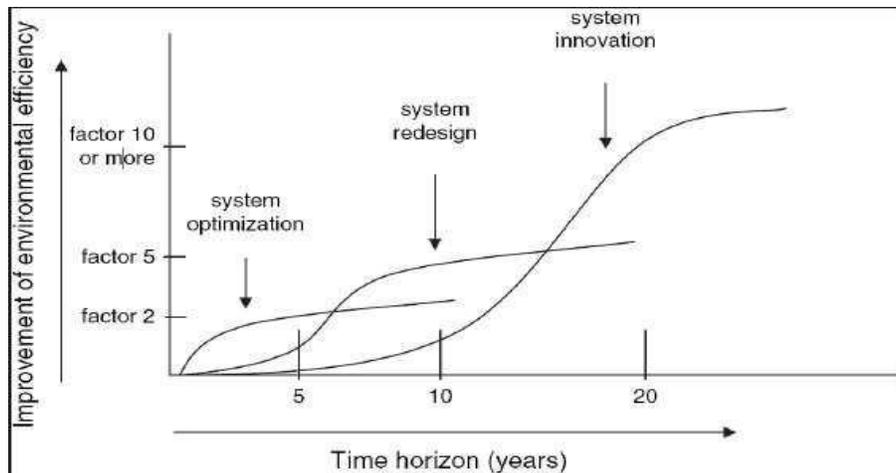


Figure 3. Innovations in patterns of material flows [16]

## 2.1 Energy-intensive industries for selective green technologies

### 2.1.1 Iron and steel industry

There are various steps in steel production process which can be categorized in different combination such as mixing of product, availability of raw material, and supply for energy and capital investment as shown in Figure 4. These characteristics can be mentioned in three routes:

- Blast furnace produces pig iron using iron ore and coke. Afterwards this can be converted into steel by using oxygen furnace. This is high energy intensive process as it involves sintering process by involvement of coke making.
- Scrap furnace uses scrap from iron input and this route uses considerably less energy intensive as compared to blast furnace due to coke omission.
- Finally there is process of direct reduced iron in which utilized scrap iron and this route is less energy intensive.

In recent years, increasing attention has also been paid to smelting reduction, which is emerging as a contender to the blast furnace process.

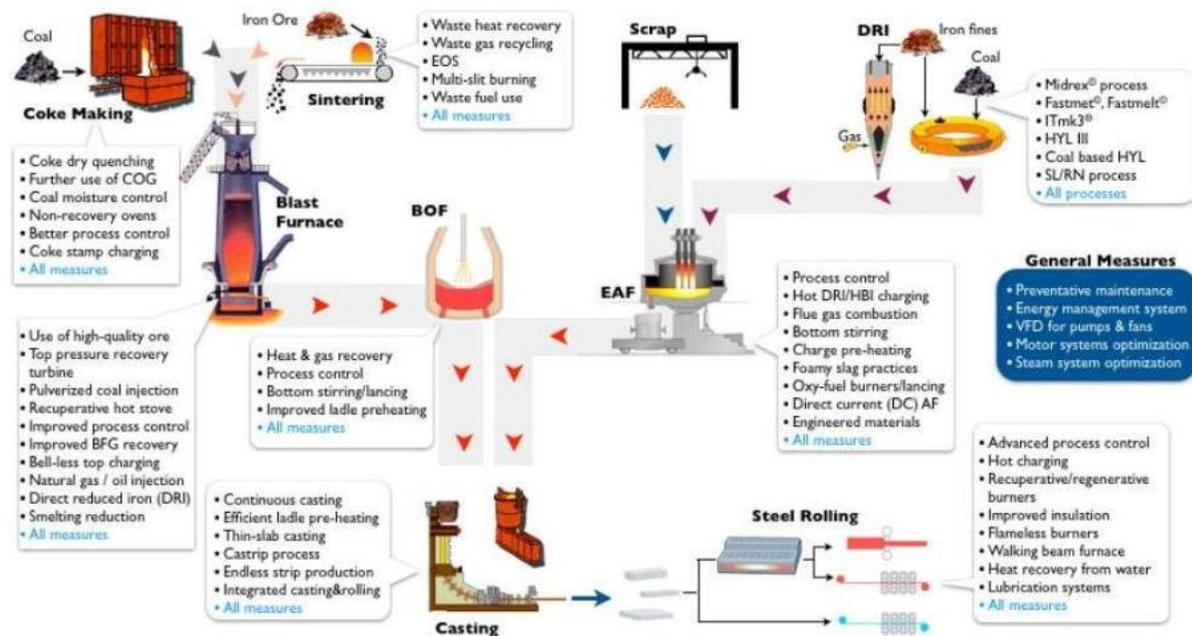


Figure 4. Source: Industrial Efficiency Technology Database, Institute for Industrial Productivity [17]

### 2.1.2 Cement production

The main four process routes utilized in cement production is dry process, semi- wet process, semi-dry and wet processes. Although dry processes are more energy efficient but availability of the raw resources also plays an important part in its production. On the other hand, the wet process is more energy intensive process therefore it is being ruled out in many countries such as Australia, New Zealand etc. There are several processes involved in cement production such as sintering limestone, grinding raw material which require high demand of fuel. Therefore nowadays alternate blends for fuels, energy efficient technologies and other options are also emerging in the form of alternative cementitious materials which reduces carbon emissions and consumption of fuel. Figure 5 shows the schematic diagram for use of alternate efficient technologies in cement industry.

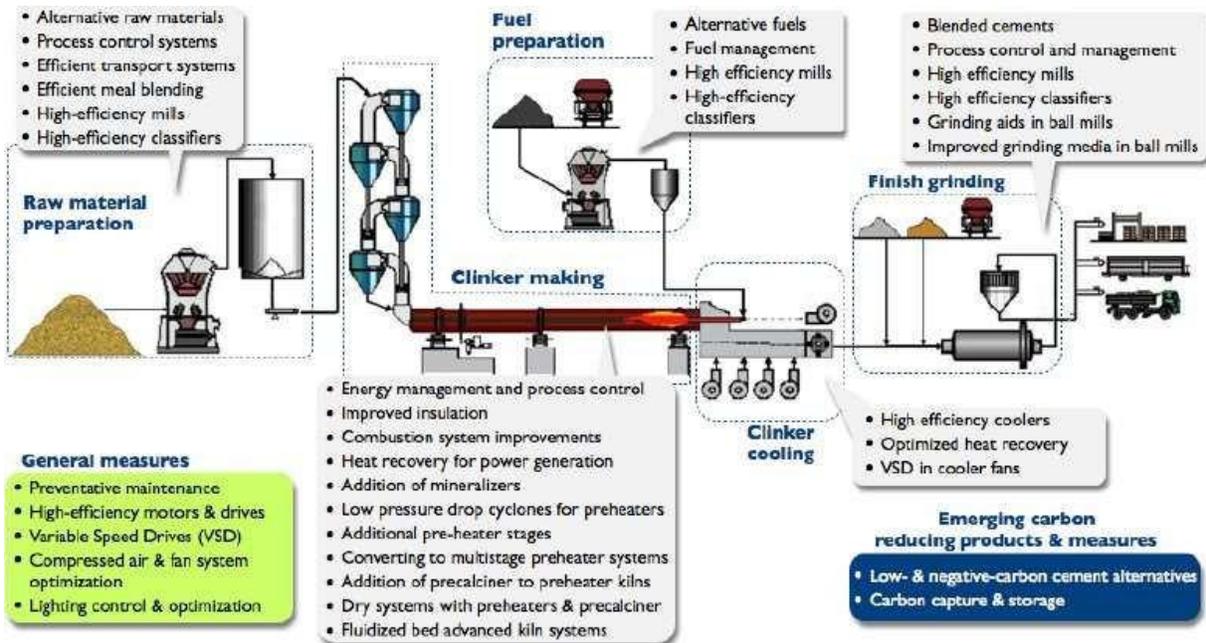


Figure 5. Cement production schematic, Institute for Industrial Productivity [17]

### 2.1.3. Paper production

Generally in paper production industry, pulp production and its conversion to dry paper are the main energy consuming processes which need to be reduced by better technologies. Therefore integrated mills are being encouraged these days for balancing the energy consumption as they are more energy efficient as shown in Figure 6. The major energy consumer in the industry is the process which involves production of pulp and its conversion to dry paper. Efficient Integrated mill have significantly have reduced the impact of pulp mills and other integrated mills. Kraft chemical is the most favourable material uses in pulp industry although it needs large amount of heat energy for its processing but it can be compensated by the by-products such as black liquor. Another chemical used is sulphite which also involves high energy consumption but large part of energy can be met by its by-products too. Although weaker fibres are produced by mechanical pulping but due to the high yield of the fibres, the energy demand is considerably lower. Innovative technologies such as thermal –mechanical process for pulping are being used because a large portion of heat is recovered at different grades.

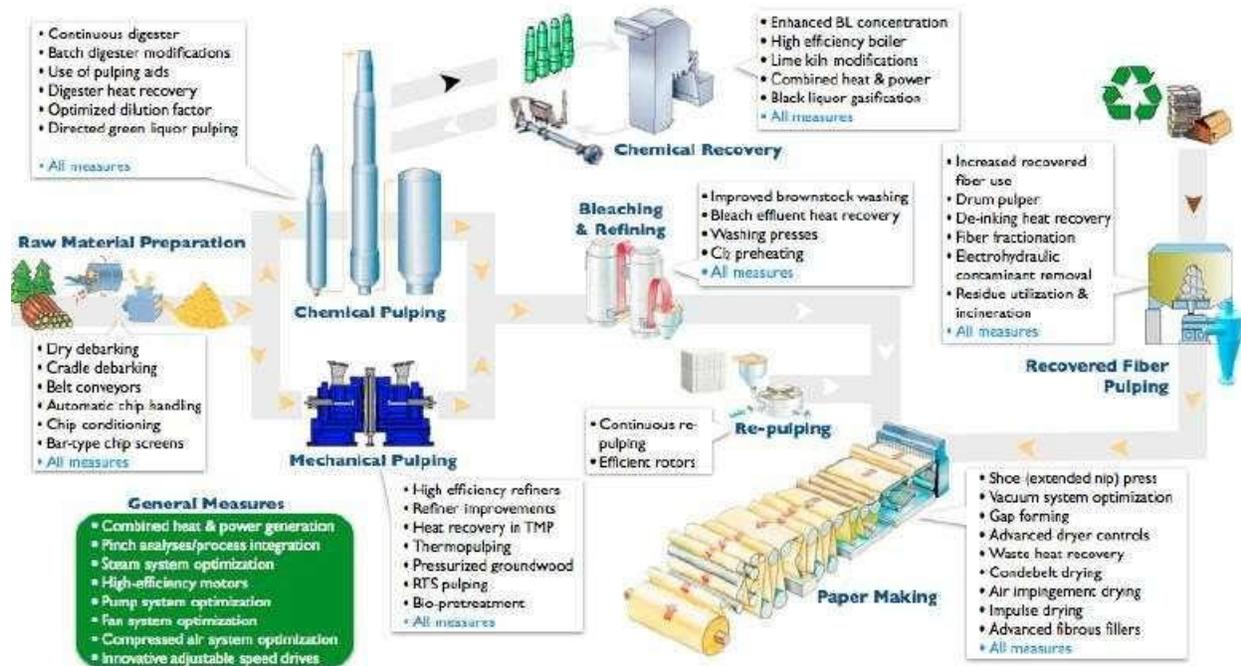


Figure 6. Paper production schematic, Institute for Industrial Productivity [17]

## 2.2. Less Energy Intensive Industries for Green Technologies

Electrical motors convert electrical energy into mechanical energy and are motor driven system. These motor driven systems find application in applications such as conveyor belts, fans, pumping, handling of mechanical equipment's and processing. As we know that most of the electricity is consumed by the motor parts but if we consider the overall efficiency then the overall electricity consumption is often limited. The main reason attributed to this fact is that the system components of motor driven system such as valve pipes, pumps, and ducts have affect on mechanical power of the entire system and all the other losses incurred during the delivery of the power have large impact on overall consumption of energy. Therefore it is much more important to adopt an optimized system in way to reduce the overall energy consumption. The advanced solution and technologies are very much responsible for improving the overall design of the system. In most cases, improving the efficiency of a motor-driven system involves the following parameters such as making use of energy efficient motors, selection of core components such as fans, compressors, speed drives with high efficiency as shown in Figure 7.



Figure 7. Equipment of motor systems, Institute for Industrial Productivity [17]

### 2.2.1 Renewables and Smart Grids

Renewable energy sources are considered as one of the possible solution for manufacturing industry but only for short duration of time because these renewable resources are not a mainstream for fields like industrial manufacturing and applications as these continuously demands innovation in technology. This renewable energy finds application in generation of electricity by utilizing wind energy or photo voltaic source. Similarly small batch of power units in an approximate power range of 20-30 KW can be utilized for medium heat generation for industrial purpose. In building, small units of solar panels can be utilized for temperature control in building and offices. Other source such as bio-waste and bio genetic material further can also be used for power generation and oil based chemistry respectively.

### 3. Conclusions

- Several developments have taken place in previous two decades related to green manufacturing. Different innovations role has been played at different strategies ash shown in Figure 8.



Figure 8. Various innovations in environmental technology [18]

- Initially end of pipe solutions were followed but these solutions do not provide any modification in the manufacturing process. This strategy was focussed on reducing pollutants.
- In other stage process integration came into existence which used policy of efficient energy and at the same time lower emissions. Quality production and economic productivity were of utter importance along with environmental benefits such as use of electrical efficient motors in steel making industry.
- Thirdly use on non-toxic material was encouraged for product design and development. Recycling of end products and life cycle assessment was focussed in this trend.
- In this study it was concluded that various efforts have been made in order to attain sustainability and there is complete transformation of industry in the global level. Secondly carbon free economy is the need of the hour without any further delay in the future.

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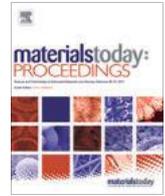
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## A review of evaporation droplets on a transparent heater

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## ABSTRACT

Many devices are using transparent heaters and they often face problems due to fogging or icing on the surface of the transparent heater (TH). The fogging or icing is mainly due to the droplet that gets deposited over the surface of the transparent heater. If the evaporation of these droplets from the surface of TH gets obstructed, then only the fogging or icing starts. To develop an effective defogging, we require the effective evaporation rate of the droplet. Many studies have already been done on the dependence of evaporation on the various factors of the substrate as well as the ambient conditions. In this paper, the evaporation droplet characteristics of the transparent heater are analysed. Theoretical and experimental investigations on droplet evaporation are reviewed. The dependence of droplet evaporation time and temperature distribution on transparent heater coating properties are studied. Finally, the role of material coating on defogging and defrosting properties of transparent heaters are investigated and discussed. Also, the dependence of surface wettability of transparent heaters on the droplet evaporation property has been investigated.

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## 1. Introduction

The phenomenon of how liquid droplet is responsible for wetting the solid surface has already been studied since the 18<sup>th</sup> century. The control of wettability on the surface of heater and the characteristic of evaporation of a droplet is an important function for developing an effective photo electronic instrument with TH [1]. With the modification of the wettability of the substrate, the evaporation rate of the water droplet can be controlled which is a prime requirement for the defogging and deicing effectiveness devices with TH [2]. The angle of contact between the solid and liquid is an important factor for wetting the solid by liquid droplet. The role of Contact angle, wetting properties and the bonding of liquid and solid was investigated by Young and Pierre-Simon Laplace. In biomedical and normal life situations, it is very complicated to solve and predict the wetting and evaporation of droplets, though the geometry is simple for a sessile droplet [3]. Agrawal et al. [4] stated the optimal design parameters using Aluminium Alloy AA6063. Also, deformation analysis of Al Alloy AA2024 through Equal Channel Angular [5]. Further, experimental study

carried out on RMDTM welding parameters for ASTM A387 Grade 11 Steel and optimal solution were obtained [6], Beniwal et al. [7] conducted an extensive review on Pore and Porosity in Tissue Engineering. A simple droplet becomes a complicated one when the wetting together with evaporation is investigated, which is because of the factors of full coupling of the droplet with the substrate on which the drop is deposited, the nature of the fluid, the particles contained by the fluid and the mechanism of physics involved. In this review paper, the mechanism involved in the evaporation and wetting of droplets by considering the flow dynamics, surface tension, dynamics of evaporation, properties of wetting, and the behavior of vapor will be discussed. It is found that the droplet of different liquid when deposited on the same solid surface behaves differently. On the other hand, the same liquid also behaves differently when deposited on different solid surfaces. Various literature describes the thin film behavior [8–11]. It is not possible to produce a uniform layer of mercury over a glass surface because mercury will produce a drop with a spherical cap immediately as it falls over a glass surface. The contact angle of this spherical cap is more than 90° as depicted in Fig. 1. This case of formation of the mercury drop over a glass surface is a classic example of a non-wetting phenomenon. On the other hand, oil drop can easily spread over the same glass surface and is a classic example

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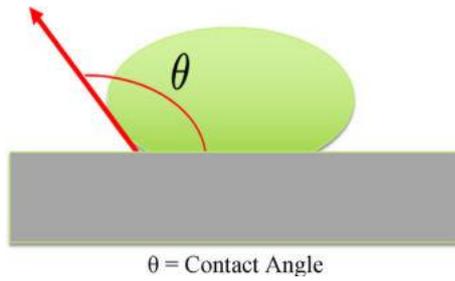


Fig. 1. Shape of the mercury droplet on a glass surface.

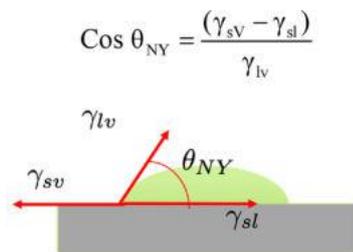
of wetting of the surface. The oil drop can be deposited over the surface of the glass and with time it will completely spread over the surface. The corresponding contact angle in this case will decrease to zero with respect to time. An ordinary droplet of water on the same surface of the glass will spread partially keeping the contact angle between zero to 90°.

Thus an aqueous drop of water behaves between the phenomena of mercury and oil with the same substrate glass. Like mercury on a glass surface, the water drop also shows the same behaviour on the Teflon surface. So it may be concluded that the same drop behaves differently with respect to different surfaces and the wetting, non-wetting or partially wetting behaviour is dependent on both the liquid and solid substrate. With respect to Fig. 2 the contact line of three phases may be considered to determine the meeting point of the three phases namely the liquid phase, solid phase, and vapor phase. The equivalent contact angle  $\theta_{NY}$  and the interfacial tensions between solid-liquid phase  $\gamma_{sl}$ , solid-vapor phase  $\gamma_{sv}$  and liquid-vapor interfacial tension  $\gamma_{lv}$  can be connected by Neumann-Young's rule as;

$$\cos \theta_{NY} = \frac{(\gamma_{sv} - \gamma_{sl})}{\gamma_{lv}} \quad (1)$$

- $\theta_{NY}$  = equivalent contact angle.
- $\gamma_{sl}$  = interfacial tensions between solid-liquid phase.
- $\gamma_{sv}$  = interfacial tensions between solid-vapor phase.
- $\gamma_{lv}$  = interfacial tensions between liquid-vapor phase.

Now if  $\gamma_{sv} > (\gamma_{sl} + \gamma_{lv})$  then no forces in the tangential direction will be compensated and the corresponding case will refer to the wetting surface condition. If  $0 < \cos \theta_{NY} < 1$  the corresponding case will be partial wetting and finally if  $-1 < \cos \theta_{NY} < 0$  then the case will be the non-wetting case. Thus we can conclude that Eq. (1) by Neumann-Young can be easily applied to find out the wetting, partial wetting, and non-wetting case provided we know the values of  $\gamma_{sv}$ ,  $\gamma_{sl}$  and  $\gamma_{lv}$ . But in reality, it is still impossible to directly



- $\theta_{NY}$  = equivalent contact angle
- $\gamma_{sl}$  = interfacial tensions between solid-liquid phase
- $\gamma_{sv}$  = interfacial tensions between solid-vapor phase
- $\gamma_{lv}$  = interfacial tensions between liquid-vapor phase

Fig. 2. Depiction of forces applied on droplet contact point with the solid and vapor phase.

measure the interfacial tensions  $\gamma_{sv}$  and  $\gamma_{sl}$ . Further Eq. (1) of Neumann-Young has also not shown any dependency of the contact angle of the droplet on the volume of the droplet and the excess pressure inside the droplet, which is denoted as  $P_e$ . The values of both volumes of the droplet and the pressure may be arbitrary. This is because a droplet may be of any volume and of any value of excess pressure  $P_e$ . Hence the conditions at equilibrium should be.

- (1) In the droplet the liquid must be in equilibrium with its vapor.
- (2) In the droplet the liquid must be in equilibrium with the solid.
- (3) The vapor should be in equilibrium with the solid substrate.

The excess pressure  $P_e$  inside the droplet is given by the Kelvin equation as;

$$P_e = \left( \frac{RT}{V_m} \right) \ln \frac{p_s}{p} \quad (2)$$

where  $V_m$  is molecular volume,  $p_s$  is saturated vapor pressure at temperature  $T$ ,  $p$  is the vapor pressure in equilibrium with the liquid droplet and  $R$  is the universal gas constant. Thus it may be concluded from the above discussion that any droplet deposited on a solid surface is always in a state of evaporation and not in equilibrium with its surroundings under a saturated vapour [12]. Kumar et al. [13] re-investigated on the effect of powder metallurgy parameters of aluminium matrix composites. Surface Roughness in EDM of Pure Magnesium was optimized Using TLBO [14]. Naik et al. [15] studied the effect of Microstructure, on Al-CNTs/Graphene Hybrid MMC. Also, a microstructural analysis on mechanical properties of 316L Stainless Steel were carried out [16].

In the remaining part of the paper, section 2 discusses the dependence of evaporation flux on droplet size and section 3 discusses the thermal phenomena during evaporation. Finally, in section 4, the application of such droplet evaporation study in developing transparent heaters is reviewed.

## 2. Evaporation flux and its dependence on the size of the droplet

Various models relating thermal effects, surface tension and vapor pressure at the evaporating surface are developed [7,17-22]. The evaporation highly depends on the droplet size at the liquid-vapor interphase. The water droplet mass evaporation rate depends linearly on the increase in droplet base radius [23-25].

The theoretical investigation and the simulation suggested that the rate of evaporation of sessile droplet is modelled as;

$$\frac{dv}{dt} = -\beta F(\theta)L \quad (3)$$

where

$$\beta = \frac{2\pi DM}{\rho [c(T_{\text{surface}}) - (Hc(T_{\infty}))]} \quad (4)$$

$V$  is the droplet volume,  $t$  is the time,  $D$  is the vapor diffusivity in the air,  $\rho$  is the density of the liquid,  $M$  is the molar mass,  $H$  is the atmospheric air humidity,  $T_{\text{surf}}$  is the average temperature of the air-droplet interface and  $T_{\infty}$  is ambient air temperature.

## 3. Thermal phenomena during evaporation

With the increase in temperature the kinetic energy of the molecules also increases. The increase in molecular kinetic energy results in the molecules escaping the forces of attraction leading to

faster evaporation. David et al. [26] experimentally showed that the temperature in the bulk of a sessile evaporating droplet is a function of the rate of evaporation and the thermal properties of the substrate. They also proved that during the course of evaporation, the temperature of an evaporating droplet almost remains constant and is different from the ambient temperature. In reference [27–28], an investigation using numerical simulations on the dependence of the droplet base radius  $L$ , the contact angle  $\theta$ , and total vapor flux  $J$  was done along with the effects of Marangoni convection (MC) and the local heat of vaporization. Here the substrates with different conductive materials were considered and the results so obtained were compared with the results calculated by Hu and Larson [29] and Schonfeld et al. [17] for the isothermal cases. It was found that the difference between the results from reference [30–31] and the present simulations remains within three percent. However, if the material with lower conductivity (less than the thermal conductivity of air) is used then it is found that the evaporation flux reduces substantially than that of the isothermal case [32]. Such a reduction of flux is due to the lowering in the surface temperature of the droplet. Transparent heaters are devices that contain electrically conductive layers and are visually transparent. Transparent heaters generate heat by Joule effect when current passes through them. Numerical studies on thin films are reported in [33] and [10]. Transparent heaters are used in a number of applications ranging from the electronic industry to solar energy and medical sensors [34]. Transmittance and other optical properties of transparent heaters are well understood. However, the evaporation properties of transparent heaters are still an active research area. This has applications in defogging and defrosting applications in windshields and goggles [35]. A recent paper from Park et al. [36] has investigated the role of aspect ratio (droplet height to base radius ratio) for transparent heaters.

$$T = \left[ 1 + \frac{z_0 \sigma_{\text{opt}}}{2RS\sigma d c} \right]^{-2} \quad (5)$$

Eq. (5) depicts the Figure of merit in an electrical to optical conductance ratio (OCR). For a low contact angle, the evaporation time was decreased by advancing the dissimilarity between the ambient temperature and the temperature of a heated substrate. The following equation depicts this dependence.

$$t_{\text{tot}} = \frac{\rho L}{2[h(T_s) - Hc_s(T_s)]} \quad (6)$$

Based on the experimental outcomes, TP with steady wettability is expected to be used as wide reference material for de-fogging in automobiles, detectors, greenhouses and bio-chips. Because of low aspect ratio (AR) or lower value of CA on a hydrophilic surface of ITO (Indium Tin Oxide) and Silver (Ag), rapid evaporation of water droplet occurs. The result demonstrates that ITO/Ag/ITO multiple layer flexible TH with hydrophilic texture was utilized as transparent de-icing appliance and can be employed in distinct operations such as in automobile windows, side mirrors, drones, cameras and CCTV lenses. Also it can be employed as a heating source and greenhouse [37]. Also if the ITO/Ag/ITO multiple layer TH having hydrophilic surface is involved in detectors, biochips, advancements in durability as well as performance are predicted due to chemical affinity and high attachment between the heater and the activity coating.

Picknett and Bexon [38] have identified two modes of evaporation for a droplet resting on a smooth surface, namely, the constant-contact-angle (CCA) mode and the constant contact radius (CCR) mode. It is observed that the evaporation rate is a function of radius of curvature ( $r$ ) of the droplet surface. It can be expressed simply by the following model

$$\frac{dm}{dt} = KC \quad (7)$$

where  $C$  represents an equivalence of capacitance of a droplet and  $K$  is a constant depending on the boundary conditions of the droplet. With some mathematical simplification, Eq. (9) can be further represented as;

$$\frac{dm}{dt} = K_1(\theta, r) \quad (8)$$

where  $F(\theta, r)$  is a function of the angle of contact  $\theta$  and  $r$ . Further, this term is defined as;

$$F(\theta, r) = \frac{C}{r} \quad (9)$$

The term  $K_1$  is constant. In the CCA mode,  $F(\theta, r)$  can be approximated as a function  $f(\theta)$ , i.e. only a function of contact angle  $\theta$ . Therefore, it is constant during the evaporation phase in CCA mode. In the CCR mode,  $r$ ,  $\theta$ , and  $F$  varies during the evaporation phase. Further, it is experimentally observed that in CCR mode the rate of evaporation falls very slowly compared to CCA mode during the period of evaporation.

Ambient interface temperature, vapor concentration, and therefore vapor pressure and the droplet curvature play a critical role in evaporation. These factors further make it complicated to determine the evaporation rate via experimental methods and mathematical modelling. Following are some further research conclusions for obtaining the evaporation rate on the droplet surface:

- Popov [39] obtained an exact mathematical model for the rate for the droplet evaporation rate by the diffusion of vapor in a specific range of contact angles. With the change in contact angle, the contact area and hence the radius also changes thereby affecting the evaporation rate [14,40].
- The role of substrate conductivity in determining evaporation is not explored well compared to other factors.

However, in recent studies, it is depicted that substrate conductivity has an important effect in defining ER of pinned sessile droplets [41]. Further, Dunn et al. [42] proposed a model, which determines the role of thermal conductivity in droplet evaporation. The model predicts well the evaporation rates of volatile liquid droplets compared to water droplets. Non-uniform form evaporation flux on the droplet is demonstrated by the accumulation of suspended particles at the outer edges of a droplet, also denoted as the “coffee-ring” phenomenon. Such in-homogeneous solute deposition due to varying evaporation flux is undesirable in certain applications such as ink-jet printing, spotting of bio-fluids, and surface coating [43–44]. Singh et al. [45–50] reported that with the increase of temperature the moisture evaporation rate was increased. Singh et. [51,52] investigated the effect of transverse speed on microstructural feature of friction stir welded Al AA2024-T351. Furthermore, Devangan et al. [53] analyzed TIG weld properties. The work of Dash et al. [54] observed that the entire time of droplet evaporation on the hydrophobic surface was expected well by a vapor-diffusion-only model for a hydrophobic surface. However, for super-hydrophobic surfaces, the vapor-diffusion model overrated the rate of evaporation remarkably. This anomaly is mainly due to the thermal conductivity effect of the substrate is not accounted for in a vapor-diffusion-only model. The mesh of the acetone droplet, the temperature profile and water-vapour concentration of the droplet are presented in the droplet simulation Figs. 3 and 4, respectively.

The rate of volume loss from the droplet due to evaporation with respect to the radius for PTFE base plate is simulated and is

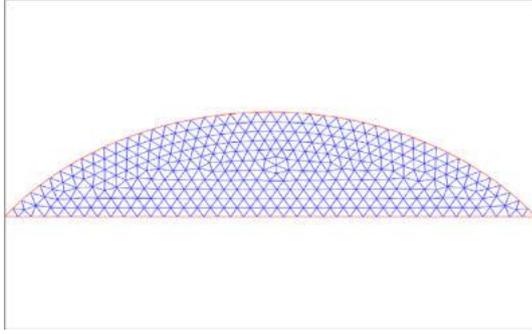


Fig. 3. A representative figure of the meshing on the droplet.

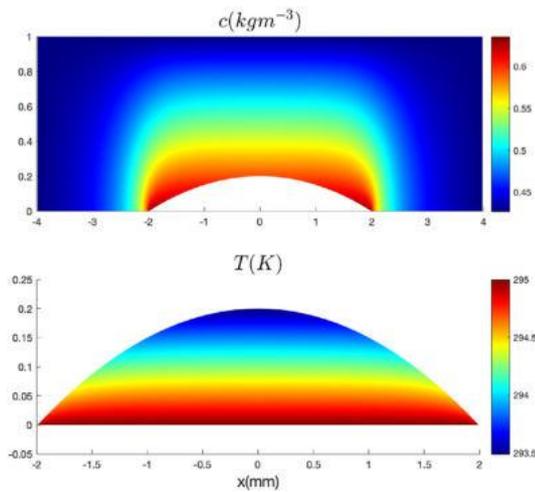


Fig. 4. Droplet Simulation for profile of the droplet and water vapor concentration above the droplet.

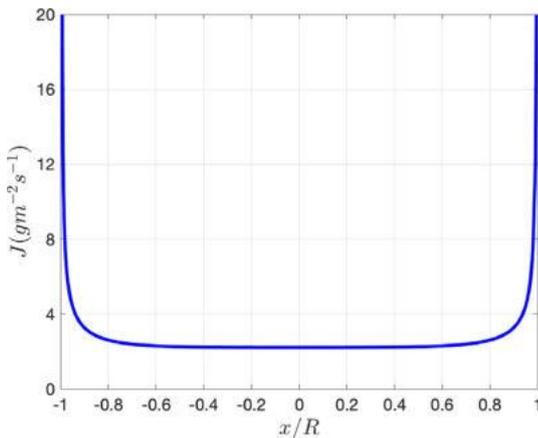


Fig. 5. Flux Val-This shows the evaporation flux on the droplet surface.

compared with the experimental result of the PTFE base plate shown in Fig. 5. The validation is carried out by comparing results of evaporation rate obtained in simulation and the experimental outcomes with the maximum difference of 2.8 %, as presented in Figs. 5 and 6, respectively.

#### 4. Conclusion

The phenomena of wetting by a droplet on a substrate is becoming the subject of interest since last three decades and

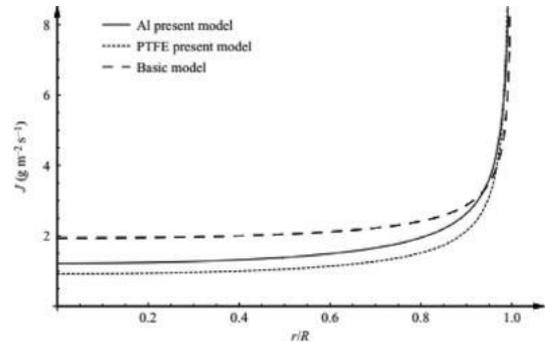


Fig. 6. Theoretical prediction for the initial evaporation mass flux from droplets of methanol of radius  $R = 1.35$  mm on different substrates [3].

becoming more prominent since 2010 because of more applications of such phenomena is in new areas. Due to huge number of publications, it is not possible to review every publication. Hence we selected publications on investigations carried on near past. The role of contact angle with respect to the droplet evaporation as well as spreading over the surface of the substrate along with the various numerical and experimental investigations on droplet evaporation phenomena is reviewed. Vapor-diffusion- only model for a hydrophobic surface, coffee-ring phenomena, ambient interface temperature, vapor concentration, and vapor pressure role on evaporation and the role of surface tension on droplet shape formation is studied. Further, the dependence of evaporation flux on various droplet physical properties has been reviewed. Finally, a special case of application of droplet evaporation study in the process of defrosting and de-fogging for transparent heaters has been studied and various papers on this specific application are reviewed.

#### CRediT authorship contribution statement

**Rupak Kumar Deb:** Methodology, Formal analysis, Investigation, Resources, Supervision, Writing – review & editing, Writing – original draft. **Iqbal Ahmed Khan:** Methodology, Formal analysis, Investigation, Resources, Supervision, Writing – review & editing, Writing – original draft. **Sanjay Sundriyal:** Methodology, Formal analysis, Investigation, Resources, Supervision, Writing – review & editing, Writing – original draft.

#### Data availability

No data was used for the research described in the article.

#### Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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# The Effect of Wood Ash on the Workability, Water Absorption, Compressive Strength in Cement Mortar

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# The Effect of Wood Ash on the Workability, Water Absorption, Compressive Strength in Cement Mortar

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## Article Info

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## ABSTRACT

Many researches had been carried out to incorporate wood waste ash as a cement replacement material in the production of greener construction material (concrete/mortar) and also as a sustainable means of disposal for wood waste ash. Results of these researches indicated that wood waste ash can be effectively used as a cement replacement material for the production of structural concrete/mortar of acceptable strength and durability parameters.

In the present study water absorption, compressive test are performed in simulated environment of cement mortar, an overview of the work carried out with cement mortar in which cement is partially replaced by wood waste ash on several aspects such as the physical, chemical, strength and durability properties of mortar with wood waste ash and the result shows Compressive strength of 40mm cubes at 0% replacement of WWA is 24.07 N/mm<sup>2</sup> at 7 days of curing and 28.13 N/mm<sup>2</sup> at 28 days of curing while at 10% replacement of WWA, the compressive strength is 17.28 N/mm<sup>2</sup> at 7 days of curing and 20.67 at 28 days of curing. It is clear from results that at replacement of 10%, compressive strength decreased by 26.52% in comparison to control mortar and also Water absorption capacity of mortar decreases with increase in percentage of wood ash. The reason behind this is that the particles of wood waste ash are finer than particles of cement which also acts like a filler material in hardened state.

**KEYWORDS:** Wood waste ash; Water Absorption Coefficient of Cement Mortar ; UTM Machine; Mortar with wood waste ash.

## 1. INTRODUCTION

This chapter contains the introduction, wood ash origin, wood ash applications, factors that affect quantity and quality of wood ash and objectives of wood ash in cement industry[1]. This chapter also deals with the problems that arise from combustion of wood, from cement industries and how we can handle wood ash economically as well as environment friendly. In the

current trends of energy production, power plants which run from biomass have low operational cost and have continuous supply of renewable fuel[2].

The thermal combustion/incineration reduces the mass and the volume of the waste up to a large extent, thus providing an environmentally safe and economically efficient way to manage the solid waste. Solid wood waste is commonly preferred as fuels over other

light/herbaceous and agricultural waste as their combustion produces comparatively less fly ash and other residual material[5].

### Origin of WoodAsh

The combustion/incineration of wood biomass produces wood ash as a by-product. A major problem arising from the usage of forest/agricultural waste product as fuel is related to the ash produced in significant amount after the combustion of such wastes[3]. It is commonly observed that the hardwood produce more ash than softwood and the bark and leaves generally produce more ash as compared to the inner part of the trees.

### Applications of Wood ash

Ash by-products obtained from combustion of wood biomass are generally used in land filling for embankments, road/highway construction[8]. It can be used as soil supplementing material to reduce the alkalinity of soil in agricultural lands. And it can also be used as raw material in the manufacturing of cement in cement industries[17].

As per current situation, approximately 70% of wood ash produced is managed by land filling, 20% of total wood ash produced is used as a soil supplement material for agricultural activity and the remaining 10% is implemented for other/miscellaneous applications as metal recovery and pollution control[10].

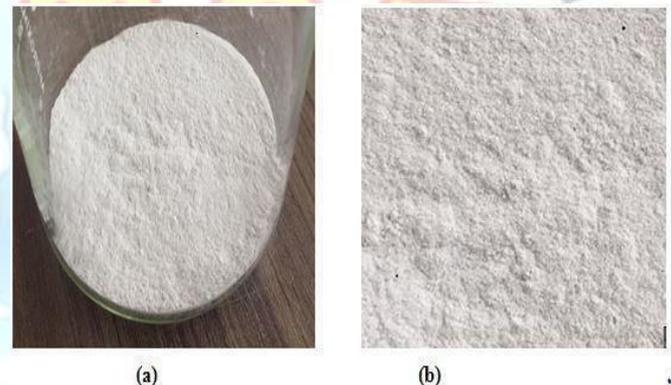
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**Udoeyo et al. (2006)** found the behavior of concrete containing wood ash at varying replacement percentages (0%, 5%, 10%, 15%, 20%, 25%, 30%). It was found out by experiments that concrete mix with WWA as a replacing material, decreases the workability of concrete[6,7]. This was due to that wood ash particles are smaller than that of cement particles due to which, wood ash particles has more specific surface area. Hence these particles absorb more water and ultimately, workability decreased.

Similarly, **Elinwa and Mehmood (2002)** found that when the cement is partially by wood waste ash obtained from open combustion/incineration of saw dust ash had the adverse effect on workability of grade 20 concrete. At constant w/c ratio of 0.565, when the percentage of replacement of cement is increased from

5% to 30% by weight of cement, slump value of concrete is decreased by 5-40mm with respect to control mix.

However, **Horsakulthai et al. (2011)** studied the effect of finely ground ash obtained from combustion of wood, rice husk ash, sugarcane bagasse waste (BRWA) as partial replacement of cement on chloride permeability of concrete. They used replacement percentages as 0%, 10%, 20%, 30% and 40% of total cement content by weight. It was concluded that incorporation of wood ash enhanced the chloride permeability. In the present study, The report presents an overview of the work carried out with cement mortar in which cement is partially replaced by wood waste ash on several aspects such as the physical, chemical, strength and durability properties of mortar with wood waste ash. This report shows the effect of wood ash on the workability, porosity, water absorption, compressive strength, flexural strength, thermal cycling, salt crystallization and rapid chloride permeability test etc.



**Fig 1: Wood Waste Ash Obtained from Open Burning.**

## 2. EXPERIMENTAL SETUP

### 1. Water absorption Test

To perform this test, we made prisms of size 40mm\*40mm\*160mm as per BS EN 1015:1999 Part-18, three for each replacement percentage (0, 5, 7.5, 10%). Take material in already given proportion as the cement and sand ratio is 1:3 and water/cement ratio is 0.50 and mixed it by hand or by epicyclic mixture. Prepare three specimens for each replacement percentage for testing at an age of 28 days.



**Fig 2: Moulds for Prisms of Size 40mm\*40mm\*160mm.**

**Testing:**

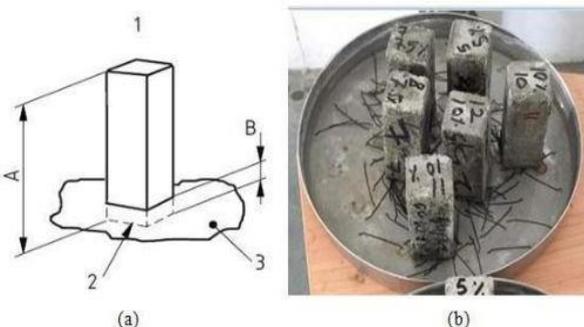
The prisms were dried at a temperature of  $60\pm 5^{\circ}\text{C}$  till constant mass is attained. The constant mass is reached when the difference between two consecutive weighing is very very negligible. Drying was done at lower temperature instead of higher temperature so that organic matter in mortar, if present, should not be decomposed and so that structural water should not be destroyed.

After drying to constant mass, samples are coated with wax/epoxy on all four faces lengthwise as shown in fig 3.10 so that evaporation from sides does not take place.



**Fig 3: Prisms with Epoxy Coating**

Now, cut these samples into two halves (i.e., 80mm) and place the samples into tray as shown in fig 3.11 with cutting edge downwards in water. Put water upto 5 to 10mm depth into the tray to allow capillarity in samples.



**Fig 4: Immersion of Samples into Water Tray**

Remove the samples after 10 minutes to get readings. Weigh individually the specimen and note down as M1. Now, take the readings after 90 minutes and note.

**2. COMPRESSIVE STRENGTH:**

Compressive strength is defined as the resistance of mortar breaking under compressive load. It is the capacity of mortar to withstand under compressive load which break the specimen or fracture occurs in specimen. Here, compressive load is applied by Universal Testing Machine or by Compression Testing Machine.

To perform compressive strength test, we used two broken pieces (two halves) of flexural strength test (as mentioned in **BS EN 1015-11:1999**). When load was applied on prisms in flexure test, these prisms broke into two halves. These two halves were used for compression test. Two bearing plates of steel of size **40mm\*40mm\*10mm** are used to apply load on broken pieces.

**Testing:**

Test the samples at 7 days and 28 days after regular curing. **Universal Testing Machine (UTM)/ Compression Testing Machine (CTM)** of capacity 3000kN are used to test the compressive strength. Prisms, to be tested, were placed on UTM/CTM as shown in fig 5.

Bearing plates were applied, one above the prism and the other one below the prism, to uniformly distribute the load and to apply load on specified area (40mm\*40mm). Fig.5 shows the different arrangements of placing the sample between



**Fig 5: Different Arrangements of Bearing Plates on UTM**

The loading rate should be uniform (without shock) at a rate of **10N/sec to 50N/sec** so that failure can occur within a period of 30 sec to 90sec.

Calculate the compressive strength as the maximum/peak load carried by the specimen divided by its cross-sectional area (area of bearing plates). Record the strength of each specimen individually.

### 3. CALCULATIONS

UTM/CTM gives us peak load (in kN) value. We have to find out compressive strength/compressive stress (in N/mm<sup>2</sup>). To get compressive strength of broken halves (obtained from flexural strength test), we use following formula:

**Compressive Strength = Peak load/ area of bearing plates**

where,

Area of bearing plates = 40mm\*40mm = 1600mm<sup>2</sup>

To get compressive strength of cubes, we use following formula:

**Compressive Strength = Peak load/ area of cube [13,19]**

where, Area of cube = 50mm\*50mm = 2500mm<sup>2</sup>

### 4. RESULTS AND DISCUSSION

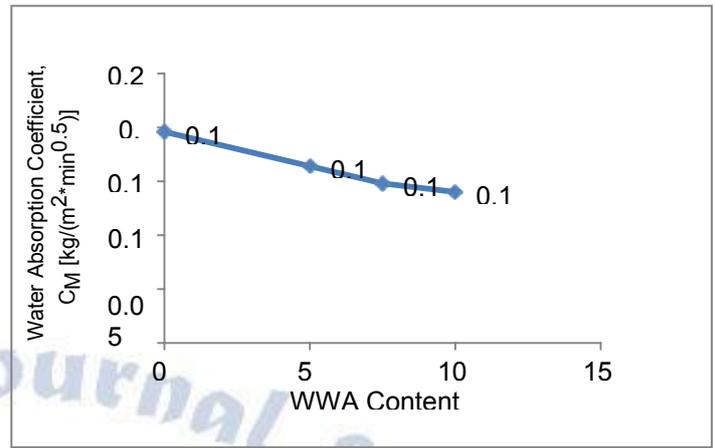
This chapter contains the outcomes of our experimental work. In this chapter, results of all the experiments are mentioned with their explanations and reasons behind the outcomes. This chapter gives the details of variation in results, graphical and tabulated representation of results.

#### 1. Water Absorption Capacity

Water absorption capacity is measured by calculating water absorption coefficient and for all replacement levels, water absorption coefficient is depicted in table 1 and Variation in water absorption coefficient [11,13], when replacement level of wood ash in cement is increased, is shown in fig 6.

**Table 1: Water Absorption Coefficient of Cement Mortar Containing WWA**

WWA Content (%)	Water Absorption Coefficient, C <sub>M</sub> [kg/(m <sup>2</sup> *min <sup>0.5</sup> )]	Mean of C <sub>M</sub>
0%	0.197	0.196
	0.184	
	0.209	
5%	0.172	0.164
	0.160	
	0.162	
7.5%	0.159	0.148
	0.145	
	0.140	
10%	0.147	0.140
	0.139	
	0.135	



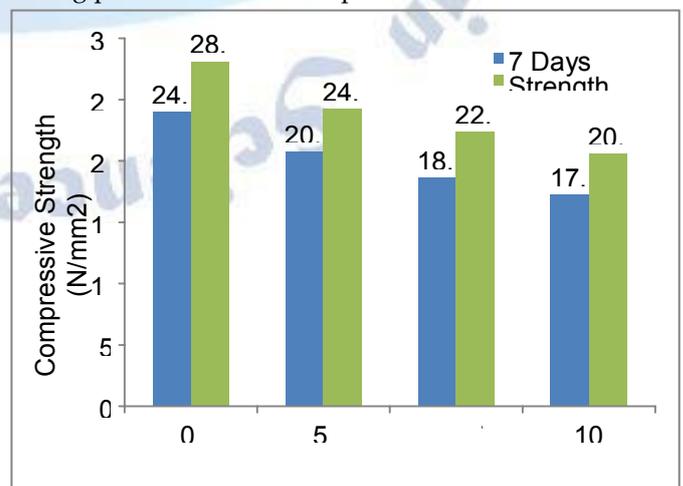
**Fig 6: Variation in Water Absorption Coefficient with Different WWA% Levels**

From figure 6, Water absorption capacity is inversely proportional to porosity and directly proportional to bulk density. Water absorption capacity of mortar decreases with increase in percentage of wood ash. The reason behind this is that the particles of wood waste ash are finer than particles of cement which also acts like a filler material in hardened state. As these particles are smaller than cement particles, they fill the void space between cement and sand particles [14,15]. As we increase the percentage of wood ash, we get compacted matrix which reduce water absorption capacity of hardened mortar.

#### 2. Compression Test

The Variation in compressive strength of broken pieces obtained from flexural test, for 7 days and 28 of curing, is shown in table 2. UTM gives load value, we have to convert these load values in stress values by dividing load value from area of samples [1,12,18].

From Figure 7, shows how the strength values differ with each other at 7 days curing period and at 28 days curing period at different replacement level



**Fig 7: Variation in Compressive Strength with Variation in WWA Content at 7 Days and at 28 Days (Broken Halves)**

the compressive strength of cubes of 50mm size with different replacement levels of wood ash in cement mortar illustrated in table 3.

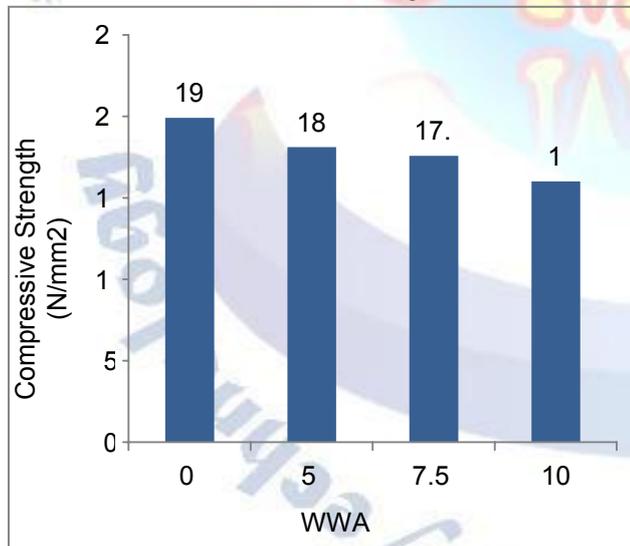
**Table 2: Compressive Strength of Mortar with WWA (Cubes)**

WWA Content (%)	28 days strength (N/mm <sup>2</sup> )
0%	19.9
5%	18.1
7.5%	17.56
10%	16

**Table 3: Compressive Strength of Mortar with WWA (Broken Halves)**

WWA Content (%)	7 days strength (N/mm <sup>2</sup> )	28 days strength (N/mm <sup>2</sup> )
0%	24.07	28.13
5%	20.81	24.23
7.5%	18.63	22.37
10%	17.28	20.67

The Variation in Compressive Strength of Cubes with Variation in WWA Content at 28 Days graph of decrease in compressive strength with increase in percentage of wood ash in mortar is shown in fig 8.



**Fig 8: Variation in Compressive Strength of Cubes with Variation in WWA Content at 28 Days**

Main components of cement are C<sub>3</sub>S, C<sub>2</sub>S, C<sub>3</sub>A and C<sub>4</sub>AF. During hydration process, C<sub>3</sub>S and C<sub>2</sub>S react with water to form calcium silicate hydrate (C-S-H) gel. C-S-H gel is important for good binding properties in mortar/concrete.

If silica content is more, more is the formation of C-S-H gel and more is the strength. But, from chemical composition of wood ash, silica is present in negligible amount which reduce the formation of C-S-H gel, hence reduction in compressivestrength[4,21,22].

## 5. CONCLUSIONS

On the basis of results and discussion following conclusions are drawn:

1. Compressive strength of 40mm cubes at 0% replacement of WWA is 24.07 N/mm<sup>2</sup> at 7days of curing and 28.13 N/mm<sup>2</sup> at 28 days of curing while at 10% replacement of WWA, the compressive strength is 17.28 N/mm<sup>2</sup> at 7 days of curing and 20.67 at 28 days of curing. It is clear from results that at replacement of 10%, compressive strength decreased by 26.52% in comparison to controlmortar.
2. Flexural strength results show that there is a significant decrease in flexural strength at upto 10% replacement level of wood ash. At 0% replacement of cement by WWA, the flexural strength is 7.1 N/mm<sup>2</sup> and at 10% replacement, strength is 5.82N/mm<sup>2</sup>.
3. If silica content is more, more is the formation of C-S-H gel and more is the strength. But, from chemical composition of wood ash, silica is present in negligible amount which reduce the formation of C-S-H gel, hence reduction in compressivestrength.
4. Water absorption capacity of mortar decreases with increase in percentage of wood ash. The reason behind this is that the particles of wood waste ash are finer than particles of cement which also acts like a filler material in hardened state.
5. Workability decreases with increase in replacement percentage of woodash.

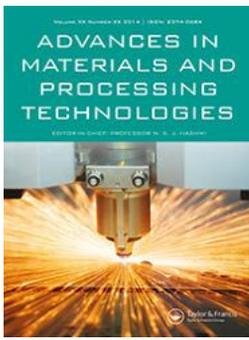
## Conflict of interest statement

Authors declare that they do not have any conflict of interest.

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## A brief review on the perspective of a newer incremental sheet forming technique and its usefulness

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## A brief review on the perspective of a newer incremental sheet forming technique and its usefulness

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### ABSTRACT

Incremental sheet formation (ISF) is extensively used versatile technique for newer manufacturing processes, such as creating skull prostheses, aerospace equipment, automobile, and so on. The current work describes the techniques, history, and classification of ISF-based on the results of few aspects such as force forming, stress triaxiality, force forming, bending stress, and so on. In addition, the influence of different parameters and their effect on building force, formability, spring-back, failure, surface roughness, rupture, and so on, have been analysed. It has been noticed that an investigation of the two degrees of freedom (DF) robot-manipulators with the ISF and its influences on surface coarseness and formability are greatly suggested.

### ARTICLE HISTORY

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### KEYWORDS

ISF; spring back; forming forces; SPIF

## 1. Introduction

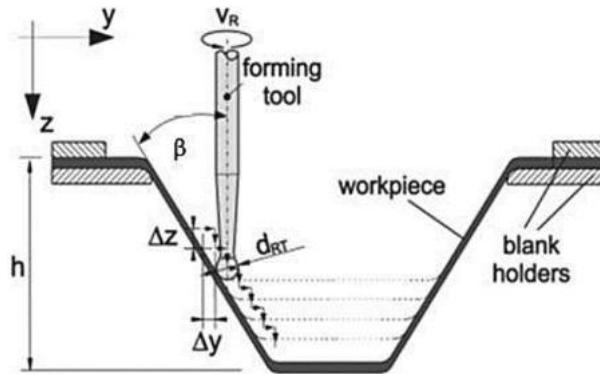
ISF technique is invented to minimise demerits of deep drawing of distinct processes, higher operation cost and the complications. Using the ISF technique, the shortcomings [1] had been excluded applying recently introduced die and punch-less methods [2] and are appropriate for short run production. In addition, the ISF practice is also used to produce a compound 3D object at a genuine price [3] that was difficult for built-up by conventional approaches. In the ISF, the forming instrument rotates inward towards a radial contour of a sheet clamped between blank pockets and support plates; hence a final shape is acquired [4]. A moderately a low price of hardware, higher flexibility of the forming process, and superior formability are the key rewards of ISF. Incremental sheet hydro-forming (ISHF) grow into a vital attention towards exploration as an advanced material processing-methodology for investigators over a decade due to its features of heightened formability than the traditional processes [5]. J. Jeswiet et al. [6] discussed about integrating surface unevenness of the deformed component, multi-pass system, tool, and SPIF at raised temperature. It was reported that a galvanised steel and tool made of stainless steel offers

an utmost outstanding combination of excellent formability and a minor surface roughness. Malwad and Nandedkar [7] used a hemispherical tool that affected both the surface coarseness and formability. It was reported that, formability decreased for lower (less than 6 mm) diameter of tool. Abbas [8] compared the effect of elliptical profile tool on final product profile, final thickness, and strain and stress distribution of formed component over results by hemispherical and flat profile tools using numerical simulation. They obtained forming limitation curve of negative slop with much higher strains by forming sheets into a variety of geometrical shapes, including dome, cone, hyperbola, pyramid, using SPIF. Chen Ke et al. [9] proposed a constitutive model of aluminium 2024 T4 sheet of 1 mm thickness for comparative (theoretical and experimental) stress-strain analysis of a truncated cone. Moreover, Behera et al. [10] stated that a higher formable wall-angle acquired by several researchers using instrument of different diameters to make a varying or fixed wall angle of a multiplicity of sheet materials of altered thicknesses. The researchers stated the scope in instantaneous governance over dimensional accuracy with thickness variation for an actual tool-path improvement strategy [11]. In the ISHF process, pressurised fluid in the chamber applies pressure on the backside of the sheet and others, similar to the ISF process. The 20 mm tool diameter, wall angle 45°, and speed of 200 mm/s move on a 0.85 mm sheet (Al6061 T6 material) in both cases ISF and ISHF. The ISHF process overcomes the drawbacks of non-uniform sheet thinning and reduces the spring back experimental done on conical and rhomboidal frustum [12]. Formability assessment of any sheet material is an interest to bring out in requisites of sheet thickness distribution after forming, maximum formable wall angle, and maximum formable depth of the component formed using single point incremental forming (SPIF) [13]. A consequence of process parameters and material property parameters on dimensional and geometrical accuracy of the produced component through SPIF is also the key interest of research. Formability is the ability of the material to withstand the stretch or draw stresses of forming before failure in terms of necking or bearing spherical tool profiles. The formability of a material mainly depends on the factors like anisotropy, strain hardening, yield strength, ductility, strain hardening, modulus of elasticity, and so on. An elastic modulus of the material plays a vigorous role that defines elastic spring-back. It meant that as the modulus of elasticity of Aluminium is one-third of that of Steel, the spring back of Aluminium will be three times that of Steel. Hence, it is desirable to carry out the deformation beyond the desired point based on the amount of spring back.

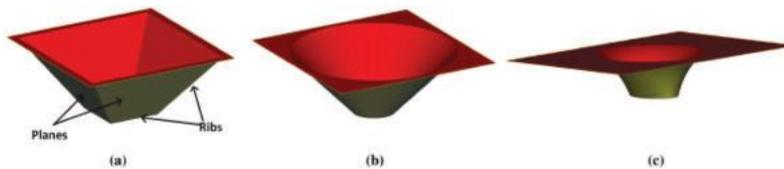
## 2. Classification of newer IF techniques

The term incremental forming (IF) [14] is meant that at any instant of time, only a slight portion of a product deforms using a deforming tool by applying incremental feed step-by-step as shown in Figure 1 [15]. For an example, three features of ISF planes-ribs, cone shown with ruled feature and freeform feature of double curved hyperboloid are presented in Figure 2. A ruled feature which swept towards directrix line, can be represented by a generatrix curve. A double curved surface cleared towards alternative curve that forms a freeform-surface [16].

Further, ISF is divided in two categories namely, traditional and hybrid methods as described below. Further, the conventional ISF methods are of three types such as a single



**Figure 1.** Basic principle of IF [15] with forming angle  $\beta$ , and incremental step-down size.



**Figure 2.** Different types of behavior during ISF (a) planes-ribs, (b) cone shown for ruled feature, and (c) Double-curved hyperboloid [16]. .

point incremental forming (SPIF) process, two-point incremental forming (TPIF) process, and multi point incremental forming (MPIF) process.

### 2.1. SPIF

In SPIF, the sheet is held between backing plate's and blank holders, to attained a preferred shape. Also, it is known as negative die-less forming. Furthermore, to distinguish the formability of a material, a forming angle is used in the SPIF method. Though, the custom of  $\beta_{max}$  provides only a rough guess due to the complexity of distortion mechanisms in SPIF, while the formability is not possible to expressed using a single constraint [17,18]. A few distinct geometries produced by SPIF method are illustrated in Figures 3 and 4.

### 2.2. TPIF

There are two styles of tools to support and form the back side of the sheet, in which both ends are clamped during the process; it is named die-less positive, positive forming. Generally, in ISF, a hemispherical-shaped instrument employed to process the sheet in stages, following a tool tack tailored to a geometry created on computer-numeric controlled (CNC) device.

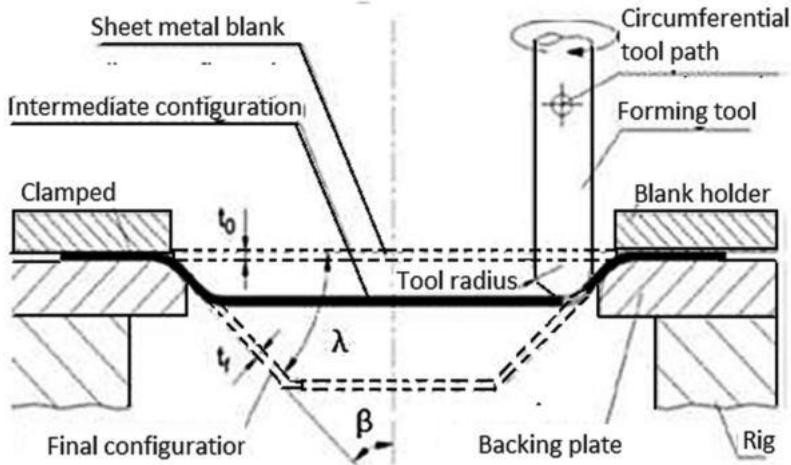


Figure 3. Schematic view of SPIF [17].

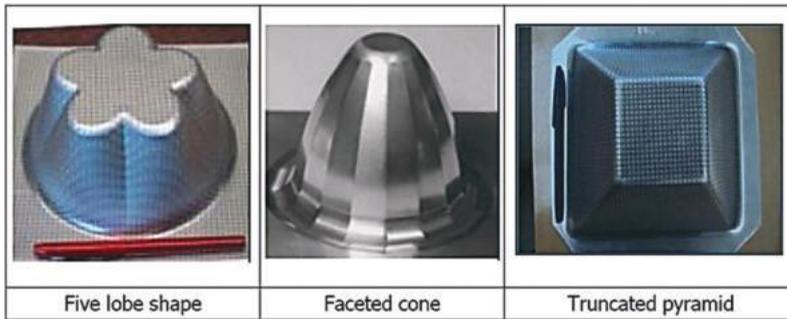


Figure 4. Examples of a few geometries created by SPIF [18]. .

### 2.3. MPIF process

MPIF process is a flexible three-dimensional manufacturing technique applied for a very long sheet. In this process, between two opposite lower and upper-dices, a matrix of multiple-punches is fitted with a climb to height via linear actuators that press a blank to find required desired shape. As shown in Figure 5, the alignment of two upper and lower blank holders was used in various sections, and every section has diverse hydraulic cylinders governed by the servo motor equipped mechanism. While the forming forces are provided from the blank holders to give the preferred shape [19].

#### 2.3.1. SPIHF

In SPIHF technique, only a forming tool is to perform required activities, while an opposite-side was supported using hydraulic-fluid by the pump [20]. Currently, various investigations are going on it because of the thinning problem.

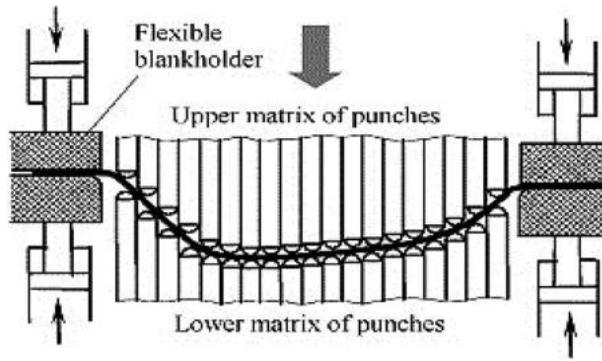


Figure 5. MPIF of sheet metal with blank holder [19].

2.3.2. TPIFPD

A forming tool travels on one face of a formable-sheet, while the other face used partial-die [20]. By comparing TPIF with PD and SPIF, the portions fabricated using these two processes. While, total geometric accuracy is found better in TPIFPD as compared to SPIF due to high negligence of elastic recovery in unloading.

2.3.3. TPIFD

In this technique, a forming tool rotates on a side, while other side, a full die is applied in Figure 6. There is applied a complete and partial in a small series production. In a double-sided ISF, the two tools were used to create geometry on the sheet while in opposite side used local associate tool to deliver local hold [21].

Various process parameters influencing incremental forming process comprises sheet blank of initial thickness of  $t_i$  and final thickness of  $t_f$ , wall angle of  $\phi$ , tool diameter, the spindle rotational speed, incremental, stage depth of  $\Delta z$ , tool-end geometry, tool-sheet interface lubrication, and tool path strategy.

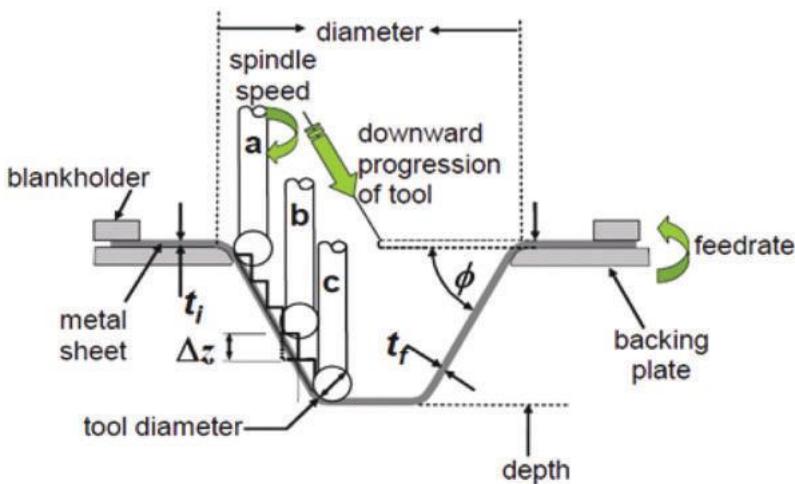


Figure 6. SPIF Terminology in a deformed part [21].

## 2.4. Sheet materials

Nowadays, many researchers have reported the effect of process parameters in relation to properties of various grades of sheet metals like AA1050-O, AA6114-T4, AA3003-O, and so on. Copper, Brass formed by SPIF. Ham and Jeswiet [21] conducted experiments using the design of experiments for deforming a cone out of AA3003-O of thickness ranging from 0.8 mm to 2.1 mm. The authors presented a methodology to develop FLDs for forming AA6451, AA5182, and AA5754 using SPIF and summarised that material with lower ultimate tensile strength offers more formability. It was reviewed the procedure to generate the contour and spiral tool paths for incremental sheet forming. Based on sheet blank materials and component geometries can be observed that the major work had been carried out for Steel sheets, Aluminium sheets, and its alloys. Similarly, major work on the component geometry of constant wall or variable wall angle frustum of the cone was found. Very less work had been found on the hard sheet metal like Ti, Mg, and its alloys to form it into pyramidal geometry.

## 2.5. Parameters affecting ISF

The number of critics arises that require distinct conversation in order to optimise the governing ISF parameters. The major process affecting parameters are wall angle, tilting angle, forming angle, sheet thickness, step depth, spindle speed, feed rate, temperature, stress tri-axiality, bending and rotational speed and interface of these parameters [22]. There are a few other considerable parameters in ISF that cannot be tolerated, such as formability, surface-roughness (SR), geometric accuracy, and forming forces.

### 2.5.1. Formability

Formability is a critical parameter in deciding the material deformation capability. Usually, there are four types: tool profiles of flat, angular, parabolic, and hemispherical shapes. Also, contour and spiral types of tool paths were used in ISF [17] that influence formability consistently as per the experimental observations on FLD [23].

SPIF affords a quick and cheaper forming process, easy however exciting form with sort of forming strategies for lubrication [24]. Multi-Stage SPIF (MS SPIF) is a variety of stages in SPIF employed for small quantities and complicated sheet metal domains of the vertical axis. Also, in MS SPIF the strain path is noticed linear and nonlinear in other succeeding steps [25]. Test the formability and to get FLD proposed on the basis of different forming techniques and it is affected through loading path and to show the feasibility. Forming test offers diverse approaches with uncommon distributions on the rupture points [26]. To further enhance the formability and surface roughness using digital image correlation (DIC) approach, to study the major and negligible strains and compare the result with FEM [27].

### 2.5.2. Surface roughness C

A surface coarseness tester can be used by inserting it into the display unit and also can be used by detaching it from the display unit. Also, process parameters are examined related to effect on surface roughness. Another main focus is on the bending effect, stress-strain analysis in Forming Limit diagram (FLD), formability, and accuracy [27]. The FLD has

for failure and safe zone of ISF, economy, flexibility, small-batch manufacturing, and remarkably rapid prototyping [20]. It is observed that the surface roughness is affected by the numerous parameters, namely feed rate, step depth, tool radius, sheet thickness after applying etching, and different tool types affect the surface roughness [28].

### **2.5.3. Geometric accuracy**

During the ISF process, produced geometry represents some errors along the oblique walls; elastic spring back reduces, and geometric is higher than in the other areas. Continuous yielding of the sheet becomes problematic at a higher rate of strain hardening for hard material, which requires a higher load and energy to deform the sheet. Deflection of smaller diameter tool during operation of SPIF against hard sheet metal also leads to deviation of geometrical accuracy.

### **2.5.4. Forming forces**

The load cell measures the occurrence of forming forces during the ISF process fitted on the tool holder [29]. During sheet deformation, analytically predict the forming forces and experimentally arises in three-dimensional perspective view analysed [30]. Analytical predictions of forming forces in SPIF with the hydraulic fluid process have developed based on analytical models used to compute part through-thickness stress in the 3-D perspective view is obtained during the sheet deformation. Experimentally, the process parameters with total force, moment, the thickness of the component, and plastic strain distribution [31] in a sequence of additional SPIF tests; to evaluate the influence of the axial forming force [32]. Finally, on the variation of the process parameters, the forming force varied [33].

## **2.6. Stress triaxiality, spring-back and fracture strain**

There are several available aspects out of them we have studied a few such that stress spring back, fracture strain, and triaxiality.

### **2.7. Stress triaxiality**

Stress triaxiality deformed a sheet in radial, circumferential and meridional directions [34]. Stress triaxiality is less stable in deformation stability, and a thinning sheet thickness occurs, leading to failure. In the maximum shear stress (MSS) criterion, the fracture condition characterised by stress triaxiality parameters is a mean to yield pressure ratio.

### **2.8. Spring back**

There are two types of spring-back in SPIF. The tool passes over the formable sheet to achieve a desired shape by removing additional geometry because it yields a poor accuracy. Also, a global spring back is formed due to other residual stress developed in the matter. Also, it has been discussed a spring-back and the accuracy of the desired product [35].

## 2.9. Fracture strain

The major and minor strains are plotted along the Y- and X-axis, respectively, in the FLD diagram in Figure 5. A combination of the stress and strain analyses the fracture initiation in ISF. The elongation at fracture, the ratio of changed to initial length after breakage of the test specimen. This fracture criterion is used to revise the scale impact and previously published experimental records are used to authenticate the feasibility [36]. Forming assessment offers diverse approaches with different deliveries at breakage points, it occurs in contact and vicinity of the contact zone [37]. In MS-SPIF comparison of measured and calculated primary and secondary forming strain distributions of a spherical and cylindrical roller [38] of experimental deformation [39] and Analytical validation of the results is achieved [6]. During the control of material provides thinning and thickening of sheet and effect tool path of forming limit curve [40]. G. Centeno et al. [37] took tool diameters 6, 10, and 20 mm rotate on AISI 304 metal sheet thickness of 0.8 mm and evaluate forming forces, failure, and fracture strain measure at failure and crack initiation. The influence of varying process parameters like tool diameter, spindle speed and step down is on suitability. At the contact area of tool and blank prediction, analytical of forces in three directions with process parameters feed rate, tool diameter, and constant sheet thickness AA2022 sheet, wall angle, and results verify by extra experiments, in which high accuracy and maximum prediction of error less than 18% of forces have obtained [41].

Poor ductility of a specimen at atmospheric conditions is hard to form employing ISF. There is numerous heat affected approaches to apply, such that, electric, induction, laser halogen lamp, hot air, oil, heat friction, are applied on different materials [42]. A laser and other heating methods improve formability by local heating of sheets [43]. A hemispherical tool used with process parameters producing a series of plastic deformations affects formability [3]. At the critical radius, 2.2 times of blank thickness was found out excessive compression with low damage maximise formability [44]. It functions at a continual feed rate, and tool-hammering, stable SR is obtained using an industrial robot [45]. Improving geometric accuracy and multistage forming have discussed and compared mechanics of deformation and forming limits, distribution of stresses- strains derived. The selected process parameters are more affected by the formability and hardening law [46]. So all the experiments observed that surface roughness varies with process parameter.

## 2.10. Process capabilities

According to several investigates, explanations, and strategies in IF recommended to the improvement in ISF about the process capability. To mark one portion at a time, noble accuracy by means of simulation, emerging time and energy depletion, water jet method is found accurate and, sheets appearance of non-simulation.

## 3. Discussion and future scopes

Influence of input constraints on surface coarseness, spring-back, precision the formability, and miscellaneous in SPIF were examined outcomes illustrations that:

An increase in tool speed, spindle rotation speeds, sheet thickness, wall angle, forming angle, and electric current, but the decrease in tool diameter, tool feed rate, step down, tensile stress sheet rotational speed, respectively, shows formability increases. The interaction of (a) smaller tool size and step size, (b) decrease in sheet rotational speed and increase in tilting angle, and (c) increase the rotational speed and decrease the feed rate all tends to formability increases. As per previous investigations, feed rate does affect the surface roughness. In the case of other parameters, spindle speed increases, but wall angle, step depth, and forming time decrease, respectively, tend to enhance the surface roughness. The utmost outstanding amalgamation of a better formability and very low surface roughness is delivered by adopting flat-ended tool. The presence of feed rate interfaces and friction coefficient upgraded surface quality and with no influence on the formability. Spring-back can also be diminished by perfect calculation and modifying the tool path. In a deformed part wall, spring-back can be diminished with the increase of the tensile force. Also, the forming force was noticed to be decreased by increasing the temperature. Finally, the destruction value along meridional direction tends increases the fracture tendency and its value higher than 1.0 leads to crack in sheet. Future prospectus conclude the consequence of many constraints and their interfaces can affect the formability, geometrical accuracy, and SR of AA3003-O by means of SPIF. Multi DOF robotics in the ISF, ISHF, and a corresponding mechanism can distort the sheet incrementally. In order to appraise formability, dimensional accuracy, and spring-back for a constant slope and force, and variable slope and force.

#### 4. Conclusions

Formability is affected due to the dissimilarity of distinct parameters and its interaction. Some elements of SPIF play a vital role in enlightening formability, flexibility, and forming time reduction, while some process constraints and parts of SPIF have noticed an effect on the surface finish and accuracy. Furthermore, it is observed that the decrease in spring-back property effects reduces elastic limit and increases strength. Also, a two degrees of freedom (DF) robot-manipulators with the ISF and its influences on surface coarseness and formability are greatly suggested for future prospective.

#### Disclosure statement

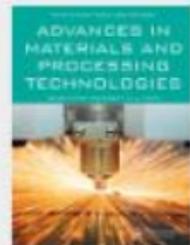
No potential conflict of interest was reported by the authors.

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TECHNICAL ARTICLE

# Triethoxyoctylsilane-Modified SiO<sub>2</sub> Nanoparticle-Based Superhydrophobic Coating for Corrosion Resistance of Mild Steel

Konica Sharma, M.K. Malik, Amrita Hooda, Kailash Pandey, Jaishree Sharma, and M.S. Goyat

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In this work, SiO<sub>2</sub> nanoparticles-based corrosion-resistant superhydrophobic coating for mild steel has been developed. A wire electrical discharge machine (EDM) was used to cut micro-patterned mild steel followed by chemical etching via Piranha solution. The etched metal was coated with triethoxyoctylsilane-modified SiO<sub>2</sub> nanoparticles via the solution method to generate the hierarchical micro-nano roughness with low surface energy. The developed coating exhibited micro-nano hierarchical roughness due to SiO<sub>2</sub> nanoparticles and their clusters, verified by atomic force microscope (AFM) and field-emission scanning electron microscope (FESEM) analysis. The maximum water contact angle (CA) of  $153 \pm 2^\circ$  with a sliding angle (SA) of  $5 \pm 2^\circ$  was obtained for the coated mild steel. The electrochemical impedance spectroscopy (EIS) plots confirmed the noteworthy corrosion resistance performance of coated metal over the uncoated one. Thus, the modified SiO<sub>2</sub> nanoparticles-based superhydrophobic coating could be a good option for inhibiting the corrosion of mild steel.

**Keywords** corrosion resistance, mild steel, SiO<sub>2</sub> nanoparticles, superhydrophobic coating, triethoxyoctylsilane

## 1. Introduction

Mild steel is one of the extensively utilized types of steel due to its low-cost and exhibits such properties, which are suitable for a wide range of applications like transportation, construction and oil and gas pipelines (Ref 1). Conversely, worldwide every year, billions of dollars are spent on repairing or replacing corroded mild steel. It is well acknowledged that mild steel suffers from corrosion when exposed to moisture and air (Ref 2). Moisture protection of mild steel is more challenging forcing the researchers to manufacture water-resistant mild steel using the fundamental concepts of hydrophobicity (Ref 3). Lotus leaves, bird feathers and water strider legs are natural water-resistant objects (Ref 4, 5). Such objects exhibit superhydrophobicity. The superhydrophobic surfaces of any material have a static water contact angle  $> 150^\circ$ , which results in the bouncing of water droplets on their surface or displaying non-wetting behavior. Several researchers mimic these types of natural superhydrophobic features on

artificial surfaces to utilize their benefits for various applications, such as anti-corrosion, anti-oxidation, water drag reduction, anti-soiling and anti-icing (Ref 5-8). Superhydrophobic surfaces have unique features such as low surface energy and micro-nano scale structures (Ref 9). Numerous methods were tried out in the past to generate micro-nano level roughness on the metals using well-known techniques such as electrodeposition, sandblasting, plasma etching, chemical etching, lithography and nanoparticle deposition (Ref 3). However, the most economical and feasible routes are chemical etching and micro-nanoparticle deposition (Ref 10-12). For the generation of superhydrophobicity on metallic surfaces, low surface energy of the surface is required which can be obtained easily on a chemically etched surface by the deposition of surface-functionalized nanoparticles. Over the past few years, various nanoparticles, such as carbon nanotubes, ZnO (Ref 12), TiO<sub>2</sub> (Ref 13), and SiO<sub>2</sub> (Ref 9, 14), were explored to generate nano-scale roughness to achieve superhydrophobicity. However, SiO<sub>2</sub> nanoparticles are most commonly used for superhydrophobic surfaces because of their low cost, ease of fabrication, ease of functionalization and low density compared to other nanoparticles (Ref 15). Such properties make these nanoparticles an ideal choice for manufacturing superhydrophobic surfaces. However, the use of surface-functionalized SiO<sub>2</sub> nanoparticles on chemically etched metallic surfaces is not been fully explored yet (Ref 9).

In the present study, a unique approach was employed to protect the mild steel from corrosion. A wire electrical discharge machine (EDM) was used to generate a micro-pattern on mild steel followed by chemical etching via Piranha solution. The wire EDM and chemical etching produced micron-level roughness on the surface of the mild steel. Then the etched metal was coated with triethoxyoctylsilane-modified SiO<sub>2</sub> nanoparticles to generate the hierarchical micro-nano roughness with low surface energy. The superhydrophobicity

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and anti-corrosion performance of the samples produced promising results, which can be very useful for the metal industry.

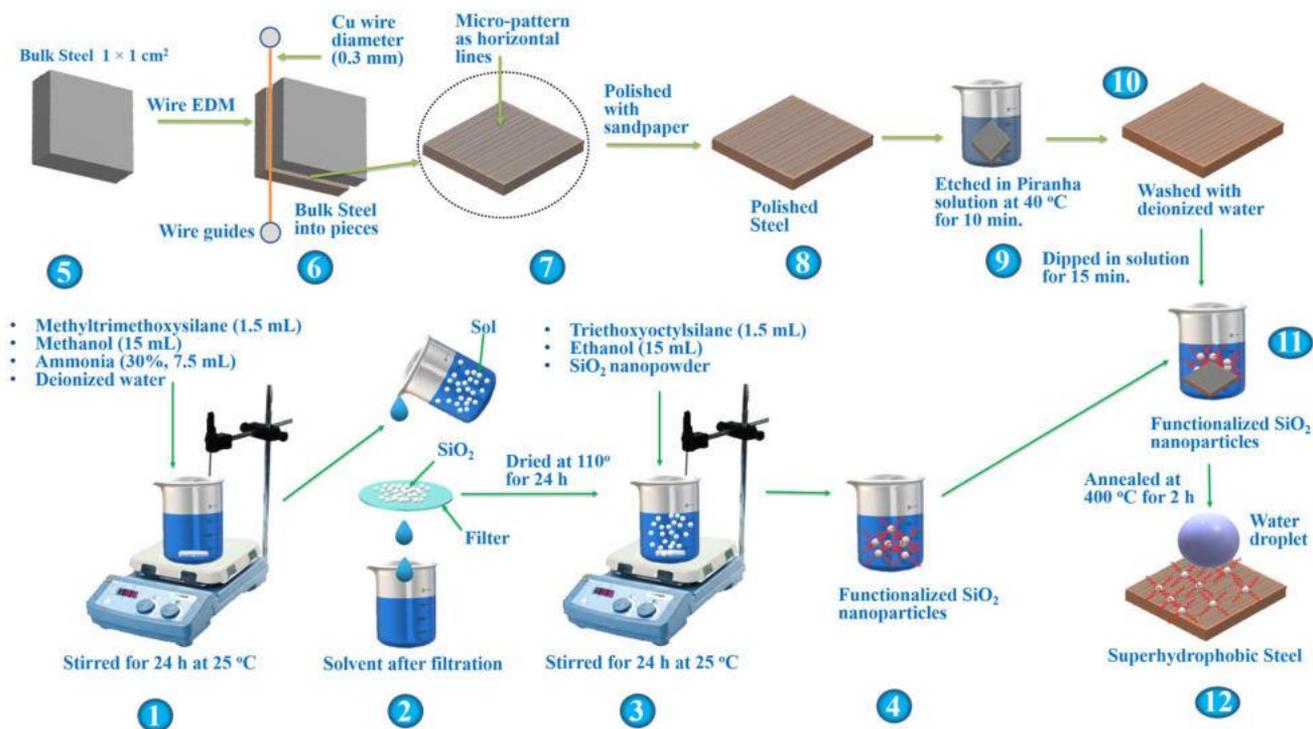
## 2. Experimental

### 2.1 Fabrication of Superhydrophobic Coating on Mild Steel

The fabrication of functionalized SiO<sub>2</sub> nanoparticles-based superhydrophobic coating on mild steel is schematically illustrated in Fig. 1. Methyltrimethoxysilane (1.5 mL), Methanol (15 mL), Ammonia (30%, 7.5 mL) and deionized water were continuously stirred for 24 h at 25 °C to obtain the silica sol. The silica sol was then filtered and dried at 110 °C for 24 h and collected as silica nanopowder. The surface of SiO<sub>2</sub> nanoparticles was functionalized by blending triethoxyoctylsilane (1.5 mL) and ethanol (15 mL) with the nanoparticles followed by magnetic stirring for 24 h at 25 °C. On the other hand, the mild steel of 1 × 1 cm<sup>2</sup> size was cut from the bulk sample using wire EDM (Ezeewin). The wire EDM created a micro-pattern in form of parallel lines over the metal substrate, which was further polished with 400-1200 Grit sandpapers. The polished substrate was ultrasonically cleaned in acetone for 30 min. The polished substrate was etched in a Piranha solution (Ref 16) (concentrated H<sub>2</sub>SO<sub>4</sub>, 98% and H<sub>2</sub>O<sub>2</sub>, 30%. Ratio 7:3) at 40 °C for 10 min. The etched substrate was washed with deionized water several times and dried at room temperature. The etched metal substrate was dipped in the solution of functionalized nanoparticles for 15 min. Later on, the coated substrate was annealed at 400 °C for 2 h to obtain the superhydrophobic mild steel.

### 2.2 Characterization

The morphology of triethoxyoctylsilane functionalized SiO<sub>2</sub> nanoparticles and deposited coatings were characterized using a high-resolution scanning electron microscope (FESEM, Quanta 200F, FEI, USA). The surface modification or functionalization of the nanoparticles by triethoxyoctylsilane was characterized by a Fourier transform infrared (FTIR) spectroscopy (Perkin Elmer FTIR/FIR Frontier, Spectrometer, USA). Both the functionalized and non-functionalized SiO<sub>2</sub> powder samples were separately mixed with high purity potassium bromide (purity 99.9%, Sigma-Aldrich) using a pestle motor and converted into transparent films using a stainless steel die and a hydraulic press. The infrared spectra of the transparent thin films was recorded at ambient conditions. Bruker D8 Advance Diffractometer (Germany) carried out the structural characterization of the samples with a Cu-K $\alpha$  radiation source. The optical micrographs of the samples were recorded using Nikon Eclipse MA200 optical microscope. The wettability of the samples was characterized using a drop shape analyzer (DSA 100, Krüss GmbH, Germany). An atomic force microscope (AFM, NT-MDT, Ntegra) was used to investigate the roughness and surface morphology of the samples. An electrochemical workstation (CHI 660E, CH Instruments, USA) was used to obtain polarization curves with a low scan rate of 0.2 mVs<sup>-1</sup>. The samples were immersed in corrosive salt solution (3.5% NaCl) to obtain polarization curves. The corrosion resistance of the samples was characterized using electrochemical impedance spectroscopy (EIS) from 200 kHz to 50 MHz frequency and via excitation of sinusoidal wave amplitude of  $\pm 5$  mV.



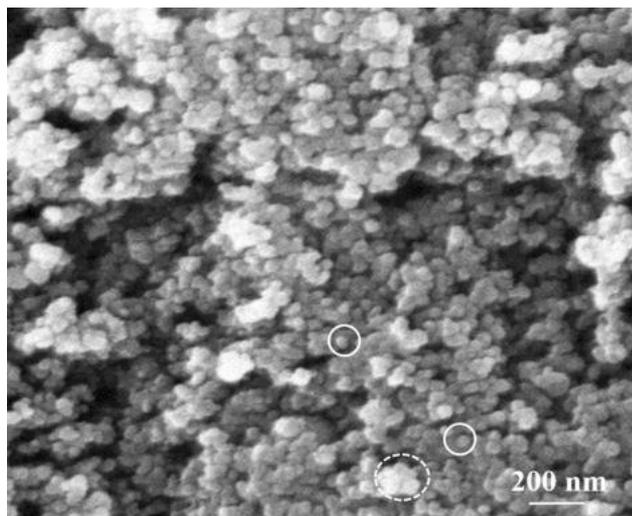
**Fig. 1** Schematic illustration of the systematic fabrication of functionalized SiO<sub>2</sub> nanoparticles-based superhydrophobic coating on micro-patterned and chemically etched mild steel

### 3. Results and Discussion

The FESEM image of triethoxyoctylsilane functionalized silica nanoparticles is shown in Fig. 2. The FESEM images revealed a very smooth spherical shape of the SiO<sub>2</sub> nanoparticles with an average size of ~ 30 nm. However, very limited large size clustered particles can be seen but most of the individual round shape particles are revealed by the FESEM image. This indicates the successful functionalization of the nanoparticle surface because the functionalization agent significantly reduced the clustering of nanoparticles (Ref 12). The particles in solid circles indicate the individual particles, and the particles in the dotted circle indicate the clustered particles (Fig. 2).

FTIR spectra of SiO<sub>2</sub> nanoparticles and triethoxyoctylsilane-modified SiO<sub>2</sub> nanoparticles are shown in Fig. 3. Both the unmodified and modified SiO<sub>2</sub> nanoparticles reveal sharp absorption peaks at 1103 and 802 cm<sup>-1</sup>, which are designated as anti-symmetric and symmetric vibrational peaks of the Si-O-Si bond, respectively (Ref 17-19). A very broad peak centered at 3421 cm<sup>-1</sup>, which is common in both the spectra and a small peak at 966 cm<sup>-1</sup> in the case of unmodified nanoparticles are corresponding to the stretching vibration of Si-OH groups indicating the presence of hydroxyl groups on the surface of nanoparticles (Ref 19). In the case of modified nanoparticle spectra, the change in the position of absorption peak from 966 to 882 cm<sup>-1</sup> and the generation of new peaks at 2978, 2921 and 1381 cm<sup>-1</sup> are corresponding to C-H, CH<sub>3</sub> and C-O functional groups, confirming the surface modification of SiO<sub>2</sub> nanoparticles by long chain triethoxyoctylsilane (Ref 9, 19-22).

X-ray diffraction (XRD) pattern of uncoated and coated mild steel samples is shown in Fig. 4. The XRD analysis was performed to investigate the effect of the presence of SiO<sub>2</sub> nanoparticles-based coating on the crystallinity of the mild steel. The 2θ values were matched to the standard International Centre for Diffraction Data (ICDD) data card (04-014-0360). The XRD pattern of both the uncoated and coated mild steel samples revealed one sharp peak at 2θ = 45.26° corresponding to a plane (110) and one low-intensity peak at 2θ = 65.30° corresponding to a plane (200), which indicates polycrystalline



**Fig. 2** FESEM image of triethoxyoctylsilane functionalized silica nanoparticles

nature and body-centered-cubic (bcc) structure of mild steel (Ref 23, 24). However, the SiO<sub>2</sub> nanoparticles-based coating does not reveal any new peaks except a low-intensity peak at 2θ = 27.30°, which may be due to some impurity of the sample. Nevertheless, the relative intensity of the coated samples was reduced due to the coating on the mild steel substrate. The generation of no new peaks may be due to the amorphous nature of the SiO<sub>2</sub> nanoparticles. Thus, the coating does not change the basic structural characteristics of the steel substrate.

Optical microscopic images of polished mild steel and etched steel substrate at different magnifications such as 20X and 100X with their corresponding water contact angles (CAs) are shown in Fig. 5. The polished sample revealed parallel microscopic lines on the surface due to the use of wire EDM. The surface seems smooth and exhibits a water CA of 92° as depicted in the inset of Fig. 5(a). The water CA > 90° indicates the hydrophobic nature of the metallic substrate. However, the Piranha solution etching of the metallic substrate generates roughness on the surface, which makes the microscopic parallel lines diffused. However, the etching of the metallic surface results in a significant increase in the surface roughness from 90 to 110 nm which remarkably increased the water CA from 92° to 123° as shown in the inset of Fig. 5(c), which is in close agreement with the results reported by others (Ref 11). Thus, the etched metallic substrate exhibits a more hydrophobic character compared to the polished metallic substrate.

Optical microscopic images of the coated mild steel at different magnifications such as 20X and 100X with corresponding water CA are shown in Fig. 6. Due to the coating, the surface of mild steel seems very smooth with uniform surface roughness. The coated substrate exhibits a water CA of 153° as depicted in the inset of Fig. 6(a). Thus, the superhydrophobic character of the coated mild steel has been generated because of the presence of surface-functionalized SiO<sub>2</sub> nanoparticles. The surface functionalization of the nanoparticles reduced the surface energy of the particles and the nano-size of the particles offered nanoscale roughness. Thus, the combination of these two transformed the hydrophobic mild steel into the superhydrophobic one (Ref 12, 14).

AFM analysis was performed to characterize the topography and surface roughness of the polished, etched and coated mild steel samples. The 2-dimensional (2D) and 3-dimensional (3D) images of the polished and etched mild steel are shown in Fig. 7. The polished mild steel is revealing micro-patterned morphology (Fig. 7a, b). The parallel vertical lines with some cavities are exposed by the 2D image and uniform surface roughness is revealed by the 3D image. However, the etched mild steel is revealing a completely different morphology, which is obvious as the chemical etched away the metallic surface. The 2D and 3D images of etched mild steel reveal the non-uniform roughness and significant variation in the surface roughness compared to polished steel (Fig. 7c, d).

The 2D and 3D AFM images of coated mild steel at different magnifications are shown in Fig. 8. The 2D (Fig. 8a, c) and corresponding 3D (Fig. 8b, d) images revealed the presence of significant but uniform surface roughness on the coated mild steel. Additionally, the higher magnification AFM image (Fig. 8c) revealed the presence of individual nanoparticles and their agglomerates on the coated surface of mild steel, which is producing a combination of micro-nano hierarchical surface roughness responsible for the superhydrophobic behav-

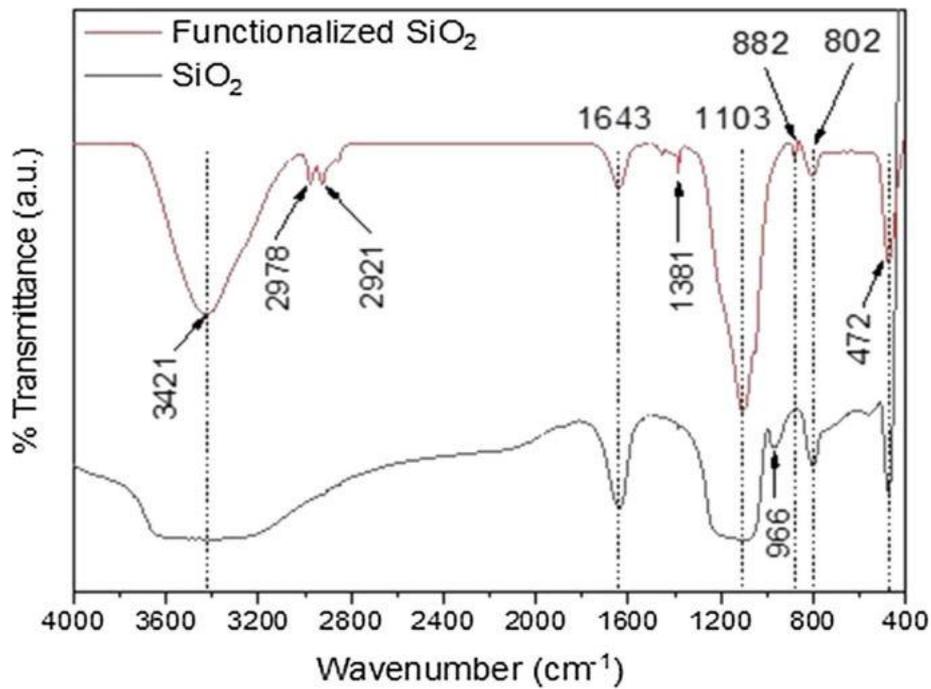


Fig. 3 FTIR spectra of SiO<sub>2</sub> nanoparticles and triethoxyoctylsilane-modified SiO<sub>2</sub> nanoparticles

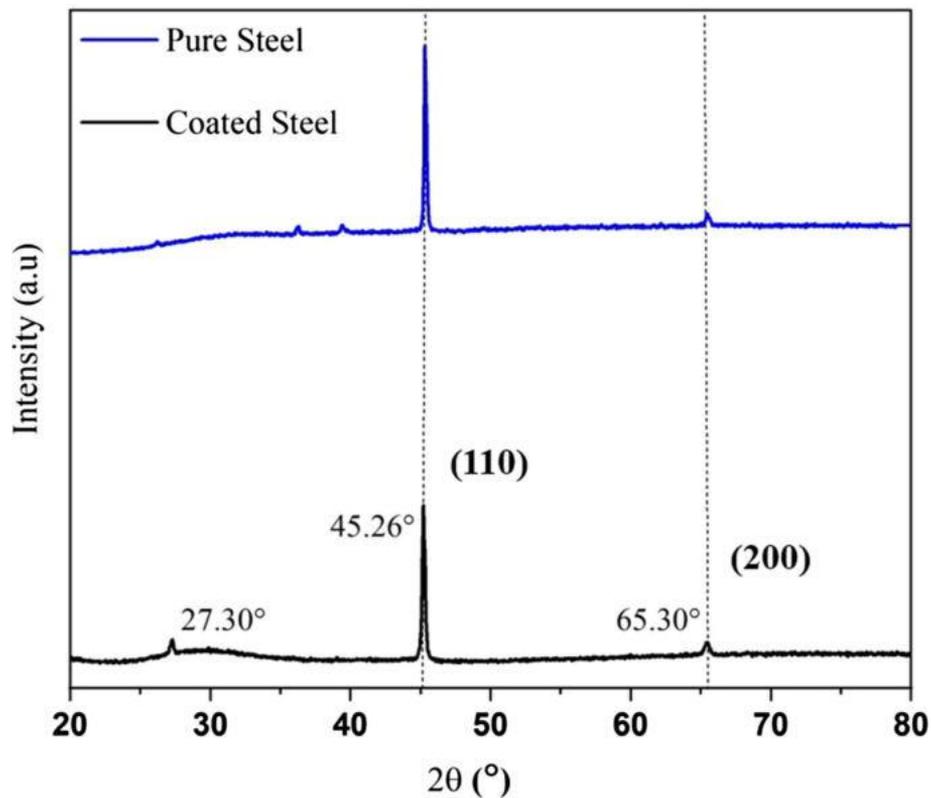
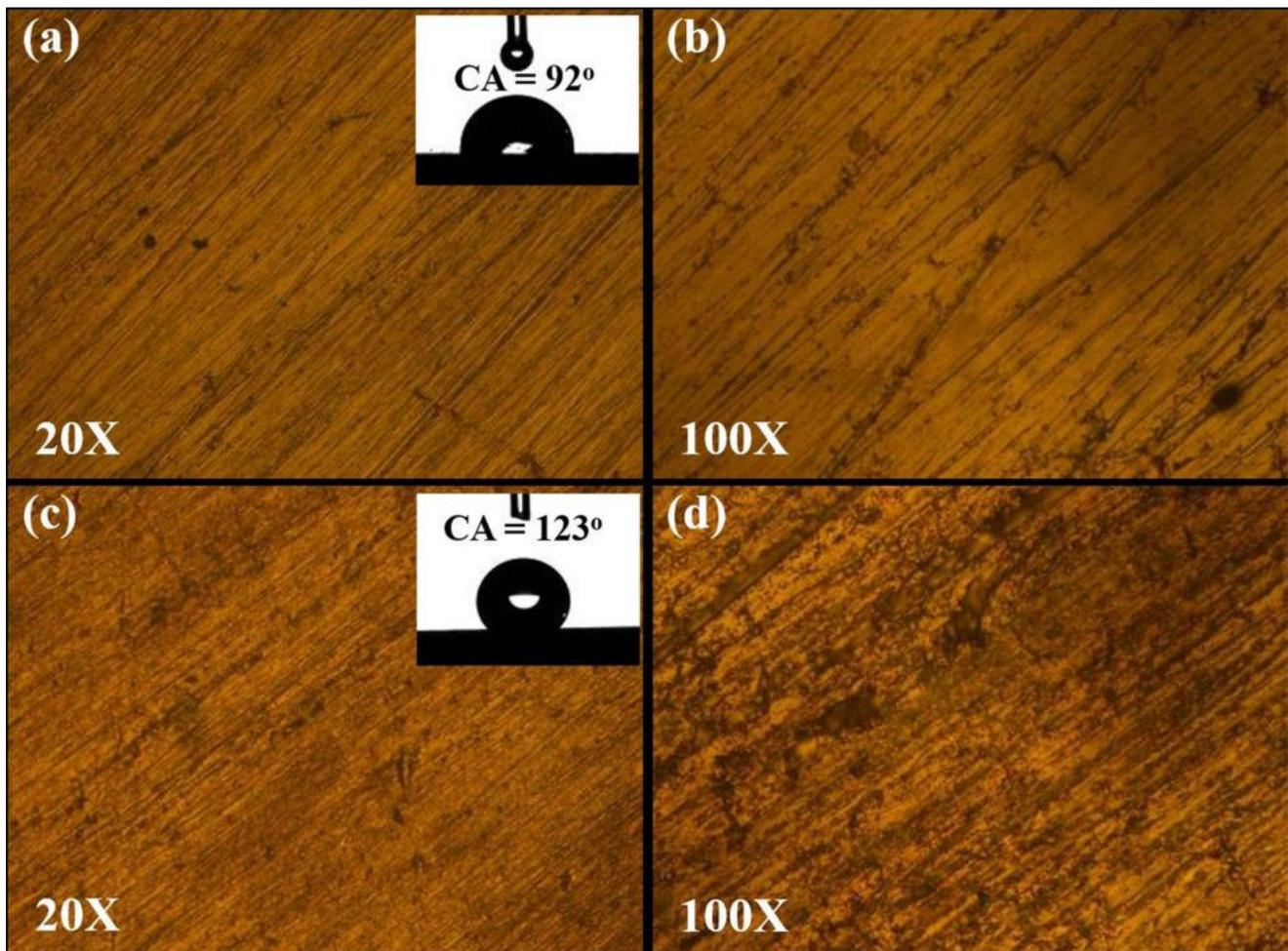


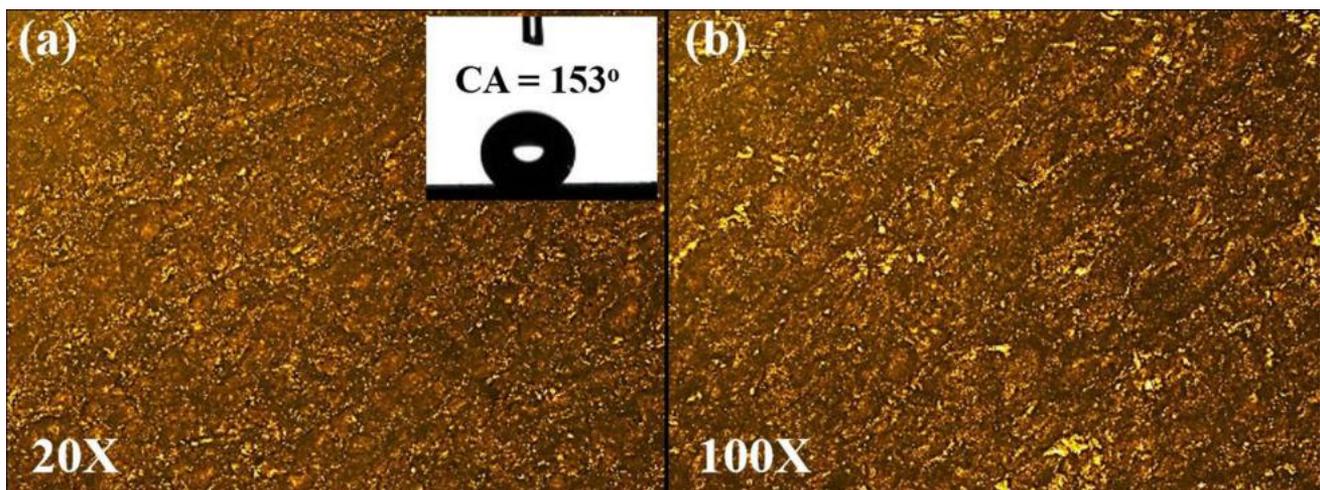
Fig. 4 X-ray diffraction (XRD) pattern of uncoated (pure steel) and coated mild steel samples

ior of the coating. The relation between an average surface roughness ( $R_{avg}$ ) and contact angle (CA) with sliding angle (SA) of the polished, etched and coated mild steel is shown in Table 1. It is evident from Table 1 that etched mild steel has higher  $R_{avg}$  (110 nm) compared to polished steel  $R_{avg}$  (60 nm)

which is obvious because the chemical eats away some portion of the metal (Ref 11). Similarly, the coated mild steel exhibits higher  $R_{avg}$  (193 nm) compared to the etched mild steel. A similar trend is followed by the water CA, because as per the literature if the  $R_{avg}$  of a surface increases then the water CA



**Fig. 5** Optical micrographs of (a, b) polished mild steel and (c, d) etched mild steel substrates at 20X and 100X with their corresponding contact angles (inset of a and c)

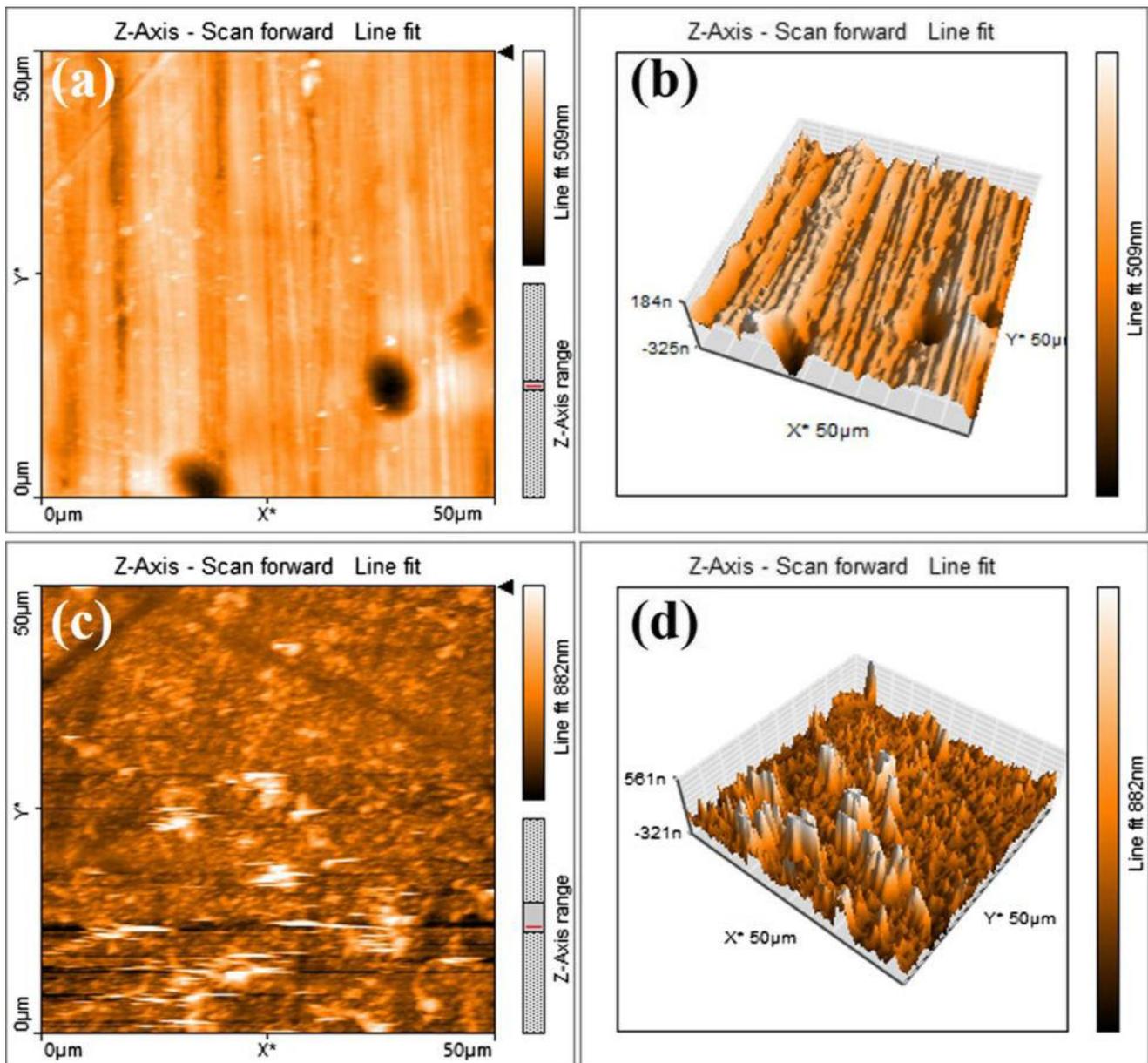


**Fig. 6** Optical micrographs of (a, b) coated mild steel at 20X and 100X with their corresponding contact angle (inset of a)

also increases (Ref 12, 14). However, with the increase in surface roughness, the SA goes on decreasing which is in close agreement with the results published by others (Ref 16). Thus, in the current study, the surface-functionalized  $\text{SiO}_2$  nanopar-

ticles are found responsible for the increased roughness of the mild steel in different situations.

FESEM analysis was performed to characterize the morphology of the coated mild steel. The FESEM images of coated



**Fig. 7** The 2D and 3D AFM images of (a, b) polished and (c, d) etched mild steel

mild steel at different magnifications are shown in Fig. 9. The lower magnification image is showing a quite rough surface of the coated mild steel. The high roughness is in close agreement with the AFM results. However, the high magnification FESEM image is showing individual nanoparticles (solid white circle) and their large size spherical agglomerates (dotted white circle) on the coated surface of mild steel. The presence of nanoparticles and their micron or sub-micron size clusters jointly produce a micro-nano hierarchical surface roughness, which is in close agreement with the AFM results. Thus, this hierarchical roughness leads to the superhydrophobic surface formation on the metallic substrate. That can be very effective in controlling the corrosion of mild steel.

The corrosion resistance of the uncoated and coated mild steel samples was characterized by immersing the samples in a corrosive salt solution (3.5% NaCl) for 30 days. Optical images of uncoated and coated mild steel after dipping in a corrosive

salt solution for a 1-month under ambient conditions are shown in Fig. 10. The physical appearance is revealing that the uncoated substrate corroded significantly, while the coated substrate remains almost non-corroded. However, the coating is damaged a little bit and reveals partially inflated spots on the surface. The water droplet sitting on coated mild steel after a 1-month corrosion test is shown in Fig. 11. The CA of the coated mild steel substrate was reduced to  $\sim 135 \pm 3^\circ$  from  $153 \pm 2^\circ$  after the 1-month corrosion test, which is obvious as the coating was found little bit damaged due to corrosive salt. Thus, it indicates the reliability of the coating and its efficiency as corrosion resistance material for mild steel.

The corrosion resistance performance of uncoated and coated mild steel samples was estimated using Nyquist plots and potentiodynamic polarization curves of EIS (Fig. 12). Figure 12(a) shows that the impedance of coated mild steel is significantly higher than that of uncoated mild steel, signifying

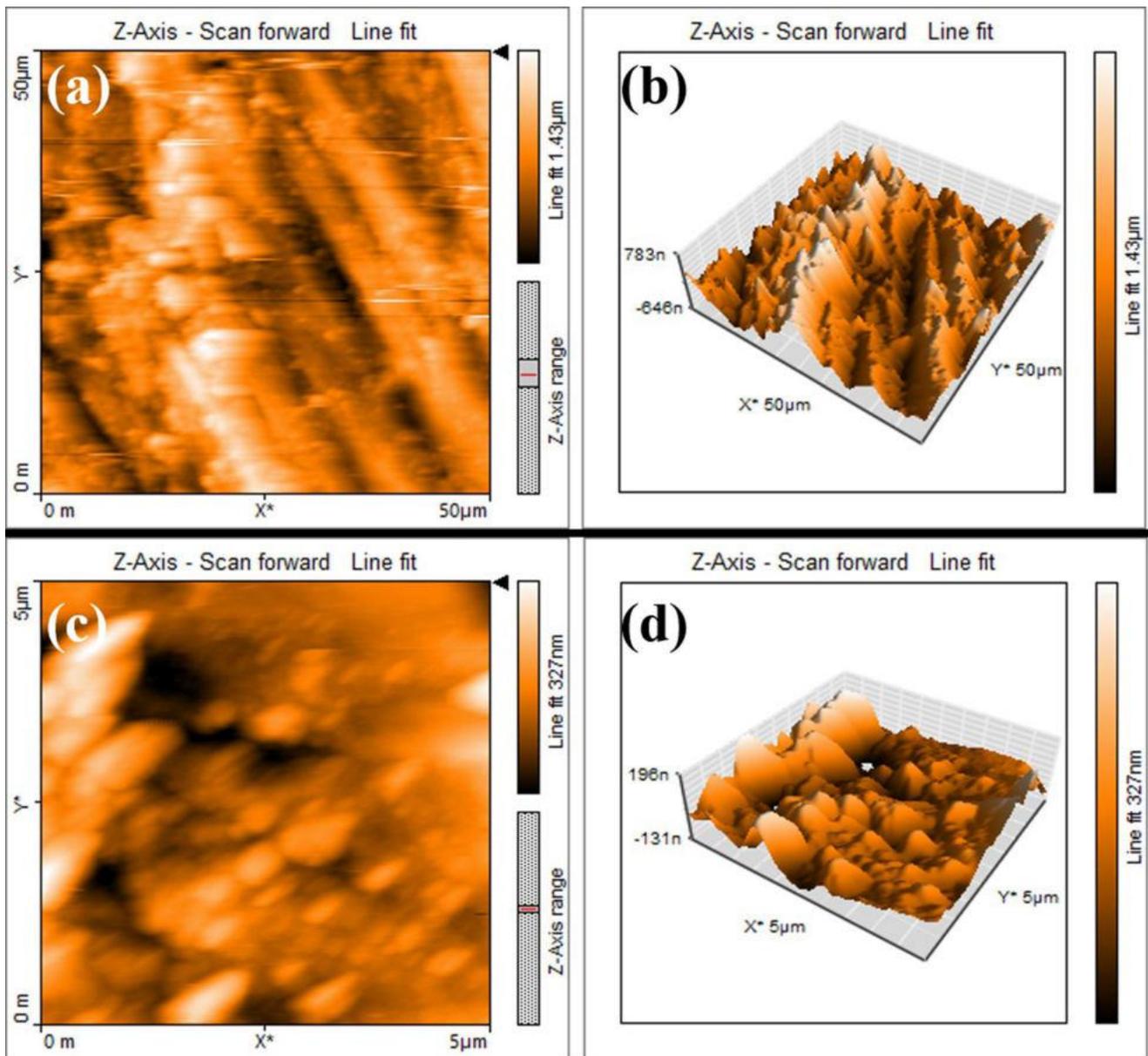


Fig. 8 The 2D (a, c) and 3D (b, d) AFM images of coated mild steel at lower and higher magnifications

Table 1 The relation between  $R_{avg}$  and CA with sliding angle (SA) of the polished, etched and coated mild steel

Metallic substrate	Avg. roughness, nm	CA, °	SA, °
Polished Steel	60	$92 \pm 2$	$50 \pm 5$
Etched Steel	110	$123 \pm 3$	$28 \pm 3$
Coated Steel	193	$153 \pm 2$	$5 \pm 2$

that the corrosion confrontation of coated mild steel is very high compared to the uncoated mild steel (Ref 16, 25). The polarization curves of coated sample (Fig. 12b) demonstrating the low current density ( $I_{corr}$ ) and high  $E_{corr}$  compared to the uncoated one specified the higher corrosion resistance due to the superhydrophobic coating (Ref 16, 25). The corrosion properties of uncoated and coated mild steel are illustrated in

Table 2. The EIS Nyquist plots exhibit typical semi-circle for mild steel and semi-circle type arc with tail for coated mild steel, therefore EIS data was fitted using two equivalent electric circuit models (Fig. 12c and d), which are typically used for bare and coated mild steel (Ref 25, 26). The fitted EIS data of uncoated and coated mild steel is shown in Table 3. Where  $R_s$  is solution resistance,  $R_{pro}$  is the resistance of corrosion products,  $CPE_1$  is the coating constant phase element which corresponds double-layer capacitance at the interface of metal and coating.  $CPE_{dl}$  corresponds to double layer capacitance occurred at the interface of metal and solution (corroded area) and  $R_{ct}$  is charge transfer resistance.  $R_s$  depends on the geometry of the area through which current is flowing as well as on the resistivity of electrolyte.  $R_s$  is technically not the main component as it is not representing the property of a coating during coating performance analysis (Ref 25). The use of modified nanoparticles-based coating on mild steel-enhanced  $R_{ct}$  value almost 8 times

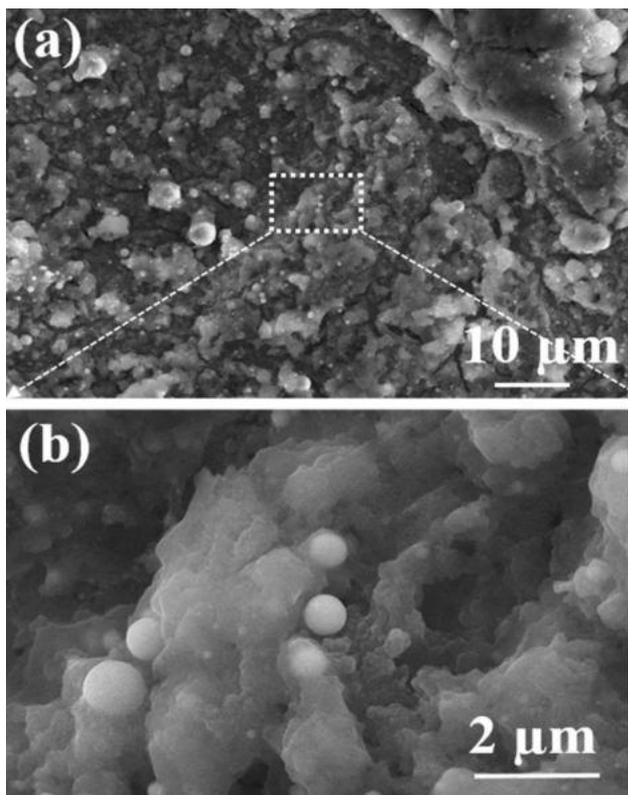
higher than the mild steel whereas diminished double layer capacitance  $CPE_{dl}$ . The low value of  $CPE_{dl}$  signified decreased coating porosity as well as better corrosion resistance performance for coated steel substrate, which is in close agreement with the results reported by others (Ref 25, 26).

Usually, low  $I_{corr}$  means a low corrosion rate. Silica is a well-known coupling element for the corrosion resistance of metals for ages. This may be due to the formation of a layer of Si-O metal bonds over the sample surface, which dominates the

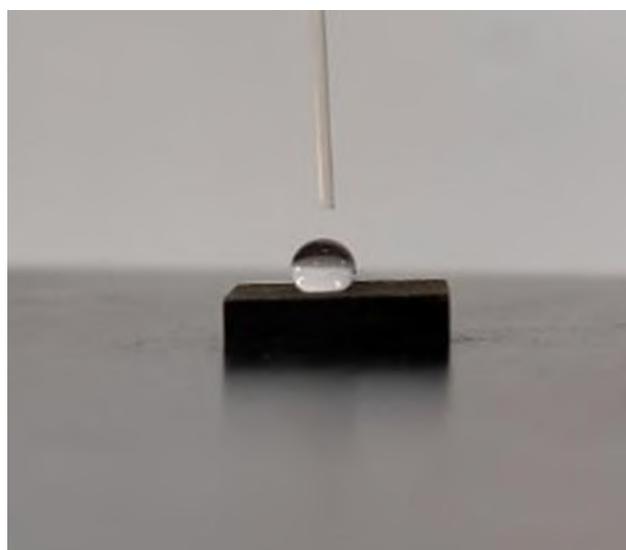
corrosion reaction and decrease its speed, even if the substrate does not possess superhydrophobic properties (Ref 27). The cathodic and anodic current goes down and corrosion potential ( $E_{corr}$ ) goes toward a positive value due to superhydrophobic coating (Ref 28, 29). Thus, the superhydrophobic coating has an inordinate potential to resist the corrosion of mild steel or other metals.

#### 4. Conclusions

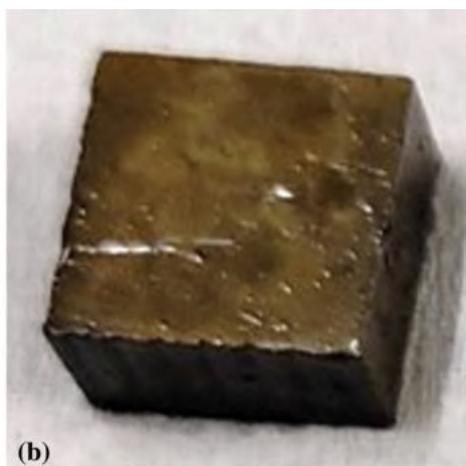
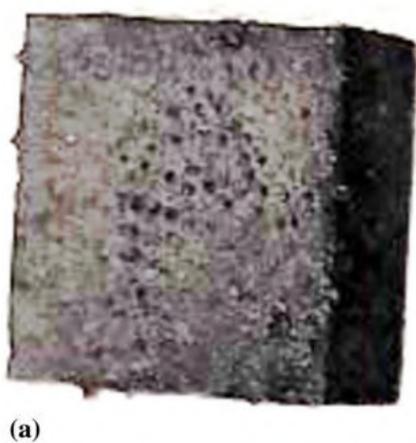
Triethoxyoctylsilane-modified  $SiO_2$  nanoparticles-based superhydrophobic coating was successfully prepared via solution method to prevent the corrosion of mild steel. The developed coating exhibited micro-nano hierarchical roughness due to the presence of individual nanoparticles and their micron size clusters as verified by AFM and FESEM analysis. The hierarchical roughness of the coating resulted in the superhy-



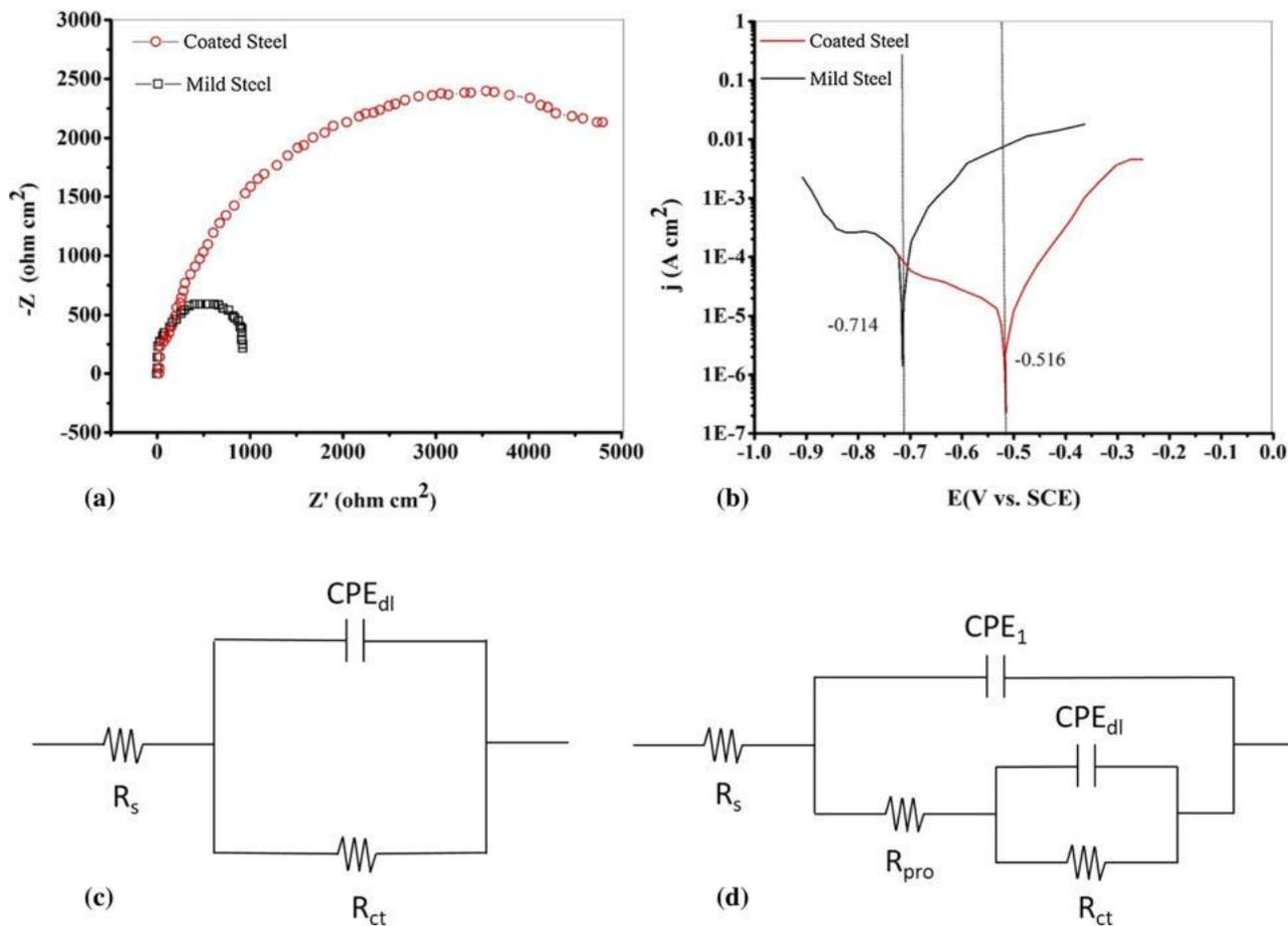
**Fig. 9** FESEM images of coated mild steel at lower and higher magnifications



**Fig. 11** The water droplet sitting on coated mild steel after a 1-month corrosion test



**Fig. 10** Optical images of (a) uncoated and (b) coated mild steel after dipping in a corrosive salt solution for a month at ambient conditions



**Fig. 12** (a) Nyquist plots, (b) potentiodynamic polarization curves and (c) equivalent circuits based on EIS data fitting of uncoated and coated mild steel. SCE-saturated calomel electrode

**Table 2** The corrosion properties of uncoated and coated mild steel

Metallic substrate	$E_{\text{corr}}$ , V versus SCE	$I_{\text{corr}}$ , $\times 10^{-6}$ A/cm <sup>2</sup>
Uncoated mild steel	- 0.516	0.201
Coated mild steel	- 0.714	0.041

**Table 3** Fitted EIS data of uncoated and coated mild steel

Metallic substrate	$R_s$ , $\Omega$ cm <sup>2</sup>	CPE <sub>dl</sub>		CPE <sub>1</sub>		$R_{\text{pro}}$ , $\Omega$ cm <sup>2</sup>
		$C$ , $\mu\text{F}/\text{cm}^2$	$n$	$C$ , $\mu\text{F}/\text{cm}^2$	$n$	
Uncoated mild steel	2.32	6.99	1	121	...	...
Coated mild steel	3.58	2.12	1	962	1000	1 6.288

drophobicity of the mild steel. The maximum water CA of  $153 \pm 2^\circ$  with a SA of  $5 \pm 2^\circ$  was obtained for the coated mild steel compared to the uncoated mild steel (CA of  $92 \pm 2^\circ$  with

SA of  $50 \pm 5^\circ$ ). The EIS plots confirmed the significant corrosion resistance performance of coated metal over the uncoated one. Thus, the developed superhydrophobic coating can play a vital role in controlling the corrosion of metals. However, there is a great need to study the mechanical and thermal stability of such coatings for industrial applications.

### Acknowledgments

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# Development of corrosion-resistant superhydrophobic coating on brass using modified silica nanoparticles

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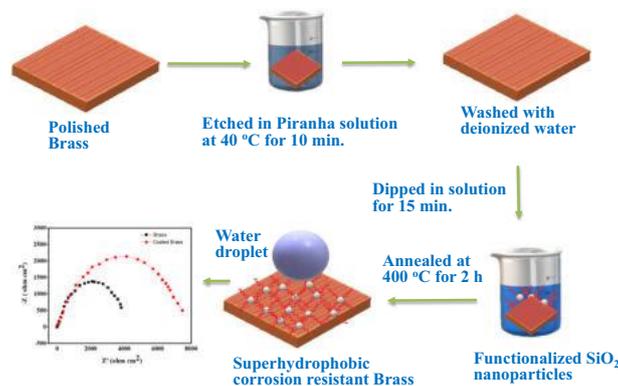
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## Abstract

In this study, SiO<sub>2</sub> nanoparticles were modified using triethoxyoctylsilane to fabricate a corrosion-resistant superhydrophobic coating on brass. The brass substrate of 1 × 1 cm<sup>2</sup> was cut from the bulk using an electrical discharge machine (EDM) that generated a micro-pattern on its surface then it was chemically etched with Piranha solution. In order to create nano roughness on the etched micro-patterned brass substrate and to reduce its surface energy, surface-modified SiO<sub>2</sub> nanoparticles were coated on the brass using the solution-immersion approach followed by annealing. AFM and FESEM analysis of the coated brass showed the presence of SiO<sub>2</sub> nanoparticles and their clusters leading to the superhydrophobicity. The coated brass exhibited a maximum water contact angle (CA) of 152° ± 2° and a sliding angle (SA) of 7° ± 3°. The electrochemical impedance spectroscopy (EIS) plots demonstrated a high impedance value for coated brass compared to uncoated brass. Conversely, the corrosion current density (I<sub>corr</sub>) of coated brass (0.068 × 10<sup>-6</sup> A cm<sup>2</sup>) is much lower than the uncoated brass (0.369 × 10<sup>-6</sup> A cm<sup>2</sup>) signifying efficient corrosion resistance of the coated brass. The present work has inordinate potential to control the corrosion of metals in corrosive conditions.

## Graphical Abstract



**Keywords** Corrosion resistance · Superhydrophobic coating · Brass · SiO<sub>2</sub> nanoparticles · Triethoxyoctylsilane

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## 1 Introduction

Brass is a multipurpose alloy made up of copper and zinc. The mechanical, electrical and chemical characteristics of brass can be easily altered by changing the ratio of copper and zinc [1]. Brass has a broad range of applications in various sectors such as healthcare, defense, marine, engineering tools, musical instruments, ornaments, construction, electrical, sculptures [1–3], etc. due to its affordability and the characteristics it possesses [4]. However, billions of dollars are spent annually throughout the world on fixing or changing corroded brass. Brass corrodes significantly when exposed to corrosive media like seawater [3]. The conversion of the brass into a superhydrophobic brass is a better option to avoid the corrosion of brass [3–9]. The notion of superhydrophobicity originated from the self-cleaning surface of lotus leaves long back, which consists of hierarchical micro-nano size roughness on its surface [10]. Later on, the superhydrophobic surface features were mimicked by numerous researchers for various applications like corrosion resistance, self-cleaning, energy application, etc. [11–15]. Superhydrophobic surfaces exhibit a water contact angle (CA)  $> 150^\circ$  and roll-off angle or sliding angle (SA)  $< 10^\circ$ , which keeps the surface dry. Such a surface does not allow moisture to come in contact with the metallic surface and metal remains corrosion resistant for a longer time [16]. Several techniques, including chemical etching, nanoparticle deposition, sandblasting, lithography, electrodeposition, and plasma etching have been used in the past to produce a hierarchical micro-nano roughness on various metallic substrates [17, 18]. Chemical etching and nanoparticle deposition methods are the most practical and affordable [19–21]. Various nanostructures of 1D (dimension), 2D and 3D have been coated on various metals to change their wetting properties [22–25]. In a recent study, Dominic et al. [26] presented the preparation of superhydrophobic coating on thermally oxidized brass using 1H,1H,2H,2H-perfluorooctyltriethoxysilane for corrosion inhibition. In another work, Cao et al. [27] presented the Mussel-inspired superhydrophobic coating on brass for controlling corrosion using 1H,1H,2H,2H-perfluorodecanethiol. Yu et al. [4] developed a superhydrophobic H62 brass surface via chemical etching followed by electrodeposition to enhance the corrosion resistance. Similarly, Jie et al. [28] reported an integrated etching and heating treatment methodology to fabricate corrosion resistant superhydrophobic surface on brass. However, silica nanoparticles are one of the most explored superhydrophobic materials because of their cost-effectiveness and simplicity of their surface functionalization [29]. However, to improve the superhydrophobic performance of SiO<sub>2</sub> nanoparticles, their surface

functionalization using different silanizing agents is still not explored in full capacity [30].

In the above context, a micro-pattern on the brass substrate was created using an EDM and then chemically etched with Piranha solution. To create low surface energy and nanoscale roughness, triethoxyoctylsilane-modified SiO<sub>2</sub> nanoparticles were deposited on the etched brass using the solution-immersion approach. The anti-corrosion performance of superhydrophobic brass yielded encouraging outcomes, which can be quite beneficial to protect the metals against corrosion.

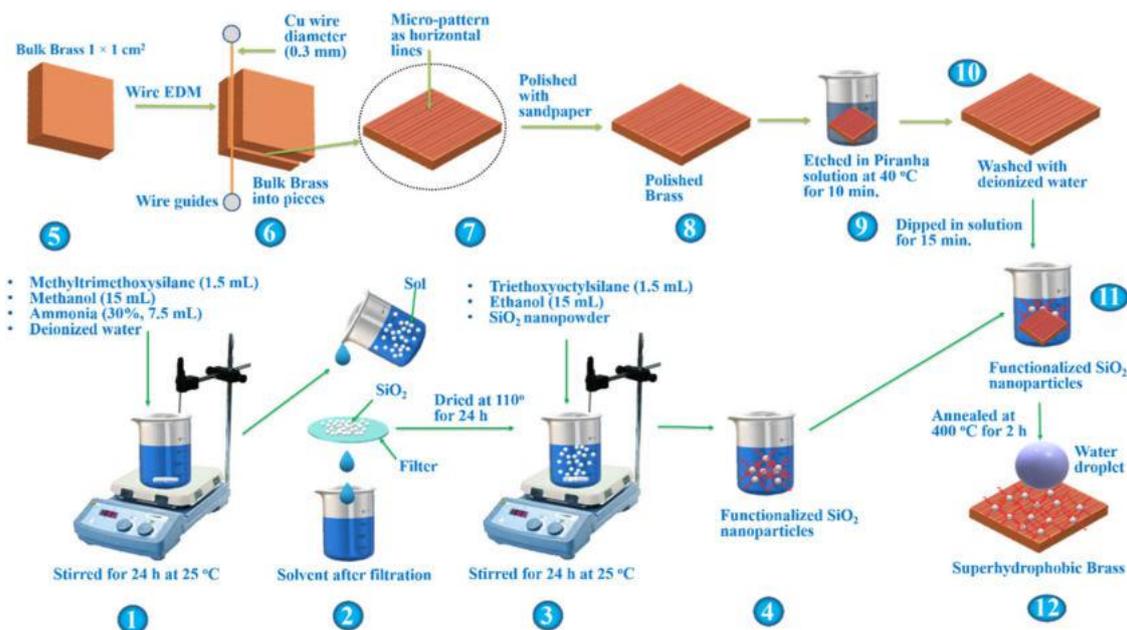
## 2 Materials and methods

### 2.1 Preparation of superhydrophobic brass

Figure 1 schematically depicts the deposition of a superhydrophobic coating on brass using functionalized SiO<sub>2</sub> nanoparticles. To make silica sols, methyltrimethoxy silane (1.5 mL), methanol (15 mL), ammonia (30%, 7.5 mL), and deionized water were blended via magnetic stirring at 25 °C for 24 h. After filtering, the sols of SiO<sub>2</sub> were heated at 110 °C for 24 h to form SiO<sub>2</sub> nanoparticles. The SiO<sub>2</sub> nanoparticles were mixed with triethoxyoctylsilane (1.5 mL) and ethanol (15 mL) to functionalize their surface using magnetic stirring at 25 °C for 24 h. A wire EDM (Ezeewin) was used to cut the brass substrate of 1 × 1 cm<sup>2</sup> size from the bulk material. The metal substrate exhibited a micro-pattern after the wire EDM processing. The micro-pattern of the brass substrate was refined by 400–1200 grit sandpapers. Acetone was used to ultrasonically clean the polished substrate for 30 min. A Piranha solution (concentrated H<sub>2</sub>SO<sub>4</sub>, 98% and H<sub>2</sub>O<sub>2</sub>, 30% in a ratio of 7:3) was used to etch the polished substrate at 40 °C for 10 min. Later on cleaning of the substrate was performed using deionized water and allowed to dry at ambient conditions. Finally, the brass substrate was immersed in silanized SiO<sub>2</sub> nanoparticle solution for 15 min followed by its annealing at 400 °C for 2 h to produce the superhydrophobic brass.

### 2.2 Characterization

A high-resolution scanning electron microscope (FESEM, Quanta 200F, FEI, USA) was considered to characterize the shape and size of silanized and non-silanized SiO<sub>2</sub> nanoparticles and the superhydrophobic brass surface. The structural information of the samples was obtained by Bruker D8 Advance Diffractometer (Germany) using Cu-K $\alpha$  source radiation. A Nikon Eclipse MA200 optical microscope was employed to capture optical images of the specimens. A drop shape analyzer (DSA 100, Krüss GmbH, Germany) characterized the wetting behavior of the

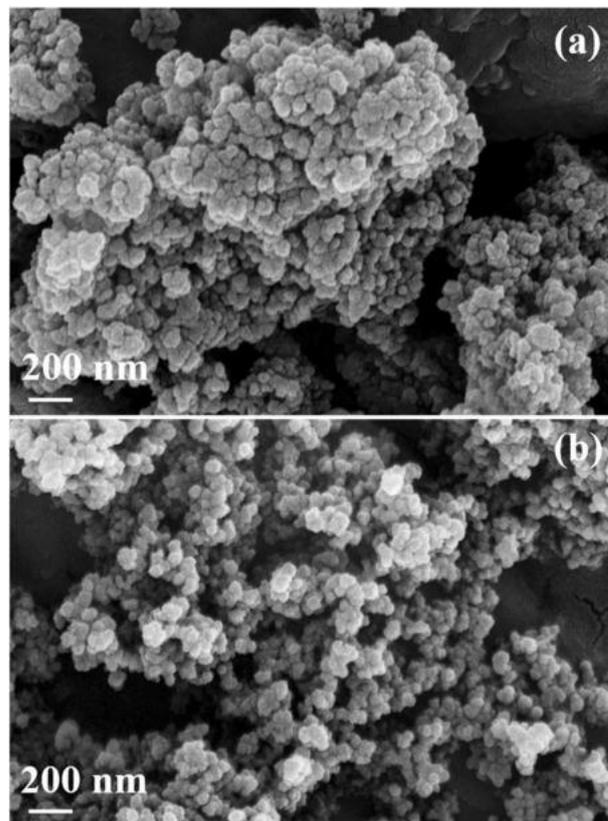


**Fig. 1** Pictorial representation of a step-by-step approach for synthesis of silanized  $\text{SiO}_2$  nanoparticles and superhydrophobic coating on a brass substrate

samples. The metallic specimens were placed on the sample holding stand of the DSA and an automatic contact angle measurement mode was set to drop a standard  $10\ \mu\text{l}$  water droplet on the specimens. Then the profile of water drop was utilized for determining a static water CA followed by automatic sample tilting to measure sliding angle via the software. At least, three different locations on the samples were used for the measurement of the CA and SA and their mean values are reported. The morphology and roughness of the specimens were examined by an atomic force microscope (AFM, NT-MDT, Ntegra). Polarization curves were acquired by utilizing an electrochemical workstation (CHI 660E, CH Instruments, USA) with a scanning rate of  $0.2\ \text{mVs}^{-1}$ . To acquire polarization curves, the specimens were submerged in a 3.5 wt.% NaCl solution. Electrochemical impedance spectroscopy (EIS) was employed to estimate the corrosion inhibition capacity of samples at frequencies ranging from 200 kHz to 50 MHz.

### 3 Results and discussion

FESEM images of silanized  $\text{SiO}_2$  nanoparticles are depicted in Fig. 2. Most of the particles are clustered into large clusters for non-silanized  $\text{SiO}_2$  nanoparticles. However, the surface-modified  $\text{SiO}_2$  nanoparticles exhibit a smooth and spherical shape with an average size of about 30 nm. The majority of the particles are appearing as individual and round shape particles but partially clustered. This might have happened



**Fig. 2** FESEM images of (a) unmodified  $\text{SiO}_2$  nanoparticles and (b) silanized  $\text{SiO}_2$  nanoparticles

because of the successful silanization or functionalization of the SiO<sub>2</sub> nanoparticles by triethoxyoctylsilane [13, 31].

X-ray diffraction (XRD) patterns of uncoated and coated brass substrates are presented in Fig. 3. The diffraction pattern of brass revealed the presence of the face-centered cubic (fcc) phase of Cu(0) and the hexagonal closed packed (hcp) phase of Zn(0). The main sharp diffraction peaks observed at 42.69°, 49.55°, 72.54° are as per JCPDS File No. 50-1333 of brass [32]. However, almost all the diffraction peaks in the present study such as 31.73°, 36.76°, 42.69°, 49.55°, 63.25°, 72.54° and 79.90° are in close agreement with the work reported by Galai et al. [33]. The presence of these diffraction peaks revealed the  $\alpha$  phase of brass consisting of copper and zinc as the main components with small traces of lead. However, the silanized SiO<sub>2</sub> nanoparticles coated brass does not disclose any novel XRD peaks. However, the relative intensity of XRD peaks of the coated brass was declined because of the superhydrophobic coating compared to the uncoated brass. Thus, even after the coating, the structure of the surface of brass remains unmodified.

Polished, etched and coated brass substrates characterized using an optical microscope at different magnifications.

The micrographs of these specimens along with CAs are depicted in Fig. 4. The polishing of the brass sample removed the micro-pattern and created some fine scratches

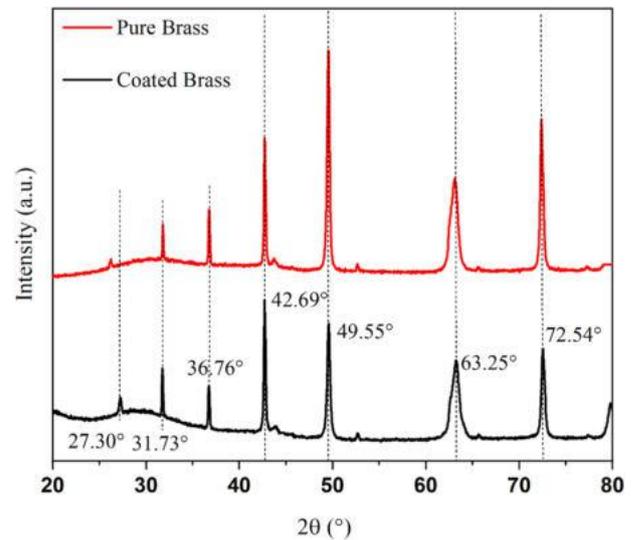
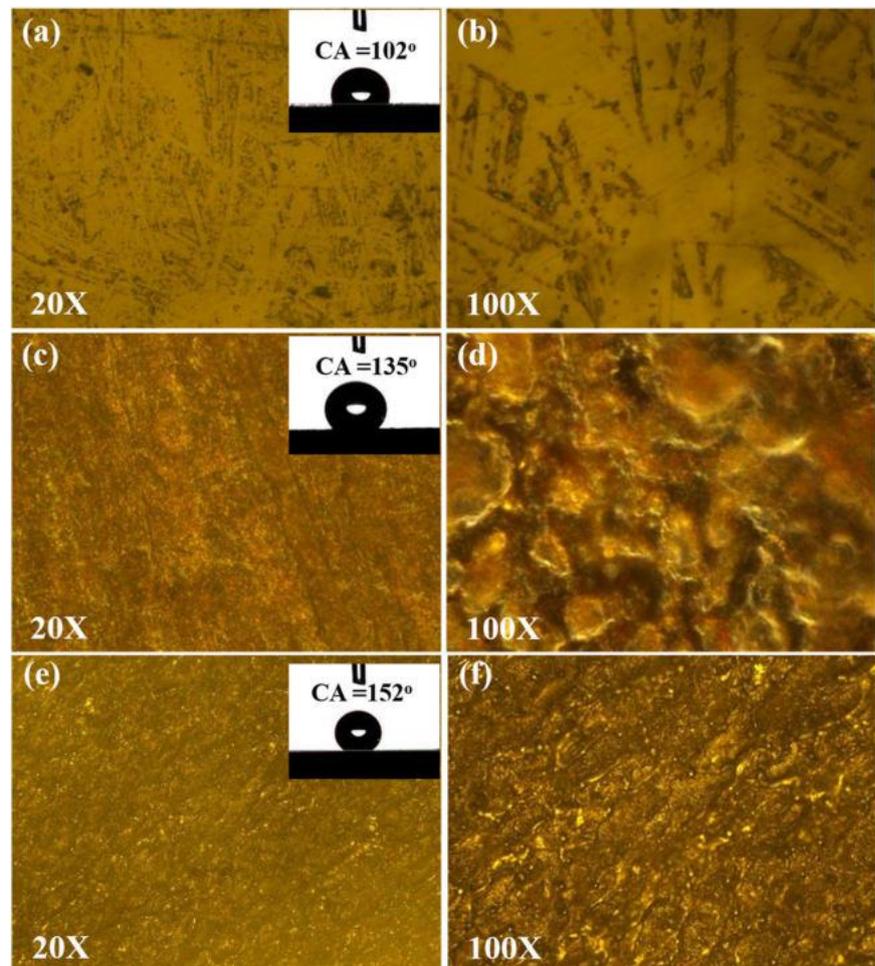
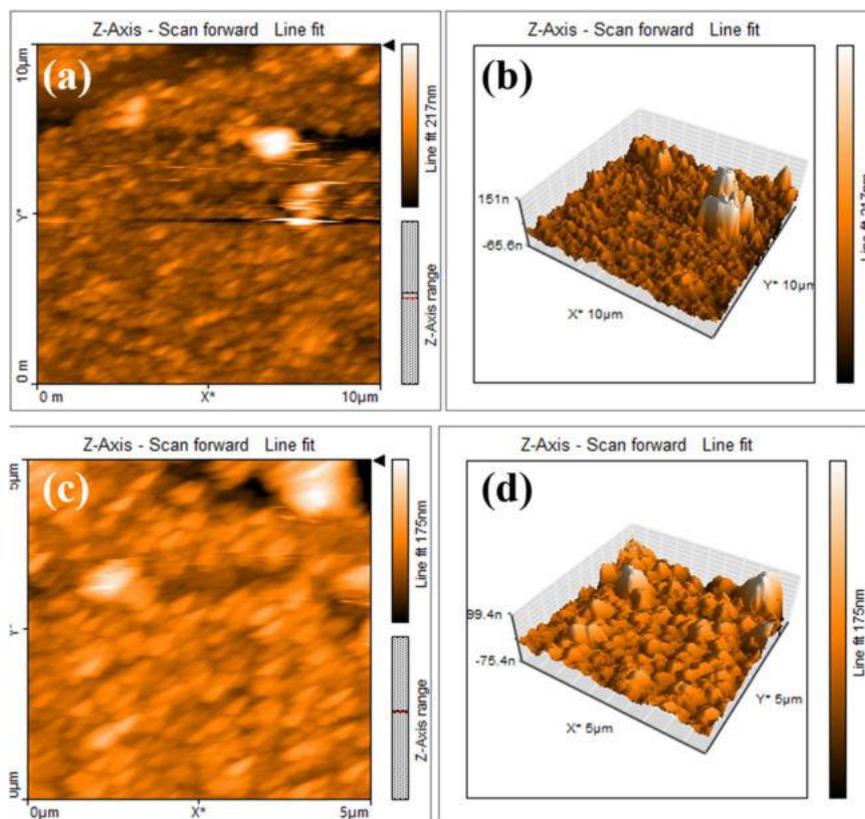


Fig. 3 X-ray diffraction spectra of pure and coated brass

Fig. 4 Optical micrographs of (a, b) polished brass, (c, d) etched brass and (e, f) coated brass at 20X and 100X magnifications with CAs (inset of a, c and e)



**Fig. 5** (a, c) 2D and (b, d) 3D AFM images of coated brass at different scales



on the surface (Fig. 4a, b). The polished brass substrate revealed hydrophobicity with a water CA of  $102^\circ$  (inset of Fig. 4a). The chemically etched brass substrate revealed a rough surface (Fig. 4c, d) compared to the polished substrate. The increased roughness increased the water CA from  $102^\circ$  to  $135^\circ$  (depicted in inset of Fig. 4c). Similar observations are stated by Jie et al. [34]. Therefore, the rough surface of etched brass can exhibit more hydrophobicity compared to the smooth polished brass. The coating significantly tuned the surface of the brass compared to the etched brass. The coated brass surface becomes smooth and exhibits even roughness. A large CA of  $152^\circ$  (inset of Fig. 4e) was revealed by the coated brass. Thus, the silanized  $\text{SiO}_2$  nanoparticles result in the superhydrophobic behavior of the coated brass by reducing the surface energy of the substrate and generating the micro-nano hierarchical roughness on the surface. Thus, the proposed methodology in the present study can easily alter the wetting behavior of brass [35, 36].

Figure 5 displays the 2-dimensional and 3-dimensional AFM images of coated brass. The 2D images (Fig. 5a, c) with corresponding 3D images (Fig. 5b, d) revealed consistent surface roughness. The AFM images demonstrated the presence of a majority of the individual nanoparticles and their limited agglomerates on the coated brass, resulting in a combined micron and nano level roughness imperative

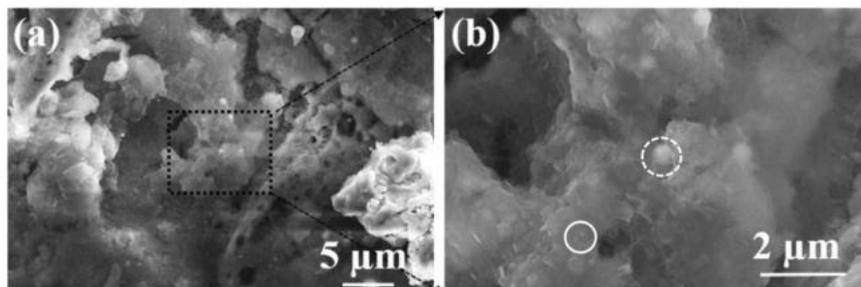
**Table 1**  $R_{\text{avg}}$ , CA and SA values of brass specimens

Sample name	$R_{\text{avg}}$ . (nm)	CA ( $^\circ$ )	SA ( $^\circ$ )
Polished brass	45	$102^\circ \pm 4^\circ$	$39^\circ \pm 4^\circ$
Etched brass	65	$135^\circ \pm 4^\circ$	$19^\circ \pm 4^\circ$
Coated brass	72	$152^\circ \pm 2^\circ$	$7^\circ \pm 3^\circ$

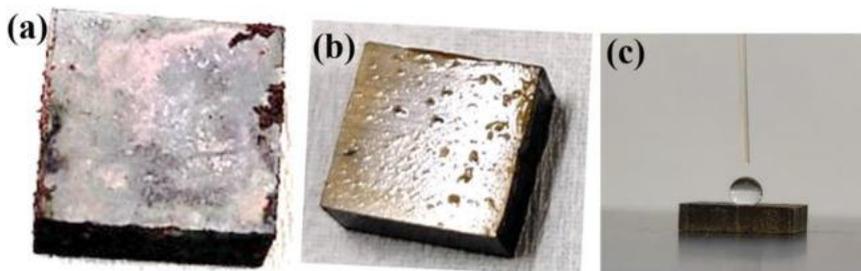
for superhydrophobicity of the brass. Table 1 illustrates the relationship among the average surface roughness ( $R_{\text{avg}}$ ), CA and SA of brass specimens. The polished brass has the lowest  $R_{\text{avg}}$  (45 nm), while the coated brass reveals the highest  $R_{\text{avg}}$  (72 nm). However, the etched brass shows the  $R_{\text{avg}}$  (65 nm) in-between as per the results reported by others [21]. The increase in water CA also follows a similar trend as in the case of the  $R_{\text{avg}}$  [10, 37]. Conversely, the rise in roughness of a surface declines the SA as per the findings of other researchers [38]. Because, in a highly hydrophobic zone, the SA decreases with the increasing CA. The rough surface features can easily trap air and play a crucial role for reducing the SA. It happened because of the transition from a liquid-solid interface to a composite surface that consists of trapped air, as proposed by Cassie's equation. Similar observations were reported by Miwa et al. [39].

The morphology of the coated brass was further studied using FESEM analysis. Figure 6 presented FESEM

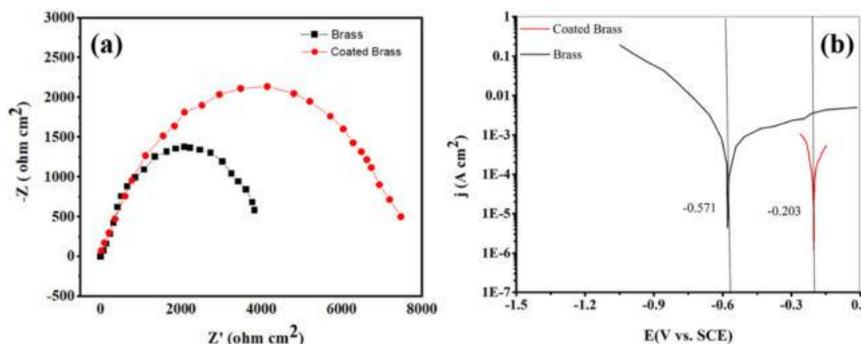
**Fig. 6** FESEM micrographs of coated brass at dissimilar scales



**Fig. 7** Photographs of (a) pure brass, (b) coated brass and (c) water droplet on coated brass after immersion in (3.5% NaCl) for one month



**Fig. 8** (a) Nyquist and (b) potentiodynamic polarization plots of pure and coated brass. SCE-saturated calomel electrode. The samples were immersed for 30 days in 3.5 wt.% NaCl solution



micrographs of coated brass at dissimilar scales. The coated brass surface seems fairly rough at lower magnification (Fig. 6a). However, the higher magnification image (Fig. 6b) reveals the presence of individual  $\text{SiO}_2$  nanoparticles and their clusters circumscribed by solid and dotted white circles, respectively. The coexistence of individual nanoparticles and their clusters generates a combination of micron and nano level roughness essential for superhydrophobic behavior of the metal substrate. Similar kind of roughness is also validated by the AFM data.

The corrosion-control capability of brass substrates was examined by dipping them in a 3.5 wt.% NaCl corrosive solution for one month. Photographs of pure brass and coated brass after the immersion test are illustrated in Fig. 7a, b. The significant corrosion can be seen in the case of uncoated brass, however, the coated brass appears almost non-corroded. Though the coating on the brass appears somewhat damaged and it is reflecting some inflated spots on its surface. The photograph of a water droplet sitting on coated brass after the immersion test is

illustrated in Fig. 7c. After the corrosion test, the CA of the coated brass was slightly reduced to  $\sim 145^\circ \pm 2^\circ$  from  $152^\circ \pm 2^\circ$ , which may be due to partially damaged coating. Thus, the developed coating is highly efficient against the corrosion of brass.

Nyquist plots along with polarization curves of uncoated and coated brass substrates are depicted in Fig. 8. Figure 8a clearly reveals the significant difference in the impedance value of pure brass and coated brass, indicating efficient corrosion inhibition capacity of coated brass [38, 40]. The polarization curves of coated brass present lower current density ( $I_{\text{corr}}$ ) and high  $E_{\text{corr}}$  values (Fig. 8b) as compared to uncoated brass resulting in higher corrosion inhibition efficiency because of the superhydrophobic coating, which is keeping the moisture content away from the metallic surface [41, 42]. The (open circuit) corrosion potential ( $E_{\text{corr}}$ ) and corrosion current density ( $I_{\text{corr}}$ ) measurements for uncoated brass and coated brass are shown in Table 2.

Generally, a lower value of  $I_{\text{corr}}$  indicates a low corrosion rate. The cathodic and anodic current goes down while

**Table 2** The  $E_{\text{corr}}$  and  $I_{\text{corr}}$  measurements of uncoated brass and coated brass

Sample name	$E_{\text{corr}}$ (V vs SCE)	$I_{\text{corr}}$ ( $\times 10^{-6}$ A/cm <sup>2</sup> )
Uncoated brass	−0.571	0.369
Coated brass	−0.203	0.068

corrosion potential ( $E_{\text{corr}}$ ) moves towards a positive value because of the superhydrophobic coating [35, 43]. Thus, the fabricated corrosion-resistant coating has the potential to protect the metals in a corrosive environment due to its superhydrophobic nature.

## 4 Conclusions

A superhydrophobic coating to protect the brass against corrosion was successfully developed using chemical etching followed by solution-immersion route in presence of silanized SiO<sub>2</sub> nanoparticles. AFM and FESEM results validated the presence of micro-nano hierarchical roughness imperative for superhydrophobicity. The hydrophobic brass (CA of  $102^\circ \pm 4^\circ$ ) was successfully transformed into superhydrophobic brass ( $152^\circ \pm 2^\circ$ ). A significant corrosion is found in the case of uncoated brass and coated brass revealed almost no corrosion confirmed by optical images. The EIS plots demonstrated that coated metal outperformed uncoated metal in terms of corrosion resistance. Thus, the developed corrosion-resistant superhydrophobic coating can be quite beneficial to protect the metals against corrosion after its thermal and mechanical performance testing.

**Author contributions** All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by KS, MKM, AC, SD, DSA and MSG. The first draft of the manuscript was written by KS and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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## Compliance with ethical standards

**Conflict of interest** The authors declare no competing interests.

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# Comparative studies of structural, impedance and magnetic behavior of cobalt ferrite modified barium calcium titanate particulate composites

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## ABSTRACT

The compositions  $(\text{Ba}_{0.85}\text{Ca}_{0.15}\text{TiO}_3)_{1-x}-(\text{CoFe}_2\text{O}_4)_x$   $(\text{BCT})_{1-x}-(\text{CFO})_x$  (where  $x = 0.10, 0.20, 0.30$  and  $0.40$ ) were synthesized to study the effect of simultaneous growth of ferroelectric and ferromagnetic phase for switching applications. X-ray diffraction confirms the double-phase formation in all composites possessing tetragonal and cubic symmetry. SEM micrograph strongly suggests the homogenous and uniform dispersion of the grains and grain size in the ceramic. The dielectric and electrical characteristics of ceramics have been thoroughly investigated in temperature range  $-50$  to  $410$  °C, and frequency ( $10^2$ – $10^6$  Hz). The grain and grain boundary also significantly contribute to relaxation process, shown by fitting of Nyquist plots. The frequency dependence of impedance plots has been used to characterize the electrical conduction of the sample at various observed temperatures, which demonstrate the Negative Temperature Coefficient of Resistance (NTCR) behavior. The composite with  $x = 0.40$  of pure CFO in  $(\text{BCT})_{1-x}-(\text{CFO})_x$  composite showed maximum value of saturated magnetization, remnant magnetization and coercive field of  $M_s \approx 38$  emu/g,  $M_r \approx 15$  emg/g and  $H_c \approx 0.66$  T, respectively.

## 1 Introduction

Multiferroics are the most appealing multifunctional materials due to their wide range of applications in magnetic sensors, actuators, transducers, spintronics, and storage media devices are unique in that they use a novel way to converting electric and magnetic fields

[1]. Electrical polarization can be operated using an external magnetic field, and magnetization can be induced by varying an external electrical field, due to the coupling between ferroelectric phases and ferromagnetic phases [2–5]. Few functional materials that have magnetoelectric coupling among multiferroics are known as magnetoelectric (ME) materials; these

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materials have a wide range of applications in microwave devices and magnetic field detection sensors [6–8]. Single-phase multiferroics have a very limited range of application due to their poor ME response at low temperatures. As a result, two-phase multiferroic composites were developed and are now widely used for magnetoelectric coupling due to their high ME coefficients when compared to single-phase materials [8, 9]. The elastic coupling between the magnetostrictive and piezoelectric components induces the ME effect in composites, which is a product property. ME composite characteristically consists of two phases: a ferromagnetic/ferrimagnetic phase (magnetostrictive) and a ferroelectric/piezoelectric phase (piezoelectric) [10–12]. At room temperature, composite ME coupling is recommended over single-phase coupling. Due to their excellent ferroelectric properties, composites with lead-based ferroelectric materials have the highest ME output voltage, but these materials are hazardous and volatile in nature. Due to their toxicity, there is a need for other lead-free environment-friendly materials with unique ferroelectric properties. As a result, recent research has focused on finding lead-free ferroelectric-ferromagnetic composites with a high ME coefficient [13–16]. Due to the individual properties of its constituents, BaTiO<sub>3</sub>–CoFe<sub>2</sub>O<sub>4</sub> composites are a promising candidate for ME materials. BaTiO<sub>3</sub> has polymorphs that change with temperature and have excellent ferroelectric and piezoelectric properties; and CoFe<sub>2</sub>O<sub>4</sub> has a spinel structure with high coercivity and magnetostriction. [17–19]. As a result, ME composites may be a suitable replacement for lead-based systems in integrated magneto/electric devices such as sensors, transducers, high-density memories, spintronics, and microelectromechanical systems, among other applications [20, 21]. Liu and Ren reported a new lead-free piezoelectric (1-x)Ba(Ti<sub>0.8</sub>Zr<sub>0.2</sub>)O<sub>3</sub>-x(Ba<sub>0.7</sub>Ca<sub>0.3</sub>)TiO<sub>3</sub> material for the first time in 2009 [22]; carrying certain exceptional piezoelectric properties like  $d_{33} \sim 600$  pC/N, what was reported to be significantly higher when we compare this with other lead-based piezoelectric systems. BZT-BCT

exhibits high piezoelectric response that contributes towards its morphotropic phase boundary (MPB) composition.

Ba(Ti, Sn)O<sub>3</sub> – (Ba, Ca)TiO<sub>3</sub> ( $d_{33} \sim 550$  pC N<sup>-1</sup>) [21] and Ba(Ti, Hf)O<sub>3</sub> – (Ba, Ca)TiO<sub>3</sub> ( $d_{33} \sim 550$  pC N<sup>-1</sup>) [22]. The high piezoelectric response is because 0.5BZT-0.5BCT or BCTZ composition corresponds to nominal morphotropic phase boundary (MPB) composition in which free energy anisotropy is reduced like that observed in PZT. Thus, Ba<sub>0.85</sub>Ca<sub>0.15</sub>Ti<sub>0.9</sub>Zr<sub>0.1</sub>O<sub>3</sub> or 0.5BZT-0.5BCT has emerged as potential alternative to the conventional lead-based piezoelectric materials.

ABO<sub>3</sub> based ferroelectric with large piezoelectric coefficient and ferrite with high magnetostriction are preferred in order to achieve strong magnetoelectric coupling effect. Many researchers have observed a significant piezoelectric effect in BCT based ABO<sub>3</sub>, which is a promising candidate to develop lead-free multiferroic composites and can help in producing a significant ME response. BCT has a lower Curie temperature approximately around  $90 \pm 10$  °C, while BaTiO<sub>3</sub> has a Curie temperature of around 120 °C [12, 22–26]. The symmetry of the ferroelectric crystal structure transitions from rhombohedral to orthorhombic, then to tetragonal, as the BCT content increases at room temperature [24]. Among all the ferrite families, cobalt ferrite (CoFe<sub>2</sub>O<sub>4</sub>) exhibits the highest value of magnetostriction coefficient ( $\lambda \sim -110 \times 10^{-6}$ ), high curie temperature and outstanding magnetic properties. Therefore, combining the BCT and CoFe<sub>2</sub>O<sub>4</sub> (CFO) in a composite structure is worth exploring. Sadhana et al. has synthesized xBa<sub>0.8</sub>Ca<sub>0.2</sub>TiO<sub>3</sub>-(1-x)Ni<sub>0.2</sub>Cu<sub>0.3</sub>Zn<sub>0.5</sub>Fe<sub>2</sub>O<sub>4</sub> nanocomposites with x = 0.1, 0.3, 0.5, 0.7, and 0.9 and reported the maximum magnetoelectric coefficient 280 mV/cm Oe at x = 0.3 composition [4]. Leonel et al. investigated the structural characterizations of Barium Titanate–Cobalt Ferrite (BaTiO<sub>3</sub>–CoFe<sub>2</sub>O<sub>4</sub>) composite materials and discovered that vacancies and interfacial stress were related to the ferroelectric structure's tetragonal distortion being reduced [18]. The BCZT<sub>85</sub>-CFO<sub>15</sub> composite materials were

identified by Naveed et al. as promising candidates for developing lead-free materials with higher ME coupling at room temperature. and ME coefficient around 6.03 ps/m [27]. Shrma et al. has synthesized  $(1-x)$  BaTiO<sub>3</sub>- $x$  CoFe<sub>1.8</sub>Zn<sub>0.2</sub>O<sub>4</sub> (where  $x = 10, 20, 30$  and  $40$  wt.%) by the solid-state reaction method and reported that morphology and Dielectric constant is found to increase as ferrite fraction increases. The increase in dielectric constant is attributed to the space charge effect and the hopping conduction mechanism [28]. Varma et al. fabricated  $(1-x)$  (Ba<sub>0.8</sub>Ca<sub>0.2</sub>TiO<sub>3</sub>)- $x$ (Co<sub>0.6</sub>Zn<sub>0.4</sub>Fe<sub>2</sub>O<sub>4</sub>) (with  $x = 0.00, 0.01, 0.02, 0.03, 0.04,$  and  $1.00$ ) via wet chemical method and found that the leakage current measurement value obey Ohmic conduction mechanism for all the samples and with increasing ferrite concentration saturation magnetization (Ms) was increased and attain maximum value for  $x = 0.04$  concentration [29].

The purposed (Ba<sub>0.85</sub>Ca<sub>0.15</sub>TiO<sub>3</sub>)<sub>1-x</sub>-(CoFe<sub>2</sub>O<sub>4</sub>)<sub>x</sub> (where  $x = 0.10, 0.20, 0.30$  and  $0.40$ ) composite materials were synthesized by using solid-state reaction method. Individual Ba<sub>0.85</sub>Ca<sub>0.15</sub>TiO<sub>3</sub> and CoFe<sub>2</sub>O<sub>4</sub> ceramic samples were first synthesized, and then composite samples were prepared. The structural, microstructural, dielectric, electrical properties, and magnetic properties of (Ba<sub>0.85</sub>Ca<sub>0.15</sub>TiO<sub>3</sub>)<sub>1-x</sub>-(CoFe<sub>2</sub>O<sub>4</sub>)<sub>x</sub> composite materials were investigated using XRD, Impedance spectroscopy and Magnetic hysteresis loop.

## 2 Materials and methods

(BCT)<sub>1-x</sub>-(CFO)<sub>x</sub> (where  $x = 0.00, 0.10, 0.20, 0.30, 0.40$  and  $1.00$ ) composites materials were synthesized using solid-state reaction method with analytical-grade metal oxides. Barium carbonate (99.9% pure M/S Aldrich chemicals India), Calcium carbonate CaCO<sub>3</sub> (99.9% pure M/S Aldrich chemicals, India), Titanium Oxide TiO<sub>2</sub> (99.9% pure M/S Aldrich chemicals, India), ferric oxide Fe<sub>2</sub>O<sub>3</sub> (99.9% pure M/S Aldrich chemicals, India) and Cobalt oxide CoO<sub>2</sub>, (99.9% pure M/S Aldrich chemicals, India). Both the ceramic materials Ba<sub>0.85</sub>Ca<sub>0.15</sub>TiO<sub>3</sub> and CoFe<sub>2</sub>O<sub>4</sub> in the stoichiometric ratio of the compositions were weighed and mixed thoroughly in the presence of

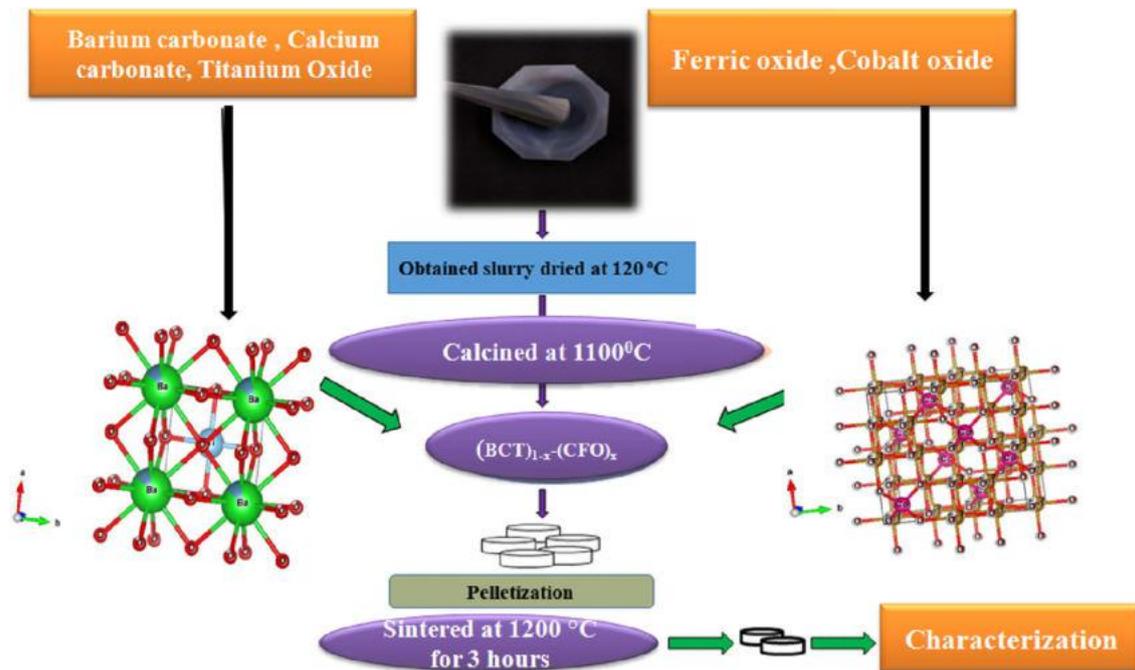
acetone. Later the composite powder was dried at 125 °C. Ba<sub>0.85</sub>Ca<sub>0.15</sub>TiO<sub>3</sub> calcined at 1100 °C for 3 h and CoFe<sub>2</sub>O<sub>4</sub> calcined at 850 °C for 4 h in alumina crucibles.

X-ray diffraction (XRD) technique was used at room temperature to confirm the formation of pure phase and compound quality. After the confirmation of pure phase these obtained samples were used for the synthesis of composites (Ba<sub>0.85</sub>Ca<sub>0.15</sub>TiO<sub>3</sub>)<sub>1-x</sub>-(CoFe<sub>2</sub>O<sub>4</sub>)<sub>x</sub> (where  $x = 0.10, 0.20, 0.30$  and  $0.40$ ) by varying the weight percentage of CoFe<sub>2</sub>O<sub>4</sub> from  $x = 0.10$  to  $0.40$  and prepared the composite samples. The composite samples were calcined at 1200 °C for 3 h before being pressed into pellets with a thickness of 1–2 mm and a diameter of 10 mm using a hydraulic press at a pressure of 50 MPa. The pellets were embedded in the same composition powder and sintered in a closed alumina crucible at 1250 °C for 3 h. At room temperature, the XRD patterns of the compounds were reported using a Rigaku Miniflex (Japan) X-ray powder diffractometer with CuK<sub>α</sub> radiation ( $\lambda = 1.5405 \text{ \AA}$ ) in a range ( $20 \leq 2\theta \leq 70$ ) of Bragg angles  $2\theta$  at a scanning rate of  $1/2 \text{ min}^{-1}$ . Rietveld Refinement was performed using Full-Prof method to calculate the lattice parameters and other structural study. Scanning Electron Microscopy (SEM) JEM-2000FX (JEOL Ltd.) was used to examine the surface morphology of these composite pellets at 20 keV. The sintered pellets were ground and polished for dielectric measurements; silver paste was applied to opposite parallel faces and coated pellets were heated at 550 °C for 10 min in a furnace to create the electrode. An HP Agilent impedance analyzer (4294 A Hewlett Packed) was used to measure the dielectric properties in the temperature range of 25–400 °C sintered ceramic pellets. A vibrating sample magnetometer (VSM) was used to record the magnetic data (Cryogenic).

## 3 Results and discussion

### 3.1 Crystal structure

Figure 1 shows the Rietveld refinement of the (BCT)<sub>1-x</sub>-(CFO)<sub>x</sub> (where  $x = 0.00, 0.10, 0.20, 0.30,$



**Fig. 1** Schematic flow figure of the experiment

0.40, 1.00) XRD pattern at room temperature, with individual growth of both phases in all composite samples. From the XRD pattern, it can be concluded that composites were polycrystalline in nature. XRD pattern depicts that BCT-CFO have both tetragonal as well as cubic (spinel) structure. The peaks of XRD pattern of BCT and CFO matches with the JCPDS no. 811289 for  $\text{BaTiO}_3$  and the JCPDS no. 22-1086 for  $\text{CoFe}_2\text{O}_4$  phase. The patterns corresponding to the mentioned ICSD files, indicating that the samples possess the tetragonal phase at room temperature. All Composites have both cubic spinel and tetragonal structures in their XRD patterns, with no bias/deformation in the structure. When XRD patterns were analyzed, it was observed that all composites have only BCT and CFO peaks. No extra peaks or splitting in peaks were observed, indicating that no transition from tetragonal to cubic phase occurred during the formation of the composite structure. By envisioning the presence of the highest intensity peak of both the

pure samples in the composite materials, we can see both phases together in composite samples. As the wt.% of CFO increased in BCT, the intensity of the peaks associated with the CFO phase increases, while the intensity of the peaks associated with the BCT phase decreases.

Rietveld Refinement has been used to further analyse the crystal structure of all the samples using Full-Prof software. CFO has a spinel structure ( $\text{AB}_2\text{O}_4$ ) with cubic symmetry and space group  $\text{Fd}3\text{m}$ , while BCT has a perovskite structure ( $\text{ABO}_3$ ) with tetragonal symmetry and space group  $\text{P}4\text{mm}$ . All the samples' XRD patterns were refined using a full-prof approach that is based on space groups and an approximate structural model of these structures. Table 1 summarizes some refined lattice parameters, as well as their residual factor  $R_p$ , goodness of fit  $\chi^2$  and weighted residual factor  $R_{\text{wfp}}$ . Since the ionic radii of  $\text{Fe}^{3+}$  (0.645 Å) and  $\text{Co}^{2+}$  (0.58 Å) in the B (octahedral) site of ferrite phase

**Table 1** Dielectric properties of BT, BZT, BCT, BCZT, BSZT composites

Sr. no	Sample name	Smax/Emax ( $d_{33}$ ) (pm/V)	$d_{33}$ (pC/N)	References
1	BNKTC	280	140	[41]
2	BT-NF (97–03)	150	77	[41]
3	BT-NF (94–06)	119	70	[41]
4	BT-NF (91–09)	99	68	[41]
5	BT-NF (88–12)	49	54	[41]
6	BT-NF (85–15)	30	47	[41]
7	$(1-x) \text{BaTiO}_3 + \text{Li}_{0.5}\text{Fe}_{2.5}\text{O}_4$	34.69		[42]
8	(x) BCZT –(100-x)NFO (90–10)		84	[43]
9	(x) BCZT –(100-x)NFO		71	[43]
10	(x) BCZT –(100-x)NFO		53	[43]
11	BSZT-NFO (BN0)		269	[43]
12	BSZT-NFO (BN5)		291	[43]
13	BSZT-NFO (BN10)		247	[43]
14	BSZT-NFO (BN20)		219	[43]
	BCZT-(100-x) NFO			[43]
15	BCZT-(90–10) NFO		84	[43]
16	BCZT-(80–20) NFO		71	[43]
17	BSZT-NFO (BN30)		189	[44]
	xBZT-BXT-(1-x)CFCO			[45]
18	x = 0.2 (CS-1)		294	[45]
19	x = 0.4 (CS-2)		322	[45]
20	x = 0.6 (CS-3)		413	[45]
21	x = 0.8 (CS-4)		382	[45]
22	$(1-x)\text{Ba}_{0.9}\text{Sr}_{0.1}\text{Zr}_{0.1}\text{Ti}_{0.9}\text{O}_{3-x}\text{CoFe}_2\text{O}_4$ (x = 0.30)		281	[46]
	$(\text{BCT})_{1-x}(\text{CFO})_x$			
23	$(\text{BCT})_{90}(\text{CFO})_{10}$		<b>196</b>	
24	$(\text{BCT})_{80}(\text{CFO})_{20}$		<b>289</b>	
25	$(\text{BCT})_{70}(\text{CFO})_{30}$		<b>254</b>	
26	$(\text{BCT})_{60}(\text{CFO})_{40}$		<b>219</b>	

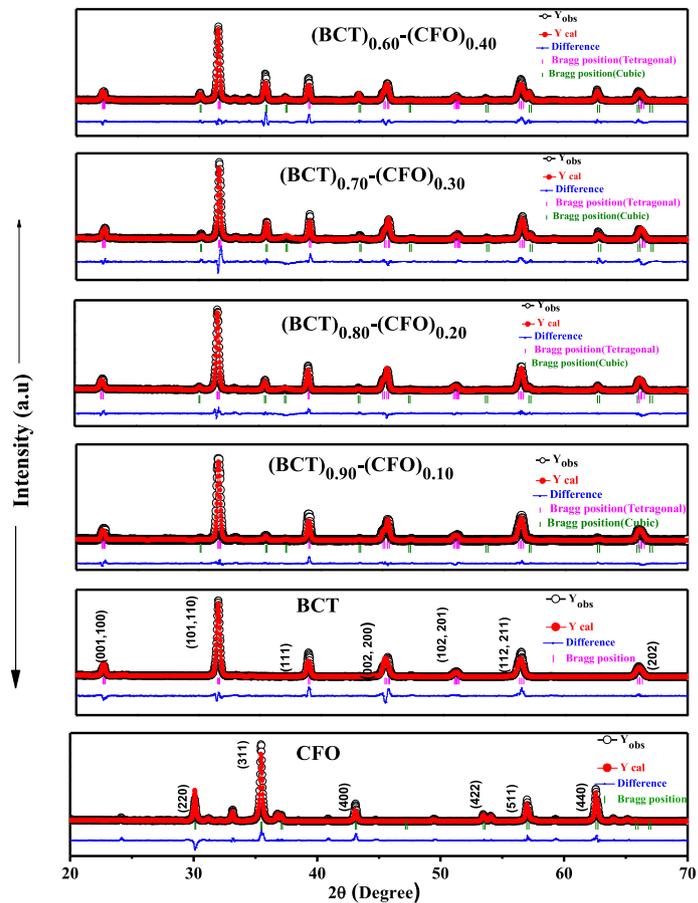
( $\text{AB}_2\text{O}_4$  structure) are analogous to the ionic radii of  $\text{Ti}^{4+}$  (0.605 Å) in the B-site of the ferroelectric phase ( $\text{ABO}_3$  structure), there could be a possibility that during sintering process, ion diffusion between the two sites of the ferroelectric-ferrite phase may occur, which might be the one of the possible reasons for the modification of lattice parameters.

As shown in Fig. 2, the bond lengths and angles were determined using rietveld refinement. The VESTA software was used to visualize and determine the electronic state of the crystal structure in three dimensions.

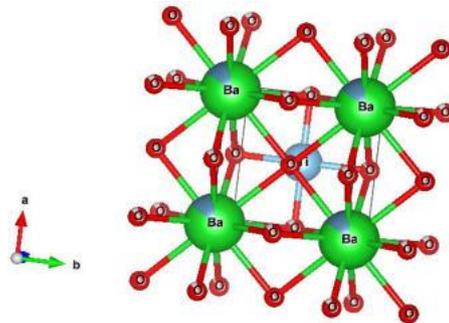
### 3.2 Morphology

Figure 3a–f shows microstructure of  $(\text{BCT})_{(1-x)}\text{CFO}_x$  (where  $x = 0, 0.10, 0.20, 0.30, 0.40$  and  $1.00$ ) were studied using SEM. The polycrystalline  $(1-x)\text{BCT}-x\text{CFO}$  composite samples had densely compacted crystal grains and grain growth that was randomly directed. The grains are evenly distributed across the surface of sintered samples, demonstrating their high compactness and polycrystallinity. The ceramics density was estimated to be about 87% of the theoretical density.

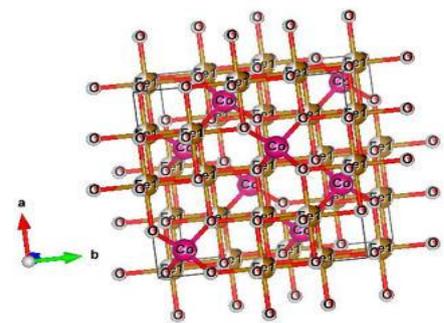
**Fig. 2 a** Rietveld refinement XRD pattern in the  $2\theta$  range of  $20\text{--}70^\circ$  of  $(\text{BCT})_{1-x}\text{-(CFO)}_x$  where  $x = 0.00, 0.10, 0.20, 0.30, 0.40$  and  $1.00$  composites. **(b, c)** The unit cell of pure  $\text{Ba}_0.85\text{Ca}_0.15\text{TiO}_3$  (tetragonal structure) and pure  $\text{CoFe}_2\text{O}_4$  (cubic structure) constructed by using VESTA software by data obtained from rietveld refinement



**a**



**b**



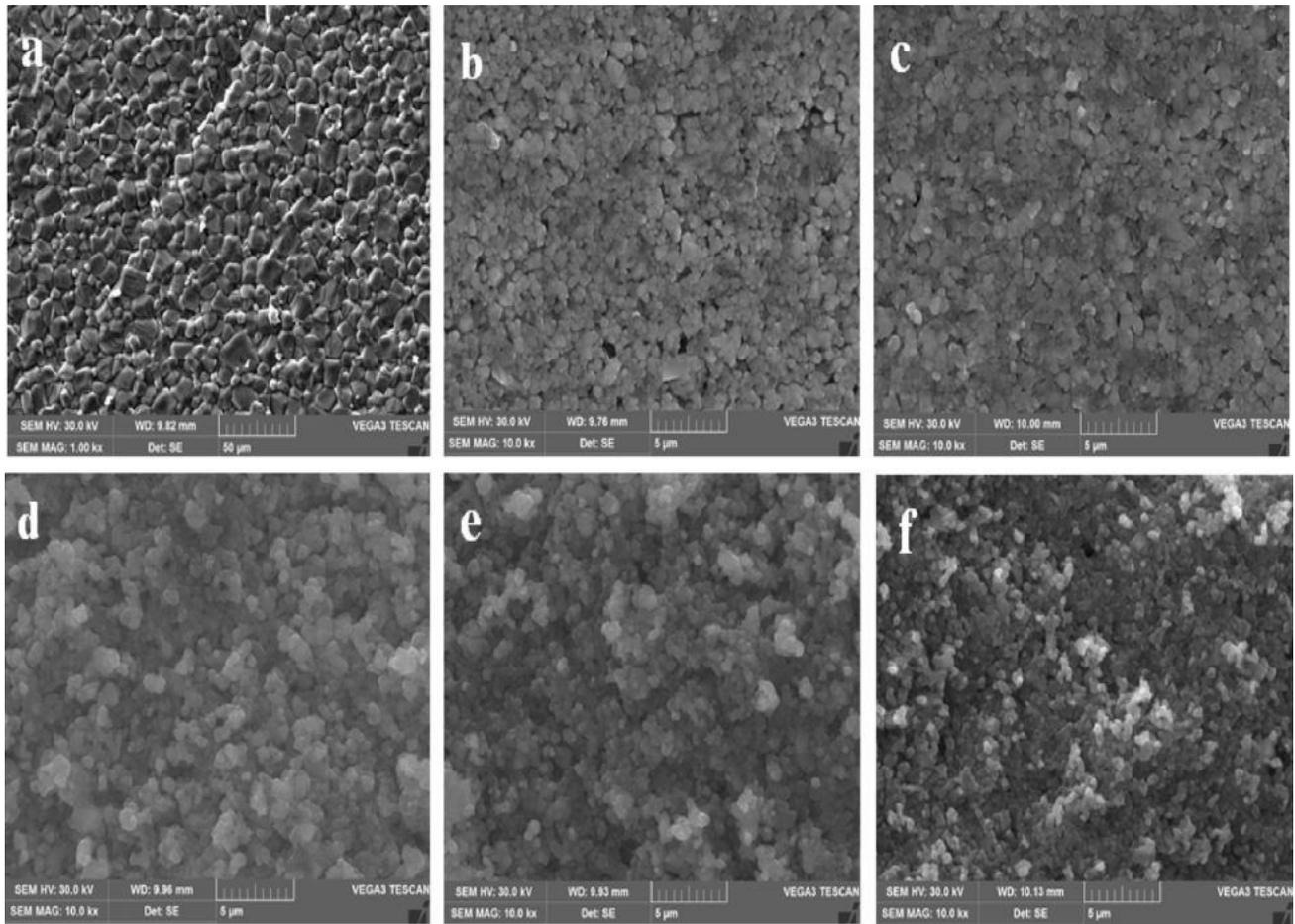
**c**

### 3.3 Dielectric studies

The dielectric constant of  $\text{BCT}_{(1-x)}\text{-CFO}_x$  ceramics varies as a function of temperature at different frequencies (1, 10 and 100 kHz), as shown in Fig. 4a–d. The stoichiometry and choice of precursors have a substantial impact on the electric and magnetic properties of ferrite. Each sample had one transition temperature: initially,  $\epsilon_r$  increases with increasing temperature until it reaches the phase transition

temperature, and then with increasing temperature it decreases, that is a typical ferroelectric behavior. This transition was observed in all samples due to the orthorhombic-to-tetragonal phase transition.

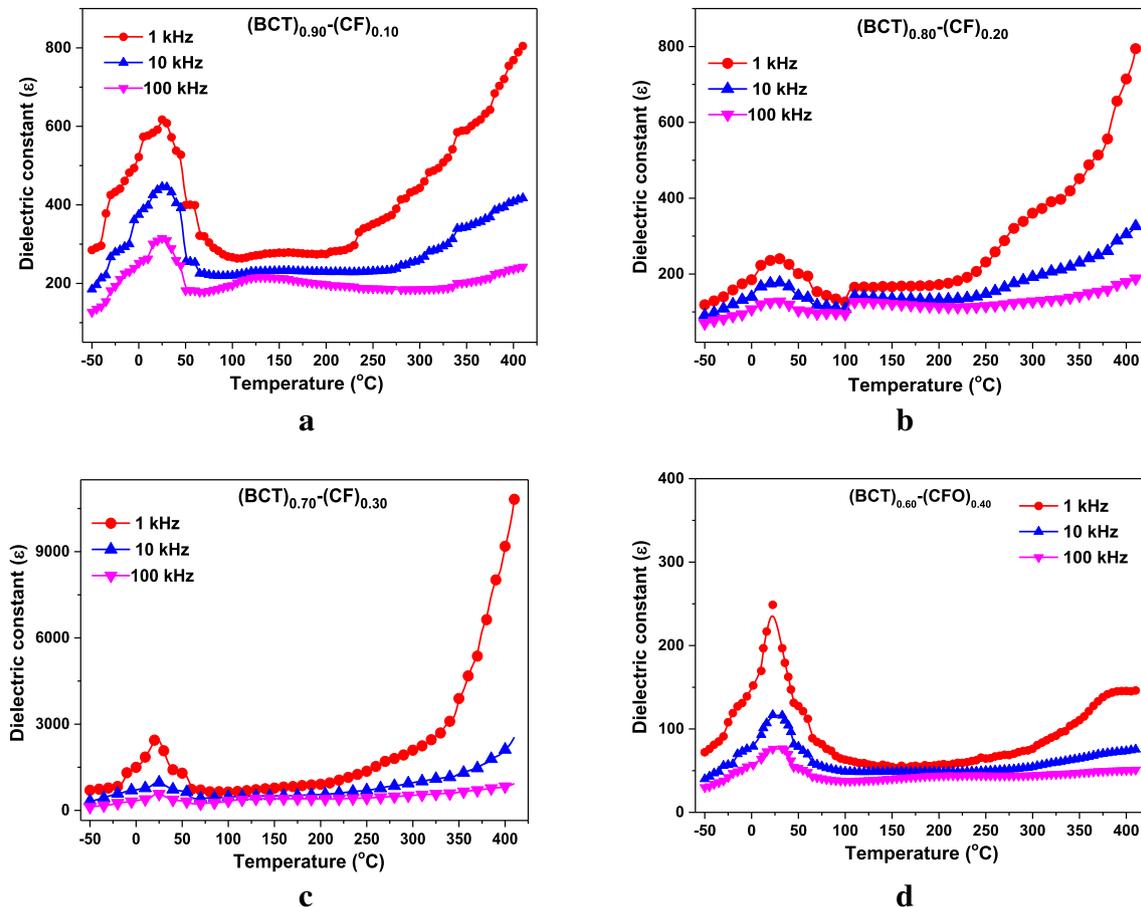
(O–T) at the range  $-50^\circ\text{C}$  to  $+50 \pm 20^\circ\text{C}$  temperature. With the increasing frequency, the peak shifts towards higher temperatures. It was also observed that the samples impregnate into the second transition at higher temperature due the tetragonal- to—paraelectric phase transition. Dielectric



**Fig. 3** a–f SEM images of  $(\text{BCT})_{1-x}-(\text{CFO})_x$  composite (where  $x = 0, 0.10, 0.20, 0.30, 0.40$  and  $1.00$ )

constant decreases with increasing CFO content, due to the excessive magnetic phase present in the ceramic. The cubic phase of CFO based magnetic material decreases the percentage of tetragonality of perovskite phase, restrict the atomic polarization.  $\text{BCT}_{(1-x)}-\text{CFO}_x$  at  $x = 0.30$  were found to have maximum value of  $\epsilon_r \sim 2515$  at temperature  $10 \pm 5$  °C). Compared to BCT, CFO exhibits lower electrical resistivity, and its inclusion in composites will have a significant impact on the conductivity of ceramics. The percolation threshold is reached when the inclusions' volume filling factor is near to one-third,

according to Bruggeman's effective medium approximation (EMA) model, which was created to characterise spherical inclusions implanted into a continuous backdrop. According to this model, the concentration of ferrite in BCT-CFO composites with composition  $x = 0.10, 0.20, 0.30$ , and  $0.40$  is close to the percolation threshold; as a result, both percolation strengths are nonzero and percolating clusters coexist, resulting in the detection of effective permittivity and permeability. It is a thermally activated technique, therefore when we raise the ferrite phase, the conductivity is improved at low frequencies and



**Fig. 4** a–d Variation of dielectric constant of  $(\text{BCT})_{1-x}-(\text{CFO})_x$  composite (where  $x = 0.10, 0.20, 0.30$  and  $0.40$ ) with temperature at different frequencies 1, 10, 100 kHz

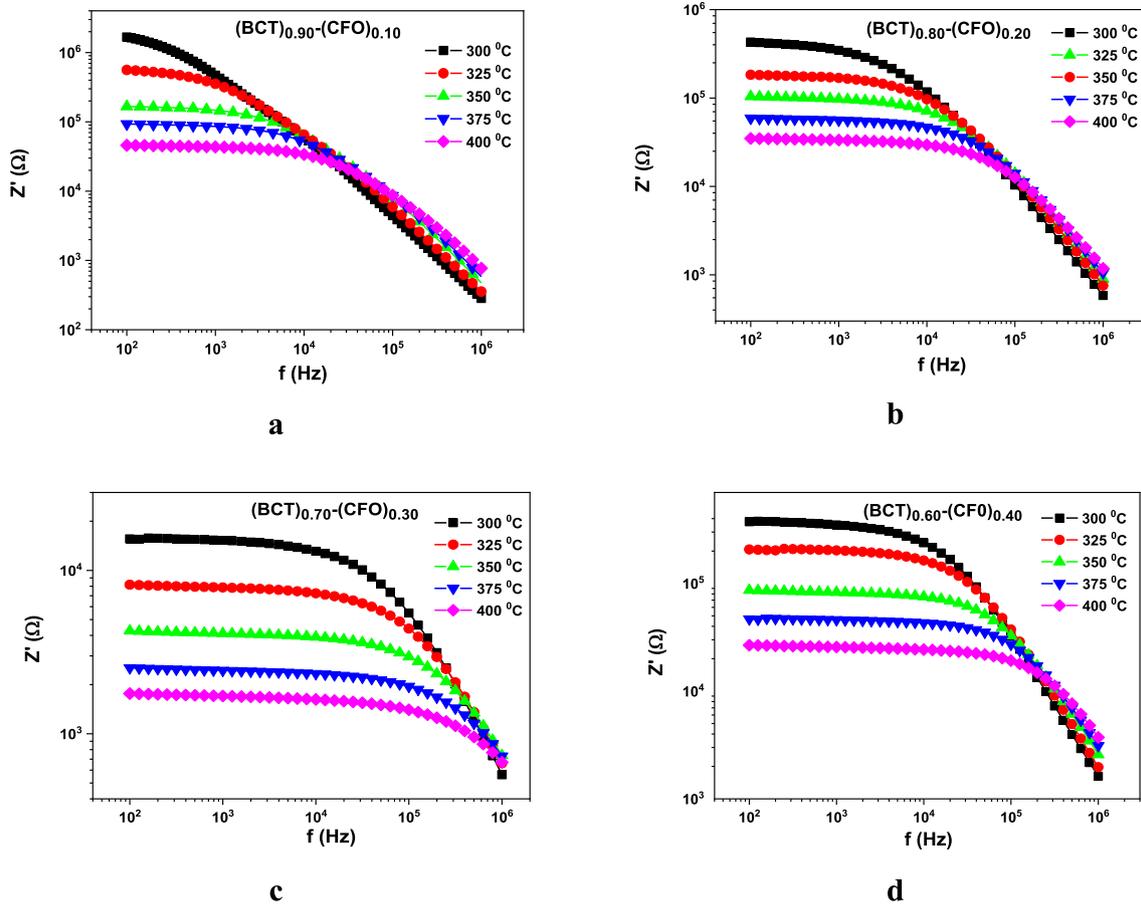
higher temperatures. As a result, the effect can be seen as a mutual rise in dielectric permittivity at the lowest frequencies and highest temperatures [30].

### 3.4 Impedance spectroscopy

Figure 5a–d shows the spectrum of real part of impedance ( $Z'$ ) at different temperatures and frequencies along with compositional variations. In low-frequency region the variation of  $Z'$  is sigmoid and a saturated behavior in high frequency region. As a result, the presence of a material with a mixed nature of polarization behavior, such as electronic, dipolar

polarizations, may be presumed. The negative temperature coefficient of resistance (NTCR) behavior of the material in the low-frequency range is depicted by lowering the value of  $Z'$  as the temperature increases. These results suggest that a rise in temperature could lead to an increase in ac conductivity. This is due to the space charge that is released as the material's barrier potential decreases.

Figure 6a–d shows the spectrum of the  $Z''$  (imaginary part of the impedance) as a function of frequency 300–400  $^{\circ}\text{C}$  for  $\text{BCT}_{(1-x)}-\text{CFO}_x$  (where  $x = 0.10, 0.20, 0.30$  and  $0.40$ ) samples. Wide-ranging peaks were detected in plots, and it was determined

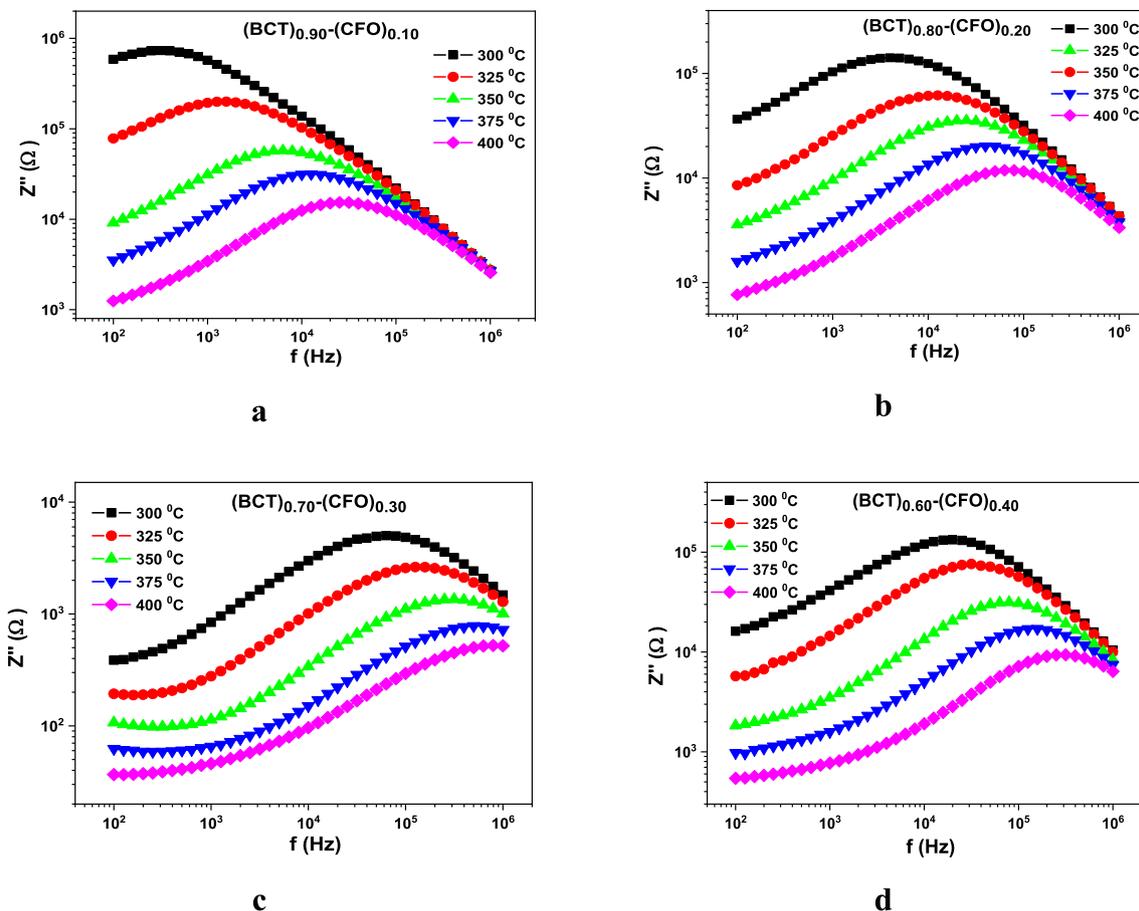


**Fig. 5** a–d Variation of real of impedance of  $(\text{BCT})_{1-x}\text{-(CFO)}_x$  composite (where  $x = 0.10, 0.20, 0.30$  and  $0.40$ ) at different temperatures

that bulk resistance reduced as frequency and temperature (300–400 °C) increased. The presence of a relaxation process in the materials is confirmed by a decrease in bulk resistance as temperature rises. At high frequency, the perimeters the grain boundary effect due to low relaxation time [31–33]. This signifies that dielectric relaxation is temperature-dependent, and that there is no single relaxation time.  $Z''$  decreases continuously as frequency and temperature increase, and eventually decreases in the high frequency domain. At lower frequencies, it reveals the presence of space charge polarization, which vanished at higher frequencies [34, 35].

Figure 7a–d illustrate the temperature dependence of complex impedance spectrum  $Z'$  vs.  $Z''$  (known as

Nyquist plot) of  $\text{BCT}_{(1-x)}\text{-CFO}_x$  (where  $x = 0.10, 0.20, 0.30$  and  $0.40$ ) composite samples, which displays semicircular arc at high temperatures range 300–400 °C. Semicircles arc suggest the occurrence of grain (bulk) and grain boundary contribution of the material. The material's bulk (grain) properties are represented by the high-frequency semicircle. The intersection of the semicircle arc with the  $Z'$  provides us an estimate of the material's bulk resistance ( $R_b$ ), which has been seen to decrease as temperature increased. This shows semiconducting property, i.e. NTCR behavior of the samples. The decrease in resistance with increasing temperature, indicated the reduction in charge barriers from the grains and grain boundaries, so that with the increase in

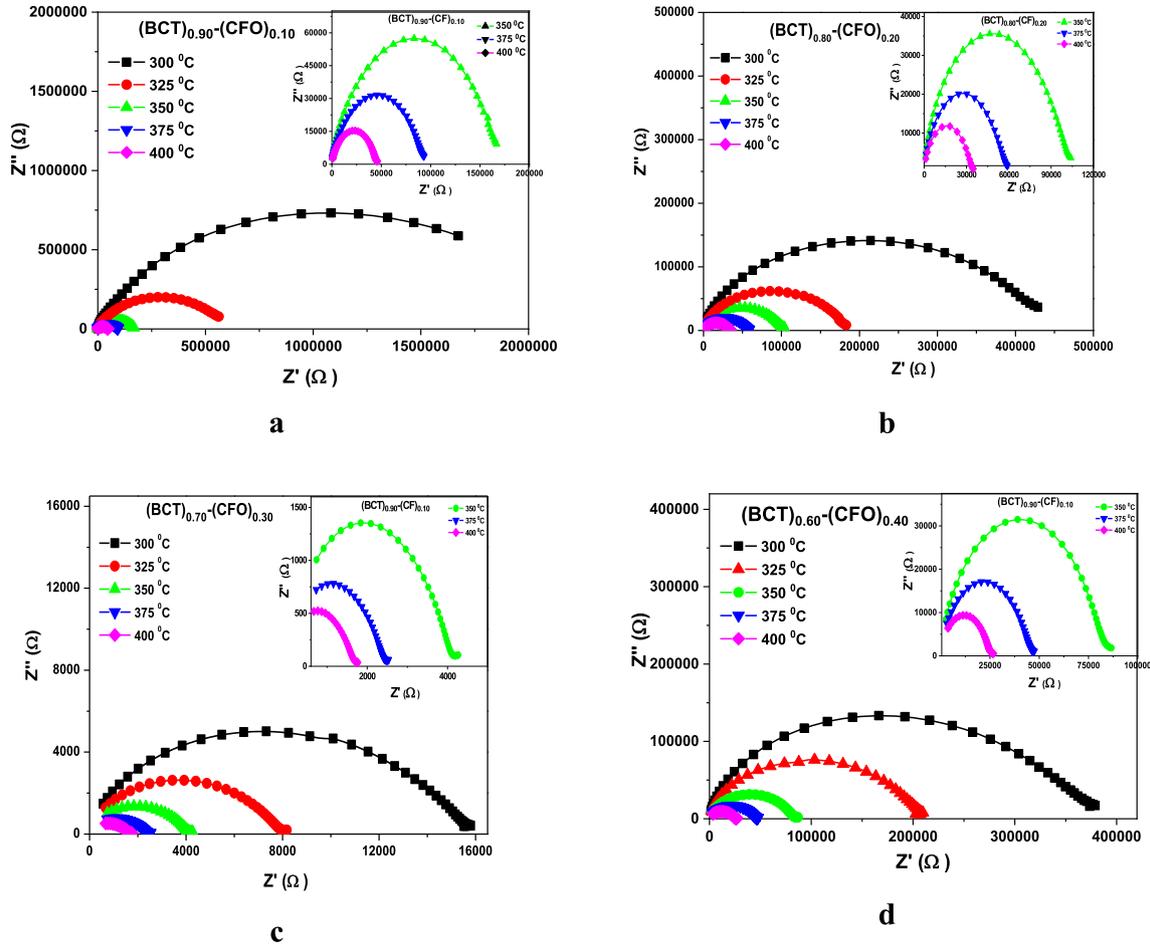


**Fig. 6** a-d Variation of imaginary part ( $Z''$ ) of impedance with frequency at different temperatures of  $(\text{Ba}_{0.85}\text{Ca}_{0.15}\text{TiO}_3)_{1-x}-(\text{CoFe}_2\text{O}_4)_x$  composite (where  $x = 0.10, 0.20, 0.30$  and  $0.40$ )

temperatures the conduction is enhanced [36]. Bulk capacitance ( $C_b$ ) and bulk resistance ( $R_b$ ) correspond electrical behavior that can be described using an equivalent circuit containing of a series combination of parallel RC circuits. The material's depressed semicircles with centers below the real axis suggest a divergence from ideal Debye behavior and a non-Debye form of relaxation phenomenon. [37, 38]. Fig. 8a–d depicts the fitting of Nyquist plot of  $\text{BCT}_{(1-x)}-\text{CFO}_x$  (where  $x = 0.10, 0.20, 0.30$  and  $0.40$ ) ceramics, which displays semicircular arc at high temperatures range 300–400 °C.

The variability of the Real component ( $M'$ ) of modulus with frequency at ambient temperatures of

$(\text{BCT})_{1-x}-(\text{CFO})_x$  composite samples is shown in Fig. 9a–d. The variation of  $M'$  with frequency illustrates a dispersion leading to  $M_\infty$  (the asymptotic value of  $M'$  at higher frequencies), which shifted towards the higher frequency side as temperature was raised. The stretching of exponential character of the material's relaxation time provides by  $M'$  asymmetric plot. At lower temperatures, charge carriers' short-range mobility will result in monotonous dispersion as frequency increases. These results could be the sign of a lack of restoring force regulating charge carrier mobility under the presence of an induced electric field.

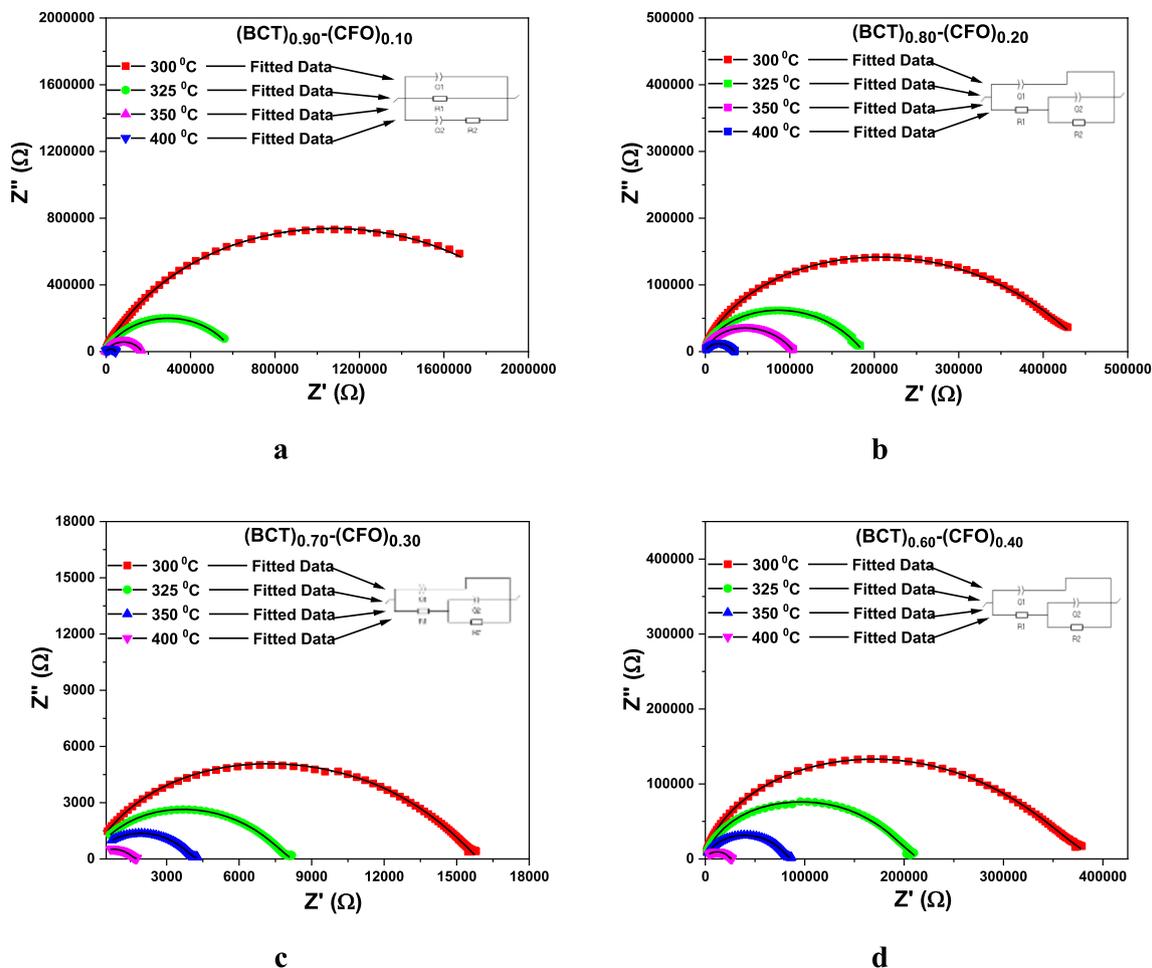


**Fig. 7** a–d Variation of real and imaginary part of impedance of  $(\text{Ba}_{0.85}\text{Ca}_{0.15}\text{TiO}_3)_{1-x}(\text{CoFe}_2\text{O}_4)_x$  composite (where  $x = 0.10, 0.20, 0.30$  and  $0.40$ ) at different temperatures

The variability of the imaginary part of modulus ( $M''$ ) with frequency at different temperatures is shown in Fig. 10a–d. As shown by the graph,  $M''$  indicates the significant peaks and the site of the peak, i.e.,  $M''_{\text{max}}$  shifted to higher frequencies with the increasing temperature. The frequency range below peak maximum  $M''$  represents the range in which charge carriers are mobile over long distances. Carriers are only mobile over short distances and are restricted to potential wells at frequencies above peak maximum. The peaks of the observed Debye curve are asymmetric and broader than those of the ideal

Debye curve. Peaks in the frequency spectrum signify a shift in mobility from long-range to short-range.

Complex modulus analysis is a technique for investigating electrical properties of materials that magnifies any other effects present in the sample. It's a useful method for determining, analyzing, and interpreting the dynamical characteristics of electrical transport phenomena (i.e., parameters like conductivity, carrier/ion hopping rate, relaxation time etc.). Figure 11a–d indicates the complex electric modulus distribution  $M'$  vs.  $M''$  for  $(\text{BCT})_{1-x}(\text{CFO})_x$  (where  $x = 0.10, 0.20, 0.30,$  and  $0.40$ ) composite samples at different temperatures. The existence of small

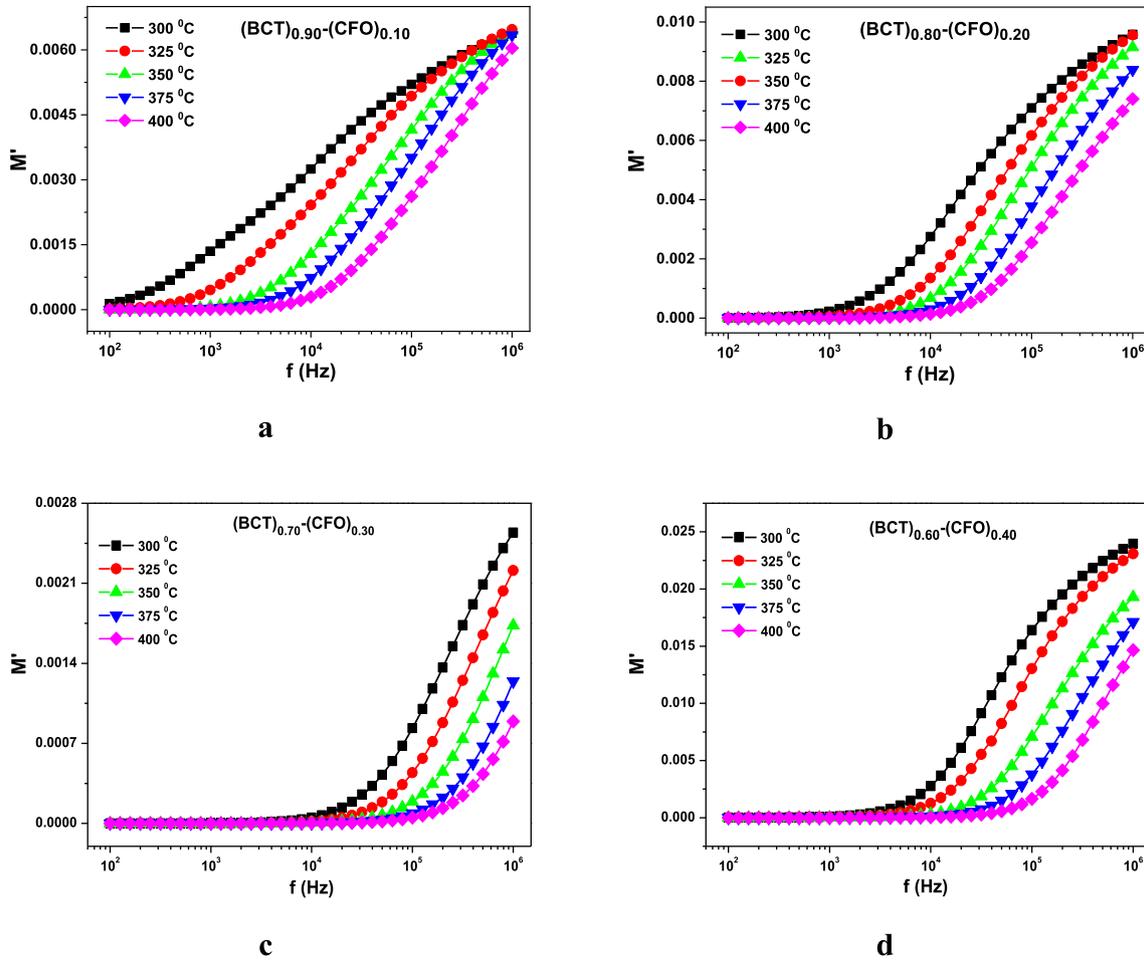


**Fig. 8** a–d Fitting of Cole–cole plot of  $(\text{BCT})_{1-x}\text{-(CFO)}_x$  composite (where  $x = 0.10, 0.20, 0.30$  and  $0.40$ ) at different temperatures with equivalent circuit

asymmetric and depressed semicircle arcs with centers that does not lie on the  $M'$  axis characterizes the patterns. The pattern of the electric modulus spectrum indicates to a temperature-dependent hopping type of electric conduction (charge transport) in composite materials as well as non-Debye type dielectric relaxation.

The scaling response of the composite samples  $(\text{BCT})_{1-x}\text{-(CFO)}_x$  (where  $x = 0.10, 0.20, 0.30$  and  $0.40$ ) impedance data is shown in Fig. 12a–c using  $Z''(f)$  spectroscopic plots. At all observed temperatures, the normalized plot of  $Z''/Z''_{\text{max}}$  overlapping on a single

master curve. With an increase in temperature, the frequencies of  $Z''$  peaks were clearly coincident and had the same shape and pattern in the peak position, with a slight variation in full width at half maximum FWHM. The master impedance plot can be used to investigate the dielectric phenomenon that occur within the material, with the conclusion that for lower temperatures, the dynamical processes are nearly temperature-independent [37, 39]. The observation is also noteworthy that the  $Z''/Z''_{\text{max}}$  curves were asymmetric and signifying the conductivity relaxation has non-exponentially behavior. The



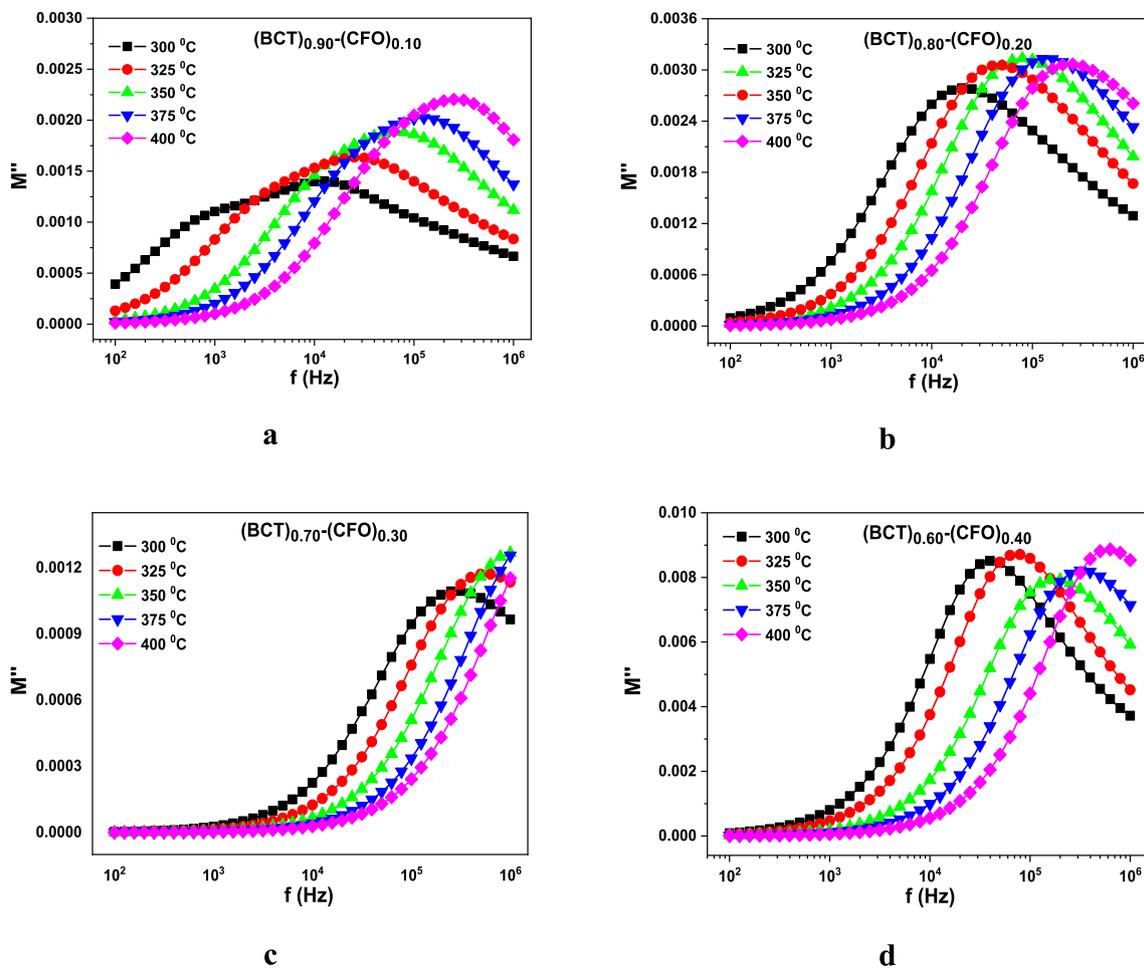
**Fig. 9 a–d** Variation of real part ( $M'$ ) of modulus with frequency at different temperatures of  $(\text{Ba}_{0.85}\text{Ca}_{0.15}\text{TiO}_3)_{1-x}-(\text{CoFe}_2\text{O}_4)_x$  composite (where  $x = 0.10, 0.20, 0.30$  and  $0.40$ )

presence of a non-Debye form of relaxation process is indicated by the spectra's FWHM considerably wider than a Debye peak [40].

### 3.5 Magnetic studies

Figure 13 shows the magnetization as a temperature dependent between 5 and 300 K under Field Cooling (FC) and Zero Field Cooling (ZFC) conditions with a 1 T magnetic field. The temperature at which the ZFC and FC curves split apart is known as the transition temperature. The samples are cooled in a field of 1 T to reach a temperature of 5 K for the Field Cooled

(FC) magnetization, and they are heated in the same field of 1 T for the Zero Field Cooled (ZFC) magnetization, with the magnetization being measured as the temperature rises. It is evident that when temperature rises, ZFC magnetization rises, reaches a maximum at blocking temperature ( $T_B$ ), and then decreases again. The temperature at which the nanoparticle moments do not relax (are blocked) over the course of the measurement is known as the  $T_B$ . Only above  $T_B$  the spins capable of flipping, and at that point the ZFC magnetization and FC magnetization coincide. The materials exhibit

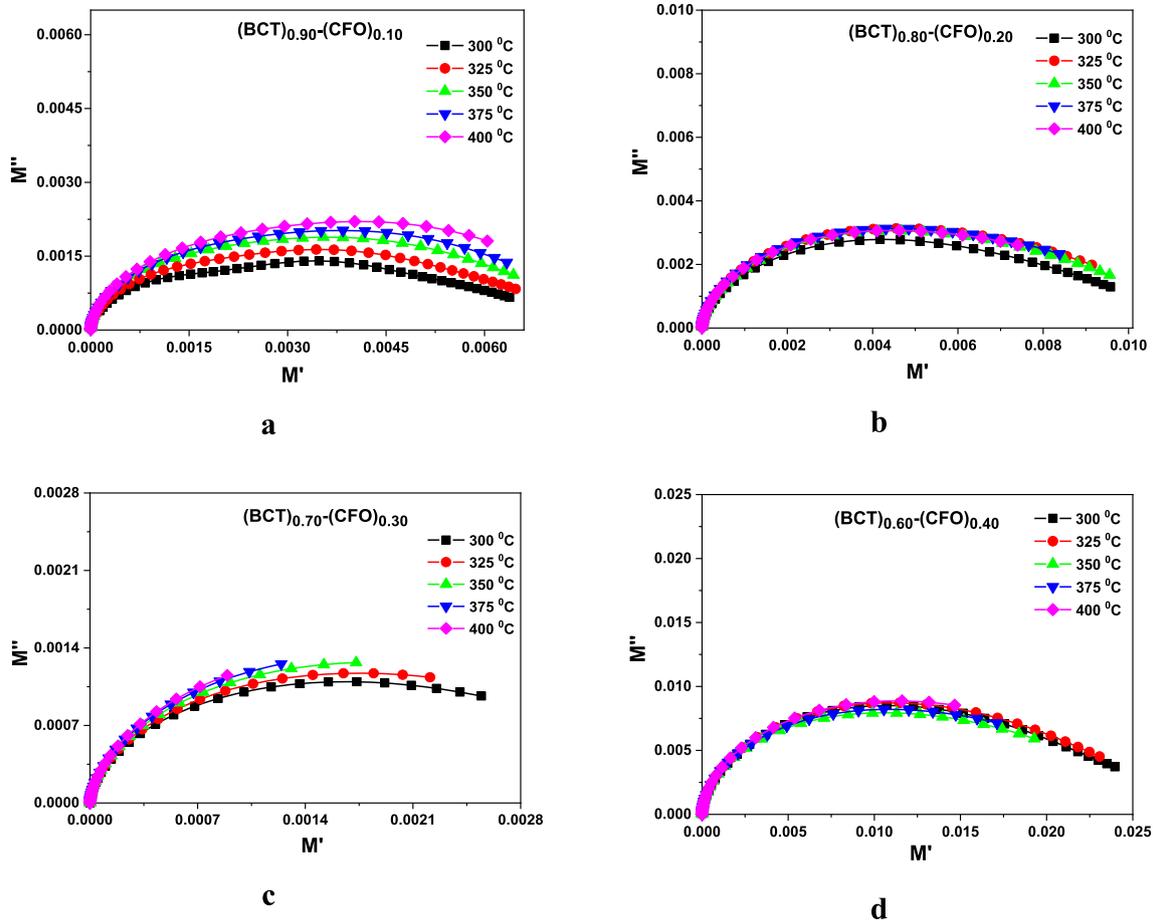


**Fig. 10** a–d Variation of imaginary part ( $M''$ ) of modulus with frequency at different temperatures of  $(\text{BCT})_{1-x}\text{-(CFO)}_x$  composite (where  $x = 0.10, 0.20, 0.30,$  and  $0.40$ ) composites

Superparamagnetism in conformance with the Curie–Weiss law at temperatures above TB because the thermal energy is greater than the magnetic energy barrier at these temperatures. The blocking temperatures of  $(\text{BCT})_{1-x}\text{-(CFO)}_x$  (where  $x = 0.10, 0.20, 0.30$  and  $0.40$ ) were found to be 50, 49, 48 and 47 K as the wt.% of CFO increases as mentioned. When nanoparticles are cooled from room temperature to 5 K, the magnetic direction of the particles is frozen to the direction of the applied field for FC measurements. A maximum magnetization has been seen at 5 K because the anisotropy energy barrier prohibits

the magnetic moments from flipping at this temperature. Because of the nanoparticles' anisotropic energy barrier, the FC and ZFC curves diverge, which is a key characteristic of super-Paramagnetism. Because the moments of the nanoparticles are orientated along their easy axis, they must break through the anisotropy energy barrier in the ZFC process. The FC curve is unaffected by the anisotropic energy barrier because the cooling process aligns the nanoparticle moments with the field [41].

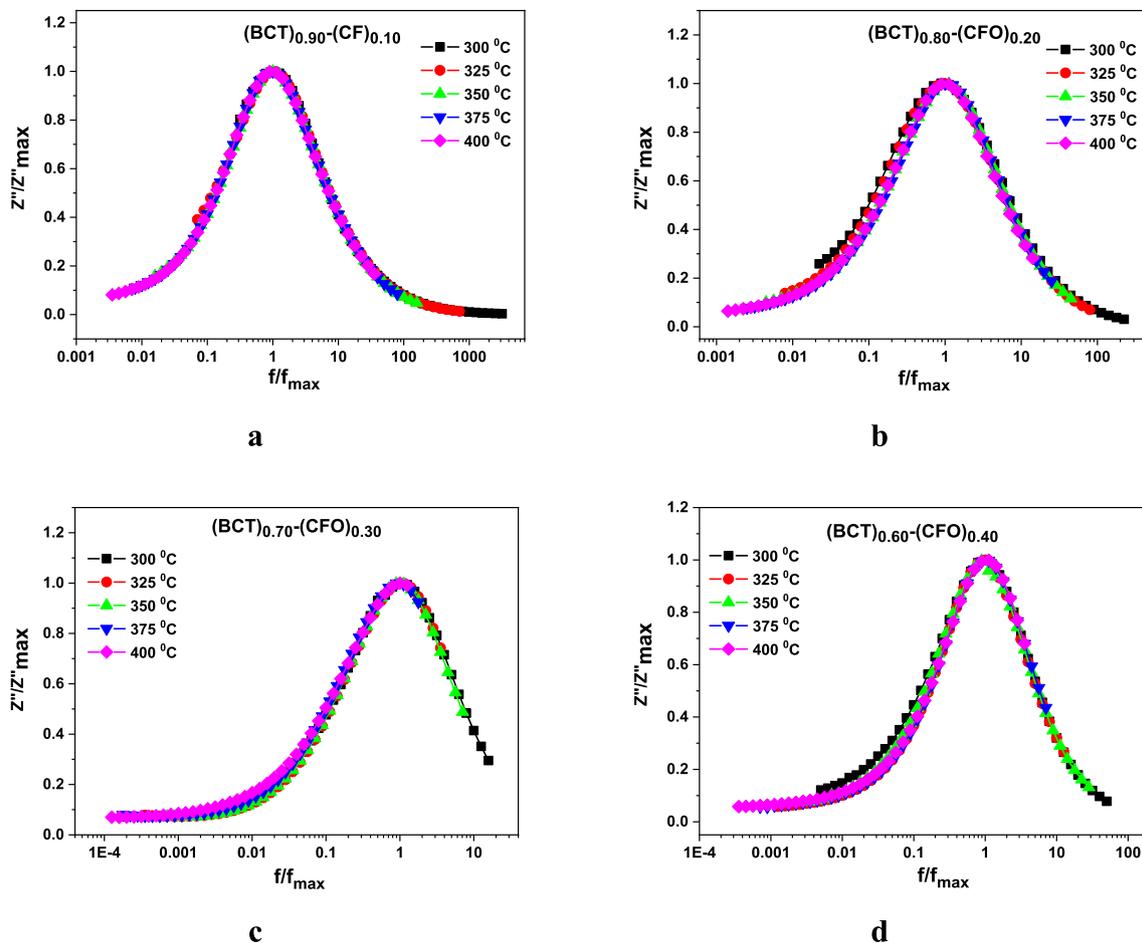
The magnetic hysteresis loops for  $(\text{BCT})_{(1-x)}\text{-CFO}_x$  composite samples with various  $\text{CoFe}_2\text{O}_4$  contents



**Fig. 11 a–d** Variation of real and imaginary part of modulus at different temperatures of  $(BCT)_{1-x}-(CFO)_x$  composites (where  $x = 0.10, 0.20, 0.30$  and  $0.40$ )

are shown in Fig. 14 for all samples at 300 K in a field range of 0–15 T. The well-defined magnetic hysteresis loops show that  $(BCT)_{1-x}-(CFO)_x$  composite samples exhibit ferromagnetic characteristics (where  $x = 0.10, 0.20, 0.30$ , and  $0.40$ ). Ceramics' magnetic properties are influenced by particle size, sintering temperature, additives, nanostructure, and the external field applied. All the samples show the characteristic hysteresis loops seen in soft magnetic materials, confirming that incorporating  $Ba_{0.85}Ca_{0.15}TiO_3$  to the

composite has no influence on the magnetism of  $CoFe_2O_4$ . For  $(BCT)_{1-x}-(CFO)_x$  (where  $x = 0.10, 0.20, 0.30$ , and  $0.40$ ) composite samples, maximum saturated magnetizations of 15, 22, 30, and 38 emu/g were reported, respectively. With decreasing  $CoFe_2O_4$  content and increasing  $Ba_{0.85}Ca_{0.15}TiO_3$  content, the saturated magnetization was found to decrease. It may also be explained by the existence of the  $Ba_{0.85}Ca_{0.15}TiO_3$  phase, which could have disrupted the ferromagnetic  $CoFe_2O_4$  phase's continuity or



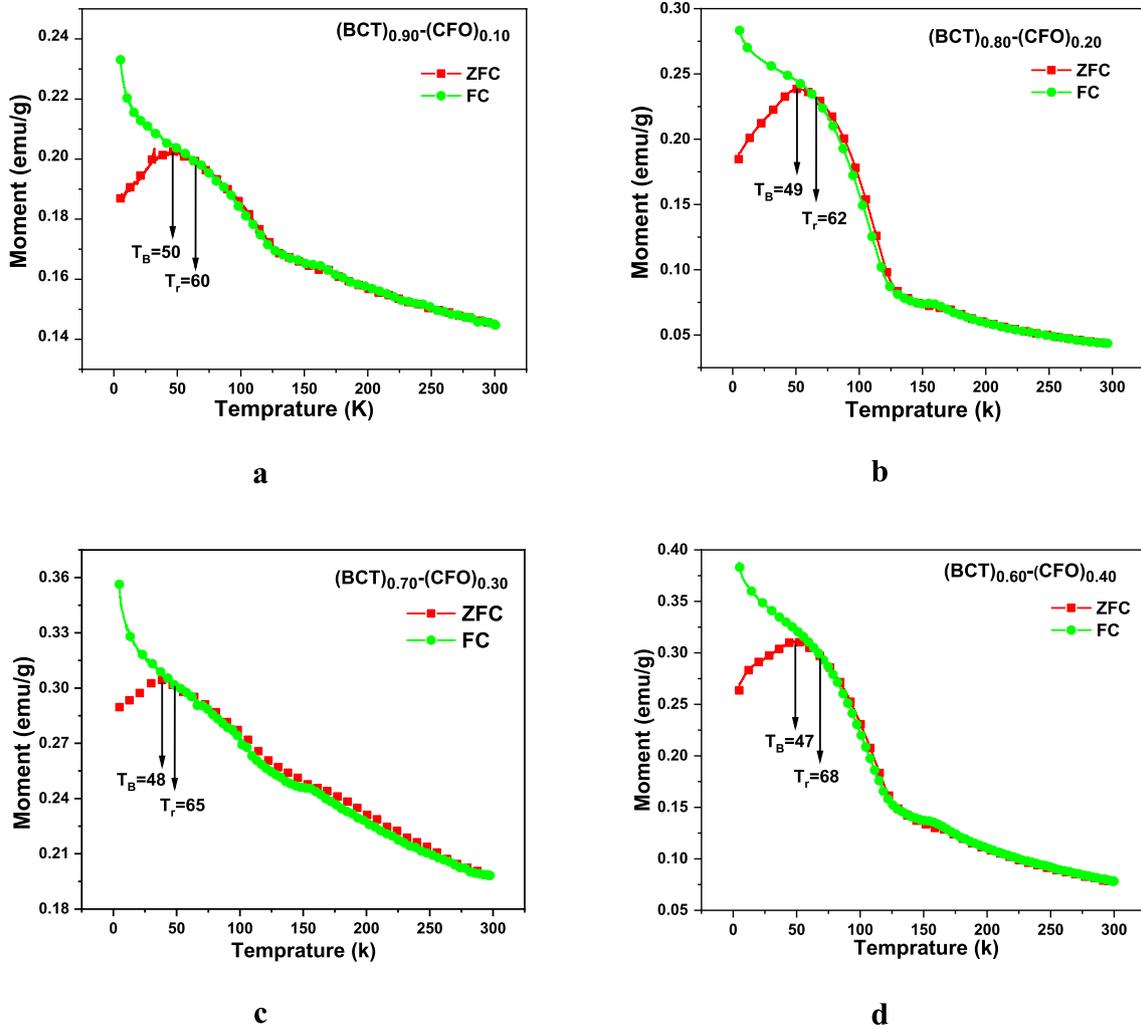
**Fig. 12** a–d Impedance and modulus scaling behavior of the master curves at different temperatures of  $(\text{BCT})_{1-x}\text{-(CFO)}_x$  composites (where  $x = 0.10, 0.20, 0.30$  and  $0.40$ )

magnetic ordering. As a result, as the  $\text{Ba}_{0.85}\text{Ca}_{0.15}\text{TiO}_3$  content increases, the regional magnetic moments decrease dramatically.

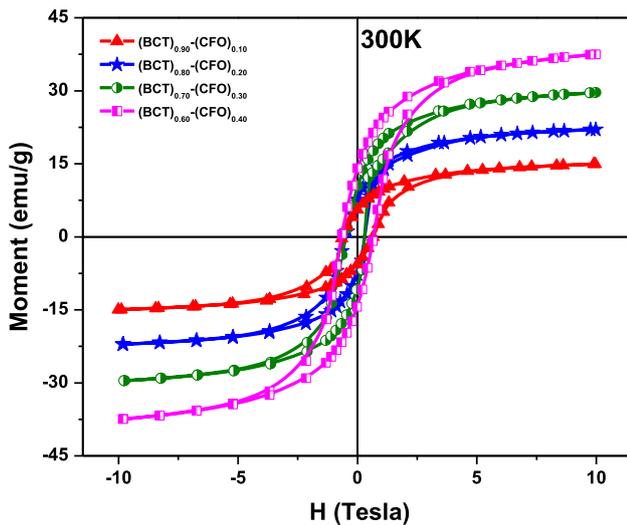
Figure 15 shows variation of saturated magnetization with value of  $x$  % in compositions of  $(\text{BCT})_{1-x}\text{-(CFO)}_x$  (where  $x = 0.10, 0.20, 0.30$  and  $0.40$ ) composite materials. The saturated magnetization increases as the content of  $\text{CoFe}_2\text{O}_4$  increases from 0.10 to 0.40, as shown in the graph.

## 4 Conclusions

XRD pattern of BCT-CFO composite samples depicted both tetragonal as well as cubic (spinel) structure. Polycrystalline  $\text{BCT}_{(1-x)}\text{-CFO}_x$  composite samples exhibited dense packing of grains in SEM micrographs with randomly oriented grains. Decreasing trend of  $Z'$  with the increasing temperature in impedance spectroscopy suggested NTCR behavior of the samples in low-frequency region. The material's depressed semicircles, whose centers are below

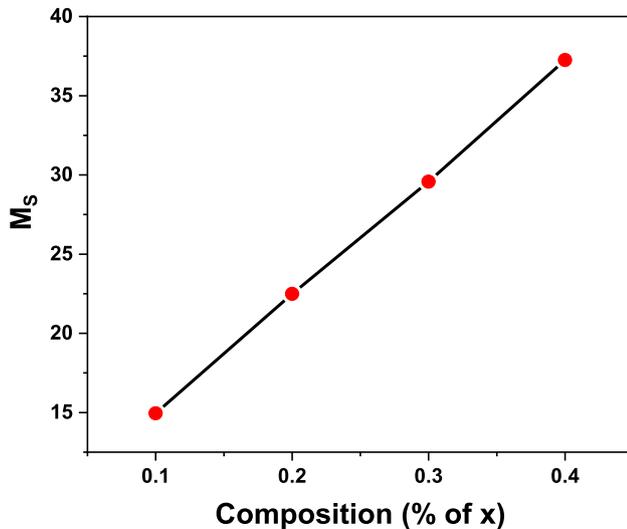


**Fig. 13** Variation of magnetization FC and ZFC with temperature (K)  $(BCT)_{1-x}-(CFO)_x$  composite (where  $x = 0.10, 0.20, 0.30$  and  $0.40$ )



**Fig. 14** MH loop of  $(BCT)_{1-x}-(CFO)_x$  composite (where  $x = 0.10, 0.20, 0.30$  and  $0.40$ )

the real axis, showed a deviation from ideal Debye behavior and a non-Debye type of relaxation process. The  $Z''/Z''_{max}$  curves were also identified to be asymmetric, indicating that the conductivity relaxation shows non-exponential behavior. The electric modulus spectrum's behavior indicated a temperature-dependent hopping type of electric conduction mechanism and the existence of non-Debye type dielectric relaxation in the composite samples. All the samples exhibited the characteristic magnetic hysteresis loops indicating typically soft ferromagnetic behavior. Maximum saturated magnetization  $\sim 15, 22, 30$  and  $38$  emu/g were observed for  $(BCT)_{1-x}-(CFO)_x$  (where  $x = 0.10, 0.20, 0.30$  and  $0.40$ ) composite samples, respectively.



**Fig. 15** Variation of saturated magnetization with x content in composition of  $(\text{BCT})_{1-x}(\text{CFO})_x$  composite (where  $x = 0.10, 0.20, 0.30$  and  $0.40$ )

## Author contributions

Monika Mishra: Investigation, Validation, Writing—original draft and Visualization. Shweta Thakur: Writing—original draft, Writing—review & editing, and Supervision. Sapna Thakur: Validation, and Writing—structural & morphology. Mamta Shandilya: Investigation, Validation, and Writing—magnetic behavior & editing. Radheshyam Rai: Conceptualization, Writing—review & editing, Supervision.

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## Data availability

The data generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

## Declarations

**Conflict of interest** The authors declare that they have no known competing financial interests or

personal relationships that could have appeared to influence the work reported in this paper.

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## Microwave-Assisted OPC-VH Mediated Synthesis of 2-Amino-1,3,4-thiadiazoles

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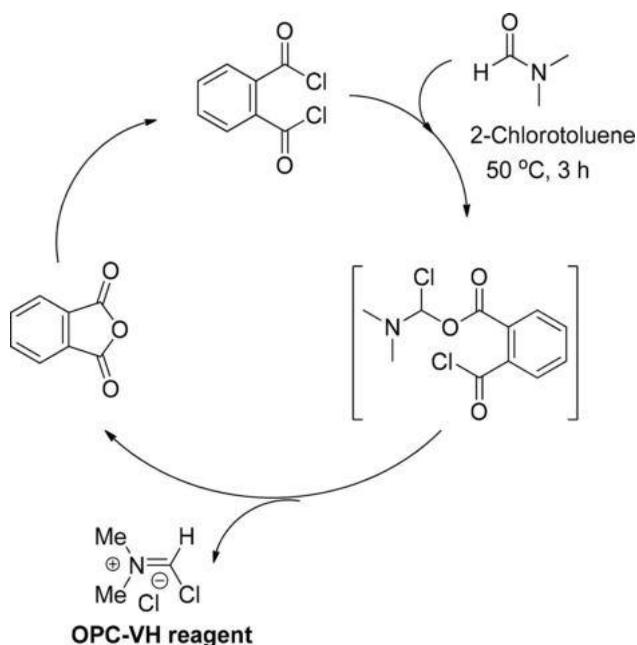
Bioactive thiadiazoles represent an indispensable class of nitrogen and sulfur containing heterocycles, in part due to their extensive applications in medicinal chemistry.<sup>1</sup> It is generally assumed that the biological activities of thiadiazoles are due to the presence of the =N-C-S- moiety and the aromaticity of the ring, responsible for the *in vivo* stability and low toxicity for higher vertebrates.<sup>2,3</sup>

Indeed, the thiadiazole ring represents a remarkably divergent scaffold responsible for numerous biological properties including antimicrobial,<sup>4</sup> antituberculosis,<sup>5</sup> antiviral,<sup>6</sup> analgesic,<sup>7</sup> antidepressant,<sup>8</sup> antihypertensive,<sup>9</sup> local anesthetic and kinesin inhibitory activities.<sup>10,11</sup> Consequently, 1,3,4-thiadiazole chemistry is a mature field and occupies an important niche in heterocyclic chemistry. The unit serves as a vital synthon for the preparation of more elaborate bioactive molecules.

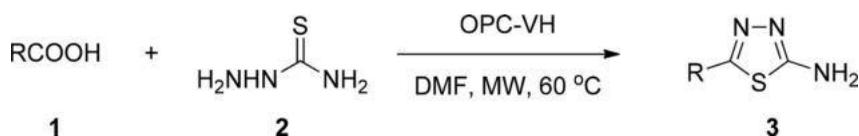
Several synthetic approaches are well known in the literature for the synthesis of 1,3,4-thiadiazoles. Some one-pot synthetic methods involve the reaction between carboxylic acids and thiosemicarbazides using (i) ionic liquids;<sup>12</sup> (ii) excess POCl<sub>3</sub>;<sup>13</sup> (iii) polyphosphoric acid;<sup>14</sup> (iv) a mixture of P<sub>2</sub>O<sub>5</sub> and MeSO<sub>3</sub>H;<sup>15</sup> and (v) polyphosphate ester (PPE).<sup>16</sup> However, high production costs, reagent toxicity, and by-product formation are disadvantages of some of the known methods.<sup>16</sup> Given the movement of the field towards greener, more efficient and lower cost methods,<sup>17</sup> microwave-assisted construction of heterocycles has truly come into its own.<sup>18–20</sup>

Recently, the Vilsmeier–Haack reagent (Scheme 1, OPC-VH) prepared by Kimura and his team<sup>21,22</sup> using *o*-phthaloyl dichloride and dimethylformamide was employed by us for the synthesis of 4-functional pyrazoles.<sup>23–26</sup> Taking into account our interest in the construction of heterocycles<sup>27–32</sup> and in light of the versatility of OPC-VH reagent, we sought a method to produce 2-amino-1,3,4-thiadiazoles, which may then be used to introduce substituents on the 5-position of the heterocycle. We now report an optimized microwave-assisted OPC-VH mediated synthetic approach for the needed 2-amino-1,3,4-thiadiazole derivatives.

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**Scheme 1.** Preparation of OPC-VH reagent.



**Scheme 2.** Construction of 2-amino-1,3,4-thiadiazoles **3** using OPC-VH reagent.

The OPC-VH reagent was first prepared from phthaloyl dichloride (OPC) and dimethylformamide (DMF) using Kimura's procedures.<sup>21,22</sup> The reagent was obtained in pure form, obviating the use of toxic  $\text{POCl}_3$ . The phthalic anhydride formed as a by-product may in its own turn be reused in the preparation of phthaloyl dichloride (Scheme 1).

Recently, the conversion has been reported in the literature of numerous hydrazones to 4-formyl pyrazoles and 4-formyl pyrazoles to 4-cyanopyrazoles using OPC-VH reagent.<sup>23,24,26</sup> These results encouraged us to study the synthesis shown in Scheme 2.

We further hoped that the microwave method would increase the rate of reaction as well as improve the overall yield of the products.<sup>31</sup> As a model experiment, the one-pot reaction of benzoic acid and thiosemicarbazide using OPC-VH (2.5 equiv.) at 60 °C in acetonitrile for 3 hours afforded the desired thiadiazole **3a** (**3**, R = Ph) in 54% yield (Table 1, entry 1). The reaction was also attempted with *o*-phthaloyl dichloride (2.5 equiv.) at 60 °C in acetonitrile for 6 hours but no desired product **3a** was observed (entry 2). Microwave irradiation, operating at a frequency of 2.455 GHz with continuous irradiation power of 0 to 850 W, was next studied, varying the solvent, temperature, and the amount of OPC-VH reagent.

**Table 1.** Optimization of OPC-VH mediated synthesis of 2-amino-1,3,4-thiadiazole.

Entry	OPC-VH (equiv.)	Solvent	Temp (°C)	Reaction time	Yield (%) <sup>a</sup>
1	2.5	Acetonitrile	60	3 hours	54 <sup>b</sup>
2	0.0	Acetonitrile	60	6 hours	NR <sup>c</sup>
3	1.5	Acetonitrile	60	10 minutes	45
4	2.0	Acetonitrile	60	10 minutes	51
5	2.5	Acetonitrile	60	5 minutes	60
6	2.5	Toluene	60	10 minutes	56
7	3.0	Toluene	60	10 minutes	53
8	2.5	DMF	60	4 hours	65 <sup>b</sup>
9	2.5	DMF	60	5 minutes	85
10	2.5	DMF	60	10 minutes	77
11	2.5	DMF	80	5 minutes	73
12	3.0	DMF	80	5 minutes	71
13	0.0	DMF	60	20 minutes	NR

Reaction conditions: benzoic acid (1 equiv.), thiosemicarbazide (1.1 equiv.), solvent (5 mL), OPC-VH,  $\mu$ W power, temperature as specified.

<sup>a</sup>Yields of isolated products.

<sup>b</sup>The reaction was performed at 60 °C without any  $\mu$ W activation.

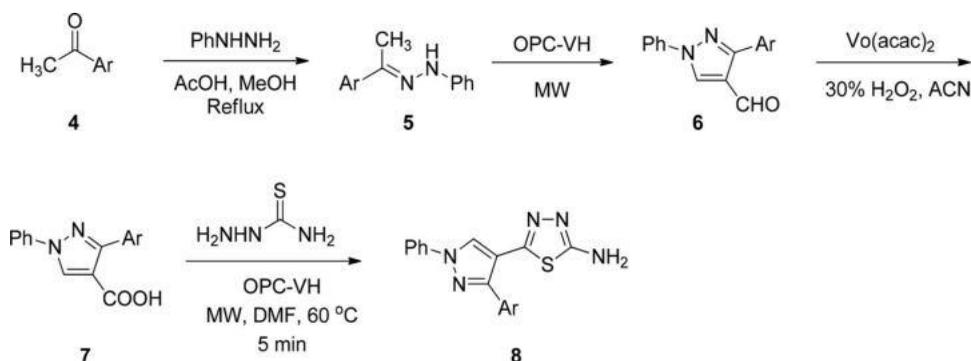
<sup>c</sup>Benzoic acid (1 equiv.), thiosemicarbazide (1.1 equiv.), o-phthaloyl dichloride (2.5 equiv.), acetonitrile, 60 °C, 6 hours.

**Table 2.** Scope of the microwave-assisted OPC-VH synthesis of 2-amino-1,3,4-thiadiazoles **3a-j**.

Entry	Product	R	Yield (%)	m.p (Lit.) <sup>33</sup>	CAS No.
1	<b>3a</b>	C <sub>6</sub> H <sub>5</sub>	85	223-224 (227-230)	2002-03-1
2	<b>3b</b>	4-ClC <sub>6</sub> H <sub>4</sub>	81	228-230 (229-231)	28004-62-8
3	<b>3c</b>	4-BrC <sub>6</sub> H <sub>4</sub>	79	232-234 (228-232)	13178-12-6
4	<b>3d</b>	4-FC <sub>6</sub> H <sub>4</sub>	86	240-242 (238-241)	942-70-1
5	<b>3e</b>	(CH <sub>3</sub> ) <sub>3</sub> C-	75	185-187 (181-185)	39222-73-6
6	<b>3f</b>	4-Py	72	238-240 (242-246)	2002-04-2
7	<b>3g</b>	4-CH <sub>3</sub> Bz	87	205-207 (207-212)	39181-45-8
8	<b>3h</b>	4-ClBz	83	196-198 (195-197)	39181-43-6
9	<b>3i</b>	4-BrBz	80	208-210 (206-210)	329921-62-2
10	<b>3j</b>	4-FBz	84	201-203 (202-207)	39181-55-0

The formation of the desired product **3a** in 60% yield within 5 minutes at the same temperature demonstrated the efficiency of microwave irradiation in this setting (entry 5, Table 1). In the absence of OPC-VH reagent, no product was observed. The reaction carried out in dry DMF at 60 °C for 5 minutes in microwave irradiation was best as it gave 85% yield (entry 9). We thus extended the reaction conditions of entry 9 of Table 1 to further exploration of preparing compounds **3** having different substituents at the 5-position. The results are summarized in Table 2. Under the optimized conditions, the yields of isolated 1,3,4-thiadiazole derivatives **3a-j** were uniformly good (72 – 87%) and did not depend much on the given substituents.

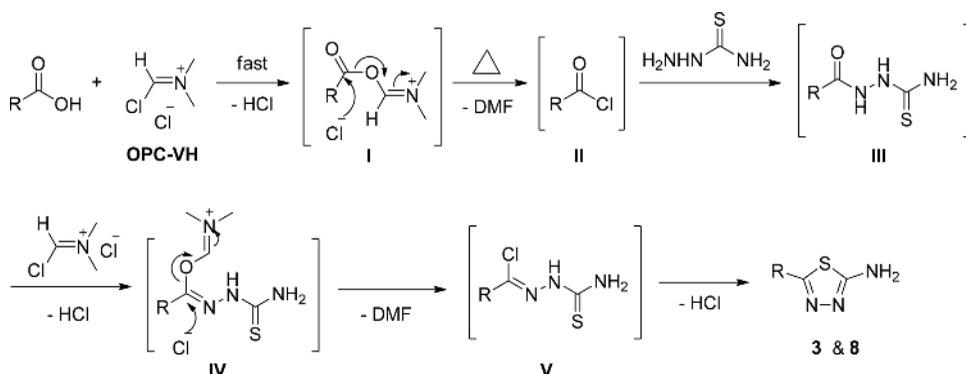
The investigation was further extended to prepare a series of pyrazolylthiadiazoles **8a-e**. The pyrazole-4-carboxylic acids **7** needed were prepared from pyrazole-4-carbaldehydes **6** using vanadium catalyst in the presence of 30% H<sub>2</sub>O<sub>2</sub> in acetonitrile as shown in Scheme 3.<sup>34</sup> The treatment of aryl methyl ketones **4** with phenylhydrazine in refluxing methanol using acidic conditions afforded the corresponding hydrazones **5**. The microwave-assisted cyclization of hydrazones **5** using OPC-VH reagent in DMF at 60 °C within 10 minutes afforded the corresponding pyrazole-4-carbaldehydes **6**.<sup>35</sup> The pyrazole-4-carboxylic acids **7** were further subjected to the optimal reaction conditions



**Scheme 3.** Microwave synthesis of pyrazolythiadiazoles **8a-e** using Vilsmeier–Haack reagent (OPC-VH).

**Table 3.** Yield of a series of pyrazolythiadiazoles **8a-e**.

Entry	Product	Ar	Yield %	Formula
1	<b>8a</b>	C <sub>6</sub> H <sub>5</sub>	75	C <sub>17</sub> H <sub>13</sub> N <sub>5</sub> S
2	<b>8b</b>	4-FC <sub>6</sub> H <sub>4</sub>	85	C <sub>17</sub> H <sub>12</sub> FN <sub>5</sub> S
3	<b>8c</b>	4-ClC <sub>6</sub> H <sub>4</sub>	79	C <sub>17</sub> H <sub>12</sub> ClN <sub>5</sub> S
4	<b>8d</b>	4-BrC <sub>6</sub> H <sub>4</sub>	76	C <sub>17</sub> H <sub>12</sub> BrN <sub>5</sub> S
5	<b>8e</b>	4-EtC <sub>6</sub> H <sub>4</sub>	82	C <sub>19</sub> H <sub>17</sub> N <sub>5</sub> S



**Scheme 4.** Plausible mechanism of the OPC-VH mediated synthesis of 2-amino-1,3,4-thiadiazoles **3** and **8**.

used for **3a** to obtain novel pyrazole-1,3,4-thiadiazoles **8** in good yield (75–85%) and the results are summarized in [Table 3](#). Compounds **8** were rigorously characterized.

The IR spectrum of 5-(1,3-diphenyl-1*H*-pyrazol-4-yl)-1,3,4-thiadiazole-2-amine **8a** showed bands at 3321 and 3265 cm<sup>-1</sup> (NH stretching), 1632 (C=C), 1598 (C=N thiadiazole) and 698 (C-S-C). In the <sup>1</sup>H NMR spectra, compound **8a** showed a singlet at  $\delta$  6.89 due to the –NH<sub>2</sub> protons. In the <sup>13</sup>C NMR spectra, the C=N carbons appeared at  $\delta$  173.1 and 160.2, deshielded due to the adjacent sulfur atom. The mass spectral analysis of **8a** showed the molecular ion peak at  $m/z$  320.19 (M + H)<sup>+</sup>.

In considering a plausible mechanism ([Scheme 4](#)), we believe that the intermediate **I** might be quickly formed in the reaction of the carboxylic acid with the OPC-VH reagent. After that, the chloride anion attacks the intermediate **I** to afford the acid chloride **II**. On reacting with thiosemicarbazide the acid chloride yields thiosemicarbazone **III**. The subsequent reaction of thiosemicarbazone **III** with OPC-VH reagent forms intermediate **IV**, on

which chloride ion attacks to produce the intermediate **V**. Upon cyclization compound **3** or **8** is obtained.

In summary, an efficient microwave assisted OPC-VH mediated synthesis of 2-amino-5-substituted-1,3,4-thiadiazoles from corresponding carboxylic acids has been reported. The operational simplicity, avoidance of toxic materials, easy work up and feedback into the process of a generated by-product are the advantages of this approach. Given the practicality of this method, it is our hope that pyrazolythiadiazole-2-amines can be further investigated for the development of pyrazole-based drugs.

## Experimental section

Melting points were determined in open glass capillaries on a Fisher-Johns melting point apparatus and are uncorrected.  $^1\text{H}$  NMR (400MHz) spectra were recorded at room temperature in  $\text{CDCl}_3$  as solvent and tetramethylsilane (TMS) as an internal standard. Coupling constants ( $J$ ) are reported in Hz; those for common alkyl groups were in the expected range and are not separately marked.  $^{13}\text{C}$  NMR (100 MHz) spectra were recorded in  $\text{CDCl}_3$  solutions with TMS as internal standard. The mass spectra were recorded on a JOEL JMS 600 mass spectrometer at an ionizing potential of 70eV (EI) in the electron impact ionization mode using the direct inlet system. All the reactions were monitored by thin-layer chromatography (TLC) on pre-coated silica gel 60 F254 (mesh); spots were visualized under UV light at 254 nm. Elemental analyses were obtained using a Carlo Erba EA1108 microanalyzer. Microwave irradiation was done using an Anton Paar Monowave-300 Reactor (Gaas, Austria), operating at a frequency of 2.455 GHz with continuous irradiation power of 0 to 850W.

### *Synthesis of 2-amino-5-substituted-1,3,4-thiadiazoles (3 and 8)*

These compounds were synthesized using an Anton Paar Monowave-300 Reactor (Gaas, Austria), operating at a frequency of 2.455 GHz with continuous irradiation power of 0 to 850W. The reactions were carried out in a G-4 borosilicate glass vial sealed with a Teflon septum and placed in a microwave cavity. Sufficient power was used to ramp up from room temperature to the desired temperature. Once this temperature was attained, the process vial was held at this temperature for the required time. The reactions were continuously stirred. Temperature was measured by an IR sensor. After the experiments, a cooling jet cooled the reaction vessel to ambient temperature.

For the representative preparation of compound **3a**, to a mixture of benzoic acid (0.10 g, 0.82 mmol) and thiosemicarbazide (0.082 g, 0.90 mmol) in DMF (5.0 ml) in a microwave vial was added OPC-VH (2.05 mmol) at room temperature and the mixture was stirred for 1 min. The vial was sealed with the Teflon septum and aluminium crimp, using an appropriate crimping tool. The vial was then subjected to microwave irradiation, and the temperature was ramped from room temperature to 60 °C with the holding time of 5 min. The reaction was then brought to room temperature, and the crude product was poured into ice water (approximately 15 mL), then extracted with ethyl acetate (2 x 15 mL). The organic layer was washed with brine solution (2 x 15 mL). The organic layer was dried over anhydrous  $\text{Na}_2\text{SO}_4$ , filtered and the filtrate was

concentrated under reduced pressure to afford crude 5-phenyl-1,3,4-thiadiazol-2-amine **3a**. The crude compound was purified by column chromatography using silica gel (100-200 mesh, eluting solvent 10% ethyl acetate in pet-ether) and concentrated under reduced pressure to afford 5-phenyl-1,3,4-thiadiazol-2-amine **3a** as an off white solid in 85% yield. Compounds **3** are known materials, identified on the basis of comparing their melting points with those available in the literature, as specified in Table 2.

For the preparation of representative compound **8a**, the known compound 1,3-diphenyl-1*H*-pyrazole-4-carboxylic acid **7a**<sup>34</sup> (0.200 g, 0.76 mmol) was mixed with thiosemicarbazide (0.076 g, 0.84 mmol) in DMF (5.0 ml) in a microwave vial, to which was added OPC-VH (2.05 mmol) at room temperature, and the mixture was stirred for 1 min. The vial was sealed with the Teflon septum and aluminium crimp, using an appropriate crimping tool. The vial was then subjected to microwave irradiation, and the temperature was ramped from room temperature to 60 °C with the holding time of 5 min. The reaction was then brought to room temperature, and the crude product was poured into ice (approximately 25 g), then extracted with ethyl acetate (2 x 20 mL). The organic layer was washed with brine solution (2 x 15 mL). The organic layer was dried over anhydrous Na<sub>2</sub>SO<sub>4</sub>, filtered and the filtrate was concentrated under reduced pressure to afford crude compound **8a**. The crude compound was purified by column chromatography using silica gel (100-200 mesh, eluting solvent 12% ethyl acetate in pet-ether) and concentrated under reduced pressure to afford 5-(1,3-diphenyl-1*H*-pyrazol-4-yl)-1,3,4-thiadiazol-2-amine **8a** as an off white solid in 75% yield.

The other derivatives **8b-e** were prepared by following the above procedure. Compounds **8** are novel and were fully characterized as shown below.

#### **5-(1,3-Diphenyl-1*H*-pyrazol-4-yl)-1,3,4-thiadiazol-2-amine (8a)**

Off white solid; 75% yield; mp 225-227 °C; TLC solvent system: 20% EtOAc in pet-ether, Rf: 0.5; IR (KBr)  $\nu$  cm<sup>-1</sup>: 3321, 3265 (NH Str.), 1632 (C=C), 1598 (C=N thiadiazole), 698 (C-S-C); <sup>1</sup>H NMR (CDCl<sub>3</sub>, 400 MHz):  $\delta$  8.89 (s, 1H, Pyrazole-*H*), 7.23-7.80 (m, 10H, Ar*H*), 6.89 (s, 2H, NH<sub>2</sub>). <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>):  $\delta$  173.1, 160.2, 144.5, 142.6, 138.9, 131.2, 129.1, 128.9, 128.2, 127.1, 125.8, 118.1, 102.9. ESI-MS (m/z): 320.19 [M + H]<sup>+</sup>.

*Anal.* Calcd for C<sub>17</sub>H<sub>13</sub>N<sub>5</sub>S: C, 63.93; H, 4.10. Found: C, 63.89; H, 4.07.

#### **5-(3-(4-Fluorophenyl)-1-phenyl-1*H*-pyrazol-4-yl)-1,3,4-thiadiazol-2-amine (8b)**

Off white solid, 85% yield; mp 218-220 °C; TLC solvent system: 20% EtOAc in pet-ether, Rf: 0.4; IR (KBr)  $\nu$  cm<sup>-1</sup>: 3318, 3271 (NH Str.), 1630 (C=C), 1597 (C=N thiadiazole), 697 (C-S-C); <sup>1</sup>H NMR (CDCl<sub>3</sub>, 400 MHz):  $\delta$  8.90 (s, 1H, Pyrazole-*H*), 7.21-8.01 (m, 9H, Ar*H*), 6.85 (s, 2H, NH<sub>2</sub>). <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>):  $\delta$  173.4, 162.3, 160.4, 145.5, 143.1, 131.3, 130.2, 129.1, 128.3, 125.9, 118.9, 115.2, 102.9. ESI-MS (m/z): 338.36 [M + H]<sup>+</sup>.

*Anal.* Calcd for C<sub>17</sub>H<sub>12</sub>FN<sub>5</sub>S: C, 60.52; H, 3.59. Found: C, 60.69; H, 3.56.

#### **5-(3-(4-Chlorophenyl)-1-phenyl-1*H*-pyrazol-4-yl)-1,3,4-thiadiazol-2-amine (8c)**

White solid, 79% yield; mp 258-260 °C; TLC solvent system: 20% EtOAc in pet-ether, Rf: 0.45; IR (KBr)  $\nu$  cm<sup>-1</sup>: 3321, 3287 (NH Str.), 1631 (C=C), 1597 (C=N

thiadiazole), 698 (C-S-C);  $^1\text{H}$  NMR ( $\text{CDCl}_3$ , 400 MHz):  $\delta$  8.92 (s, 1H, Pyrazole-*H*), 7.31-7.75 (m, 9H, Ar*H*), 6.81 (s, 2H,  $\text{NH}_2$ ).  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ ):  $\delta$  172.8, 161.2, 145.4, 143.3, 133.8, 131.1, 130.8, 129.1, 129.0, 128.3, 125.8, 118.7, 102.9. ESI-MS (*m/z*): 356.11 [ $\text{M} + \text{H}$ ,  $^{37}\text{Cl}$ ] $^+$ , 354.09 [ $\text{M} + \text{H}$ ,  $^{35}\text{Cl}$ ] $^+$ .

*Anal.* Calcd for  $\text{C}_{17}\text{H}_{12}\text{ClN}_5\text{S}$ : C, 57.71; H, 3.42. Found: C, 57.65; H, 3.39.

### 5-(3-(4-Bromophenyl)-1-phenyl-1*H*-pyrazol-4-yl)-1,3,4-thiadiazol-2-amine (8d)

White solid, 76% yield; mp 269-271 °C; TLC solvent system: 20% EtOAc in pet-ether, Rf: 0.52; IR (KBr)  $\nu$   $\text{cm}^{-1}$ : 3334, 3286 (NH Str.), 1629 (C=C), 1596 (C=N thiadiazole), 697 (C-S-C);  $^1\text{H}$  NMR ( $\text{CDCl}_3$ , 400 MHz):  $\delta$  8.86 (s, 1H, Pyrazole-*H*), 7.36-7.78 (m, 9H, Ar*H*), 6.85 (s, 2H,  $\text{NH}_2$ ).  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ ):  $\delta$  172.3, 161.3, 145.5, 143.3, 131.8, 131.7, 130.9, 129.1, 128.3, 125.9, 122.7, 118.9, 102.8. ESI-MS (*m/z*): 400.17 [ $\text{M} + \text{H}$ ,  $^{81}\text{Br}$ ] $^+$ , 398.19 [ $\text{M} + \text{H}$ ,  $^{79}\text{Br}$ ] $^+$ .

*Anal.* Calcd for  $\text{C}_{17}\text{H}_{12}\text{BrN}_5\text{S}$ : C, 51.27; H, 3.04. Found: C, 51.19; H, 3.01.

### 5-(3-(4-Ethylphenyl)-1-phenyl-1*H*-pyrazol-4-yl)-1,3,4-thiadiazol-2-amine (8e)

Off white solid; 82% yield; mp 212-214 °C; TLC solvent system: 20% EtOAc in pet-ether, Rf: 0.55; IR (KBr)  $\nu$   $\text{cm}^{-1}$ : 3309, 3251 (NH Str.), 1625 (C=C), 1593 (C=N thiadiazole), 697 (C-S-C);  $^1\text{H}$  NMR ( $\text{CDCl}_3$ , 400 MHz):  $\delta$  8.91 (s, 1H, Pyrazole-*H*), 7.16-7.51 (m, 9H, Ar*H*), 6.77 (s, 2H,  $\text{NH}_2$ ), 2.56 (q, 2H,  $\text{CH}_2$ ), 1.28 (t, 3H,  $\text{CH}_3$ ).  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ ):  $\delta$  172.9, 160.7, 144.5, 143.8, 142.6, 131.3, 129.9, 128.9, 128.5, 126.1, 125.3, 118.1, 102.9, 30.3, 15.3. ESI-MS (*m/z*): 348.49 [ $\text{M} + \text{H}$ ] $^+$ .

*Anal.* Calcd for  $\text{C}_{19}\text{H}_{17}\text{N}_5\text{S}$ : C, 65.68; H, 4.93. Found: C, 65.61; H, 4.89.

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## Microwave-Assisted Iodotrimethylsilane-Promoted Synthesis of Novel Pyrazolyl Chalcones

Anil Kumar, Shikha Kashver, Kajal Sharma, Parmod Kumar, Vandana Devi, Anil Kumar & Karan Singh

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## Microwave-Assisted Iodotrimethylsilane-Promoted Synthesis of Novel Pyrazolyl Chalcones

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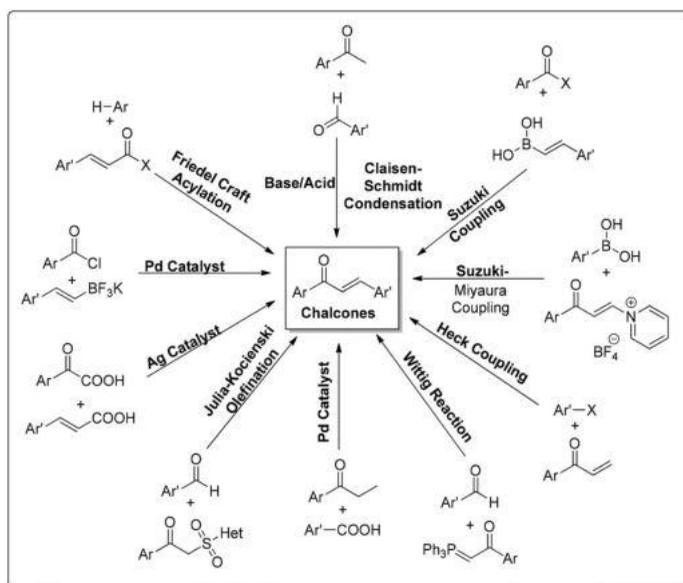
The presence of heterocyclic units as central structural features in both natural products and synthetic molecules has been long recognized in preparative organic chemistry.<sup>1</sup> Among heterocycles, some pyrazoles have been successfully commercialized as medicines or pesticides,<sup>2–5</sup> and, as a class, pyrazoles exhibit a wide range of pharmacological properties. The latter represent remarkably divergent areas, including antimalarial, anti-glaucoma, antihypercholesterolemia, antihyperglycemic, antihypertensive, analgesic, anti-Parkinson, antipsychotic, antimicrobial, anti-inflammatory, anticonvulsant, anticancer, and estrogen receptor (ER) ligand activities.<sup>4–10</sup> Consequently, pyrazole chemistry is a mature field and occupies a prime place in organic synthesis.<sup>11</sup>

Chalcones are key synthons used to design heterocyclic compounds in drug development. It is believed that the broad range of biological activities of chalcones is due, at least in part, to the presence of the ethylene unit in conjugation with the carbonyl functionality, as removal of this functionality makes them inactive. Such biological properties as anticancer,<sup>12–14</sup> anti-oxidant,<sup>15–18</sup> anti-inflammatory,<sup>19–21</sup> antimicrobial,<sup>22</sup> antitubercular,<sup>23</sup> antileishmanial,<sup>24</sup> antimalarial,<sup>25</sup> anthelmintic,<sup>16</sup> and osteogenic<sup>26</sup> activities of chalcones are well known in the literature. The synthesis of chalcones remains a crucial area of research for synthetic organic and medicinal chemists. Several synthetic protocols are reported in the literature for the synthesis of chalcones (Figure 1). The most common involves acid or base mediated Claisen-Schmidt condensation under homogeneous conditions.<sup>27,28</sup> The search for new synthetic protocols with such advantages as shortened reaction times, high yields, and eco-friendliness remains challenging.<sup>29</sup> The advent of microwave-assisted synthesis of heterocyclic compounds has the potential to assist in this search because it offers many of the needed advantages.<sup>30–34</sup>

In our ongoing investigations into the synthesis of pyrazoles<sup>35–47</sup> we have considered Me<sub>3</sub>SiI in its role as a promising promoter and water scavenger. We now report an

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**Figure 1.** Some synthetic methods used for chalcone synthesis.

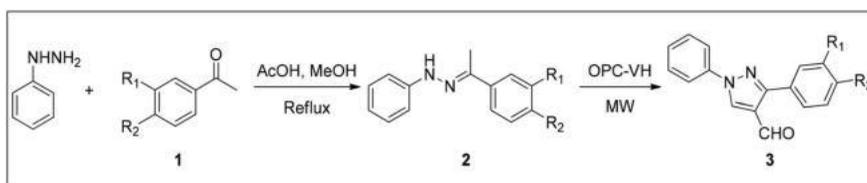
optimized microwave-assisted  $\text{Me}_3\text{SiI}$ -promoted synthetic procedure for pyrazolyl chalcones.

This closely relates to our prior work on the Vilsmeier-Haack reagent OPC-VH (prepared from phthaloyl dichloride (OPC) and DMF), enabling in a convenient way the reaction of acetophenone hydrazones to give 4-formylpyrazoles **3** (Scheme 1).<sup>35,41,48,49</sup>

Having in hand the 4-formylpyrazoles **3** prepared by this method, we sought to use them to prepare the title pyrazolyl chalcones. First, as a model, 1,3-diphenyl-1*H*-pyrazole-4-carbaldehyde **3a** (1.0 equiv.) was subjected to Claisen-Schmidt condensation with propiophenone (1.2 equiv.) to prepare pyrazolyl chalcone **5a** under the conditions noted in Table 1. Under a variety of conventional conditions (Entries 1-6) compound **5a** was formed only in yields of 30-45%. The use of dimethylformamide (DMF), higher temperatures and  $\text{Me}_3\text{SiI}$  offered encouraging improvements in the yield (Entries 7-12). Finally, the reaction of **3a** and propiophenone with 3 equivalents of  $\text{Me}_3\text{SiI}$  in DMF for 10 min at 100 °C using microwave irradiation gave 88% of the pyrazolyl chalcone **5a** (Entry 13). The great reduction in reaction time made possible by microwave irradiation is noteworthy.

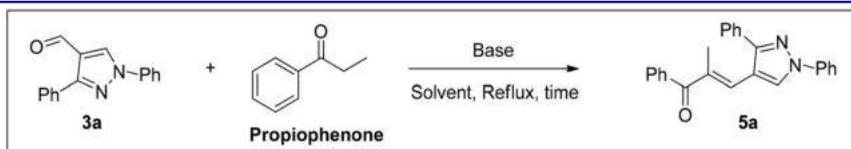
Having established the optimized reaction conditions, we extended the scope and generality of the procedure with different substituents at the aryl moieties as shown in Table 2. Each of the pyrazolyl chalcones **5a-l** could easily be prepared within 15 minutes (yields 76-93%, mean 85%). It was found that the reactions proceeded smoothly when either electron donating or withdrawing groups were present at the aryl rings. All of the novel compounds were rigorously characterized (see Experimental section).

In summary, this study presents a microwave-assisted iodotrimethylsilane-promoted synthesis of novel pyrazolyl chalcones. Hallmarks of this method include operational simplicity, easy work up procedures, very good yields and short reaction times. Now that pyrazolyl chalcones are readily available with the structural complexity



**Scheme 1.** Synthesis of 4-formylpyrazoles **3** using microwave assisted OPC-VH reaction.

**Table 1.** Optimization of reaction conditions.



Entry	Method <sup>b</sup>	Base (equiv.)	Solvent	Time (h)	Temperature (°C)	<b>5a</b> yield (%) <sup>a</sup>
1	A	–	MeOH	24	Reflux	NR
2	A	NaOMe (1.0)	MeOH	7	Reflux	30
3	A	NaOEt (1.0)	EtOH	7	Reflux	33
4	A	NaOH (1.0)	MeOH	6	Reflux	37
5	A	KOH (1.0)	MeOH	6	Reflux	45
6	A	Piperidine (2.0)	EtOH	24	Reflux	32
7	A	Me <sub>3</sub> Sil (2.0)	DMF	18	60°C	61
8	A	Me <sub>3</sub> Sil (2.0)	DMF	14	80°C	63
9	A	Me <sub>3</sub> Sil (2.0)	DMF	10	100°C	68
10	A	Me <sub>3</sub> Sil (2.0)	DMF	10	120°C	67
11	A	Me <sub>3</sub> Sil (3.0)	DMF	10	100°C	71
12	A	Me <sub>3</sub> Sil (4.0)	DMF	10	100°C	69
13	B	Me <sub>3</sub> Sil (3.0)	DMF	10 min	100°C	88

Reaction Condition: Compound **3a** (1 eq.), propiophenone (1.2 eq.), Base, Solvent, time, temperature.

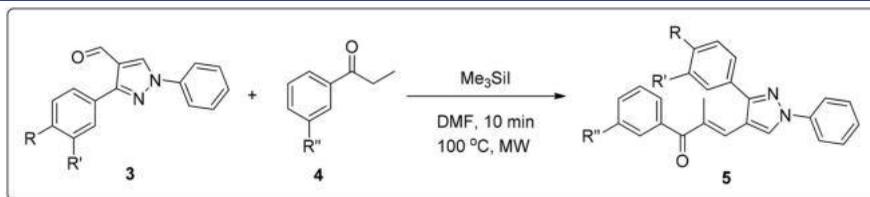
<sup>a</sup>Isolated yields.

<sup>b</sup>Conventional heating (Method A) and Microwave irradiation (Method B).

demonstrated here, we hope that our methods will promote further investigation of their useful properties.

## Experimental section

Chemicals were obtained from commercial sources and used without further purification. Melting points were determined in open glass capillaries on a Fisher-Johns melting point apparatus and are uncorrected. <sup>1</sup>H NMR (400 MHz) spectra were recorded at room temperature in CDCl<sub>3</sub> as solvent and tetramethylsilane (TMS) as an internal standard. Coupling constants (*J*) are reported in Hz; those for common alkyl groups were in the expected range and are not separately marked. <sup>13</sup>C NMR (100 MHz) spectra were recorded in CDCl<sub>3</sub> solutions with TMS as internal standard. The mass spectra were recorded on a JOEL JMS 600 mass spectrometer at an ionizing potential of 70eV (EI) in the electron impact ionization mode using the direct inlet system. All the reactions were monitored by thin-layer chromatography (TLC) on pre-coated silica gel 60 F254 (mesh); spots were visualised under UV light at 254 nm. Elemental analyses were obtained using a Carlo Erba EA1108 microanalyzer. Infrared (IR) spectra were obtained

**Table 2.** Microwave assisted synthesis of Pyrazole based Chalcones (**5**)<sup>a</sup>.

Entry <sup>c</sup>	Product	R	R'	R''	%Yield <sup>b</sup>
1	<b>5a</b>	H	H	H	88
2	<b>5b</b>	Cl	H	H	79
3	<b>5c</b>	CH <sub>3</sub>	H	H	78
4	<b>5d</b>	F	Br	H	87
5	<b>5e</b>	OCH <sub>3</sub>	H	H	90
6	<b>5f</b>	Br	H	H	87
7	<b>5g</b>	H	H	Cl	76
8	<b>5h</b>	Cl	H	Cl	78
9	<b>5i</b>	CH <sub>3</sub>	H	Cl	89
10	<b>5j</b>	F	Br	Cl	86
11	<b>5k</b>	OCH <sub>3</sub>	H	Cl	87
12	<b>5l</b>	Br	H	Cl	93

<sup>a</sup>Reaction conditions: 1*H*-Pyrazole-4-carbaldehyde **3** (1.0 equiv.), propiophenone **4** (1.2 equiv.) and Me<sub>3</sub>SiI (3.0 equiv.), DMF (3 mL), 100 °C, 10 min, MW.

<sup>b</sup>Yields of isolated products **5** with respect to **3**.

<sup>c</sup>All the products were duly characterized by <sup>1</sup>H NMR, <sup>13</sup>C NMR, Mass, IR and elemental analysis.

on the Shimadzu FTIR spectrophotometer using KBr and only functional group frequencies are given in cm<sup>-1</sup>.

### 1,3-Disubstituted-4-formylpyrazoles<sup>35</sup>

Vilsmeier-Haack reagent (OPC-VH reagent)<sup>35</sup> (0.73 g, 5.76 mmol) at 0 °C was added to a solution of the appropriate hydrazone **2** (1.92 mmol) in dimethylformamide (10 mL) in a microwave vial. The vial was closed with a Teflon septum and aluminium crimp by using a suitable crimping tool. The vial was then irradiated in the microwave and the temperature was steadily raised from room temperature to 60 °C in the interval of 10 minutes. The reaction mixture was cooled down and the crude product was poured into ice water. The crude product was neutralized with saturated NaHCO<sub>3</sub> solution and extraction of the target compound was done with ethyl acetate (2 × 50 mL). The ethyl acetate layer was washed with brine solution (2 × 15 mL), then dried over anhyd. Na<sub>2</sub>SO<sub>4</sub>, filtered and the solvent was evaporated under reduced pressure to afford crude compound **3** which was recrystallized with refluxing CHCl<sub>3</sub>-EtOH. The physical data of all 4-formylpyrazoles are provided in Table 3.

### 3-(3-Aryl-1-phenyl-1*H*-pyrazol-4-yl)-2-methyl-1-phenylprop-2-en-1-ones (**5**)

#### Method A (Conventional conditions)

Propiophenone (0.064 g, 0.48 mmol) and 1,3-diphenyl-1*H*-pyrazole-4-carbaldehyde (0.10 g, 0.40 mmol) were placed in a 20 mL tube and dissolved in DMF (5.0 mL).

**Table 3.** Physical data of 4-formylpyrazoles (**3a-f**).

Entry	Compound	R	Mol. Formula	Mol. Wt	%Yield	m.p. <sup>35</sup>
1	<b>3a</b>	H	C <sub>16</sub> H <sub>12</sub> N <sub>2</sub> O	248.28	85	142-145
2	<b>3b</b>	4-Cl	C <sub>16</sub> H <sub>11</sub> ClN <sub>2</sub> O	282.72	88	109-111
3	<b>3c</b>	4-CH <sub>3</sub>	C <sub>17</sub> H <sub>14</sub> N <sub>2</sub> O	262.31	87	99-101
4	<b>3d</b>	3-Br,4-F	C <sub>16</sub> H <sub>10</sub> BrFN <sub>2</sub> O	345.17	91	128-130
5	<b>3e</b>	4-OCH <sub>3</sub>	C <sub>17</sub> H <sub>14</sub> N <sub>2</sub> O <sub>2</sub>	278.31	79	134-136
6	<b>3f</b>	4-Br	C <sub>16</sub> H <sub>11</sub> BrN <sub>2</sub> O	327.18	78	155-157

Iodotrimethylsilane (TMSI) (0.24 g, 1.20 mmol) was added dropwise to the solution. The tube was sealed tightly and heated at 100 °C for 10 h. The reaction progress was monitored by TLC (20% ethyl acetate in pet ether). On completion, the sealed tube was cooled and the reaction mixture was poured onto crushed ice. The organic compound was extracted into ethyl acetate (2 x 50 mL). The organic layer was washed with brine solution (2 x 20 mL). The organic layer was dried over anhydrous Na<sub>2</sub>SO<sub>4</sub>, filtered and the filtrate was concentrated under reduced pressure to afford crude 3-(1,3-diphenyl-1H-pyrazol-4-yl)-2-methyl-1-phenylprop-2-en-1-one **5a**. The crude compound was purified by column chromatography using silica gel (100-200 mesh, 10% ethyl acetate in pet-ether) and afforded **5a** as an off-white solid in 71% yield.

#### **Method B (Microwave irradiation)**

All compounds **5** were synthesized using an Anton Paar Monowave-300 reactor (Gaes, Austria), operating at a frequency of 2.455 GHz with continuous irradiation power of 0 to 850W. The reactions were carried out in a G-4 borosilicate glass vial sealed with a Teflon septum and placed in a microwave cavity. Sufficient power was used to ramp up from room temperature to the desired temperature. Once this temperature was attained, the process vial was held at this temperature for the required time. The reactions were continuously stirred. Temperature was measured by an IR sensor. After the experiments, a cooling jet cooled the reaction vessel to ambient temperature. In a representative case, to a mixture of propiophenone (0.064 g, 0.48 mmol) and 1,3-diphenyl-1H-pyrazole-4-carbaldehyde (0.10 g, 0.40 mmol) in DMF (3.0 ml) in a microwave vial was added TMSI (0.24 g, 1.20 mmol) at room temperature and the mixture was stirred for 1 min. The vial was sealed with the Teflon septum and aluminium crimp, using an appropriate crimping tool. The vial was then subjected to microwave irradiation and the temperature was ramped from room temperature to 100 °C with the holding time of 10 min. The reaction was brought to room temperature, and the reaction mixture was poured into ice-water, and then extracted with ethyl acetate (2 x 20 mL). The organic layer was washed with brine solution (2 x 10 mL). The organic layer was dried over anhydrous Na<sub>2</sub>SO<sub>4</sub>, filtered and the filtrate was concentrated under reduced pressure to afford crude **5a**. The crude compound was purified as before to afford as an off-white solid in 88% yield.

#### **3-(1,3-Diphenyl-1H-pyrazol-4-yl)-2-methyl-1-phenylprop-2-en-1-one (5a)**

Off white solid; 88% yield; m.p. 126-128 °C. TLC solvent system: 20% EtOAc in pet-ether, Rf: 0.7. IR (KBr)  $\nu$  cm<sup>-1</sup>: 1685 (C=O), 1652 (C=N), 1621 (C=C); <sup>1</sup>H NMR

(CDCl<sub>3</sub>, 400 MHz):  $\delta$  8.24 (s, 1H, Pyrazole-H), 7.81 (d,  $J = 7.8$  Hz, 2H, ArH), 7.68 (d,  $J = 7.8$  Hz, 2H, ArH), 7.60 (dd,  $J = 7.5$  & 1.8 Hz, 2H, ArH), 7.33-7.53 (m, 9H, ArH), 7.23 (s, 1H, =CH), 2.30 (s, 3H, =C-CH<sub>3</sub>). <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>):  $\delta$  190.1 (C=O), 151.2 (C=N), 139.3, 139.1, 138.9, 138.3, 133.8, 132.9, 130.1, 129.1, 129.0, 128.9, 128.3, 128.1, 127.1, 125.7, 119.2, 112.6, 10.1 (CH<sub>3</sub>). ESI-MS ( $m/z$ ): 365.19 [M + H]<sup>+</sup>.

*Anal.* Calcd for C<sub>25</sub>H<sub>20</sub>N<sub>2</sub>O: C, 82.39; H, 5.53. Found: C, 82.07; H, 5.51.

### **3-(3-(4-Chlorophenyl)-1-phenyl-1H-pyrazol-4-yl)-2-methyl-1-phenylprop-2-en-1-one (5b)**

Light yellow solid, 79% yield; m.p. 157-159 °C. TLC solvent system: 20% EtOAc in pet-ether, Rf: 0.8. IR (KBr)  $\nu$  cm<sup>-1</sup>: 1687 (C=O), 1648 (C=N), 1619 (C=C); <sup>1</sup>H NMR (CDCl<sub>3</sub>, 400 MHz):  $\delta$  8.23 (s, 1H, Pyrazole-H), 7.79 (d,  $J = 8.4$  Hz, 2H, ArH), 7.68 (d,  $J = 8.4$  Hz, 2H, ArH), 7.49-7.55 (m, 5H, ArH), 7.43 (t,  $J = 7.6$  Hz, 2H, ArH), 7.33-7.38 (m, 3H, ArH), 7.16 (s, 1H, =CH), 2.30 (s, 3H, =C-CH<sub>3</sub>). <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>):  $\delta$  190.2 (C=O), 150.1 (C=N), 139.5, 139.3, 138.9, 138.4, 134.2, 133.9, 130.1, 129.2, 129.1, 129.0, 128.3, 128.1, 127.1, 125.9, 119.4, 112.5, 10.2 (CH<sub>3</sub>). ESI-MS ( $m/z$ ): 401.15 [M + H, <sup>37</sup>Cl]<sup>+</sup>, 399.25 [M + H, <sup>35</sup>Cl]<sup>+</sup>.

*Anal.* Calcd for C<sub>25</sub>H<sub>19</sub>ClN<sub>2</sub>O: C, 75.28; H, 4.80. Found: C, 74.89; H, 4.67.

### **2-Methyl-1-phenyl-3-(1-phenyl-3-(p-tolyl)-1H-pyrazol-4-yl)prop-2-en-1-one (5c)**

Light green solid, 78% yield; m.p. 124-126 °C. TLC solvent system: 20% EtOAc in pet-ether, Rf: 0.8. IR (KBr)  $\nu$  cm<sup>-1</sup>: 1690 (C=O), 1649 (C=N), 1625 (C=C); <sup>1</sup>H NMR (CDCl<sub>3</sub>, 400 MHz):  $\delta$  8.23 (s, 1H, Pyrazole-H), 7.80 (dd,  $J = 8.8$  & 1.2 Hz, 2H, ArH), 7.68 (dd,  $J = 8.4$  & 1.6 Hz, 2H, ArH), 7.48-7.52 (m, 5H, ArH), 7.44 (t,  $J = 7.6$  Hz, 2H, ArH), 7.35 (t,  $J = 7.6$  Hz, 1H, ArH), 7.24 (s, 1H, =CH), 7.18 (d,  $J = 7.6$  Hz, 2H, ArH), 2.37 (s, 3H, ArCH<sub>3</sub>), 2.30 (d,  $J = 1.2$  Hz, 3H, =C-CH<sub>3</sub>). <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>):  $\delta$  190.1 (C=O), 149.3 (C=N), 139.5, 139.3, 138.9, 138.2, 134.1, 131.1, 130.5, 130.1, 129.4, 129.2, 129.1, 128.3, 128.1, 125.9, 119.3, 112.6, 21.1 (Ar-CH<sub>3</sub>), 10.2 (CH<sub>3</sub>). ESI-MS ( $m/z$ ): 379.10 [M + H]<sup>+</sup>.

*Anal.* Calcd for C<sub>26</sub>H<sub>22</sub>N<sub>2</sub>O: C, 82.51; H, 5.86. Found: C, 82.19; H, 5.83.

### **3-(3-(3-Bromo-4-fluorophenyl)-1-phenyl-1H-pyrazol-4-yl)-2-methyl-1-phenylprop-2-en-1-one (5d)**

Light brown solid, 87% yield; m.p. 152-154 °C. TLC solvent system: 20% EtOAc in pet-ether, Rf: 0.8. IR (KBr)  $\nu$  cm<sup>-1</sup>: 1681 (C=O), 1651 (C=N), 1620 (C=C); <sup>1</sup>H NMR (CDCl<sub>3</sub>, 400 MHz):  $\delta$  8.22 (s, 1H, Pyrazole-H), 7.77-7.83 (m, 3H, ArH), 7.68 (d,  $J = 8.0$  Hz, 2H, ArH), 7.44-7.54 (m, 6H, ArH), 7.37 (t,  $J = 7.6$  Hz, 1H, ArH), 7.10-7.15 (m, 2H, ArH, =CH), 2.30 (d,  $J = 1.2$  Hz, 3H, =C-CH<sub>3</sub>). <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>):  $\delta$  189.3 (C=O), 164.1 (Ar-F), 149.9 (C=N), 139.3, 139.1, 138.8, 138.1, 134.1, 133.9, 130.5, 130.2, 129.5, 129.2, 129.1, 128.3, 125.9, 119.3, 117.9, 112.6, 109.5, 10.2 (CH<sub>3</sub>). ESI-MS ( $m/z$ ): 463.17 [M + H, <sup>81</sup>Br]<sup>+</sup>, 461.19 [M + H, <sup>79</sup>Br]<sup>+</sup>.

*Anal.* Calcd for C<sub>25</sub>H<sub>18</sub>BrFN<sub>2</sub>O: C, 65.09; H, 3.93. Found: C, 65.15; H, 3.88.

### **3-(3-(4-Methoxyphenyl)-1-phenyl-1H-pyrazol-4-yl)-2-methyl-1-phenylprop-2-en-1-one (5e)**

Light yellow solid, 90% yield; m.p. 162-164 °C. TLC solvent system: 20% EtOAc in pet-ether, Rf: 0.8. IR (KBr)  $\nu$   $\text{cm}^{-1}$ : 1684 (C=O), 1652 (C=N), 1620 (C=C);  $^1\text{H}$  NMR ( $\text{CDCl}_3$ , 400 MHz):  $\delta$  8.22 (s, 1H, Pyrazole-H), 7.80 (d,  $J=7.5$  Hz, 2H, ArH), 7.68 (dd,  $J=8.4$  & 1.8 Hz, 2H, ArH), 7.34-7.54 (m, 8H, ArH), 7.22 (s, 1H, =CH), 6.91 (d,  $J=8.7$  Hz, 2H, ArH), 3.83 (s, 3H, ArOCH<sub>3</sub>), 2.30 (d,  $J=1.2$  Hz, 3H, =C-CH<sub>3</sub>).  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ ):  $\delta$  190.0 (C=O), 159.9 (C-OCH<sub>3</sub>), 149.8 (C=N), 139.5, 139.3, 139.2, 138.3, 134.2, 130.1, 129.2, 129.1, 128.3, 128.2, 125.9, 125.1, 119.3, 113.9, 112.6, 51.1 (Ar-OCH<sub>3</sub>), 10.1 (CH<sub>3</sub>). ESI-MS (m/z): 395.07 [M + H]<sup>+</sup>.

*Anal.* Calcd for C<sub>26</sub>H<sub>22</sub>N<sub>2</sub>O<sub>2</sub>: C, 79.16; H, 5.62. Found: C, 78.94; H, 5.58.

### **3-(3-(4-Bromophenyl)-1-phenyl-1H-pyrazol-4-yl)-2-methyl-1-phenylprop-2-en-1-one (5f)**

Yellow solid, 87% yield; m.p. 174-176 °C. TLC solvent system: 20% EtOAc in pet-ether, Rf: 0.7. IR (KBr)  $\nu$   $\text{cm}^{-1}$ : 1681 (C=O), 1645 (C=N), 1618 (C=C);  $^1\text{H}$  NMR ( $\text{CDCl}_3$ , 400 MHz):  $\delta$  8.23 (s, 1H, Pyrazole-H), 7.79 (d,  $J=7.8$  Hz, 2H, ArH), 7.68 (d,  $J=8.4$  Hz, 2H, ArH), 7.36-7.54 (m, 10H, ArH), 7.16 (s, 1H, =CH), 2.30 (d,  $J=1.2$  Hz, 3H, =C-CH<sub>3</sub>).  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ ):  $\delta$  190.1 (C=O), 150.3 (C=N), 139.7, 139.4, 139.1, 138.5, 134.3, 131.9, 131.7, 130.1, 129.2, 129.1, 128.3, 128.1, 125.7, 122.9, 119.7, 112.7, 10.2 (CH<sub>3</sub>). ESI-MS (m/z): 445.14 [M + H,  $^{81}\text{Br}$ ]<sup>+</sup>, 443.17 [M + H,  $^{79}\text{Br}$ ]<sup>+</sup>.

*Anal.* Calcd for C<sub>25</sub>H<sub>19</sub>ClN<sub>2</sub>O: C, 67.73; H, 4.32. Found: C, 67.48; H, 4.29.

### **1-(3-Chlorophenyl)-3-(1,3-diphenyl-1H-pyrazol-4-yl)-2-methylprop-2-en-1-one (5g)**

Yellow solid; 76% yield; m.p. 128-130 °C. TLC solvent system: 20% EtOAc in pet-ether, Rf: 0.7. IR (KBr)  $\nu$   $\text{cm}^{-1}$ : 1685 (C=O), 1651 (C=N), 1621 (C=C);  $^1\text{H}$  NMR ( $\text{CDCl}_3$ , 400 MHz):  $\delta$  8.24 (s, 1H, Pyrazole-H), 7.78-7.84 (m, 4H, ArH), 7.66 (t,  $J=1.6$  Hz, 1H, ArH), 7.47-7.55 (m, 9H, ArH), 7.15 (s, 1H, =CH), 2.30 (s, 3H, =C-CH<sub>3</sub>).  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ ):  $\delta$  189.9 (C=O), 149.8 (C=N), 139.3, 139.1, 139.0, 138.4, 134.5, 134.3, 132.9, 130.5, 130.1, 129.6, 129.1, 128.9, 128.3, 127.1, 125.9, 125.5, 119.4, 112.9, 10.2 (CH<sub>3</sub>). ESI-MS (m/z): 401.08 [M + H,  $^{37}\text{Cl}$ ]<sup>+</sup>, 399.10 [M + H,  $^{35}\text{Cl}$ ]<sup>+</sup>.

*Anal.* Calcd for C<sub>25</sub>H<sub>19</sub>ClN<sub>2</sub>O: C, 75.28; H, 4.80. Found: C, 74.89; H, 4.76.

### **1-(3-Chlorophenyl)-3-(3-(4-chlorophenyl)-1-phenyl-1H-pyrazol-4-yl)-2-methylprop-2-en-1-one (5h)**

Light Green Solid, 78% yield; m.p. 112-114 °C. TLC solvent system: 20% EtOAc in pet-ether, Rf: 0.8. IR (KBr)  $\nu$   $\text{cm}^{-1}$ : 1690 (C=O), 1653 (C=N), 1625 (C=C);  $^1\text{H}$  NMR ( $\text{CDCl}_3$ , 400 MHz):  $\delta$  8.26 (s, 1H, Pyrazole-H), 7.81 (d,  $J=8.4$  Hz, 2H, ArH), 7.67 (t,  $J=1.6$  Hz, 1H, ArH), 7.59 (d,  $J=8.0$  Hz, 2H, ArH), 7.33-7.55 (m, 8H, ArH), 7.23 (s, 1H, =CH), 2.31 (s, 3H, =C-CH<sub>3</sub>).  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ ):  $\delta$  190.1 (C=O), 150.2 (C=N), 139.5, 139.3, 138.9, 138.4, 134.2, 133.9, 133.6, 130.9, 129.9, 129.7, 129.3, 128.7,

128.6, 128.2, 125.9, 125.7, 119.6, 112.8, 10.2 (CH<sub>3</sub>). ESI-MS (m/z): 437.12 [M + H, <sup>37</sup>Cl]<sup>+</sup>, 434.99 [M + H, <sup>37</sup>Cl<sup>35</sup>Cl]<sup>+</sup>, 433.16 [M + H, <sup>35</sup>Cl]<sup>+</sup>.

*Anal.* Calcd for C<sub>25</sub>H<sub>18</sub>Cl<sub>2</sub>N<sub>2</sub>O: C, 69.29; H, 4.19. Found: C, 68.96; H, 4.15.

### **1-(3-Chlorophenyl)-2-methyl-3-(1-phenyl-3-(p-tolyl)-1H-pyrazol-4-yl)prop-2-en-1-one (5i)**

Yellow Solid, 89% yield; m.p. 118-120 °C. TLC solvent system: 20% EtOAc in pet-ether, Rf: 0.8. IR (KBr)  $\nu$  cm<sup>-1</sup>: 1691 (C=O), 1654 (C=N), 1623 (C=C); <sup>1</sup>H NMR (CDCl<sub>3</sub>, 400 MHz):  $\delta$  8.24 (s, 1H, Pyrazole-H), 7.80 (dd, *J* = 8.8 & 1.2 Hz, 2H, ArH), 7.67 (t, *J* = 1.6 Hz, 1H, ArH), 7.46-7.56 (m, 6H, ArH), 7.34-7.38 (m, 2H, ArH), 7.23-7.25 (m, 3H, ArH), 2.38 (s, 3H, ArCH<sub>3</sub>), 2.30 (s, 3H, =C-CH<sub>3</sub>). <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>):  $\delta$  190.2 (C=O), 150.1 (C=N), 139.5, 139.3, 138.9, 138.2, 134.3, 134.1, 131.1, 130.5, 130.1, 129.8, 129.4, 129.2, 129.1, 128.3, 126.3, 125.9, 119.5, 112.7, 21.1 (Ar-CH<sub>3</sub>), 10.2 (CH<sub>3</sub>). ESI-MS (m/z): 415.14 [M + H, <sup>37</sup>Cl]<sup>+</sup>, 413.24 [M + H, <sup>35</sup>Cl]<sup>+</sup>.

*Anal.* Calcd for C<sub>26</sub>H<sub>21</sub>ClN<sub>2</sub>O: C, 75.63; H, 5.13. Found: C, 75.54; H, 5.07.

### **3-(3-(3-Bromo-4-fluorophenyl)-1-phenyl-1H-pyrazol-4-yl)-1-(3-chlorophenyl)-2-methylprop-2-en-1-one (5j)**

Yellow solid, 86% yield; m.p. 132-134 °C. TLC solvent system: 20% EtOAc in pet-ether, Rf: 0.8. IR (KBr)  $\nu$  cm<sup>-1</sup>: 1684 (C=O), 1651 (C=N), 1621 (C=C); <sup>1</sup>H NMR (CDCl<sub>3</sub>, 300 MHz):  $\delta$  8.24 (s, 1H, Pyrazole-H), 7.83 (dd, *J* = 6.6 & 2.4 Hz, 1H, ArH), 7.79 (d, *J* = 7.8 Hz, 2H, ArH), 7.63 (t, *J* = 1.5 Hz, 1H, ArH), 7.36-7.55 (m, 7H, ArH), 7.18 (t, *J* = 8.4 Hz, 1H, ArH), 7.12 (s, 1H, =CH), 2.30 (s, 3H, =C-CH<sub>3</sub>). <sup>13</sup>C NMR (75 MHz, CDCl<sub>3</sub>):  $\delta$  189.9 (C=O), 165.2 (Ar-F), 150.1 (C=N), 139.3, 139.1, 138.8, 138.4, 134.3, 134.2, 134.1, 130.5, 130.3, 129.9, 129.5, 129.2, 128.9, 125.9, 125.5, 119.3, 117.9, 112.6, 109.5, 10.2 (CH<sub>3</sub>). ESI-MS (m/z): 499.39 [M + H, <sup>81</sup>Br<sup>37</sup>Cl]<sup>+</sup>, 496.96 [M + H, <sup>79</sup>Br<sup>37</sup>Cl, <sup>81</sup>Br<sup>35</sup>Cl]<sup>+</sup>, 494.90 [M + H, <sup>79</sup>Br<sup>35</sup>Cl]<sup>+</sup>.

*Anal.* Calcd for C<sub>25</sub>H<sub>17</sub>BrClFN<sub>2</sub>O: C, 60.57; H, 3.46. Found: C, 60.39; H, 3.44.

### **1-(3-Chlorophenyl)-3-(3-(4-methoxyphenyl)-1-phenyl-1H-pyrazol-4-yl)-2-methylprop-2-en-1-one (5k)**

Light yellow solid, 87% yield; m.p. 159-160 °C. TLC solvent system: 20% EtOAc in pet-ether, Rf: 0.8. IR (KBr)  $\nu$  cm<sup>-1</sup>: 1681 (C=O), 1647 (C=N), 1618 (C=C); <sup>1</sup>H NMR (CDCl<sub>3</sub>, 400 MHz):  $\delta$  8.24 (s, 1H, Pyrazole-H), 7.79 (d, *J* = 8.8 Hz, 2H, ArH), 7.66 (t, *J* = 1.6 Hz, 1H, ArH), 7.45-7.55 (m, 6H, ArH), 7.33-7.38 (m, 2H, ArH), 7.21 (s, 1H, =CH), 6.97 (d, *J* = 8.8 Hz, 2H, ArH), 3.84 (s, 3H, ArOCH<sub>3</sub>), 2.30 (d, *J* = 1.2 Hz, 3H, =C-CH<sub>3</sub>). <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>):  $\delta$  190.1 (C=O), 159.8 (C-OCH<sub>3</sub>), 149.6 (C=N), 139.5, 139.3, 139.2, 138.3, 134.2, 134.0, 130.1, 129.8, 128.8, 127.9, 125.9, 125.5, 124.9, 119.3, 113.9, 112.6, 51.1 (Ar-OCH<sub>3</sub>), 10.1 (CH<sub>3</sub>). ESI-MS (m/z): 431.11 [M + H, <sup>37</sup>Cl]<sup>+</sup>, 429.06 [M + H, <sup>35</sup>Cl]<sup>+</sup>.

*Anal.* Calcd for C<sub>26</sub>H<sub>21</sub>ClN<sub>2</sub>O<sub>2</sub>: C, 72.81; H, 4.94. Found: C, 72.71; H, 4.91.

### 3-(3-(4-Bromophenyl)-1-phenyl-1H-pyrazol-4-yl)-1-(3-chlorophenyl)-2-methylprop-2-en-1-one (5I)

Light brown solid, 93% yield; m.p. 147-149 °C. TLC solvent system: 20% EtOAc in pet-ether, Rf: 0.7. IR (KBr)  $\nu$  cm<sup>-1</sup>: 1683 (C=O), 1651 (C=N), 1620 (C=C); <sup>1</sup>H NMR (CDCl<sub>3</sub>, 400 MHz):  $\delta$  8.24 (s, 1H, Pyrazole-H), 7.79 (d, *J* = 8.8 Hz, 2H, ArH), 7.66 (t, *J* = 1.6 Hz, 1H, ArH), 7.46-7.57 (m, 8H, ArH), 7.36-7.40 (m, 2H, ArH), 7.15 (s, 1H, =CH), 2.30 (d, *J* = 1.2 Hz, 3H, =C-CH<sub>3</sub>). <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>):  $\delta$  190.2 (C=O), 150.1 (C=N), 139.1, 138.8, 138.7, 138.1, 134.3, 134.1, 131.9, 131.7, 130.1, 129.8, 129.4, 128.9, 127.6, 125.7, 125.1, 122.9, 119.7, 112.7, 10.2 (CH<sub>3</sub>). ESI-MS (*m/z*): 480.76 [M + H, <sup>81</sup>Br<sup>37</sup>Cl]<sup>+</sup>, 478.94 [M + H, <sup>79</sup>Br<sup>37</sup>Cl, <sup>81</sup>Br<sup>35</sup>Cl]<sup>+</sup>, 476.96 [M + H, <sup>79</sup>Br<sup>35</sup>Cl]<sup>+</sup>.

*Anal.* Calcd for C<sub>25</sub>H<sub>18</sub>BrClN<sub>2</sub>O: C, 62.85; H, 3.80. Found: C, 62.49; H, 3.77.

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# Solution of Unconstrained Non-Linear Programming Problems Using Differential Evolution, Genetic Algorithm and Artificial Bee Colony Evolutionary Algorithms: A Comparative Study

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## Abstract

Evolutionary computation (EC) is a set of global optimization algorithms inspired by biological evolution. EC techniques, which are based on principle of evolution and survival of the fittest Darwinian Theory. It is a sub-field of Artificial Intelligent techniques and soft computing. In Evolutionary computation, we use non classical methods based on natural evolution instead of classical methods. When fitness function has several local extreme or not known derivative then it is very difficult to use classical methods for solution of optimization problem in such situation non classical methods gives very convenient and faster solution. In this paper we present Genetic algorithms, Artificial bee colony algorithm and Differential evolution algorithm of Evolutionary computation technique for solution of unconstrained non-linear programming problem. Numerical examples have solved using software MATLAB and the result has compared among evolutionary algorithms as Genetic algorithm, differential algorithm and artificial bee colony algorithm.

**Keywords:** Evolutionary computation, Genetic algorithm, Differential evolution algorithm and Artificial bee colony algorithm.

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## 1. Introduction

Last few decades there are a lot of evolutionary algorithms subset of evolutionary computational approach have been proposed and used to many real world complex optimization problems and got the success in finding the near best optimal solution. Solution of non-linear optimization problems is one of the most important issues in many field like complex research problem and real world problems. Evolutionary algorithm uses the computational model of evolutionary processes as key

element and share a usual concept based on the processes of selection and reproduction. Mostly all evolutionary algorithms are inspired by the natural concept of Darwinian Theory and this theory tells that EAs are not static but dynamic as they can evolve over time. Evolutionary algorithms are population based local search algorithm. During the last twenty years most of the research has done in the complex objective function without using constraints. Genetic algorithm, differential evolution, Particle swarm optimization, Artificial Bee Colony algorithm, Ant colony optimization and Spider monkey optimization etc. are the evolutionary algorithms and all type of non-linear complex optimization problem can be easily solved by these algorithms. Among all Differential evolution is very easy and effective to apply. GA is evolutionary algorithm based on the theory of natural selection of Charles Darwin. GA and DE both uses same operator's mutation, crossover and selection but in GA crossover is used first then mutation while in DE mutation is used first then crossover. DE algorithm solved continuous optimization problems first and depends on the differentials of two vectors. ABC algorithm introduced by Dervis Karaboga in 2005. It is inspired by the behaviour of natural honey bees and uses three main phases employed bee phase, onlooker bee phase and scout bee phase. In ABC algorithm the aim of the bees is to find the best place of food sources with high nectar amount.

## **2. Literature Review**

### **2.1 Genetic algorithms**

Nuno Neves et al. [1] discussed the study of NON-LINEAR Optimization problem using a distributed GA. GA is used in large space for the optimization problem. Dr. Yuyi Lin et al. [2] proposed solution of non-linear optimization problems using GA with penalty method. This paper discussed the techniques of applying GAs with penalty function to solve highly constrained nonlinear engineering design problems. Subrata Datta et al. [3] proposed the efficient genetic algorithm on programming problems for fittest chromosomes. Chhavi Mangla et al. [4] proposed the genetic algorithm based optimization problem for solution of system of non-linear equations. D.E technique is applied for the solution of non-linear optimization problem. This type of problems is changed first in to multi objective problem then a new fitness function is used further process and both result is compared. Dr. Amanpreet Singh et al. [5] discussed some special type of Unconstrained Optimization Problem with using G.A and main focus of G.A is on the simulation of natural evolutionary process which can use for certain standard optimization problems. It is evolutionary algorithm which works according to the basis of natural genetics on a population string structures. The global and population based optimization technique is used to avoid the

problem like stagnation of the solution to a local minimum. Punam S Mhetre et al. [6] introduced G.A for the solution of both linear and Non-linear optimization problems and check the major benefits acquired as a result of using G.A. Gauss- Legendre integration method as a technique is used for the solution of NLPP and to get the result without changing the non -linear equation to linear. G.A result are very good for all tasks requiring optimization and highly successful in any situation where many variables interact to produce a large number of possible solutions. T Yokota et al. [7] discussed non- linear optimization problems of integer programming and also its applications. T. Yokota also introduced the new method for the solution of NLPP for better comparison. Some methods and holding property are discussed with the help of G.A. From the result it is observed that proposed method is best then the property. Chhavi Mangla et al. [8] discussed solution of non- linear optimization problem by using Genetics algorithm. Both type of problems singles and multi-objective optimization problem based on engineering, social sciences and medical sciences are solved by using standard benchmark problems. This paper carries out a comprehensive review to analysis the work of GA.

## 2.2 Artificial Bee Colony Algorithm

Lalit Kumar et al. [9] proposed solution of NP-hard Problem using ABC algorithm. ABC is considered as a newest nature-inspired swarm intelligence-based optimization algorithms. S. T S. Talatahari et al. [10] discussed solution of Parameter Identification of Nonlinear Problems by Artificial Bee Colony Algorithm. Dervis Karaboga et al. [11] discussed the ABC algorithm for solution of non -linear unconstraint optimization problem. Modified result of ABC algorithm has been compared to state of art algorithm. Result of modified ABC algorithm are tested for real engineering problems and found that it can efficiently applied for solving constrained optimization problem. Weifang Gao et al. [12] introduced a framework of constraint optimization problem by novel ABC algorithm. Bi -objective optimization problem is taken in which first part remains same (objective function) and the second part is the degree of constraint. Multi-strategy technique is used which consists three types of strategies, and play the main role between diversity and convergence. Soudeh Babaeizadeh et al. [13] discussed Constrained based ABC Algorithm for Optimization Problems. It is an optimization algorithm and compared to other optimization based algorithms. ABC has one poor exploitation ability that can be removed by using three types of phases employee bees, onlooker bees and scout bees phase by a new search technique. Soudeh Babaeizadeh et al. [14] discussed non-linear optimization problem related to enhanced Constrained ABC Algorithm. From last few years ABC with less parameters and strong global optimization ability researcher

paid their attention on these two problems. But still there is one drawback in ABC algorithm that is poor in exploitation. Numerical examples results are shown with several benchmark functions and result are compared. Nadezda Stanarevic et al. [15] proposed improved ABC algorithm for constrained optimization problem. Artificial bee colony algorithm is applicable only on unconstrained optimization problems but later a lot of modification in ABC was introduced of constraints problems. ABC modified version introduced for constraint optimization problem.

### 2.3 Differential Evolution Algorithm

Jouni Lampinen et al. [16] discussed the mixed variable non-linear optimization by differential evolution. This paper solving non-linear programming problems containing integer, discrete and continuous variables. Md. Abul Kalam Azad et al. [17] proposed the solution of non-linear continuous global optimization problems by modified differential evolution. This paper discussed about modified differential evolution in which some self-adaptive parameter is introduced. Mutation is modified and then use its inversion operator. Some non-linear continuous optimization problems are tested. Inversion operator has used in this proposed differential evolution algorithm. Musrrat Ali et al. [18] discussed simpler differential evolution algorithm. Simple and modified version of differential evolution algorithm (NSDE) is presented. In simple DE & NSDE there is only one difference of initial population between them. NSDE uses non-linear simplex method to create the initial population. Twenty benchmark problem are taken with box constraint and numerical result are compared with traditional DE and other DE. Zhang Xiao Fei et al. [19] proposed different concept related to reactive power optimization of power system based on niching differential evolution algorithm, As the problem is non-linear integer type. In this Zhang introduced the niche theory and some improvement in the differential evolution which aim of the modified RPO. Local search ability and broaden search range also increased. Different degrees of improvement are also used for speed and precision of convergence. Chiha Ibtissem et al. [20] discussed differential evolution algorithm for special multi-objective optimization problems. A new variant is discussed for DE. Proposed algorithm named based cost differential evolution generate the mutant vector. This vector is created by adding a weighted difference of two cost functions. Then performance of Bc.DE is calculated on several bound constrained non-linear and non-differentiable numerical problems and compare with the DE and other DE variants. Jeerayut Wetweerapong et al. [21] Proposed an improved differential evolution algorithm with a restart technique to solve system of non-linear equations, which often used for the solution of complex computational problems with variables. In DE –R a new approach is used for mutation and restart

technique to stop premature convergence. Proposed technique is applied on various world and synthetic problems and compare with other methods, it found that DER gives fast convergence and high quality solutions. Saeed Nezhad Hosein et al. [22] Introduced integrating differential evolution algorithm with modified hybrid GA for solving non-linear optimal control problems. Two phase algorithm is used based on IDE. Associate non-linear problems with hybrid GA of optimal control problem is discussed. In First phase DE is completely depends on initial population. In 2<sup>nd</sup> phase MHGA starts with new population.

### 3. Evolutionary Computational Approach

#### 3.1 Genetic Algorithm

Genetic Algorithms are metaheuristic optimization method and based on the biological theory introduced by Charles Darwin and provides an extended concept survival of the fittest [23]. GA is developed by Professor Johan Holland along with his students and colleagues at the University of Michigan during the 1960s and 1970s. [24] Dr Johan Holland then developed the theoretical framework for applying genetic algorithm many complex computational problems needed searching through huge search domain. In that cases G.A gives best and efficient tool to reach at an optimal solution and gives an efficient way for solving computationally hard non-linear optimization problems. GA starts with a set of possible solutions where each solution in GA, is represented as a chromosome. Set of operators are applied to the initial set of solution space. GA does not work on a single trial solution at a time but work on entire population. In special generation, the whole population comprises to the set of solution then select the fittest member and share their qualities. GA is based on the principal of Natural selection and applied to discrete optimisation problem. It is frequently used to find optimal or near optimal solution to difficult problem. GA can solve both types of problems unconstrained and constrained optimization problems [25].

GA has three main operators:

##### 3.1.1 Selection Operator

This operator gives preference to better solution allowing them to pass on their genes to the next generation of the algorithm. The main objective is to select the good solution and discard the bad solution. The individual with a higher fitness must have a higher probability of having offspring. There are different selection techniques in GA.

- (a) **Roulette Wheel Selection.** Here selection is done by Roulette wheel.
- (b) **Rank Based Selection:** Rank the all individual firstly and then give the fitness ranking to each.
- (c) **Tournament Selection:** A group of n individuals is randomly selected from the current population and from them best is selected. Here n is the tournament size the higher n the higher the pressure to select above average quality individual. A lot of tournaments are held between the individual and this process is repeated as often as desired.

### 3.1.2 Crossover Operator

The crossover between two parents string produce offspring by swapping genes of the chromosomes. With the help of crossover, we can combine partial solution from different candidate.

In GA three types of crossover are used

1-point Crossover,

2-point crossover and

3-Uniform- Crossover.

### 3.1.3 Mutation Operator

GA get better solution by using this operator. This operator is used to maintain genetic diversity from one generation of population to the coming generation. After mutation the solution may change entirely from the last solution. Mutation operator changes 1 to 0 or 0 to 1.

**Bit Flip Mutation:** We can select one or more random bits and flip them to each other

**Swap Mutation:** In swap mutation we select two position on the chromosome at random and interchange the values

**Scramble Mutation:** This is also famous with permutation representation choose, select a subset of genes and shuffled their values.

**Inverse Mutation:** In Inverse mutation, we select a subset of genes and inverse that selected subset.

### 3.2 Artificial Bee Colony Algorithm

ABC is same as swarm based intelligence, metaheuristic and global optimization algorithm and advanced proposed algorithm by Dervis Karaboga in 2005. Dervis Karaboga with his research members studied on ABC algorithm and some of its applications. The first journal article of ABC was presented by Karaboga and Basturk in 2007 in which the performance of ABC was compared to GA and PSO. First conference paper is published in 2006. In ABC algorithm [26, 27], the swarm of artificial bees are categorised in three groups of bees: employed bees, onlookers and scout bee. 50% are the employed bees and 50% are onlooker's bees to the total bees and only 1 and 2 are scout bees. The total numbers of employed bees are equal to the number of onlooker's bees. Every food source is a possible solution to the optimization problems. Here the main aim of the bees is to find the best place of food source with high amount of nectar. Fitness of bees is determined in terms of best quality of the food source. Initially first group of employed bees goes to random places for searching the food. At that time onlooker bees are at bee hive. They are waiting for the employed at the hive. When the employed returns to beehive then they share all the information like quality, quantity and distance with onlooker bees regarding the food source. After receiving all information from the employed bees the onlooker bees also start searching in neighbourhood of same food source. Food sources which are abandoned changed by scout bees in to new randomly generated food source.

#### Behaviour of Honey Bee in Nature

ABC algorithm is inspired by honey bees, where honey bee's swarm works in collective intelligence way, while searching the food. Bees have many qualities, like bees can communicate in their own language, can memorize all the information and take best own decisions based on that gathered information. By the intelligence behaviour of bees, many researchers motivate to simulate above foraging behaviour of the bees. The nature of honey bees is listed as

**Employed Bees:** Every employed Bee exploit only single food source and store every information regarding that food source like richness, direction and distance.

**Unemployed bees:** These bees divided in to two groups of bees, onlooker and scout bees. Only these bees found and shape out all information from 1<sup>st</sup> group of bees based on certain probability.

**Foraging behaviour:** Foraging behaviour is the important characteristic of the bees. In this process, bees go away from their hive and starts searching best food with high nectar amount, extracts all

nectar and stores in her abdomen. She can store nectar till 30-120 minutes, on the basis of nectar quantity and distance. Finally, they share all information.

### Four Phases of ABC Algorithm

1. **Initialization Phase:** In this phase we select the food sources randomly with the expression.

$$x_i^j = x_{min}^j + \text{rand}(0,1) \times (x_{max}^j - x_{min}^j)$$

Here  $x_{min}^j$  &  $x_{max}^j$  are the upper and lower bound of the solution space (Domain) of objective function,  $\text{rand}(0,1)$  is a random number lies between [0 1]. And fitness function is determined by this formula

Evaluate the fitness function of all new solution with the help of this formula.

$$fit = \begin{cases} \frac{1}{1+f}, & \text{if } f \geq 0 \\ 1 + f \cdot \text{abs}(f), & \text{if } f < 0 \end{cases}$$

2. **Employed Bee Phase:** Three steps are used mainly in this phase a) Generate a new solution

b) Calculate new fitness, c) Apply greedy selection

The neighbourhood food source is determined and calculated by the following equation.

$$x_{new}^j = x^j + \phi (x^j - x_p^j), \phi \in [-1,1]$$

Where  $x$  = Current solution

$x_p^j$  = Random partner,  $x_{new}^j$  = New solution

$f$  = Objective function value of a solution.

### 3. Onlooker Bee phase

Firstly, calculate the probabilities of every food source. Then generate a new solution that depends on probability value after that Calculate new fitness by applying greedy selection

$$\text{Probability} = 0.9 \times \frac{fit_i}{fit} + 0.1$$

Here  $fit_i$  is the fitness value of the solution  $i$ . Onlooker bees search the neighborhood food sources according to this expression.

$$x_{new}^j = x^j + \phi (x^j - x_p^j)$$

#### 4. Scout Bee Phase

First of all, found the abandoned solution which based on limit value. Then discard that abandoned solution and generate a new solution randomly to replace that. The new food sources are randomly generated by the scout bees. The new solution will be discovered by the scout bees by using the expression.

$$x_i^j = x_{min}^j + \text{rand}(0, 1) \times (x_{max}^j - x_{min}^j)$$

### 3.3 Differential Evolution Algorithm

Differential Evolution Algorithm is very simple and easy stochastic optimization technique for the solution of non-linear optimization problems which evolves a population of potential solutions (individuals) in order to increase the convergence to optimal solutions. DE is population based stochastic search algorithm developed by Storn and Price in 1995 for the solution of Chebyshev fitting problems [28]. DE is different from other algorithm in the sense that distance and direction from current population is used to guide the search process. DE has evolutionary operators like mutation, crossover and selection and totally depends on difference of vectors. DE is not nature inspired algorithm like PSO, ABC etc. But in DE global search algorithm employ investigate to allow escaping from local minima. Here three main operators are used mutation, crossover and last selection. The special work of DE algorithm is generating a trial vector, for this three different vectors are selected from the initial population and got the trial vector by adding a weighted difference of two randomly selected solutions to a third one which is target vector. This process is known as mutation operator of evolutionary algorithm. After mutation operator vectors are merged with another vector and this operation is called crossover operators. After this process we get a new trial vector and this trial is accepted after applying greedy selection in new population if its fitness function value is better than the target vector fitness value. It evolves generation to generation until the stopping criteria would be met. There is one difference between GA and DE algorithm is the mutation and recombination phase. In DE position of the vectors give important information about the best vectors. Diversity of the present population is determined by the distance between the individuals. If distance is large then steps size are also large for the individuals and they can explore much search space in another side if distance is small, then step size should be small to exploit local areas. Minimum population size in differential evolution should be 4.

## Three Main Operators of Differential Evolution

### 3.3.1 Mutation Operator

In DE trial vector plays an important role and it is created by mutation operator.

Trial vector is created for each solution as follow

Trial Vector=Target vector + Scale factor× (Randomly selected solution1- Randomly selected solution2)

Five mutation strategies are proposed by Storn and Price initially. Later Storn and Price discussed ten different working strategies of DE and these are derived from mutation schemes. Every mutation strategy either used exponential type crossover or the binomial type crossover.

$$\text{DE/rand/1: } U_{ij} = x_{r_1j} + F(x_{r_2j} - x_{r_3j})$$

$$\text{DE/best/1: } U_{ij} = x_{bestj} + F(x_{r_2j} - x_{r_3j})$$

$$\text{DE/target to best/2: } U_{ij} = x_{ij} + F(x_{bestj} - x_{ij}) + F(x_{r_1j} - x_{r_2j})$$

$$\text{DE/best/2: } U_{ij} = x_{bestj} + F(x_{r_1j} - x_{r_2j}) + F(x_{r_3j} - x_{r_4j})$$

$$\text{DE/rand/2: } U_{ij} = x_{r_1j} + F(x_{r_2j} - x_{r_3j}) + F(x_{r_4j} - x_{r_5j})$$

### 3.3.2 Crossover Operator

Crossover is the discrete recombination of parent and trial vector and increase the diversity.

Crossover is of two type Binomial and Exponential crossover. Binomial crossover is commonly used by the researchers as it gives best result. Any calculation work is not used in crossover operator only some conditions which are user defined gives the trial vector. Trial vector is generated as

$$U_j = \{v_j, \text{ if } r \leq p_c \text{ OR } j = \delta \text{ if } r > p_c \text{ AND } j \neq \delta$$

Here  $p_c$  is the Crossover probability

$$\delta = \text{Randomly selected variable } \delta \in \{1, 2, 3, 4, \dots, D\}$$

$r = \text{random number between 0 and 1}$

$U_j$  jth variable of trial vector

$v_j$  jth variable of donor vector

$x_j$  jth variable of target vector

### 3.3.3 Selection operator

In this operator apply greedy selection and find the best fitness vector which can take part in mutation operator to produce best trial vector which will continue in next iteration. It constructs the new generation for the next iteration and apply deterministic selection. The offspring replaces the parent if the fitness of the offspring is better than its parent otherwise the parent survive to the next generation. This ensure that the average fitness of the population does not deteriorate.

## 4. Non Linear Programming Problems

There are different types of non –linear optimization problems like continuous optimization, Bound constraint, discrete, global derivative free and non -differentiable optimization problems. Among these problems some are solved by traditional method which give the approximate solution result rather than accurate solution and some are solved by evolutionary algorithm which are derivative free algorithm. As everyone know that solution of NLPP are difficult in comparison to LPP. Many traditional methods are available for the solution of LPP and these are easy to apply. There are two types of NLPP constraints and without constraints. NLPP without constraints could be designed with several methods like steepest descent, Newton’s method. They are taking less time in comparison to the NLPP with constrains. On the other hand, various methods are available like KKT conditions, Lagrangian multiplier, penalty method, barrier method for the solution of NLPP with constraints and there are special problems of quadratic NLPP that cab solved by Beal’s method, Wolfe’s method etc. Special method is not available for the solution of both types of problems LPP and NLPP. Many non-traditional methods have been introduced for the solution of different optimization problems. These methods are very powerful, easy, populations based and metaheuristic algorithm, by which we can solve NLPP without constrains and with constraints like PSO, DE, ABC and GA to implement for the solution of complex research problems and others problems. DE is very easy to apply because this algorithm used less parameters to others algorithm. In NLPP the function may be convex or non-convex. A convex optimization problem maintains the properties of a linear programming problem and a non-convex problem the properties of a nonlinear programming problem. The basic difference between the two categories is that in a) convex optimization there can be only one optimal solution, which is globally optimal or you might prove that there is no feasible solution to the problem, while in b) non convex optimization may have multiple locally optimal points and it can take a lot of time to identify whether the problem has no solution or if the solution is global.

Suppose we are given an NLP with constraint

$$\text{Min. } f(x)$$

Subject to linear or non-linear constraints

$$g(x) \leq 0; \text{ and } h(x) = 0;$$

### 5. Numerical Examples

$$1.\text{objective function (min)} = x_1 - x_2 + 2x_1^2 + 2x_1 x_2 + x_2^2$$

$$0 \leq x_1, x_2 \leq 10$$

$$2.\text{objective function (min)} = 20x_1 + 26x_2 + 4x_1 x_2 - 4x_1^2 - 3x_2^2$$

$$-10 \leq x_1, x_2 \leq 10$$

### Genetic Algorithm problems

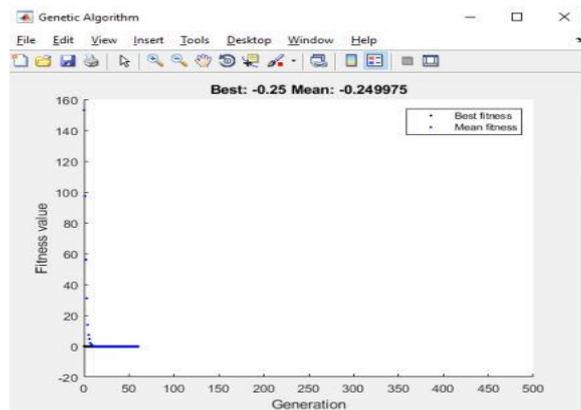
$$1.\text{Objective function (min)} = x_1 - x_2 + 2x_1^2 + 2x_1 x_2 + x_2^2$$

$$0 \leq x_1, x_2 \leq 10$$

1<sup>st</sup> Table of G.A

S.No	Population	No. of Variable	Generation	Function Value	X1	X2
1	10	2	50	-0.22185	0	0.667
2	20	2	10	-0.25	0	0.5
3	50	2	50	-0.2599	0	0.5
4	100	2	50	-0.25	0	0.5
5	100	2	100	-0.25	0	0.5
6	500	2	100	-0.25	0	0.5
7	500	2	500	-0.25	0	0.5

Figure 1 (GA)

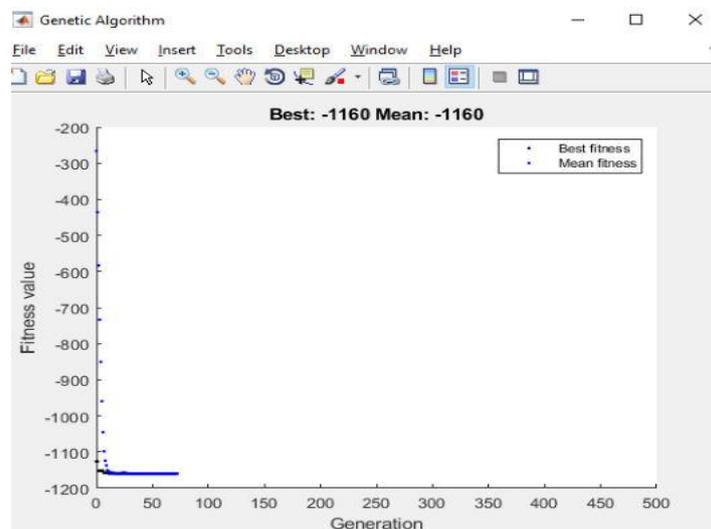


2. Objective function(min) =  $20x_1+26x_2+4x_1x_2-4x_1^2-3x_2^2$   
 $-10 \leq x_1, x_2 \leq 10$

2<sup>nd</sup> Table of G.A

S.No	Population	No. of Variable	Generation	Function Value	X1	X2
1	10	2	50	-1072.0593	9.998	-9.292
2	20	2	10	-1144.975	9.971	-9.903
3	50	2	50	-1159.695	9.998	-9.999
4	100	2	50	-1159.999	10	-10
5	100	2	100	-1159.999	10	-10
6	500	2	100	-1159.999	10	-10
7	500	2	500	-1159.999	10	-10

Figure 2 (GA)



**Artificial Bee Colony Algorithm problems**

1.Objective function (min) =  $x_1 - x_2 + 2x_1^2 + 2x_1 x_2 + x_2^2$

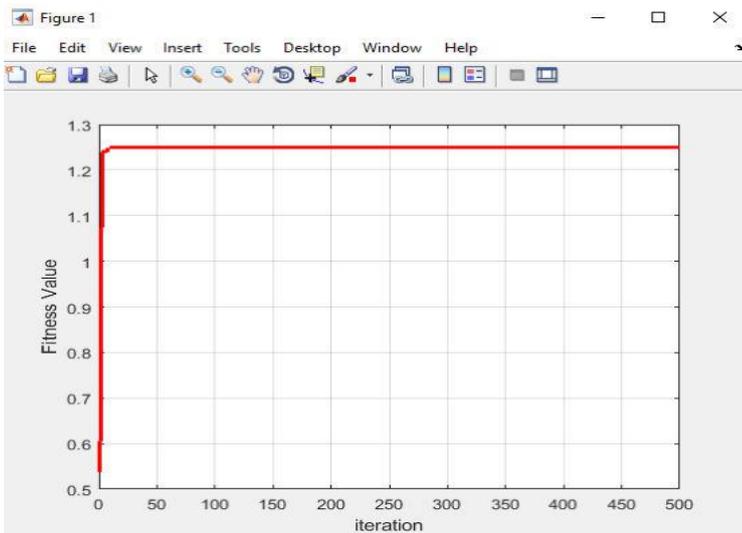
$0 \leq x_1, x_2 \leq 10$

**1<sup>st</sup> Table of ABC**

Pop Size	Variable	Iteration	Function value	X1	X2	Fnew
10	2	50	-0.25(38ite)	0	0.5006	-0.2500
20	2	10	-0.2103(1it)	0	5.0616	20.5585
50	2	50	-0.25(40ite)	0.0011	0.4290	-0.2429
100	2	50	-0.25(10ite)	0	0.3876	-0.25
100	2	100	-0.25(39ite)	0	0.5000	-0.25
500	2	100	-0.25(4ite)	0	0.5000	-0.25
500	2	500	0(2iter)	0	0.5000	-0.25

For ABC solution is -0.2103 in 10 iterations with 20 populations but when iteration and population are increasing ABC gives the best optimal solution is -0.25 near to 0 in 50 iterations and all other iteration with different population. Values of  $x_1 = 0$  and  $x_2 = 0.5$ .

Figure 3(ABC)



**2.Artificial Bee Colony Algorithm problems**

2.objective function(min) =  $20x_1 + 26x_2 + 4x_1x_2 - 4x_1^2 - 3x_2^2$

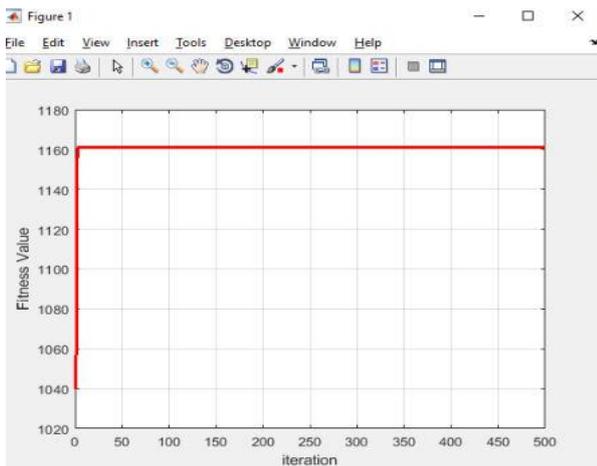
$-10 \leq x_1, x_2 \leq 10$

**2<sup>nd</sup> Table of ABC**

Pop size	Variable	Iteration	Function value	X1	X2	fnew
10	2	50	-865(50iter)	-9.9823	-4.5912	-597.5201
20	2	10	-1080.337(5iteration)	-9.9987	6.4894	-817.0251
50	2	50	-1160(20iteration)	10	-8.6092	-990.5670
100	2	50	-1160(8iteration)	10	-10	-1160
100	2	100	-1160(6iteration)	-10	-2.5203	-583.7715
500	2	100	-1160(2iteration)	-9.7807	10	-1.0095e+03
500	2	500	-1160(3iteration)	10	-10	-1160

For ABC solution is -0.2103 in 10 iterations with 20 populations but when iteration and population are increasing ABC gives the best optimal solution is -0.25 near to 0 in 50 iterations and all other iteration with different population. Values of  $x_1 = 0$  and  $x_2 = 0.5$ . In the same way for 2<sup>nd</sup> problem we got the optimal solution -1160 when we take 50 iterations with 50 populations and gives the best solution in 20 iterations. When iterations are increasing solution obtained in less number of iterations.

Figure 4



**3. Differential Evolution Algorithm**

1. Objective function (min) =  $x_1 - x_2 + 2x_1^2 + 2x_1x_2 + x_2^2$

$$0 \leq x_1, x_2 \leq 10$$

**1<sup>st</sup> Table of DE**

Pop Size	Variable	Iteration	Best Cost	X1	X2	New Sol
5	2	50	29.2154(54)	2.6437	2.0023	2.6437, 2.0023
20	2	10	-0.2498(3)	0.0104	0.5143	0,0.5221
50	2	50	0(1it)	0	0.5000	0,0.5000
100	2	50	-0.25(20ite)	0	0.5000	0,0.5000

In DE result is faster than ABC and GA here optimal solution is near to 0 in 3<sup>rd</sup> iteration with 20 populations and  $x_1=0.0104$ ,  $x_2= 0.5143$ . when iterations and population are increasing than we got optimal point in minimum no of iterations.

$$2.\text{objective function}(\min) = 20x_1+26x_2 +4x_1x_2-4x_1^2-3x_2^2$$

$$-10 \leq x_1, x_2 \leq 10$$

**2<sup>nd</sup> Table of DE**

Pop Size	Variable	Iteration	Best Cost	X1	X2	New Sol
5	2	50	-1.160(3ite)	10	-10	10,-10
20	2	10	-1160	10	-10	10,-10
50	2	50	-1.160	10	-10	10,-10
100	2	50	-1160(2ite)	10	-10	10,-10

**Result of the problems**

In GA 1<sup>st</sup> problem we got the optimal solution -0.25 near to 0 because problem is of minimization in 10 number of iterations with 20 population and values of  $x_1=0$ ,  $x_2=0.5$ . These values are same for all other iterations in the table. so we get our optimal solution in 10 number of iterations. 2<sup>nd</sup> problem gives the optimal solution -1154.695 in 10 number of iteration with 20 populations, value of  $x_1$  and  $x_2$  are near to 10 and -10. These value remain same for all other iteration also in the table.

For ABC solution is -0.2103 in 10 iterations with 20 populations but when iteration and population are increasing ABC gives the best optimal solution is -0.25 near to 0 in 50 iterations and all other iteration with different population. Values of  $x_1 =0$  and  $x_2=0.5$ . In the same way for 2<sup>nd</sup> problem we got the optimal solution -1160 when we take 50 iterations with 50 populations and gives the best solution in 20 iterations. When iterations are increasing solution obtained in less number of iterations. In DE result is faster than ABC and GA here optimal solution is near to 0 in 3<sup>rd</sup> iteration with 20 populations and  $x_1=0.0104$ ,  $x_2= 0.5143$ . when iterations and population are increasing than

we got optimal point in minimum no of iterations. In 2<sup>nd</sup> problem optimal point -1160 is obtained in second iteration when population is 100 and iteration are 50. Value of x1, x2 are 10 and -10 So we can conclude that DE gives faster convergence point in less iterations. Result of DE is better in comparison of ABC and GA.

**COMPARISON TABLE OF 1<sup>st</sup> problem**

Pop	Variable	Gen	GA			ABC			DE		
			X1	X2	F.V	X1	X2	F.V	X1	X2	F.V
10	2	50	0	0.667	0.22185	0	0.5006	0.25(38iter)	2.6437	2	29.2154(54ite)
20	2	10	0	0.5	-0.25	0	5.0616	0.2103(lit)	0.0104	0.5143	0.2498(3)
50	2	50	0	0.5	-0.2599	0.0011	0.4290	0.25(40ite)	0	0.5	0 (1st)
100	2	50	0	0.5	-0.25	0	0.3876	0.25(10ite)	0	0.5	0
100	2	100	0	0.5	-0.25	0	0.5000	0.25(39ite)	0	0	0
500	2	100	0	0.5	-0.25	0	0.5000	0.25(4ite)	0	0	0
500	2	500	0	0.5	-0.25	0	0.5000	0(2iter)	0	0	0

**COMPARISON TABLE OF 2<sup>nd</sup> problem**

Population	No. of Variable	Gen	GA			ABC			DE		
			X1	X2	F.V	X1	X2	F.V	X1	X2	F.V
10	2	50	9.998	9.292	1072.059	9.9823	4.5912	865(50iter)	10	-10	1.160(3ite)
20	2	10	9.971	9.903	1144.975	9.9987	6.4894	1080.3371(5it)	10	-10	-1160
50	2	50	9.99	-	-	10	-	-	10	-10	-1.160

			8	9.99	1159.6		8.60	1160(20ite			
				9	95		92	e)			
100	2	50			-			-			-
			10	-10	1159.9	10	-10	1160(8ite	10	-10	1160(
					99			)			2iter)
100	2	100			-		-	-			
			10	-10	1159.9	-10	2.52	1160(6ite	10	-10	-1160
					99		03	)			
500	2	100			-			-			
			10	-10	1159.9	9.780		1160(2ite	10	-10	-1160
					99	7	10	)			
500	2	500			-			-			
			10	-10	1159.9	10	-10	1160(3ite	10	-10	-1160
					99			r)			

## 7. Conclusion

This paper discussed the solution of unconstrained non-linear optimization problems by using evolutionary computational approaches Genetic algorithm, Artificial bee colony algorithm, and Differential evolution by using MATLAB. For this comparison unconstrained non-linear optimization problems are solved and result are compared. According to 1<sup>st</sup> comparison table result of DE at 50 number of iteration and 50 populations is 0 in 1<sup>st</sup> iteration but GA and ABC result are – 0.2599 and -0.25 in 40 number of iteration, so result is faster than both algorithms. In 2<sup>nd</sup> comparison table we can see result is better in with 20 particles and 10 number of iterations DE result is -1160 which is minimum but GA and ABC result are -1144.975 and -1080. So DE result is better in comparison GA and ABC algorithm in less number of iterations. These algorithms are computational algorithms and efficient for the solution of non-linear optimization problems. From tables and figures it is concluded that Differential evolution gives better result in less number of iterations. Optimal solution obtained from the DE algorithm is much better than Genetic algorithm and ABC algorithm.

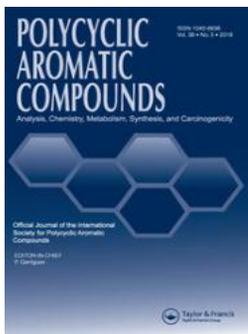
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## 4-Bromo-1,8-Naphthalimide derivatives as Antifungal Agents: Synthesis, Characterization, DNA Binding, Molecular docking, Antioxidant and ADMET studies

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# 4-Bromo-1,8-Naphthalimide derivatives as Antifungal Agents: Synthesis, Characterization, DNA Binding, Molecular docking, Antioxidant and ADMET studies

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## ABSTRACT

A series of heterocyclic derivatives (**2a-2n**) was synthesized and characterized by melting point, FT-IR <sup>1</sup>H, <sup>13</sup>C NMR, UV-visible spectroscopy and mass spectrometry. *In vitro* antifungal activity of the heterocyclic derivatives (**2a-2n**) was evaluated against the fungal strains: *C. albicans*, *C. glabrata* and *C. tropicalis*. The results revealed that heterocyclic analog **2a** exhibits significant activity against all three strains with MIC value of **200 µg/mL**, **2b** exhibits antifungal activity against *C. albicans* with MIC value of **400 µg/mL** and *C. glabrata* and *C. tropicalis* with MIC value of **500 µg/mL**. Analog **2m** also shows antifungal activity against *C. albicans* with MIC values of **200 µg/mL** and *C. glabrata* and *C. tropicalis* with a MIC value **250 µg/mL** as compared to the standard drug fluconazole. The binding interaction study of promising heterocyclic derivatives **2a**, **2b**, and **2m** with CT-DNA was carried out by using UV-visible, fluorescence, cyclic voltammetry, circular dichroism, and viscosity measurements. The molecular docking study of the heterocyclic derivatives (**2a-2n**) was done with PDB ID: 1BNA. The pharmacokinetics properties of the heterocyclic derivatives (**2a-2n**) showed good oral bioavailability. Antioxidant potential of heterocyclic derivatives (**2a-2n**) was further approximated through DPPH and H<sub>2</sub>O<sub>2</sub> free radical and showed that all the derivatives exhibited remarkable antioxidant activity.

## ARTICLE HISTORY

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## KEYWORDS

Heterocyclic derivatives; antifungal activity; CT-DNA binding; molecular docking; antioxidant properties

## 1. Introduction

Heterocyclic derivatives are an important class of ligands and have found various applications in the research area of medicinal chemistry. Heterocyclic derivatives show significant interest in the field of pharmaceutical chemistry and biology due to their antifungal<sup>1,2</sup> anticancer,<sup>3,4</sup> antibacterial,<sup>5,6</sup> antimalarial<sup>7,8</sup>, and antiviral activities.<sup>9</sup> A large proportion of the heterocyclic derivatives of the chemotherapeutic anticancer agents nowadays used are DNA-binding drugs.<sup>10,11</sup> The investigation into the DNA binding ability of small heterocyclic molecules will provide important information for the development of a new DNA-drug complex and a probe for biological activity.<sup>12</sup> Meanwhile, heterocyclic derivatives are also important reactive 'NOS' donor species, especially 4-bromo-1,8-naphthalic anhydride derivatives, which have received remarkable attention due to

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their unique ability to form chelates with DNA and have huge biomedical applications in living organisms.<sup>13</sup> It participates in many pathological and physiological processes and can react with numerous biological molecules in living organisms such as DNA and RNA.<sup>14,15</sup>

In the last few decades, the chemistry of heterocyclic derivatives viz. 4-bromo-1,8-naphthalimides has received significant attention in biological activities.<sup>16,17</sup> Functionalized, 4-bromo-1,8-naphthalimide and its derivatives have incredibly useful applications especially as anticancer,<sup>18–21</sup> antifungal,<sup>22–24</sup> antitubercular,<sup>25</sup> antioxidant<sup>26</sup>, and antiviral drugs<sup>27</sup> with various pharmacological applications.<sup>28,29</sup> Because of their pharmacological properties, it is a particularly versatile scaffold that has demonstrated very effective in DNA intercalation drugs and currently in a clinical investigation such as amonafide (1) and mitonafide (2) has been examined as potential anticancer therapeutics.<sup>30,31</sup>

Consequently, biological and molecular docking properties of DNA-topoisomerase-II inhibitors with different substituted 4-bromo-1,8-naphthalimide have been reported earlier.<sup>32</sup> Therefore, the synthesis of 4-bromo-1,8-naphthalic anhydride derivatives has gained much importance in the field of medicinal chemistry due to their potential as labile pro-drugs.<sup>33</sup>

In view of these investigations, we have synthesized a new series of heterocyclic derivatives and characterized using melting point, <sup>1</sup>H, <sup>13</sup>C-NMR, UV-visible, FT-IR spectroscopy and mass spectrometry. The heterocyclic derivatives (**2a–2n**) were examined for *in vitro* antifungal activity against three *Candida* strains. The lead heterocyclic analogs **2a**, **2b** and **2m** were further evaluated for binding interaction with CT-DNA. The molecular docking and pharmacokinetic study as a Lipinski's rules five parameters of the derivatives were measured through online software. Additionally, the antioxidant activity of the heterocyclic derivatives (**2a–2n**) was evaluated against DPPH and H<sub>2</sub>O<sub>2</sub> free radicals.

## 2. Materials and methods

All the chemicals and solvents were commercially available and used as received without further purification. 5-Bromo-2-hydroxybenzaldehyde, 2-quinolinecarboxaldehyde from GLR Innovations Pvt. Ltd., 4-(dimethylamino)benzaldehyde, hydrazine hydrate from SD fine chemicals Pvt. Ltd., 4-(diethylamino)benzaldehyde from Alfa Aesar Pvt. Ltd., isovanillin, 4-hydroxybenzaldehyde from LOBA chemie, ethyl vanillin from SRL Pvt. Ltd., 4-hydroxy-3-methoxycinnamaldehyde, 2-imidazolecarboxaldehyde, 4-imidazole carboxaldehyde, 3,4-dihydroxy benzaldehyde, fluconazole were purchased from Sigma-Aldrich Chemicals Pvt. Ltd., DPPH (2,2-diphenyl-1-picrylhydrazyl), hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) from Merck., 4-bromo-1,8-naphthalic anhydride, 5-methoxyindole-3-carboxaldehyde, 2,5-dimethoxybenzaldehyde, 6-methoxynaphthaldehyde, 5-bromothiophene-2-carbaldehyde from Spectrochem Pvt. Ltd.

Melting point of the heterocyclic derivatives was measured in a capillary of open tubes. The precoated silica gel aluminum plates (silica gel 20 × 20 cm, 60 F<sub>254</sub>, Merck, Germany) were used for thin layer chromatography (TLC). The Agilent technologies Cary 100 series spectrophotometer was used for UV-visible spectra in DMSO as solvent. By using Agilent Technologies Fluorescence Cary Eclipse spectrophotometer at room temperature (25 °C), emission spectral studies were performed. Circular dichroism was carried out using an Applied photophysics Chirascan spectrometer. Viscosity measurements were carried out using Ostwald viscometer at room temperature. Infrared spectra of all the neat heterocyclic derivatives were recorded by using Agilent Technology FTIR Cary 630 spectrophotometer. By using Bruker 300, 400, and 500 MHz NMR spectrometer in the solvent of CDCl<sub>3</sub>, DMSO-d<sub>6</sub> and tetramethyl silane (TMS) as internal standard, <sup>1</sup>H and <sup>13</sup>C NMR spectra analysis of all the heterocyclic derivatives were performed. Mass spectral analysis of synthesized heterocyclic derivatives was carried out by using of LCMS/MS Waters system.

### 3. Experimental section

#### 3.1. Synthesis of *N*-amino-4-bromo-1,8-naphthalimide (**1**)

Hydrazine hydrate (0.05 ml, 1 mmol) was added dropwise in a solution of 4-bromo-1,8-naphthalic anhydride (0.138 g, 0.5 mmol) in 5 ml DMF. The reaction mixture was refluxed at 80 °C for 12 h and then poured into crushed ice. The progress of the reaction was monitored by TLC (ethyl acetate and hexane; 7:3). A light-yellow precipitate (**1**) obtained was filtered and washed with cold water and then dried in a vacuum desiccator. The synthesis of heterocyclic derivative (**1**) is given in Scheme 1.<sup>34</sup>

#### 3.2. General synthesis of heterocyclic derivatives (**2a–2n**)

To a solution of *N*-amino-4-bromo-1,8-naphthalimide (**1**) (0.077 g, 0.25 mmol) in 5 ml ethanol, substituted aldehydes (0.2 mmol) in 5 ml ethanol was added. After some time, a few drops of conc. HCl was added, and the reaction mixture was refluxed at 80 °C with constant stirring for 6–12 h. The reaction mixture was monitored by TLC in 1:1 ratio of hexane and ethyl acetate. The resulting precipitates of heterocyclic derivatives (**2a–2n**) were filtered and washed several times with cold ethanol and dried in vacuum desiccators on fused calcium chloride. The synthesis of heterocyclic derivatives (**2a–2n**) is given in Scheme 2.

#### 6-Bromo-2-amino-benzo[de]isoquinoline-1,3-dione (**1**)

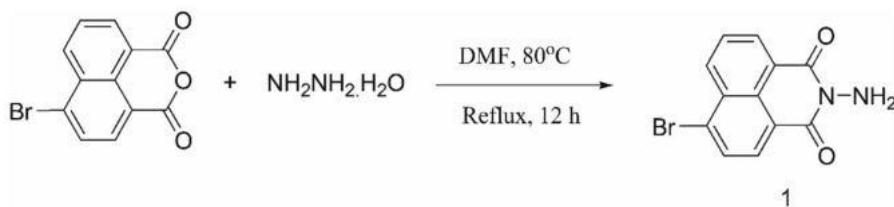
Yellow solid, Yield: 86%, M.p.: 235 °C. FT-IR (neat,  $\nu_{\max}$  cm<sup>-1</sup>): 3343–3246(NH<sub>2</sub>), 3097(C–H), 1700(C=O), 1656(C=N). <sup>1</sup>H-NMR (CDCl<sub>3</sub>,  $\delta$ , ppm): 8.57–8.56 (1H, d, Ar-CH), 8.54–8.52 (1H, d, Ar-H), 8.34–8.32 (1H, d, Ar-H), 8.21–8.19 (1H, d, Ar-H), 8.01–7.97 (1H, t, Ar-H), 5.78–5.80 (s, 2H, NH), <sup>13</sup>C NMR (75.49 MHz, DMSO-d<sub>6</sub>,  $\delta$ , ppm): 159.97, 132.70, 131.58, 131.38, 130.95, 129.75, 129.24, 128.82, 126.99, 122.42, 121.88. Mass spectrum: m/z: 291.1 [M]<sup>+</sup>.

#### 6-Bromo-2-[(4-imidazolidine)amino]benzo[de]isoquinolin-1,3-dione (**2a**)

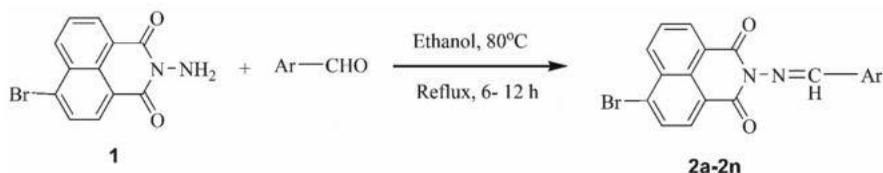
Light yellow powder, Yield. 75%,  $\lambda_{\max}$  = 342, M. p.: 242 °C. IR (neat,  $\nu_{\max}$  cm<sup>-1</sup>): 1709(C=O), 1620(C=N), 3250 (N–H). <sup>1</sup>H-NMR (DMSO-d<sub>6</sub>,  $\delta$ , ppm): 9.1 (1H, s, -NH), 8.82 (1H, s, -CH), 8.65–8.05 (7H, m, Ar-H), <sup>13</sup>C NMR (75.49 MHz, DMSO-d<sub>6</sub>,  $\delta$ , ppm): 160.61, 160.29, 133.42, 133.16, 131.74, 131.49, 130.10, 129.77, 129.26, 127.58, 122.78, 121.97. Mass spectrum: m/z: 371.03 [M + 2]<sup>+</sup>.

#### 6-Bromo-2-[(2-quinoline)-benzylidene]amino]benzo[de]isoquinolin-1,3-dione (**2b**):

Light yellow, Yield 75%,  $\lambda_{\max}$  = 342, M. p.: 210 °C. FT-IR (neat,  $\nu_{\max}$  cm<sup>-1</sup>): 1711(C=O), 1620(C=N). <sup>1</sup>H-NMR (DMSO-d<sub>6</sub>,  $\delta$ , ppm): 9.00 (1H, s, -CH), 8.90–8.88 (1H, d, Ar-H), 8.87–8.76 (1H, d, Ar-H), 8.66–8.63 (1H, d, Ar-H), 8.63–8.62 (1H, d, Ar-H), 8.52–8.50 (1H, d, Ar-H), 8.45–8.42 (1H, t, Ar-H), 8.40–8.39 (1H, d, Ar-H), 8.08–8.07 (1H, t, Ar-H), 8.05 (1H, d, Ar-H),



Scheme 1. Synthetic route of heterocyclic derivative **1**.



-Ar					
a		e		i	
b		f		j	
c		g		k	
d		h		l	
m					
n					

**Scheme 2.** Synthetic route of heterocyclic derivatives (2a–2n).

7.89–7.85 (1H, d, Ar-H), 7.69–7.65 (1H, d, Ar-H), 7.14–7.12 (1H, d, Ar-H),  $^{13}\text{C}$  NMR (75.49 MHz, DMSO- $d_6$ ,  $\delta$ , ppm): 163.92, 137.94, 134.42, 132.92, 132.33, 131.62, 131.33, 130.87, 129.66, 128.54, 128.32, 128.23, 125.42, 125.34, 123.40, 117.95, 117.81, 113.70, 113.65. Mass spectrum:  $m/z$ : 432.04  $[\text{M} + 2]^+$ .

**6-Bromo-2-[(4-dimethylamino)-benzylidene]amino]benzo[de]isoquinolin-1,3-dione (2c):**

Yellow powder, Yield 80%,  $\lambda_{\text{max}} = 359$ , M. p.: 200 °C. FT-IR (neat,  $\nu_{\text{max}}$   $\text{cm}^{-1}$ ): 1672(C=O), 1596(C=N).  $^1\text{H}$ -NMR ( $\text{CDCl}_3$ ,  $\delta$ , ppm): 8.76 (1H, s, -CH), 8.72–8.71 (1H, d, Ar-H), 8.46–8.37 (1H, t, Ar-H), 8.48 (1H, s, Ar-H), 8.61–8.59 (1H, d, Ar-H), 8.08–8.06 (1H, d, Ar-H), 7.74–7.72 (1H, d, Ar-H), 7.89–7.87 (1H, d, Ar-H), 7.82 (1H, d, Ar-H), 6.77–6.72 (1H, d, Ar-H), 2.18 (1H, s, -CH $_3$ ),  $^{13}\text{C}$  NMR (75.49 MHz,  $\text{CDCl}_3$ ,  $\delta$ , ppm): 40.53, 111.44, 111.84, 120.29, 121.36, 122.78, 123.90, 128.61, 131.64, 131.97, 132.82, 133.81, 153.84, 161.43, 171.74. Mass spectrum:  $m/z$ : 424.11  $[\text{M} + 2]^+$ .

**6-Bromo-2-[(4-hydroxy-3-methoxycinnamal)-benzylidene]amino]benzo[de]isoquinolin-1,3-dione (2d):**

Yellow solid, Yield 68%,  $\lambda_{\text{max}} = 359$ , M.p.: 220 °C. FT-IR (neat,  $\nu_{\text{max}}$   $\text{cm}^{-1}$ ): 3524 (O-H), 1732(C=O), 1590(C=N).  $^1\text{H}$ -NMR (DMSO- $d_6$ ,  $\delta$ , ppm): 9.63 (1H, s, -CH), 8.60–8.58 (1H, d, Ar-H), 8.39–8.37 (1H, d, Ar-H), 8.25–8.23 (1H, d, Ar-H), 8.04–8.00 (1H, t, Ar-H), 7.39 (1H, s,

-CH), 7.30 (1H, s, -CH), 7.26–7.24 (1H, d, Ar-H), 7.15–7.12 (1H, d, Ar-H), 6.85–6.82 (1H, d, Ar-H), 6.73 (1H, s, Ar-H), 5.80 (1H, s, O-H), 3.90 (3H, s, -OCH<sub>3</sub>), <sup>13</sup>C NMR (75.49 MHz, DMSO-d<sub>6</sub>, δ, ppm): 173.54, 159.80, 149.4, 148.00, 147.67, 146.98, 132.68, 132.45, 131.74, 131.00, 130.91, 129.73, 127.60, 126.68, 123.04, 122.78, 122.27, 120.68, 115.58, 110.78, 55.89. Mass spectrum: m/z: 451.25 [M]<sup>+</sup>.

**6-Bromo-2-[(4-diethylamino)-benzylidene]amino]benzo[de]isoquinolin-1,3-dione (2e):**

Brown solid, Yield 65%,  $\lambda_{\max}$  = 341, M.p.: 224 °C. FT-IR (cm<sup>-1</sup>): 1729(C=O), 1588(C=N).

<sup>1</sup>H NMR (DMSO-d<sub>6</sub>, δ, ppm): 9.63 (1H, s, -CH), 8.60–8.58 (1H, d, Ar-H), 8.57–8.55 (1H, d, Ar-H), 8.36–8.34 (1H, d, Ar-H), 8.25–8.23 (1H, t, Ar-H), 8.22–8.01 (1H, d, Ar-H), 6.88–6.86 (1H, d, Ar-H), 3.49–3.46 (2H, t, -CH<sub>2</sub>-), 1.17–1.13 (3H, q, -CH<sub>3</sub>), <sup>13</sup>C NMR (75.49 MHz, DMSO-d<sub>6</sub>, δ, ppm): 171.50, 160.44, 133.41, 132.17, 131.94, 131.66, 131.45, 130.42, 130.22, 129.92, 129.38, 127.93, 127.61, 123.92, 123.58, 122.87, 122.14, 45.08, 12.80. Mass spectrum: m/z: 450.40 [M]<sup>+</sup>.

**6-Bromo-2-[(3,4-dihydroxy)-benzylidene]amino]benzo[de]isoquinolin-1,3-dione (2f):**

Yellow, Yield 80%,  $\lambda_{\max}$  = 329, M. p.: 195 °C. FT-IR (neat,  $\nu_{\max}$  cm<sup>-1</sup>): 3281(O-H), 1704(C=O), 1598(C=N). <sup>1</sup>H-NMR (CDCl<sub>3</sub>, δ, ppm): 8.75 (1H, s, -CH), 8.72–8.70 (1H, d, Ar-H), 8.62–8.59 (1H, d, Ar-H), 8.55–8.48 (1H, d, Ar-H), 8.47–8.45 (1H, t, Ar-H), 8.08–8.06 (1H, d, Ar-H), 7.88–7.86 (1H, d, Ar-H), 7.33–7.31 (1H, d, Ar-H), 7.28 (1H, s, Ar-H), 3.76 (2H, s, O-H), <sup>13</sup>C NMR (75.49 MHz, CDCl<sub>3</sub>, δ, ppm): 172.05, 160.29, 151.09, 146.30, 133.44, 132.06, 131.48, 129.75, 128.15, 127.26, 124.24, 123.63, 122.78, 121.96, 116.36, 114.42. Mass spectrum: m/z: 412.25[M+2]<sup>+</sup>.

**6-Bromo-2-[(3-hydroxy-4-methoxy)-benzylidene]amino]benzo[de]isoquinolin-1,3-dione (2g):**

Light yellow, Yield 79%,  $\lambda_{\max}$  = 342, M. p.: 244 °C. FT-IR (neat,  $\nu_{\max}$  cm<sup>-1</sup>): 3373(O-H), 1711(C=O), 1615(C=N). <sup>1</sup>H-NMR (DMSO-d<sub>6</sub>, δ, ppm): 8.72 (1H, s, -CH), 8.63–8.61 (1H, d, Ar-H), 8.09–8.07 (1H, t, Ar-H), 8.70–8.68 (1H, d, Ar-H), 8.48–8.46 (1H, d, Ar-H), 7.71 (1H, s, Ar-H), 7.01–6.99 (1H, d, Ar-H), 6.15 (1H, s, Ar-H), 4.23 (3H, s, -OCH<sub>3</sub>), 3.39 (1H, s, O-H), <sup>13</sup>C NMR (75.49 MHz, DMSO-d<sub>6</sub>, δ, ppm): 171.94, 160.30, 152.32, 147.41, 133.13, 132.46, 129.80, 129.47, 128.13, 125.51, 123.50, 113.85, 112.21, 106.23. Mass spectrum: m/z: 426.80 [M + 2]<sup>+</sup>.

**6-Bromo-2-[(3-ethoxy-4-hydroxy)-benzylidene]amino]benzo[de]isoquinolin-1,3-dione(2h):**

Dark yellow, Yield 68%,  $\lambda_{\max}$  = 340, M. p.: 185 °C. FT-IR (neat,  $\nu_{\max}$  cm<sup>-1</sup>): 3345(O-H), 1709(C=O), 1592(C=N). <sup>1</sup>H-NMR (DMSO-d<sub>6</sub>, δ, ppm): 8.92 (1H, s, -CH), 8.72–8.72 (1H, d, Ar-H), 8.65–.63 (1H, d, Ar-H), 8.49–8.43 (1H, d, Ar-H), 8.10– 8.08 (1H, d, Ar-H), 7.92–7.93 (1H, d, Ar-H), 7.07–7.04 (1H, t, Ar-H), 6.95–6.93 (1H, d, Ar-H), 8.74 (1H, s, Ar-H), 3.96 (2H, t, -CH<sub>2</sub>-), 1.21 (3H, q, -CH<sub>3</sub>), <sup>13</sup>C NMR (75.49 MHz, DMSO-d<sub>6</sub>, δ, ppm): 159.90, 159.77, 151.47, 147.21, 132.64, 131.73, 131.07, 130.88, 129.74, 129.25, 128.74, 127.55, 126.87, 124.41, 123.68, 122.31, 121.55, 115.58, 111.66, 63.91, 14.64. Mass spectrum: m/z: 439.00 [M]<sup>+</sup>.

**6-Bromo-2-[(2,5-dimethoxy)-benzylidene]amino]benzo[de]isoquinolin-1,3-dione (2i):**

Light yellow, Yield 75%,  $\lambda_{\max}$  = 357, M. p.: 230 °C. FT-IR (neat,  $\nu_{\max}$  cm<sup>-1</sup>): 3082(OCH<sub>3</sub>), 1704(C=O), 1588(C=N). <sup>1</sup>H-NMR (CDCl<sub>3</sub>, δ, ppm): 8.95 (1H, s, -CH), 8.06–8.05 (1H, d, Ar-H), 8.47–8.45 (1H, d, Ar-H), 8.60–8.59 (1H, d, Ar-H), 8.71–8.67 (1H, t, Ar-H), 7.84 (1H, s, Ar-H), 7.85 (1H, s, Ar-H), 7.09–7.08 (1H, d, Ar-H), 6.94–6.92 (1H, d, Ar-H), 3.84 (6H, s, -OCH<sub>3</sub>), <sup>13</sup>C NMR (75.49 MHz, DMSO-d<sub>6</sub>, δ, ppm): 167.79, 160.54, 154.09, 153.52, 133.88, 132.48, 131.69,

131.35, 130.79, 130.53, 128.23, 123.21, 122.35, 122.14, 121.24, 112.82, 110.29, 56.24, 55.95. Mass spectrum:  $m/z$ : 441.00  $[M + 2]^+$ .

#### **6-Bromo-2-[(2-imidazolidine)amino]benzo[de]isoquinolin-1,3-dione (2j):**

Yellow solid, Yield 73%,  $\lambda_{\max} = 342$ , M. p.: 215 °C. FT-IR (neat,  $\nu_{\max}$   $\text{cm}^{-1}$ ): 3345(N-H), 3246(O-H), 1700(C=O), 1559(C=N).  $^1\text{H-NMR}$  (DMSO- $d_6$ ,  $\delta$ , ppm): 8.77 (1H, s, -CH), 8.69–8.67 (1H, d, Ar-H), 8.61–8.59 (1H, d, Ar-H), 8.43 (1H, s, Ar-H), 8.07–8.05 (1H, d, Ar-H), 7.88–7.86 (1H, d, Ar-H), 7.19–7.14 (1H, d, Ar-H).  $^{13}\text{C NMR}$  (75.49 MHz, DMSO- $d_6$ ,  $\delta$ , ppm): 160.02, 159.97, 132.75, 131.63, 131.43, 131.00, 129.79, 129.28, 128.88, 127.05, 122.47, 121.70. Mass spectrum:  $m/z$ : 369.90  $[M]^+$ .

#### **6-Bromo-2-[(4-hydroxy)-benzylidene]amino]benzo[de]isoquinolin-1,3-dione (2k):**

Light yellow, Yield 80%,  $\lambda_{\max} = 340$ , M. p.: 265 °C. FT-IR (neat,  $\nu_{\max}$   $\text{cm}^{-1}$ ): 3421(O-H), 1704(C=O), 1603(C=N).  $^1\text{H-NMR}$  (DMSO- $d_6$ ,  $\delta$ , ppm): 8.6 (1H, s, -CH), 8.61–8.60 (1H, d, Ar-H), 8.26–8.24 (1H, t, Ar-H), 8.58–8.57 (1H, d, Ar-H), 8.38–8.36 (1H, d, Ar-H), 8.36–8.34 (1H, d, Ar-H), 8.01–7.99 (1H, d, Ar-H), 8.05–8.03 (1H, d, Ar-H), 7.81–7.79 (1H, d, Ar-H), 6.96–6.94 (1H, d, Ar-H), 5.80 (1H, s, O-H),  $^{13}\text{C NMR}$  (75.49 MHz, DMSO- $d_6$ ,  $\delta$ , ppm): 161.64, 159.93, 132.68, 131.76, 131.56, 131.39, 131.11, 130.97, 129.76, 129.29, 128.81, 128.78, 127.59, 126.89, 123.39, 123.04, 122.33, 121.56, 115.92. Mass spectrum:  $m/z$ : 395.20  $[M]^+$ .

#### **6-Bromo-2-[(5-bromothiophene)amino]benzo[de]isoquinolin-1,3-dione (2l):**

Yellow solid, Yield 70%,  $\lambda_{\max} = 341$ , M. p.: 225 °C. FT-IR (neat,  $\nu_{\max}$   $\text{cm}^{-1}$ ): 1704(C=O), 1603(C=N).  $^1\text{H-NMR}$  (DMSO- $d_6$ ,  $\delta$ , ppm): 8.72 (1H, s, -CH), 8.72–8.70 (1H, d, Ar-H), 8.62–8.65 (1H, d, Ar-H), 8.48–8.46 (1H, d, Ar-H), 7.88 (1H, s, Ar-H), 7.30–7.26 (1H, t, Ar-H), 7.14 (1H, d, Ar-H),  $^{13}\text{C NMR}$  (75.49 MHz, DMSO- $d_6$ ,  $\delta$ , ppm): 162.99, 162.68, 137.60, 134.54, 133.82, 132.72, 132.54, 131.96, 131.85, 131.35, 130.92, 130.79, 128.30, 123.60, 106.52. Mass spectrum:  $m/z$ : 462.90  $[M + 1]^+$ .

#### **6-Bromo-2-[(6-methoxy-1H-indole)-benzylidene]amino]benzo[de]isoquinolin-1,3-dione (2m):**

Yellow solid, Yield 85%,  $\lambda_{\max} = 340$ , M. p.: 250 °C. IR (neat,  $\nu_{\max}$   $\text{cm}^{-1}$ ): 3371(N-H), 1704(C=O), 1607(C=N).  $^1\text{H-NMR}$  ( $\text{CDCl}_3$ ,  $\delta$ , ppm): 9.8 (1H, s, NH), 8.67 (1H, s, -CH), 8.62–8.59 (1H, d, Ar-H), 8.56–8.56 (1H, d, Ar-H), 8.36–8.33 (1H, d, Ar-H), 8.33 (1H, s, Ar-H), 8.26–8.23 (1H, t, Ar-H), 8.02–8.00 (1H, d, Ar-H), 7.73 (1H, s, Ar-H), 7.45–7.43 (1H, d, Ar-H), 6.94–6.92 (1H, d, Ar-H), 3.8 (3H, s, -OCH $_3$ ),  $^{13}\text{C-NMR}$  (75.49 MHz, DMSO- $d_6$ ,  $\delta$ , ppm): 167.55, 160.53, 155.48, 135.31, 132.50, 131.94, 131.43, 130.29, 129.71, 129.13, 128.01, 127.44, 125.79, 123.84, 123.26, 121.88, 113.46, 110.87, 104.44, 55.94. Mass spectrum:  $m/z$ : 449.02  $[M + 1]^+$ .

#### **6-Bromo-2-[(5-bromo-2-hydroxy)-benzylidene]amino]benzo[de]isoquinolin-1,3-dione (2n):**

Light yellow powder, Yield 78%,  $\lambda_{\max} = 343$ , M.p.: 260 °C. FT-IR (neat,  $\nu_{\max}$   $\text{cm}^{-1}$ ): 3108(O-H), 1715(C=O), 1579(C=N).  $^1\text{H-NMR}$  (DMSO- $d_6$ ,  $\delta$ , ppm): 11.4 (1H, s, O-H), 8.95 (1H, s, -CH), 8.75–8.73 (1H, s, Ar-H), 8.67–8.65 (1H, d, Ar-H), 8.49–8.50 (1H, d, Ar-H), 8.14–8.10 (1H, t, Ar-H), 7.96–7.92 (1H, s, Ar-H), 7.92–7.91 (1H, d, Ar-H), 7.50 (1H, s, Ar-H), 7.00–6.98 (1H, d, Ar-H),  $^{13}\text{C NMR}$  (75.49 MHz, DMSO- $d_6$ ,  $\delta$ , ppm): 160.44, 160.07, 157.46, 134.94, 133.39, 132.92, 131.99, 131.67, 131.29, 129.95, 129.63, 129.27, 128.96, 127.62, 127.32, 122.70, 122.02. Mass spectrum:  $m/z$ : 474.40  $[M]^+$ .

### 3.3. Antifungal activity

#### 3.3.1. Disk diffusion assay

The heterocyclic derivatives (**2a–2n**) were screened for *in vitro* antifungal activity against three fungal strains: *C. albicans*, *C. glabrata*, and *C. tropicalis* with a concentration of 200–600  $\mu\text{g}/\text{mL}$  by Agar disk diffusion assay.<sup>35,36</sup> Solutions of the heterocyclic analogs in DMSO were plated onto the cultured agar medium and incubated for a period of 48 h at 37 °C. Fluconazole was used as a standard drug. The results were measured in terms of the zone of inhibition in mm.

#### 3.4. Growth curve

The growth motif of the heterocyclic analogs **2a**, **2b**, and **2m** was analyzed against three different *Candida* strains sustained at 4 °C which were immunized in fresh YEPD media. On the culture dish with the whisking rate of 200 rpm differing concentrations of compounds **2a**, **2b**, and **2m** were added and incubated at 37 °C. The motif was observed with pre-established time intervals of 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22 and 24 h before removing aliquots. At 595 nm absorbance of the compounds was recorded by using UV–Vis. spectrophotometer for every concentration in DMSO and a graph plotted against time.<sup>37</sup>

### 3.5. DNA binding studies

#### 3.5.1. Electronic absorption spectra

The CT-DNA binding ability of the heterocyclic derivatives **2a**, **2b**, and **2m** were investigated using absorption spectroscopy. In Tris–HCl buffer (50 mM) at 7.4 pH, CT-DNA stock solution was made ready, and concentration was obtained by the coefficient of molar absorption ( $\epsilon_{260} = 6600 \text{ liter mol}^{-1} \text{ cm}^{-1}$ ). The absorbance spectra ratio of 1.9:1 was recorded in between 260 and 280 nm to confirm the purity of prepared CT-DNA.<sup>38–40</sup> Experimental absorbance was determined in the range of 200–600 nm by maintaining the fixed concentrations of the compounds **2a**, **2b**, and **2m** ( $1.0 \times 10^{-5} \text{ M}$ ) with increasing concentrations of CT-DNA ( $0.1\text{--}0.8 \times 10^{-5} \text{ M}$ ) and absorption spectra were measured using UV-visible spectrophotometer in Tris–HCl buffer (50 mM, 7.4 pH). The mixture solutions of heterocyclic derivatives **2a**, **2b** and **2m** were incubated for 5–15 min at 25 °C before recording the spectra. All the experiments were carried out in triplicate. The Binding constant ( $K_b$ ) was calculated by using the given Equation (1):

$$\frac{[\text{DNA}]}{(\epsilon_a - \epsilon_f)} = \frac{[\text{DNA}]}{(\epsilon_b - \epsilon_f)} + \frac{1}{k_b(\epsilon_b - \epsilon_f)} \quad (1)$$

where,  $\epsilon_a$ ,  $\epsilon_f$  and  $\epsilon_b$  are the correlate extinction coefficients of the heterocyclic compound at every concentration of CT-DNA, for unbounded heterocyclic compounds and for totally bounded compounds to DNA respectively. For the value of  $K_b$  graph was plotted between [DNA] versus [DNA]/ $[\epsilon_a - \epsilon_f]$  with a slope of  $1/(\epsilon_b - \epsilon_f)$  and intercept  $1/K_b(\epsilon_b - \epsilon_f)$  ratio.

Gibb's free energy (G) was also calculated to observe the spontaneity of the heterocyclic derivatives **2a**, **2b**, and **2m** was calculated by the following formula;

$$G = -2.303RT \log k$$

where, K=binding constant, T=absolute temperature (298 K), R=Universal gas constant ( $8.3141 \text{ J mol}^{-1} \text{ K}^{-1}$ ) for heterocyclic compounds with CT-DNA.<sup>41</sup>

#### 3.5.2. Fluorescence study

Fluorescence emission titrations were further studied to observe the effect of CT-DNA on synthesized heterocyclic derivatives **2a**, **2b**, and **2m**. At a fixed concentration of CT-DNA (10  $\mu\text{M}$ ) in

Tris-HCl buffer solution (50 mM) at 7.4 pH with increasing concentration of heterocyclic derivatives **2a**, **2b**, and **2m** ( $0.1\text{--}0.8 \times 10^{-5}$  M). Emission titration spectra were recorded between 300–500 nm after incubating the mixture solutions for 10 minutes at room temperature.<sup>42–44</sup> From the obtained experimental data, the graph was plotted against wavelength (nm) vs intensity.

### 3.5.3. Cyclic voltammetry

Cyclic voltammetry (CV) is another method to investigate the interaction of CT-DNA with heterocyclic derivatives **2a**, **2b**, and **2m**. Cyclic voltammetry measurements were completed in the presence and absence of CT-DNA in Tris-HCl buffer solution (50 mM) at 7.4 pH. A Pt wire has been laid hold of as a counter electrode, solid Pt was used as the working electrode and Ag/AgCl was used as a reference electrode. CV measurements of heterocyclic derivatives **2a**, **2b**, and **2m** have been completed by cycling the potential of the working electrode and calculating the resulting current. All the investigations have been finalized with the  $50 \text{ mVsec}^{-1}$  scan rate in the potential interval of -1 to +1 V at 25 °C and spectra of voltammetry were plotted between potential (V) vs current (A).<sup>45,46</sup>

### 3.5.4. Circular dichroism spectroscopy

A circular dichroism measurement study is also a very important method to examine the interaction of CT-DNA with heterocyclic derivatives **2a**, **2b**, and **2m**. Spectra were obtained with an Applied photophysics Chirascan spectrometer with  $50 \mu\text{M}$  of CT-DNA in the absence and presence of  $5 \mu\text{M}$  each of heterocyclic derivatives of **2a**, **2b**, and **2m** separately in 50 mM Tris-HCl buffer (pH 7.4) at 200–300 nm by using of 1 mm path length cuvette with the scan rate of  $30 \text{ nmmin}^{-1}$ .<sup>47,48</sup>

### 3.5.5. Viscosity measurement

Viscosity titrations of the synthesized heterocyclic analogs **2a**, **2b**, and **2m** were performed at rt (25 °C) by using the Ostwald viscometer. Measurements were carried out at increasing concentrations of synthesized heterocyclic derivatives **2a**, **2b**, and **2m** ( $0.1\text{--}0.9 \times 10^{-5}$ ) with a fixed concentration of CT-DNA ( $10 \mu\text{M}$ ) and flow time was recorded with a digital stopwatch. The graph between the  $[\text{compound}]/[\text{DNA}]$  vs  $(\eta/\eta_0)^{1/3}$  respective specific viscosity was plotted.<sup>49</sup> From the average flow time (Equation 2), the viscosity of the three heterocyclic derivatives **2a**, **2b**, and **2m** was calculated from the solution having CT-DNA by using.

$$\begin{aligned}\eta_0 &= t - t_0 \\ \eta &= t_1 - t\end{aligned}\quad (2)$$

where  $t$ ,  $t_0$ , and  $t_1$  are the average flow times for CT-DNA, Tris- Buffer and compounds respectively and  $\eta_0$  and  $\eta$  are the specific viscosity for CT-DNA in with and without the heterocyclic compounds **2a**, **2b**, and **2m**.

## 3.6. Molecular docking

*In silico* molecular docking study was also done in order to determine the interaction between the DNA (PDB ID: 1BNA) and heterocyclic derivatives (**2a–2n**). The main target of the docking study for specified heterocyclic derivatives (**2a–2n**) was to approximate the experimental active binding sites. The initial structures of the heterocyclic derivatives (**2a–2n**) were generated by Chem Draw Ultra 12.0 software. 1BNA crystal structures were downloaded from ([www.rcsb.org/pdb](http://www.rcsb.org/pdb)) RCSB Data Bank of Protein in PDB format. To convert PDB structure files into PDBQT format, protein and target heterocyclic derivatives (**2a–2n**) drugs were loaded in AutoDock online

software. For the evaluation of the smallest binding energy, a grid box was created in the place of the drug and excellent corroboration was selected. The most developed model was chosen on the basis of the smallest binding energy and zero roots mean square deviation (rmsd). By using Discovery Studio 3.0 (Accelrys, DS visualizer, and pymol) software, results of AutoDock were analyzed like hydrogen bonding and hydrophobic interactions. The best docking pose result of each heterocyclic derivatives (**2a–2n**) was proved relevant information with regard to the interaction of active sites of 1BNA with the heterocyclic derivatives (**2a–2n**).<sup>50–53</sup> The 3D, 2D poses of the most active heterocyclic derivatives **2a** were taken using discovery studio.

### 3.7. Pharmacokinetics studies

ADME was used to predict pharmacokinetic properties of the synthesized heterocyclic derivatives (**2a–2n**) were determined by using Molinspiration Chemo Informatics as online free software to investigate the bioavailability of the synthesized heterocyclic derivatives (**2a–2n**) to ensure that it has drug potential.<sup>54–56</sup>

### 3.8. Antioxidant activity

#### 3.8.1. DPPH free radical scavenging assay

Antioxidant activity of the heterocyclic derivatives (**2a–2n**) was measured with DPPH (2,2-diphenyl-1-picrylhydrazyl) free radical. 2 ml of test compounds ( $10^{-4}$ M) in DMSO was added to the 1 ml of DPPH ( $10^{-4}$  M) in ethanolic solution. The absorbance of all the heterocyclic derivatives (**2a–2n**) was recorded by using a UV-visible spectrophotometer at 511 nm after the incubation of 2 h at 37 °C and ethanol was taken as a blank. The graph between percentage antioxidant activity v/s concentrations of heterocyclic derivatives (**2a–2n**) gave the IC<sub>50</sub> value in µg/ml.<sup>57,58</sup> All the experiments were performed in triplicate and the antioxidant activity of all the heterocyclic compounds was calculated by Equation 3.

$$\% \text{Inhibition} = \frac{A_{\text{control}} - A_{\text{sample}}}{A_{\text{sample}}} \times 100 \quad (3)$$

where  $A_{\text{control}}$  = absorbance of DPPH free radical in ethanol in the absence of compound and  $A_{\text{sample}}$  = absorbance of DPPH free radical in the presence of compound.

#### 3.8.2. Hydrogen peroxide scavenging assay:

Antioxidant activity of the heterocyclic derivatives (**2a–2n**) was also further determined by using hydrogen peroxide as used in the reported method.<sup>59,60</sup> 1 ml of 40 mM of hydrogen peroxide solution in the phosphate buffer (pH-7.4) was added to the 2 ml of heterocyclic derivatives ( $10^{-5}$  M). Absorbance was recorded at 220 nm after incubating the test compound for 10 minutes and phosphate buffer was used as a blank.

The % inhibition of free radical H<sub>2</sub>O<sub>2</sub> was calculated by using Equation (4).

$$\% \text{Inhibition} = \frac{A_{\text{control}} - A_{\text{sample}}}{A_{\text{sample}}} \times 100 \quad (4)$$

where  $A_{\text{control}}$  and  $A_{\text{sample}}$  = are the absorbance of H<sub>2</sub>O<sub>2</sub> free radical in presence and absence of compounds.

## 4. Results and discussion

### 4.1. Chemistry

#### 4.1.1. FT-IR spectra

In the heterocyclic derivative **1**, stretching vibration of (-N-NH<sub>2</sub>) group appears at  $\sim 3343\text{ cm}^{-1}$ . The disappearance of the stretching and bending vibration of the group (-N-NH<sub>2</sub>) indicates the formation of heterocyclic derivatives (**2a-2n**). The (-C=N) azomethine group appears in the range of  $1559\text{--}1620\text{ cm}^{-1}$ .<sup>61</sup> A broad band in the region of  $3281\text{--}3525\text{ cm}^{-1}$  attributed to the phenolic group (-OH) stretching vibration for the heterocyclic derivatives **2d**, **2f**, **2g**, **2h**, **2k**, **2n**, and a sharp peak of (-N-H) band for the heterocyclic derivatives **2a**, **2j**, and **2m** in the range of  $3108\text{--}3371\text{ cm}^{-1}$  attributed. The characteristic bands at  $3136\text{--}2831$ ,  $1339\text{--}1236$ , and  $820\text{--}775\text{ cm}^{-1}$  can conditionally be assigned to (-C-H) aromatic, (C=C) aromatic and C-Br mode of vibration spectra respectively of all the heterocyclic derivatives. The band appearing at  $\sim 2941\text{--}3190\text{ cm}^{-1}$  range in the IR spectra of the heterocyclic derivatives (**2d**, **2g**, **2i**, **2m**, and **2n**) and may be assigned to the stretching vibration of -OCH<sub>3</sub>.<sup>62</sup> Mass spectrometry and FT-IR spectra of all heterocyclic analogs (**2a-2n**) are given in [supplementary Figures S1 and S2](#), respectively.

#### 4.1.2. NMR spectra

<sup>1</sup>H NMR spectra of the heterocyclic derivatives (**2a-2n**) exhibited well-resolved signals. A characteristic peak appears at 8.60–9.63 ppm range corresponding to the azomethine proton of the heterocyclic derivatives (**2a-2n**). A broad peak assigned to O-H proton appeared in the range of 3.76–11.47 ppm for the heterocyclic derivatives **2d**, **2f**, **2g**, **2h**, **2k**, and **2n**. A sharp signal for the heterocyclic analog **2a**, **2j**, and **2m** appeared at 8.69–9.89 ppm range corresponds to -N-H proton. The aromatic proton for all the heterocyclic derivatives (**2a-2n**) appeared in the range of 6.15–8.90 ppm.<sup>63</sup> <sup>13</sup>C NMR spectra of heterocyclic derivatives (**2d**, **2g**, **2i**, **2m** and **2n**) exhibited a peak in the range of 40.53–63.91 ppm for the methoxy carbon (-OCH<sub>3</sub>). The methene (-OCH<sub>2</sub>-) and methyl (-CH<sub>3</sub>) carbon of compound **2h** appeared at 14.64 and 63.91 ppm respectively. <sup>13</sup>C NMR peak of carbonyl groups (C=O) of the heterocyclic derivatives (**1** and **2a-2n**) was found in 173.54–157.75 ppm range. The azomethine carbon was observed at 137.98–139.2 ppm range. Aromatic carbon appeared at 104.44–155.48 ppm range. <sup>1</sup>H and <sup>13</sup>C NMR spectra of the heterocyclic analogs (**2a-2n**) given in [supplementary Figure S3](#).

### 4.2. Antifungal study

#### 4.2.1. Disk diffusion assay

The *in vitro* antifungal activities of the heterocyclic derivatives (**2a-2n**) were examined at 200–600  $\mu\text{g/mL}$  concentrations by Agar Disk-diffusion assay against three fungal strains *C. albicans*, *C. glabrata* and *C. tropicalis*. Disk figures of heterocyclic derivatives (**2a-2n**) are shown in [Figure S4](#). The results were measured in terms of the zone of inhibition (mm).<sup>64,65</sup> It has been observed that the **2a** exhibited significant activity against *C. albicans*, *C. glabrata*, and *C. tropicalis* with MIC value 200  $\mu\text{g/mL}$  and **2b** exhibited activity 400  $\mu\text{g/mL}$  against *C. albicans* and 500  $\mu\text{g/mL}$  *C. glabrata*, and *C. tropicalis* **2m** exhibit greater activity against *C. albicans* with MIC value 200  $\mu\text{g/mL}$  and 250  $\mu\text{g/mL}$  against *C. glabrata*, and *C. tropicalis* fungal strains. This may be described based on the chelation theory. It is also distinguished that the activities of the heterocyclic derivatives increase as well as the increase in the concentration of the test compounds. It is because the concentration of the compounds plays a vital role in increasing in the degree of inhibition of antifungal growth. Additionally, many other important factors like the nature of the compounds, dipole moment, solubility, the geometry of the compounds and conductivity may be responsible for the

**Table 1.** *In vitro* susceptibility of test compounds (**2a–2n**) against *Candida albicans* (ATCC 90028), *Candida glabrata* (ATCC 90030) and *Candida tropicalis* (ATCC750). Fluconazole was taken as a positive control with MIC value of 10 µg/ml (ZOI of 18 mm).

Test compounds	MIC(µg/ml)			Diameter of zone of inhibition (mm)					
	<i>C. albicans</i> (ATCC 90028)	<i>C. glabrata</i> (ATCC 90030)	<i>C. tropicalis</i> (ATCC 750)	<i>C. albicans</i> (ATCC 90028)		<i>C. glabrata</i> (ATCC 90030)		<i>C. tropicalis</i> (ATCC 750)	
2a	200	200	200	MIC/2	18	MIC/2	17	MIC/2	18
				MIC	21	MIC	22	MIC	22
				2MIC	23	2MIC	23	2MIC	23
2b	400	500	500	MIC/2	17	MIC/2	10	MIC/2	11
				MIC	21	MIC	13	MIC	13
				2MIC	22	2MIC	15	2MIC	14
2c	400	500	500	MIC/2	15	MIC/2	12	MIC/2	11
				MIC	17	MIC	14	MIC	12
				2MIC	18	2MIC	16	2MIC	14
2d	450	500	500	MIC/2	14	MIC/2	10	MIC/2	11
				MIC	16	MIC	12	MIC	12
				2MIC	17	2MIC	14	2MIC	13
2e	300	400	400	MIC/2	18	MIC/2	15	MIC/2	16
				MIC	22	MIC	18	MIC	19
				2MIC	23	2MIC	20	2MIC	21.5
2f	500	600	600	MIC/2	14	MIC/2	12	MIC/2	13
				MIC	16	MIC	15	MIC	15
				2MIC	17	2MIC	17	2MIC	16
2g	500	550	550	MIC/2	13	MIC/2	11	MIC/2	12
				MIC	15	MIC	13	MIC	14
				2MIC	16.5	2MIC	15	2MIC	15
2h	350	400	400	MIC/2	18	MIC/2	15	MIC/2	13
				MIC	20	MIC	17	MIC	16
				2MIC	22	2MIC	18	2MIC	18
2i	400	500	500	MIC/2	15.5	MIC/2	12	MIC/2	13
				MIC	18	MIC	14	MIC	15
				2MIC	20	2MIC	15.5	2MIC	16
2j	300	350	350	MIC/2	15	MIC/2	16	MIC/2	15
				MIC	19	MIC	18	MIC	18
				2MIC	20	2MIC	20	2MIC	21
2k	500	500	600	MIC/2	12	MIC/2	11.5	MIC/2	12
				MIC	14	MIC	12	MIC	16
				2MIC	16	2MIC	15	2MIC	18
2l	450	550	500	MIC/2	11	MIC/2	12	MIC/2	11
				MIC	13	MIC	14	MIC	12
				2MIC	15	2MIC	15.5	2MIC	13.5
2m	200	250	250	MIC/2	15	MIC/2	16	MIC/2	15
				MIC	18	MIC	18	MIC	18
				2MIC	20	2MIC	21	2MIC	20.5
2n	500	500	600	MIC/2	10	MIC/2	12	MIC/2	10
				MIC	12	MIC	14	MIC	12
				2MIC	14	2MIC	16	2MIC	14

higher activity. The relative antifungal activities of all the heterocyclic derivatives (**2a–2n**) against *C. albicans*, *C. glabrata*, and *C. tropicalis* are given in Table 1.

#### 4.3. Growth curve

The growth patterns of heterocyclic derivatives **2a**, **2b**, and **2m** were carried out in the media of YEPD and observed for a period of 24 hours as given in Figures 1, 2, 3. Fluconazole (FLC) as a standard drug showed MIC value of 10 µg/ml with ZOI of 25 mm. From the experimental observations, heterocyclic derivatives **2a**, **2b**, and **2m** indicate a concentration-dependent subduing of a pattern of growth.<sup>66</sup>

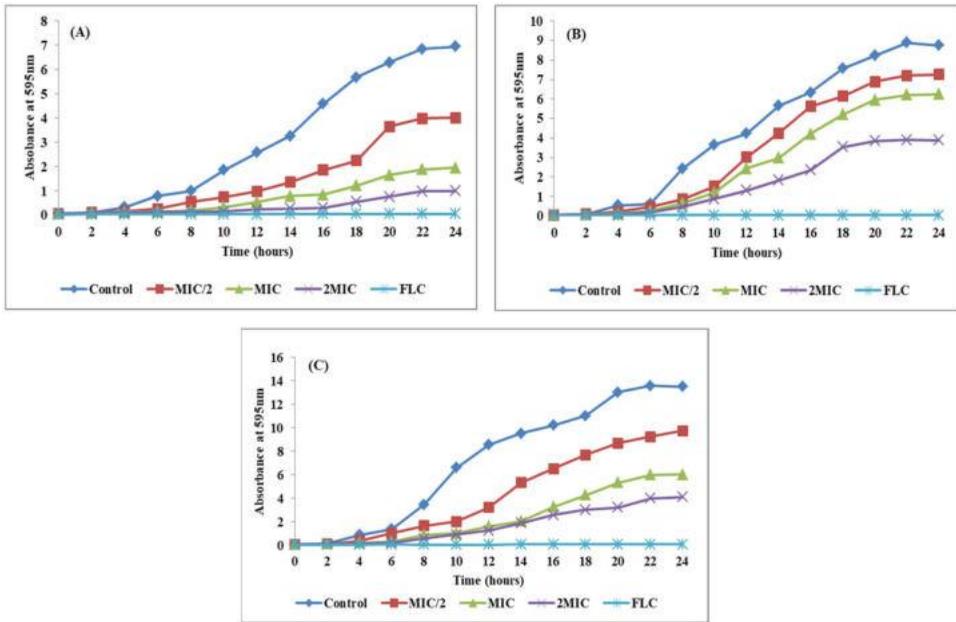


Figure 1. Growth curves of *C. albicans* (A), *C. glabrata* (B) and *C. tropicalis* (C) in absence and presence of 2a at varying concentrations.

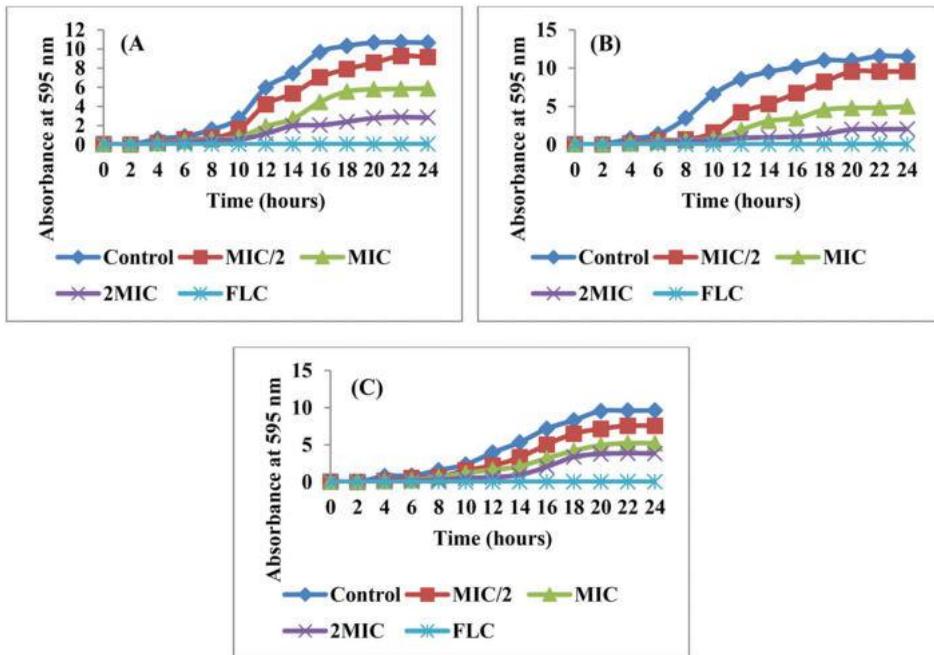
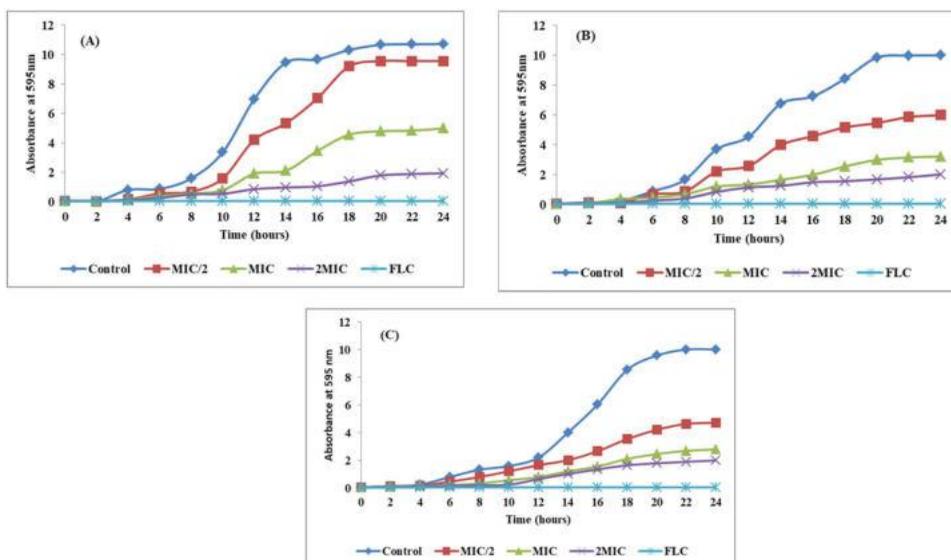


Figure 2. Growth curves of *C. albicans* (A), *C. glabrata* (B) and *C. tropicalis* (C) in absence and presence of 2b at varying concentrations.



**Figure 3.** Growth pattern of *C. albicans* (A), *C. glabrata* (B) and *C. tropicalis* (C) in absence and presence of **2m** at varying concentrations.

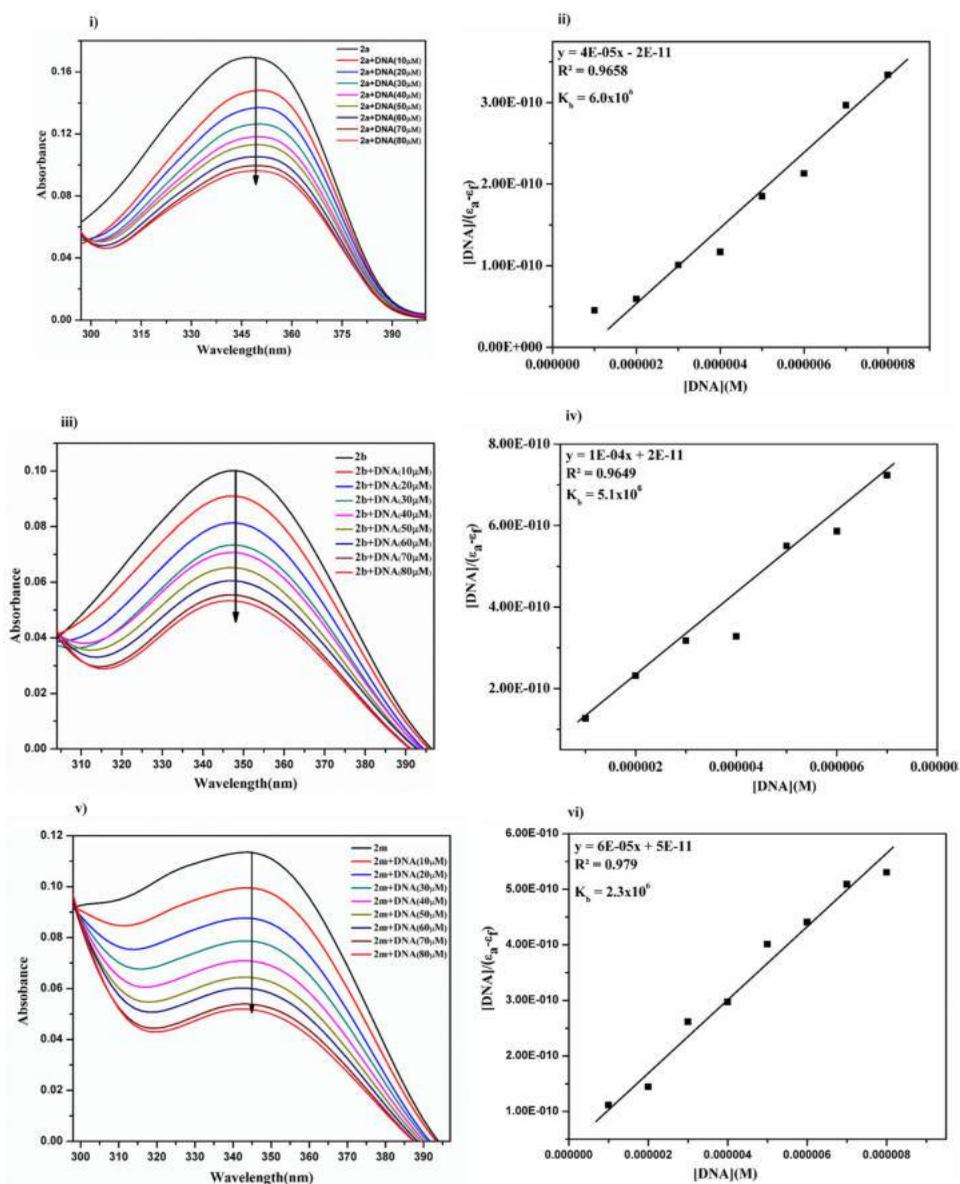
#### 4.4. DNA binding study

##### 4.4.1. Absorption study

Binding affinity of heterocyclic derivatives **2a**, **2b**, and **2m** with CT-DNA was observed using absorption spectroscopy in which two informative features arise. In DNA groove binding or electrostatic mode, the hyperchromic shift appears which is due to the cracking of the secondary structure of the DNA. Even though, in hypochromism take place in which the intercalative binding mode of the heterocyclic confirms because of  $\pi$ - $\pi^*$  transition between the DNA base pair and the aromatic chromophore of the heterocyclic compounds. The absorption spectra of heterocyclic compounds **2a**, **2b**, and **2m** were performed with and without the CT-DNA as shown in Figure 4. From the experimental observations, it was concluded that as the absorbance decreases on increasing the CT-DNA concentration. Which revealed that CT-DNA interacts with heterocyclic analog **2a**, **2b**, and **2m** through intercalative mode of the binding. The strength of binding mode of CT-DNA with compounds has also been confirmed by calculating the intrinsic binding constant ( $K_b$ ) as  $6.0 \times 10^6$ ,  $5.1 \times 10^6$ ,  $2.3 \times 10^6 \text{ M}^{-1}$  respectively and Gibbs free energy (G) as -38.6, -38.3 and -36.3 kJ mol<sup>-1</sup> which determined the spontaneity of binding interaction between compounds and CT-DNA[67].<sup>67,68</sup>

##### 4.4.2. Emission study

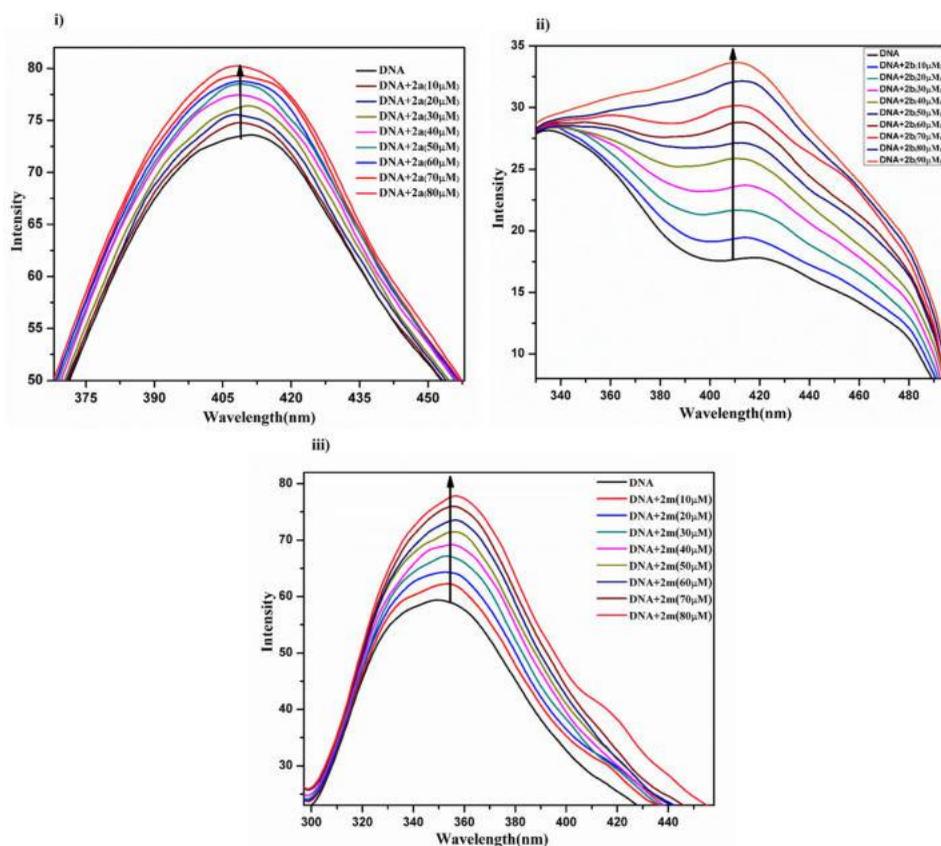
Fluorescence emissions were further carried out to understand the interaction effect between CT-DNA and heterocyclic derivatives **2a**, **2b**, and **2m** with and without the CT-DNA. From the obtained results, it was concluded that emission intensity increases continuously on every addition of heterocyclic derivatives **2a**, **2b**, and **2m** (Figure. 5) which is due to the reason the heterocyclic derivatives get into a hydrophobic environment within the DNA helix and prevented quenching effect. These results also confirmed the binding of CT-DNA with heterocyclic derivatives **2a**, **2b** and **2m**.<sup>69</sup>



**Figure 4.** Absorption spectra (i), (iii) & (v) of heterocyclic derivatives **2a**, **2b**, and **2m** in increasing concentration of DNA [ $0.1$ – $0.8 \times 10^{-5}$  M] and Plot (ii), (iv) and (vi) for calculating the intrinsic binding constant ( $K_b$ ).

#### 4.4.3. Electrochemical measurements

Further cyclic voltammetry (CV) also provides some additional support for the interaction mode of heterocyclic analogs **2a**, **2b**, and **2m** to CT-DNA. CV displayed one step irreversible oxidation–reduction process in the case of heterocyclic derivatives **2a**, **2b** and **2m**. A shift in peak potential in the cyclic voltammogram confirms the interaction of CT-DNA with heterocyclic derivatives **2a**, **2b**, and **2m**. After the eventually addition of CT-DNA ( $1 \times 10^{-4}$  M) to the synthesized heterocyclic derivatives **2a**, **2b**, and **2m** ( $1 \times 10^{-5}$  M), it has been observed that current of voltametric peaks drop remarkably which is shown in Figure 6. The decline in current of voltametric after each adding of CT-DNA referred to the complex formation which is because of the aggregation of heterocyclic derivatives **2a**, **2b**, and **2m** between the CT-DNA base pair.<sup>70,71</sup> The



**Figure 5.** Fluorometric measurements (i), (ii) and (iii) in increasing concentration of heterocyclic derivatives **2a**, **2b**, and **2m** [ $0.1\text{--}0.8 \times 10^{-5}$  M] with constant concentration of DNA ( $10 \mu\text{M}$ ).

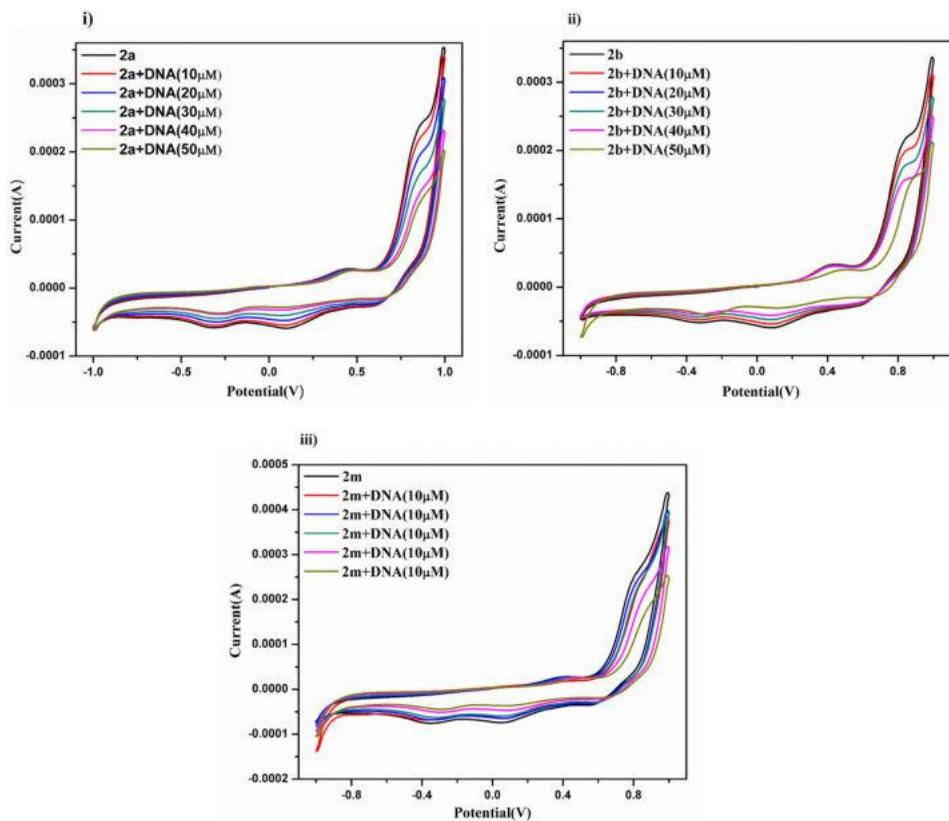
result demonstrates that the compound binds with CT-DNA via intercalative mode of binding interactions.

#### 4.4.4. Circular dichroism

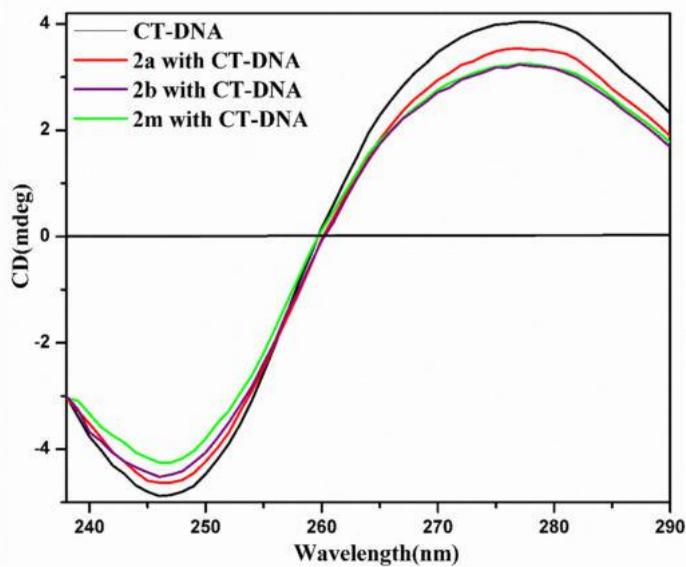
CD spectroscopy is another important method to observe the modes of binding of CT-DNA with heterocyclic derivatives **2a**, **2b**, and **2m**. In the circular dichroism spectra, the B form of CT-DNA shows a characteristic positive shift at 277 nm for the base stacking and a negative band at 246 nm for the helicity.<sup>72</sup> Intercalative mode of CT-DNA binding changes both the positive and a negative shift and in the case of minor groove binding and electrostatic interaction, minor changes with either the positive or negative shift are observed. To study the relative CT-DNA binding ability of heterocyclic derivatives **2a**, **2b**, and **2m** with the conformational change of CT-DNA, the same concentration of these heterocyclic derivatives was incubated containing CT-DNA. Significant variation in the intensity of both the negative and positive shift of CT-DNA was observed (Figure 7) which is due to the formation of intercalative binding with heterocyclic derivatives **2a**, **2b**, and **2m**.<sup>73</sup>

#### 4.4.5. Viscosity measurements

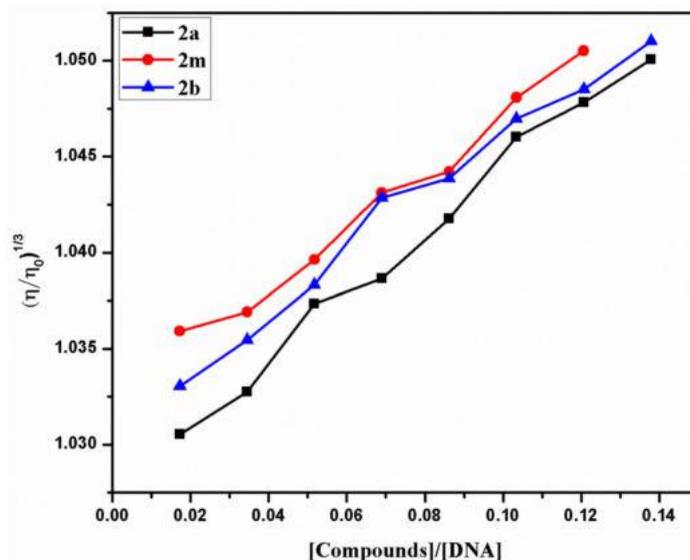
The binding interaction between the CT-DNA is further elucidated by the viscosity quantifications. Optical photo-physical probes generally do not provide sufficient indication to support the



**Figure 6.** Cyclic voltammograms (i), (ii) and (iii) of lead analogs 2a, 2b and 2m in the absence and presence of various concentration of DNA.



**Figure 7.** Circular dichroism of lead derivatives 2a, 2b and 2m with DNA.



**Figure 8.** Viscosity measurements with increasing concentration of lead derivatives **2a**, **2b** and **2m** [ $0.1\text{--}0.9 \times 10^{-5}$  M] at constant concentration of CT-DNA ( $10 \mu\text{M}$ ).

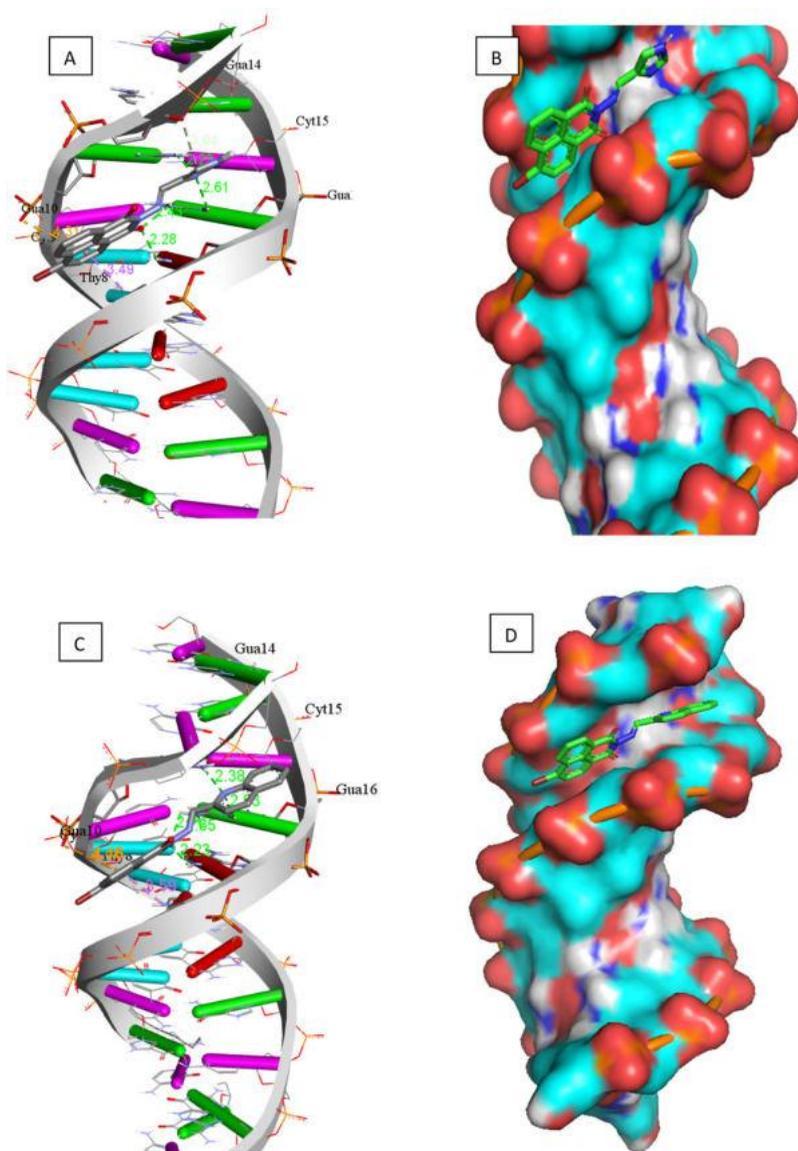
binding model of heterocyclic derivatives with CT-DNA, hence hydrodynamic measurements have been carried out. Intercalative binding mode is due to the division of base pairs at intercalation sites and hence an increase in overall CT-DNA length, thereby increase in viscosity. Groove binding or electrostatic mode is due to the diminished in CT-DNA helix length which gives rise to the CT-DNA to bend and therefore, viscosity decreases. Viscometric investigation results reveal that on varying the concentration ( $0.1\text{--}0.9 \times 10^{-5}$  M) of the tested heterocyclic derivatives **2a**, **2b**, and **2m**, the viscosity of CT-DNA increases and proposes to be bound to CT-DNA by intercalation as shown in Figure 8.<sup>74,75,76</sup>

#### 4.5. Molecular docking

We have performed experiments to investigate the binding mode of interaction of lead analogs with CT-DNA. The molecular docking study was also done using PDB ID: 1BNA for experimental validation. The binding energies (Table S1) of the heterocyclic derivatives **2a**, **2b**, **2c**, **2d**, **2e**, **2f**, **2g**, **2h**, **2i**, **2j**, **2k**, **2l**, **2m**, **2n** and fluconazole were observed **-10.2**, **-10.1**, **-9.3**, **-7.7**, **-6.7**, **-9.5**, **-9.2**, **-9.4**, **-9.1**, **-7.2**, **-9.1**, **-8.6**, **-7.7**, **-9.5**, and **-7.3**, kcal/mol respectively. Among all drugs **2a**, **2b**, and **2m** showed higher binding affinity which indicates the good-quality results for 1BNA.<sup>77,78</sup> The molecular docking poses of lead analogs **2a**, **2b** and **2m** are shown in Figure 9 and S5.

#### 4.6. Pharmacokinetics studies

According to Lipinski, the synthesized heterocyclic derivatives (**2a**–**2n**) have good membrane permeability,  $\log P \leq 5$ , number of hydrogen bond acceptors  $\leq 10$ , molecular weight  $\leq 500$ , and number of hydrogen bond donors  $\leq 5$ . The drug-like properties of the heterocyclic derivatives (**2a**–**2n**) showed that none of the compounds violates the Lipinski rule and all the properties are in a considerable range which is shown in Table 2.<sup>79,80</sup>



**Figure 9.** Molecular docking pose of lead derivative **2a** (A,B) and **2b** (C,D).

**Table 2.** Pharmacokinetics studies parameters of heterocyclic derivatives (**2a–2n**) for drug likeness properties.

Compounds	%ABS	Volume (A3)	TPSA (A2)	NROTB	n-ON acceptor	n-OHNH donor	miLog P	MW	Lipinski's violation
2a	93.605	261.33	80.12	2	6	1	2.48	369.18	0
2b	98.066	320.33	64.33	2	5	0	4.33	430.26	0
2c	99.512	326.40	54.68	3	5	0	4.36	422.28	0
2d	96.027	341.48	80.90	4	6	1	4.35	451.28	0
2e	98.448	360.01	54.68	5	5	0	5.11	450.34	1
2f	95.467	296.53	91.90	2	6	2	3.29	411.21	0
2g	96.997	314.06	80.90	3	6	1	3.59	425.24	0
2h	96.124	330.86	80.90	4	6	1	3.97	439.26	0
2i	99.866	331.59	69.91	4	6	0	4.29	439.26	0
2j	93.613	261.33	80.12	2	6	1	2.35	369.18	0
2k	95.516	288.52	71.67	2	5	1	3.77	395.21	0

(continued)

Table 2. Continued.

Compounds	%ABS	Volume (A3)	TPSA (A2)	NROTB	n-ON acceptor	n-OHND donor	miLog P	MW	Lipinski's violation
2l	95.716	289.10	51.44	2	4	0	5.08	464.14	1
2m	94.983	335.02	76.47	3	6	1	4.44	448.28	0
2n	95.106	306.40	71.67	2	5	1	4.70	474.10	0

% **ABS**: Percentage of absorption; **TPSA**: topological polar surface area), **NROTB**: number of rotatable bonds; **n-ON**: number of hydrogen bond acceptors; **n-OHND** number of hydrogen bond donors; **miLogP**: logarithm of compound partition coefficient between n-octanol and water; **MW**: molecular weight.

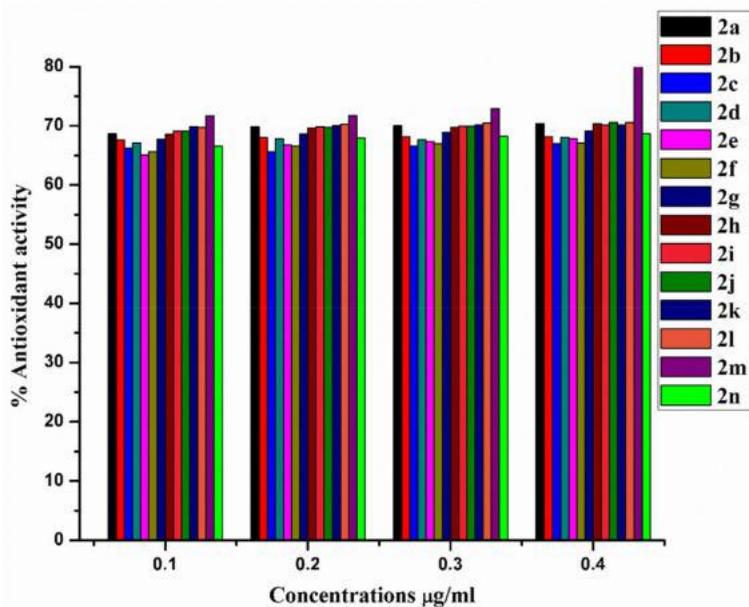


Figure 10. % Antioxidant activity bar graph of heterocyclic derivatives (2a–2n).

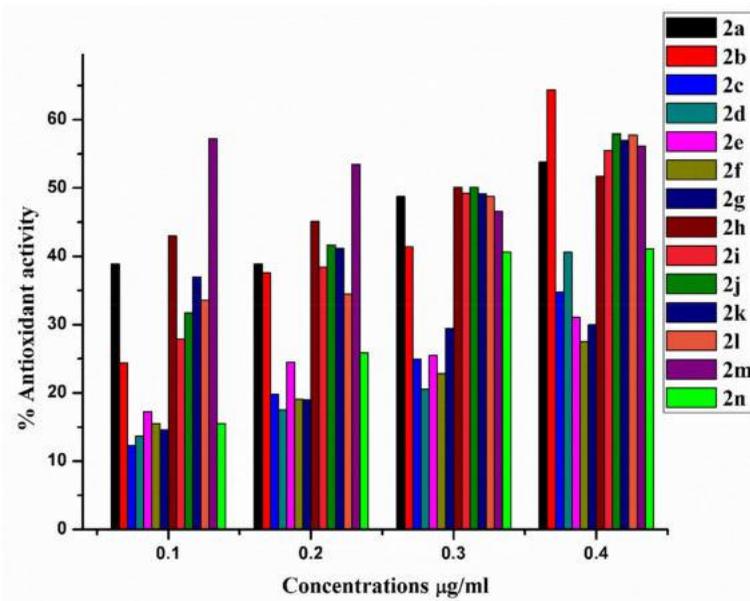


Figure 11. Antioxidant activity bar graph of heterocyclic derivatives (2a–2n).

## 4.7. Antioxidant activity

### 4.7.1. DPPH free radical scavenging assay:

*In vitro* antioxidant properties of heterocyclic derivatives (**2a–2n**) were screened by DPPH free radical. The heterocyclic derivatives (**2a–2n**) exhibited antioxidant activity against DPPH free radicals as shown in (Figure 10 and Table S2). Significant  $IC_{50}$  values were found to be  $0.158 \pm 0.003 \mu\text{g/ml}$ ,  $0.167 \pm 0.002 \mu\text{g/ml}$  and  $0.138 \pm 0.001 \mu\text{g/ml}$  for the heterocyclic analogs **2a**, **2b**, and **2m**, respectively.<sup>81,82</sup>

### 4.7.2. Hydrogen peroxide scavenging assay

*In vitro* antioxidant activity of heterocyclic derivatives (**2a–2n**) was also studied by  $H_2O_2$ . All the heterocyclic derivatives (**2a–2n**) exhibited significant antioxidant activity against  $H_2O_2$ . The significant  $IC_{50}$  values are  $0.32 \pm 0.006 \mu\text{g/ml}$ ,  $0.26 \pm 0.013 \mu\text{g/ml}$ , and  $0.14 \pm 0.018$  for the heterocyclic analogs **2a**, **2b** and **2m** respectively (Figure 11 and Table S2).<sup>83,84</sup>

## Conclusions

We have synthesized a heterocyclic derivative (**2a–2n**) and characterized by various spectroscopic techniques. Among all the heterocyclic derivatives (**2a–2n**), derivatives **2a**, **2b** and **2m** exhibited significant antifungal activity against *C. albicans*, *C. glabrata*, and *C. tropicalis*. The binding strength of all three heterocyclic analogs with CT-DNA using various measurements which showed an intercalation mode of binding. A molecular docking study of all heterocyclic derivatives (**2a–2n**) with PDB ID: 1BNA also validates to the experimental studies. Heterocyclic derivatives **2a**, **2b** and **2m** exhibited higher binding affinity. Furthermore, it was also concluded that all the heterocyclic derivatives (**2a–2n**) exhibited significant antioxidant activity against DPPH free radical and hydrogen peroxide. Also, pharmacokinetics studies revealed that none of the heterocyclic compounds (**2a–2n**) violates the Lipinski rule and all the properties are in considerable range for good oral bioavailability.

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## Disclosure statement

No potential conflict of interest was reported by the author(s).

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## **TECH-LIFE BALANCE IS A NEW WORK-LIFE BALANCE OF CURRENT DIGITAL SOCIETY**

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### **Abstract**

The work-life balance is most important concept in the current scenario of rat race life full with competition everywhere. Technology has entered our lives as a boon but converting into a curse as it makes a person less focused to set boundaries for different domains. Now the question arises that whether the working individuals should have focus on the balance of work-life domains, or tech-life domains, because technology itself has made a domain in our lives. While getting comfort by using technological advancements, are the employees able to set time limits of its usage? The current study has focused on the exploration of balance of work and life domains with involvement of technological domain. It also based on analysis of those factors which are responsible for creating imbalance in work and life domains. The data has been collected by telephonic interview from 80 respondents working in private power sector.

**Keywords:** Tech-life balance, Work-life balance, Digital Society, Technology, Work-from home.

### **Conceptual Background**

Technology is playing a vital role since the pandemic came on earth. Social distancing and lockdowns to slow down the virus spread upgraded the people to a new version of digital era. Online delivery of essentials at door step for the accomplishment of routine necessities has only fulfilled because of the existence of the technology. When offices were shut down, people used to work from home and students were supposed to attend online classes. From online payments to online entertainment, the whole world was revolving around the technology. But the concept of work-life balance has added one more dimension of technology to be balanced in a perfect way for better time management and mind relaxation. Work-life balance is a balance between personal and professional lives. Whereas, tech-life balance is about balancing one's life roles and usage of technology while keeping time factor in mind. Technology has made us so vast that we communicate quickly and able to send messages in a fraction of time, which keep the mobile and other interactive gadgets handy with us all the time from kitchen to washroom and balcony to gate. The detachment from technology is less as there is reduction in family communication though everyone is busy over tech-world. Social media is a biggest factor of technology and internet to spend much of the time over there as it is habit of current generation. In such a case, how are working individuals able to spare 'me time', and 'quality time' with family? Though work-life balance and tech-life balance both are of high significance to be maintained for better mental peace and happy life.

### **Need of the study**

The current study is about to explore the factors related to work-life balance and tech-life balance as both the concepts are alarming in the current scenario. There is a need to study the impact of technology on work-life balance of working individuals. There is a required phase of technology usage to maintain proper time management. Technology is not keeping us busy with official work, but also engaged us with social platforms which are followed for entertainment and time pass. The limit of technology usage has not been set by anyone. It has become a democratic factor to use, without any restrictions. The habit of spending quality time among families is depleting from the existence as mobile has overrated and work-family balance counted as underrate. The incompatible demands from work, life and technology domain create work-life imbalance and stem task and time pressure.

## Literature Review

Work-life balance is a significant concept of human resource management (Raiven & Caven, 2011). A balance is required to be maintained and to set a specific limit for work and life domain separately for better mental peace. According to Currie & Eveline (2011), the limit between work and life domain has been blurred since 1980's. But in the current scenario, development ways have been overlapped with technology. The much use of information technology systems has contributed a lot to increase boundary porosity (Hislop & Axtell, 2009). As per a United Nations (UN) report (2013), there are estimated 6 billion people who are having access to mobile phones. The more use of smart phones has made the scenario difficult to analyse work and non-work time of working individuals (Den Nagy, 2014). Particularly, Kahn et al. (1964) has defined separation of work and non-work time that work time occurs specified hours at a designated place while including distance from home. However, work time can occur anytime nowadays (Glucksmann & Nolan, 2007). Technology is enhancing the work performances and productivity of working individuals, but also serving a challenge to work-life balance. Technology has made working people more available anytime and anywhere. The moulding of boundaries has been done by some employees who actually should be segmented from one another to ensure work and non-work lives (Nippert Eng, 1996). The communication modes have changed so quickly with the advancement of computers, laptops, and mobile technology (Chamakiotis, 2014). That saves travel time to talk to someone and sending post mails. It is easy for the employer to be in touch with the employees whenever they are absent or on official visits. Information technology is vital for the workforce, but that creates time pressure and stress to technological and software experts (Teagarden, Meyer, & Jones, 2008). The connectivity between technology usage and time factor is conflicting somehow, as it is complicated. These changes have been impacted employees not only individual basis, but also on the society front and social groups (Wajcman, Bittman & Brown, 2008). The interaction of tech-life and work-life can take many forms like lack of mental presence, relationship conflicts, work-life conflict, and lack of absence from work domain. Various disadvantages have been traced out from the increase usage of technology as it is boosting the expectations of employers and closed ones with a hike in workload which sensed of on duty all the time (Towers et al., 2006). Work-life balance is difficult to gain in the era where notion of work keeps on changing so fast. Work from home portrayed as a problem solver to maintain work-life balance, but it is always contradictory which clearly depends on the number of working hours, whether individuals are extending working hours to the life domain space (Hislop & Axtell, 2007). Long working hours and larger connectivity brought a drastic change in the life of an employee, which further leads the way to allow the different domains interfering with one another's space. As per the border theory, when physical and psychological borders of an individual are best suitable in one domain but not in another one. Physical border includes workplace and temporal working hours, and psychological border is based on the behaviour, thoughts, emotions and technology (Henderson et al., 2014). It is essential part of routine operations to get supported by information system. The changing trends of technology have improved the communication around the globe and created a wider range of choices to opt for work place as remote working (Kornad et al., 2012). The concept of portable computers, mobiles and tablets has made long working hours much possible (Lewis et al., 2005). It represents all time availability of working individuals. Employees has got more flexibility in their location and also compelled to check on official e-mails and notifications (Adkins et al., 2014). Technological advantages are not all the time positive but also increase work-life conflict because of expectation of 24hour availability and this is challenging one to maintain work-life balance (Prasopoulou et al., 2006). In the era of new technology, when work is highly portable, it is highly possible that work domain will integrate with personal domain and occupies home space. If anyone wants no interruptions between different domains, then one should set boundaries for every domain (Ashforth et al., 2000). E-technologies have gone beyond the time and space, and need more management. According to Wong & Ko (2009), there is gradual enhancement in the awareness regarding issues of work-life balance as the various organisations with the adoption of technology trying for the betterment of work-life balance in a maintained way.

Extensive working hour causes mood swings, fatigue and stress that finally lead to impact personal domain in a negative way (Dierdorff & Ellington, 2008). The effects of technology on work-life balance have been studied by Greenhaus et al. (2006). The roles have been described by them that improve work-life of working individuals and opposes all the conflicts between two domains. The use of technology during working hours is much better for job of employees. The use of technology in communication means for the purpose of official work leads to work-life imbalance when it crosses the limit of working hours (Golden and Geisler, 2007). Technology has made the working hours more non-scheduled (Derks & Bakker, 2014). The work facilitated by the technology is progressing into one's personal domain, but it is helpful for those who are working from home. Skilled employees are much benefited with the technological factor rather than low- skilled workers (Fenner & Renn, 2004). Span geographies by collaborative technologies like as video conferencing is the need of the hour taught by the pandemic. To operate in the fast-moving world, technology is must to adopt by the organisations. It opens the way for new opportunities for working individual without any hustle of travelling. Technology has been proven as crucial factor by many studies which influence professional and personal domains. The employees can attain work-life balance by positive potential realization of mobile and internet technology. The development of relevant policies and sustainable workplace is required to support work-life balance (Rahman et al., 2019; Twaronite, K., 2015). People adopt technology to convenient their lives but balance requires with the usage. That does not support in working end but also comfort our personal life. The working style has changed with the change in the technology and there is an influence on the way of working with technology in work and personal domains (Hecht & Allen, 2009). The use of mobile and internet make a difference while accomplishing various roles of different domains with a count of time factor. It is not necessary that combination of work and technology hamper the personal life when cross the set limits. But over expending of time on personal calls and too much emotional dependency of working people creates a misbalance between professional and personal life. High usage of technology during pandemic COVID 19 for online work mode has resulted in techno- overload and conflicts between personal and professional domain (Molino et al., 2020). The technological use is a constituent of stress with stressors like overload, boredom, lack of control and ambiguity (Day, Paquet, Scott, & Hambley, 2012). The technological usage contributes significantly to the consequences of negative predictable stressors (Barber & Santuzzi, 2015). Stress determinants occur because of technological usage impact employees in a significant way harming their self- efficacy, reducing their well- being, and evoking stress reaction (Ayyagari et al., 2011; Srivastava et al., 2015). Cognitive emotional reaction of a person to negative experience based on technology usage involves fatigue, dropping self-efficacy, and anxiety (Salanova et al., 2013). Techno stress is responsible for dropping focus ability of employees, decision making power, and increase the ambiguity sense among them (Aghwotu & Owajeme, 2010). Technology is a boon and curse as it has been clear by various studies. It is impacting life of an employee in a negative way though benefitting him in ways too. Work-life balance is not only based on routine life rather it includes various factors which directly or indirectly impacting lives of working individuals. Technological factor is one of them which is easing the work-life but on the same side consuming much time and all-time availability impacting personal and professional life in a worst way. It causes lack of time for different roles. Technology factor does not affect time schedules but also causes stress and anxiety which need to be handling in a proper way on time better productivity and work performance. Moreover, work-life management is all about time management and stress management.

### **Study Hypothesis**

H<sub>0</sub>: There is not a vital correlation between usage of technology and work-life balance.

H<sub>1</sub>: There is a vital correlation between usage of technology and work-life balance.

### **Research Objectives**

- To explore the relationship between work-life balance and tech-life balance.

- To analyse the impact of imbalanced work and tech on life domain.

### Research Methodology

The researcher conducted a study utilising telephonic interview to gather information in a cross-sectional design in order to test these assumptions. This strategy was adopted to enable the researcher to assess the variables with the least amount of interference.

An extensive review of pertinent literature was used to create a pool of items for measuring each of the constructs. In order to get different managers' and professionals' opinions on a variety of organisational characteristics, a set of questions was created. With regard to remarks made regarding these variables, data was gathered using a five-point scale (1 being strongly disagree, and 5 being strongly agree).

The researcher approached 93 professionals from various private power sector organizations, out of which 85 respondents (91.39 %) were received. The Statistical Package for Social Science (SPSS) software further examined that, as the other questions set were disregarded due to inaccurate responses or results that were duplicated and judged invalid. In this study, there are 63.3% male respondents and 36.7% female respondents. The respondents are asked to rate the correlation between work-life balance and tech-life balance using a predetermined scale based on their own opinions.

The interview was based on following factors:

- Time Management and Time Limit
- e- Training
- Teamwork
- Online monitoring of work

### Statistical Analysis of the Survey

The researcher has tested the hypothesis of study with Pearson's coefficient of correlation to find out the relationship between two variables. The following is the analytical statistics:

**Table 1: Correlation of time factor with work-life balance and tech-life balance**

Pearson correlation coefficient		Time management and time limit
Balancing	Correlation	**0.402
	Significance	0.00
**Correlation is significant at the 0.05 level		

The Pearson correlation coefficient between allocating enough time for work and life while only using the internet or mobile devices when necessary is 0.402 at the 0.05% level of significance, indicating a relationship between time management and the allotted amount of time needed to maintain a work-life balance.

**Table 2: Correlation of variables on the basis of e-training and hybrid work model**

Pearson correlation coefficient		e-training/ online learning
Balancing	Correlation	**0.538
	Significance	0.00
**Correlation is significant at 0.005 % level		

A relationship exists between e-training and online learning to maintain a work-life balance, as shown by the Pearson correlation coefficient of 0.538 at the 0.05% level of significance between

**Table 3: Correlation of variables on the basis of teamwork and supportive co-employees**

Pearson correlation coefficient		Teamwork
Balancing	Correlation	**0.586
	Significance	0.00
**Correlation is significant at 0.005 % level		

At the 0.05% level of significance, the Pearson correlation coefficient between allocating enough time for work and life and only using the internet or mobile devices when necessary is 0.586, indicating a relationship between teamwork and supportive co-employees to maintain a work-life balance.

**Table 4: Correlation of variables on the basis of online monitoring**

Pearson correlation coefficient		Online monitoring
Balancing	Correlation	**0.556
	Significance	0.00
**Correlation is significant at 0.005 % level		

A relationship exists between online monitoring and remote working to maintain a work-life balance, as shown by the Pearson correlation coefficient of 0.556 at the 0.05% level of significance between allocating enough time for work and life while only using the internet or mobile devices when necessary.

As per the above analysis, with significance level at 5% of correlation, all the values are positive which rejects the null hypothesis and accepts the alternate one with the representation of relationship between tech-life balance and work-life balance.

### Discussions and Analysis

To attain the research objectives of this study, it is required to explore both the positive and negative side of work and technology domains which ultimately leads a way towards life domain of working individuals.

*Objective1. To explore the relationship between work-life balance and tech-life balance:*

The relationship between work and technology has lighted during pandemic when because of lockdown and social distancing imposed by all over the world governments to lower down the spreading of virus. In such a scenario, working people supposed to work from home. In such a time, technology is a significant support to work-life balance in different remote or working environment. Empirical research by Popovici (2020) has shown the impact of technology in such a way to maintain better connectivity with colleagues, and work monitoring by the superiors and top management. Socialisation is an important factor for employees and technology ensures it in a perfect manner to increase work-life balance among those who stayed at distance (Dolot, 2020). It enhances team spirit and efficient way to attainment of team goals all set together by online platform. That all is of much value as pandemic depressed the employees in a worst way and make them isolated during lockdowns (Almonacid, N., Calderon, E., Vicente, R., 2020). The factors like job satisfaction and career development also plays a significant role while balancing work-life domain. The aspect of e-training has substantially contributed to career development of employees with emergence of technology and internet usage. It is overlapping the traditional way of training because of some limitations and constraints which declines its efficiency. Online work by technology adoption has increased it significantly in the initial level (Bellmann, Hubler, 2020; Hashim, Bakar, Noh, & Mahyudin, 2020). For career development of employees, e-trainings have paid a vital role to enhance the productivity of working individuals during the pandemic COVID 19 (Wolor, et, al. 2020). It has brought light to some significant factors played a positive role in context with work-life balance such as distance connectivity, career development, online work monitoring, teamwork, and job satisfaction. The fulfilment of all these makes the work domain much controlled with effective work performances, which further brings positivity from work end. Attainment of better balance in all the domains can be done in a way to manage and organise with the help of technology.

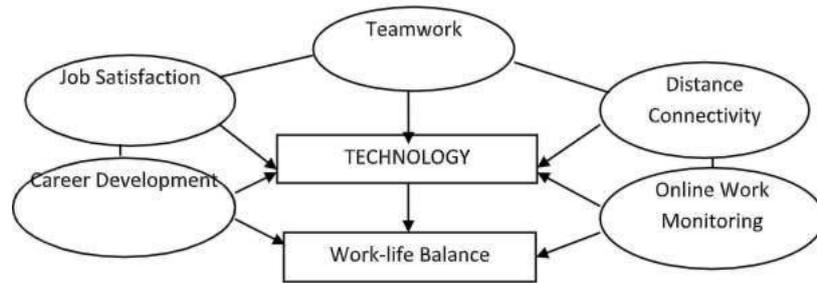


Figure 1. Positive support of technology to enhance various factors at work domain while working online or during pandemic to maintain work-life balance.

*Objective2. To analyse the impact of imbalanced work and tech on life domain:*

The excess and misuse of anything can result in a poor way. A time limit and proper work environment is highly demanded while working online. As it said by Suh Lee (2017), technology intensive online working can reduce the level of job satisfaction. Employee engagement is another factor to have an eye during online working while keeping the record of working hours is another challenge (Pattnaik, J., 2020). Various studies related to social media usage has shown the consequences by describing the way it is spoiling routine working hours (Zoonen, et al., 2017). As the way social media is consuming time of employees or working individuals, it is impacting work-life balance. This is a worst side of technology and internet. There is drastic change in the work system due to the development of internet facilities (Lewis, Gambles, & Rapoport, 2007). With the involvement of technology and human, work and life domains have become more complex. The changing technology is affecting quality of life on daily basis and difficult to balance personal and professional paradigms (Dorrestijn & Verbeek 2013; Haeger & Lingham, 2014).

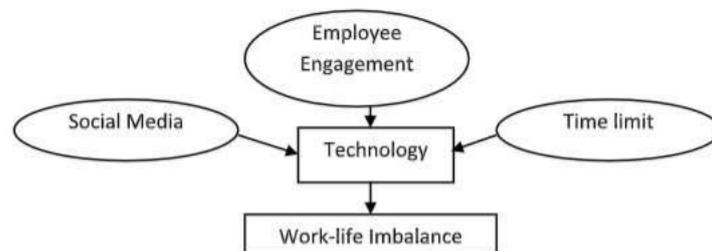


Figure 2. The negative side of technology impacting work-life balance.

### Findings

As per the data collected from respondents by telephonic interview based on some factors and statistical analysis, the following facts have been come into light:

#### *Time management and Time Limit*

Time management requires a way to be better arranged and organised while spending in a routine schedule. With a little effort one can make effective changes not for a day or week but for the months in order if noticed by working individuals (Claessens et al., 2009). The skill of time management will not be attained in a single day. That requires setting priorities for different domains while aware about what is necessary and what not to be done in a particular time. Time is a running factor which never stops, so to manage it, one should have an estimated overview the he or she spending it (Peter, 2002). Efficient time management opens the way of effective work performances while increasing the productivity of working individuals. It further helps to elevate work pressure, anxiety and depression with a good health which set up better work-life balance. Time management stays up to the mark when they follow a particular routine from home to office and office to home. They also complained for distractions while working on mobile and laptops. The random pop-ups and notifications keep them distracting. Some told that their official laptops are restricted by the organisations for using social media, which keeps them focused on work mode during official hours. Restricted to time limit is difficult to follow and they took it casually sometimes.

### *e- Training*

Amara & Atia (2016) has defined e-training as distance training about selected subjects of knowledge and skills. It is about the delivery of various methods and technology usage as a shorter time course to attain a particular goal of learning (Ramayah, Ahmad, & Hong, 2012). While talk about the concept of e-learning and trainings during the pandemic scenario, there is positive impact of technology to achieve career development and better work performances. But with the same as it seems to be difficult to learn more technical and empirical things by listening and watching only. For them offline trainings with practical knowledge were far better. E-training is an important aspect of human resource development and supports in the attainment of organisational goals.

### *Teamwork*

Technology is significant for communication and team meetings. The fact of connectivity and quick interaction is possible because of the vast technology we have. As in such a case some individuals break the time rule to call or text someone. Everyone is having different lifestyle and sleeping pattern. Some are early riser, though others are late going to bed which create a mismatch between their communication timing. But all are agreed with the fact that in case of official emergencies, it is easy to collaborate with the team.

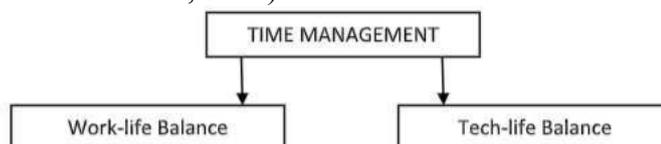
### *Online Work Monitoring and Employee Engagement*

It is easy for the top level, managers and supervisors to monitor the work by video conferences, emails and other online ways. On the other hand, the fact is that sometimes employees fake their presence with the excuses of poor connectivity. Thus, it is not easy to ensure the engagement of employees with work as with the adoption of technology, electricity and internet broad bands are some other factors to be lined up. That creates uncertainty of working hours.

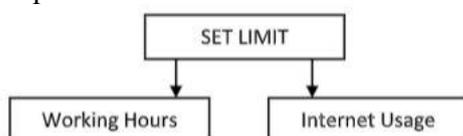
## **Suggestions**

With all the discussions by primary and secondary resources of data, some suggestions have been listed up in this study:

1. It is necessary to have a better control on time factor and routine schedules should be set in a proper way so that there will be better utilisation of time with effective work performance and productivity. This is the factor to keep in mind while dealing with work, life and as well technology domain. Nielson and Randall (2009) have suggested that time management is a method by adopting which one can attain hi/her goals in an effective manner, and will be able modify oneself efficiently for career and job. Time management is a technique to enhance work performance (Claessens et al., 2009).

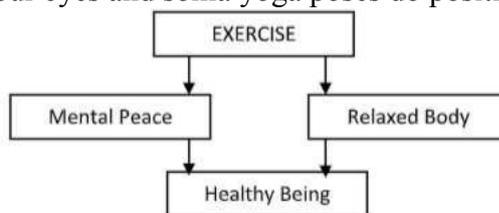


2. There is a need set some limits for every domain. If an individual is spending much time on one, then other will get affected and difficult to maintain a balance among the entire domain. The work assisted by technology enforced an employee to use laptops, computers, mobiles and tablets on remote locations which are carried by skilled working individuals (Fenner & Renn, 2010). That merged the domains and crosses the limits of each domain too. According to Currie & Eveline (2011), there is a shift in work and life domains which has increased the work hours after the office. Technology has fused the work-life balance and equilibrium is required to maintain the same.



3. One should spare some time for exercise or yoga for better health and mental peace. It releases stress also. A tuned body stay ready for all the challenges in routine life. A clear

mind helps to set priorities and keeps better focus on what to do, rather than what not to. Too much screen time affected our eyes and some yoga poses do positive impact on that.



4. Stress is one of the famous factors nowadays working individuals are facing. On a right time, it requires to be settled down for better preparation for the next day. Stress causes by one domain impacted others too. There are different ways to cope up with that without opting for temporary solutions. A stress-free person is much capable of handling various domain roles. Excess use of technology, too much workload, and poor family conditions – all are alarming to stress. Overloaded working hours and family issues impacted the productivity of working individuals and thus overall productivity of a particular organisation (Dogra et al., 2011).
5. Concentration is one of the significant individual factors to be kept in mind. There should be a schedule to get done with a particular task. Technology should be used in an efficient way. Home sickness, emotional dependency, habit of social media, and work performance pressure can distract an individual from the actual space or involvement.

### Limitations of Study

The current study involved various positive and negative factors of work-life and tech-life domains. All the working individuals vary with different psychological patterns and perceptions towards a specific domain and its related variables. Lifestyles and responsibilities are different to different persons. There is a limited and not particular capability of individuals to handle workload, working hour pressure, handling technological changes, family responsibilities, and stress or anxiety levels. Some people seem to be strong emotionally while others not. Such factors lacked to study better in the current research paper.

### Conclusion

This study has taken out the fact that work, life and technology are interrelated to each other in both positive and negative ways. But by controlling some factors, one can get better results in balancing work-life. Tech-life requires some detachment when not in use. It is the fact to be aware about for effective work-life balance. Tech-life is a need of the hour without that no one can survive in the digital era. It has overlapped all the domains at personal and professional ends. But one should not misuse it by wasting time on social media or gaming. A better utilisation leads the way for entertainment, routine needs, and official requirements while keeping time factor and screen time in mind to maintain work-life balance. On the journey of improvement and with perfect balance, one needs a better level of motivation. Motivation is a drive to an individual which supports to attain organisational goals with maximum results (Pancasila, Haryono, & Sulistyono, 2020). Performance has an impact of motivation which binds a relationship between action and behaviour needs that satisfies too (Nguyen et al., 2020). Some people are blessed with intrinsic motivation, but others required external boost up for accomplishment of a task. Without motivation it is not possible to maintain a habit of time management and taking the workload with technological usage.

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## IMPACT OF ARTIFICIAL INTELLIGENCE ON APPARELS POST PANDEMIC: REVIEW STUDY OF AMPLIFIED INTELLIGENCE IN H&M

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### **Abstract**

Artificial Intelligence and industries are going hand in hand. Technological Advancements wherein simulation of machines and human intelligence is providing avenues for innovation and furthering technologies based on AI and AI driven processing. The apparel and fashion industry is evolving faster than words and top companies' ideation and innovation techniques like flywheel marketing, circular fashion economy has come up with wider experience in customer satisfaction, demand forecasting, product designing and sustainability. This is an exploratory paper based on primary and secondary research methods. We develop a conceptual model that shows the relation between AI tools, Human Intelligence tools, Data science tools, Amplified Intelligence and Apparel Industry which in turn leads to sustainable shopping experience. At present, there is little empirical evidence of the impact of technology in the apparel industry. PLS-SEM was used to analyze 150 survey responses to examine the research gap. The results confirmed that all hypotheses were accepted except 2. Hence, this paper shows an effort of researchers to undergo empirical study of AI investment in H&M, AI tools & Techniques in consumers shopping experience, environmental sustainability and amplified intelligence of H&M in social culture development.

**Keywords:** H&M Amplified Intelligence, Artificial Intelligence, Apparel Industry, COVID 19, Sustainability

### **Introduction :**

Fast Fashion and hybrid retail are the buzzwords that describe the Apparel Industry 4.0 trends (McKinsey 2021). The apparel and fashion industry is evolving faster than words and top companies' ideation and innovation techniques like Artificial Intelligence Tools Augmented reality (AR) and Virtual reality (VR) in circular fashion economy has wider experience in customer satisfaction, demand forecasting, product designing and sustainability (Techpacker 2021). According to luxiders (2021) sustainable apparel is a journey to sustainable fashion. Impact of Artificial Intelligence on apparel Industry 4.0 has shown a complete turnaround in experiential shopping and consumer purchase behavior (McKinsey 2021).

Fashion and Apparel is one of the biggest industries, contributing 2% of global GDP in the world economy (IBEF 2021). The word fashion encompasses everything in formal or casual fashion from the outfits that come together to the individual clothes that make it up. Today, where Artificially intelligent tools are considered necessity for experiential shopping, AR and VR are the techniques of AI have reshaped and redefined the apparel structure in Industry 4.0. (Bisen, 2020) These are the grooming tools of AI that significantly boomed up the customized buying and purchasing behavior in consumers (Bisen, 2020). They are used as digital assistants to recommend clothing and styling to customers based on their demographic facts i.e. color, height, weight, shape, and size. According to Maghan (2021) from Vogue Business Report AR clothing or try-on is a feature that creates a 3-D clothing which will automatically

appear on a person as and when the person moves (just like the concept of snap chat filters). When the body of a consumer moves the item also reacts in sync, measurements and environment appears to be realistic. On the other hand, Virtual Reality is used by top fashion designers to help consumers get a realistic sensation of being present in famous fashion shows just with the help of a VR headset and virtual fashion software. VR does assist in virtual visit view or even try on the collection. When we derive value from artificial intelligence, the key factor is not algorithms, nor technology — but it is the human in the equation,”(Sean Lang 2021) and H&M has evolved the customer experience combining AI and Analytics with human intelligence in use as “Amplified Intelligence”. This paper is a on the world's largest fashion retailer Swedish brand Hennes&Mauritz (H&M) who started its journey in 1947 with women's clothing under the name Hennes, further adding to the collection of men’s apparels in 1964 and then, the name was changed to Hennes&Mauritz.

ErolKoolmeister, the product Area Leader AI foundation H&M, at Data Innovation Summit 2019 said in his talks that they already started adopting AI into his retail business in 2016 and in order to stay relevant they need to move online. In 2018, H&M brand came up with a new mobile app and online platform. With the help of AI, it is able to deliver to its customers as per the demand predictions by applying it to RFID generated data tags.

COVID-19 in China (Dec 2019), created havoc throughout the world. Baldwin and Freeman (2020) presented a triple hit of COVID 19 on the global value chain of apparels i.e. disruptions in direct supply, supply chain contagion and global demand. Consumer behavior started to move towards digitalization and social networking (Nowland, Necka 2018). Retail locations were changed to retail-as-theatres with touch screen interfaces and holographic enchantment mirrors (Priya, 2020). Jennifer (2020) suggested few policies to be implemented like supporting technology adoption and skills development to mitigate the post COVID 19 effects on the apparel sector.

Though from the above discussion it is clear that AI initiatives have been taken long back at H&M but, when COVID 19 hit the globe, H&M like other brands was forced to close down 80% of its outlets because of high rent and other miscellaneous expenses as per Elizabeth Mixson (2021). If it had not built up its digital infrastructure previously, it would have surely gone bankrupt. In the words of Helena Helmersson (C.E.O H&M, 2021), post pandemic more of such digital transformation initiatives and investments are being made for sustainability targets and focus on enabling a transition towards a circular business model to overcome the crisis.

## **Literature Review**

### **2.1 Artificial Intelligence**

AI is defined as a field of engineering and science that focuses on computational understanding of intelligent behaviour, along with the making of traces that exhibit such behavior (Ramesh, 2004). AI technology has also been applied in the field of surgery, medicine etc for diagnosing diseases with computer analysis, making of therapeutic decisions and predictions of outcome. AI is also being used in education for solving a major problem by creating a system that is as effective as human one-on-one tutoring (VanLehn, 2011). AI tools like machine learning, deep learning and predictive analysis are intended in a way to increase planning, thinking, reasoning and decision making ability (Jahanzaib, 2018). Jarek (2019) said that AI is even used in marketing field now, though at the operational level. It also influences marketing mixes, impacts consumer delivery value and marketing organization and management.

AI started in the form of a computer in education industry and then transitioning towards a online-based intelligent education systems then finally into humanoid robots and web-based chatbots (Chen, 2020). As per Sebastian (2021), if organizations adopt a perspective of working with automation (machines takeover a human task) and augmentation (humans collaborate at a closer level with machines to finish a task) both it could reduce tensions and be beneficial for the business and society both. According to David (2021), the use of AI has increased during COVID 19 times and later. Various online digital platforms have been created which show the number of active cases worldwide, whether any positive patients have come in contact, identify and isolate covid positive patients etc... Machine Learning (ML), which is a part of AI, can be used for developing drugs against COVID 19, helps to develop vaccines, distribution of vaccines and monitor the vaccinated people.

## **2.2 Technology and Apparel**

H&M Group is optimally utilizing AI to achieve a positive value chain and sustainability by 2040. The global clothing retailer brand uses AI-driven calculations for demand prediction to optimize the supply chain, as said by Linda Leopold (2021), head of AI at H&M. According to Trieu (2020) Industry 4.0 race convinces all domains and industries to integrate digital technologies like IOT (Internet Of Things), RFID (radio-frequency identification) (Denuwara, Maijala, 2019), robots, AR (augmented reality), additive manufacturing (Khorram, Torrabi, 2019), cloud technology and big data. These techniques are considered as foremost measures for sustainability in the apparel industry. The era of manufacturing, where hardware and softwares are considered as critical elements of the production process is what we talk about in industry 4.0. As per Navodya (2019) the RFID technology in apparel industry is focusing on sustainability and giving benefits related to economies and efficiencies. Social sustainability of AI in product design (Lee, 2021) has enhanced the social culture of the apparel sector. Such benefits make it more competitive than others in the market. This leads to the impact of technological advancements on industrial sectors, distributors, suppliers, customers and potential new entrants (Porter, 2001). Technological revolution is the game changer of three pillars of sustainability i.e economy, environment and society (Nilima&Ravinder, 2017).

As per Ana (2006) smaller the size of the firm, greater is the possibility of using an external internet technology device because of less managerial abilities in the organization. However, VenuVarukolu (2008) studied the apparel sector and found that the Internet being the most widely accepted and adopted technology whereas robots were the least adopted. Also, the level of technology adoption for apparel manufacturers was directly related to the size of the firm and inversely related to export orientation.

A study was done by Jing Sun and Ting Chi (2018) that showcased a few factors like ease of usage, perceived usefulness, past non-store shopping experience and compatibility positively affects the shopping behavior of Chinese customers who opt for m-commerce transactions. Supporting this study, they constructed a consumer apparel m-commerce adoption model by way of merging both m-commerce and e-commerce theories. This trend clearly shows that the level of adoption of technology has evolved through years to come i.e. from Internet to e-commerce to m-commerce and RFID and then Artificial Intelligence. Finally paving the way to Amplified Intelligence in the apparel industry.

### **2.3 Amplified Intelligence**

As per the article in Deloitte (Forrest, 2015) on Tech trends in 2015, the usage trends show that Amplified intelligence is still in its early days, but there is a huge potential in every domain. According to PRNewsWire (2017), Amplified Intelligence is the process by which artificial intelligence is used to supplement human intelligence in making sound decisions and judgements. It creates the potential for an organization to work in a significant operational efficient manner and have competitive advantage in the market. The intelligence community is now able to inspect the world over texts, emails and calls to identify the possible location of terrorists. The medical industry is very well capable of analyzing billions of web-based links to analyze and predict the spread of a virus. Also, farmers are able to use collected data via their own equipment, from each and every foot of their plantation, to increase their crop yields. Companies in the domains of accounting and law can allow their frontline employees to harness research, case histories and diagnostics, which would help to a great extent for the practitioners with expertise to know about the knowledge of their organization's practices and with the clinical, academic and practical experience.

Even for the Information Technology department of the world, amplified intelligence is offering a big chance to emphasize its role in the broader data analytics journey and directing the advances toward real use cases with measurable impact. Amplified intelligence is creating a buzz and is becoming critical for achieving competitive success in the economy or even around the globe. USA-based companies like Uber have to use big data to match their passengers with their car services. European based grocery-company like Tesco leverages big data analytics to capture the share of sales from new parents and families.

#### **Research Gaps**

Undergoing Systematic review of literature, the researchers were able to identify the research gap that very few studies have been done on the impact of AI on apparel industry giving rise to the research questions and evolving objectives of this study. Amplified Intelligence is the only measure for structured data integration, human and artificial intelligence to support all industrial stakeholders in decision-making. Despite such importance of Amplified Intelligence, there is a lack of theory development that has resulted in ambiguity in the relationship with Apparel Industry.

#### **Research Model**

With technology growing faster than ever before, the future of Artificial Intelligence, amplified intelligence and Data Science is even more interesting than what is happening now. The model shows impact of all such technologies and Human Intelligence Tools on the Apparel Industry.

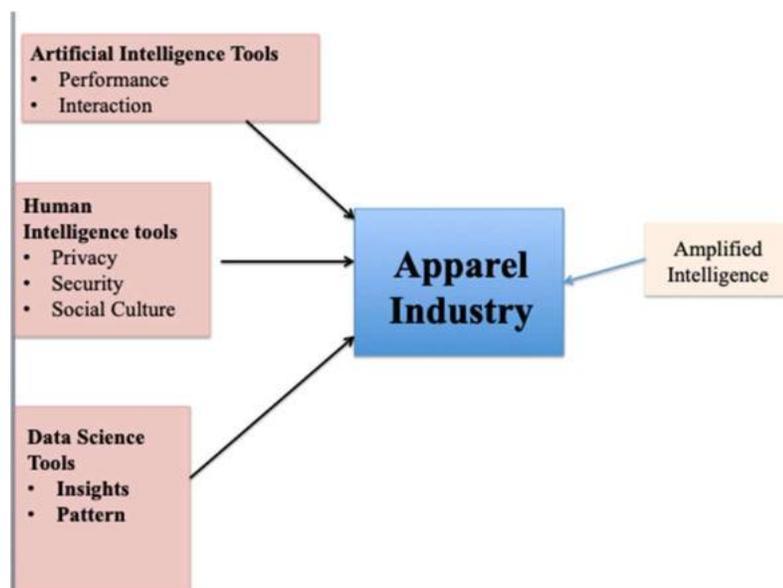


Fig. 1

## Research Objectives

1. To study the impact of Artificial Intelligence, Human intelligence & Data Science (Tools & techniques) adopted by H&M in consumer's better shopping experience.
2. To study the level of sustainability of H&M with AI (Amplified Intelligence) during pandemic.

## Methodology

Undergoing the key aspects of the pandemic that is changing the scenario of Apparel Industry, the main aim of the paper is to study and identify the impact of Artificial Intelligence and Amplified Intelligence on the Apparel Industry.

At the initial phase of study we analysed that the impact of Amplified intelligence i.e Artificial & Human Intelligence in coordination with Data science during and after COVID 19 pandemic that has changed the market structure and shopping experience have accelerated the online purchasing behavior on whole. The research design is descriptive and empirical data is collected via purposive sampling through a structured questionnaire of 150 respondents who shop from H&M brand online or offline. To ensure the reliability and validity of the research instrument pilot test was conducted on four sets of administered research questionnaires on specific domains of the apparel industry like manufacturing, distribution, warehousing and buying & merchandising. Swedish Brand H&M is the case study of current paper who has invested in Amplified Intelligence tools & techniques.

## Hypotheses Development

Artificial Intelligence Tools & Techniques (AR/VR/Rfid/IOT) concerns two constructs: tools performance and interactions. Tools (Rfid and IOT technology) include lack of transparent recommendation process (Mitchell,2019) complex interactions, safe and secure transactions. Human Intelligence (Digital Assistants/Chatbots /Robots) concerns three constructs: privacy concerns, security mechanisms, social Ethics.As ethical concerns are related to trust factors between AI-tools & consumers, regarding personal information and accountable compatibility of machine - human values with technology (DwivediHughes,Coomb 2019). Data science concerns two constructs: Data insights and

Data patterns. All these are considered as independent variables along with Amplified Intelligence. So, in this study the following hypothesis are proposed with Apparel Industry being the Dependent Variable:

- H1: Technical performance of AI tools have a positive impact on the Apparel industry.
- H2: Consumer interaction by AI tools have a positive impact on the Apparel industry.
- H3: Human intelligence tools significantly impact privacy while doing online apparel shopping.
- H4: Human intelligence tools significantly impact security concerns to personal accounts while online apparel shopping.
- H5: Human Intelligence tools impact social culture while doing apparel shopping.
- H6: Data insights from data Science tools impact apparel fashion industry
- H7: Patterns from Data science tools impact apparel fashion industry
- H8: Amplified Intelligence tools significantly reduce online shopping sustainability.

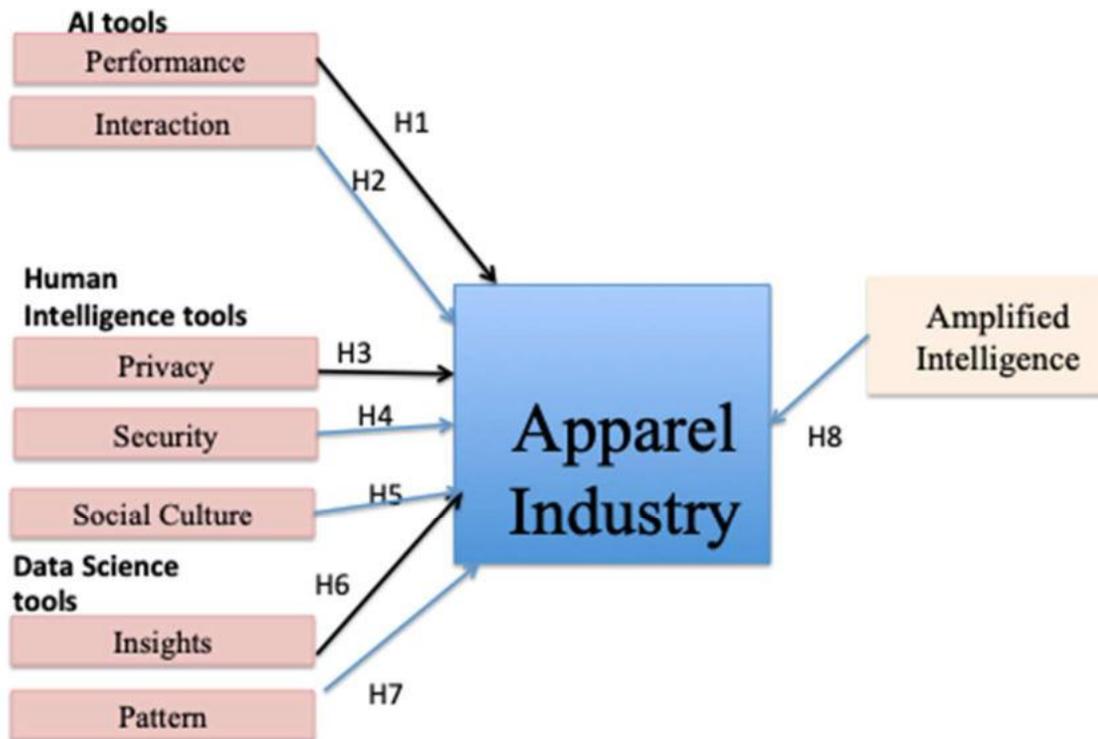


Figure3: Hypothesis Model of Research Framework

### Data collection

In this paper, the empirical data is collected via purposive sampling through a structured questionnaire of 150 respondents who shop from H&M brand online or offline. A self-managed survey in Google Structure was ready for essential information assortment to guarantee that shoppers/respondents totally appreciated the unique circumstance. Also, maintaining the emphasis on the review a circumstance was depicted in which people have the choice of utilizing AI-based instruments while selecting H&M quick style items. The advanced aides collaborate while buying, independent direction, and ongoing decision

making (AR/VR innovation).

### Data Analysis and Interpretation

As the review was intentional so reactions from ideal interest groups were limited. As referenced in the exploration model, the quantity of inert or noticed factors expected size (0.3), the likelihood esteem (0.8), and critical insights ( $\alpha = 0.05$  and power  $\beta = 0.95$ ), on the base example size of 150 in the design model. A satisfactory review shows 127 examples could decrease conceivable testing blunders and limit Type II mistakes. Thus, to test the theories inside a Structural Equation Modeling (SEM) system information is examined with IBM SPSS AMOS (form 26) in this review. Measurable investigation showed ordinariness was assessed and worked with fair and predictable models to display the attribute, with conveyances of information. Hair and Black (2006), expressed balance with skewness and kurtosis with the peakedness of dissemination. Consequently, ordinariness suspicions investigated every one of the developments utilized in the model. Testing of the build measures showed a skewness range from  $- 0.068$  to  $0.003$ , and a kurtosis range from  $- 1.192$  to  $- 0.216$ . These discoveries showed every one of the qualities falls inside the given reach and most extreme adequate levels (2) for skewness and (7)for kurtosis tests (Bansal,Gefen,2010).

**Table 2. Scores of Convergent Validity**

Variables	Constructs	Items	Standardised Factor Loadings (>0.7)	Composite Reliability (>0.7)	AVE(>0.5)	
<b>Variables</b>	<b>Construct</b>					
<b>Artificial Intelligence Tools (AR/VR/Rfid/IOT)</b>		TP1	0.86			
		TP2	0.86			
	<b>Tools Performance</b>	TP3	0.85		0.925	0.78
		TP4	0.87			
		TP5	0.85			
	<b>Tools Interaction</b>	TI1	0.88			
		TI2	0.87			
		TI3	0.86		0.919	0.778
		TI4	0.89			
TI5		0.77				
<b>Human Intelligence (Chat Bot/</b>	<b>Tools Privacy</b>	TPC1	0.88			
		TPC2	0.89			
		TPC3	0.9		0.932	0.756

<b>Digital Assistants/Robot)</b>	<b>Concerns</b>				
		TPC4	0.92		
		TPC5	0.79		
		TSC1	0.87		
		TSC2	0.88		
	<b>Tools Security Concerns</b>	TSC3	0.89	0.945	0.798
		TSC4	0.91		
		TSC5	0.79		
		TSE1	0.87		
	<b>Tools Social Ethics</b>	TSE2	0.88	0.915	0.735
		TSE3	0.87		
		TSE4	0.86		
		TSE5	0.86		
<b>Data Science (Big Analytics /Business Intelligence)</b>		DI1	0.84		
		DI2	0.86		
	<b>Data Insights</b>	DI3	0.87	0.934	0.823
		DI4	0.89		
		DI5	0.92		
		DP!	0.78		
	<b>Data Pattern</b>	DP2	0.84	0.912	0.777
		DP3	0.86		
		DP4	0.85		
<b>Amplified Intelligence (Artificial +Human Intelligence &amp; Data Science)</b>		TR1	0.76		
		TR2	0.78		
	<b>Tools Risk</b>	TR3	0.84	0.923	0.635
		TR4	0.86		
		TR5	0.85		
		TB1	0.86		
		TB2	0.85		
<b>Tools Benefit</b>	TB3	0.89	0.926	0.745	

	TB4	0.87		
	TB5	0.89		
	SE1	0.84		
	SE2	0.86		
<b>Shopping Experience</b>	SE3	0.87	0.956	0.786
	SE4	0.89		
	S1	0.92		
	S2	0.78		
<b>Sustainability</b>	S3	0.84	0.972	0.799
	S4	0.86		
	SC1	0.85		
	SC2	0.88		
<b>Social Culture</b>	SC3	0.84	0.962	0.765
	SC4	0.85		

Confirmatory Factor Analysis (CFA) was done on the nine builds to evaluate the estimation model for approving the study instrument (i.e. poll). A concurrent and discriminant legitimacy test was attempted by SPSS AMOS (ver.26) in the paper. Normalized factor loadings, composite dependability, and the Average Variance Extract (AVE) were inspected to test (Gefen, Straub, 2010) merged legitimacy. Table 2 addresses the Convergent Validity Test Scores. Composite dependability scores similar with the edge worth of 0.7, featured the sufficiency for the unwavering quality of builds (Fiske, Heningson, 2019). The measurable normalized factor loadings were more prominent than 0.7 score in this review, which was OK Hair and Black (2006). Further AVE of each development was assessed utilizing normalized factor loadings. Measurements of the AVE were additionally more prominent than 0.5 scores, the base prerequisite. (Gefen Straub, 2018).

Construct	Mean	SD	TP	TI	TPC	TSC	TSE	DI	DP	TR	TB	SE
<b>TPerformance</b>	3.48	0.99	<b>0.845</b>									
<b>TInteraction</b>	3.19	1.08	0.499	<b>0.832</b>								
<b>TPC</b>	3.32	1.1	0.437	0.439	<b>0.865</b>							
<b>TSC</b>	3.07	0.98	-0.328	-0.177	-0.127	<b>0.856</b>						
<b>TSE</b>	3.36	1.03	0.377	0.403	0.32	-0.168	<b>0.858</b>					
<b>Data Insights</b>	3.45	1.04	0.437	0.438	0.446	-0.16	-0.459	<b>0.868</b>				
<b>Data Pattern</b>	3.12	1.06	0.455	0.396	0.399	-0.235	-0.555	0.526	<b>0.862</b>			

<b>Tool risks</b>	3.07	0.96	-0.186	-0.137	-0.048	0.495	-0.045	0.049	-	0.045	<b>0.849</b>	
<b>Tool Benefits</b>	3.59	1.03	0.459	0.464	1	-0.478	0.595	0.522	0.553	0.272	<b>0.828</b>	
<b>Shopping Exp.</b>	3.67	1.08	-0.338	-0.192	-0.158	0.453	-0.214	0.156	-0.22	0.61	-0.388	<b>0.86</b>
<b>Table Legend: TP-Tool Performance ,TI- Tool Interaction , TPC-Tool Privacy Concern , TSC - Tool Security Concern , TSE -Tool Social Ethics , DI- Data Insights, DP -Data Patterns , TI -Tool Risk, TB -Tool Benefits, SE- Shopping Exp.</b>												

Subsequently above discriminant legitimacy scores approve the prerequisites of the satisfactory exploration model in this examination paper. Since the relationships between's developed measures were not exceptionally huge, the Variance Inflation Factor (VIF) and resilience esteem for the indicator factors were determined by multicollinearity check. The indisputable VIF scores were somewhere in the range of 1.79 and 2.64, very underneath the cutoff worth of 5, while the resilience scores were somewhere in the range of 0.55 and 0.37, i.e higher than the edge of 0.1 (Hair and Ringle 2011). Further to check in the event that the normal strategy inclination would be a problem(Cenefetelli,2008), Harman's one-factor test was embraced with build measures. It at long last reasoned that develops could represent 85.40% of the complete difference, and the elements were generally not noticed for covariance among build measures (< 15%). Thus, normal technique predisposition was found as a non-critical danger.

**Results (Descriptive statistics)**

**Table 4** portrays the Respondents' control trademark factors. The segment attributes show that the significant respondents were understudies (65.7%) and youthful representatives (66.5%). The sex was similarly dispersed with guys (45.1%) and females (58.9%). 66.1% youthful respondents between the 25-40 age bunch. 65% yearly pay among 25,000 and under 50,000. 41% responded familiar with AI tools of other sectors not fashion apparel (such as financial decision making), moderately, only 55% were familiar with AI-Apparel tools. Only 23% used an AI enabled Fashion apparel support services (such as AR/VR/RFID/IOT), and 60% were not familiar with the Amplified intelligence of H&M.

<b>Control Factors</b>	<b>Characteristics</b>	<b>Percentage</b>
Gender	Male	45.1
	Female	58.9
Age Group	15-24	42.3
	25-34	63.7
	35-44	65.8
	45-54	52.9

Occupation	student	65.7
	Influencer	64.3
	Service	66.5
	Business	55.5
Income Level	0-10K	43.4
	10-20K	42.3
	20-30K	67.5
	30-40K	64.3
Clothing Collection Preference	Fad	45.3
	Fast Fashion	62.3
	Moderate fashion	55
	Classic fashion	49
Shopping Frequency	Once a week	34.5
	Twice a Week	45.2
	Once a month	48.2
	Twice a Month	59.2
Do you go for AI Based information search before shopping fashion apparel	Strongly Disagree	23.2
	Disagree	25.2
	Agree	68.2
	Strongly Agree	65.3
Do you prefer Chatbot interaction for color style performance	Strongly Disagree	34.2
	Disagree	25.6
	Agree	69.3
	Strongly Agree	68.7
Do you prefer AR/VR check in apparel decision Making ?	Strongly Disagree	23
	Disagree	34
	Agree	63.9%
	Strongly Agree	56.4
Do you prefer RFID technology for personalised apparel recommendation ?	Strongly Disagree	22
	Disagree	19
	Agree	38

	Strongly Agree	48
Do you prefer automated supply chain for fast services ?	Strongly Disagree	23
	Disagree	28
	Agree	54
	Strongly Agree	49
Do you prefer AI based Fashion Apparel Support services for privacy , security and ethical concerns ?	Strongly Disagree	32
	Disagree	17
	Agree	48
	Strongly Agree	47
Do you feel AI based shopping as High class social activity?	Strongly Disagree	23
	Disagree	31
	Agree	48
	Strongly Agree	52
Is Fashion apparel shopping hygienic and eco friendly at H&M?	Strongly Disagree	12
	Disagree	17
	Agree	54
	Strongly Agree	49
Do H&M Fashion apparel has social and cultural awareness?	Strongly Disagree	26
	Disagree	27
	Agree	38
	Strongly Agree	42
Is an AI based H&M fashion apparel environment a sustainable brand ?	Strongly Disagree	27
	Disagree	25
	Agree	38
	Strongly Agree	42
Is automated technology driven retail more sustainable at H&M?	Strongly Disagree	20
	Disagree	16
	Agree	38

	Strongly Agree	44
Is Data Insights and the pattern of smart Manufacturing ,Warehouse management , SCM & CRM at H&M working towards a sustainable apparel industry?	Strongly Disagree	23
	Disagree	22
	Agree	42
	Strongly Agree	49

### Structural model

Theories testing was additionally done in SPSS AMOS (form 26) inside an SEM system. As indicated by (HO,2006), the decency of fit measurements can assess the whole primary model and survey the general attack of the examination model.

It was critical that the measurable Chi-square worth ( $\chi^2/df$ ) was 2.24. The file scores for CFI = 0.91, NFI= 0.92, RFI = 0.91, and TLI = 0.92 were above 0.899 and the SRMR = 0.05 and RMSEA = 0.06 were underneath 0.08( Byrne, 2001). The score of AGFI was 0.91 that surpassed 0.90. All factual means were a solid match and in the adequate reach, with the exception of GFI = 0.83 which was minimal. Four of the measurable scores determined the base suggested qualities (Kline, 2015), supporting a solid match between the theorized model and the noticed information. Figure 2 shows the primary exploration model of standard way coefficients being scrutinized. The speculation testing scores are classified in Table 5.

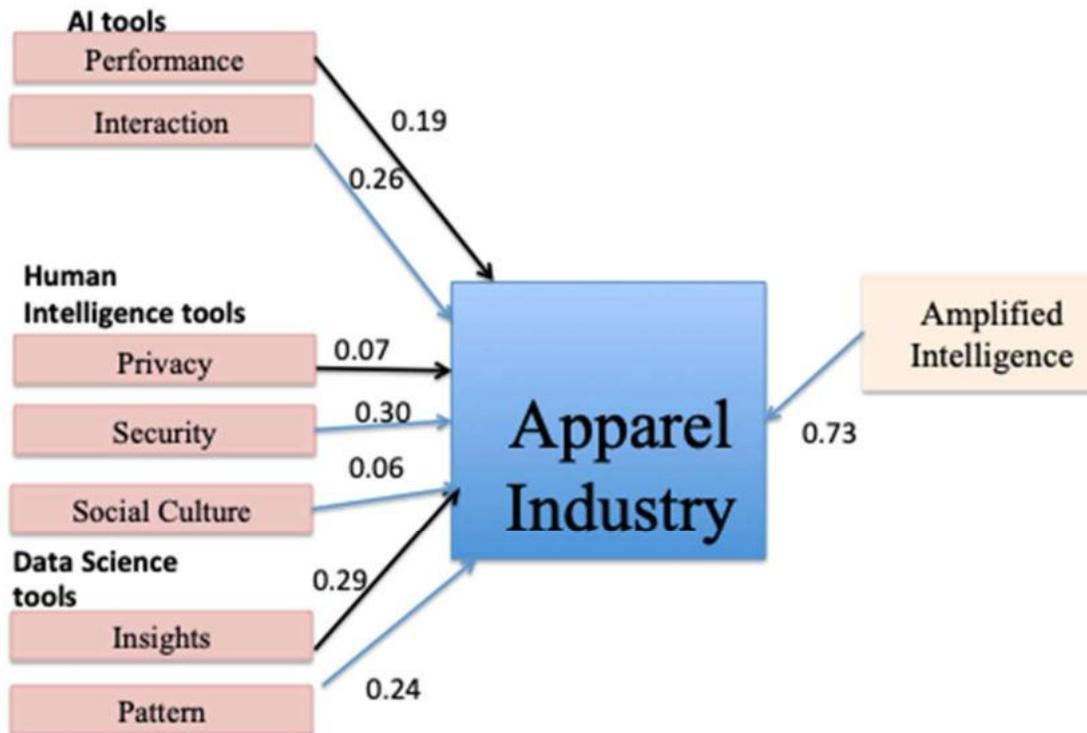
Regarding AI-based design devices, the insights acknowledge H1 by the critical positive connection among execution and attire industry ( $\beta = 0.19, p < 0.001$ ). The measurements in all actuality do acknowledge H2, where communication impacts the clothing industry ( $\beta = 0.26, p < 0.001$ ). Be that as it may, in Human knowledge concerns, H3 was dismissed, where protection concerns don't essentially add to shopping in attire ( $\beta = 0.07$ , non-critical way). H4 is acknowledged where security worries in AI systems altogether lead to more serious dangers while doing web-based shopping of attire ( $\beta = 0.30, p < 0.001$ ). H5, where social morals don't altogether affect the attire business, is rejected( $\beta = 0.06$ , non-critical way). As to information bits of knowledge and information designs, the examination likewise exhibits that partners i.e buyers, inventory network the executives, and (SCM) Customer relationship the board emphatically impacts the clothing business ( $\beta = 0.29, p < 0.001$ ), consequently acknowledges H6 and H7 ( $\beta = 0.24, p < 0.05$ ). The discoveries likewise give sufficient proof to acknowledge H9 by showing more the advantages related with Amplified Intelligence ( $\beta = 0.73$  and  $p < 0.001$ ).

### Discussion

With the promising chances made by Amplified Intelligence innovation (like AR/VR/IoT clothing emotionally supportive network ), the inquiry emerges when AI apparatuses will be business as usual? Artificial intelligence installed shrewd gadgets democratizes Fashion Apparel by bringing AI-empowered clothing administrations (like AR and VR) into the existence of customers (Zandi, Vayena Goodman 2019). In any case, a few worries connected with the utilization of AI should be tended to. Due to the affectability and oddity, the effect of AI apparatuses in style clothing might include an elective methodology with more grounded forecast power than existing models of instruments and innovation acknowledgment.

<b>Table 5 Hypothesis testing Scores</b>				
<b>Hypothesis Path</b>	<b>Standard Path Coefficient</b>	<b>S.E</b>	<b>CR</b>	<b>Results</b>
H1 Performance-> Apparel Industry	0.19***	0.04	6.24	Accepted
H2 Interaction-> Apparel Industry	0.26***	0.04	5.03	Accepted
H3 Privacy -> Apparel Industry	0.07	0.06	1.23	Rejected
H4 Security-> Apparel Industry	0.30***	0.05	3.58	Accepted
H5 Social Culture-> Apparel Industry	0.06	0.08	0.07	Rejected
H6 Data insights-> Apparel Industry	0.29***	0.05	3.64	Accepted
H7 Data Patterns-> Apparel Industry	0.24*	0.09	1.89	Accepted
H8 Amplified Intelligence-> Apparel Industry	0.73***	0.45	6.27	Accepted
<b>Risk R2:0.67</b>				

**Figure 2**



### Findings

Findings of the research paper provide that AI has taken a competitive edge and is helping the Apparel Industry revive post-pandemic, in a big time. AI tools like automated warehousing, data insights, predictive market demand, algorithmic purchase patterns, one day delivery are playing a significant role in enhancing the social culture and overcoming the sustainability in Fashion and apparel sector in the market. The paper has seen the high transition in the sector from a sharp fall down in pandemic to a steep revival post-pandemic with Envirotech measures in the industry. Artificial Intelligence tools AR/VR/Rfid/IOT accessibility (i.e., performance and interaction) are the significant indicators of transaction issues, social interaction and security & privacy concerns. Human intelligence tools (Digital assistants & Chatbots) are significant indicators of privacy risk associated with personal information, security of personal accounts and social ethics. Data science tools are significant predictors of data insights and pattern recognition in SCM/CRM/automated warehouses and demand production. Except H3 and H5 all the hypotheses were accepted. Respondents risk AI performance (H1) and AI Interaction (H2) at the same time distrust AI's personal recommendation privacy and security (color, size, style) for clothing and financial Transaction (H3 & H4). Social ethics are at risk (H5). Research structure models are acceptable (80%), and being useful for future studies adding economic factors to increase exploratory context.

### Conclusion

Widespread implementation of Amplified intelligence tools and techniques has fundamental changes significant effects on the apparel industry. Artificial Intelligence is an integral element in demand for

every business model, and human factors are integrated with AI strategic components for business, in apparel fashion institutions. Study analytics demonstrate category concerns with Amplified Intelligence i.e Artificial Intelligence Performance and Interactions efficiently and effectively exhibit the shape and structure of apparel industry in coming years. Human Intelligence concerns i.e Privacy & Security in AI mechanisms, socio-cultural ethics, while only security significance to risk in AI based tools. Data Science tools concern data insights and data patterns directly contribute to risk AI in smart manufacturing, supply chain, and customer relationship management adding value to retail analytics of the global fashion retailer H&M. We suggest AI researchers conduct further studies on Fashion and Apparel perspectives. Factors such as economic (Financial variables) and organizational challenges (catering to the general mass), to be taken in a research model concerns a sufficient budget about the technology to make a decisive action.

### Limitations

Apparel industry has seen tremendous rise in business just after the AI investment and found significant relationships in Amplified intelligence tools and customer experience, sustainability and social up-gradation. Though the findings were very enthusiastic to raise the profitability margin but at the same time question mark to consumer privacy as personal demographic factors are on the board, the employment rate is slowing down, adaptability to Gen Z is tough and cost to pocket. Big players in the market do have to think about the pocket friendly measure between AI tools and society at large. Big question to various software like branding compliance have arisen in the market. Also, Intellectual Property Rights have become a major limitation for developing countries like India etc.

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## ANALYSIS OF THE DYNAMICS OF CRUDE OIL PRICES IN RELATION TO THE DOLLAR AND GOLD PRICES– INDIAN PERSPECTIVE.

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### **Abstract:**

As one of the most essential energy sources in our nation, crude oil is also one of the most important Imported goods. India imports around 84% of its total Crude oil needs. This clearly illustrates the extent to which fluctuations in crude oil prices effect our economy. The energy industry is one of the most volatile industries, and energy dependence is substantial. Additionally, crude oil is a significant commodity traded on the commodities market. Considering all of the aforementioned variables, fluctuations in the price of crude oil have a significant influence on the nation's economy as a whole, making crude oil forecasting a necessity. This study analysed data from 2000 to 2021 to develop a very accurate predictive model. In addition to crude oil prices, macroeconomic indicators such as gold prices and dollar exchange rates have been collected and evaluated using ARIMA model.

*Key words: Crude oil, Gold, Dollar, Fluctuation, prediction, ARIMA model.*

### **Introduction:**

Crude oil is one of the vital energy sources that serves as a gauge of a nation's economic health. India is reliant on crude oil imports for more than 80 percent of its crude oil requirements. In 2016, India imported over 84% of its crude oil and petroleum products. India purchased crude oil worth around US\$77 billion or 239 million metric tonnes (MT) in 2020-21, representing more than 19 percent of the country's total imports. In 2019–20, about 85 percent of the demand for petroleum products was met by imports. Petroleum constituted twenty-five percent of India's total imports, with a gross import volume of around 270 MT valued at US\$119 billion. This is a huge increase compared to 2006–07, when imports of around 145 MT accounted for over 77% of consumption.

### **Classification of Crude oil:**

Throughout the world, oil is extracted. Brent Crude, West Texas Intermediate, and Dubai and Oman are the three primary crude oil sources that serve as standards for rating and pricing other oil suppliers.

Brent Crude is a blend of 15 unique North Sea oil sources situated between Scotland and Norway. The bulk of Europe receives oil from these sources. West Texas Intermediate (WTI) is a lighter

oil that is produced mostly in Texas, United States. It is of the finest quality and is "sweet" and "light." WTI supplies much of North America with crude oil.

Dubai crude, often popularly referred to as Fateh or Dubai-Oman crude, is a light, sour oil produced in Dubai, United Arab Emirates. Recent oil production has begun in the neighboring country of Oman. Oils from the Persian Gulf that are mostly exported to Asia are priced relative to Dubai and Oman crudes.

It is believed that the United States has the largest oil reserves, followed by Russia and Saudi Arabia. According to a 2016 survey, the numbers for the top 10 nations are presented in the table below.

Country	Estimated oil reserves (Billions of barrels)
United States	264
Russia	256
Saudi Arabia	212
Canada	167
Iran	143
Brazil	120
Iraq	117
Venezuela	95
Mexico	72
China	59

Recently, oil consumption in growing economies such as China and India has surged. This tendency is anticipated to continue, but at a slower rate (EIA, 2008). Over the last two decades, oil price fluctuations have undergone significant changes, including the introduction of new oil producers such as Canada, Alaska, and the North Sea. Moreover, the rise in oil prices has made certain oil wells commercially feasible. On the supply side, East Asian countries such as China, India, and Malaysia are expanding rapidly. China has surpassed the United States as the world's second biggest oil consumer, reflecting changes in the composition of the demand equation. New environmental restrictions have also promoted the use of light oil, which contains less Sulphur. These regulations have increased the strain on refinery utilisation. (2018) (Hamza & Alredany).

Recent emphasis has been focused on the volatility of crude oil prices, since crude oil is the most strategic and traded commodity on the planet. Oil-producing nations, oil firms, individual refineries, oil-importing nations, and speculators engage in international crude oil trading. (2015) (Bildirici & Ersin). Although the price of crude oil is mostly driven by supply and demand (Hagen 1994; Stevens 1995), it is also affected by a number of irregular occurrences, including stock levels, economic growth, political considerations, political instability, OPEC actions, and traders' psychological expectations (Yu et al. 2008). It is well acknowledged that oil price volatility has a substantial influence on economic activity. Commodity market prices change in lockstep with the rise and fall of the oil price, therefore any dramatic spike or reduction in oil prices causes an economic slowdown and price variations for other commodities. Consequently, projecting crude oil prices is a crucial field of study, and modeling/forecasting oil prices is hampered by intrinsic challenges such as excessive volatility (Wang et al. 2005).

Due to the fact that crude oil spot prices are often seen as a nonlinear and nonstationary time series that is impacted by a number of variables, it is rather challenging to properly anticipate crude oil prices (Yu et al. 2008). While oil prices may not always react instantly to fresh information, limited liquidity and infrequent trading on imperfect markets may result in a delay (McMillan and Speight 2006; Monoyios and Sarno 2002; Lee et al. 2008). When big worldwide political and economic events occur, such as changes in government policies, geopolitical dangers, investor attitude, and natural catastrophes, structural changes in oil prices and, subsequently, panic indexes adopt a nonlinear connection. 2019 (Lin, Liang, & Tsai).

The conditional variance of oil returns demonstrates time-varying volatility. The evidence for unequal effects in conditional variance is contradictory. There is no indication of risk-reward trade-offs. There is evidence that the conditional standard deviation is a more accurate estimate of the volatility of oil returns than the conventional conditional variance. (2010) (Mohammadi & Su). Numerous economists, practitioners, and analysts are intrigued by the current fluctuations in the stock market; they strive to understand the fundamental reasons of these huge swings, which cost the economy roughly billions of dollars. The key factors of the stock market are the interest rate, currency exchange rate, and oil prices in particular. (Ahmed, n.d.)

### **Crude Oil Import Scenario of India:**

- In December 2021, the average daily crude oil imports into India were 4,243.758 barrels. In December 2020, the previous peak of 4,033,050 Barrel/Day was attained.
- From December 1980 to 2021, annual data on India's crude oil imports indicate an average of 1,557.335 Barrel/Day.

- In 2018, the statistics reached an all-time high of 4,543.634 Barrel/Day and an all-time low of 278.073 Barrel/Day.

Eighty-four percent of India's crude oil requirements are covered by imports, and this proportion has continuously increased over time. Too great is the disparity between domestic demand and output. The majority of India's oil imports originate from Iraq and Saudi Arabia in the Middle East. India Imports Crude oil from various parts of the world, they are:

- Middle East – 52.7%
- Africa – 15 %
- United States of America - 14%

### **Research gap:**

After analysing prior research, it is clear that changes in economic indicators have a major influence on crude oil prices. Numerous financial time series have leptokurtic distributions, large tails, and nonlinear conditional volatility. This trait reduces the predictive power of traditional models like the ARCH and GARCH models (Bildirici, Melike).

A little amount of research has been undertaken to demonstrate the similar association between the Indian crude oil basket price and the price of crude oil. Insignificant research has also been conducted to determine the worldwide elements driving fluctuations in the Indian basket crude oil price. In other words, the Indian basket crude oil price benchmark has garnered minimal attention, similar to other international crude oil price benchmarks. This research aims to discover the elements that cause fluctuations in the price of Indian basket crude oil. As a consequence, it contributes originality to this area of study. Crude oil prices are sensitive to changes in other significant macroeconomic indices, such as the gold price, the US dollar to Indian rupee exchange rate, the Gross Domestic Product, the SENSEX, and the NIFTY. This study employs Univariate analysis to examine the relationship between significant macroeconomic indicators and crude oil prices over the medium and long term. Which in turn aids the research in determining the feasibility of crude oil price predictions after accounting for the impact of economic factors on the commodity.

### **Statement of Problem:**

Revenue and expenditures are the lifeblood of every economy, and they may be brought in via several means. Income is often broken down into two categories: taxable and nontaxable. Forex, gold prices, stock market indexes, GDP, and crude oil prices are all examples of macroeconomic factors that affect the economy. These metrics show a statistically significant positive correlation. To help reduce price volatility in the future, this research builds univariate and multivariate models to predict crude oil prices and aims to establish a linear link between these factors.

Businesses that depend on crude oil, commodities speculators, and investors may all benefit from accurate price predictions due to crude oil price forecasting. The availability of crude oil is essential to the prosperity of every country. All of the country's macroeconomic indices are

affected to some degree by it. The results of this research will help us estimate the long-term and short-term consequences of rising crude oil prices on key economic variables including the US dollar/gold exchange rate.

**Objectives of the study:**

- a) To analyse the impact of Macro Economic Indicators on Crude oil Price
- b) To forecast the Crude oil prices by considering Macro economic indicators.
- c) To interpret the forecasted price of Crude oil.

To draw the significance and to forecast crude oil price this study has adopted predictive analysis. The data has been first tested for Multiple Linear regression which runs on mean difference has high Multicollinearity within the variables hence further Quantile regression test has been tested. This study for analysis and prediction purpose has considered Crude oil as dependent variable and Macro Economic indicators such as Forex (US \$), Gold Price, Sensex, Nifty as these Indicators will have high impact on Crude oil prices.

Initially study has considered Descriptive Statistics and Correlation to check linear relationship among the variables.

**Descriptive Statistics:**

	Crude	Dollar	Gold
count	252.000000	252.000000	252.000000
mean	63.224118	54.157738	1870.536997
std	28.870070	10.678496	1133.994996
min	18.240000	39.195000	386.299579
25%	40.587875	45.643750	663.840979
50%	60.443794	48.690000	1989.640592
75%	78.345516	64.486250	2718.265889
max	132.471248	75.590000	4726.129845

**Correlation:**

	Crude	Dollar	Gold
Crude	1.000000	0.190393	0.429275

	coef	std err	t	P> t	[0.025	0.975]
<b>const</b>	0.2931	0.025	11.570	0.000	0.243	0.343
<b>Dollar</b>	-0.4844	0.091	-5.305	0.000	-0.664	-0.304
<b>Gold</b>	0.8790	0.101	8.703	0.000	0.680	1.078
	<b>Crude</b>		<b>Dollar</b>		<b>Gold</b>	
Dollar	0.190393		1.000000		0.841202	
Gold	0.429275		0.841202		1.000000	

After looking at the correlation matrix study understands positive relationship between the Dependent and Independent variables. Further study gives ample opportunity to go for predictive analysis.

The twenty-one years data has been divided into Sample data set and Forecasting data set to have a better prediction model.

Initially the data has been tested for Linear Regression with Crude oil as dependent variable and Dollar price as independent variable which gave a very less prediction factor to the data hence the study has added Gold also to the Regression equation. The equation to calculate Multiple Linear Regression in this case will be:

$$\alpha + \beta_1x_1 + \beta_2x_2$$

**Hypothesis:**

**H<sub>0</sub>: There is no significant Linear relationship between Crude oil, Dollar and Gold Prices**

OLS, using observations 2000:04-2020:03 (T = 240)

Dependent variable: Crude Oil Price

	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>	
Constant	95.8684	9.88655	9.697	<0.0001	***
Dollar	-1.54591	0.240360	-6.432	<0.0001	***
Gold	0.0288687	0.00235026	12.28	<0.0001	***

Mean dependent var	64.15792	S.D. dependent var	29.15433
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Sum squared resid	114254.3	S.E. of regression	21.95645
R-squared	0.437570	Adjusted R-squared	0.432824
F(2, 237)	92.19286	P-value(F)	2.42e-30
Log-likelihood	-1080.410	Akaike criterion	2166.821
Schwarz criterion	2177.263	Hannan-Quinn	2171.028
rho	0.967235	Durbin-Watson	0.099877

The regression equation from the above table is  $95.8684 - 1.54591x_1 + 0.0288687x_2$  and later Variance inflation Factor has been tested for Multicollinearity problem and model doesn't have Multicollinearity problem and p-value is less than 0.05 hence study rejects null hypothesis and accepts alternate hypothesis that is there is a significant relationship between Crude oil, Dollar and Gold Prices.

ARIMA model with Seasonal Lags has been considered to test the model. Dollar as Independent and Crude oil as Dependent variable ARIMA model has been tested.

AR - 1, I - 1, MA - 1 (seasonal) has been considered with 1 lag points for analysis purpose. The equation being;  $\hat{y}_t = \mu + \phi_1 y_{t-1} + \dots + \phi_p y_{t-p} - \theta_1 e_{t-1} - \dots - \theta_q e_{t-q}$

ARIMA, using observations 2001:04-2020:03 (T = 228)

Dependent variable: (1-Ls) Crude Oil Price

Standard errors based on Hessian

	<i>Coefficient</i>	<i>Std. Error</i>	<i>z</i>	<i>p-value</i>	
Phi_1	0.781494	0.0553394	14.12	<0.0001	***
Theta_1	-1.00000	0.0451871	-22.13	<0.0001	***
Dollar	1.19674	0.303861	3.938	<0.0001	***

Mean dependent var	1.776930	S.D. dependent var	22.94899
Mean of innovations	2.743051	S.D. of innovations	20.84486
R-squared	0.539924	Adjusted R-squared	0.535834
Log-likelihood	-1023.197	Akaike criterion	2054.394
Schwarz criterion	2068.112	Hannan-Quinn	2059.929

		<i>Real</i>	<i>Imaginary</i>	<i>Modulus</i>	<i>Frequency</i>
AR (seasonal)					
	Root 1	1.2796	0.0000	1.2796	0.0000
MA (seasonal)					
	Root 1	1.0000	0.0000	1.0000	0.0000

The model equation may be derived from the data in the previous table as follows:

$$\hat{y}_t = 1.19674 - 1 y_{t-1} - 0.781494 e_{t-1}$$

The p-value indicates that the model has a substantial effect on prediction. The value of the dollar is a reliable indicator of the cost of crude oil. The research will also examine the relationship between Gold and the predicted price of crude oil.

ARIMA, using observations 2001:04-2020:03 (T = 228)

Dependent variable: (1-Ls) Crude Oil Price

Standard errors based on Hessian

	<i>Coefficient</i>	<i>Std. Error</i>	<i>z</i>	<i>p-value</i>	
Phi_1	0.628949	0.0681103	9.234	<0.0001	***
Theta_1	-1.00000	0.0576984	-17.33	<0.0001	***
Gold	0.0114775	0.00286535	4.006	<0.0001	***

Mean dependent var	1.776930	S.D. dependent var	22.94899
Mean of innovations	3.241575	S.D. of innovations	20.81682
R-squared	0.507293	Adjusted R-squared	0.502914
Log-likelihood	-1025.709	Akaike criterion	2059.419
Schwarz criterion	2073.136	Hannan-Quinn	2064.953

		<i>Real</i>	<i>Imaginary</i>	<i>Modulus</i>	<i>Frequency</i>
AR (seasonal)					
	Root 1	1.5900	0.0000	1.5900	0.0000
MA (seasonal)					
	Root 1	1.0000	0.0000	1.0000	0.0000

From the table the ARIMA equation can be drawn as follows.

$$\hat{y}_t = 1.19674 - 1 y_{t-1} - 0.781494 e_{t-1}$$

p-value of the above table also helps the study to understand that the model has strong predictable capacity with all the variables having p-value less than 0.05.

Hence the study understands that ARIMA is one of the univariate model which has the strong predictable capacity of Crude oil against its relationship with Dollar and Gold prices.

Interpretation from the above analysis:

- In the above study Crude oil has been considered as a Dependent variable, Dollar and Gold prices as Independent Variable.
- Initially Correlation of Crude oil with Dollar and Gold prices has been established and study understood that there is a positive relationship among the variables.
- Further Multiple Linear regression has been drawn to establish Linear relationship among the variables. With no Multicollinearity study established strong relationship among Dependent and Independent Variables.
- To establish prediction of Crude oil when compared with Dollar and Gold prices study has used ARIMA model which showed a strong predicting capacity of the model.

### Conclusion:

About 82% of the crude oil used in our country is imported. Which contributes substantively to the study's ability to comprehend the impact of Crude oil Prices on the State of the Economy as a Whole. Therefore, an accurate forecast of future crude oil prices is a must for the nation.

The ability of the ARIMA model to forecast Gold and Dollar prices relative to Crude oil prices was tested using a Univariate test in this research. Insights gained from this study not only led to the realisation that ARIMA is a promising candidate for predicting future crude oil prices but also convinced the researchers that other methods, such as Univariate and Multivariate analysis, have promise as well.

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## A Study on Reasons to use Microfinance Products in Rural District of Bengaluru

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### Abstract

Savings are a key resource for Microfinance Institutions (MFIs). They need to save enough savings to meet their obligations and become self-sufficient from grant suppliers. As a result, they need to persuade customers—in this example, the general public and micro- and small-sized businesses—to put their savings in their hands. This calls for understanding the characteristics, needs, and goals of these clients. What factors affect consumers' decisions to use and save money using an MFI's microfinance products? this raises the question of research.

The purpose of this study is to determine the rural people in Bengaluru district's reasons for using microfinance products, such as farming, land purchase, medical bills, unexpected expenses, social security, and education for children.

**Key words:** Microfinance products, Reasons, Rural District, Clients, Social Security.

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### Introduction

Microfinance is credited to Bangladeshi economist Shri. Muhammad Yunus. ING claims that Yunus has acquired the title of "the banker of the poor." In 1976, Yunus established the Grameen Bank in Bangladesh. This business provided "microcredit," which is just the disbursement of loans to borrowers in need of money. Prior to that, banks had a propensity to restrict their lending activities to middle- and upper-income clients—as well as the very affluent, of course. Yunis' idea of microcredit quickly became well-liked. Due to its tremendous

success, similar microfinance groups started to pop up all over the world, eventually resulting in the modern definition of microfinance.

Microfinance Institutions (MFIs) lending in India began in earnest in the middle of the 1990s with a suitable adaption of the Grameen model, where the al of the impoverished, Core was able to continue to prosper off of their reliance on their creditworthiness. Customer centricity has always been important to the success of the model, industry, or institution.

Microfinance institutions supplement the services provided by banks. Financial services like remittance, savings, and insurance are also provided in addition to microcredit. Additionally, non-financial services like training, counselling, and guidance for borrowers are offered in the most beneficial way possible. The borrower can use the aforementioned services as described below at their convenience. MFI interest rates are typically higher than those of conventional banks. Interest rates change depending on the purpose of the loan and the borrower's credit history. The repayment plan can be chosen by the borrower as well.

### **Research methodology**

The present study is both description & analytical study. This study is mainly based on Primary and secondary data. Primary data is collected through questionnaire.

Secondary data is collected from various sources like journals, magazines and reports.

### **Objectives of the research**

The following were the study's general and specific objectives:

1. To list the numerous justifications for utilising MFI products.
2. To research the reasons people use MFI microfinance products for improvement.
3. To research how each factor affects the beneficiaries' well-being.

### **Literature Review**

With the use of Google Scholar, we looked for old empirical investigations. The initial search produced 50 articles, including overlaps across two databases. Based on the study's title and objectives, we evaluated each research paper, taking into account the following:

Qualitative and quantitative analysis

Data analysis from underdeveloped nations is step two.

Step three is an analysis of the clientele's motivations for using microfinance programmes.

According to an investigation by Ali and Mughal from 2019, financial help provided by microfinance institutions can only produce positive outcomes when it is combined with business management expertise. This study has highlighted the significance of giving small-scale entrepreneurs managerial and non-managerial skills training in order to prepare them for fully utilising the growth opportunities provided by the financial advantages of a microbanking system.

Sussan and Obamuyi (2018) have highlighted the role that microfinance institutions play in enabling aspiring business owners to the point where they can ensure the expansion and development of their enterprises. The outcome has also acknowledged the significance of non-financial services provided by MFIs for exerting a significant influence.

Hussain et al., (2017) highlighted the significance of microfinance segment by analysing its impact on the economy. Research has particularly evaluated the influence of microfinance sector on the poverty-stricken segment of the society. The study has revealed that microfinance industry has specifically offered its contribution in the income segment, housing infrastructure, education, agriculture, health safety and food security in order to minimize the level of poverty and raises the living standard of the people.

Taiwo et al., (2016) research has examined the significance of contribution of microfinance banks or institutions on the SME sector. It has discussed about the level of support and assistance received by the small scale businesses from microfinance sector. The study has actually discussed about the kind of influence it carries on the growth of business enterprises by providing them sufficient amount of financial as well as non-financial support in every possible manner.

Ferdousi, (2015) evaluated the importance of microfinance institutions in facilitating the growth of micro-entrepreneurs by assisting them with the necessary support and sufficient guidance regarding innovative methods, market trends and latest technologies that needs to be implemented in the business. It has recommended that microfinance segments need to

support the small level entrepreneurs by educating them with some effective business knowledge to upgrade their skills along with the financial support in order to develop a sustainable business setup for them. This analysis has firmly augmented the role of client oriented services in enhancing the potential of entrepreneurs to a greater scale.

Ali et al., (2015) studied contribution of various factors such as level of education, increment in income and improvement in the business process in making an influence on the standard of living of the people. It has revealed that the financial or non-financial services availed through microfinance organisations plays a crucial role in the overall growth and development of the society.

Fwamba et al., (2015) have observed that microfinance industry expanded its service dimensions to the segments like advisory and savings rather than limiting itself to the traditional approach of offering monetary services only. It has proven to be a great help for female entrepreneurs. They are now getting themselves highly engaged in the process of decision making. This has encouraged them to a great extent since it provides an approach to satisfy their needs and empowers them by increasing their capabilities that subsequently motivates them to perform and handle all sorts of activities in the business

Modi et al., (2014) given an insight about the various dimensions of microfinance segments which are responsible for uplifting the situation of unprivileged rural women. It has also identified the contribution of some specific factors such as status of socio economic up-gradation, position of woman in society/family, autonomy for life choices and positive approach towards child development in creating an influential impact on the living standard of the society. The outcome of the research simply focuses on the role of government and microfinance institutions to setup the measures that are needed to drastically enhance the social and economic conditions of the poor rural women entrepreneurs.

Al-Shami et al., (2014) disclosed about the approaches followed by microfinance institutions to empower the clients and improve their wellbeing. It has analysed the role of microfinance institutions in the reduction of poverty and increasing the sustainability of the small level entrepreneurs. The study has subsequently discussed about the positive influences of those services which are delivered by microfinance units in the form of

monetary support, efficient training, proper guidance and social empowerment. These benefits are majorly responsible for the overall functioning and growth of the small scale business segments.

Girabi and Mwakaje, (2013) have identified the role of microfinance segments in up-scaling the standard of the small-scale farmers by enhancing their level of productivity. It has been concluded through the research that the assistance offered by the microfinance institutions contributes to a great extent in providing a better access to agricultural markets, farming products, efficient labour and suitable transportation facilities which eventually generates the chances to increase the profitability of the small farm holders. This study has also suggested some supportive measures that are needed to be taken for controlling the factors responsible for creating any hindrance in availing the micro-banking services by the poor farmers.

Awojobi, (2013) came up with the fact that an active participation of government in controlling the issues faced by microfinance banks is highly required in order to ensure an easy accessibility of the financial services provided by them. It has actually acknowledged the role of government to ensure the fund requirements of microfinance institutions so that they can perform their credit operations effectively. This study has also helped in evaluating the impact of positive influence created by microfinance in empowering women entrepreneurs by enhancing their income generating sources.

Adhikari and Shrestha, (2013) presented an image of microfinance segment as a change-maker in the society. It has revealed about the role played by the micro-banking industry in bringing a socio-economic stability in the society. This stability occurs especially due to the fund mobilisation exercises performed efficiently by micro-banking units which subsequently empower the women entrepreneurs to a great extent that helps them to raise their standard in the society.

Nwankwo et al., (2013) reflected that induction of microfinance industry in the economy became a necessity due to the result of inefficient banking mechanism to address and resolve the financial requirements of the underprivileged sections of the society. This concept of micro-banking open new avenues for the people to fulfil their economic needs and enhances their potential to achieve a sustainable growth in the business. The study

has also suggested certain measures for curbing the problems which are imposing a challenge against the efficient performance of micro-banking.

Imai et al, (2012) have analysed the overall impact of microfinance in building up the level of sustainability in an economy. It has been revealed that the active involvement of microfinance industry in the economy of a country minimises its poverty level to a large extent. In fact the study has shown a negative relationship of microfinance loan portfolio with the state of poverty in the society. Reduction in loan portfolio along with the GDP brings unemployment which eventually exemplifies the level of poverty. So, the role of micro-banking industry is considered to be huge in improving the financial performance of the country.

Yahaya and Osemene, (2011) have come up with the concept of promoting micro-banking system in the society as it helps in developing a mechanism to access and support the small level entrepreneurs. It has also highlighted the importance of governing bodies in setting up a system for offering guidance to the micro level businessmen to grow their business. It is clearly evident from the research that the microfinance industry is majorly responsible for improving the conditions of poverty-stricken community of the society through affordable financing, fund mobilisation and opportunities of employment generation.

Okpara (2010) has recognised the influence of certain factors in causing poverty and also acknowledged the role of micro-financial support in controlling these factors. It has measured the impact of microcredit facilities in two stages. Initially it observes a marginal increment in the poverty level with a reducing rate but later on it has shown a steep decline due to constant growth in credit services offered by microfinance segment. This impact clearly signifies the need to establish a system for enhancing the expansion of microfinance industry in the economy.

Anono (2009) have appreciated the role of microfinance industry in actively engaging itself with the underprivileged sections of the society. Research has greatly emphasized its contribution in poverty alleviation. This study has not only highlighted the financial contribution of micro-banking to the entrepreneurs but also focussed on the concept of offering non-financial support and guidance to them in order to enhance their growth opportunities.

**Sample Unit**

Bengaluru Rural District

**Sample size**

300 respondents/beneficiaries of Micro Finance Institutions.

**DATA ANALYSIS AND INDTERPRETATIONS****Table showing the Reasons behind the use of micro finance products**

	Reasons	SDA	DA	N	A	SA	Total
1	Agriculture	38	66	29	38	127	300
		13%	22%	10%	13%	42%	100
2	Animal Husbandry	37	64	28	37	121	300
		12%	21%	9%	12%	40%	100
3	Income generating activities	38	67	29	38	127	300
		13%	22%	10%	13%	42%	100
4	Asset Building	37	65	28	37	122	300
		12%	22%	9%	12%	41%	100
5	Starting own business and its development	38	64	28	48	122	300
		13%	21%	9%	16%	41%	100
6	Consumption or Household expenditure	37	65	28	37	123	300
		12%	22%	9%	12%	41%	100
7	Education to children	138	0	65	33	45	300
		46%	0	22%	11%	15%	100

	Reasons	SDA	DA	N	A	SA	Total
8	Wealth creation purpose	133	0	65	33	45	300
		44%	0	22%	11%	15%	100
9	To acquire land or assets	138	0	66	45	33	300
		46%	0	22%	15%	11%	100
10	Medical expenses	131	0	64	45	33	300
		44%	0	21%	15%	11%	100
11	Emergencies	136	0	66	33	46	300
		45%	0	22%	11%	15%	100
12	Social Security	131	0	63	44	33	300
		44%	0	21%	15%	11%	100
13	Farm Mechanization	137	0	67	46	34	300
		46%	0	22%	15%	11%	100

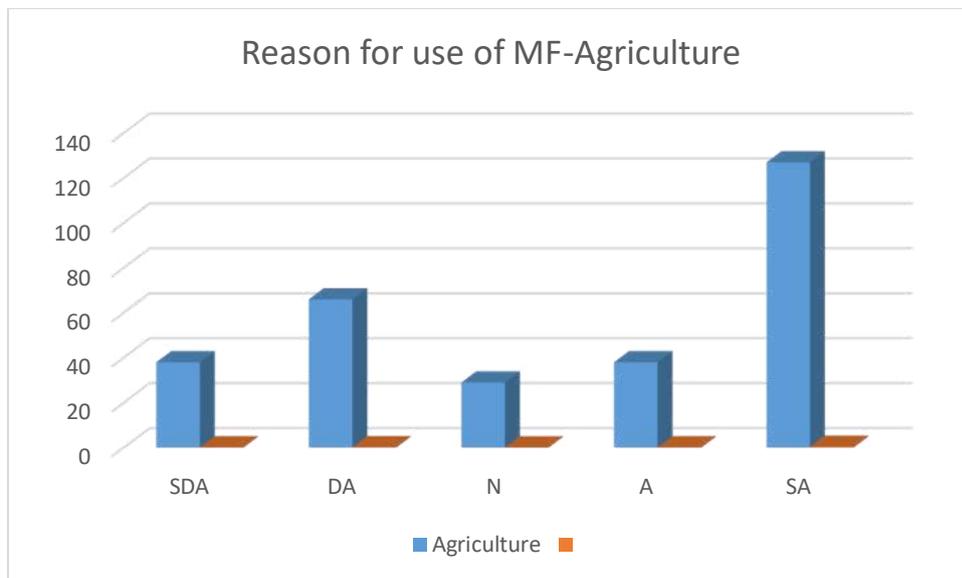
**\*SDA-Strongly Disagree**

**\*DA-Disagree**

**\*Neutral**

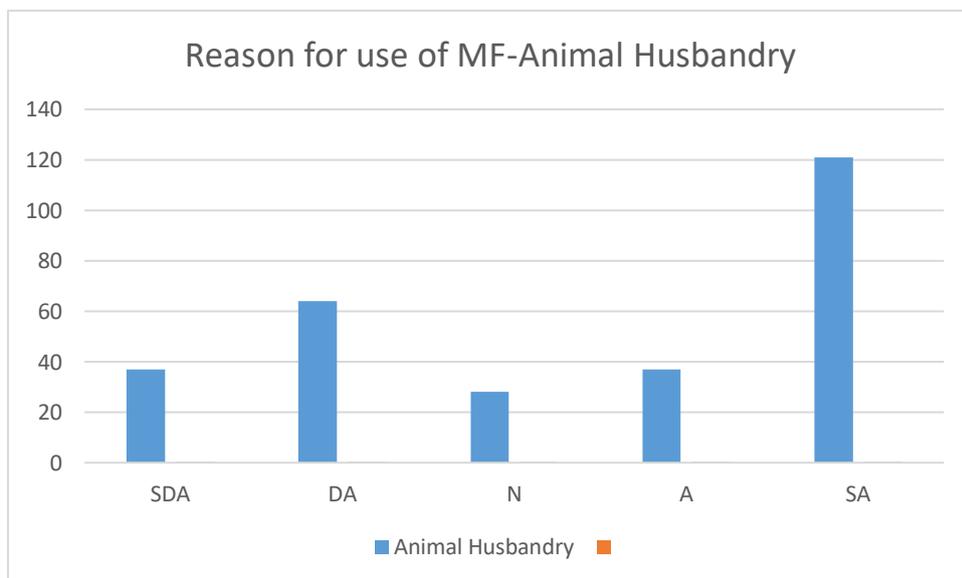
**\*A-Agree**

**\*SA-Strongly Agree**



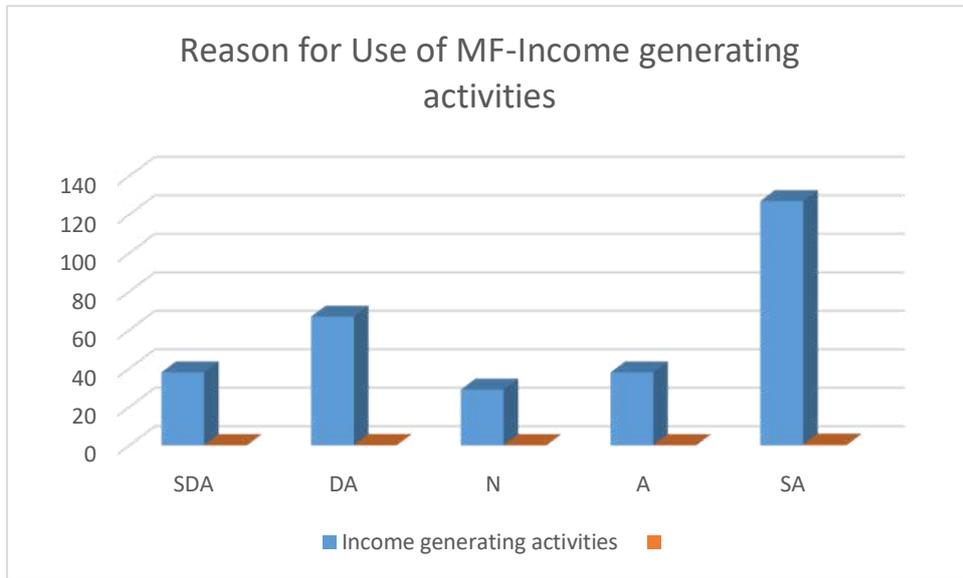
**Interpretation:**

According to above graph of 300 respondents, the reasons for use of microfinance products for Agriculture purpose is -127(44%).



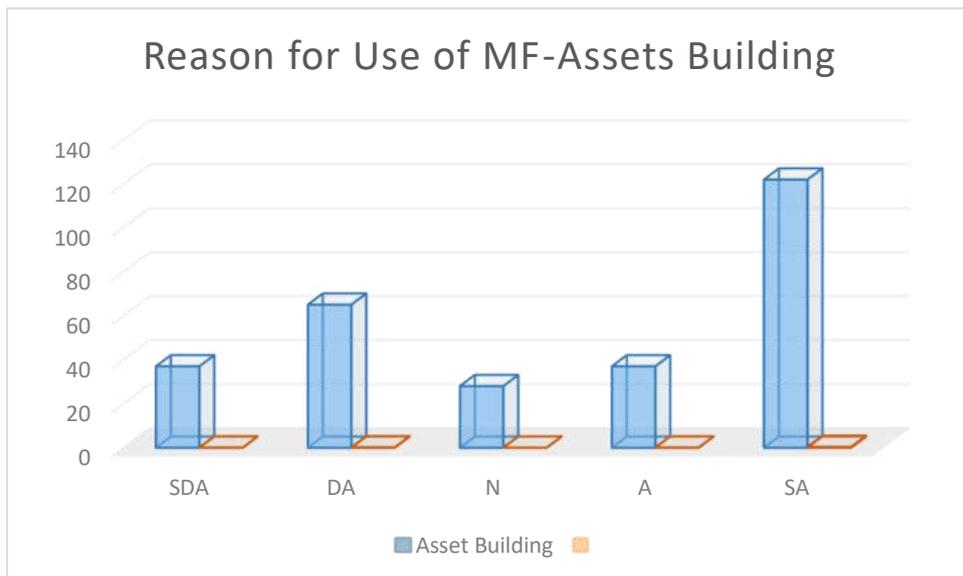
**Interpretation:**

According to above graph of 300 respondents, the reasons for use of microfinance products for Animal Husbandry purpose is -121(40%).

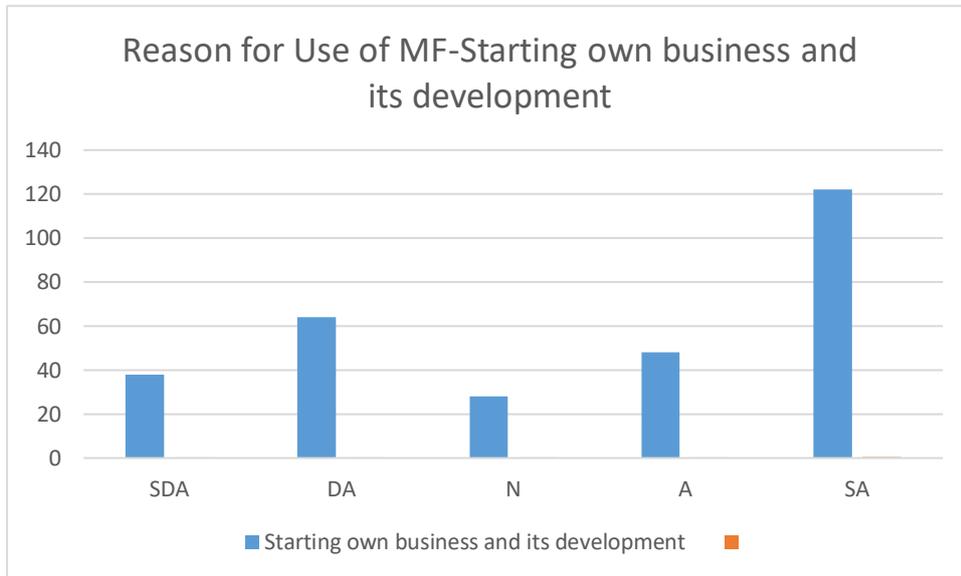


**Interpretation:**

According to above graph of 300 respondents, the reasons for use of microfinance products for Income Generating Activities purpose is -127(42%).

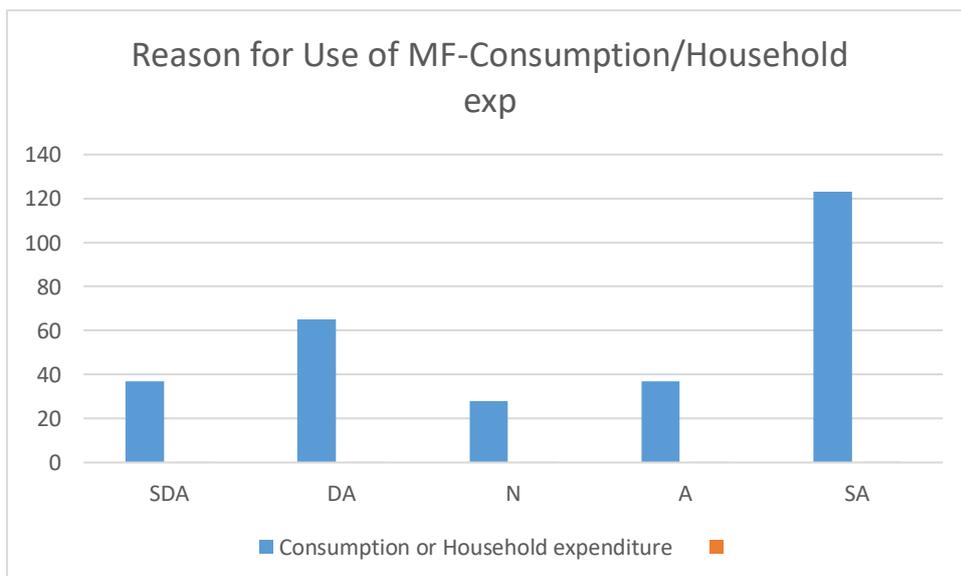


**Interpretation:** According to above graph of 300 respondents, the reasons for use of microfinance products for Asset Building purpose is -122(41%).



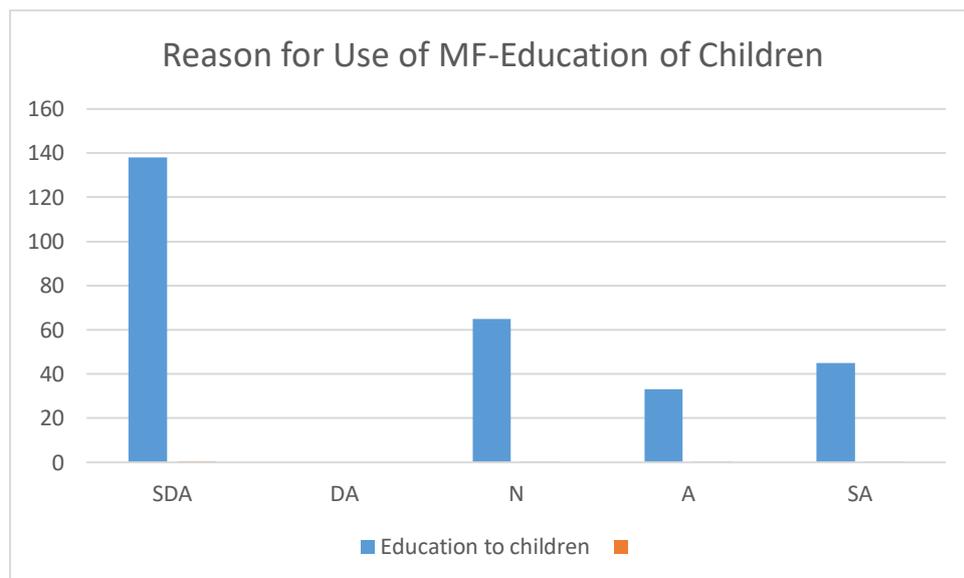
**Interpretation:**

According to above graph of 300 respondents, the reasons for use of microfinance products for starting own business and its development purpose is -122(41%).



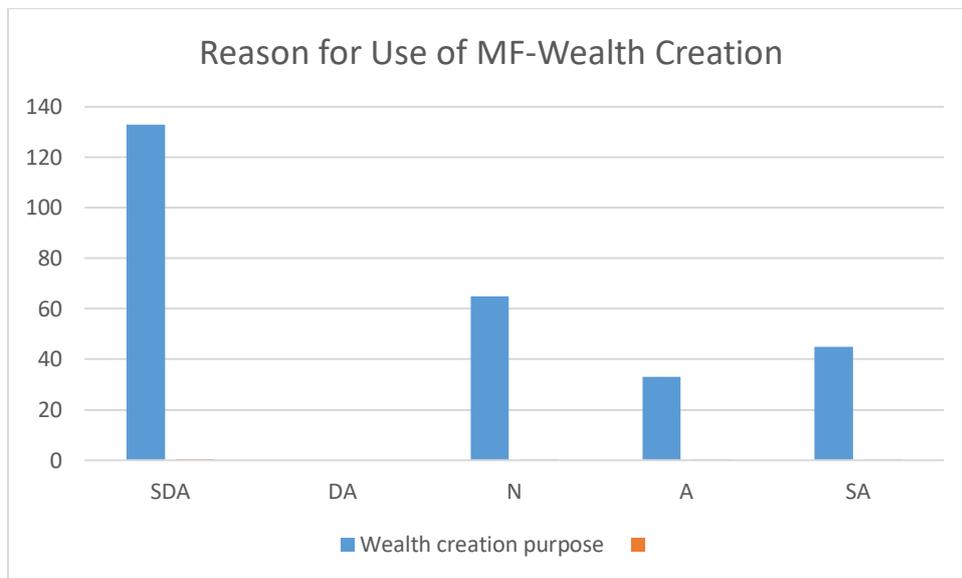
Interpretation:

According to above graph of 300 respondents, the reasons for use of microfinance products for Consumption/House hold expenditure purpose is -123(41%).



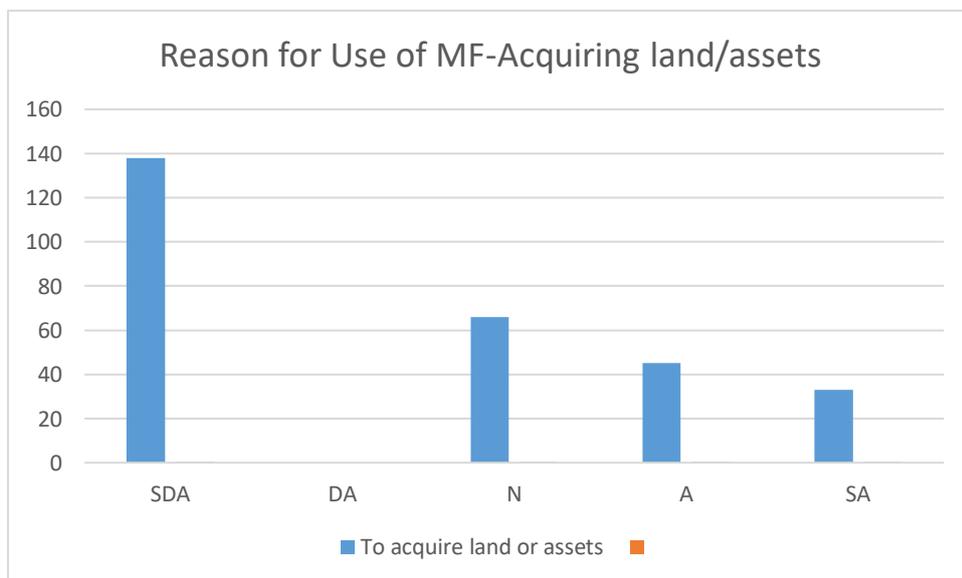
Interpretation:

According to above graph of 300 respondents, the reasons for use of microfinance products for Education of Children purpose is 15% .



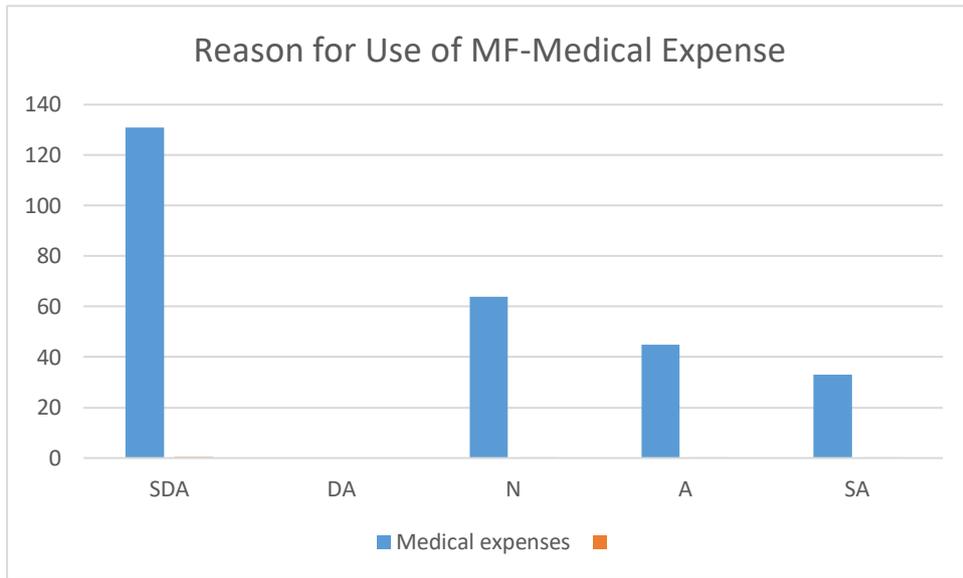
Interpretation:

According to above graph of 300 respondents, the reasons for use of microfinance products not for Wealth Creation Purpose is 133(44%).



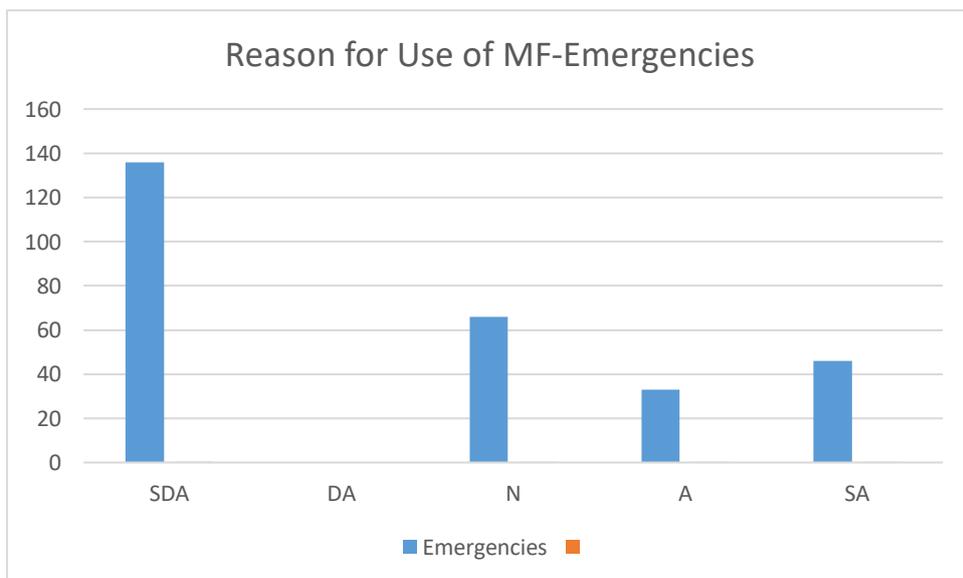
Interpretation:

According to above graph of 300 respondents, the reasons for use of microfinance products not for Acquiring land or assets Purpose is 138(46%).



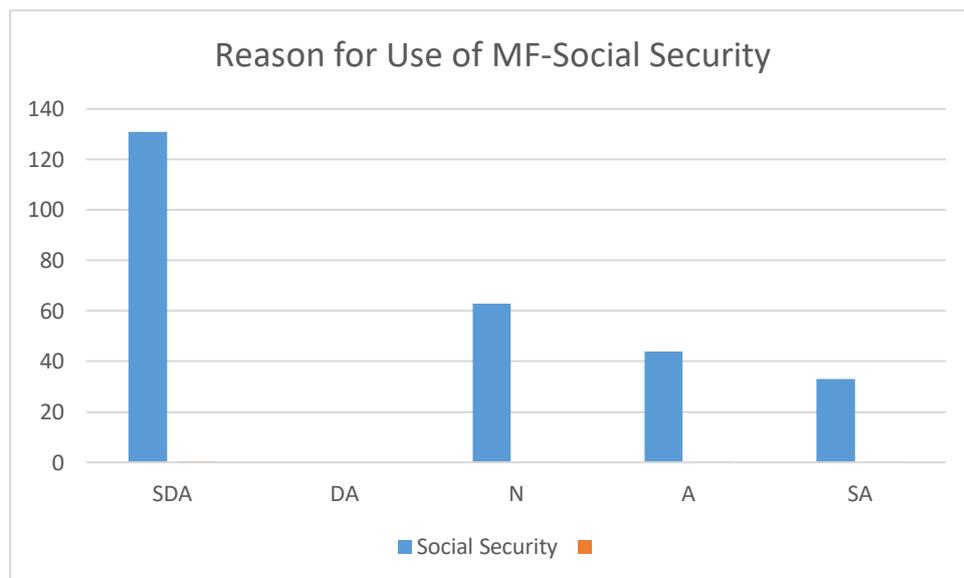
Interpretation:

According to above graph of 300 respondents, the reasons for use of microfinance products not for Medical expenses Purpose is 131(44%).



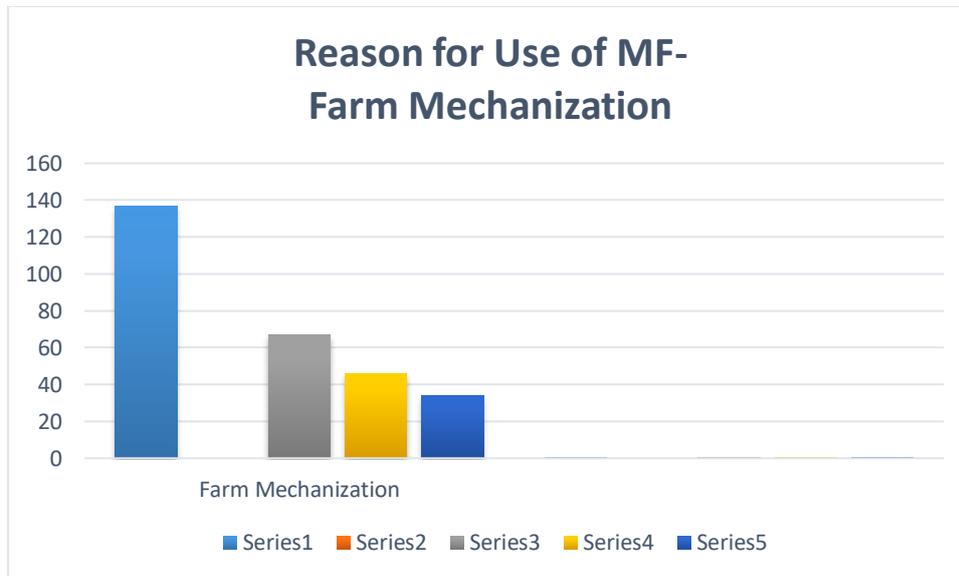
Interpretation:

According to above graph of 300 respondents, the reasons for use of microfinance products for Emergencies Purpose is 46(15%).



Interpretation:

According to above graph of 300 respondents, the reasons for use of microfinance products for Social Security Purpose is 33(11%).



#### Interpretation:

According to above graph of 300 respondents, the reasons for use of microfinance products not for the Farm Mechanization Purpose is 137(46%).

#### Findings/Observations

- 137 respondents, or 46%, support the use of farm mechanisation.
- 33 (11%) of the respondents attest to the Social Security purpose.
- 46 (15% of the responders) attest to the emergency purpose.
- 131 respondents (44%) testify for medical bills as their reason for responding.
- 138 respondents, or 46%, support buying property or other assets for personal gain.
- 133 respondents, or 44%, support the goal of wealth creation.
- 15% of respondents support the goal of educating children.
- The number of respondents who attest to spending for consumption or housing is 123 (41%).

- The number of respondents who attest to the use of income-generating activities is 127 (42%).
- 121 (40%) of the responders said they are doing it for animal husbandry purposes.
- The number of respondents who attest to the use of agriculture is 127 (44%).
- There are -123 (41%) respondents who attest to spending for consumption or housing.
- 127 respondents (42%) attest to the respondents' use of income-generating activities.
- 121 respondents, or 40%, are willing to attest to the use of animals in animal husbandry.
- 127 (44%) of the respondents attest to the use of agriculture.

## Conclusion

The primary conclusion of this study is that respondents have expressed the least interest in Social Security, crises, and children's education. The challenge is to find a degree of flexibility in the credit instrument that would allow it to serve the diverse credit needs of low-income borrowers without creating an unreasonable load on the lenders to supervise its end-use.

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## Mediating the COVID-19 Pandemic through Positive Psychology

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### ABSTRACT

In the past two years, the world has witnessed the gravest pandemic probably the present generation would ever experience. The numbers quoted about the exigencies have time and again been contested for being misguiding the humanity at large. The damage caused is multidimensional. One such area is the mode of livelihood which was deeply impacted. It has indeed exhausted quantum of psychological capital of people effected. This study aimed to explore the mediating role of optimism and hope in the relationship between coronavirus stress and those who lost their jobs during the pandemic. The sample of the study consist of people from the working age group. Qualitative method of research is used. The findings emphasize that hope and optimism are potential sources of explanation for how coronavirus stress is associated with subjective well-being.

**Keywords:** *Mediating, COVID-19, Pandemic, Positive Psychology*

### Positive psychology

Positive psychology is comparatively a new field of psychology. It has been set up as the scientific study of positive functioning and thriving on personal, social, cultural and universal levels of life. Positive psychology was presented by Seligman and Csikszentmihályi (2000) as “a science on best qualities of life”. Since its foundation, it demonstrated fruitful in making modifications in psychology and drawing consideration of psychologists from sufferings and other negative perspectives of life to endeavoring towards better understanding of well-being and building on the finest human qualities that make our life worth living.

One curious thing to take note is that the targets of western positive psychology are comparable to some extent to Indian psychology, which has its roots in Indian philosophical and spiritual literature. Positive psychology and Indian psychology have similar concerns about human life’s ultimate purpose. Rao has recommended a potential proposal in 2014, claiming that Indian psychology might give a noteworthy and compelling meta-theoretical framework for sustaining positive psychological aims.

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### Hope

Hope, as a construct, can be perceived as a way into a more joyful future. Assuming that one loses the key, the entryway stays shut. Assuming an individual loses hope, the person remains secured in difficulty and vulnerability. In psychology, hope has been perceived as a multidimensional concept. Dufault and Martocchio (1985) identified six elements of hope which are - affective, cognitive, behavioral (psychological, physical, social, and spiritual), affiliative (hope in relationships), temporal (drawn from the past, the present, and the future), and contextual (initiated within a given context).

The difference between hope and other related categories such as optimism, self-efficacy, self-determination, resilience, and others has moreover been clarified by positive psychology research investigate. In reasoning, philosophy, human studies, behavioral sciences, and other social sciences, hope is characterized as a positive desire and want for something to happen within the future.

Researches differentiate between two fundamental concepts of hope: dispositional hope (individualistic, cognitive point of view) and perceived hope (supernatural, spiritual perspective). Snyder (2000), who is considered to be the creator of the cognitive theory of hope gave three components of hope: goals, pathways (plans to realize the goals), and agency (goal directed energy). He characterized dispositional hope as ‘the figure of perceived capacities to supply routes to desired goals, nearby the perceived motivation to utilize those routes. Another concept of Perceived Hope was given by Krafft in the year 2014, on the other hand is relatively a broader concept, i.e., feeling hopeful amid a deeper sense, having a fundamental trust in positive results, especially in troublesome life circumstances which can't be directly controlled.

### Optimism

Winston Churchill once said, "A pessimist sees the issues in each opportunity; an optimist sees the chance in every difficulty". According to various researches on Optimism on the normal, citizenry are wired to be more idealistic than not. To various psychologists, optimism reflects the notion that the results of occasions or encounters will usually be positive. Others contend that optimism is more an explanatory style. According to this notion it dwells inside the way individuals clarify the causes of occasions. Optimists are likely to discover the causes of failure or negative experiences as brief rather than fixed, definite rather than universal, and external instead of internal. Such an outlook empowers optimists to more effectively see the probability of change.

Optimism doesn't mean engaging in aspiring or imaginary thinking. It's how you observe the planet that provides more agency to the optimist as being a least of somewhat responsible when life goes well. These people have more advantageous viewpoints and have an inclination to degree longer than their more pessimistic partners. They are moreover less helpless to the negative impacts of illness, fatigue, and depression. Optimism though is a positive construct but an unlikely belief that a person's future is going to be filled with only positive events can lead them to require pointless dangers, especially with their wellbeing and finances.

### Optimism, Pessimism, and Realism

Some optimists attribute generous thought processes to others and interpret situations within the absolute best light; others just disassociate their inner disposition from outside circumstance. Being optimistic isn't essentially always the “best” strategy. Research appears

## Mediating the COVID-19 Pandemic through Positive Psychology

that hardening a sunny disposition with a little dose of realism, or perhaps pessimism, can be the only much appreciated to construct resilience and accomplish one's goals.

### **Covid 19**

The COVID-19 crisis has had, and continues to possess, a significant impact on individuals throughout the planet. As a result of the pandemic, individuals face continuous changes in various aspects of their lives, like health, employment, and family life. This accumulation of multiple sources of stress could increase feelings of psychological distress and reduce feelings of wellbeing for several individuals. Wellbeing is often defined because the evaluation, either positive or negative, of one's life and quality of functioning in life is dependent on our subjective evaluation. This definition is in accordance with second wave of positive psychology, which posits that wellbeing should be understood and should be supported by the situational context during which individuals may experience a mixture of positive (e.g., positive affect) and negative (e.g., distress) wellbeing. Further, wellbeing can include both hedonic (e.g., low levels of stress) and eudemonic (e.g., meaning in life) aspects. As a crucial, yet still understudied component of wellbeing, meaning in life denotes to "the degree to which people comprehend, include up of, or see importance in their lives, in the midst of the degree to which they see themselves to have a reason, mission, or overarching point in life".

### ***The Stress of Losing a Job***

Whether we've been laid off, downsized, forced to require early retirement, or seen contract work dry up, losing employment is one among life's most stressful experiences. Apart from the apparent financial anguish it can cause, the strain of losing employment can also take a crucial toll on the mood, relationships, and overall mental and emotional health.

Our jobs are often quite just the way we make a living. They influence how we see ourselves, also because the way others see us. Although you didn't love your job, it likely provided you a social outlet and gave a structure, purpose, and about to your life. Suddenly finding yourself out of labor can leave you feeling hurt, angry, or depressed. You'd possibly be questioning your identity, grieving all that you've lost, or feeling anxious about what the longer term holds.

Depending on the circumstances of your unemployment, you'll feel deceived by your boss, feeble over the heading of your life, or fault yourself for variety of seen deficiency or botch. The strain and stress can feel overpowering. But notwithstanding of how distressing things seem immediately, there's trust. With time and then the proper coping techniques, you'll come to terms with these difficulties, ease your push and uneasiness, and progress in conjunction together with your working life.

### **CASE STUDIES OF THE PARTICIPANTS**

Mr. B was temporary employee in a reputed organization. He was very much satisfied with his job. During the pandemic, his company started getting rid of the workers who were temporary and were paying only to the permanent staff as there was less production thanks to which providing salaries to any or all the workers was becoming difficult. Mr. X also had to allow resignation from the corporate. Due to these reasons, now Mr. X was very much stressed out as he was the only bread earner in his house. This happened during the primary wave of the pandemic where it had been becoming difficult for people to satisfy their basic needs. While, Mr. X didn't lose hope and was optimistic towards his future. He overcame many challenges after losing the duty, because it was becoming difficult for him to search

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out employment during the pandemic as no company was hiring new employees. Recently, he got a permanent job in an another reputed company where he's much satisfied both with his income and also the organizational environment.

Mrs. T was a tuition teacher and accustomed to give classes to the scholar students at her home only. Her life was excellent. She was earning a decent amount and was taking care of all the members within the family as her husband was unemployed. Because of the effect of pandemic, parents were now more concerned about the lives of their children and weren't allowing them to go out from their respective homes. Also, now students started taking classes from online tutors thanks to which the duty of Mrs. T was now in danger. Only few students were taking classes from her but that too was for a short time only. Slowly and gradually not a single child came to her tuition center leading to financial problems in her family. Now over this case, she even lost her husband to Covid. Even after all these hardships she didn't lose hope as she made herself clear that she must work flat out so as to take care of her children. Mrs. T is now trying to adapt to the current online means of learning and is much confident that someday she is going to overcome all her problems and can lead an honest and far better life.

Mrs. L was a primary teacher at a reputed school from 5 years. Her son was also studying within the same school. Her husband was working in a very reputed organization. The school principal was replaced who as per Mrs. L was very cruel. She wasn't providing proper facilities and also the salaries to the teachers. Mrs. L and lots of teachers were dissatisfied with the principal but thought that complaining against the principal isn't very easy so they decided to stay quiet. Due to the pandemic, she lost her husband and now it had become very difficult to keep up her house and also to pay the varsity fees of her child. She was asked to convey resignation when she gave the letter of fee concession of her child. This worsened matters as now she was unemployed and also her child was given TC from the varsity. Mrs. L therefore decided to try and do small chores like tailoring, put her child in another school. She attended many interviews in various schools, but was rejected as schools weren't hiring teachers anymore, thanks to the pandemic. Therefore, recently she started a web business of selling clothes. Initially, it was absolutely becoming difficult as she wasn't much equipped with technology, but slowly and gradually, she got adapted thereto. Even when she was unemployed, she didn't lose hope and was optimistic towards her future.

Ms. M was the owner of a reputed event management company. Many people trusted her and were very much impressed by the work. Their earnings were totally dependent on big events. Whenever she signed a new contract, she along with her colleagues used to purchase all the materials related to that event 2-3 months prior. As the pandemic situation rose, people started to cancel their contracts with the company as lockdowns were announced and people gatherings were minimized. Many companies were providing services online. The company of Ms. M was now facing losses and their stocks were also getting damaged. Because of social distancing rules, they were facing financial problems. Due to this, she had to take out many employees from her company as providing them salary was becoming difficult. Also, she had to reduce the salary of their permanent staff. But even after this she didn't lose hope and is continuing her business because of her interest in this field. Ms. M is very much optimistic that one day everything will be normal again.

Mr. P was an employee in a reputed organization. Due to the pandemic situation, he along with many employees was taken out from the company. Initially he suffered a lot as he was the only bread earner in the family. So he decided to start a cookie business online which

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turned into a success but also faced many problems, in which adapting to the technology was the very first one. Even after many challenges he didn't lose hope as he was doing something in which he was very much interested and was satisfied with his work. Now his business is running in a good pace. He is earning a good amount of money and now once again his life is normal. He is also very much optimistic towards his future.

Mr. D was a private taxi owner who had many clients in the city. His family was living in their native village only. He used to send money to his family as he was the only bread earner. As the pandemic situation rose, and lockdowns were announced, only few people were getting out of their homes. This affected his job and his earnings. It became difficult for him to tell this to his family as he doesn't want his family to worry. Mr. D had to leave his rented house to cut down costs in order to send money back home. Also, he could not leave the city and go back to his village as there was no work for him there. For much time, he lived under the shed of a factory and used to borrow money from his friends to send to his family. Even after facing many difficulties, he didn't lose hope and was optimistic towards his future. Now he is working in a factory as wage laborer and is working hard to pay off the debts of his friends and also to send money back to his family.

Mr. G was a salesperson who used to sell products door to door. Due to his extrovert personality and his skills, he used to please many clients. But due to the on course of the pandemic, he was told to avoid visiting outdoors and to do online sales, i.e., through phone calls. This created the problem, as from now it was becoming difficult to Mr. G to please the clients as he knew that only verbal communication will do nothing to sell a product, body language of the employee matters much more than that. It was becoming difficult for him to now maintain the job. He was told to leave the organization later, and from now the problems rose. He suffered very much in order to earn a job as he was the only bread earner in his family. But after much suffering, he got a desk job in a sales company only. Mr. G had told that during his bad time, he didn't lose hope and was very much optimistic that one day he'll get a job in which he is interested.

Mr. R was an aged employee in a reputed organization. He was committed emotionally towards his job and decided to continue the job even after the age of retirement. As the pandemic situation rose, the production of the company decreased, which resulted in the company to face losses. Therefore, the organization started to taking out the temporary employees first, in which many people became jobless. After that, employees who were much aged were also asked to give resignation in which Mr. R was one. This disappointed him as leaving an organization which he served in for many years, was very difficult. However, this didn't make Mr. R to lose hope and optimism from the future. For now, he is not working in any company.

Ms. S was a small road side food vendor. Her family consists of her husband, son (eldest) and two daughters. She is the major bread earner of the family. Her husband works as a contract labor. She is supported in her work by her son and elder daughter. Her eatery is considered to be the best spot for people of all ages. She used to serve people according to their special requirements despite being heavy hours. Due to covid 19 induced lockdown and resultant precautions her eatery was shut down. Suddenly all her business came to halt. She had to dispose off all the preparations, vegetables and other edibles she had within one week. Her husband was also not getting work as he was a contractual labor. For 2.5 months all her business was shut. Yet with her love for cooking and confidence in herself she was never found to be dejected. She was optimistic that the people who love her food will

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definitely reach her. She started making food in small amount in her home. People nearby her started ordering food from her. Slowly other customers also came to know about where Ms. S resides and started ordering food from her. Ms. S made all efforts to follow all the covid protocols. She strictly instructed her customers to follow the same so that no-one gets into any trouble. This way with her belief in her abilities and being positive at grim situations she was able to get out of it.

Mr. K was working as an office attendant in a small organization. His family consists of his wife and 3 sons who are in the age group of 12-16 years. Due to pandemic he had to leave the organization. His life suddenly came to standstill. He was the sole earner of his life. But due to his resilience and positive attitude towards his life he was hopeful that he will find out a way out of this situation. Initially he resorted to online work like data entry but couldn't earn enough to sustain his family. Still, he didn't loose hope. Then he decides to open a grocery in the back side of his house. He made all the required arrangements in that particular room and started a small grocery store. God being kind his store is attracting a good number of customers even today. He is supplementing his earning by doing some online work as well. He is even planning to rent a small shop in a prime location in few months time.

### **DISCUSSION**

The most surprising result of the research was the positive responses the participants gave of being hopeful and optimistic towards their future. These responses, however, could be attributed to their alternative job opportunities, having high self-esteem and self- efficacy. The less surprising result of the research was the negative responses the participants gave of having high level of stress and anxiety due to job loss.

There can be a number of explanations as to why participants gave negative responses of job loss. One of this could be because of the responsibilities they manage. There were many participants who were the only bread earner in their respective families. In that condition, the job was the only way of survival, and no job meant no money.

Another possible explanation might be having no other job alternative. As many people were asked to resign from the organizations due to lack of production or having debts. No other companies were hiring them as the economy was getting weaker due to the pandemic.

The overall results of this study shows that even with job losses due to the pandemic, people have not lost hope and are optimistic about their future. They have a positive attitude that makes many of them to work hard. In summary, optimism and hope are important adaptive phenomena that promote happiness, quality of life, and psychological adjustment in the general population and in specific groups, such as those living with mental health problems. People who are optimistic and hopeful are better adapted to adversity, are less likely to develop mental disorders and exhibit healthier behaviors and related to more life satisfaction.

### **CONCLUSION**

There can be no doubt that hope and optimism are important adaptive phenomenon that foster wellbeing, quality of life, and psychological adjustment in general population. The purpose of this research was to identify hope and optimism among individuals who lost their job. Recent research on job loss incidents has provided a more complete understanding of hopeful and optimistic people who lost their jobs due to Covid-19. Based on the analysis

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conveyed, it can be concluded that more than 50% of the participants, even though were stressed out due to their job loss, were very much hopeful and optimistic towards their upcoming future.

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### **Conflict of Interest**

The author(s) declared no conflict of interest.

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## Leadership: An In-depth Study of the Attributes of an Effective Leader

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### ABSTRACT

This research paper examines the various leadership characteristics valued and practiced by employees in various workplace settings. The aim of the study is to determine whether certain common characteristics are shared by successful leaders. In depth analysis of 15 case studies were done and data was gathered from different individuals by conducting unstructured interview. According to the research, certain characteristics like honesty, integrity, transparent communication, amiability, strong decision-making abilities, emotional control and ethics are considered as essential for a leader to succeed in the workplace. The case study method of research was used as it allows for a thorough investigation of common characteristics that makes up a good leader. This method facilitates a deeper comprehension of leadership phenomena while contextualizing it in a larger organizational context. The findings of the present study will be instrumental in hiring of the employees in key leadership positions. It will further aid in developing defined leadership characteristics by people tasked to work in higher hierarchies to foster productive workplace culture.

**Keywords:** Leadership, Decision Making, Communication, Case Study, Productive Workplace

President Ronald Reagan puts it very simply for all of us that the greatest leader is not necessarily the one who does greatest things. He says that a leader is one who gets the people to do greatest things. Koontz and O'Donnell define leadership as a mechanism of positively influencing people so that they will work willingly towards the achievement of group goals. In the words of Chester I. Bernard, Leadership is a specific quality of the behavior of an individual whereby they guide people in their activities in an organized manner. It is not a trait delegated only for professionals working at the higher hierarchy. Leadership is a quality that each one of us need to possess in order to be successful both in our personal and professional life. It includes components like effective decision-making skills, assertiveness, optimism, empathy, interpersonal intelligence and the list continues. Another important quality of a leader is that she motivates individual to take a goal directed action. In the process of motivating her team he needs to know their strength and weaknesses, their preferences, emotional turmoil if any etc. It therefore means that a leader is not a person top in hierarchy rather somebody within the team who knows her team tip to

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toe. There are many definitions of leadership, but they all generally agree on the idea that exceptional leaders have the ability to make wise, visionary decisions and persuade others to follow them. He must handle his subordinates' personal issues with great care and consideration. Therefore, treating people with compassion is crucial for creating a friendly environment. This promotes better employee communication and interpersonal relationships. In nutshell we can say that employees should receive humane treatment from the leader. These aspects in culmination make an individual an effective leader.

Even if there is no direct correlation between leadership and profit, individuals who are perceived as good leaders in corporate settings are the ones who improve their company's bottom line. Therefore, any definition of leadership must take into account the relationship between the key skills of a leader and performance in business. For best results, organizations need strong leadership. He inspires the workers with monetary and non-monetary rewards and procures the work from the subordinates as a result. By securing complete cooperation, a leader can boost morale and enable employees to work as effectively as possible toward achieving their objectives. As we all know, having leadership qualities can be learned as well as inherited. Organizational leadership involves both professional strategies and aspects of human psychology. Organizational leadership places a strong emphasis on the development of leadership competencies that are applicable across all organizations. It refers to a person's capacity to endure challenging times in their field while continuing to advance. The group's members should be capable of being controlled by the leader. A good leader in an organization shouldn't be arrogant. He should act responsibly, provide direction for those who report to him so they can successfully complete organizational goals, and lead by example. He should undoubtedly have confidence. He should be empathetic and should understand the need of the group members. An organizational leader should control the actions of the group in addition to leading people on an individual basis.

Organizational leaders are more likely to succeed if they are highly ambitious, high on energy, driven to lead, intelligent, have thorough job knowledge, are honest and flexible. People who study organizational leadership acquire the abilities and skills necessary for teamwork, effective communication, conflict resolution, and collective problem solving. Building employee morale, ensuring effective business operations, assisting employees in developing professionally and positively advancing the mission of the organization are all tasks performed by organizational leaders. An effective leader will focus on creating coordination between individual goals and organizational objectives. The main goal of a leader should be to properly and effectively coordinate in order to achieve this synchronization. Through their leadership qualities, a leader aids in balancing or integrating employees' individual goals with those of the company. He works to coordinate people's efforts toward common goal in order to accomplish goals. This is only possible if he has the ability to persuade people to cooperate willingly and feel the need to achieve the goals.

A moral leader won't use his followers as a conduit for pursuing his own objectives. He ought to respect their sentiments, choices, and principles. Respecting the followers entails giving them your full attention, showing compassion for them, and being open to hearing different points of view. Simply put, it means treating followers in ways that respect their values and worldview. He values other people. An ethical leader should prioritize the needs of his followers over his own. He must always act in a way that benefits his followers. He helps communities grow. An ethical leader strives to accomplish the goals that are appropriate for both of their purposes while also taking into account the purposes of his

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followers. He pays attention to the followers' motivations. He is just and fair. Wherever there is differential treatment of some followers, the foundation for that differential treatment must be just, transparent, and morally sound. He is trustworthy and loyal. They consistently gain followers' respect. No matter how important or damaging a fact may be, an honest leader always presents the facts and circumstances honestly and completely.

### ***Types of Leadership***

**Autocratic leadership style-** A leader has total control and authority over their team members or employees when using this leadership style. Even if their opinions are in the best interests of the team or the organization, they cannot be presented. They are not allowed to critique or challenge the leader's methods. The leader completes the tasks by themselves. Under the direction of the leader, this style has the advantage of promoting quick decision-making and increased productivity. This leadership approach has drawbacks in that it increases employee turnover and absenteeism. This leadership style only functions when the leader is at their best, the work is monotonous, unskilled, and routine, or the project is brief and risky.

**The Laissez faire leadership style-** Here, the leader has complete faith in his or her team's ability to complete the task. He does not focus on the management aspect of his work, but rather just the intellectual/rational component. The team and employees are encouraged to express their opinions and make recommendations that are best for the objectives of the organization. This management approach only succeeds when the team members are intelligent, skilled, devoted, and experienced.

**Democratic /Participative leadership style-** Although the leader has the final say in all decisions, the team members are invited and encouraged to play a significant role in the process. The leader instructs the team members on what to do and how to do it, and the team members give the leader feedback on their experiences and suggestions, if any. This leadership approach has the benefit of producing contented, motivated, and more skilled workers. It promotes creativity and results in a positive work environment. The only drawback of this leadership approach is that it takes time.

**Bureaucratic leadership-** The leaders in this situation strictly abide by the organizational guidelines. Additionally, they ensure that the team members strictly adhere to the policies and procedures. Employees are promoted based on their capacity to follow company policies.

**Transactional leadership-** it is a type of leadership in which a leader will either reward or punish the employees with respect to the task completed by them. A transactional leader will build mutual trust among the employees. In a nutshell a team under a transactional leader will feel accountable for their performance.

## **REVIEW OF LITERATURE**

Singco.K (2021) conducted a study on leadership approaches and found that majority of the respondents possessed traits like extraversion, maintaining good relationship with administration, strong inter-personal relationship etc. In addition to it, the paper concludes that there is a need for leaders to practice more discernment in dealing with personnel.

According to a recent study by Radhika Kapoor on Characteristics of effective Leadership (2020), an effective leader ought to be someone who is honest, integral, confident, committed, resilient, emotionally intelligent and has a strong sense of alignment with the

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vision and mission of the organization. The author emphasizes that in order to work in the leadership position she/he should have deep faith in oneself and have a positive orientation towards the team and the characteristics of the organization.

Transparency is considered to be an important characteristic of an effective leader (Rouss, 2020). It means that the leader should be lucid and comprehensible while giving instructions and delegating various tasks to the team members. The author mentions that ensuring transparency in the workplace will enable the leader to create openness between them and their subordinates. The study further emphasized upon the need to have time management skills and should know how to prioritize the tasks in hand.

The study by Hasan (2019) on leadership concludes that honesty and integrity are the two prime characteristics that make an effective leader. It includes components like keeping one's word, commitment, giving due respect to the various internal and external factors impacting the environment of the organization, upholding the traits of morality, ethics and treating the subordinates with respect.

According to Hogan (2019), an effective leader is one who is modest and will listen to his employees. He/He will be ready to accept their mistake and will be open to change the action plan if need arises.

A study was conducted by O.Victor (2019) conducted a study to explore the various prominent qualities of a good leader. The researcher employed a structured questionnaire on 150 respondents from different industry. Some of the key characteristics valued in the study are accessibility, neutrality, dignity, reliability, honesty and a light hearted approach towards work.

Rudolf.P (2016) conducted a study on qualities of good leader and its benefit to the organization. The study reviewed the work of various researchers in the same domain. The study concluded that a leader should be able to persuade and convince the team members to walk an extra mile in order to achieve the treasured goals of the organization.

The study by Lahoti and Sahoo (2016), found that leader's effectiveness and their educational qualification do not exhibit significant positive correlation. The paper concludes that though the literature do not confirms the relationship between education and effectiveness of the leader but higher level of education does create the strength associated with an effective leader.

The study by Hosain (2015) on the characteristics of a leader honesty, creativity, knowledge, competency, kindness and courage is considered to be important in the making of an efficient leader.

According to a study by Boerritger (2015), leadership is independent of the age of the leader. He asserts that there is no clear link between leadership outcome and age of the leader. The paper concludes that there is older leaders are neither better nor worse than the younger leaders in terms of effective leadership.

A study was conducted by Kayode.K et.al. (2014) on the relationship between decision making skills and leadership behavior using a semi-structured interview. The findings of the study reveal that both these constructs share an opaque relationship with each other in theory

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but are highly connected in practice. The paper further asserts that the most favored leadership style is participatory leadership and the preferred decision-making style is consultative decision making.

### RESEARCH METHODOLOGY

**Sample-** The sample of the present study comprise of 15 male and female professionals working in the various leadership positions in different industries of Faridabad, Haryana. All the participants had more than one years of experience in handling leadership roles. It was made sure that the participants had strong knowledge of leadership behavior and the associated skills. In order to ensure the same snowball sampling method was employed to collect the sample for this research.

#### *Inclusion Criteria*

Only private sector employees working as in any leadership position with minimum 2 years of experience were taken. In addition to it all the samples fall between the age brackets of 25-58years.

#### *Exclusion Criteria*

Government sector employees and employees working in any unorganized sector were excluded from the present study.

**Research Design-** The present study is a qualitative research wherein case study method is employed to get a depth understanding of the various characteristics that makeup a good leader. Data was collected using Interview Method. The cases were interviewed using a self-designed unstructured questionnaire. The questionnaire consisted of demographic details and open-ended questions. In order to gain in-depth knowledge, lead questions were also included in the interview. Before conducting the interview on the target sample population, 5 pilot interviews were also conducted. The research was completed in a time span of 3 months and inferences of the cases were made to decipher the common underlying characteristics.

**Data Analysis-** The collected case studies were compared to generalize the similar personality and behavioral characteristics that are considered to be essential pre-requisites to work in the various leading positions inside an organization. Each case was compared to each other and in-depth analysis of the literature review was done to validate the findings of the study.

### RESULT

#### *Case 1*

In 2016, XYZ, 42, is working as a HR professional in a leading educational institute. She has completed her MPhil from North Hill University in Shillong and has a bachelor's degree from Delhi University. She has been working for seven years. Her view is that team cohesiveness and coherence are fundamental components of leadership. A leader is someone who inspires growth in their team and followers because they believe in unity. She believes that a leader should be self-assured because if he/she lacks self-assurance, they will not be able to inspire others. A leader should also be extremely talented, knowledgeable and someone who goes above and beyond. She further emphasizes that you can always learn from someone who is more knowledgeable than you. Therefore, a leader should be someone who always goes above and beyond and this becomes a reason everyone respects and looks up to him/her. She believed that a leader should have a humble outlook, be a good listener,

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and be able to motivate his team. She holds that becoming a good leader is a process and not something that can be learned overnight. She believes that you always learn from your seniors and that you learn so many things subconsciously.

### ***Case 2***

Gautam Khattar, team leader at Reliance Digital, is 21 years old and has held the same position since 2020. He believes that leadership is a skill rather than a position or role. Its ultimate objective is to change a group's mindset so that they can accomplish their own and the organization's goals. It's a skill because it can be taught, learned, and developed over time, and a good leader needs to have good decision-making skills because he always has to make important decisions. He also needs to be a good motivator who constantly encourages his team, as well as creative in his work, strategic, and problem-solving abilities. Since they are responsible for a group of people with varying opinions and viewpoints that we must direct towards a single goal, leaders must be very level-headed and understanding. This is only possible when we communicate with them and put our egos aside.

### ***Case 3***

Mr. Manjeet, 43, has been a senior general manager of sales for a real estate firm in Gurugram for the past four years and has more than 20 years of work experience in this industry. He asserts that the most crucial quality of a working professional is leadership, which is not just about being a bossy person around others or giving orders. Since no one pays attention to you anymore unless they stand to gain something, leadership is about persuading others. Leadership is therefore about persuading others to understand that your profit and the profit of the company are directly correlated. Work hard and treat the business as though you are the owner. His company's owner is his role model because he spoke with him once and realised in those 20 minutes that he wanted to be like him at this point in his life. According to him, a good leader must be able to effectively communicate, make quick decisions, inspire others, treat the team like family, and have the common objective of maximising the company's profit. He claimed that since word of mouth is how the entire world operates, effective communication with your team is the only quality you need to manage them. To manage people your age, you must be aware that everyone has a unique way of thinking and seeing the world, but that success is ultimately what we all want. Being the youngest in his family, he was always pampered and obeyed the commands of his older siblings and family members. However, after planning a festival during his college years, he discovered how to manage people and how to get them to do what you want them to. When he started his career, he joined TATA Indicom as the team leader. This was not a very positive experience for him as there were significant communication gaps among all the team members. He was also new to everything, but as he developed and worked with so many leaders, he gradually learned all the qualities of a leader. Since he is currently employed by a renowned company as a senior general manager of sales, he has come to understand that he can be a good leader.

### ***Case 4***

Mr. AVK Raju, working as a Personal Assistant to CEO of an IT firm is 45 years old and has held the same position since 2019. He believes that a leader is the one who always takes his team to a consensus. Wherever there is a problem a leader should adjust and say I'm behind you to support you. Its ultimate objective is to change a group's mindset towards positivity so that they can accomplish their own and the organization's goals. Leadership is a skill because it can be taught, learned, and developed over time. One of the key characteristics of a good leader is the ability to take good decisions. He needs to have a

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perspective which can take his team along with him in the pursuit of organizational profit. A leader should always understand his team members in order to solve any problems. Since they are responsible for a group of people with varying opinions and viewpoints that will direct towards a single goal, leaders must be very goal oriented and understanding. This is only possible when we communicate with them and put our egos aside.

### ***Case 5***

Anita aged 42 working as a manager in a premier coaching institute and has 17 years' experience in this field. According to her Leadership is about balance. A leader is not derived from designation, command or achievements. Undoubtedly, these are the people who are winners and have gained respected levels in society and we should surely be inspired by them. However, not necessarily they are your leaders. Great leaders know how to balance acumen and analytical skills with interpersonal skills, communication and empathy. They look to the future and help make today's ideas viable. They are open minded and understand the impact their actions have on others and the impact over time. As explained by her Leaders are the people you rely on. Their thoughts are far-sighted, their decisions are firm, and their conclusions are verdicts. Whether we agree with their decisions or not, we still have to follow them. Not because of the pressure, but because we believe in their confidence more than we do in our own. The truth is that everyone is a leader in their own way. Someone who helps others do the right thing, sets direction, Inspires, respects perspective, seeks to develop, and appreciates achievement. Focus more on "we" than on "me." Go beyond your limits and surpass your abilities. As mentioned by her Leaders shape nations, communities and organizations. We need great leaders to guide us and help us make the important decisions that move the world. Indeed, the best leaders consistently possess certain basic qualities and skills, such as integrity, that can become potential blind spots in their organizations. Delegating is one of the key responsibilities of a leader, but effective delegation can be difficult. The best leaders build trust in their workplaces and teams through effective delegation of authority. Effective leadership and effective communication are also linked. Effective communication and good conversations can actually improve organizational culture. They know how to show gratitude in the workplace. "Influence" feels like a dirty word to some people. However, the ability to persuade people through logical, emotional, or concerted appeal influence tactics is a key characteristic of an inspiring and effective leader. From her point of view Leaders don't micromanage. You constantly delegate to others and make them feel empowered. There are ways to personally develop leadership qualities within you, such as identifying your own strengths and weaknesses. It's not always easy. We often have blind spots in our strengths and weaknesses. By understanding these, you can increase your potential. When choosing a mentor, I was looking for someone with leadership experience and respect. Make sure you choose mentors who give honest and constructive feedback. My mentors teach me in many different ways, like a professor who inspires me, a boss who always challenges me to do a better job, or a local business owner you are friends with. The most important thing is to choose a leader who you respect.

### ***Case 6***

Mr. Gogoi aged 55 is a mechanical engineer in research and development. He has 35 years of professional experience. He asserts that leadership definitely has nothing to really do with one's level in the organization's hierarchy or one's seniority; rather, a leader should mostly listen to and mentor his subordinates in a subtle way. In his opinion his immediate boss at work serves as his leader, while his father particularly is his real leader. He for all intents and purposes believed that a leader should always literally be able to solve problems and

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should guide his team towards a successful goal so they can all achieve it, which particularly is quite significant. According to him, a leader must really be polite, maintain order, literally be punctual, literally maintain a basically positive working relationship with the team, and basically have effective communication skills, or so they mostly thought. Delegation skills, confidence, and it took a lot of practice because he gained knowledge from dealing with numerous people and co-workers while guiding them to form the really ideal team, literally develop their self-confidence, and cultivate a leadership mindset in a subtle way.

### ***Case 7***

Bhavna, 36, is an MBA Graduate and is presently employed as a head in a cement industry. He claims that the ability to motivate and direct a group of people towards a common objective or vision constitutes leadership. Being a leader involves more than just being in a position of authority; it also involves being able to win others' respect and trust. He claims that he is her own leader! He will say her father if you ask her who he looks up to. He asserts that a leader needs to possess the following qualities: Vision, Intelligence, Decision-Making, Accountability, and Emotional Control. According to her effective leaders are able to inspire and influence their followers to succeed by having certain traits and abilities, such as communication, empathy, integrity, vision, and strategic thinking. He asserts that a good leader one who is an empathetic listener, maintains discipline and is experientially intelligent. He/he should be able to motivate others and strengthen their team.

### ***Case 8***

Mr. XYZ aged 28 years old team leader in JBL, Delhi. He has completed his Graduation and has been working for 9 years in various positions. He is married for 4 years and has a child. According to him a leader is someone who is involved in shaping as well as moulding the behavior of the group towards accomplishment of organizational goals. He emphasizes on STAR technique as the best option for any aspirant who is preparing for leadership roles. The STAR technique is defined as S stands for Situation, T for Task, A for action and R for Result. He is of the opinion that in order to be a leader one needs to train him or her in that work rigorously. This will enable oneself to work independently and with self-confidence. Therefore, whoever is expert in whatever work in one's team should be allotted the work accordingly. He himself is often seen in indulging in encouraging people and appreciating them for their minutest of achievements. In his personal life, he is always seen in indulging in positive self –talks. His colleagues report him of giving them constructive feedback and are the person of immense positivism. He believes in teaching work rather than expecting them to know it all. He is reported to take initiatives both in the personal and professional life without any hesitation. He comes out to be an active learner with immense hunger for knowledge and growth.

### ***Case 9***

Mrs. Sudheera Ranjan aged 50 is working as a Senior Manager HR in a steel manufacturing industry in Faridabad, Haryana. She has been working in various hierarchies as an HR Professional for more than 25 years. She is in her current position for 5 years and is awaiting a promotion soon. She appears to be a strong and sinister personality. According to her being a wife, mother and a working professional is though is a difficult juggle to play but is worth playing. In her opinion, a person's childhood experiences shape his or her adult personality. She being the daughter of army personnel and being the eldest of the three children had to face a lot of difficult situations. Frequent changes in the posting were a major challenge for their mother because he had to leave her job as a school teacher. All the three siblings also had to adjust to a new locality, new school, cultural differences, loss of

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friends etc. which took a huge toll on their emotional wellbeing. Mrs. Sudheera was a very ambitious person right from her childhood hence was determined to not to get affected and continued her studies well. Her resilient behaviour landed her up in a very prestigious University in Madras where again he had to face cultural shock. In this entire tussle he developed a lot of skills that has made her an efficient leader. Right from guiding and raising her siblings, finding a place for her in different schools, being sensitive and active towards the various social evils in the society, becoming the college president to now working as a Senior Manager she has developed a lot of important skills that proves he is a leader not just by birth but also by sincere hard work. According to her, to live and work as a leader one should be assertive, open to new ideas and opinions, self-confident and should have the ability to bind together the team members to work towards the organizational goal. An important mantra to be a leader is to understand the need of the team member and give it an equal priority as organizational goal.

### ***Case 10***

Mr. Karan Sharma aged 46 is working as Training and Development Manager in an IT firm in Gurgaon. His wife is a homemaker and has a 14 years old son. He has been working in this field for more than 20 years. He comes out to be a highly assertive person with an optimistic outlook towards life. In the time of crisis, he has the potential to remain calm and chalk out a way for all. According to him, a leader will exhibit the traits of being a leader not just in an organizational setup but in every facets of life. In his interview he said that a common perception prevails among people that a leader is one who has to deal with challenges. Rather according to him a person who paves way for oneself and for others out of a challenging situation is an actual leader. He emphasizes that one needs to be democratic in order to be accepted as a leader in an organizational setup.

### ***Case 11***

Mr. XYZ aged 28 years old team leader in JBL, Delhi. He has completed his Graduation and has been working for around 9 years in various positions. He is married for 4 years and has a child. According to Mr. XYZ a leader is someone who is involved in shaping as well as moulding the behavior of the group towards accomplishment of organizational goals. He emphasizes on STAR technique as the best option for any aspirant who is preparing for leadership roles. The STAR technique is defined as S stands for Situation, T for Task, A for action and R for Result. He is of the opinion that in order to be a leader one needs to train him or her in that work rigorously. This will enable oneself to work independently and with self-confidence. Therefore, the tasks should be divided after analyzing the strengths and weakness of the team members. His friends and family reports that he is often seen in indulging in encouraging people and appreciating them for their minutest of achievements. In his personal life, he practices certain self-help techniques like positive self –talks and self-affirmations. He believes in teaching work rather than expecting them to know it all and will always give constructive feedback. He is reported to take initiatives both in the personal and professional life without any hesitation. He comes out to be an active learner with immense hunger for knowledge and growth. From his case study we can conclude that he is a true leader with prominent leadership traits like Optimism, self-confidence and compassion for others. He is lives in the spirit that development of an individual is dependent upon the collective development of the entire team.

### ***Case 12***

Mr. ABC is a 52 years old DGM, working in a manufacturing industry in Faridabad. He is married and is a father of two children. He has been working in managerial and leadership

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post of more than 16 years. He is reported to be a very honest, straight-forward and compassionate individual with wide area of experience. According to him, a true leader is one who has a deep understanding of the nature and requirement of the work. In addition to it he/he should be careful of few things like employee's readiness to do the job, their emotional wellbeing within the organization, sensitivity towards their personal juggles (without hampering the professional commitments) and should be people centric. He has high degree of concern regarding maintaining work motivation of the employees and giving them adequate reasons to ensure job satisfaction in their workplace. He asserts that a leader needs to be a good and active listener. If one cannot understand the thought process of their fellow mates they will not be able to bring them into consensus.

### ***Case 13***

Mr. ABC is working as a finance manager in a leading manufacturing firm in Faridabad. He has been working in various industries at different levels for around 15 years. He is married and has two daughters. He is also very socially active and works enthusiastically in the community engagement activities. He is very outgoing and cheerful person. He is known for his optimism and positive approach towards all life events. He is hardly seen lamenting on any aspects of his life. Along with these qualities he is very assertive and knows how to motivate people around him to get a task accomplished. While talking to him, we come to know that he considers leadership as a skill that each one of us possess but do not know how to channelize the same. According to him most people confuse leadership with autocracy and dominance. He says that you cannot become a leader by commanding your will on other. In order to become an accepted leader, you should know the art to understand and value the different perception of people you are working with as a team. In line with the same you should also know the ways to accommodate the personal goals of the individual employees that work as a fuel to motivate them to work towards the greater organizational goal. A good leader will also possess the ability to say no as and when needed to conducts that are far beyond the level of acceptance in a professional domain. Therefore, from his case study we can understand that empathy, extraversion, optimism and assertiveness are key traits that make you a good and effective leader.

### ***Case 14***

Mrs. Ranjana is working as Assistant Manager in a textile firm for the past 15 years. She is married and is a mother of two children. She is a business graduate and has a strong hold on her profile. While interviewing her, we got to know that he is managing a team of 15 people. She says that leadership is a skill that develops with time. As learning progresses and a human attains some sense of wisdom, the leader in her/him starts growing and maturing. According to her, leadership was an ability that he possessed right from her childhood. She has been very active in school, college, workplace and has never been a passive recipient rather an active participant. She says that a leader is someone who has an in-depth knowledge about the area of work and has the ability to transfer the same to other stakeholders involved. She/he should have an opinion and possess the courage to put forth the same as and when required. According to her, one who is open to new ideas and can spearhead change comes out to be an efficient leader. She says so because as time changes, a lot of people cling to old methods. Since everybody aspire for growth therefore change is inevitable. Any person who equips him or her with the changing environment can actually motivate and help other with the same and assure a collective growth. When one is not open for such a change they even demotivate the other and friction arises. In addition to it one must be high on professional values and commitments. Honesty should always be given priority as this the basic ethical standard that is expected from any leader. She further said

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that in her entire career, ethics have been her priority and gives credit to this philosophy for whatever success she has achieved.

### Case 15

Ms. Malik is working as a senior manager in a publishing house in Delhi and has been working for more than a decade. She is married and is a mother of a 6 year old daughter. Her husband is working as a general manager with a leading IT firm. She is an extroverted personality. Her family reports her to someone full of life right from her childhood. Along with it he is also praised for her thoughtful nature. She is extremely considerate and a god fearing person. As a leader he is managing a team of more than 15 people. According to her though accommodating them is a difficult task since they are from very different culture and backgrounds but this is what describes a leader. She says that knowledge of the discipline of psychology is very beneficial for people aspiring to be in good leadership positions. According to her, emotional intelligence is the most pivotal attribute a good leader. If one is not able to regulate one's emotions, it becomes very to bind the entire team together. In order to achieve an organizational goal, it is very important to motivate your team to work towards it in a union. In order to ensure the same, one need to give equal importance to the emotional and professional needs of your team member.

## DISCUSSION

Leadership is one of the most researched topics both in industries and academics. Literature provides us with various theories like The Great Man Theory, Contingency Theory, Behavioral Theory, Situational Theory etc. which explains the different dimensions of a leader. It is a well stated fact that leadership is a behavior so far which can be mastered with time. Extraversions, Openness to new experiences, amicability, clear vision etc. are the traits most commonly found in the literatures so far. From the cases discussed in the present study, it would not be wrong to conclude that leaders are both born and made. In the interviews concluded, it was very much evident that there are various life circumstances as well as a person's perception towards it that makes a person an efficient leader. In this paper we attempted to identify few key traits that work in combination to create a leader who has a strong ability to guide and motivate their team.

According to the present study, some of the common characteristics that make up a good leader include an innate desire as well as the ability to *motivate* his/her team. Our former president, APJ Abdul Kalam is a true example of ways a leader should motivate his followers. He was an epitome of straightforwardness, modesty and commitment to public service. He relentlessly inspired the younger generations to follow their goals in life. According to the findings of the study by Rudolf.P (2016) a leader should be able to persuade and convince the team members to walk an extra mile in order to achieve the treasured goals of the organization.

A leader should be able to *communicate* clearly the tasks and the expectation from the employees. It helps people to save themselves from experiencing role conflict. A study was conducted by Rouss(2020) wherein he asserts that transparency is an important characteristic of an effective leader. It suggests that the leader should be lucid and comprehensible while giving instructions and delegating various tasks to the team members. Communication is not only limited to clear instructions but also feedbacks. Feedbacks are the prime most force that enables a person to constantly keep him/ her motivated. The next most important characteristics in the making of a good leader is the ability to make the team feel like a family. As per McClelland's theory of work motivation, all of us have an innate

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desire to feel a sense of belongingness. All of us have the need for belongingness. When we create a comfortable environment for our employees and give them an equal say in the important matters of the organization, it strengthens their organizational commitment. This was shown by our leaders like Ashoka who is known for his tolerant and sympathetic attitude towards his people. Raja Raja Chola of the great Chola dynasty is revered for his superb administrative ability and the care he exhibited for his countrymen. This is a very important factor which decides whether the employee will walk an extra mile to get his/her job done. This further ensures a healthy achievement of the organizational goal.

A good number of our participants believe that quick and efficient *decision making* is a key characteristic of a good leader. This is evident from the research conducted by Kayode.K. et.al which concluded that there is a strong relationship between decision making styles and leadership. A good leader believes in a democratic decision making process where all the stakeholders have equal footing. A leader will be cautious enough but will not be doubtful about his/her decision. The responsibility of the leader is not only confined to making a decision rather extends even to own the consequences of the decision. In order to be a good leader one should possess both *interpersonal and intrapersonal intelligence*. Radhika Kapoor (2020) in her study on characteristics of an efficient leader found out that a leader should be honest, integral, confident, committed, resilient and *emotionally intelligent*. This will enable them to understand the emotional challenges of the team members and accordingly regulate their emotions. This will further strengthen the bond between the team members and between the employees in different hierarchies.

When we say that a leader should be emotionally intelligent, it encompasses other traits like *extraversion, openness to new ideas, amicability and a strong sense of integrity*. The participants of the present study have highly emphasized on these characteristics. This makes them approachable as well generates a sense of trust among the subordinates. The literature on the same field pays testimony to fact that extraversion is considered to be the most dominant trait in the making of a leader. Singco.K (2021) concludes in his study on leadership approaches that majority of the leaders possessed traits like extraversion, maintaining good relationship with administration, strong inter-personal relationship etc. Another similar study was conducted by Hogan (2019) wherein he found out that a leader should be ready to accept their mistake and is open to change the action plan if need arises.

As discussed, Leader is a person who has the authority (either by rule or consensus) to shape the behavior and performance of the employees. Therefore, *ethics* is considered to be a value which should never be compromised. It defines the personality and subsequently the credibility of the leader. If a leader fails on this parameter it will be difficult for the team mates to respect and follow him/her. We have numerous examples of leaders from Indian history like Mahatma Gandhi who was revered for his unwavering moral standards and inner fortitude. Therefore, a leader should be guided by ethical and moral principle in addition to the principles of the management.

### ***Future Implication***

This research will enable employees in general and young graduates in specific to understand the various leadership characteristics they possess and the areas they should work upon to have a successful work life. Professional in various leadership positions can gain inspiration and can consequently enhance their efficiency.

## CONCLUSION

The present study focused on understanding the various characteristics of an effective leader. Case study method was employed to complete this study. In the process of gaining an in-depth understanding about leadership and its different facets, we used interview to collect our data. From the analysis, we can conclude that there are few characteristics that were found to be common across most of the case study. Self Confidence, Empathy, Empathetic listening, Personal touch, effective decision making and ethics are considered to be the most valuable characteristics in the making of a good leader.

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### **Conflict of Interest**

The author(s) declared no conflict of interest.

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## Beliefs Related to the Efficacy of the Antidepressant Medications: An Exploratory Research

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### ABSTRACT

Antidepressant medication has apparently become the most popular treatment for depression in the whole world. This paper explores relevant research data and raises questions about the beliefs related to the efficacy of the antidepressant medications. The title of this research is “Beliefs related to the efficacy of antidepressant medications: An exploratory research”. To get an answer for this question, data was collected, in a qualitative way by using interview method from different psychiatrists and clinical psychologists residing in Delhi NCR. At the end, results were concluded that when the severity is more, use of antidepressants is necessary so that the crisis situation is controlled, afterwards therapeutic methods should be used in order to completely recover the individual. But, as the antidepressant medications are a foreign agent, hence, the only use of these as a form of therapy will not completely heal the person, instead, there are more chances of relapse.

**Keywords:** *Antidepressant Drugs, Depression, Psychotherapy, Psychiatrist*

**M**DD has been ranked as one of the most common mental health issues and stands at the third position in terms of cause of impediment of disease worldwide, according to the World Health Organisation’s data in 2008, which has projected that this disease will rank first by 2030. A person with MDD not only shows mood symptoms of sadness, but also a variety of other symptoms that are more severe than those in milder forms of depression. People may lack energy and the ability to carry out their daily activities. The physical symptoms include loss of appetite and sleep disturbance. People also show cognitive symptoms of worthlessness and thoughts of death and suicide.

At the diagnostic level, there are very high levels of comorbidity between depressive and anxiety disorders. However, the issues surrounding the co-occurrence of depression and anxiety are very complex. Chronic Major Depression has been associated with serious childhood family issues and an anxious personality in childhood.

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### ***DSM criteria for Major Depressive Disorder:***

A. Five (or more) of the following symptoms have been present during the same 2-week period and represent a change from previous functioning; at least one of the symptoms is either (1) depressed mood or (2) loss of interest or pleasure.

*Note: Do not include symptoms that are clearly attributable to another medical condition.*

1. Depressed mood most of the day, nearly every day, as indicated by either subjective report (e.g., feels sad, empty, or hopeless) or observation made by others (e.g., appears tearful).
2. Markedly diminished interest or pleasure in all, or almost all, activities performed in most of the day, nearly every day (as indicated by either subjective account or observation).
3. Significant weight loss when not dieting or weight gain (e.g., a change of more than 5% of body weight in a month), or decrease or increase in appetite nearly every day
4. Insomnia or hypersomnia nearly every day.
5. Psychomotor agitation or retardation nearly every day (observable by others; not merely subjective feelings of restlessness or being slowed down).
6. Fatigue or loss of energy nearly every day.
7. Feelings of worthlessness or excessive or inappropriate guilt (which may be delusional) nearly every day (not merely self-reproach or guilt about being sick).
8. Diminished ability to think or concentrate, or indecisiveness, nearly every day (either by subjective account or as observed by others).
9. Recurrent thoughts of death (not just fear of dying), recurrent suicidal ideation without a specific plan, or a suicide attempt or a specific plan for committing suicide.

B. The symptoms cause clinically significant distress or impairment in social, occupational, or other areas of functioning which are important on a day-to-day basis.

C. The episode is not attributable to the physiological effects of a substance or another medical condition.

D. The occurrence of the major depressive episode is not better explained by schizoaffective disorder, schizophrenia, schizophreniform disorder, delusional disorder, or other specified and unspecified schizophrenia spectrum and other psychotic disorders.

E. There has never been a manic episode or a hypomanic episode.

The etiology of Major Depressive Disorder is believed to be multifactorial, including biological, genetic, environmental, and psychosocial factors. MDD is considered to be mainly due to abnormalities in neurotransmitters, especially serotonin, norepinephrine, and dopamine. This has been proven by the use of different antidepressants in the treatment of depression. People with suicidal ideations have been found to have low levels of serotonin metabolites.

Both pharmacotherapy, which includes antidepressants, mood stabilizing drugs and antipsychotic drugs, and psychotherapy, which includes cognitive therapies, behavioural therapies, CBTs, interpersonal therapy and family and marital therapy are used as the treatment methods for Major Depressive Disorder.

### ***Antidepressants Drugs***

Antidepressant drugs are the most commonly prescribed psychiatric medications. More than 90 percent of patients being treated for depressive disorders will be given these medications. These are the drugs involved in elevation of mood in a depressed patient (Tripathi, 2003).

#### ***Classifications:***

##### **1) Monoamine Oxidase Inhibitors (MAOI)**

Monoamine Oxidase Inhibitors were the first drug which was introduced clinically as antidepressant. These drugs inhibit monoamine oxidase enzyme. The enzyme is existing in two molecular forms i.e., MAO-A and MAO-B. However, these drugs were initially being studied for the treatment of Tuberculosis, when they were found to elevate the mood of patients. They were later shown to be effective in treating depression. Patients taking MAOIs must avoid foods rich in amino acid tyramine. This limits the drugs' clinical usefulness.

##### ***Unwanted Effects***

The unwanted effects of MAOI include hypotension, weight gain, dry mouth, blurred vision and urinary retention. Excessive central stimulation leads to tremors, excitement, insomnia and in overdose, convulsions and MAOI of hydrazine type (phenelzine and iproniazid) produce, very rarely, severe hepatotoxicity.

##### **2) Tricyclic Antidepressants (TCA)**

TCA is one of the important class, but far from ideal in practice. The TCAs operate to inhibit the reuptake of norepinephrine and serotonin once these have been released into the synapse. The discovery of first TCA, known as imiprine, was also serendipitous as it was being studied as a possible treatment for schizophrenia when it was found to elevate mood. The theory that these drugs work by increasing norepinephrine activity is now known to be oversimplified.

##### ***Unwanted Effects***

TCA produces unwanted effects that include, weight gain, mental confusion, sedation, weakness, anticholinergic, dry mouth, blurred vision, constipation, bad taste, epigastric distress, urinary retention and palpitation. Sweating and fine tremors are also noted with most TCA. Some patients may switch to hypomania or mania, seizure, postural hypotension (in older patients) and cardiac arrhythmias (Tripathi, 2003).

##### **3) Selective Serotonin Reuptake Inhibitors (SSRI)**

Earlier, the antipsychotic medications that were discovered first (so called Classical antidepressants) included monoamine oxidase inhibitors and tricyclic antidepressants (as mentioned above). These were now been replaced in routine clinical practise by 'second generation' treatments such as the SSRIs. SSRIs are chemically unrelated to the older TCAs and to the MAOIs. However, most antidepressants work by increasing the availability of serotonin, norepinephrine, or both. As their name implies, the SSRIs serve to inhibit the reuptake of the neurotransmitter serotonin following its release into the synapse. Unlike the tricyclics, SSRIs selectively inhibit the reuptake of serotonin. SSRIs are easier to use, have fewer side effects, and are generally not found to be fatal in overdose, as the tricyclics can be.

##### ***Unwanted Effects***

The SSRI produce comparatively less unwanted side effects. However, they frequently produce nausea, nervousness, insomnia, restlessness, anorexia, headache, dyskinesia and diarrhoea. This drug may impair both hepatic and renal function and are contraindicated in

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patients with hepatic impairment. Another serious complication secondary to their effects in increasing serotonergic activity is serotonin syndrome. (Tripathi, 2003; Ferguson, 2001).

### 4) Other Antidepressants

These other antidepressants are known as atypical antidepressants which are compounds with non-selective receptor blocking effects and their antidepressant actions are poorly understood. One of such antidepressants are trazodone. Trazodone (desyrel) was the first antidepressant to be introduced in the United States that was not lethal when taken in overdose. It specifically inhibits the reuptake of serotonin. Trazodone has heavy sedating properties that limit its usefulness.

Bupropion, another atypical antidepressant is not structurally related to other antidepressants. It inhibits the reuptake of both norepinephrine and dopamine. In addition to being an antidepressant medication, bupropion (wellbutrin) also reduces the nicotine cravings, and symptoms of withdrawal in people who want to stop smoking.

Psychotherapy, or talk therapy, is a way to help people with a broad variety of mental illnesses and emotional difficulties. Psychotherapy can help eliminate or control troubling symptoms so a person can function better and can increase well-being and healing.

Psychotherapies can be used to treat the mild to moderate forms of depression. However, for treating severe forms of depression, a combination of both medications and therapeutic approaches may be used. In some circumstances, medication may be clearly useful and in others psychotherapy may be the best option. For many people, combined medication and psychotherapy treatment is better than either alone. Healthy lifestyle improvements, such as good nutrition, regular exercise and adequate sleep, can be important in supporting recovery and overall wellness.

Therapy may be conducted in an individual, family, couple, or group setting, and can help both children and adults. Both patient and therapist need to be actively involved in psychotherapy. The trust and relationship between a person and his/her therapist is essential to working together effectively and benefiting from psychotherapy. Psychotherapy can be short-term, dealing with immediate issues, or long-term, dealing with longstanding and complex issues. The goals of treatment and arrangements for how often and how long to meet are planned jointly by the patient and therapist. Confidentiality is a basic requirement of psychotherapy. Also, although patients share personal feelings and thoughts, intimate physical contact with a therapist is never appropriate, acceptable, or useful.

## REVIEW OF LITERATURE

In 2017 a systematic review was published (according to PRISMA) where all relevant databases were searched, both beneficial and harmful effects were systematically assessed, and a predefined assessment of the clinical significance of antidepressants was performed. That review found that SSRIs compared with placebo had a statistically significant effect on depressive symptoms.

Some recent studies have suggested serious potential risks. People who used antidepressants had a 14% higher risk of heart attacks and strokes and a 33% greater risk of death, according to findings in a meta-analysis of 17 studies that was published in 2017 in the journal *Psychotherapy and Psychosomatics*.

## Beliefs Related to the Efficacy of the Antidepressant Medications: An Exploratory Research

The big danger of going off antidepressants is the risk of relapse. People who have had one episode of depression have a 50% chance of having a second. Those who have had two episodes have an 80% chance of having another. Staying on antidepressant medication can cut the risk of relapse in half, according to a review of 15 clinical trials published in 2014 in the *Journal of Clinical Psychiatry*.

Regardless of recent controversy about efficacy (Kirsch et al., 2008, Nierenberg et al., 2011), updated evidence has confirmed the positive benefit–risk ratio for antidepressants in the treatment of moderate to severe Major Depressive Disorder (Möller et al., 2012, Dupuy et al., 2011, Vöhringer and Ghaemi, 2011, Horder et al., 2011).

Some recent quantitative research suggests that antidepressant medication is superior to placebo only for patients with very severe depressive symptoms, with negligible treatment effects observed for those with less severe symptoms (Fournier et al., 2010).

In the past decade, numerous new atypical antidepressants (neither tricyclics nor SSRIs) have also become increasingly popular, and each has its own advantages (Marcus & Olfson, 2010). For example, bupropion (Wellbutrin) does not have as many side effects (especially sexual side effects) as the SSRIs and, because of its activating effects, is particularly good for depressions with significant weight gain, loss of energy, and oversleeping. Furthermore, venlafaxine (Effexor) seems superior to the SSRIs in the treatment of severe or chronic depression, however the profile of side effects is similar to that for the SSRIs.

All the guidelines up to 2008, including the one by the American Psychiatric Association, the one by the Canadian Psychiatric Association, the one by the National Institute of Clinical Excellence in the United Kingdom and the Japanese one, recommend that the choice of antidepressants be made "on the basis of adverse effect profiles, cost, and patient preferences" because there are differences in side effect profiles but not in effectiveness among various antidepressants.

The irreversible inhibitors of monoamine oxidase (MAO) are known to block the mitochondrial degradation of enzyme and increase the brain levels of norepinephrine, serotonin and/or dopamine (Bortolato et al., 2008).

In double-blind randomized clinical trials, venlafaxine, a dual reuptake inhibitor of serotonin and norepinephrine was significantly more efficacious than fluoxetine in patients hospitalized with major depressive syndrome and melancholia (Nemeroff et al., 2007; 2008). In the treatment of bipolar depression, lithium may be no more effective than traditional antidepressants (study results are inconsistent), but about three quarters show at least partial improvement (Keck & McElroy, 2007). Nonetheless, treatment with antidepressants is related with substantial risk of precipitating manic episodes or rapid cycling, however the risk of this happening is abridged if the person also takes lithium (e.g., Keck & McElroy, 2007; Thase & Denko, 2008).

Several recent studies have provided additional evidence for early onset of antidepressant effects. Stassen et al. (2007) conducted a pooled analysis (N=2848 patients) of RCTs involving 7 antidepressants and placebo, and found that the mean time to onset of improvement was within 2 weeks.

## Beliefs Related to the Efficacy of the Antidepressant Medications: An Exploratory Research

There has long been a belief that antidepressants have delayed onset of action and that clinicians and patients need to wait 6–8 weeks before evaluating whether the antidepressant is having an effect (Taylor, 2007).

Recent studies show pro-inflammatory cytokine process take place during clinical depression, mania and bipolar disorder, and it is possible that symptoms of this condition are attenuated by the pharmacological effect of antidepressant on the immune system [Maes. (2005); Brien.et.al. (2006)].

It has been demonstrated that a combination of SSRIs with a noradrenergic TCA desipramine is more efficacious in the treatment of major depression (Nelson et al., 2004). The results suggest that simultaneous increase in the serotonergic as well as noradrenergic synaptic concentrations may have a synergistic effect that is beneficial for the remission of major depressive disorders (Nelson et al., 2004).

In 2003, the Committee on Safety of Medicines (CSM) in the UK advised that the majority of the selective serotonin reuptake inhibitors (SSRIs) and another new-generation antidepressant, venlafaxine, were not suitable to be used as anti-depressants by those aged under 18 years.

Proposed biological mechanisms to explain the delayed onset of therapeutic action of antidepressants included delayed desensitization of postsynaptic receptors or presynaptic auto receptors and/or downstream effects on postsynaptic signalling (Frazer and Benmansour, 2002).

Venlafaxine has provided one of the first opportunities to examine the hypothesis that a specific dual-action antidepressant would provide a superior clinical response as compared to any single-action agent (Demitrack, 2002).

The efficacy of the tricyclics in significantly reducing depressive symptoms has been demonstrated in hundreds of studies where the response of depressed patients given these drugs has been compared with the response of patients given a placebo. Though, merely about 50 percent indicate what is considered clinically significant improvement, and many of these patients still have major residual depressive symptoms. Fortunately, about 50 percent of those who do not respond to an initial trial of medication will show a clinically significant response when switched to a different antidepressant or to a combination of medications (Hollon, et al., 2002).

Neuroimaging studies have reported a loss of volume in the hippocampus, which regulates the stress response via the HPA axis (Bremner et al., 2000; Frodl et al., 2002a). Importantly, these symptoms of depression cause dendritic atrophy in the hippocampus, which too can be corrected with certain antidepressants (Watanabe et al., 1992; Magarinos et al., 1999; McEwen et al., 2002).

SSRIs are used not only to treat significant depression but also to treat people with mild depressive symptoms (Gitlin, 2002). Many mental health professionals believe that prescriptions for SSRIs are being written for these milder cases at an excessive rate. Prescribing drugs to essentially healthy people merely because the drugs make them feel more energetic, outgoing, and productive raises many ethical questions.

## Beliefs Related to the Efficacy of the Antidepressant Medications: An Exploratory Research

Cyclic antidepressants are used for the treatment of depressive mood disorders, primary major depression. Additionally, imipramine is used in children to treat functional enuresis bed wettings [Maes. (2001)].

Abnormal, excessive activation of the HPA axis is observed in approximately half of individuals with depression, and these abnormalities are corrected by antidepressant treatment (Sachar and Baron, 1979; De Kloet et al., 1988; Holsboer, 2001).

Abnormally high activation of the hypothalamic–pituitary–adrenal (HPA) axis is reported in almost half of the individuals afflicted with depression, and antidepressant treatment is able to reverse many of these aberrations (Sachar and Baron, 1979; Arborelius et al., 1999).

Newer groups of antidepressants regulate the level of serotonin and an additional neurotransmitter, the best-known serotonin and nor epinephrine reuptake inhibitor (SNRI) is venlafaxine. Bupropion is a serotonin and dopamine reuptake inhibitors (SDRI) [Rosowsky. (1984)].

An antidepressant is a psychiatric medication used to assuage mood disorders such as major depression and dysthymia. Though everyone experiences periods of sadness at certain point in their lives; depression is distinguished from this sadness, once symptoms are existent for a period of at least two weeks. Antidepressants are often the first choice of treatment for depression [Smalley. (1984)].

Antidepressants interact with neurotransmitters in numerous ways. They can alter the rate at which the neurotransmitters are either created or broken down within the body [Hall and Nugent. (1992)]. They can block the process by which neurotransmitters are recycled and reused, a process called “reuptake”, by blocking reabsorption of neurotransmitters into the nerve cells. Finally, antidepressants can interfere with the binding of a neurotransmitter to neighbouring nerve cells, thus leaving the neurotransmitter available [Rosowsky. (1984)].

Studies also suggest that depressed people who stop taking tricyclics immediately after obtaining relief have a 40 to 50 percent chance of relapse within six to twelve months. If patients continue to take the drugs for several months after being free of depressive symptoms, however, their chances of relapse apparently decrease to approximately 20 percent (Montgomery et al., 1989; Prien & Kupfer, 1986; Klerman, 1978; Weissman & Klerman, 1977).

In hundreds of studies, mild to severely depressed patients taking tricyclics have recovered considerably more than similar patients taking placebos (Morris and Beck, 1974; Davis, Klerman, & Schildkraut, 1967). When 387 depressed patients were treated with either tricyclic drugs or placebos for ten weeks, the tricyclic patients displayed significantly greater improvement than the placebo patients by the sixth week (Lipman, 1966). Various case reports have similarly described the efficacious impact of these drugs.

A survey of studies involving a total of 5864 patients found that overall, imipramine and two other widely used antidepressants (amitriptyline and isocarboxazid) helped almost 65 percent of the patients for whom they were used. Three other commonly used energizers (phenelzine, malarone, and iproniazid) aided in 40 to 49 percent of the cases in which they were used. Placebo controls were effective in only 23 percent of the cases in which they were employed (Wechsler, Grosser, & Greenblatt, 1965).

## **Beliefs Related to the Efficacy of the Antidepressant Medications: An Exploratory Research**

While imipramine has been found to be the most clinically effective of the antidepressant drugs (Klerman & Cole, 1965), recent studies have reported on the similar efficacy of a group of substances known as monoamine oxidase inhibitors. A significant correlation has been found in several studies between clinical improvement in depressed patients and the degree of inhibition of monoamine oxidation produced during drug administration (Feldstein, Hoagland, Oktem, & Freeman, 1965)

Tranquilizing and anti-depressive drugs are effective in the treatment of psychotic disorders. This is the conclusion that emerges from a review of more than 400 research investigations (David, 1965)

One study has associated the effectiveness of antidepressants with respect to non-pharmacological treatment and two studies have compared antidepressants with electroconvulsive therapy for treatment of depression. Another study compared antidepressants with both electro convulsive therapy (ECT) and non-pharmacological treatment.

Seven trials have evaluated the different dosing schedules for treatment of depression. These studies suggest that parenteral imipramine is better than oral imipramine and probably the onset of action is also earlier. Studies have evaluated single dosing against multiple dosing have shown no difference in efficacy except for one study, which showed that single dose nitroxazepine was better than divided doses.

A recently published trial, which evaluated the efficacy of milnacipran, comprised subjects who had agonized from stroke. It is also one of the few trials which have included subjects more than 65 years of age. The trial done by Margoob et al, in addition to the efficacy of escitalopram, have also shown that gene polymorphism plays an imperative role in the treatment response to innumerable antidepressants.

One double blind controlled trial has evaluated the efficacy of clomipramine in the treatment of OCD and revealed that clomipramine was superior to placebo in the management of OCD. This study also disclosed that male subjects showed better response than female subjects.

A small open label study assessed the efficacy of neuroleptic and fluoxetine combination for treatment of obsessive compulsive (OC) symptoms befalling throughout the course of schizophrenia and showed that addition of fluoxetine leads to major improvement in OC symptoms.

Two studies have also studied the effectiveness of antidepressants in common mental disorders. One study showed that treatment completion rates were higher with fluoxetine than imipramine. The trial by Patel et al. included subjects with common mental disorders and evaluated the outcome at one year. It can be considered the longest study which has evaluated the efficacy of antidepressant in Indian subjects.

Studies indicate that the benefit largely depends on the severity of the depression: The more severe the depression, the vaster the benefits will be. So particularly, antidepressants are operative against chronic, moderate and severe depression. They don't help in mild depression.

## Beliefs Related to the Efficacy of the Antidepressant Medications: An Exploratory Research

A review of 14 naturalistic studies of long-term treatment for depression over 10 years found that outcomes for depressed patients were poor, with multiple relapses and large variability, both within and between individuals. Patients in nondrug-treated samples did not show worse outcomes, while some had superior outcomes. (Journal of Affective Disorders, a systematic Review by Hughes S and Cohen D)

A study of antidepressant use over 2 years in primary and secondary clinical care found high rates of recurrence (60%–63%) in patients continuously using adequate dosages of antidepressants. 11 Patients not treated with antidepressants after remission had the lowest recurrence rate (26%). (Journal of Psychotherapy and Psychosomatics, research paper published by Bockting C, Ten Doesschate M, and Spijker J, et al.)

Frank et al, have documented response rates for extended treatment with a single effective antidepressant. In that study, the remission rate was 82%, with 75% achieving remission by 140 days. For fluoxetine, 23% of patients who were unimproved at 8 weeks showed full remission at 12 weeks.

Two recent meta-analyses based on a considerable number of placebo-controlled trials in which patients were randomized to either continuation of antidepressants or placebo during the first three months after remission, have shown that continuation treatment with antidepressants significantly decreases relapse rates within the first three months after randomization. This evidence supports the recommendation for continuation treatment with antidepressants during the first months after remission to prevent relapse.

A Danish case-control study examined age and dose effects for selective serotonin reuptake inhibitors and tricyclic antidepressants and found that the fracture risk associated with selective serotonin reuptake inhibitors increased with age but only in medium- and high-dose users, while for tricyclic antidepressants there was only an increased fracture risk in the oldest age group (> 60 years) for the highest dose.

Two studies supported by the National Institute of Mental Health (NIMH), characterized by many methodological strengths, and had lower placebo response rates (33% –35%) and meaningful between-group differences (25%) that support antidepressant efficacy.

Papakostas et al published a systematic review of fixed-dose trials comparing different starting doses of SSRIs. In comparison with starting with the minimum of the standard dose range, starting with the maximum of the standard range may be more effective (RR = 1.12, 95%CI: 0.99 to 1.27) but less acceptable (0.74, 0.54 to 1.00). The response rate may increase from 51% to 54%, at the expense of the dropout rate also rising from 10% to 17%.

Several studies have found upper gastrointestinal bleeding to be more common among patients taking selective serotonin reuptake inhibitors, particularly when used in combination with non-steroidal anti-inflammatory drugs.

Irving Kirsch, professor of psychology at the University of Hull and lead author of the study, said, “Using complete datasets and a substantially larger dataset than previously reported, we found that the overall effect of new generation antidepressant medications is below recommended criteria for clinical significance. Efficacy reaches clinical significance only in trials involving the most extremely depressed patients, and this pattern is due to a decrease in the response to placebo rather than an increase in response to medication.”

## Beliefs Related to the Efficacy of the Antidepressant Medications: An Exploratory Research

A classification-based approach of data from Tranter and colleagues' study suggests that if an early change in positive processing is not seen with antidepressant treatment, patients have little chance of responding to this same treatment later. A similar effect was seen in older adults in which a group of patients with depression who did not show an improvement in the recognition of happy faces after 1 week of citalopram treatment also did not respond after 8 weeks of treatment.

In a recent study, Godlewska and colleagues found that clinical response to escitalopram after 6 weeks of treatment was associated with early change during affective processing in the amygdala, thalamus, cingulate, and insula. The responder group showed a greater reduction in neural response in these areas during the processing of negative versus positive facial expressions, consistent with the hypothesis that these early changes are important for the expression of later clinical benefit.

Data from preclinical studies show that a single dose of ketamine produces rapid antidepressant-like effects in rodent models and reverses the depressive behaviours caused by chronic stress. The results also show that a single dose of ketamine rapidly increases synapse number and function in medial prefrontal cortex neurons, and reverses the synaptic deficits caused by chronic stress.

A recently published review assessing results after 24 weeks showed that the longer-term effects of antidepressants (SMD 0.34) seem as small as the short-term effects. A clinical practice guideline from NICE showed similar results (SMD 0.28).<sup>19</sup> It is possible that long-term treatment with antidepressants may even worsen outcomes.

A recently published review found that a significant proportion of people who experience withdrawal symptoms after treatment with antidepressants do so for more than 2 weeks and that it is not uncommon for people to experience withdrawal for several months.

Ferguson has investigated the causes of various side effects profiles, especially the causes of sexual dysfunction, weight gain, and sleep disorders. An occurrence of side effects in long-term SSRI therapy is most concerning. Ferguson's results comply with ours. The statistically significant side effects of SSRI antidepressants in correlation with the duration of the treatment in our subjects are: perception of increased sleep (0.039) as well as decreased sleep ( $P = 0.009$ ), sweating ( $P < 0.001$ ), sudden heat stroke ( $P < 0.001$ ), being without orgasm ( $P = 0.004$ ), decreased libido ( $P < 0.001$ ), weight loss ( $P = 0.045$ ).

A review of 14 naturalistic studies of long-term treatment for depression over 10 years found that outcomes for depressed patients were poor, with multiple relapses and large variability, both within and between individuals. Patients in nondrug-treated samples did not show worse outcomes, while some had superior outcomes. (Journal of Affective Disorders, a systematic Review by Hughes S and Cohen D).

## **METHODOLOGY**

In order to reach upon a solution that whether antidepressants are the best form of therapy or not, we used the qualitative method of research and interviewed various psychiatrists and clinical psychologists residing in Delhi NCR. The questions were open ended and hence the participants were free to give their responses. The personal information of the participants is also kept confidential and therefore, is anonymous. At the very beginning, a short

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introduction about the research topic was also given to all the participants and their responses for each question was recorded.

An interview is a qualitative research method that relies on asking questions in order to collect data. Interviews involve two or more people, one of whom is the interviewer asking the questions. There are several types in which the structured interview was used for our research paper. A structured interview method is a data collection method that relies on asking questions in a set order to collect data on the topic. Although, in research these are often quantitative in nature, however, they also can be used in qualitative research if the questions are open ended, which is evident in our paper.

Mr. G is a psychiatrist working in a very reputed hospital. The interview was started with a statement based question that “women are more prone to be diagnosed with depression”, do you agree with this statement? If yes, why. The answer, according to him was, yes they are, and he further added that the prevalence of depression among women is more, as emotionality and the thought processes are predominantly associated with the females than the males. Henceforth, the ratio is approximately 2:1. This is even validated by other researchers also. Mr. G included in his statement that however the risk of suicide is more in males than females, but the prevalence of depression is more in that of the females. The next question was “which age group of people are more prone to be diagnosed with depression”, to which the answer was middle age. However, he continued, that the onset of depression is multimodal, so it can start from an early age of 10-15 where the stress may be primarily related to academics. Nevertheless, dispositional age for the initiation of depression is 20-35, prevalence of geriatric depression can also be seen among individuals aging 55 and above. Mr. G, during the interview had opined about the usage of these antidepressants as, in the case of Mild Depression, non-pharmacological techniques are way better than the pharmacological methods used for the treatment, as it is less severe and the reasons behind depression are primarily the lack of coping skills. Although, when it comes to treating Moderate Depression, the severity is more, for this reason, SSRIs or the SNRIs can be prescribed for the client depending on the tolerability of doses along with the psychotherapies being given. When it comes to more severe forms of depression, higher dysfunctionality, chronicity, and most importantly treatment resistance among the clients is noticed, therefore, the pharmacological methods of treatment are used primarily. Once the crisis situation has been managed, psychotherapies are given to improve their coping skills. According to Mr.G the side effects of antidepressants varies from patient to patient. Nonetheless, the primary side effects of antidepressants what we observe usually are nausea, vomiting, abdominal discomfort, weight gain, bloating, and gaseous abdomen. Other side effects which are much milder in intensity and can be managed with other medications are associated anxiety, switch phenomenon, neurological side effects, and bleeding disorders. The next question was “can psychotherapies alone be given without antidepressants in treating a person suffering from depression”? The answer recorded was as follows, yes therapeutic approaches alone can be used but only in the treatment for the mildest forms of depression or those who are in the maintenance stage of chronic depression. As stated by Mr. G, the primary line of management with depression is to reduce the severity of the symptoms, prevention and the management of the crisis situation, management of the associated conditions related to depression which is accomplished with the help of antidepressants. The last question been asked was “according to you, are antidepressants the best form of therapy?” for which the answer recorded was as follows, no, antidepressants are not completely the best form of therapy, rather a blend of both pharmacotherapy and psychotherapy must be used in treating the more severe forms of depression such as Major

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Depressive Disorder. However, psychotherapies alone can be given in treating the mildest forms of depression.

Ms. S is a clinical psychologist who works in a very reputed hospital. The interview was started with a statement-based question that “women are more prone to be diagnosed with depression”, do you agree with this statement? If yes, why. The answer, according to her was, yes they are, usually mental illness in women are diagnosed later, and hence the precipitating factors can be mostly disturbed marital relationships, domestic violence, or due to some traumatic incidents. However, men are also diagnosed with depression, but the prevalence may be too less due to the stigmatization by the society. According to many researchers, the occurrence of depression in males can be seen in their adolescence or early adulthood stages. Hence, the report of depression is more in women, but the prevalence may be equal. As per Ms. S experience, women between the ages of 30-45 are more prone to be diagnosed with depression, while in males it is 25-35. The risk of suicide is more in males than in females. The next question been asked was “are antidepressants used only in the treatment of Major Depressive Disorder or these can be used to treat other forms of depression too?”, for which the answer was as follows, the antidepressants can be used in treating other forms of depression too including mixed anxiety and depression, depression with psychotic symptoms or without psychotic symptoms, OCD with depression, RDD, atypical depression. There are some antidepressants used specifically for MDD, where some are used in the dual diagnosis disorders. Though the ones used for treating MDD can be used to treat other forms too. According to Ms.S, when the clients have severe depression with psychotic symptoms, the side effects of antidepressants observed are gaining weight, tremors, and drowsiness which are very common. The next question was “can psychotherapies alone be given without antidepressants in treating a person suffering from depression”? The answer recorded was as follows, yes, psychotherapies alone can be given if the client becomes treatment resistant and does not respond to the antidepressants. Psychotherapies help in a very beneficial way, especially in treating anxiety, depression or neurotic disorders and are not a foreign agent, consequently, do not have any side effects. As stated by Ms. S, by taking antidepressants the client gets immediate relief, mood stability can be seen, has good decision making power, has positivistic view towards the future, improvement in sleep and appetite, and a decline in suicidal thoughts are also seen, whereas psychotherapies takes a lot of time for the client to deal with recovery and healing. The last question been asked was “according to you, are antidepressants the best form of therapy?” for which the answer recorded was as follows, no, a client who is suffering from any severe disorder needs a combination of both pharmacotherapy and psychotherapy in order to deal with recovery. Antidepressants cannot be the best form because ultimately the client has to depend upon a foreign agent completely, yet, initial improvement can be seen, but there are more chances of relapse once the medications being taken are stopped. Thus, people are usually unwilling to take these medications.

Mr. R is a psychiatrist working in a very reputed hospital. The interview was started with a statement based question that “women are more prone to be diagnosed with depression”, do you agree with this statement? If yes, why. The answer, according to him was, yes, as the responsibilities held by a women are more than that of men. Another reason can be their hormonal instability which contributes to their mental health issues and they have double the chances of having depression than men. The next question was “which age group of people are more prone to be diagnosed with depression”, to which the answer was, there is no specific age group. Nowadays, the younger generation are more prone to be diagnosed with having depression. However the psychosocial causes may be different, but every age group

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is equally prone. Mr. R, during the interview had opined about the usage of the antidepressants as, these are used not only in the treatment of MDD but can be used for treating Bipolar Depression, Dysthymia, and apart from depression these are used for treating anxiety disorders, headaches, OCD, phobias, etc., although the severity matters. Antidepressants are mostly prescribed only when the symptoms of the disorder are severe, otherwise psychotherapies alone can be used in treating any disorder. According to Mr. R the side effects of antidepressants depends on the classification of these. TCAs have more of constipation, dry mouth, blurring of vision, sedation whereas SSRIs have sexual side effects, acidity, gastric side effects. SNRIs have gastric side effects, constipation, dry mouth, increased sedation and drowsiness. Nevertheless, these side effects also depend on the tolerability of the dosage prescribed by the psychiatrists. The next question was “can psychotherapies alone be given without antidepressants in treating a person suffering from depression”? The answer recorded was as follows, no, I don’t think psychotherapies alone can help in treating MDD. Yes, however, I agree that the therapy can be very useful in the treating the mild to moderate forms of depression, but when the severity is more, medication is a necessity. As stated by Mr. R, by taking antidepressants the client gets immediate relief, mood stability can be seen, has good decision-making power, has positivistic view towards the future, improvement in sleep and appetite, and a decline in suicidal thoughts are also seen, whereas psychotherapies takes a lot of time for the client to deal with recovery and healing. The last question been asked was “according to you, are antidepressants the best form of therapy?” for which the answer recorded was as follows, no, antidepressants are not completely the best form of therapy, rather a blend of both pharmacotherapy and psychotherapy must be used in treating the more severe forms of depression such as Major Depressive Disorder. Though, psychotherapies alone can be given in treating the mildest to the moderate forms of depression.

Mrs. M is a psychiatrist working in a very reputed hospital. The interview was started with a statement based question that “women are more prone to be diagnosed with depression”, do you agree with this statement? If yes, why. The answer, according to her was, yes they are, and there are many factors which contribute to it. The first reason is the biological factor which include hormonal changes, pregnancy and child birth. Also, there are many psychological factors, for instance, women are more emotionally expressive than men. Women in the patriarchal societies are more prone to be diagnosed with depression which comes under the social factors. The next question was “which age group of people are more prone to be diagnosed with depression”, to which the answer was middle age. However, she continued, that all the age group of people are equally prone to be diagnosed with depression nowadays. Mrs. M, during the interview had opined about the usage of these antidepressants as, in the case of mild and moderate forms of depression, non-pharmacological techniques are way better than the pharmacological methods used for the treatment, as it is less severe and the reasons behind depression are primarily the lack of coping skills. Although, when it comes to treating more severe forms of depression medications must be prescribed for the early recovery from the symptoms along with psychotherapies for the complete recovery and healing. According to Mrs. M, the side effects of antidepressants varies from patient to patient. Nonetheless, the primary side effects of antidepressants what we observe usually are nausea, vomiting, abdominal discomfort, weight gain, bloating, gaseous abdomen, and drowsiness, which can be cured if the dosage given is properly adjusted by the psychiatrist. The next question was “can psychotherapies alone be given without antidepressants in treating a person suffering from depression”? The answer recorded was as follows, yes therapeutic approaches alone can be used but only in the treatment for the mildest to moderate forms of depression or those who are in the maintenance stage of chronic

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depression. As stated by Mrs. M, antidepressants are very much effective as the client responds rapidly to these medications. Also, the client is again able to carry out the daily activities in a proper manner, where psychotherapies take a long time to heal and recover a person completely. The last question been asked was “according to you, are antidepressants the best form of therapy?” for which the answer recorded was as follows, no, antidepressants are not completely the best form of therapy, rather a blend of both pharmacotherapy and psychotherapy must be used in treating the more severe forms of depression such as Major Depressive Disorder. The reason behind this is that medications work biologically whereas psychotherapies work on our thinking pattern, that’s why both are necessary in the treatment of a disorder.

Mrs. P is a clinical psychologist who works in a very reputed hospital. The interview was started with a statement based question that “women are more prone to be diagnosed with depression”, do you agree with this statement? If yes, why. The answer, according to her was, yes they are, and she further added that the prevalence of depression among women is more, as emotionality and the thought processes are predominantly associated with the females than the males. Another reasons are hormonal instability, unwanted pregnancy. Hence, the risk of suicide is more in males than in females. The next question was “which age group of people are more prone to be diagnosed with depression”, to which the answer was the middle age of 25-40. In this age, work pressure is more and the individuals have more responsibilities where they have to take care of the family and also that of the career. At this age, men become as the bread earners and the women have to fulfil the household chores and also have to take care of their children. Mrs. P, during the interview had opined about the usage of these antidepressants as, in the case of Mild Depression, non-pharmacological techniques are way better than the pharmacological methods used for the treatment, as it is less severe. When it comes to more severe forms of depression, higher dysfunctionality, chronicity, and most importantly treatment resistance among the clients is noticed, therefore, the pharmacological methods of treatment are used primarily. Once the client gets recovery from the severe symptoms, psychotherapies are given in order to treat the client completely. According to Mrs. P the side effects of antidepressants varies from patient to patient and are very mild in severity. Some of the common side effects are headaches, drowsiness and sedation, gaseous abdomen, loss of appetite. Although, these can be cured with some modifications done in the dosage given by the psychiatrists. The next question was “can psychotherapies alone be given without antidepressants in treating a person suffering from depression”? The answer recorded was as follows, yes therapeutic approaches alone can be used but only in the treatment of mild and the moderate forms of depression. As in the case of severe depression, the best method of treatment is the blend of both medications and psychotherapies. As stated by Mrs. P, firstly we should know what to prescribe and that too where. Antidepressants are very much effective when the severity of the symptoms are more. These provide an immediate relief from such symptoms and help the client in his recovery. The last question been asked was “according to you, are antidepressants the best form of therapy?” for which the answer recorded was as follows, antidepressants are very much important in treating an individual suffering from severe depression, but these are not the best form of therapy as they have many side effects and once these are stopped, there are more chances of relapse. According to me, the blend of psychotherapy and pharmacotherapy can be the best form, where medications are prescribed first and once the severity reduces, therapeutic approaches are used for the complete recovery of the client.

## DISCUSSION

This qualitative study highlights the impact of antidepressants and whether these can be used as the only form of treatment for MDD. An antidepressant is a psychiatric medication used to assuage mood disorders such as major depression and dysthymia. Though everyone experiences periods of sadness at certain point in their lives; depression is distinguished from this sadness, once symptoms are existent for a period of at least two weeks. Antidepressants are often the first choice of treatment for depression [Smalley. (1984)]. In many cases, these can be prescribed to treat other health conditions such as anxiety, pain, and insomnia. Antidepressants interact with neurotransmitters in numerous ways. They can alter the rate at which the neurotransmitters are either created or broken down within the body [Hall and Nugent. (1992)]. They can block the process by which neurotransmitters are recycled and reused, a process called “reuptake”, by blocking reabsorption of neurotransmitters into the nerve cells. Finally antidepressants can interfere with the binding of a neurotransmitter to neighbouring nerve cells, thus leaving the neurotransmitter available [Rosowsky. (1984)]. Newer groups of antidepressants regulate the level of serotonin and an additional neurotransmitter, the best known, serotonin and norepinephrine reuptake inhibitor (SNRI) is venlafaxine. Bupropion is a serotonin and dopamine reuptake inhibitors (SDRI) [Rosowsky. (1984)]. Cyclic antidepressants are used for the treatment of depressive mood disorders, primary major depression. Additionally, imipramine is used in children to treat functional enuresis bed wettings [Maes. (2001)].

In this study, we explore into both the pharmacological and the therapeutic approaches of treatment for depression. The population of the study included both psychiatrists and clinical psychologists. A total of 5 participants were interviewed for the study. To begin with, I shall explain the effectiveness of the antidepressants with respect to other methods of treatment. One study has associated the effectiveness of antidepressants with respect to non-pharmacological treatment and two studies have compared antidepressants with electroconvulsive therapy for treatment of depression. Another study compared antidepressants with both electro convulsive therapy (ECT) and non-pharmacological treatment. Two studies have also studied the effectiveness of antidepressants in common mental disorders. One study showed that treatment completion rates were higher with fluoxetine than imipramine. The trial by Patel et al. included subjects with common mental disorders and evaluated the outcome at one year. It can be considered the longest study which has evaluated the efficacy of antidepressant in Indian subjects. Tranquilizing and anti-depressive drugs are effective in the treatment of psychotic disorders. This is the conclusion that emerges from a review of more than 400 research investigations (David, 1965). Some recent quantitative research suggests that antidepressant medication is superior to placebo only for patients with very severe depressive symptoms, with negligible treatment effects observed for those with less severe symptoms (Fournier et al., 2010). Participants too had opined about the effectiveness of antidepressants. To quote them, they mentioned “the primary line of management with depression is to reduce the severity of the symptoms, prevention and the management of the crisis situation, management of the associated conditions related to depression which is accomplished with the help of antidepressants’. Also they had stated about the usage of these antidepressants. The participants mentioned, “Antidepressants can be used in treating other forms of depression too including mixed anxiety and depression, depression with and without psychotic symptoms, OCD with depression, RDD, atypical depression, Bipolar Depression, and Dysthymia”.

Through the interview process, I also got to know the side effects of antidepressants. Participants mentioned, “The side effects varies from patient to patient. Nonetheless, the

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primary side effects of antidepressants what we observe usually are nausea, vomiting, abdominal discomfort, weight gain, bloating, and gaseous abdomen". Another participant said, "When the clients have severe depression with psychotic symptoms, the side effects observed are gaining weight, tremors, and drowsiness which are very common". One other participant said, "The side effects depend on the classification of antidepressants. TCAs have more of constipation, dry mouth, blurring of vision, sedation whereas SSRIs have sexual side effects, acidity, gastric side effects. SNRIs have gastric side effects, constipation, dry mouth, increased sedation and drowsiness". The big danger of going off antidepressants is the risk of relapse. People who have had one episode of depression have a 50% chance of having a second. Those who have had two episodes have an 80% chance of having another. Staying on antidepressant medication can cut the risk of relapse in half, according to a review of 15 clinical trials published in 2014 in the *Journal of Clinical Psychiatry*. Some recent studies have suggested serious potential risks. People who used antidepressants had a 14% higher risk of heart attacks and strokes and a 33% greater risk of death, according to findings in a meta-analysis of 17 studies that was published in 2017 in the journal *Psychotherapy and Psychosomatics*.

This study also explores whether psychotherapies can be used as the only form of therapy. Participants had mentioned, "Yes, therapeutic approaches alone can be used but only in the treatment for the mildest forms of depression or those who are in the maintenance stage of chronic depression." Another participant said, "Yes, psychotherapies alone can be given if the client becomes treatment resistant and does not respond to the antidepressants. Psychotherapies help in a very beneficial way, especially in treating anxiety, depression neurotic disorders and are not a foreign agent, consequently, do not have any side effects." One participant had added, "I don't think psychotherapies alone can help in treating MDD. Yes, however, I agree that the therapy can be very useful in treating the mild to moderate forms of depression, but when the severity is more, medication is a necessity." Another participant said, "Yes, therapeutic approaches alone can be used but only in the treatment of mild and the moderate forms of depression. As in the case of severe depression, the best method of treatment is the blend of both medications and psychotherapies."

Now we shall be exploring, whether antidepressants are the best form of therapy or not. Studies indicate that the benefit largely depends on the severity of the depression: The more severe the depression, the vaster the benefits will be. So particularly, antidepressants are operative against chronic, moderate and severe depression. They don't help in mild depression. Studies also suggest that depressed people who stop taking tricyclics immediately after obtaining relief have a 40 to 50 percent chance of relapse within six to twelve months. If patients continue to take the drugs for several months after being free of depressive symptoms, however, their chances of relapse apparently decrease to approximately 20 percent (Montgomery et al., 1989; Prien & Kupfer, 1986; Klerman, 1978; Weissman & Klerman, 1977). There has long been a belief that antidepressants have delayed onset of action and that clinicians and patients need to wait 6–8 weeks before evaluating whether the antidepressant is having an effect (Taylor, 2007). Several recent studies have provided additional evidence for early onset of antidepressant effects. Stassen et al. (2007) conducted a pooled analysis (N=2848 patients) of RCTs involving 7 antidepressants and placebo, and found that the mean time to onset of improvement was within 2 weeks. A classification-based approach of data from Tranter and colleagues' study suggests that if an early change in positive processing is not seen with antidepressant treatment, patients have little chance of responding to this same treatment later. A similar effect was seen in older adults in which a group of patients with depression who did not

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show an improvement in the recognition of happy faces after 1 week of citalopram treatment also did not respond after 8 weeks of treatment. Participants had mentioned, “No, antidepressants are not completely the best form of therapy, rather a blend of both pharmacotherapy and psychotherapy must be used in treating the more severe forms of depression such as Major Depressive Disorder. However, psychotherapies alone can be given in treating the mildest forms of depression”. Another participant said, “No, a client who is suffering from any severe disorder needs a combination of both pharmacotherapy and psychotherapy in order to deal with recovery. Antidepressants cannot be the best form because ultimately the client has to depend upon a foreign agent completely, yet, initial improvement can be seen, but there are more chances of relapse once the medications being taken are stopped. Thus, people are usually unwilling to take these medications”. One other participant said, “Antidepressants are very much important in treating an individual suffering from severe depression, but these are not the best form of therapy as they have many side effects and once these are stopped, there are more chances of relapse. According to me, the blend of psychotherapy and pharmacotherapy can be the best form, where medications are prescribed first and once the severity reduces, therapeutic approaches are used for the complete recovery of the client”. A recent analysis by Sado et al. (2009) shows that combined therapy for depression appears to be cost-effective from both health care system and social perspective.

### CONCLUSION

The aim of this study was to know whether antidepressants are the best form of therapy or not. Data collected from different sources and our participants who were clinical psychologists and psychiatrists working in various hospitals, concluded that only the use of antidepressants cannot completely cure an individual who is suffering from major depression. Rather a blend of pharmacotherapy and psychotherapy must be used where the medications will help in reducing the severity of the symptoms and the therapeutic approaches will further recover and heal the individual completely.

#### *List of Abbreviations:*

DSM – Diagnostic and Statistical Manual of Mental Disorders

MDD – Major Depressive Disorder

CBT – Cognitive Behavioral Therapy

PRISMA – Preferred Reporting Items for Systematic Reviews and Meta-Analyses

NICE – National Institute for Health and Care Excellence

NCR – National Capital Region

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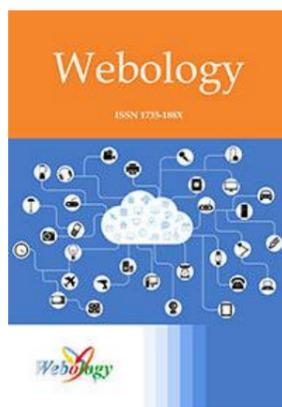
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The author(s) declared no conflict of interest.

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## Valmiki's Ram: A Personification Of Righteousness And Moral Development

[Neha Singh](#) , [Dr. Hanan Khalid Khan](#)

### Abstract

Valmiki's Ram is an incarnation of lord Vishnu in human form. Rama's journey is imbued with symbolism. In Hindu Mythology life of lord Ram is a treasure that conceptualises and discerns the world with the idea of life. Rama's life is much more complex than a battle between good or evil. He is an exemplar who takes birth to incorporate both mortals and immortals. Rama is symbolised as "Superior being" or the "Enlightenment". He takes life as it comes to him. He deals with his situations with his conduct. He is a virtuous human who adorns himself with his self control. He gives us solutions for our every question. He guides us how to live our life, how to triumph over desires and how to achieve inner peace. This paper pulls us back to our roots to push us forward in terms of morality and reality and to teach us that some things are not outdated but they are the fundamentals of life. In modern times we all face dilemmas and fall prey to stress depression as we don't know how to deal with them. Ram through his journey tells us and sails us through these dilemmas by following virtues.

**Pages:** 4658-4664

**Keywords:** Enlightenment, dharma, purushotam, virtue.

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# CONCEPT OF ALIENATION IN SHASHI DESHPANDE'S *THAT LONG SILENCE*

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**Abstract:** Women have been alienated as a result of being disadvantaged in patriarchal societies. Alienation is described as "a term used with various meanings in philosophy, theology, psychology, and the social sciences, usually with emphasis on personal powerlessness, meaninglessness, cultural estrangement, social isolation, or self-estrangement" in the Encyclopedia Britannica. An individual's sense or state of separation from himself, others, and the outside world is implied by the term "alienation." "Anomic" and "anomia" are two of the Greek terms meaning estrangement. "Anomie" relates to social alienation, whereas "anomia" stands for self-alienation. The two most fundamental types of alienation are, in fact, alienation from oneself and alienation from society. A situation of alienation from oneself or is said to exist when a person's spontaneous individual self has been stunted or suppressed. An alienated individual is stranger to both himself and to other people. Both anomie and anomia affect the major character of Shashi Deshpande's *That Long Silence*.

**Index Terms-** Alienation, Indian literature, Women

## INTRODUCTION

Women have been denied the freedom to live as they choose from ancient times. Women have been made to live a life of dependence under the authority of males. Even education has not fundamentally altered their life, despite the fact that it has brought about certain changes. Whether they are housewives or working women, they are not living lives of their own choice. Although, there have been changes with the times, at least in the case of educated metropolitan women; from being little more than puppets, yet there is scope of betterment.

### Estrangement in Deshpande's heroines

Generally, the characters of Deshpande are contemporary Indian women who are very sensitive, clever, and educated. They experience alienation because, if they follow their hearts and minds, they are labelled as unworthy daughters, sisters, and wives, and they become estranged from society and other family members. On the other hand, if they adhere to male ideals of the traditional woman, they experience internal alienation. Deshpande's heroines therefore attempt to choose a middle course so that they may carry out their household or social responsibilities without significantly sacrificing their personal goals and ideals. As a result, Deshpande's handling of estrangement in her female characters has a unique complexity. Unlike Anita Desai's characters, her heroes either commit suicide nor go into self-exile as a result of a crippling sense of alienation.

For a man to be conscious of himself as an individual, alienation may be a necessary condition. It allows him the chance to answer questions about his fundamental identity and what he should do or not do in a more general sense. On the contrary, "heroines of Shashi Deshpande" are put on the path to self-discovery when specific conditions are met. Their sense of estrangement from both oneself and people around them serves as the starting point for the process. Beyond a secondary sex, everyone tries to understand who they are. Younger generations of Deshpande's women reject the stereotype of staying at home to care for their spouse and children while submissively taking whatever comes their way. They favor taking charge of their own destiny. Even if they sometimes struggle with it and are forced to make concessions, they finally come to a greater knowledge of who they are and what their lives are all about.

### **Patriarchal Society and Women**

Although women have taken up professional professions, they are nonetheless bound by the roles that patriarchal society has historically allocated to them. Their minds are now split as a result of this. The female characters in Shashi Deshpande's works experience a prolonged period of mental anguish and self-doubt as a result of this crisis, but they eventually manage to get through it and achieve a state of mental stability. They neither entirely abandon the established order nor do they lose their uniqueness. Charu Chandra concurs with Deshpande's definition of feminism, in which achieving one's own identity is weighed against family and work responsibilities. However, harmonizing the relationship between men and women as equal partners is necessary. "Beauvoir's understanding of complicity in *The Second Sex*, before evaluating Susan James's interpretation of complicity in terms of seventeenth-century accounts of slavery and republican freedom, which emphasizes the dependent situation of women as the primary cause of their complicity." (Knowles 243)

For women in Indian society, patriarchal discrimination is a more complex phenomenon. Despite the fact that this topic has received much debate at conferences, panel discussions, seminars, etc., prejudice still exists across the globe. Few women attempt to overcome these challenges despite the bias. These women seek to establish themselves in all of the traditionally male-dominated industries. It is evident that many women succeed in the twenty-first century in a variety of sectors, including literature, art, politics, science, and technology. Only when certain feminist writers began exposing the unseen hardships of the impacted women, these changes become apparent. Many women continue to experience pressure. In Indian society, prejudice is still a problem

Shashi Deshpande through her writing style speaks up in support of women and thinks that women are also humans just as males. She speaks on behalf of the cause, emphasizing the need for focus in order for the oppressed women to escape. She explores the internal struggles of her heroines and presents the truth of their circumstances. "The correspondence columns of women's magazines provide good examples of what they talk about; one can hardly imagine a 'lonely hearts' column for men only; men meet in the world, which is their world, while women have to define, measure, and explore their social domain; their correspondence deals especially with beauty counsel, recipes for cooking, directions for knitting; and they ask for advice; through propensity for chatter and self-display genuine anxiety sometimes emerges." (Rathi 31)

### **Exploration of Women's Challenges through *That Long Silence***

Deshpande utilized "silence" as a symbol in her book *That Long Silence*, which is the patriarchal emblem. The story of man's supremacy and the idea that women are the embodiment of all virtues are both explored in the book. Eloquence and loudness are not considered to be characteristics of Indian women in the society, which is clearly male-oriented. In the end, the lady controls herself to remain silent and endure everything, which causes her to go extinct. Through her book, Deshpande encourages the protagonist to flee patriarchy and the realities of life. Jaya, the main character, is shown as a writer who has started a typical role of a woman today as a wife and mother has hidden her existential self. Because expressive women characters must endure in a culture of quiet, they are very challenging to create. By giving her protagonist a wealth of creative skill, Deshpande has been able to overcome this challenge.

Women are educated to understand that this second-class status is not imposed on them automatically by their naturally 'feminine' relatives but rather by powerful, historically male-dominated environmental factors that have shaped societal norms and educational systems. In other words, woman is nothing without a man and is therefore only permitted to adopt a committed, submissive, or subordinate position in the dominant phallogocentric culture, also

known as patriarchy, which is a society that is dominated or overly controlled by males. The woman has obviously been continually exploited and marginalized, which has led to the restriction of her social, political, intellectual, emotional, and economic independence. Shashi Deshpande aims to highlight the ethical norms that have steadily deteriorated in marriage by concentrating on this connection. The current custom teaches women to take up subordinate roles in the home. Her books depict the prevalent patriarchal system and the enormous battle that newly empowered Indian women face in order to be a part of it.

The heroine Jaya, a middle-class, middle-aged Bombay housewife, tells her story in *That Long Silence*. The dissatisfaction and isolation felt by Indian women are intended to be shown by Shashi Deshpande. The clash between modernity and tradition affects her characters. Their issues adjusting to marriage and their search for identity are the root of this alienation. Women who are seeking their own voices are the protagonists in Shashi Deshpande's works. For both men and women, marriage is crucial. However, women do not have same freedom that males have. Patriarchy frequently use it as a tool to put pressure on women. One of the oddities of Indian life is the meaninglessness of husband-wife relationships. Many times, only women make an effort to strengthen the relationships. Women are the ones who must endure all hardship while yet making an effort to keep the marriage together in quiet. The heroines of Shashi Deshpande look to marriage for some form of security. Women choose marriage over the bondage that society forces on spinsters since it is not only required by the family but also seen as a better option by the women. They quickly become aware of their loss of freedom. With new duties come new bonds, to which people must become used to for the rest of their lives. They experience a sense of loneliness and are left feeling empty because they are caught in a struggle between the conventional role of the wife and a search for individuality.

Shashi Deshpande's female narrators go beyond their gender to examine the masculine mentality, as several critics have shown. It is debatable if Shashi Deshpande is a feminist or not because she dislikes having her writing categorized as feminist fiction. Typically, a book is the author's own work and vision, which is entirely subjective. The personal opinions of Shashi Deshpande on marital discord are presented in *That Long Silence*. There is truth in the statement that each Indian woman may discover her own silence in Jaya's silence.

Jaya, the novel's narrator and protagonist, is the major subject of attention. A smart lady with strong academic credentials and a job as a writer, Jaya is this novel's heroine. However, none of her attributes earned her a decent standing in Mohan's eyes. Despite the housewife and unsuccessful writer Jaya's delicate emotional swings, pleasure and misery, she is constantly at the quiet level in the story. While Mohan, her spouse, is a conservative with deep roots in traditions, and Jaya is pro-modern, they are diametrically opposed. Due to these disparities in viewpoint and attitude, they are unable to comprehend one another. Regarding the place of women in families, Mohan holds a traditional viewpoint. His image of the perfect lady is one that prioritizes her family above her job and takes care of the home. But Jaya believes that being married is like living in a cage. They are separated by the tension between being oneself and playing the traditional roles of "good daughter," "good mother," and "good wife." The husband and wife's quiet grows longer as they retreat to their Dadar flat. In an instance of workplace corruption, Mohan is engaged. He is the subject of an investigation, and is instructed to remain silent until the matter is resolved. As a result, they are staying hidden in a little flat in Dadar.

She is given the chance and time to think back on her life. She considers her importance in Mohan's life as well as her position as a daughter-in-law, sister, wife, mother, friend, and writer, among other things. She has also taken her kids Rahul and Rati on trips. She feels isolated as she views her marriage as a pointless exercise in being together. She seems frustrated, and it comes over in her remarks.

“We lived together but there had been only emptiness between us.” (Deshpande 185)

Jaya has concerns about her own identity and her marriage. As Jaya delves deeply into her old memories, she comes to the realization that she has lost herself. In many respects, Mohan (her husband) has crushed her desire to forge her own identity. He has also changed her environment and connections. Mohan has diminished her sensitivity, she realizes. The hollowness of contemporary Indian life is demonstrated by Shashi Deshpande in this masterpiece. Jaya finds refuge in her neurosis and shirks responsibilities rather than dealing with a difficult scenario.

Self-discovery is sparked. Her aloofness in this difficult familial circumstance has the effect of making their marriage unstable. Jaya would frequently laugh aloud, but she would never dare to laugh in front of Mohan. Jaya, a brave and daring individual, attempts to be like Suhasini, a helpless lady who always need male assistance. What actually makes her feel sorry for herself is that she engaged in behavior for which she would ordinarily feel ashamed.

The reader is deeply uneasy as a result of Jaya's heartbreaking stillness. She is so preoccupied with the issue of who she is that she is unable to identify herself. Her wavering mental condition reflects her feminine problem. She is committed to ending the "Long Silence." She has two children and is a married woman named Mohan, yet she lives alone. She is tormented from the inside out because her husband cannot comprehend her emotions. It is challenging for a modern, educated woman to grant her husband's every request. Jaya's character may be seen in the majority of Indian women. "Jaya, the happiness of your husband and home depends entirely on your." (138) In spite of her rejection of the stereotype of conventional women like Sita, Savitri, and Draupadi, Jaya wants to play the part of the silent victim.

"No, what have I to do with these mythical women? I can't fool myself the truth is simpler. Two bullocks yoked together... it is more comfortable for them to move in the same direction. To go in different directions would be painful; and what animal would voluntarily choose pain?" (12)

In order to describe the Indian marital system, Shashi Deshpande chooses appropriate imagery.

While considering her marital life, Jaya realizes about her frustration and isolation. Arrangements were made for Jaya's marriage. The pair did not communicate, just like in other Indian marriages. In spite of financial pleasures, her marriage life devolved into a pattern of routine. Over the course of their 17-year marriage, she has been a submissive, quiet spouse. She struggles with being stupid and mute after the marriage. "My mother never raised her voice against my father however badly he behaved to her." (83) The mentioned statement depicts the situation of a woman who did not have courage to raise voice against behaviour that she did not deserve just because she was born a woman.

"We can always hope without that, life would be impossible. And if there is anything I know now it is this; life has always to be made possible." (193)

All characters seek a companion within the boundaries set by society since they are all in need of love and affection. Isolation is a side effect of the breach between oneself and companionship. All of the characters; Jaya, Mohan, Kamat, and Rahul—find it difficult to break the silence that serves as a barrier to developing cordial relationships with others and experience psychological estrangement as a result. People appear to find it difficult to express their emotions in the ordinary world since it seems to be filled with feared regularity and boredom.

## Conclusion

In the world of the 20th century, this is a frequent image that alienates people on a psychological and spiritual level. Not only are they left alone physically, but also emotionally. Shashi Deshpande emphasizes not just her personal quiet but also the stillness of each and every character in the book. The work is not just about Jaya's attempts to break the stillness that is strangling her, as Veena Sheshadri clearly points out in her remark. Additionally, it deals with the hopelessness and resignation of women like Kusum, Jaya's mentally ill cousin, Jaya's servant Jaya, and Mohan's mother. Shashi Deshpande has examined how temperamental and emotional mismatch affect man-woman relationships. Women's feelings of suffocation, estrangement, and quiet suffering are depicted in *That Long Silence*.

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# 2-Amino-5-substituted-1,3,4-oxadiazole as chemosensor for Ni(II) ion detection: antifungal, antioxidant, DNA binding, and molecular docking studies

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## Abstract

An oxadiazole derivative 2 was prepared by condensation reaction through cyclization of semicarbazone in the presence of bromine; the structural confirmation was supported by <sup>1</sup>H and <sup>13</sup>C nuclear magnetic resonance (NMR) spectroscopy, Fourier transform-infrared spectroscopy, and liquid chromatography-mass spectrometry. Its sensing ability towards Ni<sup>2+</sup> ion was examined showing a binding constant of 1.04 × 10<sup>5</sup> compared with other suitable metal cations (Ca<sup>2+</sup>, Co<sup>2+</sup>, Cr<sup>3+</sup>, Ag<sup>+</sup>, Pb<sup>2+</sup>, Fe<sup>3+</sup>, Mg<sup>2+</sup>, and K<sup>+</sup>) using ultraviolet-visible (UV-vis) and fluorescence spectroscopic studies. The minimum concentration of Ni<sup>2+</sup> ions and limit of detection was found to be 9.4 μM. A job's plot gave the binding stoichiometry ratio of oxadiazole derivative 2 vs Ni<sup>2+</sup> ions as 2:1. Furthermore, the intercalative binding mode of oxadiazole derivative 2 with calf thymus DNA was supported by ultraviolet-visible (UV-vis) and fluorescent light, viscosity, cyclic voltammetry, time-resolved fluorescence, and circular dichroism measurements. The molecular docking result gave the binding score for oxadiazole derivative 2 as -6.5 kcal/mol, which further confirmed the intercalative interaction. In addition, the antifungal activity of oxadiazole derivative 2 was also screened against several fungal strains (*C. albicans*, *C. glabrata*, and *C. tropicalis*) by broth dilution and disc diffusion methods. In antioxidant studies, the oxadiazole derivative 2 showed potential scavenging activity against 2,2-diphenyl-1-picrylhydrazyl and H<sub>2</sub>O<sub>2</sub> free radicals.

## KEYWORDS

antifungal, antioxidant activity, chemosensor, DNA binding and molecular docking studies, oxadiazole

## 1 | INTRODUCTION

The detection of specific metal ions using a chemosensor is a dynamic and interesting area at this time due to their environmental, clinical, biological, and practical applications.<sup>[1-3]</sup> Most metal ions make necessary contributions to determining and resolving anatomical functions in living systems; however, excessive quantities can cause toxic effects on human health and the environment.<sup>[4,5]</sup> An

important trace element, nickel (Ni), plays a vital role in living organisms especially in the respiratory system, metabolism, and biosynthesis, with the addition of various industrial and commercial applications such as in nickel-cadmium (Ni-Cd) batteries, as precursors for catalysts, in paint as a pigment, and for machinery, electroplating, welding, utensils, etc.<sup>[6-9]</sup> Nickel ions at low concentrations do not create severe health problems, but larger doses or prolonged inhalation may be toxic, even carcinogenic, and

can severely affect the excretory, circulatory, respiratory, and central nervous systems.<sup>[10]</sup> Excess concentrations of nickel ions can substitute for other metal ions in enzymes and proteins, or ions can bind to cellular compounds resulting in toxic effects on biological functions.<sup>[11]</sup> To detect Ni<sup>2+</sup> ions, numerous analytical methods have been used such as atomic absorption spectroscopy (AAS), inductively coupled plasma-atomic emission spectroscopy (ICP-AES), flame photometry, flame atomic absorption spectrometry-electrothermal atomization (AAS-ETA) and microwave-induced plasma.<sup>[12–14]</sup> However, these instrumentation techniques are expensive, time-consuming, use sophisticated instrumentation, and need large analysis time, indicating the requirement to search for new methods for metal analysis. In recent years, appropriate photophysical methods have attracted great attention because of their fast response, low cost, high selectivity, sensitivity, noninvasiveness, and convenience.<sup>[15–17]</sup> Derivatives containing heterocyclic rings are a very interesting research area for scientists due to their fascinating biological activities, especially in the area of drug design and development. Nitrogen-containing heterocyclic analogues, such as oxadiazoles, have been studied on a large scale because of their extensive pharmaceutical applications; consequently many of their derivatives have been under clinical investigation as medicines for various diseases.<sup>[18–21]</sup> Among the -N and -O heteroatom-containing oxadiazoles derivatives, drugs containing 1,3,4-oxadiazole moieties have had more consideration in research due to the presence of theirazole moieties, responsible for the lipophilicity of the drug. Substitution of some heterocyclic moieties to 1,3,4-oxadiazole is a very optimistic methodology to overcome numerous drawbacks such as drug resistance, toxicity, and many additional adverse properties. These molecules exhibit significant activities such as the inhibition of growth factors and enzymatic processes. Therefore, the hybrids of heterocycle derivative 1,3,4-oxadiazole have a significant place in the innovation of new bioactive medicines.<sup>[22,23]</sup> Amino group substitution at the fifth position on the 1,3,4-oxadiazole ring has generated substantial therapeutic and material attention, recognized by increased numbers of research publications and patents. Oxadiazole compounds display various biological actions such as antibacterial, anti-HIV, antimicrobial,<sup>[24–26]</sup> antifungal,<sup>[27,28]</sup> anticancer,<sup>[29,30]</sup> anti-inflammatory,<sup>[31,32]</sup> and antioxidant activities.<sup>[33]</sup> Oxadiazole derivatives also function in comprehensive applications in light-emitting diodes as organic semiconductors, and in semiconductors as field-effect transistors, and chemical, and electrochemical sensors, etc.<sup>[34–36]</sup> In particular, 1,3,4-oxadiazole derivatives have displayed good photoluminescence properties including high thermal stability and hydrolytic robustness.<sup>[37,38]</sup> With the quality of fluorescence emitters, oxadiazole derivatives also present excellent chemosensing properties towards metal ions.<sup>[39–42]</sup> Based on the above considerations, here we synthesized a novel oxadiazole derivative 2, which exhibited selectivity for Ni<sup>2+</sup> ions and was sensitive towards solvent polarity and pH, etc. In addition to chemosensing behaviours, oxadiazole derivative 2 has drug–DNA binding capabilities through interactions of small molecules with DNA. DNA–drug interactions were investigated using UV–vis spectroscopy, fluorescence

spectroscopy, circular dichroism (CD), cyclic voltammogram (CV), and viscosity measurements. In addition we examined antifungal activity against *Candida* species and antioxidant scavenging properties using 2,2-diphenyl-1-picrylhydrazyl (DPPH) and H<sub>2</sub>O<sub>2</sub> free radical assays.

## 2 | EXPERIMENTAL

### 2.1 | Reagents and instruments

All the reagents, salts, and instruments used are mentioned in the Supporting information.

### 2.2 | Synthesis and characterization of compounds (1 and 2)

#### 2.2.1 | (E)-1-([5-Bromothiophen-2-yl]methylene) semicarbazide (1)

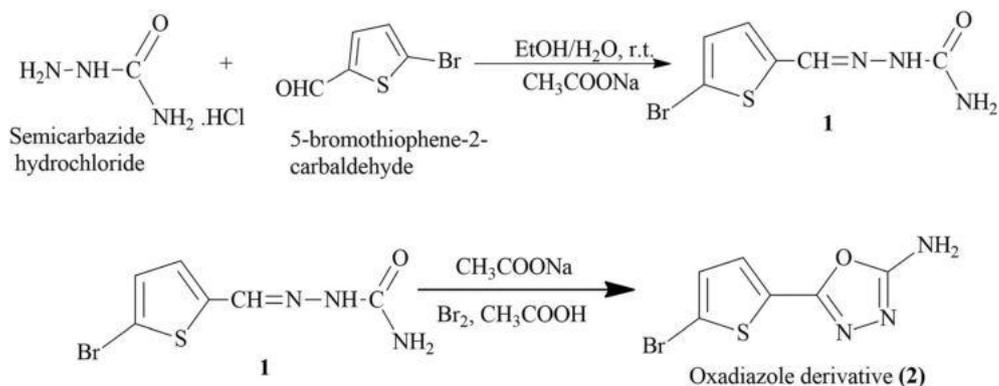
To the stirred solution of 5-bromothiophene-2-carbaldehyde (1.18 g, 10 mmol) in ethanol sodium acetate (0.82 g, 10 mmol) and semicarbazide hydrochloride (1.11 g, 10 mmol) were slowly added into the ethanol/water solution. The resulting reaction mixture was refluxed at 40°C for 2 h and the obtained precipitate of semicarbazone (1) was purified with ethanol and dried under vacuum.

Off-white solid; molecular formula: C<sub>6</sub>H<sub>6</sub>BrN<sub>3</sub>OS, yield: 91%. Melting point: 205°C. FT-IR (cm<sup>-1</sup>): 3445 and 3271 (N–H primary amide); 3105 (N–H secondary amide); 1645 (C=O); 1572 (HC=N); 798 (C–Br). <sup>1</sup>H NMR (300 MHz, DMSO-d<sub>6</sub>) δ (ppm): 10.34 (s, CH=N, 1H), 7.951 (s, 1H, -NH), 7.15–7.20 (dd, aromatic-H, 2H), 6.33 (s, -NH<sub>2</sub>, 2H). <sup>13</sup>C NMR (75 MHz, DMSO-d<sub>6</sub>) δ (ppm): 156.18, 141.45, 133.88, 130.92, 129.14, 112.96. MS (m/z): 248.9 [M + 1]<sup>+</sup>.

#### 2.2.2 | 5-(5-Bromothiophen-2-yl)-1,3,4-oxadiazol-2-amine (2)

The solution of semicarbazone 1 (2.48 g, 10 mmol) in 10 ml glacial acetic acid was added to sodium acetate (1.64 g, 20 mmol) in 20 ml glacial acetic acid with continuous stirring and 5 ml of bromine solution from stock solution (20 ml Br<sub>2</sub> in 50 ml glacial acetic acid) was added slowly with the help of a dropping funnel by continuous stirring. The resulting mixture was then refluxed at 60–70°C with constant stirring for 4 h and, after completion of the reaction, the resulting solution was poured onto crushed ice. The obtained cream precipitate was separated using vacuum filtration, dried, and recrystallized in ethanol. The synthesis of oxadiazole derivative 2 is given in Scheme 1.

Cream; molecular formula: C<sub>6</sub>H<sub>4</sub>BrN<sub>3</sub>OS. Yield: 93%. MP: 215°C. FT-IR (cm<sup>-1</sup>): 3312 and 3115 (primary amine); 1656, 1588, 1510, 1413, 1302 (C–O–C), 799 (C–Br). <sup>1</sup>H NMR (300 MHz, DMSO-d<sub>6</sub>): δ

**SCHEME 1** Synthesis of oxadiazole derivative (2)

(ppm): 7.36 (s,  $-\text{NH}_2$ , 2H), 7.35–7.33 (m, aromatic  $-\text{H}$ , 2H).  $^{13}\text{C}$  NMR (75 MHz,  $\text{DMSO}-d_6$ ):  $\delta$  (in ppm): 163.82, 153.15, 132.19, 128.40, 127.51, 115.17. MS (m/z): 247.95  $[\text{M} + 1]^+$ .

## 2.3 | Chemosensing properties

### 2.3.1 | Sensitivity of metal sensing analysis

A stock solution of oxadiazole derivative 2 at  $1.0 \times 10^{-3}$  M concentration was prepared in different solvents: dimethyl sulfoxide (DMSO), ethyl acetate (EtOAc), *N,N*-dimethyl formamide (DMF), methanol (MeOH), ethanol (EtOH), dichloromethane (DCM) and acetone and further diluted to a concentration of  $1.0 \times 10^{-5}$  M in DMSO and  $\text{H}_2\text{O}$  solution (1:1, v/v) to carry out UV-visible and fluorescence measurements. Stock solutions of various metal nitrates ( $\text{Ca}^{2+}$ ,  $\text{Co}^{2+}$ ,  $\text{Cr}^{3+}$ ,  $\text{Ag}^+$ ,  $\text{Pb}^{2+}$ ,  $\text{Fe}^{3+}$ ,  $\text{Mg}^{2+}$ ,  $\text{Ni}^{2+}$ , and  $\text{K}^+$  ions) of  $1 \times 10^{-3}$  M concentration were prepared and then diluted to  $1 \times 10^{-5}$  M concentration in double-distilled water.<sup>[43]</sup>

### 2.3.2 | Binding stoichiometry study by Job's plot analysis

A constant volume (5 ml) containing a series of solutions of  $\text{Ni}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$  and test compound 2 was prepared so that the overall volume of metal ion and chemosensor remained the same. After mixing the metal ions in oxadiazole derivative 2, absorption spectra were recorded using UV-vis spectroscopy at room temperature. From the data obtained from the UV-vis spectra, a Job's plot was drawn between the molar fraction of test compound oxadiazole derivative 2 from 0 to 1.0 in a solution of compound 2 +  $\text{Ni}^{2+}$  at a fixed concentration of  $1 \times 10^{-5}$  M.

### 2.3.3 | Determination of detection limit

The artificial analytical parameter for limit of detection (LOD) of the metal ion by chemosensors was calculated using the standard

deviation (SD) value of the oxadiazole derivative 2 ( $10^{-5}$  M) at  $\sim 10$  times in absence of  $\text{Ni}^{2+}$  ions using absorption titration measurements. After scanning the blank solution of oxadiazole derivative 2, the resulting mixture was titrated with different concentrations of  $\text{Ni}^{2+}$  ions and recorded using UV-vis spectroscopy. A graph was plotted for the absorbance of oxadiazole derivative 2 against  $\text{Ni}^{2+}$  ion concentration. The LOD value was calculated using the following Equation 1:

$$\text{LOD} = 3\text{SD}/s \quad (1)$$

where SD is the standard deviation of oxadiazole derivative 2 (without  $\text{Ni}^{2+}$  ions) and 's' is the slope obtained by the plot of absorbance vs concentration of  $\text{Ni}^{2+}$  ions.<sup>[44,45]</sup>

### 2.3.4 | Association constant determination

The binding constant ( $K_a$ ) for oxadiazole derivative 2 with  $\text{Ni}^{2+}$  ions was calculated by the absorbance titration method using the Benesi-Hildebrand Equation 2:

$$\frac{1}{(A-A_0)} = \frac{1}{\text{Ni}^{2+}} \times \frac{1}{K_a[A_{\text{max}}-A_0]} + \frac{1}{[A_{\text{max}}-A_0]} \quad (2)$$

where A is the absorbance of the compound 2 +  $[\text{Ni}^{2+}]$  mixture,  $A_0$  is the absorbance of oxadiazole derivative 2 only,  $A_{\text{max}}$  is the absorption at a maximum concentration of  $\text{Ni}^{2+}$  ions in the presence of oxadiazole derivative 2.<sup>[46]</sup>

### 2.3.5 | Effect of pH

To show the effect of pH on oxadiazole derivative 2 with and without the addition of  $\text{Ni}^{2+}$  ion, firstly prepared different solutions of oxadiazole derivative 2 ( $10^{-5}$  M) from the pH range 2.0–12.0. Also, the solution of compound 2 +  $\text{Ni}^{2+}$  complex was prepared in different pH range from 2.0 to 12.0 in DMSO and  $\text{H}_2\text{O}$  solution (1:1, v/v), after the formation of separate pH solutions recorded

the absorption spectra by UV-vis spectrophotometry at room temperature.

## 2.4 | DNA-drug interaction studies

### 2.4.1 | Absorption measurements

To investigate the interaction between drug and nucleic acids, the most common optical technique is absorbance spectroscopy that was carried out following the standard approaches described in the literature.<sup>[47-49]</sup> A comparative binding study of oxadiazole derivative 2 with CT DNA in Tris-HCl buffer (50 mM, pH 7.4) solution was first approved through absorption measurement over the wavelength range 200–400 nm. The molar extinction coefficient ( $\epsilon$ ) with a value of 6600 L/mol.cm of CT DNA was used to determine the concentration of the stock solution of DNA at wavelength 260 nm in UV-vis.<sup>[50]</sup> These measurements were done by the addition of different concentrations of oxadiazole derivative 2 (10.0–60.0  $\mu$ M) in a fixed concentration of DNA (10  $\mu$ M) and all the prepared solutions were kept for 10 min before taking absorption spectra. The quantitative interaction of oxadiazole derivative 2 with calf thymus DNA was analyzed by calculation of binding constant using following Benesi-Hildebrand Equation 3:

$$\frac{1}{(A-A_0)} = \frac{1}{K_b[C][A_{\max}-A_0]} + \frac{1}{[A_{\max}-A]} \quad (3)$$

where  $A$  and  $A_0$  are the absorbance values of DNA in the presence and absence of oxadiazole derivative 2.  $A_{\max}$  is the maximum absorbance when saturation occurred;  $K_b$  is the association constant obtained from the intercept to slope ratio, while  $[C]$  is the concentration of oxadiazole derivative 2.<sup>[51]</sup> The calculated value of the Benesi-Hildebrand binding constant ( $K_b$ ) was further used for the calculation of Gibb's free energy ( $\Delta G$ ) to check the spontaneous behaviour of the drug and DNA interaction<sup>[52]</sup> by the following Equation 4:

$$\Delta G = -RT \ln K_b \quad (4)$$

where  $R = 8.3141 \text{ J mol}^{-1} \text{ K}^{-1}$ , and  $T = 298 \text{ K}$ .

### 2.4.2 | Fluorescence titration

The binding affinity of the compound with DNA was further examined using the emission titration method that is widely used to obtain insight into the interactions due to its high selectivity, sensitivity, and convenience.<sup>[53,54]</sup> In this process, increasing amounts of CT DNA (10–70  $\mu$ M) were added to a fixed concentration of oxadiazole derivative 2 (100  $\mu$ M) in 50 mM acidic (HCl) Tris buffer (pH 7.4) for emission titrations. Fluorescence titrations were carried out in the range 300–500 nm after equilibrating the mixture of oxadiazole derivative 2 and DNA for 30 min ( $\lambda_{\max} = 265 \text{ nm}$ ). A graph was plotted from obtained

data for fluorescence intensity vs wavelength. The value of the binding constant ( $K_f$ ) was calculated from the fluorescence titration by plotting the graph of  $\log(F_0 - F)/F$  vs  $\log[C]$  using the following Equation 5:

$$\log \frac{(F_0 - F)}{F} = \log K_f + \log [C] \quad (5)$$

where  $[C]$  = concentration of DNA;  $F$  and  $F_0$  are the fluorescence intensities of oxadiazole derivative 2 in the presence and absence of increasing concentrations of DNA.<sup>[55]</sup>

### 2.4.3 | Viscosity measurement

An Ostwald viscometer was used at room temperature for viscosity measurements of varying concentrations of oxadiazole derivative 2 (0.1–0.5  $\times 10^{-4} \text{ M}$ ) with fixed amounts of CT DNA (10  $\mu$ M). The time of flow of the solutions was measured using a digital stopwatch. To calculate the mean value this experiment was carried out in three replicates to evaluate the viscosity of the DNA with test compound oxadiazole derivative 2. A graph was plotted of relative specific viscosity ( $\eta/\eta_0$ )<sup>1/3</sup> against the concentration of  $[\text{Compound}]/[\text{DNA}]$ <sup>[56]</sup>:

$$\eta = (t_1 - t)$$

$$\eta_0 = (t - t_0)$$

where,  $\eta$  = relative viscosity of oxadiazole derivative 2 with DNA,  $\eta_0$  = relative viscosity of DNA only,  $t_1$  = time of flow of the oxadiazole derivative 2,  $t$  = time of flow of DNA without oxadiazole derivative 2,  $t_0$  = time of flow of Tris buffer.

### 2.4.4 | Cyclic voltammogram

An Ivium potentiostat was used to investigate the DNA and drug interaction through CVs to calculate the redox reaction between oxadiazole derivative 2 in the absence or presence of CT DNA. In this experiment, a gold-plated copper-based electrode was used as the reference and a film of the oxadiazole derivative 2 was used as the working electrode. Electrochemical measurements were recorded at 25°C with or without CT DNA in 50 mM Tris-HCl buffer (pH 7.4). All experiments was carried out at a scan rate of 50 mV/s in the potential range +1.0 to -1.0 V at room temperature.<sup>[57]</sup>

### 2.4.5 | Circular dichroism

The morphological modification that occurs during the DNA-drug interactions was monitored using the most convenient method through CD. Chirascan CD spectropolarimeter was used to record the spectra of DNA in the absence and presence of oxadiazole derivative

2. All the samples were prepared in Tris-HCl buffer and set aside for 30 min to equilibrate before measuring the spectra at wavelength range 200–300 nm with a scan rate of 30 nm/min.<sup>[58]</sup>

## 2.5 | Time-resolved fluorescence measurements

The measurement of fluorescence lifetime was recorded on an Horiba DeltaFlex01-DD spectrophotometer with the excitation wavelength  $\lambda_{\max} = 265$  nm at room temperature. The obtained result gave the information for suitability of decay in a lifetime based on the decreased  $\chi^2$  value and the corresponding residual distribution.<sup>[59]</sup> The tri-exponential function,  $f(t)$  and average fluorescence lifetime ( $\tau_{av}$ ) were used to fit the time-resolved decay curve according to the following Equations (6 and 7):

$$f(t) = \alpha_1 e^{-t/\tau_1} + \alpha_2 e^{-t/\tau_2} + \alpha_3 e^{-t/\tau_3} \quad (6)$$

$$\langle \tau_{av} \rangle = \sum_i a_i \tau_i \quad (7)$$

## 2.6 | Molecular docking study

An *in silico* molecular docking study was performed to explain the interaction behaviour of the proposed drug and protein to predict the experimental interaction site and computational binding of synthesized molecules. The PDB format of 1BNA was downloaded from the RCSB Protein Data Bank ([www.rcsb.org/pdb](http://www.rcsb.org/pdb)) and a PDB file of the ligand was created. AutoDock 4.0, software was used for these experiments, and the empirical scoring function was calculated based on the  $\Delta G$  binding. 1BNA and oxadiazole derivative 2 were loaded into AutoDock software and, with the help of Python script, the PDB file was converted to a PDBQT format. The grid centre was also recognized by centring the grid box on either the minor groove or the intercalation site. From one of the minimum energies, the lowest energy was selected using zero root mean square deviation to obtain the most optimized model. After that, the output results from AutoDock were analyzed using Discovery Studio 3.0 software and PyMOL software. The obtained docking score provides information about the interactions (hydrogen bonding and pi-pi interaction) of the synthesized compounds with active sites of 1BNA.<sup>[60,61]</sup>

## 2.7 | Antifungal activity

The minimum inhibitory concentration values of the oxadiazole derivative 2 for several fungal *Candida* strains (*C. albicans*, *C. glabrata* and *C. tropicalis*) were determined using the broth dilution method as per Clinical and Laboratory Standards Institute (CLSI) guidelines.<sup>[62,63]</sup> The required minimum concentration to decrease the absorbance value by 90% compared with the control is defined as the minimum inhibitory concentration (MIC) (in absence of tested compounds). The screening

of antifungal activity of oxadiazole derivative 2 was carried out as per a previous method.<sup>[64]</sup> The zone of inhibition (ZOI) was measured after 48 h of mixing and fluconazole (10  $\mu\text{g}/\text{disc}$ ) was used as a reference.

## 2.8 | Antioxidant activity

### 2.8.1 | 2,2-Diphenyl-1-picrylhydrazyl (DPPH) radical scavenging activity

Here, 1 ml of freshly prepared DPPH solution ( $10^{-4}$  M) in ethanol was added to a 2 ml ethanolic solution of oxadiazole derivative 2 ( $10^{-4}$  M) and the prepared solution was incubated for 90 min at 37°C in the incubation chamber. After the addition of oxadiazole derivative 2 in DPPH, the decrease in absorbance at 517 nm (characteristic peak of DPPH) was recorded, and ethanol was used as a blank for all the measurements. The experiment was performed in a triplicate. The DPPH % scavenging effect was calculated using the following Equation 8:

$$\text{DPPH\%absorption} = \frac{A_{\text{DPPH}} - A_{\text{compound}}}{A_{\text{DPPH}}} \quad (8)$$

$\frac{A_{\text{control}} - A_{\text{sample}}}{A_{\text{control}}}$  where  $A_{\text{DPPH}}$  is the absorbance of DPPH without oxadiazole derivative 2 and  $A_{\text{compound}}$  is the absorbance of oxadiazole derivative 2 with DPPH.<sup>[65]</sup>

### 2.8.2 | Hydrogen peroxide ( $\text{H}_2\text{O}_2$ ) scavenging activity

The  $\text{H}_2\text{O}_2$  scavenging process for the analysis of antioxidant activity was performed according to earlier reported methods.<sup>[66,67]</sup> Here, a 0.4 ml (43 mM) solution of hydrogen peroxide ( $\text{H}_2\text{O}_2$ ) was added to oxadiazole derivative 2 ( $5 \times 10^{-5}$  M) dissolved in 3.4 ml phosphate buffer. The resulting solution was incubated at 37°C for ~15 min and the absorbance value at 236 nm wavelength was recorded, taking the buffer as the blank solution. The percentage inhibition of oxadiazole derivative 2 against  $\text{H}_2\text{O}_2$  was examined using the following Equation 9:

$$\% \text{Inhibition} = \frac{A_c - A_s}{A_c} \times 100 \quad (9)$$

where  $A_c$  = absorbance value of hydrogen peroxide and  $A_s$  = the absorbance value of hydrogen peroxide in the presence of oxadiazole derivative 2.

## 3 | RESULTS AND DISCUSSION

### 3.1 | Chemistry

The FT-IR spectra of oxadiazole derivative 2 were recorded in the range 4000–400  $\text{cm}^{-1}$ . The FT-IR spectra of oxadiazole derivative

2 presented specific peaks at  $3312\text{--}3115\text{ cm}^{-1}$  and  $1659\text{--}1588\text{ cm}^{-1}$ , which were assigned to the primary amine (N-H) attached to the oxadiazole ring and the  $\text{--C=N}$  group in the oxadiazole ring, respectively (Figure S1). The  $^1\text{H}$  NMR spectrum of intermediate compound 1 exhibited sharp signals at 6.33 and 7.95 ppm corresponding to the primary amide ( $\text{CONH}_2$ ) and secondary amide proton ( $\text{CONH}$ ), respectively. The aromatic protons appeared as a doublet of doublet at 7.15–7.20 ppm. In addition, the presence of another peak at 10.34 ppm corresponded to azomethine proton ( $\text{--CH=N}$ ). The signal of the azomethine carbon of compound 1 in the  $^{13}\text{C}$  NMR spectrum was observed at 156 ppm. The signals that appeared between  $\delta$  129 and 133 ppm were attributed to carbon atoms present in the thiophene ring (Figure S2).  $^1\text{H}$  NMR spectrum of oxadiazole derivative 2 for primary  $\text{NH}_2$  was observed at 7.36 ppm. The thiophene proton signals for oxadiazole derivative 2 were observed in the 7.35–7.33 ppm range as a doublet of doublet. The carbon signal in  $^{13}\text{C}$  NMR spectrum of two  $\text{--C=N}$  group appears at 163 and 153 ppm (Figure S2). The mass spectral analysis also confirms the formation of compounds 1 and 2 as shown in Figure S3.

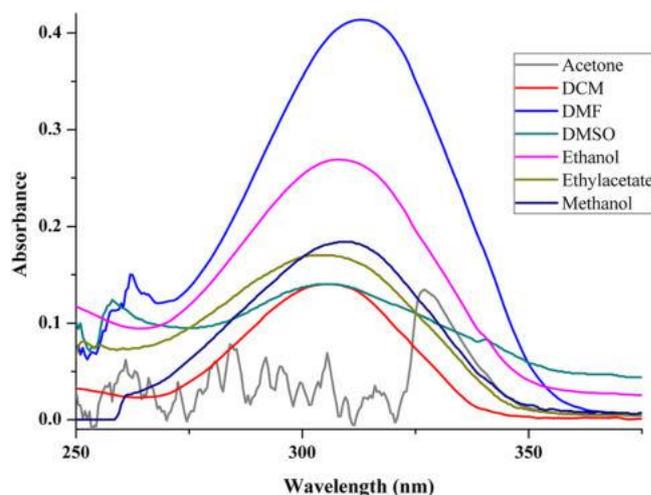
## 3.2 | Chemosensing properties

### 3.2.1 | Sensitivity of oxadiazole derivative 2 with different solvents

The photophysical sensitivity of oxadiazole derivative 2 towards various organic solvents based on polarity (ethanol, methanol, acetone, DMSO, DCM, ethyl acetate, and DMF) was studied to find out the spectral properties using UV–vis spectroscopy. The oxadiazole derivative 2 was dissolved in these solvents and spectra were recorded using UV–vis spectroscopy. Using the obtained data, the spectra of oxadiazole derivative 2 in different solvents are presented in Figure 1 and its photophysical properties such as  $\lambda_{\text{max}}$  and absorbance values are presented in Table 1. From Figure 1, we can see that the absorption maxima of oxadiazole derivative 2 in various solvents increased according to the polarity of the solvents but, for most polar solvent DMSO, the absorbance decreased and exhibited slight shifting (hypsochromic shift) with the maximum broadness in the peak in the absorption spectra. The observed hypsochromic shift in the presence of DMSO indicated that the ground state was more polar than the excited state.

### 3.2.2 | Selectivity of oxadiazole derivative 2 with different metal ions

The chemosensing activity of oxadiazole derivative 2 was accompanied by monitoring the UV–vis absorption spectra in the presence of different metal ions in DMSO or  $\text{H}_2\text{O}$  solution (1:1, v/v). The maximum absorbance value of oxadiazole derivative 2 was obtained at 305 nm. After introduction of metal ions such as  $\text{Ca}^{2+}$ ,  $\text{Co}^{2+}$ ,  $\text{Cr}^{3+}$ ,  $\text{Ag}^+$ ,  $\text{Pb}^{2+}$ ,  $\text{Fe}^{3+}$ ,  $\text{Mg}^{2+}$  and  $\text{K}^+$  (5 equivalents) in the solution of



**FIGURE 1** Absorbance spectra of oxadiazole derivative 2 in different solvents

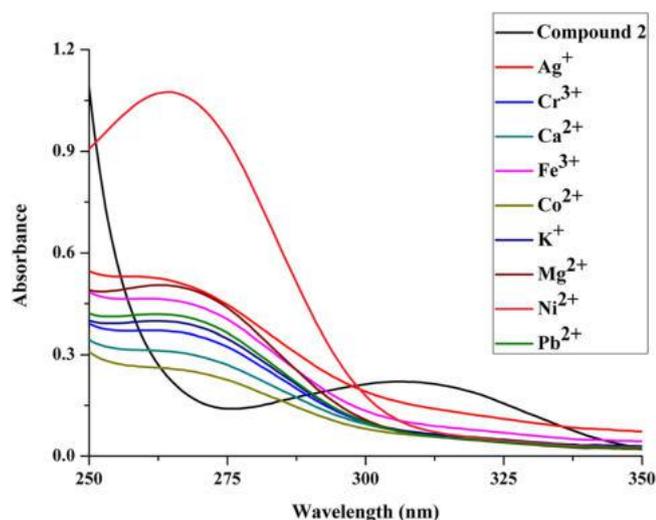
**TABLE 1** Photophysical properties of oxadiazole derivative 2 in various solvents

Solvent	Polarity	$\lambda_{\text{max}}$ (nm)	Absorbance
Ethanol	5.2	308.7	0.267
Methanol	5.1	309.5	0.182
Acetone	5.1	327.3	0.135
DMSO	7.2	305.4	0.140
DCM	3.1	306.4	0.143
Ethyl acetate	4.4	303.8	0.168
DMF	6.4	312.9	0.414

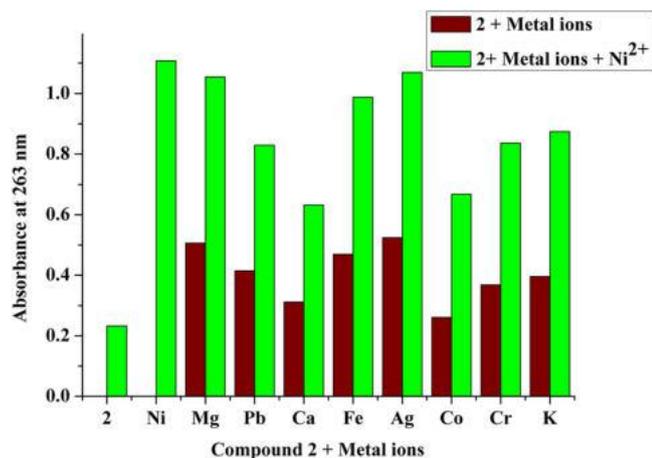
1 equivalent of oxadiazole derivative 2 in DMSO and  $\text{H}_2\text{O}$  solution (1:1, v/v), the absorption spectra of oxadiazole derivative 2 shift from 305 nm to shorter wavelengths at 263 nm with an increase in band intensity that was nearly identical for all metal salts. However, upon the addition of  $\text{Ni}^{2+}$  ions at the same concentration in oxadiazole derivative 2, a maximum increase in absorbance at 263 nm was observed, as shown in Figure 2. Based on the above results, we can propose that, among all the metal salts, the  $\text{Ni}^{2+}$  ions displayed a significantly better sensing ability with oxadiazole derivative 2.

### 3.2.3 | Competitive binding studies of $\text{Ni}^{2+}$

To validate the selectivity of  $\text{Ni}^{2+}$  ions for oxadiazole derivative 2, competitive binding studies were monitored for other tested metal salts ( $\text{Ca}^{2+}$ ,  $\text{Co}^{2+}$ ,  $\text{Cr}^{3+}$ ,  $\text{Ag}^+$ ,  $\text{Pb}^{2+}$ ,  $\text{Fe}^{3+}$ ,  $\text{K}^+$ , and  $\text{Mg}^{2+}$ ) using UV–vis spectroscopic measurements at 263 nm. The absorbance responses of derivative 2 ( $1 \times 10^{-5}$  M) in DMSO and  $\text{H}_2\text{O}$  solution (v/v, 1:1) with the occurrence of equivalent values of  $\text{Ni}^{2+}$  with other interacting metal ions are demonstrated in Figure 3. The results revealed that the enhanced absorbance values of  $\text{Ni}^{2+}$  were not considerably affected compared with other interacting metal cations during the detection of



**FIGURE 2** Absorption spectra of oxadiazole derivative 2 ( $1 \times 10^{-5}$  M) in DMSO and H<sub>2</sub>O solution (1:1, v/v) in the presence of different metal ions ( $1 \times 10^{-5}$  M)



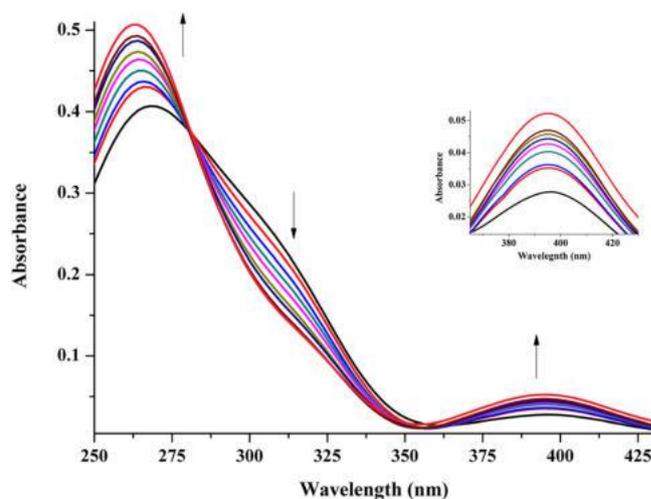
**FIGURE 3** Competitive binding of oxadiazole derivative 2 ( $1 \times 10^{-5}$  M) at 263 nm with the presence of an equivalent value of Ni<sup>2+</sup> ions and other interacting metal cations. The brown bars in the graph denote the addition of metal ions in the solution of oxadiazole derivative 2, whereas the green bars denote the Ni<sup>2+</sup> ions with oxadiazole derivative 2 in the presence of other interacting metal ions

Ni<sup>2+</sup>. These outcomes noticeably implied that derivative 2 displayed a high selectivity towards Ni<sup>2+</sup> ions compared with other competitive metal ions.<sup>[68]</sup>

### 3.2.4 | Concentration variation of Ni<sup>2+</sup> with oxadiazole derivative 2

#### Absorbance spectroscopic studies

The effect of concentration variation of Ni<sup>2+</sup> ions with oxadiazole derivative 2 was monitored using UV-vis spectroscopy and based on the change in absorption intensity after complexation with increasing concentrations of Ni<sup>2+</sup> ions (1.0–9.0 μM). With the successive



**FIGURE 4** Absorption spectrum of oxadiazole derivative 2 in DMSO and H<sub>2</sub>O solution (1:1, v/v) at different Ni<sup>2+</sup> ion concentrations (1.0–9.0 μM). The zoom view of the spectra in the region 365–430 nm is given in inset

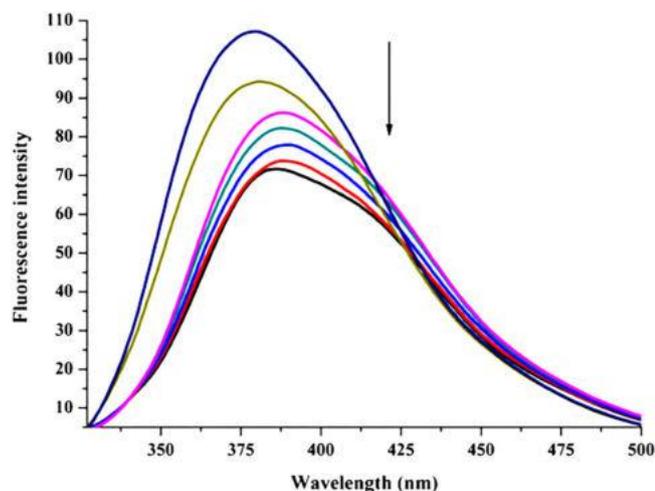
addition of Ni<sup>2+</sup> ions in a fixed amount of oxadiazole derivative 2, the absorbance at 305 and 263 nm progressively decreased and increased, respectively; a new isosbestic point at 280 nm represented the formation of a new complex between oxadiazole derivative 2 and Ni<sup>2+</sup> ions (Figure 4). The successive increase in absorption at ~263 nm occurred due to complexation between oxadiazole derivative 2 and Ni<sup>2+</sup> ions. Additionally, a new increased absorption band at 393 nm appeared with the successive addition of Ni<sup>2+</sup> ions to oxadiazole derivative 2.

#### Fluorescence spectroscopic measurement

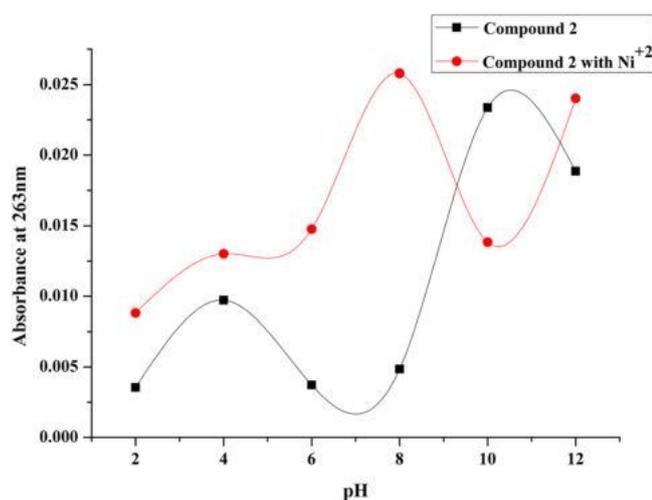
The sensitivity of oxadiazole derivative 2 in solutions of DMSO and H<sub>2</sub>O (1:1, v/v) towards Ni<sup>2+</sup> ions was further examined by fluorimetric titrations by the continuous addition of Ni<sup>2+</sup> ions (1.0–7.0 × 10<sup>-5</sup> M).<sup>[69]</sup> The emission spectrum of oxadiazole derivative 2 showed a representative peak at 375 nm ( $\lambda_{\text{max}} = 263$  nm). The fluorescence spectra of oxadiazole derivative 2 with successive additions of Ni<sup>2+</sup> ion are shown in Figure 5. We can see from Figure 5 that the fluorescence emission of oxadiazole derivative 2 showed a red shift of 10 nm that was observed at 375 nm with the decrease in fluorescence intensity and on increasing the concentration of Ni<sup>2+</sup> ions, and then becomes constant on further addition. Fluorescence quenching may occur due to the transfer of an electron between the Ni<sup>2+</sup> ion and the donor group present on the oxadiazole ring.

### 3.2.5 | Effect of pH

For detection of chemosensors, the effect of pH plays a significant role in that it shifts the absorption band and also changes the properties of the ligand at different pH values.<sup>[70]</sup> The influence of pH on the absorption spectra of oxadiazole derivative 2 with or without Ni<sup>2+</sup> metal ions was studied in the pH range 2.0–12.0 (Figure 6). The



**FIGURE 5** Fluorescence spectra of oxadiazole derivative 2 with increasing concentrations of  $\text{Ni}^{2+}$  ions ( $1.0\text{--}7.0 \times 10^{-5}$  M)



**FIGURE 6** Effect of pH of the oxadiazole derivative 2 at 263 nm in the absence or presence of  $\text{Ni}^{2+}$  ions

$\lambda_{\text{max}}$  of oxadiazole derivative 2 was observed at 263 nm at pH 10.0. After the addition of  $\text{Ni}^{2+}$  ions, oxadiazole derivative 2 showed a lower response to  $\text{Ni}^{2+}$  ions in absorbance values across a lower pH range due to protonation. At pH 7.5 it reached its maximum value, whereas at higher pH it decreased, which may be due to the fact that oxadiazole derivative 2 is less stability at higher pH values. This study indicated that oxadiazole derivative 2 might be appropriate for biological applications of  $\text{Ni}^{2+}$  ions at physiological pH 7.5.

### 3.2.6 | Validation of sensing mechanisms by spectroscopic studies and

#### FT-IR experimental studies

To further study the binding of derivative 2 with  $\text{Ni}^{2+}$  ions, the IR spectra were recorded of the oxadiazole derivative 2 +  $\text{Ni}^{2+}$  complex,

as represented in Figure S4. The FT-IR spectral studies confirmed complex formation between oxadiazole derivative 2 and  $\text{Ni}^{2+}$  ions. The IR spectra of the free oxadiazole derivative 2 presented a specific peak at  $3312\text{ cm}^{-1}$ , which was assigned to the primary amine ( $-\text{NH}_2$ ) attached to the oxadiazole ring, as shown in Figure S1. The corresponding FT-IR spectra of oxadiazole derivative 2 in the presence of  $\text{Ni}^{2+}$  ions exhibited a shift in the frequency of  $-\text{NH}_2$  and reappeared at  $3306\text{ cm}^{-1}$ , demonstrating the broadness of the peak (Figure S4).

#### Validation by $^1\text{H}$ NMR titration studies

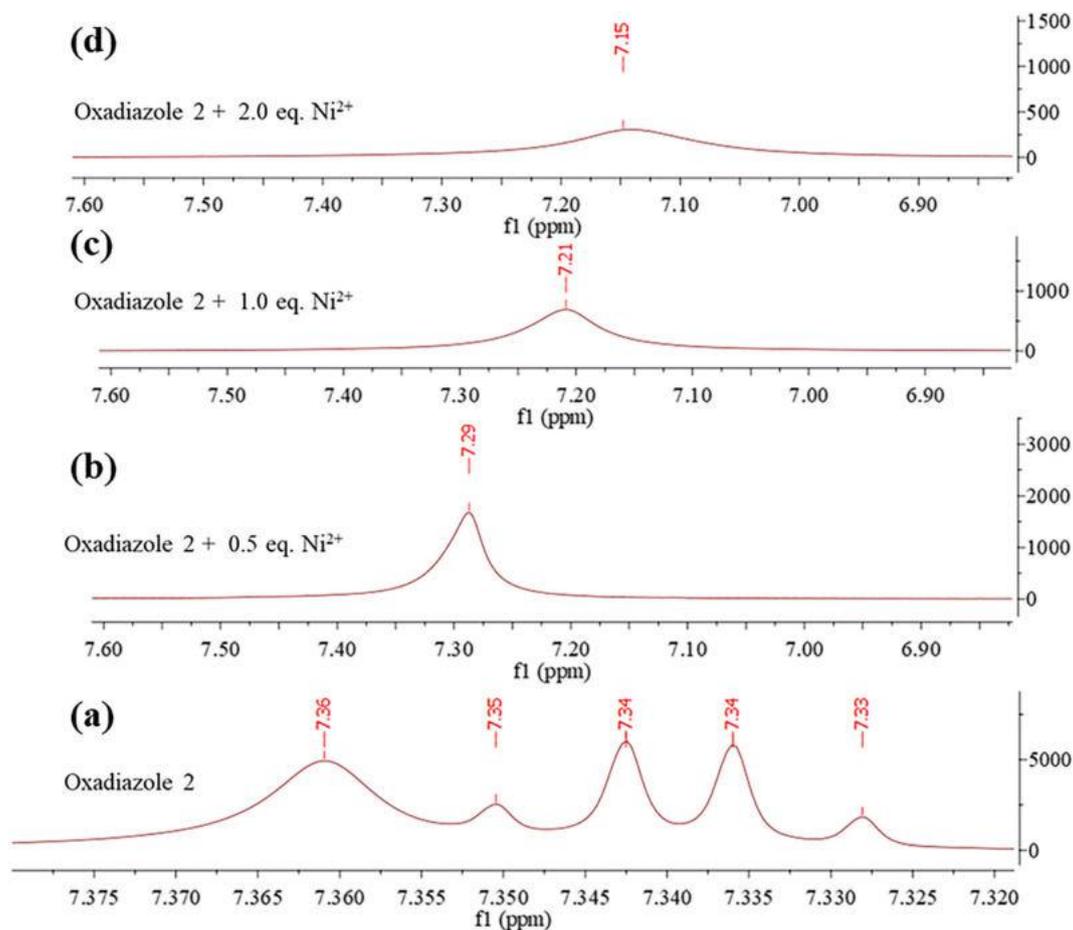
For further validation of the sensing mechanism of oxadiazole derivative 2 with  $\text{Ni}^{2+}$  cations, a  $^1\text{H}$  NMR titration was performed in  $\text{DMSO-}d_6$  with the addition of different equivalents (0, 0.5, 1.0, 2.0) of  $\text{Ni}^{2+}$  ions in oxadiazole derivative 2; this demonstrated the characteristic shift in peaks observed upon interaction with  $\text{Ni}^{2+}$  ions. From the results of  $^1\text{H}$  NMR titrations, it was seen that the signal at  $\delta$  7.36 ppm corresponded to  $-\text{NH}_2$  proton in free ligand oxadiazole 2 (Figure 7a) that disappeared after the addition of  $\text{Ni}^{2+}$  ions, as shown in Figure 7(b), and confirmed the interaction of nitrogen with the  $\text{Ni}^{2+}$  ions. In addition, the thiophene proton peaks had been changed to a greater extent.<sup>[71]</sup> The characteristic peaks of thiophene proton showed a doublet of doublet from  $\delta$  7.35–7.33 ppm in the absence of nickel ions (Figure 7a), whereas after the addition of 0.5, 1.0 and 2.0 equivalents of nickel, an upfield shift from  $\delta$  7.29 to 7.15 ppm was displayed, with a decrease in relative intensity (Figure 7b–d).

### 3.2.7 | Analysis by Job's plot method

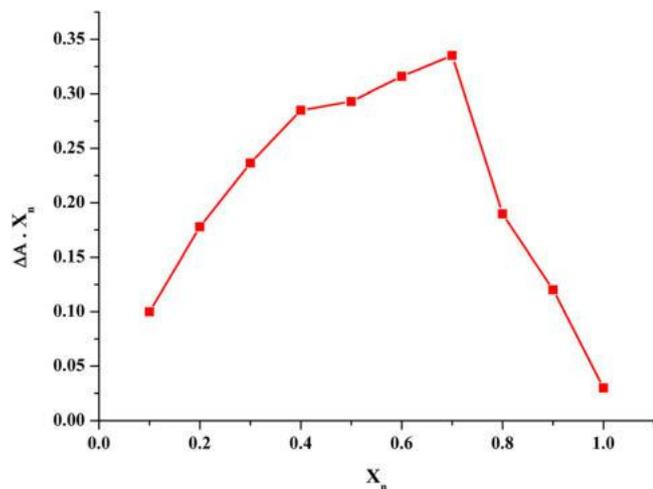
To verify the stoichiometric interaction of oxadiazole derivative 2 with  $\text{Ni}^{2+}$  ions, the absorption titration was assessed using the constant variation method and Job's plot.<sup>[72]</sup> The determination of stoichiometry ratio was observed by plotting  $\Delta A \cdot X_n$  vs  $X_n$  (where  $\Delta A$  = change of intensity of absorbance during titration at 263 and 305 nm and  $X_n$  is the mole fraction of  $\text{Ni}^{2+}$  ions) by the absorbance technique, which represented the maximum absorbance at molar ratio 0.7, as shown in Figure 8. The Job's plot measurement suggested that the oxadiazole derivative 2 and  $\text{Ni}^{2+}$  ions produced a newly formed species in a 2:1 stoichiometric ratio.

### 3.2.8 | Association/binding constant and LOD

The association constant and detection limit for the complex were determined from the absorption titration results. The calculated limit of detection was found to be  $9.4\text{ }\mu\text{M}$  using the following formula,  $\text{LOD} = 3\text{SD}/s$ , where  $\text{SD} = 0.004073$  and is the standard deviation of only oxadiazole derivative 2, and where  $s = 1288$  is the slope, calculated from the linear calibration curve between the absorbance of oxadiazole derivative 2 in the presence of  $\text{Ni}^{2+}$  cations (Figure S5). The association or binding constant ( $K_a$ ) of



**FIGURE 7** (a–d)  $^1\text{H}$  NMR spectra of oxadiazole 2 with 0, 0.5, 1.0 or 2.0 equivalent of  $\text{Ni}^{2+}$  ions in  $\text{DMSO}-d_6$



**FIGURE 8** Job's plot diagram of oxadiazole derivative 2 in the presence of  $\text{Ni}^{2+}$  ion (where  $X_n$  is the molar fraction of  $\text{Ni}^{2+}$  ion and  $\Delta A$  gives the value of the difference in absorbance at 263 and 305 nm)

oxadiazole derivative 2 with  $\text{Ni}^{2+}$  ion was obtained to be  $1.04 \times 10^5$  ( $R^2 = 0.9508$ ) using a Benesi-Hildebrand plot (Figure S6).

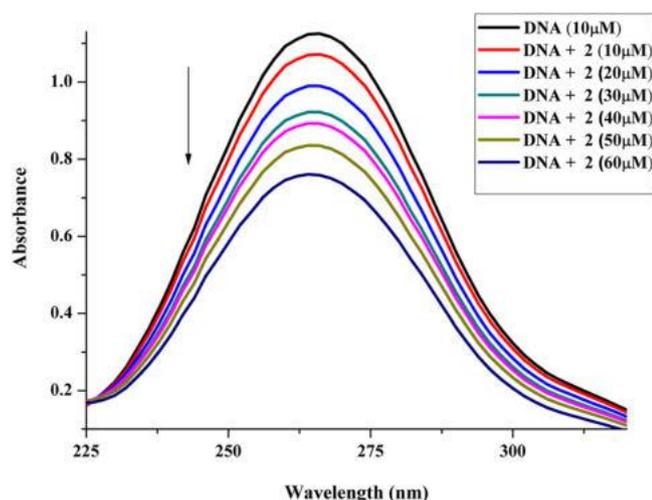
### 3.3 | DNA binding measurements

#### 3.3.1 | Electronic absorption titration

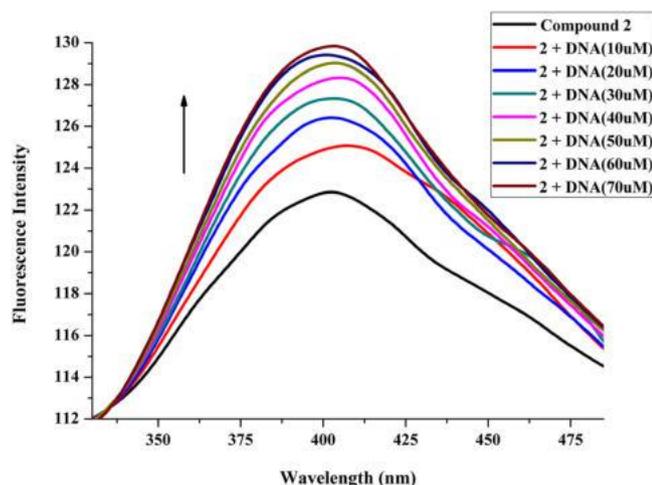
During DNA–drug interaction, some conformational changes occurred in CT DNA and this interaction has been investigated by UV–vis absorption spectroscopy. The stability of interaction was related to the change in absorbance value or the shift in the  $\lambda_{\text{max}}$  value. The hypochromic or hyperchromic shift revealed the capability of the interaction of drugs with CT DNA. A hypochromic shift or decreases in absorbance value represents the intercalative mode of binding, while the change in the secondary structure of DNA in presence of a drug occurs due to the electrostatic or groove interactions through hyperchromic shift. The absorption spectra in the presence of increasing amounts of oxadiazole derivative 2 with DNA are given in Figure 9. From the obtained spectra, as shown in Figure 9, we can see that a hypochromic shift was observed after the addition of oxadiazole derivative 2 in DNA; this revealed the intercalative mode of binding. From these data, we can estimate the intrinsic binding constant ( $K_b$ ) and Gibb's free energy ( $\Delta G$ ), which were obtained to be  $1.15 \times 10^4$  and  $-23.17$  kJ/mol, respectively (Figure S7).

### 3.3.2 | Fluorescence studies

The binding capacity of CT DNA with oxadiazole derivative 2 was further explored by emission titration in support of previous studies. The fluorescence spectra of oxadiazole derivative 2 are presented in Figure 10 and show the occurrence of increasing amounts of DNA (10–70  $\mu\text{M}$ ). From the obtained spectra, it can be seen that, on each addition of CT DNA, the fluorescence intensity increased regularly due to the intercalative mode of interaction. The increased emission intensity of oxadiazole derivative 2 with DNA might be due to the transfer of photoelectrons from the base pair guanine of CT DNA to the excited state of oxadiazole derivative 2. The emission data also supported the intercalative mode of binding for oxadiazole derivative 2 with DNA and these outcomes were related to electronic absorption titration and hydrodynamic studies. As shown in Figure 10, the



**FIGURE 9** UV-visible spectra of increasing amounts of oxadiazole derivative 2 ( $1.0\text{--}6.0 \times 10^{-5}$  M) in the presence of CT DNA ( $1 \times 10^{-5}$  M)



**FIGURE 10** Emission spectra of oxadiazole derivative 2 (100  $\mu\text{M}$ ) with increasing amounts of DNA (10–70  $\mu\text{M}$ )

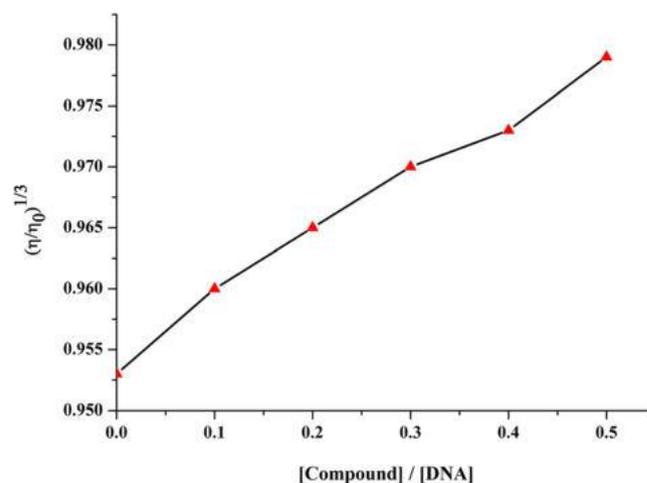
fluorescence intensity increased after increasing the amount of CT DNA in oxadiazole derivative 2; the binding constant ( $K_b$ ) was found to be  $1.22 \times 10^5$ , which was obtained by plotting the graph between  $\log(F_0 - F)/F$  vs  $\log[\text{DNA}]$  (Figure S8).

### 3.3.3 | Viscosity measurement

To study the DNA binding properties for interaction with the drug, viscometric measurements are another method that can be applied as they are a most important tool that reflects the investigation of sensitivity related to change in length of DNA. In intercalation binding, the distance between base pairs of DNA increased with adjustment of molecules, this resulted in the increased viscosity values after the addition of the compound. As illustrated in Figure 11, on the addition of different concentrations ( $0.1\text{--}0.5 \times 10^{-4}$  M) of test oxadiazole derivative 2 to the fixed concentration of CT DNA, a marked increase in viscosity was observed. The obtained results demonstrated that oxadiazole derivative 2 can intercalate in between the structure of base pairs of DNA, and this was why the viscosity increased; and this also showed similarity with conventional intercalators, as verified by absorption measurements.

### 3.3.4 | Circular dichroism studies

Circular dichroism is a very useful technique to monitor the conformational changes in the secondary structure of DNA. A negative band indicated  $\pi - \pi^*$  base stacking and a positive band was due to the helicity of B-DNA that appeared at 247 and 275 nm, respectively. Due to classical intercalators, the change in intensity of both positive and negative bands was due to the disruption in the base sequence of nucleotide, whereas little perturbation took place in small molecules due to electrostatic or groove binding. From Figure 12, it was observed that the ellipticity of both positive (plus) and negative



**FIGURE 11** Outcome of concentration variation of oxadiazole 2 ( $0.1\text{--}0.5 \times 10^{-4}$  M) with relative viscosity of CT DNA (10  $\mu\text{M}$ )

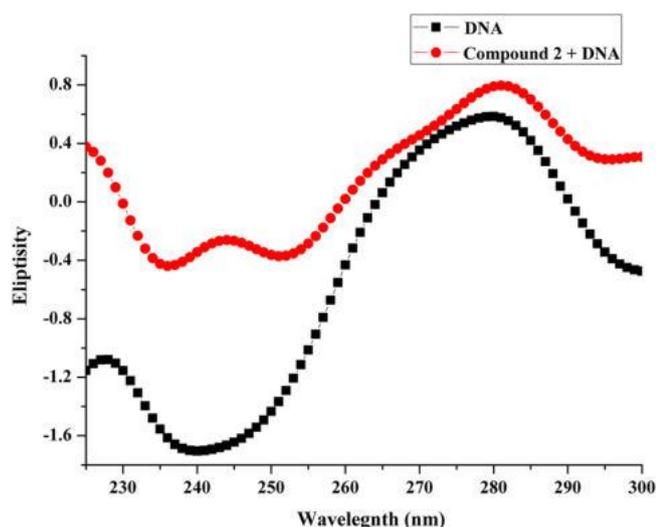
(minus) bands increased and shifted significantly as a result of the addition of oxadiazole derivative 2 to DNA (red) compared with blank DNA (black); this was an indication of changes in base pairs of DNA and also changes in the conformation during binding to oxadiazole derivative 2.

### 3.3.5 | Cyclic voltammogram

The cyclic voltammetric experiment was also supported by interaction ability between oxadiazole derivative 2 and DNA and provided further confirmation for the corroboration of the techniques described previously. Cyclic voltammetric measurements are based on the oxidation–reduction process. The change in peak potential and current produces the confirmation of binding between DNA and drug. Cyclic voltammograms of oxadiazole derivative 2 with or without DNA are shown in Figure S9. From the obtained results we can conclude that the decrease in current value might be attributed to the creation of drug–DNA complexes, because of the decrease in compound concentration.

### 3.3.6 | Time-resolved emission study

The emission decay of oxadiazole derivative 2 in the presence or absence of CT DNA was confirmed through lifetime measurements. The change in lifetime distributions was recorded based on average fluorescence decay in oxadiazole derivative 2 with or without CT



**FIGURE 12** Circular dichroism spectra of CT DNA (black) and of oxadiazole derivative 2 plus CT DNA (red)

**TABLE 2** Time-resolved emission results of oxadiazole derivative 2 with and without CT DNA

Compound	$\alpha_1$	$\alpha_2$	$\alpha_3$	$\tau_1$	$\tau_2$	$\tau_3$	$\langle \tau \rangle$	$\chi^2$
2	0.82	0.0023	0.180	0.074	3.909	1.477	0.32	1.02
2-DNA	0.60	0.0013	0.389	0.127	4.845	1.425	0.63	1.08

DNA, as presented in Table 2. The lifetimes  $\tau_1$ ,  $\tau_2$ , and  $\tau_3$  for oxadiazole derivative 2 without CT DNA were observed to be 0.074, 3.909, and 1.477 nsec, respectively. However, DNA addition to oxadiazole derivative 2 produced a considerable change in all three lifetime values. The decrease in pre-exponential factor  $\alpha_1$  was from 82% to 60%, whereas an  $\alpha_3$  increase from 18% to 38% was observed. Therefore, these changes confirmed that structural modifications occurred after binding of oxadiazole derivative 2 to CT DNA, with gradual increases in the magnitude of the shorter lifetime, whereas the relative amplitude of the longer lifetime values decreased.

### 3.4 | Molecular docking study

Molecular docking was performed to detect the best binding sites between synthesized compound oxadiazole 2 and the active site of 1BNA for the calculation of binding score (−6.5 kcal/mol). After analysis of all the obtained binding energy along with superimposition of the compound with 1BNA, the finest orientation was selected for our docked ligands (Figure 13). The oxadiazole derivative 2 showed a higher binding affinity with −6.5 kcal/mol energy, which pointed out that it gave good results for 1BNA. The docking result of oxadiazole derivative 2 with 1BNA provides the information for hydrophobic interaction, Pi-sulphur bond, hydrogen bonding, energy value, etc. The molecular docking effects clearly described that there was an intercalative mode of binding between the drug and 1BNA.

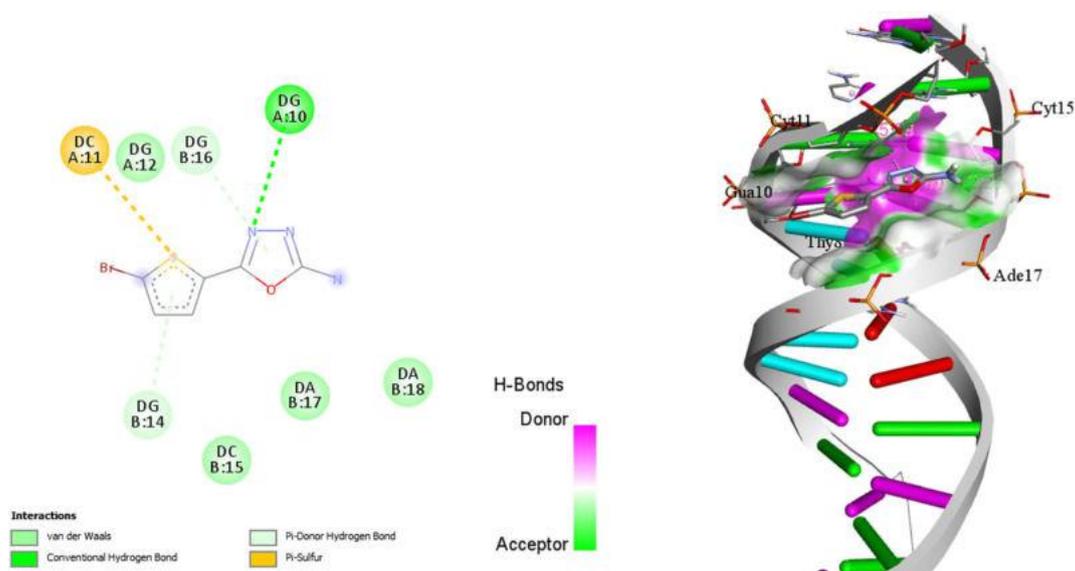
### 3.5 | Pharmacokinetics properties

To find out the molecular properties and Lipinski rule of five for oxadiazole derivative 2, the Mol Inspiration Chemo Informatics online software was used. By the Lipinski 'Rule of five', oxadiazole derivative 2 exhibited good membrane permeability,  $\log P = 2.13 (\leq 5)$ , number of hydrogen bond acceptors = 4 ( $< 10$ ), molecular weight = 246.09 ( $\leq 500$ ), and number of hydrogen bond donors = 2 ( $\leq 5$ ). The calculated pharmacokinetic properties of oxadiazole derivative 2 showed no violation of the Lipinski rule and all the properties were in the considered range shown in Table S1 (in Supplementary Information).

### 3.6 | Antifungal activity

#### 3.6.1 | Disc diffusion analysis

The inhibitory efficiency of tested oxadiazole derivative 2 towards fungal growth was studied against three *Candida* species, *C. albicans* ATCC 90028, *C. glabrata* ATCC90030, and *C. tropicalis*



**FIGURE 13** Molecular docked model of oxadiazole derivative 2 with 1BNA

**TABLE 3** *In vitro* susceptibility of test compound oxadiazole derivative 2 against *Candida albicans*, *Candida glabrata*, and *Candida tropicalis* strains. Fluconazole was used as a positive control. The MIC of FLC (positive control) was 10  $\mu\text{g/ml}$  and gave a zone of inhibition of 20 mm

Compound	MIC ( $\mu\text{g/ml}$ )			Zone of inhibition (mm)		
	<i>C. albicans</i> ATCC 90028	<i>C. glabrata</i> ATCC 90030	<i>C. tropicalis</i> ATCC 750	<i>C. albicans</i>	<i>C. glabrata</i>	<i>C. tropicalis</i>
2	600	500	600	MIC/2 9 MIC 9 2MIC 10	MIC/2 9 MIC 10 2MIC 11	MIC/2 9 MIC 10 2MIC 11

ATCC750, and illustrated in terms of MIC and agar disc diffusion. The tested strains were fluconazole (FLC) susceptible with a 10  $\mu\text{g/ml}$  MIC value and gave a ZOI value of 20 mm. The antifungal efficacy of test oxadiazole derivative 2 using agar disc diffusion was measured at the MIC, sub-MIC, and 2MIC concentrations given in Table 3 and depicted in Figure S10. The tested oxadiazole derivative 2 exhibited antifungal activity against *Candida* strains with a MIC value of 500–600  $\mu\text{g/ml}$ . The ZOI value was obtained in the range 9–11 mm.

### 3.7 | Antioxidant assay

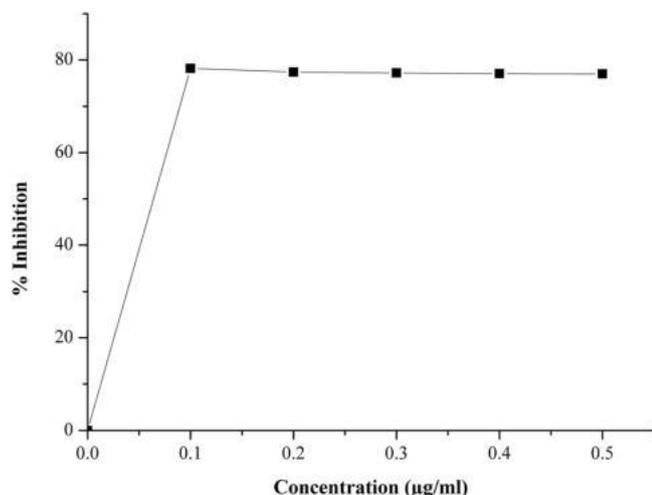
#### 3.7.1 | DPPH scavenging activity

Radical scavenging activity of the synthesized compound against violet-coloured free radical 2,2-diphenyl-1-picrylhydrazyl (DPPH) is the most common spectrophotometric procedure due to high sensitivity, ease of use, and fast analysis of many samples at one time. After incubating the mixture of DPPH and oxadiazole derivative 2 for  $\sim 90$  min, a colour change was observed from purple to yellow and a

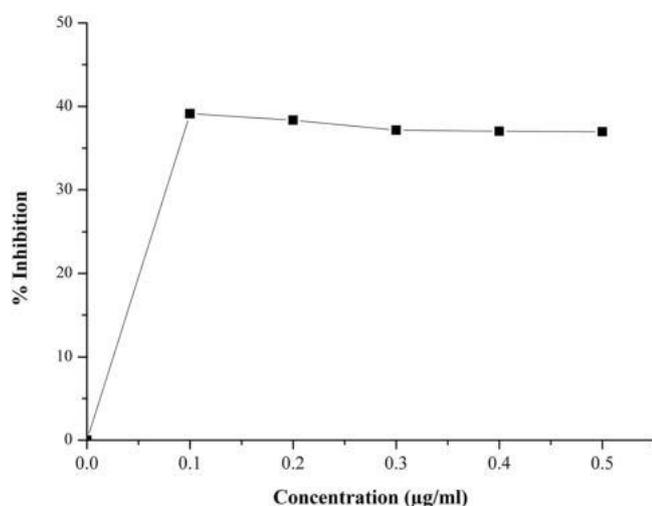
decrease was also noted in the absorbance value at 517 nm using UV spectroscopy that showed the existence of an antioxidant moiety in oxadiazole derivative 2. From the graph of percentage absorbance vs concentration we could calculate the  $\text{IC}_{50}$  value that refers to the proficiency of oxadiazole derivative 2 to scavenge 50% free radical DPPH activity, as presented in Figure 14. The calculated  $\text{IC}_{50}$  value for oxadiazole derivative 2 against DPPH was found to be  $0.11 \pm 0.0008$ , which indicated that oxadiazole derivative 2 had effective scavenging antioxidant activity.

#### 3.7.2 | Hydrogen peroxide assay

The capability of oxadiazole derivative 2 to scavenge hydrogen peroxide was also estimated. Hydrogen peroxide is a reactive oxygen species and also has strong oxidizing properties. The scavenging capability of test oxadiazole derivative 2 against hydrogen peroxide was obtained using an absorbance value at 236 nm and a UV-vis light spectrophotometer. From the obtained data, a graph was plotted for percentage absorbance vs concentration to calculate the hydrogen peroxide percentage scavenging activity, as shown in Figure 15. The



**FIGURE 14** DPPH radical scavenging activity of oxadiazole derivative 2



**FIGURE 15** Hydrogen peroxide assay of oxadiazole derivative 2

IC<sub>50</sub> value of oxadiazole derivative 2 for H<sub>2</sub>O<sub>2</sub> free radical scavenging activity was found to be 0.62 ± 0.006.

## 4 | CONCLUSION

A new oxadiazole-based chemosensor was synthesized and characterized using various spectroscopic studies. The relative absorption maxima was dependent on the polarity of the solvents, suggesting that oxadiazole derivative 2 had the capacity for use as a solvent polar sensor. Oxadiazole derivative 2 showed selective detection for Ni<sup>2+</sup> ions compared with other competitive metal cations, as confirmed by UV-vis light and emission spectroscopy. The LOD and association constant of oxadiazole derivative 2 for Ni<sup>2+</sup> ions were found to be 9.4 µM and 1.04 × 10<sup>5</sup>, respectively. The influence of pH on the absorption spectra of oxadiazole derivative 2 with Ni<sup>2+</sup> metal ions

was also studied and the binding stoichiometry obtained was a 2:1 ratio. The intercalative mode of interaction of oxadiazole derivative 2 for calf thymus DNA was examined using various DNA binding studies; the binding score was found to be -6.5 kcal/mol using molecular docking studies. In addition, antifungal activity against *Candida* strains and antioxidant scavenging properties against DPPH and H<sub>2</sub>O<sub>2</sub> free radicals of oxadiazole derivative 2 were also examined.

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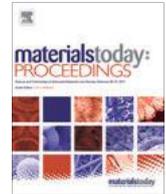
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## Use of coir fiber and analysis of geotechnical properties of soil

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## ABSTRACT

This paper presents the study on the construction of pavement layers to be spread over subgrade soil starts with the calculation of the power of the subgrade and the traffic volume to be transported. The design of the different pavement layers depends very much on the strength of the sub-grade soil they are to be laid over. The power of a subgrade is expressed mainly in terms of CBR (California Bearing Ratio). Weaker sub-grade essentially needs thicker layers when stronger sub-grade works along with thinner layers of pavement. Normally CBR testing is a simple and well accepted process conducted on soil samples to determine subgrade intensity. For an engineer to understand the exact CBR strength of the sub-grade strength becomes absolutely essential. However, several other measurements are also taken into account for determining the power of the subgrade.

The use of waste material and natural fibers to boost soil quality is beneficial, because they are inexpensive, accessible locally and Ecological. The stabilizing effect of Natural Fiber (coconut coir) on soil properties was observed in this research. On the last the use of surplus material and fiber has seen a huge growth over the decade. Hence, an attempt has been made in this analysis to test the rise in subgrade intensity by supplying Coir Fiber in different layers. In this CBR study, different variations of parent sub-grade soil with Coir Fiber were performed. From the laboratory study it was observed that coir fiber's overall efficiency is higher. The CBR value of the parent subgrade soil was also found to increase as the number of coir fiber layers increased.

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## 1. Introduction

Soil is the vital component of this ecosystem and all the necessities of life such as milk, household and clothes are provided by the soil. Soil functions include biomass transformations (productivity), water partitioning and reservoirs [1]. Black Cotton soils have high swelling potential and are one of India's main soil deposits as a result of the increase in moisture content [2]. India's wide geographical area is (3,287,264 km<sup>2</sup>) and India's population is (138 million approx.) demanding the massive road system. Soil is inexpensive construction material and readily usable. Road building enforces heavy pressure on constrained capital such as suitable soil, stone aggregates, and binders, etc. Soil stabilization is the production that increases soil's physical properties, such as shear strength, bearing potential and can be achieved by using controlled compaction or deposition of suitable admixtures such as cement, lime, clay, fly ash or by providing geotextiles, geosynthetics etc.

[3] Soil stabilization is a common method used by engineers and designers to enhance the properties of soil with different stabilizers. Engineers are continually faced with sustaining and improving facilities for pavements with minimal financial capital. Outmoded concrete planning and maintenance methods allow high-quality material for building requirements to be self-actualized. Premium content is not usable in certain parts of the world or is short of quantity. Because of these constraints, engineers are often forced to seek alternative designs using deficient materials, commercial building aids and advanced design practices. Concrete or tarmac paving cannot be constructed on poor soil, since it can easily be broken on hard soil pavements. The layer should have an appropriate load-carrying capacity as underneath the sub-grade pavement. This will have to replace the whole pavement segment and to be correct, the condition of the embankment affected by lack of strength or uniformity. The embankment must be built as solid, durable, uniform and cost-efficient as possible. The most econom-

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ical embankment is the one that maintains its life cycle by using modern technologies to help ensure sufficient strength, rigidity and uniformity.

Earlier fibers were used in soil strengthening process. Although the devices were not completely expected, roots of plants and straws were used to cob walls and render soil brick to improve the property. In the other hand, modern geotechnical engineering has mastered the use of strengthening the soil with isolated fibers which in geotechnical projects is still a comparatively recent technique.

Coir fiber is available at large scale in India which have very good property as pavement material having light weight, have ability to increase subgrade strength and can increase the life span of pavement compared to traditional method of pavement construction.

Coir fiber is part of a category of stable simple fibers [4]. It is a viable essential commodity obtained from coconut coating [5]. The coir fiber is stretchy enough to fold without breaking, and clenches a curl as though it were fluttering eternally. Soil coir fiber can be used as defective material in the stabilization cycle due to its spiral and long spike fibers [6]. The short cushion fibers were removed from the long fibers and later became waste in the coir fiber industry and this fiber waste is used in soil stabilization and can thus be disposed of efficiently. The application of fibers has had a major impact on soil and coir mixture development behavior. Reducing consolidation of clay soil settlement is caused by the addition of unsystematically distributed polypropylene fibers [7]. Because of the length of the fibers which imparts an insignificant effect on the soil characteristics, fiber content proved to be more influential and effective. Fiber inclusion results in plasticity decrease and hydraulic conductivity increase. This research has following objectives:

- To estimate the CBR strength of parent subgrade soil by placing one or more layers of coconut coir fiber at different depths.
- To understand the efficiency of coir fibre as pavement material.
- To obtain the most efficient depth for placement of coconut coir fiber.

## 2. Materials & methods

The entire research is performed in the Geotech Lab of the Lingaya's Vidyapeeth on subgrade soil, i.e. an analysis of the CBR content of subgrade soil by various layers of coconut coir fiber at different stages. Experiments have been performed to classify various soil properties, such as Index Properties i.e. Liquid Limit, Fluid Limit, Plasticity Index & specific Gravity [8]. Later on, heavy compaction experiments were accompanied to determine the optimum moisture level and the resulting overall dry pressure. The CBR experiments were then performed on a particular mixture of coconut coir fiber.

### 2.1. Material used

Subgrade Soil and coconut coir fiber are mainly used for experimental investigations [9]. Properties listed below:

#### A. Subgrade Soil

The subgrade soil used in the laboratory for analysis is obtained from the roadside of Lingaya's Vidyapeeth, Faridabad. The engineering properties of subgrade soil are going to be calculated in the laboratory in compliance with the Indian Standard Code IS 2720.

#### B. Coconut Coir Fiber (Fig. 1)



Fig. 1. Coconut Coir Fiber.

Coir is obtained from locally available coconut shells that are washed. Brown colored Coir fibers derived from coconut husks are seen in Fig. The fabrics are strong and durable. The fiber content used in this experiment is of 0%, 0.25%, 0.50%, 0.75% and 1% of 20 mm and added in discrete manner. Physical & Chemical properties of Coir Fiber is given in Table 1 & Table 2.

## 3. Experimental program

[11] CBR is the percentage of force per unit area needed to penetrate a soil mass with a standard 50 mm diameter circular plunger at a rate of 1.25 mm/min to that necessary for the equivalent penetration into a standard material. Typically, the ratio is calculated for the 2.5- and 5-mm penetration. If the ratio at 5 mm is consistently higher than at 2.5 mm, then the ratio at 5 mm is issued. The table below shows the standard loads adopted for the standard material with a C.B.R. value of 100% for different penetrations.

### 3.1. Preparation of test specimen

Remoulded specimen: The test sample should pass IS sieve of 19 mm and be held on IS sieve of 4.75 mm. For a remoulding the dry density shall be either the field density or the amount of the average dry density determined by the compaction test (Heavy Compaction Test as per IS 2720 (Part-8)-1983, for Railway Formation [12]). If the case might be, the water content used for compaction must be the optimal water quality or the field humidity. Complex compaction: A typical soil sample weighing around 4.5 kg or more for fine-grained soil and 5.5 kg or more for granular soil should be collected and thoroughly mixed with water. When the soil is to be compacted to the highest dry density at the optimum moisture content, the exact mass of the soil required shall be taken and the necessary quantity of water applied so that the soil sample water content is equal to the optimum moisture content calculated. The extension collar and base plate are attached to the mold. The spacer disk is placed over the base. Filter paper is placed on the spacer disk. Add Lubricating Oil to the mold inside. Through gentle compaction seal the soil mix in the mold. That is to say, compress the soil by 2.60 kg rammer in 3 layers of 55 blows to each layer. Then add the reinforcing material i.e. coconut coir fiber according to various variations in between different layers.

Table 1  
Chemical Properties of Coir Fiber [10].

Chemical Properties	Composition
Lignin	45.84%
Cellulose	43.44%
Hemi-cellulose	00.25%
Pectin's Related Compound	03.33%
Water Soluble	05.25%
Ash	02.22%

**Table 2**  
Physical Properties of Coir Fiber [10].

Physical Properties	Value
Length in inches	6–8
Density (g/cc)	1.40
Tenacity (g/Text)	10.0
Breaking Elongation %	30
Diameter in mm	0.1 to 1.5
The rigidity of Modulus (dyne/cm <sup>2</sup> )	1.8924
Swelling in Water (Diameter)	5%
Moisture at 65% RH	10.50

Remove the extension collar and carefully trim the compacted soil, using a straight edge, to the top of the mold. Any holes formed by removal of the coarse material on the surface of the compacted soil shall be filled with the substance of smaller size. Remove the perforated base plate, Spacer disk, and filter paper and record mold mass and compressed soil specimen. Place a filter paper into the mold over the specimen. Place annular weights at the nearest 5.0 kg to create a surcharge proportional to the base material weight and pavement.

### 3.2. Various combinations of subgrade soil with coir fiber

**Table 3**

## 4. Results and discussion

### 4.1. General

This study's key objective was to reduce the pavement thickness and increasing the efficiency of pavement systems by using coir fiber as reinforcement material. We are conducting a laboratory investigation on the parent subgrade soil to achieve this objective. In the initial stage of the laboratory analysis, we examine the index properties of parent subgrade soil (liquid limit, plastic limit, plasticity index, specific gravity, etc.). We measured the CBR value of parent subgrade soil without reinforcement after the initial analysis, and then analyzed the efficiency of parent subgrade soil by supplying coir fiber at various heights and combinations. The property of soil is given in Table 4 & the test result without reinforcement on parent soil is given in Table 5. The CBR method was used to compare the efficiency of soil strengthened with subgrade parent soil whose data is given in Table 6.

### 4.2. Properties of parent subgrade soil

**Table 3**  
Various combination of parent subgrade with coir fiber.

S. No.	Combination	No. of Layer	Fiber Content %
1.	CBR Test without Reinforcement	–	0
2.	Soil with coir fiber at a Depth of 42.43 mm (H/3) from Top.	01	0.25
3.	Soil with coir fiber in the Middle of mold specimen i.e., 63.65 mm (H/2) from Bottom.	01	0.50
4.	Soil with coir fiber at a Height of 42.43 mm (H/3) from Bottom.	01	0.75
5.	Soil with coir fiber at a Height of 42.43 mm (H/2) from Bottom & at a Depth 42.43 mm (h/2) from Top.	02	01

**Table 4**  
Index Property.

Index Property	Experimental Value
Liquid Limit	53.29%
Plastic Limit	34.01%
Plasticity Index	20.1%
Specific Gravity	2.6
Optimum Moisture Content	%

### 4.3. Result of CBR test

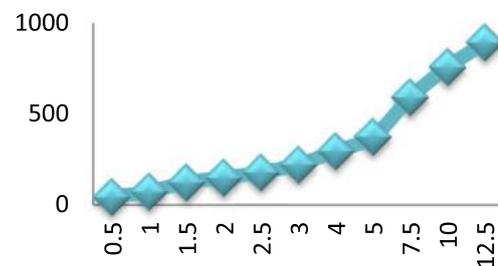
Test-01 CBR Test on parent soil, without reinforcement. The CBR test result is depicted in Table 5.

**Table 5**  
Test without Reinforcement on Parent soil.

Test Report			
CALIFORNIA BEARING RATIO (CBR) TEST (IS: 2720 PART 16/ASTM 1883-99)			
OMC	17.5%		
MOISTURE CONTENT		DRY DENSITY	
Container #	08	Wt. of the Mould (g)	3884
Wt. of Container (g)	25	Wt. of the Mould + Compacted Soil (g)	8352
Wt. of Container + Wet Soil (g)	85	Volume of Mould	2283.30
Wt. of Container + Dry Soil (g)	73	Bulk Unit Wt. (g/cc)	1.956
Moisture Content (%)	25	Dry Unit Wt. (g/cc)	1.621

### 4.4. Graphs of tests & results

- This test was performed on non-reinforced parent soil with 0% coir fibre and the CBR value at 2.50 mm was 13.026% and 18.267% at 5.00 mm (Fig. 2).
- This test was conducted on 0.25% "Coir fibre" parent subgrade soil in 01 layer at a depth of 42.43 mm (H/3) from the surface and 2.50 mm CBR value was 18.686% and 23.538% at 5.00 mm (Fig. 3).
- This test was conducted on 0.50% "Coir Fibre" parent subgrade soil in 01 layer supported in the centre (H/2) of the mould specimen, i.e. 63.65 mm from the bottom and 2.50 mm CBR was 10.690% and 14.074% at 5.00 mm (Fig. 4).
- This test was conducted on 0.75% "Coir Fibre" parent subgrade soil in 01 layer at a height of 42.43 mm (H/3) from the bottom and CBR at 2.50 mm was 8.534% and 11.379% at 5.00 mm (Fig. 5).
- This test was Conducted on parent subgrade soil with 1% "Coir Fibre" in 02 layer at a height of 42.43 mm (H/3) from the bottom and a depth of 42.43 mm (H/3) from the top and CBR at 2.50 mm was 16.171% and 20.034% at 5.00 mm (Fig. 6).

**Fig. 2.** CBR test without reinforcement.

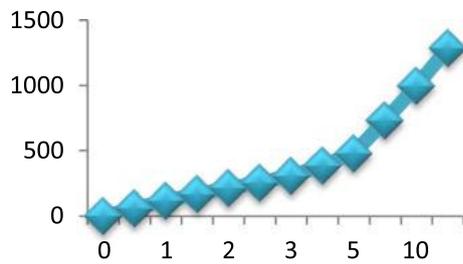


Fig. 3. Soil with 0.25% "Coir Fiber" in O1 Layer at a depth of 42.43 mm (H/3) from top.

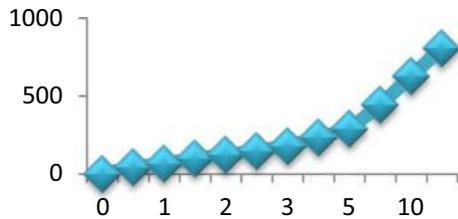


Fig. 4. Soil with 0.50% "Coir Fiber" in O1 layer provided in the middle (H/2) of mold specimen i.e., 63.65 mm from bottom.

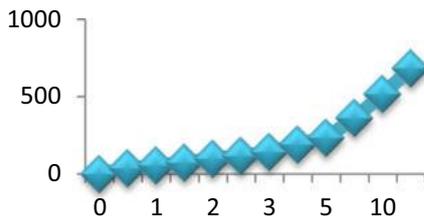


Fig. 5. Soil with 0.75% "Coir Fibre" in O1 layer at a height of 42.43 mm (H/3) from bottom.

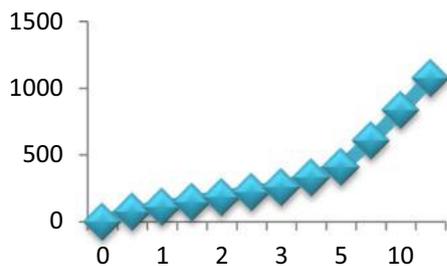


Fig. 6. Soil with 1% "Coir Fibre" in O2 layers at a height of 42.43 mm (H/3) from bottom & at a depth of 42.43 mm (H/3) from top.

Result indicates Coir Fibre's average efficiency was higher. Reinforcement at depth (H/3) from top and (H/2) from top with coir fibre gives better output. Further it was found that the Coir Fibre efficiency improves as we increase the number of layers of reinforcement, because the more layer of reinforcement, there is better binding with subgrade which helps subgrade to gain better strength.

Table 6  
CBR Test Data.

CBR TEST DATA			
CBR TEST NUMBER	01	FIBER CONTENT (%)	0%
TYPE OF CBR TEST	CBR test without reinforcement		
SURCHARGE WEIGHT(Kg)	05	PENETRATION RATE	1.25 mm/min
WEIGHT OF ORIGINAL SAMPLE (Kg)	5.5	PROVING RING CONSTANT (Kg/Div.)	6.154
Penetration (mm)	Observed unit of Dial Gauge	Proving Ring Reading (unitx5) (Div.)	Load in (Kg)
00	00	00	00
0.5	1.3	07	43.078
01	2.4	11.7	72.0018
1.5	3.9	20	123.08
02	4.7	24	147.696
2.5	5.6	29	178.466
03	08	36	221.544
04	9.5	48	295.392
05	13	61	375.395
7.5	20	96	590.784
10	24.6	123	756.942
12.5	29	145	892.33
CBR OF SPECIMEN AT 2.50 mm (STANDER 1370 KG) BY GRAPH			13.026%
CBR OF SPECIMEN AT 5.00 mm (STANDER 2055 KG) BY GRAPH			

5. Conclusions

After the results, this research was concluded as followed with justifying the objective achievements:

- When Coir Fiber's number of layers increased, it was found that the parent subgrade soil's CBR value was increased which is our first objective.
- Coir fiber is a surplus material that can be used for lightweight and solid pavements in a sub-base.
- Coir Fiber is used to increase the subgrade Strength and therefore enhances the life of the pavement, which is our second objective.
- It has been observed that better performance is given when we provide Coir Fiber at height (H/3) from the bottom, which is our third objective.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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# Detection of Android Malware App through Feature Extraction and Classification of Android Image

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**Abstract**—Android apps have security risks due to rapid development in android devices. In the Android ecosystem, there are many challenges to detecting Android malware. Traditional techniques such as static, dynamic, and hybrid approach, most of the existing approaches require a high rate of human intervention to detect Android malware. Most of the current techniques have the most significant security challenges to detect Android malware, the inspection of Android Package Kit(APK) file structures, increased complexity, high processing power, more storage space, and much human intervention. This paper proposed Machine Learning(ML)based algorithms to detect Android malware apps through feature extraction and classification of grayscale images. In our proposed approach, convert most of the files of APK such multiDex, resources, certificate, and manifest transform into a grayscale image, using the image algorithm to extract the local feature of the image. In the paper used different ML models to classify the local features with the help of multiple images of malware families. This approach deals with the obfuscation attack. It can hide in any files of APK. The proposed approach enhanced accuracy reached up to 96.86%, and computation time did not increase more than the existing techniques. The quality of that proposed worked; it has a high classification accuracy and less complexity validation loss.

**Keywords**—Android malware; obfuscation attack machine learning; android application package (APK); android malware app; grayscale images

## I. INTRODUCTION

Android operating system (OS) is the most popular OS in the smart device ecosystem. Due to intelligence devices, every android user is very close to and dependent on Android Application Package (APK). In the present scenario, the android users sharing sensitive information, banking operation, e-shopping, locations information, the identity of the users, and privacy of data are also involved. In Android, device security is the biggest challenge and severe issue. A survey report of GDATA in 2019 [1] showed that 1,852,170 Android malware samples were detected in the first half of 2019. Here, data showed an android malware is detected every 8 seconds. The statistical report represents eight mobile infected by malicious out of ten Android devices [2]. One more research report, Google detected 86% of the total Android devices market in 2017. The most popular GlobalStats website showed that 73% of Android-based devices counted sales of total devices of Android in 2019 [3]. Due to the popularity of Android

devices, Android app becomes more targeting apps compared to other kinds of apps. As per one evolution report of mobile malware, 5,321,142 apps were installed on devices, 151,359 mobile apps were detected as Trojans, 60,176 were detected as mobile ransomware by Kaspersky 2018 [4].

Android users threaten by different types of malware families; some are distributed by Google Play stores, some type apps such as downloader, banker, and hidden ads [5]. Most of the extensive attacks pointing the Android OS. The hackers mainly focused on attacking games, banking, academics, e-shopping domain. However, this domain published many malicious apps, which have gaps between the app development and the number of works. Third-party stores have untrusted apps; most gaming apps have adware due to the repackaging technique [6]; with the help of repackaging tools, reassemble the original app and add the malicious code with the original code and then assemble again, upload on third party store. Here, the main challenging task to identify malicious apps is the most severe issue. Most existing techniques are static and dynamic; most techniques used behavior and signature base to identify the android malware.

Static techniques do not require running apps; they disassemble the code and extract the feature of apps to identify. The dynamic approach always needs to run the application and identify the android malware through behavior and signature base. These techniques have significant drawbacks; it requires more computing power, resources, and space [7]. The dynamic analysis was evaded by some powerful and intelligent malware [8]. Moreover, existing dynamic and static techniques used the manual intervention of humans. It also needs domain expertise to identify reverse engineering [9]. The existing approach used single classes.dex file, but in the current scenario, we have multiclass files, or multiDex files [10], which have not been converted into a grayscale image to detect malware.

Our proposed work takes care of all essential files such as multiDex (MD), resources.ARSC(RS), Manifest.xml(MX), and certificate (CR) files of APK to detect Android malware. The existing approaches need human intervention to separate the dex, manifest.xml resource.ARSC(RS) and certificate files convert into the grayscale image [11-12].

**META-INF:** This file very essential in Android apps, which the information about the signature and information

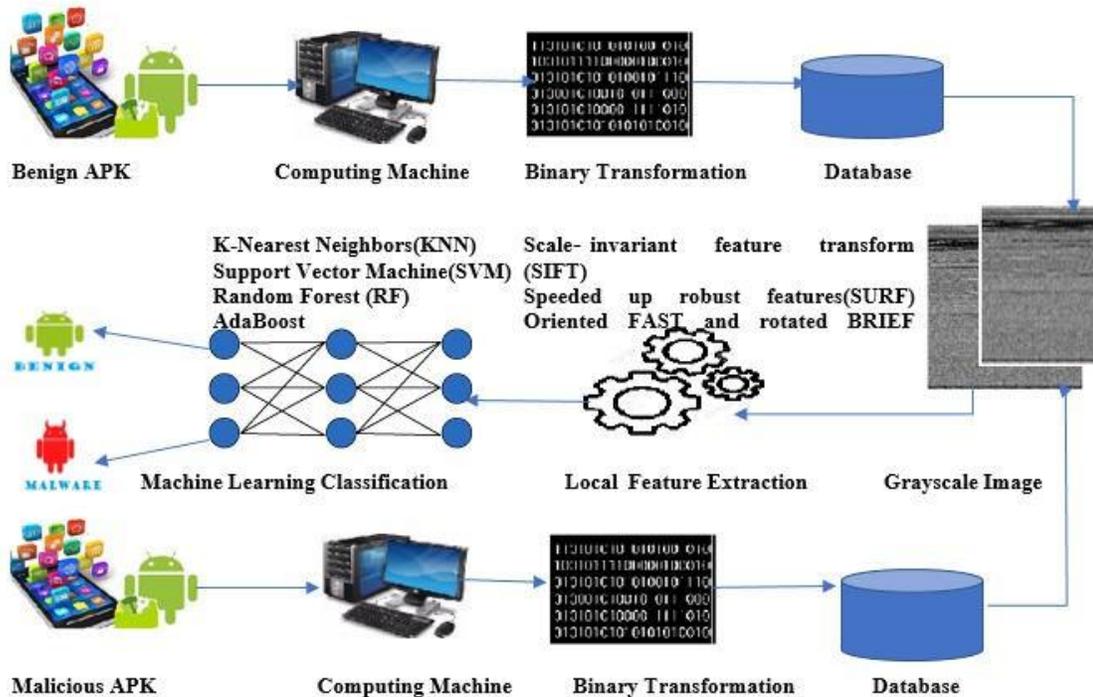


Fig. 1. Proposed Methodology to Detect the Android Malware

about the resource list.

**Lib:** lib file is used to run the specific device architectures of the native library, such as armeabi-v7a and x86.

**Res:** to Keep the resources such as images. Which is not compiled with resources.arsc

Assets: Raw information about resources

**AndroidManifest.xml:** Meta information about the apps such as version, content, and name of APK files.

**Multiple classes.dex:** Main and necessary file of apps, which run java class methods on the devices.

**Resources.arsc:** Compiled all resources on the devices which is used by the apps.

Android apps development using java.class files. By the DX tools convert multiple java.class into the DEX files. DEX and manifest are essential files in APK, and DEX consists of the data structure; the interpreter used the different data types that belong to the data structure. All static reverse engineering tools used the DEX files to reassemble the apps for reengineering. Multiple methods are proposed to protect the DEX files. Our Proposed approach does not require any human intervention, does not require separate files, and does not need reverse engineering to find different types of files. Our proposed approach takes less computation power to detect the android malware because it takes less time complexity because it worked without any reverse engineering operation. Our proposed approach used DEBIAN and AMD datasets containing 10560 apps (5000 benign and 5560 malicious apps). The grayscale image datasets, each containing 10560 samples (5000, 5560 benign, malicious samples, respectively), were constructed based on diverse files from the contents of the APK

collections. Firstly, all the benign and malicious APK convert into Grayscale images, a block diagram depicted in Fig. 2. Secondly, extract the local features from images using image-based feature extraction techniques such as SIFT, SURF, and ORB. Thirdly, apply the BOVW approach to convert multiple local feature descriptor vectors into a single feature vector to feed into ML classifiers. Finally, extract the global and local features and apply the different ML classifier techniques such as AdaBoost K-Nearest Neighbors(KNN), Support Vector Machine(SVM), and Random Forest(RF). The Proposed approach worked on the raw bytes of grayscale images; the main advantage of this approach does not require any reengineering operation and making different types of datasets. The existing approaches have the main disadvantage, approaches that require human intervention. Our approach proposed safe from human intervention and reengineering operation. Many ML algorithms are developed for the detection of malware apps. The most common challenge in Android malware detection is obfuscation attacks. Malicious code can be hidden in any files of APK, which is very dangerous to android malware app detection. Our proposed works have a novelty that now no needs to do reverse engineering to obtain all files of APK. Directly conversion of Entire APK files structure converts into a grayscale image. Most of the existing techniques used separate files to transform into grayscale scale images to analyze the image-based android malware detection. All existing methods do not care about multiple DEX, Share Object (SO), Meta-Inf, lib files, etc., just observation of manifest, single DEX files, resource files only. In the meantime, the author should explain the functions of multiDEX (MD). Resources, ARSC (RS), Manifest.xml (MX), and certificate (CR) files of APK separately because they are used to detect Android malware. Then, the proposed methodology to detect the android malware

is well represented in Fig. 1

## II. RELATED WORK

Many researchers worked in the domain of Android malware detection; some are listed below in this section. An approach designed to analyze the suspicious behaviors and detection of resources abuse [13]. The major drawback of this approach is the need to decompile the app and embedded hook code; this approach used runtime events to track and monitor the logging. The SafeDroid static framework approached, which statically analyzed the DEX (Dalvik Executable). By this approach, extract the binary feature vectors to train various ML classifiers [14]. Moreover, the multiple features are system calls, app permission, system events [15]. Those features train RF classifiers to analyze whether Apps are affected by malicious or not. Some approaches differentiate whether the app is a malicious or normal app based on patterns permission [16], the required permissions extracted statically. Most popular permissions are registered into class [17] to define whether the permission is benign or malicious. The permissions of a class determine the benign and malicious app. Moreover, a data mining technique made the constructive pattern of permission to determine whether the android app is malicious or benign. Here, the authors applied the bi-clustering method to used permissions. Also, the authors used the information of the Android app package and permissions to train of KNN, Linear Discrimination(LD) function, and Radial Basis Function (RBF) network. Moreover, Application Programming Interface(API) system calls integrated with permissions [18] are used as features to train the RF classifier of android's apps classification. It is a very lightweight method for detecting Android malware through ML and dataflow-related API system calls used in this approach [19]. In [20], the proposed approach used the n-gram series to extract the features from the opcode of malicious and benign apps. This approach used a limited number of features to train RF and Support Vector Machines (SVM) classifiers. The proposed approach [21] installed the Android application(APK) on Android devices to extract dynamic features such as networks behavior, memory consumption, computation power, time-space, battery, and binder; these features are used to classify malware. This dynamic approach [22] captured network traffic behaviors of running Android applications(APK) from different android devices. This traffic correlates with malware URLs and with DNS service network traffic for the detection of malware. An approach [23] used to fog computing reduces the load and dynamically enhances the computation power to detect Android malware. Another approach [24] used the API system calls and network behaviors, collectively applied to detect Android malware. In [25] this paper, the authors showed the multiple network behavior and emulator-based dynamic experiments to analyze android malware. Android operating system embedded by an extension kit has been proposed [26] to deals with confused delegate attacks [a genuine APK is manipulated for communicating with the trusted application for Inter-Process Communication(IPC)]. To enhance permissions-based policy [27]at runtime tracking and communication link analysis by pre-defined policy to prevent malicious behavior. Moreover, the signature set is constructed by network log and correlated with the permissions-based methods [28] for android apps classification. The recent approach [29] uses

reverse engineering techniques to decompile the APK, extract the source code, and convert it into a grayscale image. The constructed dataset of images is used to train a convolutional neural network (CNN) to detect the malicious app. API system calls and semantic information is used to train the Short-Term Long Memory (LSTM)[30] model to classify the android malware. Moreover, a hybrid approach includes CNN and deep autoencoder (DAE) [31] to detect Android malware. In [32], this proposed approach used the hybrid scheme; it extracts dynamic and static behavior features used to train the deep learning model. Also, in [33] approach extracted the four features, such as permissions, rate of permission, system events, APIs system calls used to train the collective RF classifier. DREBIN [34] is a static analysis approach; this approach used similar malicious apps as per experiment works (5,560 malicious apps). This method used as many possible features of apps and was added with joint vector space. Due maximum number of features and determination increased the complexity level. This paper [35] proposed the classification of the dependency graph. The features extracted from the dependency graph make the semantic feature set from the weighted contextual API of the graph. The metric of the homogeneous app determines same the application behaviors. The sensitive and important API call allocated the weight according to the Android malware family [36]. Every app implemented the function call graph (FCG), and each FCG construct the sensitive API call-related graph (SARG). The SARG has the parent and sensitive API call nodes. Here, train multiple machine learning approaches to classify the common behavior of the malware family. Moreover, from source code is extracted from hexadecimal representation and converted into RGB images [37]. The color RGB dataset is used to train a CNN classifier to classify Android malware. Furthermore, the Android (APK) application converted to grayscale images, then extract the feature of grayscale images for training the RF classifier for classification in [38]. Also, in [39], extracted the feature from 2D of Opcode Sequences and assigned the weight based on their occurrence. The weight value is converted into grayscale images. The image detection approach is very limited to detecting Android malware domains. Local and global feature extraction of the entire APK is more effective than existing approaches. Our paper has mainly converted the image into grayscale without any reverse engineering tools. It does not require separating the files of APK such as resource, Multidex, manifest, and certificate. Moreover, it does not require human intervention; most existing techniques have a common issue of human intervention and extracting the source code from reverse engineering tools.

## III. METHODOLOGY

This section discussed the full detail of the proposed model. The first subsection briefly describes constructed dataset, the other section described the brief details of extracted features, and the last section briefly describes the training Machine Learning (ML) classification.

1) *Dataset*: this dataset. Our experiment setup used the 5560 files of android malware and 5000 benign apps from AMD, which have 179 different Android malware families. In the investigation of research of android malware from 2012 to 2020, most of the researchers used the DREBIN dataset. The DREBIN dataset has the most famous malware such as

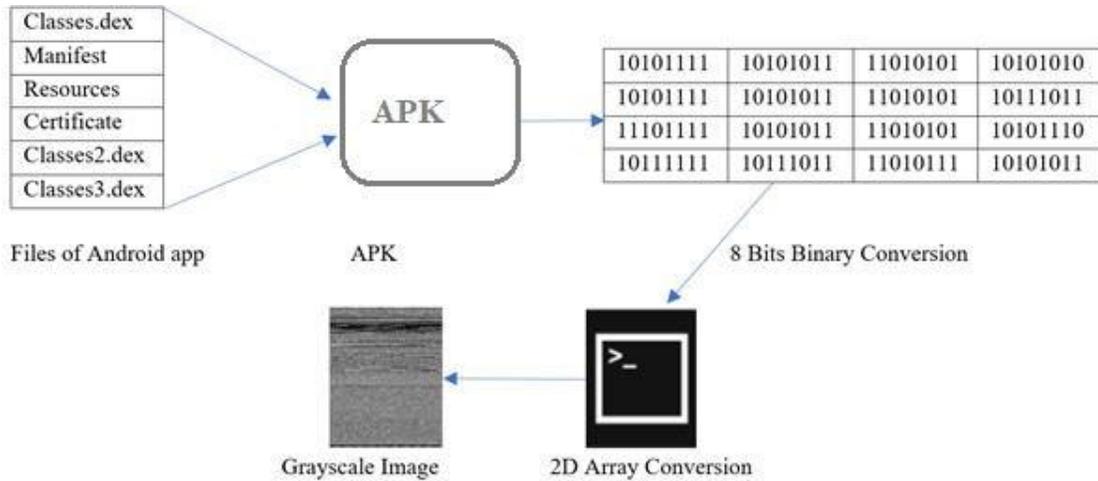


Fig. 2. APK to Image Conversion Process

DroidKungFu, GingerMaster, GoldDream, and Fake Installer. The primary objective of our proposed approach is to detect Android malware. The DREBIN dataset has the most famous malware such as DroidKungFu, GingerMaster, GoldDream, and Fake Installer. The primary objective of our proposed approach is to detect Android malware. Many researchers used the DREBIN dataset to analyze the android malware, and various institutions utilized this dataset to investigate Android malware. Our Proposed models used the DREBIN dataset because it has 179 different android malware families, appropriate for any investigation dataset.

### A. Transformation APK into Grayscale Images

The Android APK files convert into grayscale images [40]. In this proposed article, the authors construct the malware images using files of the Android app from malware APK. The APK is transformed into 8-bit vectors, and then the 8-bit vector transforms into a grayscale image. Every substring has an 8-bit value as a pixel converted into a decimal value between 0-255, shown in Fig. 2. Any digital file on the memory device is stored as a stream of a bit of '0' and '1'. In the model read every APK file as a binary stream, group every eight bits, and store them in a new file with the image file extension.

### B. Local Features Extraction

The local feature is a defined image object (basically, in the image, a cluster of pixels or small blobs) [41]. The local feature of images is the most stimulating point in the image, which defines the image descriptor vectors(DV) or feature vectors. The set of feature vectors is described by different types of algorithms. Our proposed approach used the four different algorithm types to extract the local features as Scale invariant feature transform(SIFT), Speeded up robust features (SURF), Oriented FAST, and Rotated BRIEF(ORB). Those methods are very famous in the malware domain for better accuracy.

1) *SIFT*: The Scale invariant feature transform (SIFT) method is applied to extract the local feature key points. This method computes the Laplacian of Gaussian on the multiple

scale level to provide a better result. This SIFT algorithm obtains the local minima and local maxima of stimulating points with the help of LoG at different scale levels. The several Laplacian of Gaussian on different scale levels ( $\rho$ ), by the scale, obtain the local maxima, minima of every single pixel in the image. The Laplacian of Gaussian (LoG) calculation is costly for feature points to more or less extent. The Laplacian of Gaussian(LoG) approximately is determined by Eq.1

$$\rho \nabla^2 L = \frac{\partial L}{\partial \rho} = \frac{L(x, y, k\rho) - L(x, y, \rho)}{k\rho - \rho} \quad (1)$$

where  $L(x,y,\rho)$  is the Laplacian Gaussian on the position  $(x, y)$  at scale  $\rho$ .  $L(x,y,k\rho)$  is the Laplacian of Gaussian(LoG) on the position  $(x, y)$  at scale  $k\rho$ , and the  $k\rho$  is a scale a little more than  $\rho$ . The SIFT methods identified the stimulating points at the level of 128-bit descriptors in Eq.1. The extracted feature from the input images through the SIFT matched each feature of  $k$  nearest neighbors. The main objective of SIFT is to object recognition techniques to panorama stitching. As a result, the system is insensitive to the images' ordering, positioning, scale, and illumination. Two-Dimension isotropic measure by the Laplacian to the second spatial derivative of an image. The Laplacian Gaussian approach highlights areas of speedy intensity change and is often used for zero-crossing edge detectors. In our system, the Gaussian smoothing filter reduces its sensitivity to noise for smoothing with something approximating.

2) *SURF*: The algorithm that Speeds up robust features(SURF) [42] is the faster algorithm, and it can be the replacement for SIFT. This algorithm is faster and more robust for similarity comparison and similarity invariant of images. SURF algorithm plays a vital role in the real type of tracking and recognition of the object. The main merit of this algorithm is box filters approximation and calculation of the integral images. Additionally, it has the location and scale-based determinant of the Hessian matrix. The Hessian matrix has good performance to obtain the image key points, and it has good accuracy. In the SURF algorithm filtered by Gaussian

kernel, with location  $X=(x,y)$ , and scale  $\rho$  in Eq.2

$$H(x, y) = \begin{pmatrix} S_{xx}(x, \rho) & S_{xy}(x, \rho) \\ S_{xy}(x, \rho) & S_{yy}(x, \rho) \end{pmatrix} \quad (2)$$

where,  $S_{xx}(x, \rho)$  has a Gaussian kernel derivative on the point of  $x$  in the image, and similarly for  $S_{xy}(x, \rho)$  and  $S_{yy}(x, \rho)$ . Haar-wavelet responses determine horizontal and vertical paths to the neighborhood of size six and used the 64 Bit Descriptor. Within interest point neighborhood, distribution of Haar-wavelet responses obtained from descriptor description. We used integral images to speed up the system. Additionally, using the 64 Bit Descriptor dimensions to improve the system's performance for feature computation increases robustness and matching. In the invariant to rotation, we recognized the reproducible orientation for the interest points. For this reason, we obtained the Haar-wavelet responses in the vertical and horizontal directions. The circular neighborhood of radius 6s around the interest points, with  $s$  the scale that the interesting point detected. Therefore, our proposed approach uses integral images for fast filtering again. Only six actions are needed to SURF: Speeded Up Robust Features, the seventh determines the feedback in the vertical and horizontal directions at any scale.

3) *ORB*: The feature vector Oriented FAST and rotated BRIEF (ORB) is a high-speed keypoint detector [43]; in BRIEF, descriptors have much modification to improve the algorithm performance. The ORB algorithm detects the keypoint in images by using the FAST algorithm. Also used the Harris corner to detect the key point. Moreover, it used the multiscale feature with 32 bits BRIEF-based descriptor

$$(S;x, y) = \begin{cases} 1 : S(x) < S(y) \\ 0 : S(x) \geq S(y) \end{cases} \quad (3)$$

where  $S$  is the flattened spot in the image, and  $S(x)$  is the intensity in Eq. 3. In the implementation of the FAST algorithm, we extract the kernel windows from single line buffers. In the approach, the center pixel is subtracted from each circle pixels. The result is measured with the minContrast value whenever the obligatory number of consecutive pixels exceeds the threshold level; the center is marked as the corner. For the circle region, evaluate the sum-of-absolute-difference (SAD) metric. Only the differences that exceed the minimum contrast threshold level are involved in the metric. This calculation means that the algorithm detects a light center pixel surrounded by dark pixels or a dark center pixel surrounded by light pixels as corners with high metrics. The Harris algorithm used five image filters, and three circular windows and evaluated the two gradients. The design of the calculation of the eigenvalue of the Harris matrix practices three multipliers and three adders and is pipelined to optimize performance.

### C. Machine Learning (ML) Classification

Our proposed models used four types of Machine Learning models such as Adaboost, K-Nearest Neighbors(KNN), Support Vector Machine(SVM), and Random Forest(RF) to classify the extracted local features from Grayscale images.

1) *K-Nearest Neighbors (KNN)*: K-Nearest Neighbors(KNN) is a supervised ML models, which is used for the classification of input data. It recognizes data points classified into multiple classes and calculates the class label for the new input data point. This method is famous for classifying the object into the train closest feature space. The nearest neighbors are signified by  $K$  in KNN, and the maximum unknown data points classify near to  $K$  neighbors. The primary benefit of the KNN algorithm uses the minimum distance to search the nearest neighbors. The selection of the number of nearest neighbors is essential to obtain the augmented KNN model. The selection of the number of nearest neighbors is essential to get the augmented KNN model.

2) *Support Vector Machine (SVM)*: Support Vector Machine(SVM) also is a supervised ML algorithm. In this model, take the past input data and predict the feature output. The primary purpose of SVM is classification, but it is also used for regression statements. The SVM algorithm chooses the support vectors in the dataset at the extreme points. It selects the maximum distance between the support vector and hyperplane as much as possible. A class in support vectors has the maximum distance from the hyperplane. The distance margin defines as the distance between different support vector classes. The sum of  $D+$  and  $D-$  is calculated as distance margin, where  $D-$ , hyperplane has the minimum distance from the closest negative point and  $D+$ , hyperplane has the minimum distance from the closest positive point. The main aim of SVM is to find the maximum distance margin, which gives the optimal hyperplane. The optimal hyperplane always gives excellent classification. In the case of non-linear, which produces low and no distance margin, SVM showed misclassification. In that scenario, SVM used the kernel functions to convert the non-linear data into 2D or 3 D dimension arrays. The minor dimensional feature is converted into high dimensional feature space by the kernel functions.

3) *Random Forest (RF)*: Random Forest (RF) is one of the most common and powerful supervised ML algorithms. RF executes efficiently massive datasets and predicts accurate results. This algorithm support both types of functionality, such as classification and regression—the decision tree support RF to enhance the accuracy and flexibility. In general, with more trees in the forest, the output would be more predictable. The more trees in the RF reduce the risk of when a statistical model fits exactly against its training data. RF can obtain good accuracy in case of missing a large proportion. According to attributes, the new object classifies, and the decision tree gives the classification output per the ruleset.

4) *AdaBoost*: The first boosting algorithm is AdaBoost, which solved multiple problems. The AdaBoost constructs a robust classifier from multiple weak classifiers. This algorithm keeps a single split of the decisions tree with the weak stump, known as the decision stump. AdaBoost always keeps more load on tough to classify, easy to handle the problem, and do less. This algorithm has solved both types of problems, such as classification and regression. Multiple APK's are repackaged, which steal code by reverse engineering methods and reassemble with another name by adding adware or small scripts of malicious code into repacked APK. Here the APK has very slightly changed, so the dataset has slight noise in

data We found that in the case of less noisy data, only a few hyperparameters need to be tuned to improve the Adaboost performance. In the case of the small number of input variables, KNN models provide excellent performance. Whenever we increase more number of input variables, the performance of KNN degrades. In our dataset, we used multiple DEX files based on APKs. All files structure of APK were converted into grayscale images, which increased the number of input variables and memory size and complexity of the KNN model.

#### IV. PROPOSED MODELS

In our work, we proposed an image-based detection of android malware using machine learning classification. In this process, Android APK converts into a grayscale image, extracts the image feature using image processing techniques, and trains the machine learning classification to detect malicious or benign apps depicted in Fig. 1. The novelty of this approach the entire files of APK transforms into images to deal with the obfuscation attack. Most of the existing techniques used only three files of APK to transform into the image. The main disadvantage of the other techniques requires decompiling the APK and separating the files such as DEX (MD), ARSC(RS), Manifest.xml(MX), and certificate files. Moreover, the disadvantage is that it does not take care of the multiDEX files. If APK has more than 6500 methods in the app, it needs to create the multiDex files [40]. If the malicious code is embedded with second or third classes.dex files, no existing algorithm detects the Android malware app from multiDex class files. The primary source of the malicious code is embedded into classes.dex files. Our models used three algorithms (SURF, ORB, and SIFT) to extract local features (LF) descriptors from the grayscale image dataset. One by one, local features (Extracted from each image) train to multiple machine learning algorithms (RF, KNN, DT, and AdaBoost). The multiple descriptors represent an image. Above mentioned machine learning algorithm gave the multiple vectors as outputs, which cannot be direct as inputs for any machine learning algorithm. This model used the Bag of Visual Words(BOVW) to create one feature vector with multiple local feature descriptors [41]. The BOVW uses any clustering techniques to fragment the extracted descriptors vectors into multiple clusters. Then the cluster is predicted by the clustering algorithm.

##### A. Accuracy Assessment

The accuracy metrics for multiple Machine Learning models were determined based on the precision, recall, f1-score, and accuracy in Eq. 4, 5, 6, 7 respectively, and precision in fraction of data entries of malicious activity are categorized as truly Android malware.

$$\text{Precision} = \frac{\text{True Possitive}}{\text{True Possitive} + \text{False Possitive}} \quad (4)$$

The recall is the fraction of malicious apps data of correctly classified malicious families.

$$\text{Recall} = \frac{\text{True Possitive}}{\text{True Possitive} + \text{False Negative}} \quad (5)$$

TABLE I. OBTAINED ACCURACY, PRECISION, RECALL AND F1-SCORE FROM MULTIPLE MACHINE LEARNING MODELS USING MULTIPLE LOCAL FEATURES EXTRACTOR METHODS

Performance Evaluator	Feature Vectors Methods	Machine Learning Methods			
		K-Nearest Neighbors	Support Vector Machine	Random Forest	AdaBoost
Accuracy	SIFT	92.42%	94.06%	94.65%	93.16%
	SURF	94.69%	95.37%	96.33%	96.86%
	ORB	89.41%	89.83%	91.42%	92.83%
Precision	SIFT	94.48%	91.00%	95.11%	95.71%
	SURF	95.79%	94.63%	97.44%	97.41%
	ORB	90.46%	89.13%	92.48%	93.36%
Recall	SIFT	91.31%	94.97%	93.42%	92.66%
	SURF	93.47%	96.29%	95.09%	96.35%
	ORB	88.33%	90.70%	90.24%	92.34%
F1-Score	SIFT	92.40%	94.14%	94.57%	93.18%
	SURF	94.71%	95.45%	96.25%	96.88%
	ORB	89.39%	89.91%	91.34%	92.85%

f1- score is the harmonic mean between sensitivity and precision.

$$f1 - score = 2 * \frac{\text{Precision} * \text{Recall}}{\text{Precision} + \text{Recall}} \quad (6)$$

The accuracy or complete classification accuracy is the portion of all suitably classified negative and positive records with the losses.

$$\text{Accuracy} = \frac{TN + TP}{TN + FN + TP + FP} \quad (7)$$

$$\text{Cross-EntropyLoss} = -\frac{1}{N} \sum_{o=1}^n \log p_{model}(y_o \in C y_o) \quad (8)$$

#### V. EXPERIMENT

The experiment has been designed on Intel core™ i-7 10700 CPU @ 3.8 GHz with 16 GB RAM. The experiment used the BOVW algorithm, which needs a size 120 codewords vocabulary. The K-means technique collected all key points from created datasets, and it has the codeword vocabulary size 120. Moreover, the proposed model used Opencv, Sklearn python libraries for the implementation of laboratory works.

The performance of different Machine Learning models has been achieved in terms of the whole percentage of true positive, true negative, false positive, and false-negative decisions. Our local features extractor models, such as SIFT, SURF, and ORB, extract key points from the image dataset. The extracted local feature passed to train four renowned machine learning models, i.e., K-Nearest Neighbors(KNN), Support Vector Machine (SVM), Random forest, and AdaBoost. The complete result with multiple ML models and local feature extractor models is presented in Table 1 and shown in Fig. 3. The validation set of the accuracy and losses in our proposed works proves that the results are correct, not overfitting problems depicted in Fig. 4. The high accuracies, precision, recall, and Fi-score from different machine learning models are displayed in Table 1 and Fig. 3, if the losses decrement and accuracy developments of both groups are like the same, then the process aborted changed the modeling parameters to remove the overfitting problem. Last, the AdaBoost model accuracy touched 96.86%. The traditional machine-learning algorithm shows the performance of each algorithm in Table 1 and is

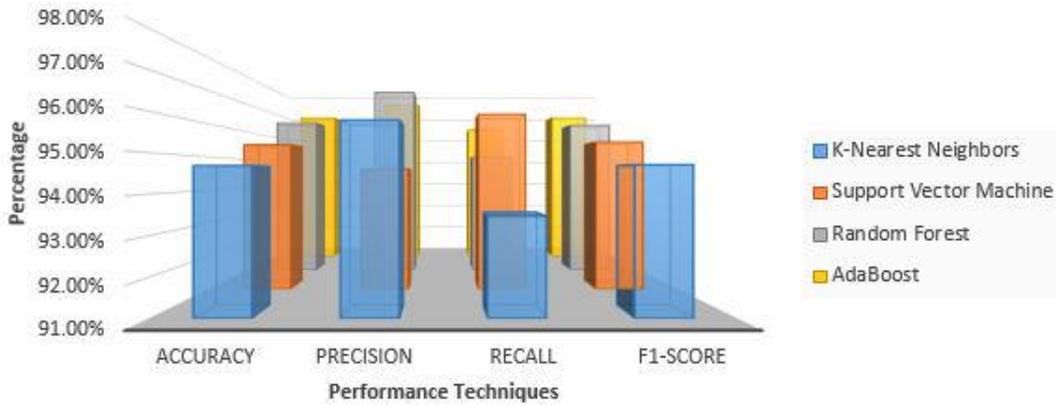


Fig. 3. Performance of Multiple Machine Learning Models

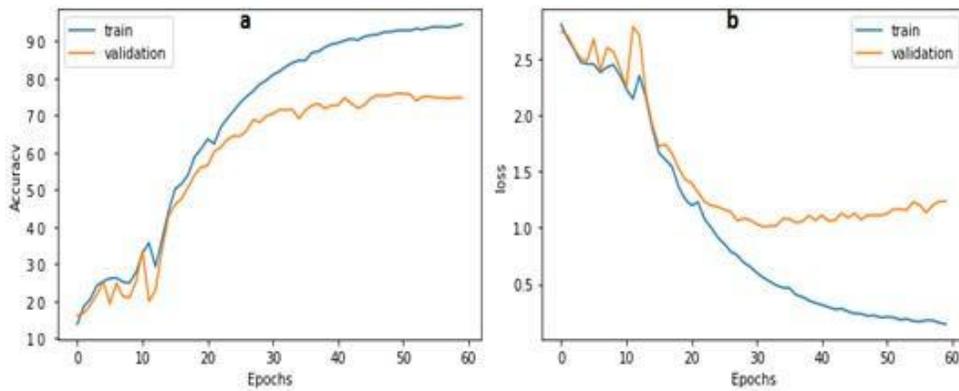


Fig. 4. (a): Train and Validation of AdaBoost Accuracy; (b): Train and Validation Loss of Model using SURF Local Feature

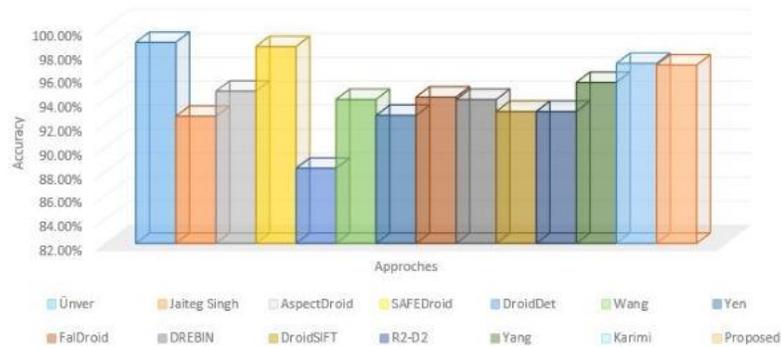


Fig. 5. Comparison of different Existing Approaches



Fig. 6. Execution Time of the Proposed Model with Feature Extraction

TABLE II. PROPOSED MULTIPLE MACHINE LEARNING MODELS WITH ACCURACY, PRECISION, RECALL AND F1-SCORE

ML Method	Accuracy	Precision	Recall	F1-Score
K-Nearest Neighbors	94.69%	95.79%	93.47%	94.71%
Support Vector Machine	95.37%	94.63%	96.29%	95.45%
Random Forest	96.33%	97.44%	95.09%	96.25%
AdaBoost	96.86%	97.41%	96.35%	96.86%

TABLE III. COMPARISON OF DIFFERENT EXISTING APPROACHES

Model	Accuracy	Types
Unver [11]	98.75%	Image-based
Jaiteng Singh [12].	92.59%	Image-based
AspectDroid[13]	94.68%	Hybrid analysis
SAFEDroid[14]	98.40%	Static analysis
DroidDet[15]	88.26%	Static analysis
Wang[16]	94.00%	Static analysis
Yen[23]	92.67%	Image-based
FalDroid[33]	94.20%	Static analysis
DREBIN[34]	94.00%	Static analysis
DroidSIFT[35]	93.00%	Static analysis
R2-D2[36]	93.00%	Image-based
Yang[37]	95.42%	Image-based
Karimi[38]	97.00%	Image-based
<b>Proposed</b>	<b>96.86%</b>	<b>Image-based</b>

depicted in Fig. 4. The accuracy value maximum 96.88% in the AdaBoost model, with losses, using SURF local feature extraction models in Fig. 4. In our work, computation time is scanned in each step of all ML models, inclusive of the feature extraction process, training, and testing of the model. The computation time from different ML models, the feature extraction process, training, and validation are presented in Table IV and Fig. 6.

## VI. CONCLUSION

Our proposed model uses an image-based framework to classify the android app, whether malicious or benign app. Most image-based detection techniques do not care about the multiDex files of APK, using only a single class.DEX file for image conversion. In existing techniques of image-based malware detection found [11-12,23,36,37] the maximum detection probability of malware in classes.DEX file, not in another file such as Resources.ARSC, Manifest.xml, certificate files, if the hackers hide malicious code into second or third classes.DEX files, there is no chance to detect the malware in previous approaches. In our experimental works, transform

TABLE IV. THE EXECUTION TIME OF THE PROPOSED MODEL

Feature Vectors Methods	Machine Learning Models			
	K-Nearest Neighbors	Support Vector Machine	Random Forest	AdaBoost
SIFT	941.63	945.87	941.03	943.91
SURF	827.00	830.64	826.72	828.91
ORB	43.36	44.87	44.10	266.43

all classes.DEX APK file's contents into grayscale images. We used the image processing techniques to extract the local feature of images, including SIFT, SURF, and ORB models. The Local features are classified using machine learning models (KNN, SVM, RF, and AdaBoost) to detect Android malware. The achieved results exhibited that the proposed approach overtakes the existing techniques in classification accuracy and computational time. Our work showed that the AdaBoost detection rate reached up to 96.86 %, shown in Fig. 5 and run time did not exceed 0.0195 s on average for each sample. In the future, we will try to use the local and global features of images on multiDEX files to classify the Android malware to improve accuracy.

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## A REVIEW ON CURCUMIN: THE SOLID GOLD HERBAL MEDICATION

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### ABSTRACT

Curcumin, a polyphenol found in turmeric, has attracted attention from both the medical and culinary worlds because it is the primary source of the spice's medicinal qualities. Oxidative and inflammatory diseases, metabolic syndrome, arthritis, anxiety, and hyperlipidemia can all be managed with this supplement. As a result, active persons may benefit from the supplement's ability to reduce inflammation and muscular soreness following exercise. For those who have not been diagnosed with a medical ailment, even a little dose of the complex can have health benefits. Its antioxidant and anti-inflammatory properties are responsible for most of these advantages. Curcumin's poor

bioavailability, which appears to be mostly attributable to poor absorption, fast metabolism, and rapid elimination, does not contribute to the related health benefits. Bioavailability can be improved by a variety of factors. Curcumin (diferuloylmethane) is one of turmeric's most potent, non-toxic, and major bioactive ingredients. Curcumin has a weak bioavailability and

low absorption rate. Curcumin nanoparticles can be used to treat cancer and wound infections, according to the findings of this study. Antibacterial, antiviral, and antiprotozoan properties of curcumin nanoparticles are excellent. As a result of this, curcumin-loaded nanoparticles can be used for drug administration in nano-gel, microemulsion, and nano-cream forms of the nanoparticle. An important component of turmeric known as curcumin is the *Curcuma longa* Linn rhizome. Since its discovery in the 16th century, curcumin has been used to treat a wide range of ailments. Curcumin's anti-oxidant and anti-inflammatory properties play a significant role in a wide range of maladies, including cancer, cardiovascular disease, Alzheimer's disease, inflammatory disorders, neurological diseases, and so on. Although natural curcumin has made amazing achievements in therapeutic applications, the clinical implications of native curcumin are hindered by restricted solubility, chemical-physical instability, poor bioavailability, rapid metabolism and poor pharmacokinetics. There are several intriguing biological effects of curcumin that have been summarised here.

**KEYWORDS:** Curcumin, *Curcuma longa*, Anticancer, Curcuminoids, Turmeric.

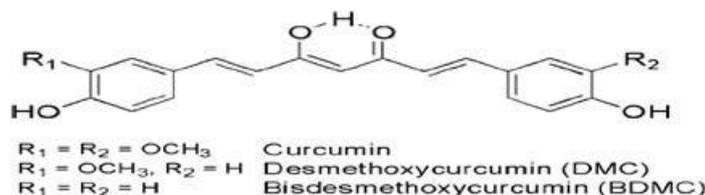
## INTRODUCTION

Turmeric is an Indian plant (*Curcuma longa*) of the ginger family (Zingiberaceae) known for its medicinal properties. *Curcuma longa* is depicted in Fig. 1. Curcuminoids, turmeric's active constituents, are thought to be responsible for the spice's health benefits. In addition to curcumin, which is a small molecular weight polyphenolic compound and lipophilic in nature, curcuminoids contain additional fascinating components such as curcuminoids, curcumin, curcuminoids, and curcuminoids. Curcumin is able to withstand the stomach's acidic environment. Additionally, volatile oils like tumerone, atlantone, and zingiberone are found in the extract. In turmeric, curcumin is extracted from *Curcuma longa*, which is the source of its colour.

An investigation on this bioactive component has been completed fully. In addition to being known as curcumin, it is also known as diferuloylmethane (1, 7-bis (4-hydroxy-3-methoxyphenyl)-1, 6-heptadiene-3,5-dione). There are two forms of this tautomeric compound: one in organic solvents, and the other in water. This is Fig. 2.



**Fig. 1: Curcuma Longa.**

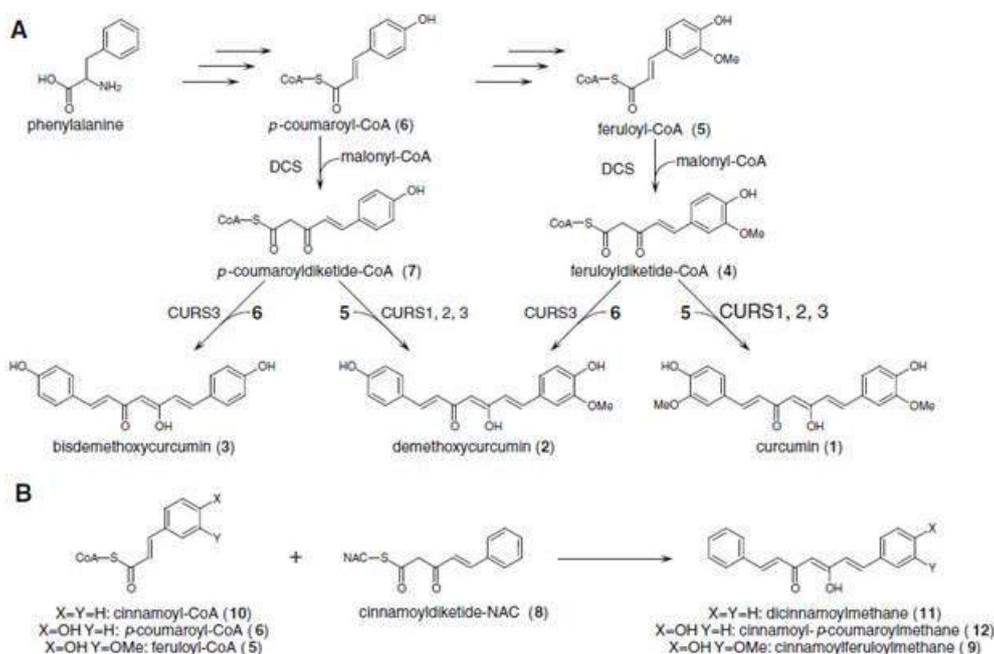


**Fig. 2: Chemical Structures of Curcuminoids.**

One of the first known polyketide synthases, diketide-CoA synthase (DCS), and curcumin-synthesizing enzyme (CURS1) were revealed to collaborate to produce curcuminoids in the herb *C. longa* (Fig. 3A). CoA (4) is formed from feruloyl-CoA (5) and malonyl-CoA by DCS. Feruloyl-CoA (5) and the DCS-produced feruloyldiketide-CoA are converted by CURS1 into curcumin (4). As a result, DCS and CURS1 are involved in the synthesis of curcumin. Bisdemethoxy curcumin (3) can also be synthesised from bisdemethoxy curcumin (6) via p-coumaroyldiketide-CoA production by both enzymes, albeit at a low efficiency. It is possible to synthesise Curcuminoids, such as curcumin (1), demethoxycurcumin (2) and bisdemethoxycurcumin (4), using a pair of DCS and CURS, but the in-vitro reaction products are different from the composition of an extract of turmeric's rhizome, which contains more bisdemethoxy curcumin (3) than the mixture of products synthesised in-vitro by DCS and CURS. Therefore, it was hypothesised that the amounts of p-coumaroyl-CoA and feruloyl-CoA in-vivo would influence the composition of curcuminoids in the mixture. It has been shown that curcuminoids (1-3) are formed from cinnamoyl-CoA, p-coumaroyl-CoA, and feruloyl-CoA incubated with NAC, an analogue of diketide-CoA, in the presence of CURSs. An illustration of the third figure.

There are two types of turmeric: ground turmeric and ground curcuma longa. Rhizomes are collected in their entirety after harvesting. Whole rhizomes are used to transport these plants. They are typically 2 to 8 centimetres long and 1 to 2 centimetres wide, with bulbous ends and splits in the middle. Processed rhizomes are then recycled to produce turmeric powder.

Nearly 4,000 years ago in India, the Vedic people utilised turmeric as a spice and a holy symbol, making it one of the oldest spices known. It's known by a variety of various names in different civilizations. Turmeric is known as "haldi" in the north and "manjal" in the south of India. Known in French as terre merite and in many other languages as "yellow root," it is a common ingredient in many cuisines. Known as Kurkum in Arabic, it is also known as Uqdah safra in Arabic. There are at least 53 different names for turmeric in the Sanskrit language. Traditionally, curcumin has been utilised as a medicinal herb because of its many beneficial properties: antioxidant, anti-inflammatory, antimutagenic, and antibacterial. Curcumin is poorly absorbed, rapidly metabolised, and rapidly excreted from the body. Curcumin's bioavailability has been improved by a variety of substances. Piperine is the most intriguing because it promotes curcumin bioavailability by blocking the metabolic pathway of curcumin. Curcumin's bioavailability is increased by a factor of 2,000. Ointments, pills and capsules are all ways to take curcumin. According to the US Food and Drug Administration (FDA), curcuminoids have been deemed "Generally Recognized as Safe." Curcumin's potential health advantages will be briefly discussed in this review.



**Fig. 3: The Biosynthesis Pathway of Curcuminoids.**

## Clinical importance of Curcumin nanoparticles

### Anticancer activity

Cancer is the most common and devastating cancer in the world. Side effects from conventional treatments like chemotherapy, radiation therapy, and surgery are severe. A safer

and more effective method of treatment is needed for this malignant illness. New drugs are currently being developed using natural resources such as plants. Non-toxic, life-saving pharmacological compounds found in plants may be used to treat a wide range of malignancies. Many types of cancer can be treated with curcumin, a natural substance derived from the turmeric plant. Cellular signalling pathways play a major role in these outcomes. It has lately been used as a cancer therapy with increased bioavailability, solubility, and tumour cell targeting by curcumin nanoformulation.

### **Breast cancer**

Every year, millions of women throughout the world are diagnosed with breast cancer, making it one of the most common diseases among women. Curcumin micelles have been shown to improve bioavailability, cytotoxicity, and half-life in *in vitro* studies of triple-negative breast cancer (TNBC) xenografts. When it comes to TNBC, chemotherapy doesn't work since it is resistant to oestrogen, progesterone, or the human epidermis factor 2 receptor. In tests on TNBC cells, magnetic nanoparticles powered by curcumin were found to be highly effective anti-cancer agents with both imaging and magnetic targeting properties (MDA-MB-231 cell line). Reactive oxygen species (ROS) production was sped up and mitochondrial membrane potentials were lost as a result. MCF-7 electroporation combined with curcumin-encapsulated nanoparticles increased human breast cancer cell activity.

### **Ovarian cancer**

There are many different types of ovarian cancer, based on the cells they produce. Ovarian cancer patients who develop resistance to chemotherapy and radiotherapy face the most significant setback during treatment. Yallapu *et al.* created a monoclonal antibody with curcumin nanoparticles to increase the specificity and sensitivity of chemoradiotherapy to ovarian cell resistance. When nanoparticle conjugate was applied to ovarian cancer cells, cisplatin-resistant A2780CP decreased cell growth and boosted apoptosis. In human ovarian cell adenocarcinoma, paclitaxel and curcumin-encapsulated nanoemulsion showed anticancer effectiveness, enhancing apoptotic response against drug-resistant SKOV3 and SKOV3 (taxol-resistant). Nuclear factor kappa B (NF5-0B) activity was repressed and P-glycoprotein expression was lowered by nanoemulsion.

### **Pancreatic cancer**

There are curcumin-loaded polymer nanoparticles in the form of N-vinyl-2-pyrrolidone and polyethylene glycol monoacrylate. Xenograft human pancreatic cancer models may benefit

from its ability to prevent tumour growth. Apoptosis induction, activation decreasing of NF- $\kappa$ B, and expression of metalloproteinase matrix MMP-9 and cyclin D1 were further halted in combination with gemcitabine. Nanocurcumin's therapeutic effectiveness was demonstrated by testing on cell viability and clonogenicity. Turcumin-powered magnetic nanoparticles significantly slowed the growth of human pancreatic cancer cells (HPAF-II and Panc-1) in the xenograft mice model. This version of curcumin has showed higher stability and enhanced bioavailability and biodistribution compared to normal curcumin.

### **Prostate cancer**

The prostate gland of men's reproductive systems is affected by prostate cancer. Bones and lymph nodes are possible destinations for this disease. Nanoparticles containing curcumin loaded with lactic-co-glycolic acid (PLGA) have been found to exhibit anti-cancer effect against prostate cancer. PLGA-curcumin nanoparticles released bioactive curcumin into the cytoplasm after embedding in cancer cells. Apoptosis was induced as a result of apoptosis-inducing effects on STAT3, AKT, and nuclear  $\beta$ -catenin expression. An increased intracellular absorption of curcumin-loaded PLGA nanospheres has been demonstrated in prostate cancer cell lines by in vitro studies in prostate cancer cell lines.

### **Antimicrobial activity**

Many human infections are caused by microorganisms. Antimicrobial agents were used to eradicate bacteria, fungi, protozoa, and viruses using a variety of chemical and natural compounds. Antibacterial properties of turmeric have long been recognised. Curcumin nanoparticles have been used because their antibacterial activity has been found to be superior to that of ordinary curcumin. Wet-milling of nanocurcumin has been shown to produce antibacterial and antifungal properties. When surfactants were absent, nanocurcumin was more water-dispersible and exceptionally active against a wide range of pathogens, including *Staphylococcus aureus*, *Bacillus subtilis*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Penicillium notatum* and *Aspergillus niger*. Cell wall damage and death resulted as a result of the nanoparticles' entry into infected cells. Gram-positive bacteria were more sensitive to nanocurcumin's effects than Gram-negative bacteria were. In a different study, curcumin was enclosed and found to inhibit the growth of methicillin-resistant *S. aureus* and *P. aeruginosa* and promote damage healing in a mouse model in vivo. The growth of *S. aureus* and *P. aeruginosa* was suppressed in vitro by chitosan tripolyphosphate nanoparticles containing curcumin.

### **Anti-HIV activity**

By destroying CD4+ T cells, the human immunodeficiency virus (HIV) attacks the immune system. In time, the immune system weakens, leading to a condition known as immunodeficiency (AIDS). Immunity is maintained by CD4+ T cells, a type of white blood cell that helps the body fight against disease. However, antiretroviral medication decreases the virus, but it hasn't removed it entirely. As a result, a new treatment is needed to cure this deadly disease. Sol-oil nanoparticles with curcumin-loaded apotransferrin were found to be particularly effective in preventing HIV-1 replication through transfer-mediated endocytosis. Transferrin receptors are commonly found on HIV-infected cells. apotransferrin nanoparticles laced with curcumin bind to and deliver medicine to infected cells. Viral production of cDNA halts HIV-1 replication as the medication is gradually delivered.

### **Antimalarial activity**

Female Anopheles mosquitoes carry parasites that cause malaria, which is transmitted to humans by these insects. Nanoparticles containing curcumin have been shown to be effective *in vivo* in the treatment of malaria. Nanoformulations have been found to have both oral and cytotoxic effects, according to toxicity studies. Plasmodium Yoelii-infected mice are cured of their infection using curcumin-laden chitosan nanoparticles.

### **Anti-inflammatory activity**

In traditional Indian medicine, turmeric was used as an anti-inflammatory agent. Compared to 400 mg/kg curcumin, nanocurcumin had a similar inhibitory impact at 50 mg/kg, which exhibited an improved anti-inflammatory efficacy. Curcumin-encased exosomes have been tested in a model septic shock mouse that was fed lipopolysaccharide. Exosome-produced curcumin was found to have higher stability, target selectivity, and high blood concentrations in this experiment.

### **Curcumin as a traditional therapeutic agent**

#### **Cardiovascular disease**

During vascular development, vascular smooth muscle cells (VSMCs) proliferate and migrate in response to vascular injury and atherosclerosis. When an angioplasty, organ transplant, or stent is performed, the arteries are damaged. As a result of statin medication, VSMC migration is effectively prevented. An amphiphilic chitosan nanomatrix with curcumin has been designed that can manipulate cells and have low-dose fatal effects on the proliferation and migration of VSMCs. There is a high risk of cardiotoxicity with the first-line

chemotherapy drug, doxorubicin hydrochloride (DOX). By reducing apoptosis and reactive oxygen species (ROS), the pluronic nanocurcumin formulation can minimise this deleterious effect (ROS). To make matters worse, it was discovered that lowering heart tissue glutathione levels and glutathione peroxidase activity using a DOX-induced intracellular oxidative stress formula helped overcome cancer cell multidrug resistance. Atherosclerosis and other cardiovascular diseases are linked to angiogenesis, which has become a serious health concern. Poly (esteramine)-coated curcumin nanoparticles effectively inhibited angiogenesis in a zebrafish model, making this a novel anti-angiogenesis treatment.

### **Neurodegenerative, Alzheimer's, and Brains Diseases**

Many diseases of the human body originate in the brain, spinal cord, or other parts of the CNS. At these locations, the blood-brain barrier must be overcome in order for curcumin distribution (BBB). Nanoparticles made from peptides synthesised from ApoE residues 141–150 are the most promising approach.

-amyloid peptide (A), which is toxic to monomeric and fibrillar species and a hallmark lesion of Alzheimer's disease (AD), is deposited in senile plaques. There is a lot of interest in curcumin because it is an amyloid pathological chemical that has been studied extensively. H<sub>2</sub>O<sub>2</sub> stimulates ROS production in human SK-N-SH neuroblastoma cells, while PLGA–curcumin nanoformulation has no toxic effect. H<sub>2</sub>O<sub>2</sub> can be used to inhibit the production of Nrf2, a redox-sensitive transcription factor that has been shown to protect neurons in the presence of DA. In addition, curcumin formulations containing biotinyl poly(ethylene glycol), biodegradable poly (halcyanocrylate), PEG liposome, anti-transferrin, lipid conjugate liposome, Nanoliposome, PEG–polylactic acid block co-polymer, and Click-chemistry-based nanosomes have been shown to inhibit A $\beta$  aggregation and toxicity. NanoCurc™ formulation has proven that in athymic mice, lower levels of H<sub>2</sub>O<sub>2</sub>, greater levels of glutathione, and lowered levels of caspase 3 and caspase 7 activity reflect a positive intracellular redox milieu that warrants this AD treatment. As an additional benefit, the combination of PBCA nanoparticles with curcumin in ApoE3 provides a significant advantage in the treatment of A-induced cytotoxicity. Gold nanoparticles containing curcumin have been shown to successfully attach to amyloid proteins and peptides while simultaneously suppressing fibrillation and disintegrating amyloid fibrils.

AlCl<sub>3</sub> (the neurotoxicant) was completely reversed by curcumin nanoformulation in male Lacca mice, resulting in 97% recovery of membrane lipids and 73% recovery of

acetylcholinesterase. As with acrolein-induced neurotoxicity, curcumin nanoformulations can counteract this effect. g-glutamylcysteine synthase, ROS, and reactive nitrogen levels were restored, however glutathione neuroprotection was not affected.

It has been shown that amyloid plaques can be seen in Tg2576 mouse brains *ex vivo* magnetic resonance imaging (MRI), however no plaques were seen in nontransgenic animals. Nanoparticle accumulation and co-localization with amyloid plaques have been seen in immunohistochemical studies on mouse brains. As a result, MRI scans have the potential to replace positron tomography (PET) scans in the noninvasive diagnosis of Alzheimer's disease. An anti-amyloid antibody and curcumin/dexamethasone-loaded gadolin/magnetic nanoparticle combination is appropriate for early diagnosis, successful targeting and therapy of cerebrovascular apolipoprotein E amyloid (s).

Several human disorders, including Huntington's disease, are caused by mitochondrial dysfunction. If mitochondrial abnormalities are reduced, this disorder might respond to treatment. An *in vitro* study of the curcumin nanoformulation library (PLGA-b PEG-TPP) shows that mitochondrial targets can be used as a chemotherapeutic. By increasing complex II activity and replenishing glutathione and superoxide dismutases, another nanoformulation of solidlipide-based curcumin attenuates Huntington's disease of three nitropropionic acid mice. Additionally, the reduction in mitochondrial swelling, fat peroxidation, protein carbonylation, and reactive oxygen species resulted in reduced mitochondrial dysfunction in HD.

### **Stroke**

Stroke permanently damages the central nervous system owing to a lack of blood, oxygen, and nourishment. Curcumin may reduce cholesterol, obstruct the arteries, and act as a blood diluting agent to reduce the risk of stroke. When curcumin is used to treat stroke as solid lipid nanoparticles in the form of lipid nanoparticles, the bioavailability, pharmacodynamics, and brain targeting are all three to four times greater than when curcumin is administered orally. Using salbutamol as an internal standard, LC-MS/MS may be used to identify curcumin simultaneously in mouse plasma and brain tissue, and this method can be used to verify the efficacy of curcumin's targeted delivery. N-trimethyl chitosan surface-modified solid lipids have been proposed as an oral nanoformulation of curcumin for effective brain distribution. Isopropylacrylamide-Curcumin Polymer The occlusion-induced cerebral ischemia created by cytokine (tumour necrosis factor alpha (TNF-) and IL-1) increased neurobehavioral activity

in the middle of the cerebrum. After the middle cerebral artery was blocked in rats, this formula was found to prevent oxidative stress-related brain injury. Strength of grip, motor activity, and biochemical brain investigations have all been used to determine this formulation's efficacy. Curcumin encapsulated as an epigenetic agent in exosomes of 200 nm size has been found to play a role in the treatment of cerebral stroke. It has been shown in animal studies that solid lipid curcumin nanoparticles reduce the damaging effects of oxygen and nitrogen radicals, acetylcholinesterase, and a variety of mitochondrial enzymes, all of which contribute to the damaging effects of cerebral ischemia reperfusion injury.

### **Inflammatory Diseases**

Damaged tissue or an infection can cause inflammation, which is the body's way of protecting itself from further harm. There are more than a dozen inflammatory conditions. The production of myeloid cells from monocytes aids in the fight against bacterial infections. For example, curcumin is antiviral, antioxidant and neuroprotective. Lipopolysaccharide-induced inflammation in rats is successfully reduced by a nanotic curcumin formulation (LPS). As a result, lactic acid concentrations in blood and the brain, kidney function, and neuronal apoptosis have no adverse effects. LPS-activated macrophages were significantly less likely to produce TNF- in response to a curcumin nanoformulation based on PLGA-Eudragit S100 (J774 cells). Neutrophil infiltration and TNF- release were similarly reduced in the mouse dextran sulphate colitis model in vivo investigations. treatment of inflammatory bowel disease should be demonstrated to be an appropriate approach (IBD). In rats, curcumin nanoemulsion reduced LPS-induced lung and liver damage by reducing neutrophil migration, TNF- levels, and oxidative stress, as well as reducing inflammation. Myeloid cells can be activated in vivo using exosome-mediated curcumin delivery in an animal model of lipopolysaccharide (LPS) septic shock.

There has been a breakthrough in the development of a non-irritating transdermal gel nanoformulation that is safe for human consumption. This can be used to treat localised inflammation in the body. Proinflammatory cytokines, such as IFN-, IL-1, and TNF-a, as well as antiinflammatory cytokines and cytokines such as TNF-a, were all reduced by curcumin-polluted solid lipid nanoparticles. The combination of celecoxib and curcumin nanoformulation medicine in rats with ulcerative colitis resulted in a synergistic effect. Hepatoprotective potential of curcumin-coated solid nanoparticles has also been investigated. These findings were backed up by a series of tests, including: I the extent of liver damage, (ii)

the extent of liver repair and repair; and, (iii) levels of alanine aminotransferase and aspartate aminotransferase, (iv) oxidative stress markers (malondialdehyde, superoxide dismutase, and glutathione reduced).

Rheumatoid Chronic inflammatory disease of the joints and cartilages causes arthritis. The entire Freund adjuvant-induced arthritic rat model was used to establish an effective solid lipid solid nanoparticles loaded with curcumin. Blood leukocyte counts, inflammation markers, oxidative-nitrotic stress, TNF-, and C-reactive protein levels all rose dramatically in the arthritic rat model. Cyclic citrullinated peptilines antibody levels spiked, as did oxidative-nitrotic stress and TNF- and C-reactive protein levels.

### **Diabetes**

People with high blood glucose levels are at risk for developing diabetes. There is evidence that curcumin can help treat heart, kidney, and liver disease-related conditions. Because curcumin is delivered in nanoparticles and lipid/liposomes, it is expected to have a positive effect on therapeutic outcomes. Male Sprague–Dawley rats were given a self-nanoemulsifying drug-containing delivery system for diabetic neuropathy and the results indicated a higher neurosensory function confirmed by many criteria, including nerve function and inflammatory protein (NF-B, IKK-, COX-2, iNOS, TNF-a, and IL-6). Free radicals and systemic proinflammatory cytokines can alter the lipid profiles of patients with diabetes. PLGA–curcumin nanoformulation reduces C-reactive protein, IL-6, and TNF in Streptozotocin-induced diabetic rats, leading to significant decreases in plasma total cholesterol, triglycerides, and high-density lipoprotein cholesterol. Treatment with liposomal nanoparticles in a leptin-deficient mouse model of insulin resistance has prevented proinflammatory pathways in the factor of liver tumour necrosis, the dendritic cells that produce nitric oxide, and the ATMs that can cure insulin resistance.

### **CONCLUSION**

Curcumin's anti-oxidant and anti-inflammatory actions appear to be the primary mechanisms via which it exerts its numerous health advantages. With the addition of substances such as piperine, curcumin's bioavailability can be considerably increased. Inflammatory and oxidative disorders, the metabolic syndrome, arthritis, anxiety, and hyperlipidemia may all benefit from curcumin's anti-inflammatory and anti-oxidative properties. As a result, active people may be able to recover more quickly and perform better after exercising, thanks to this supplement. For those who have not been diagnosed with a medical ailment, even a tiny dose

can have health benefits. Curcumin, a strong pleiotropic substance, has been utilised as traditional medicine in many nations for its medicinal properties. According to research mentioned above and the many more that are published every day, curcumin's pharmacological activities are rapidly developing and progressing. Curcumin has been used for centuries to treat a variety of ailments, including diabetes, wound healing, arthritis, Alzheimer's, Parkinson's, inflammation, angiogenesis, cataracts, cancer, atherosclerosis, and hypertension, among others. Curcumin has a wide range of phytoconstituents that have been demonstrated to be effective in both clinical and experimental studies. If you're looking for a natural remedy for everything from inflammatory conditions to allergies to hyperglycemia to cancer to microbial infections to hypertension and everything in between, this is the one for you. Curcumin's ability to effect a wide range of molecular targets and its acceptable safety profile have made it a promising contender for the prevention or treatment of a variety of disorders.

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## A COMPREHENSIVE REVIEW ON COLON TARGETED DRUG DELIVERY SYSTEM

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### ABSTRACT

Although significant interest in colon-specific drug delivery systems has been placing over the past few years to create a delivery system capable of releasing medications in the colon in a reliable and replicable manner, these attempts have been unfruitful so far. The colon is an area that can host both local and systemic medication delivery. Drug administration should begin in the proximal colon and be supported by protecting drugs against breakdown, absorption, and release. The purpose of this evaluation is to grasp recent advances in treatment approaches for dosage types that are currently designed to administer colon therapies utilizing a pH-sensitive framework, a microbially initiated system like prodrugs, and polysaccharide-based techniques.

**KEYWORDS:** Colon-specific drug delivery, pH-sensitive, time-controlled dependent, microbially triggered, pressure controlled, and osmotically controlled system.

### INTRODUCTION

Recent increases in colonic illness instances have prompted greater need for local colonic disease treatment and have also given rise to better and safer treatment options. It is the most

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common colon ailment and is third on the list of cancers diagnosed. Among colon disorders, colon cancer in Europe causes 200,000 deaths per year and is the deadliest of all colon diseases. It is also becoming more common in Asia, where people had previously thought it to be absent. Colon disease can be tough to deal with. A world with successful treatment is one that they can survive in, and it is a goal all health care specialists are working toward. In order to bring medicine to its target in the body (in this case, the colon) in an efficient manner without adverse effects, researchers have created colon-targeted drug delivery technologies. Because of a lack of protease activity in the upper GI tract, bigger proteins and peptides that are common in pharmaceuticals have a harder time getting absorbed. In order to address this problem, alternative methods like colon-targeted drug delivery systems that increase the amount of bioavailable molecules in the GI tract are being tested. As with the tiny compounds, more research might be done to prove colonic distribution's efficiency as an oral delivery method for macromolecules. To provide colon-targeted drug delivery systems, which deliver drugs only in reaction to the colonic environment and do not release any medications in the upper GI tract, drug delivery systems have been designed to distribute drugs only in response to the colonic environment. Microenvironmental factors and colon characteristics must be accounted for when delivering drugs to the colon. There are several things that change along the course of the GI tract, and some of them vary over different parts of the tract. There is a considerable difference in the environmental characteristics of the colon region with impacted tissue compared to the unaffected regions. Patients with colorectal issues (RCs) generate extreme ROS and inflammatory cytokines. When this happens, important antioxidants are impossible to synthesise, and the cells that make up the mucosa become lacking, leading to substantial mucosal injury. Several methodologies for increasing colonic medication delivery have been investigated, such as using pH-sensitive, enzyme-triggered, and magnetically-driven devices. The strategy of going beyond local tissue alterations was employed to create therapies, since changes in the area of disease must be taken into account while planning treatments. A study focused on enzymes that interact with a specific receptor in an area where the receptor is highly concentrated, unlike other enzymes. This article is about recent formula advancements that have created colon-focused medicine delivery systems, and how those delivery systems are used to treat diseases.

**Table 1: Colon targeting diseases, Drugs, and Sites.**

Target sites	Disease conditions	Drug and active agents
Topical action	Inflammatory Bowel diseases, Crohn's disease, Irritable bowel disease	Prednisolone, Budesonide, Olsalazine, Mesalazine, Hydrocortisone, Balsalazide, Sulfasalazine,
Local action	Chronic pancreatitis pancreatectomy and cystic fibrosis Colorectal cancer	Digestive enzyme Supplements 5-Fluorouracil
Systemic action	To prevent gastric irritation To prevent the first-pass metabolism of orally ingested drugs Oral delivery of peptides Oral delivery of vaccines	NSAIDS Steroids Insulin Typhoid

**Advantages of colon targeted drug delivery systems**

- Perfect for delivering a remedy to help heal Chron's disease, amoebiasis, ulcerative colitis and other colon ailments.
- There should be local treatment requirements for smaller medication amounts.
- More minor drug interactions and adverse effects take place.
- So, it is much more cost-effective. The extended colon retention period will help medication molecules have better bioavailability in the body (up to 5 days).
- Many medicines create a stomach irritation that can be avoided if kept from absorbing into the GIT (e.g., NSAIDs).
- You will save time by bypassing the first-pass metabolism of the digestive tract.
- More long days and nights.
- limits and hardships the distal region of the alimentary canal's difficulty of accessibility, which is due to its position.
- Dietary residues, digestive secretions, and fecal debris can bind to the medication and limit its bioavailability.
- Additionally, microorganisms in the colon degrade the drug, which could further disrupt colonic functioning.
- The low surface area and close connections in the colon keep the medicine from reaching the systemic circulation via the mucosa because of the lack of space and closeness.
- In-vitro dissolving tests are required to ensure that the dosage form is adequately dissolved.

- A poorly soluble medication like the one required for efficient colon delivery will face difficulties dissolving.
- Considerations to keep in mind when planning for a CDDS.
- It understands the anatomy and physiology of the colon.

### **Limitation of colon target drug delivery systems**

- Colon is challenging to reach.
- Delivering medications must happen in solution in the colon, yet it is harder for poorly soluble pharmaceuticals to dissolve in a viscous fluid environment.
- A tight junction with lower surface area and relative tightness can hinder medication delivery in the colon.

### **Need for colon targeting drug delivery**

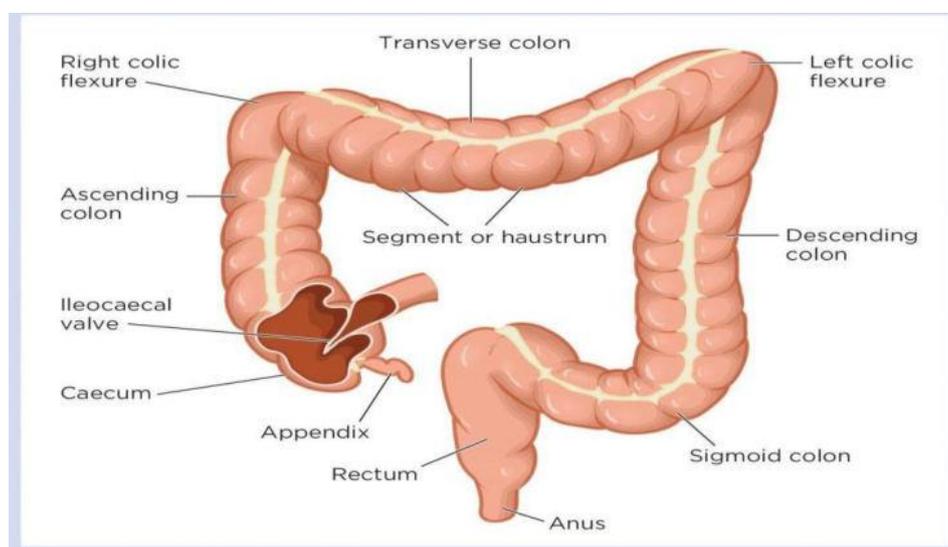
- Localized treatment by colonic medication administration to assure lower doses and more minor side effects overall
- Targeted distribution of peptide and protein medications could be achieved via oral administration.
- A medicine delivery method that only affects the colon is thought to help fight colon disorders.
- The colon is the location of two possible delivery mechanisms for inflammatory bowel disease (IBD) treatments such as ulcerative colitis and Crohn's disease: local therapy or systemic treatment. Patients diagnosed with inflammatory disorders may have to take glucocorticoids and sulphasalazine as part of treatment.
- Colorectal cancer, and many other life-threatening disorders of the colon, may potentially be treated more efficiently if medications were delivered explicitly to the colon.

### **Anatomy of the large intestine**

An intestine component located below the stomach is often made up of four segments: the cecum, colon, rectum, and anus. The term colon is also used to describe the big intestine in its entirety.

The large intestine is around a meter and a half (about 5 feet) long and is broader and shorter than the small intestine (around two-and-a-half times more expansive). Bacteria produce B12, thiamin, and riboflavin in the upper large intestine, which completes the digesting process

and supplies B vitamins. However, the large intestine's principal purpose is to extract water and electrolytes from digesting debris (which takes around 24 to 30 hours) and store fecal materials, then ejected them later. Digestive residues are gradually exposed to the absorbing walls due to the churning of the large intestine. The gastrocolic reflex is a relatively short but powerful and somewhat frequent action in the digestive system that pushes the waste matter in the system to the rectum.



**Fig. 1: Anatomy of the large intestine.**

### **Diseases of colon**

**Diverticular condition:** Weak areas in the intestinal wall, such as the diverticula, expand colonic lining sacs. Where considerable bowel pressure is maximum (the sigmoid colon), they tend to appear.

**Crohn's disease:** A digestive tract lining illness, common in older people, that is known to persist in patients above the age of 55. Crohn's disease can create serious health problems that can be fatal. Crohn's disease can suffer from abdominal pain, diarrhea, weight loss, anemia, and exhaustion. Although some people never exhibit symptoms, those who do frequently experience severe, long-term health problems.

Crohn's disease cannot be successfully treated. Steroids and immunosuppressants are used to reduce the speed of the disease's progression. If these procedures aren't successful, the patient will have to have surgery. People with Crohn's disease may need regular screening for colorectal cancer because of the high risk of developing.

**Amoebiasis:** An amoeba parasite that invades the colon, named *Entamoeba histolytica*. People who live in places with unpurified water often get amoebic infections. Raw food such as fruit washed in infected water can transmit the illness. Patients might experience moderate cramping and diarrhea if the symptoms show up at all. Severe instances are likely to have bloody stools, fever, and perhaps a liver abscess. Antibiotics are prescribed.

**Colon bleeding:** The color red indicates bleeding in the rectum or colon, leading to colon cancer or rectal cancer. Bleeding in the rectum might be a symptom of hemorrhoids.

**Diarrhea:** Diarrhea is defined as loose or watery bowel motions. Diarrhea is characterized by frequent loose, light bowel motions (or more frequently than usual). Diarrhea happens when the intestines can't properly absorb or release water.

**Colorectal polyps:** A collection of cells that are built up around the colon or rectum's lining. Some kinds are entirely safe, but others have the potential to become cancerous. Polyps usually don't produce symptoms. Before cancer is allowed to develop, routine colonoscopies, among other screening procedures, can be used to detect and remove polyps before they have a chance to grow.

**Colon cancer:** A tumor found near the end of the intestinal tract, which starts in the colon or rectum. Polyps are the earliest signs of colon cancer, which can begin as non-cancerous polyps. It is possible to detect them even though they usually lack symptoms. In light of these findings, doctors advocate routine testing for anyone at increased risk or above the age of 50. The size and location of colorectal cancer can determine the symptoms experienced. Symptoms such as bloody stools, bloating, and stomach pains are often found. To treat colorectal cancer, it's essential to understand the characteristics of the disease and how far it has progressed in the body. In cancer, people might expect surgery to get rid of it, chemotherapy, and radiation treatment.

### **Approaches used for site-specific drug delivery to the colon**

Methods used for site precise drug delivery are

#### **1) Primary approaches for CDDS**

##### **a) pH-Dependent drug delivery systems**

Altering the colon's acidity to make colonic medication distribution more effective is possible by tackling the colon. Using CAP, HPMCP 50 and 55, Eudragit® S 100, Eudragit® L,

Eudragit® FS, and Eudragit® P4135 F copolymers, it became possible to create a colon-targeted drug delivery system. The use of copolymers for colonic medication delivery is prevalent, with Eudragit polymers in particular providing mucoadhesiveness and pH-dependent drug release. A truly ideal polymer must be able to hold together in the stomach and upper small intestine but should thereafter begin to fall apart when in the lower small intestine and colon. Polymers that have a pH sensitivity level of 6.0-7.0 have a coat solubility threshold of 6.0-7.0. The polymer coat's dissolution properties will slow down the dissolution of the drug and avoid premature drug release in the upper GI tract. In spite of its inherent capabilities, this pH-dependent drug delivery system has low consistency, and it has proven incapable of handling environmental changes, such as a patient's body pH, because it has constant fluctuations.

Additionally, the pH in the GI tract can be strongly affected by factors such as the type of food, an illness, how much water the person drinks, and the digestive processes of the microbes there. Patients with ulcerative colitis, for example, show lower acidic intestinal pH than healthy individuals, which reduces the effectiveness of enteric-coated medicines and limits the amount of drug released at the target region. So, various internal and external factors can mess with pH and negatively impact the efficacy of pH-dependent drug delivery systems, with a poor site-selective drug release result. It was revealed that Eudragit® S coating was not ideal for colon-targeted drug release either because the coating broke down too soon, resulting in the colon being unable to hold the drug for any meaningful length of time or because the layer broke down too late. The prescription was released in the colon long before it could be absorbed into the bloodstream. Subsequent human investigations showed the Eudragit S tablets lack site-selective drug release, showing disintegration of the tablets is influenced by a variety of physiological parameters, including stomach pH, the food the patient is taking, and the intestinal transit time.

In addition to time-dependent and enzyme-triggered delivery systems, there have been several unsuccessful attempts to design systems which work regardless of pH, such as systems which use delivery systems which rely on time or enzymes as a means of delivery, and are paired with pH-dependent delivery systems. For example, systems made with high-amylose maize starch and Eudragit® S broke down colon microbes at different pHs. For this application, Eudragit® S was first combined with a high-amylose maize starch to form two coatings, which were applied sequentially. An alkaline water and Eudragit S were initially

sprayed on the starch in the first layer to keep it from degrading and to neutralise the starch's pH. A buffer was then added to further protect the starch. Eudragit® S, a coating made with organic ingredients, was used to speed medication breakdown at pH levels higher than 7. The breakdown of dual-coated tablets was better in the lower GI tract after the approach was studied and practised. They invented a delivery device that uses pH- and time-sensitive microspheres to provide prednisolone to patients colonoscopically. They employed ethyl cellulose and Eudragit® S to enhance colonic medicine administration and to reduce upper intestine drug release. A multi-unit drug delivery system like Eudracol® that delivers medications to the colon and leaves them there for release in equal amounts is an example of a drug delivery method. There is a delivery mechanism that targets the colon that is activated over time and in response to pH levels. Integrated systems utilising more than one method of delivery, which can all be triggered based on pH, have been more successful than only pH-controlled systems in dealing with pathological variability. However, more modifications are required to achieve the desired result. Furthermore, it is thought that small particles may aid to transport medication to inflammatory colon regions directly. To reach their target area in the colon, many types of drug delivery systems have been designed using pH-dependent components, which can make the particle they are connected to smaller.

#### **b) Time-dependent or time-controlled system**

Using a time-controlled method helps people administer their medications in the proper locations and on their predetermined schedules. Diseases that are influenced by circadian rhythms are often treated with the use of systems like this. Delayed-release formulations that use a time-controlled delivery method for the colon are also known as "delayed-release formulations" because of the delivery's use of a time-based period. The specific location of drug release in these systems is based on the transit duration of a formulation in the GI tract, making it challenging to create a formulation that will release a drug in the colon. Formulations are, ideally, made to deliver where variation in stomach emptying time, pH in the small intestine, or anaerobic bacteria in the colon won't interfere with the location. A drug taken orally takes around three hours to transit from the small intestine to the colon. A tablet form can launch a timed explosion in the colon and release the medicine. The concoction consists of three elements:

- (i) A center core containing swelling excipients and the treatment
- (ii) A plasticizer that is included in an inner semi-permeable polymer barrier, allowing water influx but preventing outward diffusion of medication

(iii) Finally, an enteric-coating that dissolves at or above pH 5.5 is included as the outermost layer.

The enteric coat, placed outside of the tablet, will keep it intact until it reaches the small intestine. The enteric covering will break down when entering the small intestine, allowing liquids to seep into the core. Consequently, the tablet bulges while traveling through the small intestine. Lastly, after the firm orb had been in the small intestine for 4-6 hours, it would expand and eventually explode, opening a hole in the semi-permeable membrane, through which the medicine was released in the colon.

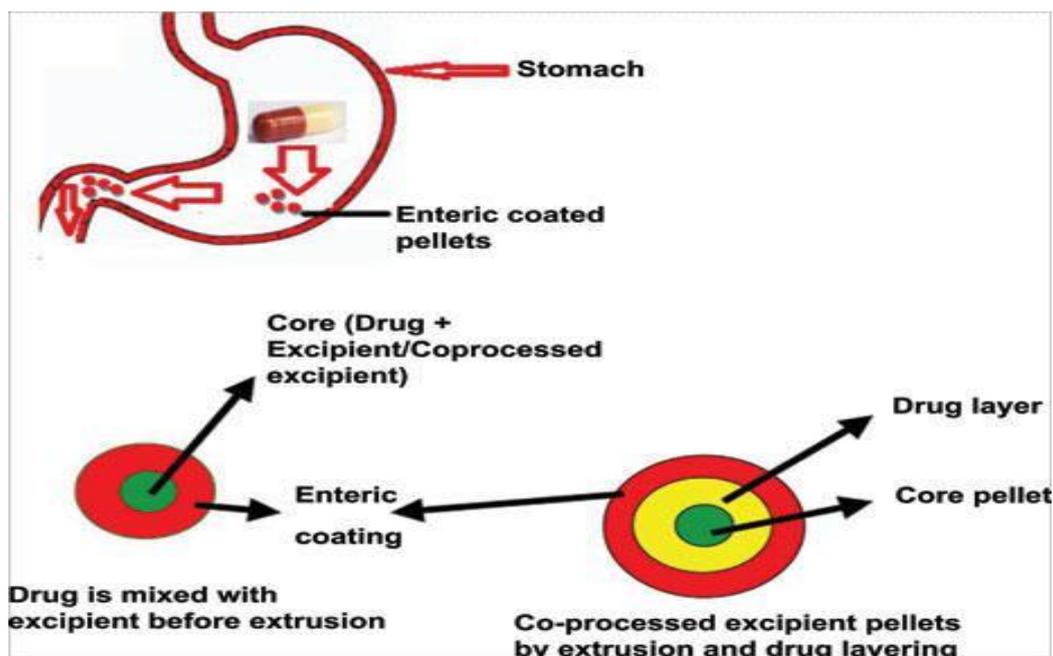


Fig. 2: Design of enteric-coated layer timed-release press coated tablet.

### c) Microbially triggered drug delivery to colon

A millilitre of colonic bacteria has roughly 100 trillion germs. Bifidobacteria, Eubacteria, Clostridia, Enterococci, Enterobacteria, Ruminococcus, and other anaerobic types are just few of the species which are contained in its arsenal of bacteria. The small intestine is deficient in digestive abilities, hence it contains lots of bacteria that can digest lots of carbohydrates. Examples include polysaccharides (e.g., long chain carbs). There are a lot of enzymes which can be created by the microflora in this fermentation. These include glucuronidase, xylosidase, arabinoside, galactosidase, nitroreductase, azareducatase deaminase, and urea dehydroxylase. To maximise colon-specific medicine administration, biodegradable polymers are a preferred choice for enzyme compartments because they reduce the chances of degradation of their polymeric medications. These polymer shields provide a

barrier to protect the drug in difficult conditions, such as in the stomach and small intestine, and help the medicine get to the colon and outside of the body. The molecular weight of the colon can be reduced with enzymes or through microorganisms. Microorganisms grow in the colon after turning it over. Reduced molecular strength means the equipment won't produce much mechanical force. At that time, the drug entity cannot be halted.

### (i) Approaches of prodrug for drug delivery to the colon

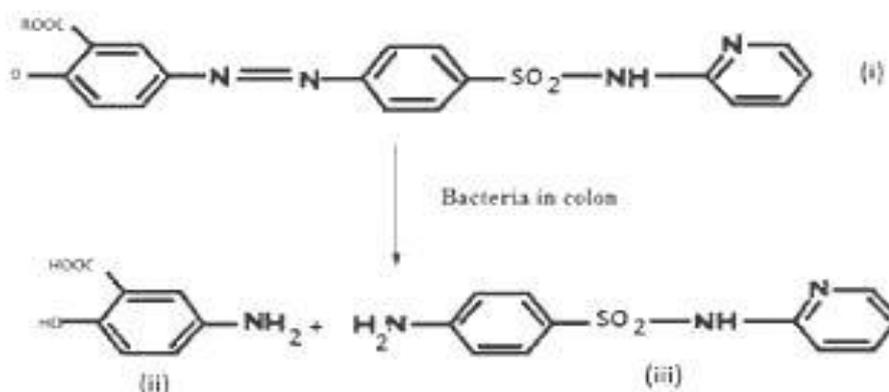
Colonic medicines undergo a minute hydrolysis in the upper intestines, and afterwards enzyme hydrolysis in the colon to ultimately produce active drug moieties.

### Limitations

- Since it depends on the functional group of a chemical bond in the drug molecule, it cannot be versatile.
- Must be thoroughly evaluated before they can be deployed as carrier organizations.

### (ii) Azo – polymeric prodrugs

When sub-synthetic polymers are utilised, a polymer containing an azo link between the polymer and drug molecule is generated. Fig. 3 illustrates the azoreductase identified in the large bowel to break down azo polymers.



**Fig. 3: (i) Hydrolysis of Sulphasalazine (ii) 5- Aminosalicylic acid (iii) Sulfapyridine.**

### (iii) Polysaccharide based delivery systems

The polysaccharide polymer of monosaccharides resists enzymatic action because of its integrity, so they are expected to retain their shape in the physiological environment of the stomach and small intestine. When they reach the colon, the polysaccharides are worked on by bacterial polysaccharides, thus degrading the matrixes. It is interesting to know that natural polysaccharide's strength lies in the fact that it is more durable, safe, and less toxic

than other polymers (Table 2). Pectin is a polysaccharide (long-chain sugar polymer) with polygalacturonic acid, which contains galactose, arabinose, and rhamnose, with short side chains of galactose and arabinose. A revolutionary approach to colonic medication administration is evaluated. High methoxy pectin compressed on tablets is enzymatically attacked in the gastrointestinal environment. Research using gamma scintigraphy confirmed that in vitro tests showed that the pectin coating tablets disintegrated in the colonic region and were degraded by microflora. This research needs to focus on devising new pectin derivatives that are less water-soluble to meet consumer demand. Using the insoluble pectin salt, calcium pectinate for colon-specific drug administration of Indomethacin was done. Turkoglu and his colleagues studied colon delivery of the 5-aminosalicylic acid tablets, which were compressed from pectin-hydroxy methylcellulose, and carried out degradation studies in pectinolytic enzyme buffer pH 1.2 and 6.4. HPMC was necessary to stabilize the pectin discovered on its own to be inadequate for supporting the structural integrity of the tablet. Pectinase is a digestive enzyme that helps to break down fibrous material. When pectinase was introduced to 6 hours of HPMC, the result was less than 30% erosion. The ichor from the vessels would then slowly leak into the colon, releasing 5-amino salicylic acid.

**Table 2: Characteristics of various biodegradable polymers for colon targeted drug delivery.**

Polysaccharide	General properties	Bacterial species
Amylose	Unbranched constituents of starch used as excipients in tablets formulation	Bacterioids, Bifidobacterium
Chitosan	Deacetylated chitin is used as absorption enhancing agent.	Bacterioids
Cyclodextrin	The cyclic structure of 6,7 or 8 units, high stability against Amylase, used as drug solubilizing agent and absorption enhancer.	Bacterioides
Dextran	Plasma expanders	Bacterioides
Arabinogalactan	Natural pectin, hemicelluloses used as thickening agents	Bifidobacterium
Guar gum	Galactomannan used as a thickening agent	Bacterioids Ruminococcus
Chondroitin sulfate	Mucopolysaccharides contains sulfate ester group at 4 or 6 position	Bacterioids

## 2) Newly developed approaches for CDDS

### a) Pressure controlled drug delivery system

Pressures of higher are found in the colon because of peristalsis. The team led by Takaya created a colon-delivery capsule that uses ethyl cellulose and is insoluble in water to support pressure regulation. Because of water reabsorption, the large intestine has more viscous contents, which induce a more significant increase in luminal pressure than the small intestine. To leverage colonic luminal pressure, studies have been done to devise colon-specific medication delivery systems. A capsule containing the medicine is the main component of the pressure-controlled drug delivery device. The polymer of water insoluble ethylcellulose is applied to the inner side of the gelatin capsules, where the drug is added along with a dissolving suppository base. When the capsules dissolve in the intestines, water from the intestinal contents is absorbed, causing the gelatin to increase viscosity and rise in pressure; this expulsion causes the drug to be released into the colon.

### b) Pulsatile colon targeted drug delivery

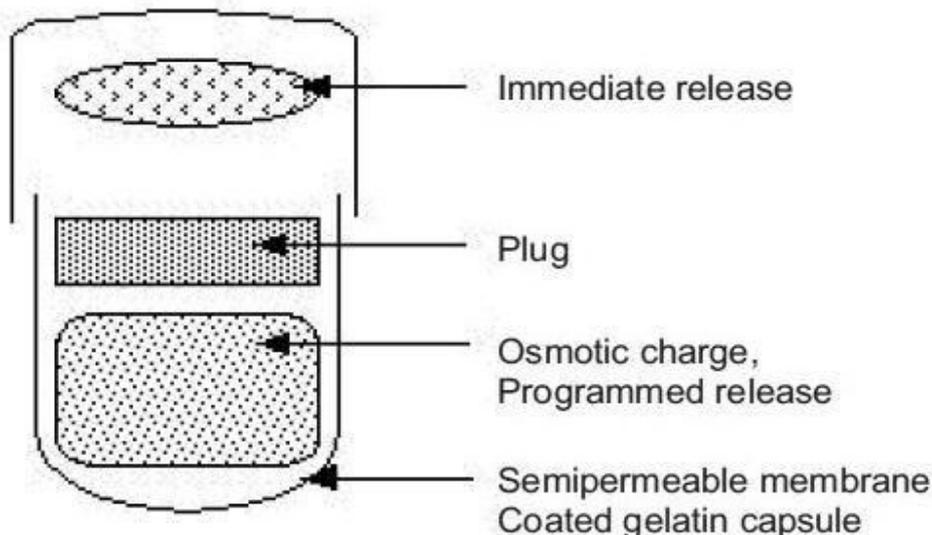
#### i) Pulsincap system

Capsule systems (single units) are where they are usually developed. By eroding the stopper inside the capsule, the medicine is "pulsed" out (control lag time). The drug capsule has a hydrogel plug, which is compressed and inserted into the capsule. Once inside, the hydrogel swells in the presence of a dissolution fluid. After a momentary delay, the swelling causes the plug to push out of the capsule and quickly release the medication. How long the pin is and where it goes into the tablet decides the length of the lag period.

#### ii) Port system

This technique utilizes delayed medication release as its fundamental premise. It has the following parts:

- Gelatin capsule housed in a cellulose acetate semi-permeable membrane
- An insoluble plug (e.g., Lipidic)
- A medication having an osmotically active ingredient added.



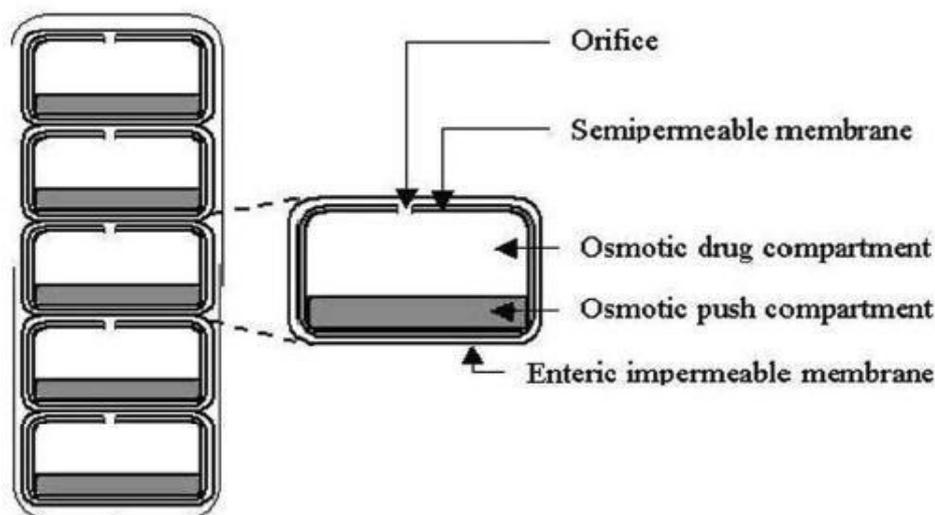
**Fig. 4: Plan of the port system.**

**c) CODES technology (Combination of pH-dependent and Microbially triggered CDDS)**

The CODES project was meant to circumvent the challenges presented by other solutions. Microbially triggered approaches control where medication release takes place and also provide control over the pH. A technique incorporating lactulose was utilized to create a specific trigger that released drugs directly into the colon. The tablets are the core of the machine, and it is made of a polymer coating applied to a base. To avoid the negatively charged polymers from interacting, an enteric polymer coating is placed on top of an acid-soluble polymer coating, with a layer of an HPMC barrier polymer placed in between. The enteric coating of the tablet dissolves when it is positioned on the stomach, and then it shields the tablet from gastric acids and pepsin while it's in the stomach. When the acidic soluble material coating goes through the small alkaline intestine, it is protected. The bacteria enzymatically degrade the polysaccharide (lactulose) into organic acid when the pill arrives in the colon. The PH becomes lowered, which will reduce the coating's disintegration and the drug's release. The polysaccharides are also in the center and work with the medication. Tablet is made of mannitol, maltose, and similar substances. Bacteria found in the colon break down polysaccharides, which are released from the middle of the tablet and then form a coating over the medication to allow it to dissolve in the stomach.

**d) Osmotic controlled drug delivery**

Osmotic drug delivery (designed by Alza Corporation) is an option for the delivery of medicine to the colon just once and twice a day through a capsule. An OROS-CT is a multi-faceted osmotic agent that can be used as a single agent or has between five and six osmotic push-pull units in a gelatin capsule. After contact with GI fluids, the gelatin capsule disintegrates, and the entry coating prevents fluids from the stomach into the system. The water transport through the membrane happens with the disintegration of the layer in the small intestine (that has a  $\text{pH} > 7$ ).

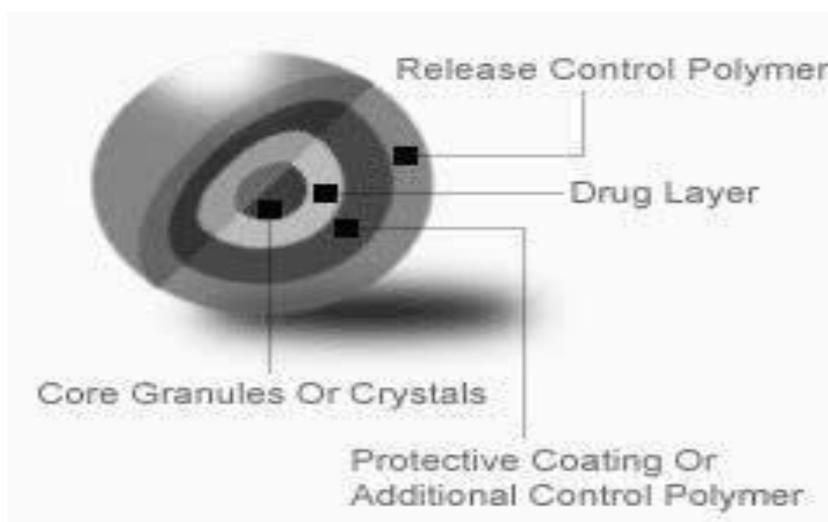


**Fig. 5: Cross-section of the OROS-CT colon targeted drug delivery system.**

**e) Multiparticulate system based drug delivery**

These formulations contain several small individual units, each housing a powerful substance to effectuate the release of medication, which is set off after a specific time interval via a set of explosion-operated release mechanisms. Pellets, granules, microparticles, nanoparticles, and beads are all included. The potential advantages of a multiparticulate system include:

- Fast, long-lasting results that stay in the body longer.
- Ensure complete absorption and even distribution in the gut.
- Fewer side effects overall, lower local irritation, and more controlled stomach emptying.



**Fig. 6: Multiparticulate drug delivery systems for controlled release.**

#### **f) Pro-biotic approach**

Currently, techniques for targeting a person's colon use three things: an implant (a microbial digestible carrier and Bifidobacterium and Lactobacillus), temperature triggering, and a particular substance (e.g., microbeads). This strain can be activated in the body at standard temperature, breaks down the drug-carrying vectors, and releases the medicine where needed. With all of these conditions readily available in the colon, this strategy has had success.

#### **Evaluation of colon targeted drug delivery system**

##### **In-vitro evaluation**

An established method for determining if someone has CDDS is missing. An ideal in vitro model must emulate the gastrointestinal system's pH, volume, bacteria, stirring, enzymes, and enzyme activity. The results are dependent on your nutrition and your physical exercise. The in-vitro dissolution and enzymatic tests are done on colon-targeted drug delivery devices.

##### **In-vitro dissolution test**

The dissolution tests are performed using the traditional basket method. To evaluate formulations at various pH levels, dissolution testing is conducted in buffers of varying pH. For the dissolution testing of colon-targeted drug delivery, several media are used, which mimic gastric fluid (pH 1.2), small intestine (pH 6.8), and large intestine (pH 7.4). The colon-targeted drug delivery devices are subjected to a series of three different environments, each lasting two hours. The first environment is 0.1N HCl (pH 2.3), the second is phosphate buffer (pH 6.8), and the third is pH 7.4 phosphate buffer. To measure colon-targeted drug delivery systems, we have designed buffers of the above pH.

### **In-vitro enzymatic test**

For this, you must take two tests:

1. Allow the bacteria to grow while the antibiotics are in their medium (*Streptococcus facial* or *B.ovatus*). We measured how much medicine was dispensed across various periods.
2. To analyze drug release, you use enzyme pectinase or rat or guinea pig or rabbit cecal contents with your buffer solution. Release rates are tied to how quickly the polymer-carriers degrade.

### **In-vivo evaluation**

A variety of creatures, such as dogs, guinea pigs, rats, and pigs, are employed in experiments that mirror the anatomic and physiological conditions of human guts, such as the presence of bacteria. These species are utilized since they're most like the conditions in human GIT. When considering the colonic disorders for an investigation, one should also think about the option of a relative model. Guinea pigs are utilized frequently to provide an IBD model for scientific purposes. There are quite a few similarities in azoreductase and glucuronidase activity levels in rat, rabbit, and human digestive systems. A new model has been developed for rapidly assessing CDDS. In this setup, human fetal bowels are transplanted under the skin of nude mice. These can affect blood vessel growth in four weeks, mature, and eventually gain the ability to create a mucosal immune system.

### **CONCLUSIONS**

Better delivery techniques are needed for localized disorders of the colon that address the existing medications. In contrast to a conventional drug that is dispersed in the whole body, a drug that targets only the colon is more likely to have side effects and needs to be more robust to be effective. This way, you don't need a dose as high to be effective, which also means that there will be less medicine in the body.

Because these materials are non-toxic, economically friendly, and chemically compatible with other ingredients, interest in biodegradable polymers is constantly expanding. The biodegradable polysaccharides in colon-specific medication delivery have been previously discussed in this article. Polysaccharides are the building blocks of a colonic delivery system with attractive characteristics. Microflora found in the colon is an attractive target for medication release in that region. Microbial degradable polymers used to create the drug's formulation are discharged from the upper GIT and pass through intact before being excreted

in the colon. Polysaccharides seem capable of delivering colon-specific drugs, a prospect that has researchers excited.

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**COMPARATIVE STUDY AMONG SENIOR SECONDARY STUDENTS FOR ASSESSING  
EMOTIONAL INTELLIGENCE AND STRESS MANAGEMENT**

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**Abstract**

Emotional Intelligence is nothing but a trait of one's personality where an individual acquires an ability to understand his emotions as well as others too. This helps him to move forward in his life by overcoming various obstacles that come in his path. Emotional Intelligence makes an individual smart. It proves to be an invaluable asset for the individuals, especially the ones who are at the difficult stage of adolescence as this trait would help them to relieve their stress and can also act as a barrier to all kinds of negative energies. This present research study aims to assess the Emotional Intelligence and Stress Management among Senior Secondary students. The study was investigated on 100 students (50 male and 50 female) studying in various streams of Senior Secondary Public Schools. The respondents were selected randomly from 11<sup>th</sup> grade. The tools employed in the research study were Emotional Intelligence inventory (EII) constructed and standardized by Mondal and to measure the Stress Management of students, scale developed and standardized by Seema Rani and Basant Bahadur Singh (SISS) was used. Mean, Standard Deviation and to know the significant difference between the means of two groups 't' test were used by the investigators as the statistical techniques. The main findings of the research study unveiled that Science and Commerce stream secondary students differ significantly on emotional intelligence and stress management. Equivalently, the senior secondary male and female students also differ significantly on emotional intelligence and stress management.

**Keywords:** *Emotional Intelligence, Stress Management, Senior Secondary Students, Science and Commerce Stream secondary students.*

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**Introduction**

“Attitude (aka Emotional Quotient / Intelligence) and not Aptitude (aka Intelligence Quotient) determines your altitude in life”. How often have we heard this timeless adage and shrugged it off as a yet another cliched advice, without realising the importance of it in our lives. Emotional Intelligence essentially means the ability to identify, understand and use your own emotions in positive ways to relieve stress and anxiety, communicate effectively, empathize with others, overcome challenges and resolve conflicts. While that might sound like a magic wand, it is like a staple which the parents should be inculcating in their kids right from the beginning. There are basically four components of Emotional Intelligence (EI) – self-awareness, self-management, empathy and social skills. Adolescence, which is very impressionable age for children's, comes with its own set of challenges the parents have to be prepared for to deal with. At this age, kids in pursuit of carving out their own identity often get rebellious, develop unhealthy behaviours, get easily swayed by peer pressure and eventually end up developing stress and anxiety issues. Inculcating strong emotional intelligence in children's from early on in their lives will thus equip them with coping stress; since by being self - aware, they can identify triggers which stress them out and express them by talking those out candidly with parents / guardians before they reach unmanageable levels and by being empathetic and socially aware, they would be able to switch the lens and see the world from other's perspective.

Thus, using Emotional Intelligence (EI), children's will be able to better harness and manage their emotions, communicate effectively, manage conflicts, manage stress, inspire and be an influence for other kids to follow and definitely proved to be as the illustrious stress buster.

**Statement of the problem**

“Comparative Study among Senior Secondary Students for assessing Emotional Intelligence and Stress Management”.

## Definitions of Key Terms

### 1. Emotional Intelligence

**According to Mayer, Salovey and Caruso (2002):** Emotional intelligence is “the ability to perceive emotions, to access and generate emotions so as to assist thought, to understand emotions and emotional meanings, and to reflectively regulate emotions in ways that promote emotional and intellectual growth”.

### 2. Stress Management

**According to Wikipedia:** Stress Management is a wide spectrum of techniques and psychotherapies aimed at controlling a person’s level of stress, usually for the purpose of and for the motive of improving everyday functioning.

## Objectives of the Research Study

The objectives for the present study were:

1. To compare the emotional intelligence of male and female students studying in senior secondary class of Public schools.
2. To compare the stress management of male and female students studying in senior secondary class of Public schools.
3. To find out the difference in emotional intelligence of Science and Commerce stream students studying in senior secondary class of Public schools.
4. To find out the difference in stress management of Science and Commerce stream students studying in senior secondary class of Public schools.

## Hypotheses

The Following were the hypotheses for the present research study

- H<sub>01</sub> – There is no significant difference in emotional intelligence of male and female students studying in senior secondary class of Public schools.
- H<sub>02</sub> – There is no significant difference in stress management of male and female students studying in senior secondary class of Public schools.
- H<sub>03</sub> - There is no significant difference in emotional intelligence of Science and Commerce stream students studying in senior secondary class of Public schools.
- H<sub>04</sub> - There is no significant difference in stress management of Science and Commerce stream students studying in senior secondary class of Public schools.

## Review of Literature

### 1. Studies conducted on Emotional Intelligence

Kar1, Dhiman, Saha, Birbal & Mondal, Chandra, Bhim (2014) investigated a study on “Measuring Emotional Intelligence of Secondary School Students in Relation to Gender and Residence: an Empirical Study”. The sample incorporated 200 respondents, selected from schools of 2 areas i.e. rural and urban. The tool used to measure the emotional intelligence of secondary school students was Emotional Intelligence Inventory (MEII) developed by Mondal (2014). ‘t’ test and One Way ANOVA were employed as the statistical techniques. The results revealed that there was no significant relationship between emotional intelligence among boys and girls. Sarita & Kataria, Sumit (2014) conducted a study on “A Study of Emotional Intelligence and Academic Achievement among Secondary school students”. The sample incorporated 100 secondary school students. Stratified sampling technique was employed for the process of data collection. Tools developed by Anukool Hyde and Sanjyot Dethe was used to measure the emotional intelligence of students. Mean, Standard deviation, ‘t’ test and Karl Pearson Product Moment Coefficient of Correlation were used as statistical techniques. The findings of the study were i) There was no significant difference in the mean score of emotional intelligence in relation to gender ii) There was slight relationship between Emotional Intelligence and Academic Achievement among secondary school students. Harjeet & Sra, Nisha (2015) administered a study on “Cor-relational Study of Stress and Emotional Intelligence among Adolescents. The sample consisted of 200 adolescents (male and female) from urban and rural areas. Stratified Random sampling was employed for data collection. Stress scale for Students, prepared by

Dr. Prerna Puri, Dr. Tejinder kaur and Prof. Manju Mehta and Emotional Intelligence Inventory constructed by Dr. S.K Mangal & Mrs. Shubra Mangal were used as tools for the conduction of the study. Mean, Standard Deviation, 't' test and Karl Pearson Product Moment Coefficient of Correlation were adopted for the interpretation of data. Through the results it was found that Male adolescents possess more emotional intelligence than female adolescents. Further it was also highlighted that the rural school adolescents possess more emotional intelligence than urban school adolescents.

## **2. Studies conducted on Stress Management**

Krishan Lal, Krishan (2014) conducted a study on "Academic Stress among Adolescent in Relation to Intelligence and Demographic Factors". The sample comprised of 200 students selected from Government and Private schools of Hisar. The tools that were employed to ascertain the data were Academic stress scale developed by Dr. Abha Rani Bist and Intelligence Test, prepared by Dr. R.K. Ojha. 't' test was employed as the statistical technique. The findings of the research study were i) There exists no significant difference in academic stress of average and low I.Q. students ii) There exists no significant difference in academic stress of Government and private senior secondary school students. Prabhu, Suresh P. (2015) investigated "A Study on Academic Stress among Higher Secondary Students". i) To find out whether there was significant difference between the following sub samples with respect to academic stress. a) Gender b) Locality c) Management [ Government / Private]. The sample consisted of 250 candidates drawn from higher secondary schools located in Namakkal District of Tamil Nadu, India. The investigator used Normative Survey method and Random sampling technique for conducting the study. For the measurement of academic stress the investigator used academic stress scale, developed by R. Balaji Rao. Mean, S.D. and 't' test were used as statistical techniques for the analysis of data. The findings showed that i) Male and female students do not differ significantly in their academic stress scores ii) Rural and urban area students do not differ significantly in their academic stress scores iii) Government and private school students do not differ significantly in their academic stress scores. Subramani, C. & Kadiravan, S. (2017) conducted a study on "Academic Stress and Mental Health among High School Students". The sample comprised of 200 respondents selected from government and private higher secondary schools. The investigator adopted stratified random sampling technique and survey method for the conduction of the study. The tools used in the study were Academic Stress scale developed by Jinadong Sun (2012) and Positive Mental Health Scale constructed and standardized by Vaingankar et al (2011). For the interpretation of data Mean, S.D., 't' test and Coefficient of Correlation were adopted as statistical techniques. The findings of the study divulged that i) students from private schools experienced high academic stress than the government school students.

## **Methodology**

The investigators have adopted survey method for the purpose of data collection in the present research study.

## **Sample and Sampling Procedure**

Hundred XI standard Science and Commerce stream students were selected through simple random sampling technique from the senior secondary schools situated in Noida region of District Gautam Buddha Nagar.

## **Instruments used in the research study**

The investigators used the following mentioned tools in this research study

1. Emotional Intelligence Inventory (EII) developed by Mondal (2014) was used for the purpose of data collection.
2. Stress inventory (SISS) standardized by Seema Rani and Basant Bahadur Singh (1986) was used to measure the stress management of the students.

## **Statistical Techniques used in the study**

In this current study different techniques of statistics were used for the interpretation. Mean and S.D. were calculated from the retrieved scores. After that 't' test was applied to know the difference between

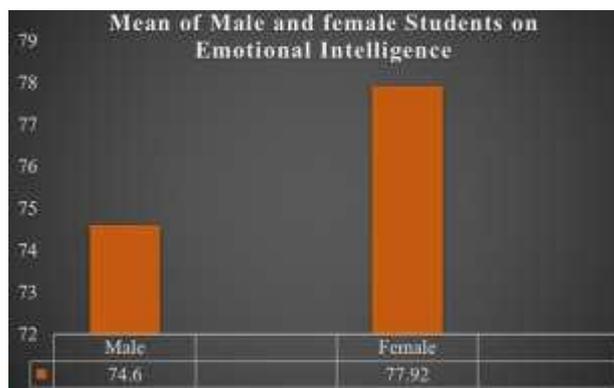
the means of two groups i.e. male and female, Science and Commerce stream on emotional intelligence and stress management etc.

**Analysis and Interpretation of Data**

**TABLE – 1 :MEAN AND STANDARD DEVIATION OF EMOTIONAL INTELLIGENCE SCORES OF MALE AND FEMALE SENIOR SECONDARY STUDENTS**

Gender	N	Mean	S.D.	‘t’ value	Significant at 0.05 level
Male	50	74.60	21.64	2.96	Significant P < 0.05
Female	50	77.92	25.83		

From the above table it was perceived that the ‘t’ value, 2.96 was found significant at 0.05 level. Therefore, it can be inferred that the H<sub>01</sub> “There is no significant difference in emotional intelligence of male and female students studying in senior secondary class of Public schools” was rejected. In other words, it can also be deduced that male and female secondary school students differ significantly on emotional intelligence.

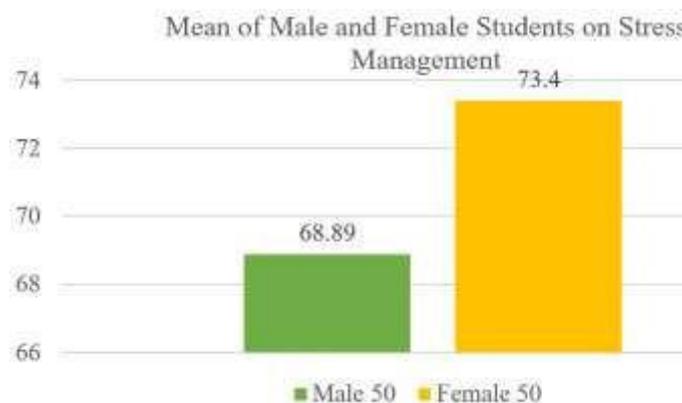


**Figure – 1 Bar Chart showing Mean difference between Male and Female senior secondary students on Emotional Intelligence**

**TABLE – 2 :MEAN AND STANDARD DEVIATION OF STRESS MANAGEMENT SCORES OF MALE AND FEMALE SENIOR SECONDARY STUDENTS**

Gender	N	Mean	S.D.	‘t’ value	Significant at 0.05 level
Male	50	68.89	18.76	2.37	Significant P < 0.05
Female	50	73.40	21.33		

From the above table it was perceived that the ‘t’ value, 2.37 was found significant at 0.05 level. Therefore, it can be inferred that the H<sub>02</sub> “There is no significant difference in stress management of male and female students studying in senior secondary class of Public schools” was rejected. In other words, it can also be deduced that male and female secondary school students differ significantly on stress management.

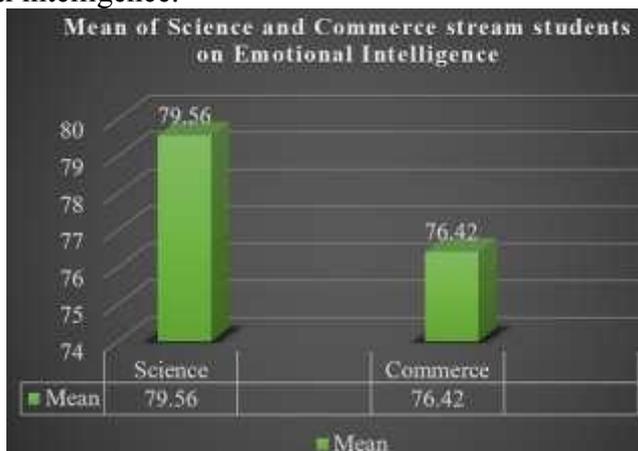


**Figure – 2 Bar Chart showing Mean difference between Male and Female senior secondary students on Stress Management**

**TABLE – 3 :MEAN AND STANDARD DEVIATION OF EMOTIONAL INTELLIGENCE SCORES OF SCIENCE AND COMMERCE STREAM SENIOR SECONDARY STUDENTS**

Stream	N	Mean	S.D.	't' value	Significant at 0.05 level
Science	50	79.56	28.80	2.83	Significant P < 0.05
Commerce	50	76.42	26.32		

From the above table it was perceived that the 't' value, 2.83 was found significant at 0.05 level. Therefore, it can be inferred that the H<sub>03</sub> "There is no significant difference in emotional intelligence of Science and Commerce stream students studying in senior secondary class of Public schools" was rejected. In other words, it can also be deduced that Science and Commerce stream students differ significantly on emotional intelligence.

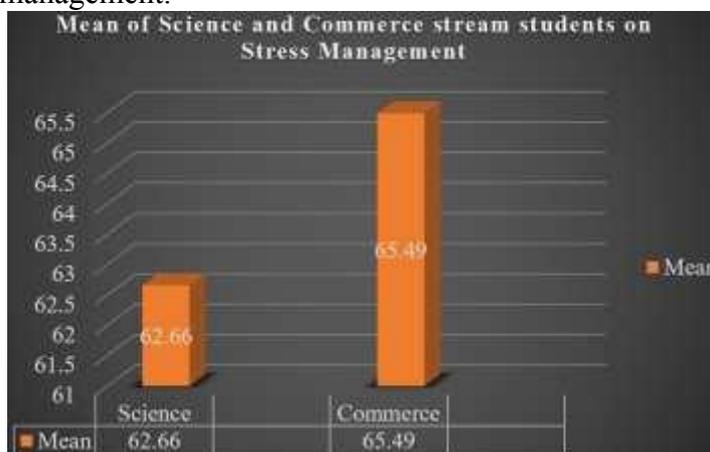


**Figure – 3 Bar Chart showing Mean difference between Science and Commerce stream students on Emotional Intelligence**

**TABLE – 4 :MEAN AND STANDARD DEVIATION OF STRESS MANAGEMENT SCORES OF SCIENCE AND COMMERCE STREAM SENIOR SECONDARY STUDENTS**

Stream	N	Mean	S.D.	't' value	Significant at 0.05 level
Science	50	62.66	16.38	2.23	Significant P < 0.05
Commerce	50	65.49	19.72		

From the above table it was perceived that the 't' value, 2.23 was found significant at 0.05 level. Therefore, it can be inferred that the H<sub>04</sub> "There is no significant difference in stress management of Science and Commerce stream students studying in senior secondary class of Public schools" was rejected. In other words, it can also be deduced that Science and Commerce stream students differ significantly on stress management.



**Figure – 4 Bar Chart showing Mean difference between Science and Commerce stream students on Stress Management**

### Findings

The major findings of the study were as follow:

- 1) Male and Female senior secondary students differ significantly on emotional intelligence. The elevated mean and S.D. in favour of female students specified that they have significantly higher emotional intelligence in comparison to male senior secondary students.
- 2) Male and Female senior secondary students differ significantly on stress management. The elevated mean and S.D. in favour of female students specified that they have significantly higher stress management in comparison to male senior secondary students.
- 3) Science stream students differ significantly on emotional intelligence.
- 4) Commerce stream senior secondary students differ significantly on stress management.

### Educational Implications

The present research study unearthed that emotional intelligence of females and Science stream students is higher as compared to the males and Commerce stream students. From the study the researcher discerned that there is an urgent need to make efforts in order to increase the level of emotional intelligence and stress tolerance among students, especially the adolescents, as these are essential traits for holistic development of personality of an individual. Therefore, in order to raise the level of emotional intelligence and stress management, subsequent steps shall be taken at school, teacher and parental level:

- In school, teachers should plan their lectures according to the correct methodology and by keeping in mind the needs of students.
- Teachers should maintain a cordial and an optimistic attitude towards growing students and their academic and personal problems. They should come up with proper solutions to the same.
- Teachers should motivate the students to participate in various extra - curricular activities according to their interests so that they can maneuver their energy in the right direction.
- School Management should arrange for Guidance and Counselling programmes for the students which might help them to get rid of negative energy and emotional stress.
- School authorities should organise several workshops, seminars, symposiums etc. so that the students can acquire some knowledge which might prove to be helpful for them in not indulging in unnecessary stress.
- Guidance and Counselling service programmes should also be systematized for the parents to provide them the knowledge about the difficult stage of adolescence and how they should be careful while dealing with their children.
- Educational tours should be arranged for the students where they learn to understand the emotions and feelings of each other while working together.

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## Eco-crisis leads to the rise of Eco-consciousness

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**Abstract:** Nature and the environment play an important role in Malayalam poetry. The beauty of the landscape, which is rich in various species of flora and fauna, mighty rivers, and the shore line, adds to Kerala's vibrant culture and tradition. It demonstrates the region's ethnic diversity. Mysticism associated with the natural landscape attempts to claim its identity once more. A few writers from the area have depicted the relationship between man and nature in their writing. One of the most prevalent themes in contemporary Kerala poetry is environmental awareness. Ecological motifs, pictures, and symbols are prominently featured, giving their poetry a sense of beauty and aesthetics. In this paper, we look at how natural landscapes and myths are represented in a few river poems by two of India's most illustrious poets, K Satchidanand and G Sankara Kurup, whose works strongly reflect ecological consciousness.

**Keywords:** Ecology, Ecological Consciousness, Identity

### OBJECTIVES OF THE STUDY

The use of poetry as a medium for understanding the complex, intricate, and highly political representation of landscape experience is investigated in this study. People create empowered place identities as a result of the story-oriented and positive practise of landscape poetry, which promotes the creation of personal interaction with environmental values, attitudes, and meanings. Furthermore, it is suggested that new models of landscape education are needed to combat disempowering public discourse about youth and the environment, as well as conventional environmental education that fails to equip youth with the resources to constructively challenge it. This project utilizes a grounded theory approach to identify and analyse people's expressions of place identity through poetry. The content of the poems have been analysed to discover what environmental subjects were expressed by the poets, and what was meaningful about them for today's youth. Findings include the increased awareness of respecting nature and the nature-culture relationships in environmental experiences.

The creation of better environmental leaders is critical to solving the very real environmental challenges that we face today. The importance of a theory of landscape interaction and learning for this initiative is suggested by an analysis of these river poems. Environmental education, in other words, must evolve beyond the passive reception of knowledge about landscape ecologies and histories. Instead, the ways in which youth communicate with their surroundings must include them as active participants and contributors to political, cultural, and ecological understandings of environmental issues. The time has come when youth are allowed to participate as creators of knowledge in their own communities through poetry, they will personally and critically engage in understanding their environments in constructive ways.

Ecology has become an important subject of cross-disciplinary debate at the end of the twentieth century due to the disturbing ecological destruction. Slowly but slowly, the planet is witnessing the scale of human-caused environmental disruption. The ecological crisis has already become a global apocalyptic subject. The literary world is reacting to the global eco-crisis, realising the urgency of saving the Earth from total annihilation. Green philosophy ushered in a change in the way people thought about literature in the West. Rachel Carson's epoch-making novel, *Silent Spring*, was published in 1962. It sparked a flood of serious debates and deliberations about ecological stress, which peaked in the twentieth century. Since literature could not remain silent on the growing relevance of ecological philosophy, a new critical genre known as Ecocriticism emerged in the 1970s. Ecocriticism examines literary works from an ecological perspective.

The Corona era has made us aware that we are living in a period of profound social, cultural, ideological, and political transformation. Academicians have always been piqued by our society's evolving perspective and how it interrogates and deals with emerging ideas and trends. Malayalam literature and literati has played a crucial position in resisting the Silent Valley Hydroelectric Project (SVHP) and spreading the message of ecological conservation during the 1970s and 1980s. The cultural and literary traditions of Malayalam have always recognized and nurtured the relationship between human and natural lives. This paper explores two river poems composed, recited, and published by K Satchidanand and G SankaraKurup, examining how their poets deftly combined scientific and environmental principles with artistic, cultural, and literary traditions through such poems. The threat to the Silent Valley shocked and galvanised a large number of Malayalam authors. Never before in Kerala's socio-political past have writers shown such unity and determination in opposing the government's policies. Now is the time to duplicate this zeal and enthusiasm and bring back the lost glory of 'God's Own Country'. Now is the time to revive the past culture which is now mired in the fishing nets of pseudo-religion and sullied politics. Now is the time to revive its rivers, to bring them back to life so that

*'this dear parched earth...*

*sings the fertile songs of the ancients once again'*. (K. Satchidanand: The Peasant who committed Suicide Speaks of Rivers)

#### Origin of Eco-criticism

Literature and various forms of art have been portraying physical and the human-environment relationship since the Vedic period. The environmentalist movement, which began in the late 1800s, produced a large body of fiction and nonfiction literature focused on human understanding of nature and their evolving relationship. Eco-criticism arose from this bio-social background of unbridled capitalism, unsustainable natural resource extraction, troubling meanings and shapes of 'development,' and environmental danger. Its aim is to see how potentially informed readings of cultural texts can help not only to raise awareness but also to look at the world in new ways.

Eco-criticism is a relatively new literary field that originated in 1990. Its origins can be traced back to environmental destruction caused by human actions, and it explores and interprets man's relationship with nature, as depicted in literature. It explores the relationship between authors, texts, and the ecosphere in an

interdisciplinary analysis of interconnections between nature and culture. When academics began to collaborate on projects and environmental literature began to appear on the programmes of annual literary conferences in the mid-eighties, the field of environmental literary studies was born. In 1992, the Association for the Study of Literature and Environment (ASLE) was established. “to promote ideas and information pertaining to literature that considers the relationship between literature and the natural world.” Elaborating on the scope of ecocriticism, Cheryll Glotfelty writes, “Nature per se is not the only focus of ecocritical studies. Other topics include the frontier, animal, cities, specific geographical regions, rivers, mountains, deserts, Indian technology, garbage and the body” (xxiii) Donelle Dreese provides a thorough description of ecocriticism, encompassing all aspects of the philosophy, its goals, and its scope: Ecocriticism, also known as landscape critique, focuses on previously unrecognised problems in the landscape and ecosystem.

G Sankara Kurup or Mahakavi G was an Indian poet, essayist, and literary critic who specialised in Malayalam literature. He was a professor of Malayalam at Maharaja's College. He was the first recipient of the Njanapedam, India's highest literary honour, and is regarded as one of the greats of Malayalam poetry. From 1968 to 1972, he was a nominated member of the Rajya Sabha, and in 1967, he was awarded the Padma Bhushan, India's third highest civilian honour. He also won the Sahitya Akademi Award, the Kerala Sahitya Akademi Award, and the Soviet Land Nehru Award.

The current study aims to reveal the country's pitiful condition of rivers through the review of poems such as "The Peasant Who Committed Suicide Speaks of Rivers," and Mahakavi G's "At the River Mouth at "Vanchi," These poems are vehement criticisms of the nation's modern culture. Rivers that were once the nation's water supply flowed honey to quench people's thirst. All beings, including animals and humans, have drunk the elixir of life from those overflowing rivers. Its never-ending passion is a constant source of inspiration for all artists.

In his poem, "At the River Mouth at "Vanchi," Mahakavi. G rues the fact that Kerala was once an 'auspicious cradle' which has been reduced to a 'hearse' now. He says that Kerala is now 'broken in three', she has lost her culture:

*Gone is Kerala broken in three*

*The bow string of its culture lies loose'(44-45)*

Once upon a time, the state was rich and prosperous, now there are starving men who turn 'rotting coconut husks to golden ropes', the sea ships full of fish have been replaced with empty Chinese fishing nets. A land where the temples and mosques lay side by side has turns into a land where even the rats and snakes fight.

*"Where now snakes and rats are fighting.*

*It made restless*

*The temples the mosques the coconut groves...(68-70)"*

Mahakavi G. ends the poem on an optimistic note:

*"It was like a bouquet of coconut flowers...*

*An auspicious symbol of prosperous life"*

He has hope, that the state will become prosperous once again, once again the seas will be full of fish, once again people will live in harmony with nature and in harmony with each other.

The poem "The Peasant Who Committed Suicide Speaks of Rivers" best expresses the poet's concern for the rivers of Kerala. Kerala is known as the "Land of Rivers" because of its forty-four rivers. The state's culture thrives along these river banks, and artists represent the beauty of these rivers in the various art forms available. Kerala was once renowned for its evergreen paddy fields, which were irrigated by the water from these rivers. The state's farmers have historically relied heavily on the state's rivers for irrigation. However, as rivers become more or less extinct in modern times, the paddy's beauty has faded. The state's agricultural sector has utterly collapsed, and stories of peasant suicide have started to flood the news media on a regular basis. In this poem, Satchidanandan gives voice to one such peasant who committed suicide. The poet gives voice to the soul of a farmer who has committed suicide and meditates on the beauty of rivers in the first part of the long poem. The poem's first section is packed with enduring memories of Kerala's late rivers. The deceased farmer's soul recalls how the rivers of old offered plentiful food to the people. The river served as a nurturer for the state's children, singing them lullabies. She used her 'Breast milk' to feed her children. The poem is replete with the cultural nuances of Kerala: Kathakali, the Theyyam gods, waves of Sopana music, Mohiniyattom, Moplah songs, Pariah's dance, the All Saints Day at the church, all this signifies the fine amalgamation of socio-religious festivals and art forms in the culture of the state. This is indeed a strong message to the public of the cultural unity that the state has witnessed irrespective of the fact that which religion one follows. It is a clarion call for the disturbed mindset of today's residents of the state who have witnessed mindless violence in the name of religion or politics or any other reason, a message to learn from its rich history that unity in diversity is the norm rather than an exception.

*... River was there as divine mercy*

*In the green Kathakali mask ...*

*In the flowing forms of the Theyyam gods,*

*In the agile steps of the Pariah's dance,*

*In the wavelike petals of the Sopana music...(41-48)*

The poem recalls how the river's divinity encompassed the entire state's spirit. However, time has separated man from all of his links to nature and rivers. His greedy self, lost in the world of profit, has attached prize tags to all of nature's possessions. In narrating the dramatic shift in man's actions towards nature, the poet gives voice to the spirit of the dead peasant:

*Then the trumpeting forests*

*mowed down by the killers*

*pierced the rivers' laughter with their tusks,*

*then the sand that used to ride the water*

*with the fish and the snake*

*began to travel on the wheels of greed. (63-68)*

The poet expresses his displeasure with the fact that Kerala's rivers have become victims of the sand mafia in these lines. The destructive effects of the sand mafia could be seen all over the state's rivers. Pampa, Kabini, and Periyar, once grand rivers, have become mere rivulets. The river "Nila," which has always been a source of inspiration for poets, has become nothing more than dry land with pebbles bathing in the sunshine as a result of excessive sand looting. Despite the fact that the court has refused permission to take sand from the state's rivers due to the destructive impact it has on the rivers, the sand mafia in Kerala continues to loot the rivers with the help of the police and politicians. The death of the state's rivers has had a negative impact on peasants, as their agricultural crops have begun to die one after another. Due to a lack of irrigation water, the paddy fields, which were once the state's main attraction, have become barren. Many peasants in the agricultural sector have died as a result of crop failure in the state. Satchidanandan ends the poem by speaking for the peasant's soul, wishing to see his mother river overflowing with cool water with the blessing of nature, quenching its thirst and assisting the barren land in giving birth to healthy offspring.

Both the poets are optimistic that the glory of the land and the nearly dead rivers will be revived, one day. The concern for the environment and ecology expressed in these poems not only reflects our personal and cultural attitudes toward the environment, but it also helps to shape a formative opinion among the masses in general, and the youth in particular, about the protection of nature, environment, and ecology. The emphasis is on the notion that humans must assume responsibility for nature and the world.

The aforementioned study does not pretend to be comprehensive, as it is impossible to do in the confines of a paper; however, it adamantly asserts that we, as teachers and students, cannot neglect the undeniable fact that current environmental issues are a by-product of culture. According to historian Donald Worster:

We are facing a global crisis today, not because of how the ecosystems function but rather because of how our ethical systems function...Historians, along with literary scholars, anthropologists, and philosophers cannot do the reforming, of course, but they can help with the understanding. (1993: 27)

Values, tradition, history, point of view, and language are all topics that literary scholars and students of literature are interested in. We can make a significant contribution to environmental thinking by focusing on these areas. While reading and evaluating texts in our classes, as this study has modestly attempted to do, we should have an ecological viewpoint and emphasise how our fractured, compartmentalised, and excessively specialised way of understanding the planet has intensified the environmental crisis. As scholars of humanities, we should make a concerted effort to educate ourselves in the sciences, follow interdisciplinary approaches, learn to take responsibility for the protection and preservation of the environment and instil the same spirit in our students.

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# Impediments for Work-Life Balance in the New Normal: Exploring the Factors Facing by Working Individuals

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## Abstract

All over the world, because of the pandemic, the scenario for working individuals totally changed from the reality before. The complete lockdown compelled the organizations to follow the concept of work from home. The study will examine the comparative factors before pandemic and new normal which impact the domains of personal and professional end, the impediments on the way to balance work, and life roles for a working individual and identifying the factors that need to be adopted with the new normal scenario. This study will be analytical and descriptive in nature by collecting data on a primary and secondary basis. Primary data will be collected from working individuals by following the telephonic interview, whereas secondary data will be collected from various publications related to the current situation.

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**Title: How to Lead a Healthy Way of Life****Sarita<sup>1</sup>, Dr. Richa khugshal<sup>2</sup>****<sup>1</sup>Research scholar (Lingaya's vidyapeeth Faridabad, Haryana)****<sup>2</sup> Professor (Lingaya's vidyapeeth Faridabad, Haryana)****Abstract**

Health is the way of life, and it leads to energies and body balances, and the quality of living is increased substantially. The Indians who lived and thrived in the medieval and post medieval era were good at practicing the philosophy - "jivem shardah shatam," all of which ultimately lead to the happiness, vigorousness and esteemed creativity. This concept aimed at building up a complete harmony with the nature, and living in the state, which is quite homeostatic.

Living a quality life balanced in nature also brings spiritual balance and one begins to feel more energetic than ever. It is the way where you begin to feel the quality. However, health is not only a dependent factor on harmony with the nature and the living, it is critical that an individual also leads a balanced food. The balanced food is going to make things easy for everyone.

Eating the natural and whole food items is better and more effective in building as well as maintains the health. It also prevents the building up of unnecessary food items like oil and fats in the body. Amidst all these, what matters is the maintaining a strong physical fitness, more or less nothing else. Having a balanced diet and well-maintained physical fitness is going to bring changes in your lives, sometimes such types of changes present a great deal of significance and innovation.

When a threshold value is maintained as the result of our physical fitness, we are also protecting the body from wide range of diseases. The fitness regimen that you plan for yourself should be well maintained and in right order. Being well structured in your fitness also means that you

going is going to ensure that you have healthy mind and body, and decisions taken as the result will matter a lot.

**Keywords:** *Exercising, Aerobic Exercises, Exercising Benefits, Health, Health Prone Food*

## **Introduction**

All of us try to keep our body weight in control as this is the only way by which means we will be in shape and balanced. Weight control in addition to the concrete diet plan plays important role in not only helps you to remain in shape, but also you prevent the obesity. If you maintain your body weight and keep the other factors balanced, it is very important that you keep the balance on the calories. The calories you are eating need to be equitable by the energy you are burning. If there is an imbalance created, the effects of which could easily be seen on your body in many ways.

Everything begins and ends with the food we are eating, and how much is really hygienic or nutritious in nature. Your food decides that you will be enjoying a healthy way of living and things will be under your balance. Along with food, there is special place for the exercises, as in this way you are going to strengthen your cardio vascular system as well as other systems.

Here your mental health is also important, because you cannot ignore the planning side, which is the result of your psychological development. Exercising and maintaining a consistent regularity is what decides the outcome. The blood sugar levels needs to be understood on several levels. On the off chance where you are exercising regularly, you are going to keep your blood pressure balanced and triglyceride levels become low, or within the limits. This is where you will keep the disease levels subdued.

A blend of a decent exercise system and a fair eating routine will deliver enduring aftereffects of sound life. Exercise keeps an individual fit as well as causes one to have a positive outlook on oneself. As the idioms go, "a sound body has a solid brain" and "the type of food you eat will

synthetic that helps an individual vibrate more loose and tranquil. A reasonable eating routine is fundamental to keep a solid weight. Exercise and nourishment go inseparably.

Studies have shown that heart stimulating exercise activities can make your bones solid which thusly assists you with maturing better. Eating a low fat, low carb and high protein diet can be useful in accomplishing objectives quicker. Practicing consistently forestalls the danger of creating heart infections, diabetes and specific kinds of malignancies. To guarantee that you are practicing hard enough without stressing your heart, ascertain pulse by utilizing the pulse adding machine. The ideal exercise requires the heart beat to go up to 75% of pulse which will consume a great deal of calories in little measure of time.

There are three fundamental parts to all activity schedules; Aerobics, Strength preparing and Flexibility or Stretching. High impact exercise work out: Walking, hopping and swimming are the best types of vigorous exercise work out. Hop rope brings the pulse up a lot quicker than strolling. Consequently, ten minutes of bounce rope, is comparable to twenty minutes of strolling. Swimming is considered as the lone exercise that permits all the muscle gatherings to cooperate at the same time to consume greatest calories.

Strength Training: Weights and Pilates are known as muscle conditioning and fortifying exercises. Weight preparing ought to be done somewhere around three times each week. Pilates are getting very well-known these days particularly in the western nations. It shows control of psyche and body and fortifies centre muscles. Adaptability works out like the Yoga and extending unwinds you internally and externally. It quiets tension and rejuvenates about a comprehensive methodology. Extending is energetically suggested after each exercise. It is a decent method to forestall wounds and calm drained and sore muscles.

The advantages of workouts are endless. With the help of workouts, you have increased cerebral activity, and there is a feeling of more vivaciousness. Your sickness will be under the control, makes the heart more grounded as well as removes tension and misery.

Adequate eating routine will give you the energy your body needs to work appropriately with good dieting propensities so your resistant framework is sufficiently able to battle sicknesses. Less than stellar eating routine can prevent the development and advancement in kids. Children with terrible dietary patterns are bound to proceed with it for the remainder of their lives.

## II – Literature Review

World wellbeing is on the move. Expanding quantities of individuals practice an inactive way of life. Also, eat unfortunate eating regimens - two propensities that are liable for the most persistent illnesses in our reality. Most youngsters should go to class; a school-based mediation is a shrewd decision; so we additionally explored some school-based intercessions.

Since research strategy is a basic region in our examination, we additionally survey a short history of wellness trial of youth, and the reasoning, unwavering quality and legitimacy of fitness program, which were utilized in our investigation. At last, we audit the examination technique for its adequacy in surveying kids' active work, weight and the components that could impact youngsters' actual wellness, for example, active work levels, phase of development.

Wellbeing has been characterized from numerous points of view since forever. The antiquated Greek doctors accepted wellbeing to be a state of amazing body balance. The antiquated Chinese accepted that wellbeing was an impression of an indispensable body power called "Qi" (Edelman and Mandle, 1986).

Great wellbeing, as indicated by Nieman (1998), may be better characterized as the presence of "adequate energy and essentialness to achieve day by day assignments and dynamic sporting pursuits without unjustifiable weariness". Great wellbeing to an individual implies that you can lead a full and dynamic life day in-and-out (working, running a family, going to classes, contemplating, taking an interest in sporting exercises, and partaking in a functioning public activity without falling into bed every evening, depleted), contract irresistible infection less regularly, and will in general ward off irresistible infection better than the individuals who are

satisfaction in later years. By and large, great wellbeing delighted in by people can be surveyed genuinely on a public level by normal life expectancies.

Wellbeing related actual wellness comprises of those parts of actual wellness that have a relationship with great wellbeing. The parts are generally characterized as body synthesis, cardiovascular wellness, adaptability, solid perseverance and strength. Ability related actual wellness comprises of those segments of actual wellness that have a relationship with upgraded execution in sports and engine abilities. The parts are ordinarily characterized as dexterity, balance, coordination, force, speed and response time. Earlier to the most recent 40 years the qualification between wellbeing related and expertise related actual wellness was not normally made. Body Composition is a wellbeing related part of actual wellness that identifies with the relative measures of muscle, fat, bone and other indispensable pieces of the body (USDHHS, 1996). Cardiovascular Fitness is a wellbeing related segment of actual wellness that identifies with capacity of the circulatory and respiratory frameworks to supply oxygen during supported physical movement (USDHHS, 1996). Cardiovascular wellness is additionally alluded to as cardiovascular perseverance, vigorous wellness and cardiorespiratory wellness. A VO<sub>2</sub> max test in the research center setting is viewed as the best proportion of cardiovascular wellness. Ordinarily managed field tests incorporate the One mile run/walk, the 12-minute run, the PACER run for kids and different bike, step, and treadmill tests.

Adaptability is a wellbeing related part of actual wellness that identifies with the scope of movement accessible at a joint (USDHHS, 1996). A few specialists determine that adaptability requires scope of movement without uneasiness or agony (Howley and Franks, 1997). Adaptability is explicit to each joint of the body, in this manner there is no broad estimation of adaptability as there is for cardiovascular wellness. Adaptability is normally estimated in the lab utilizing estimation gadgets like a goniometer, flexometer and in the field with test activities, for example, the sit what's more, reach, and the zipper.

industrialization, urbanization, financial improvement and market globalization have sped up over the previous decade.

This mix of unfortunate eating regimens and way of life is essentially affecting the wellbeing also, dietary status of populaces, especially in non-industrial nations and in nations on the move (WHO, 2003a, p.1). As of now today in the whole world, except for sub-Saharan Africa, persistent sicknesses are currently the main sources of death. The WHO gauges that in 2001, constant illnesses contributed roughly 60% of the 56.5 million complete announced passings on the planet and around 43% of the worldwide weight of infection (WHO, 2003a, p.4).

On a worldwide premise 79% of all passings inferable to ongoing infections are as of now happening in non-industrial nations (WHO, 2003a, p.5). It has been extended that, by 2020, ongoing infections will represent very nearly 75% of all passings and 57 percent of the worldwide weight of illness. They are additionally showing stressing patterns, not just in light of the fact that they as of now influence an enormous extent of the populace, yet additionally since they have begun to show up before throughout everyday life (WHO, 2003a, p.1-3).

Systemic physical work is a complex multi-useful conduct performed by everybody to keep up with day by day life. It differs impressively from individual to individual and changes all through the human life expectancy. The terms 'work out', 'active work' and 'actual wellness' are regularly utilized reciprocally, both expertly and in like manner language Caspersen, Powell and Christenson (1985).

Action is most normally estimated by computing the measure of energy, in kilocalories (kcal), required to accomplish an action. Exploration oftentimes arranges day by day action concurring to explicit components of regular living, for example word related action, family, relaxation time and rest. Late patterns, for example, an expansion in physical idleness during relaxation time

al, 2001); (Hu et al, 2004).

### **III. Objectives**

The principle objectives of this research paper are drawn here:

- 1) to find what types of health tools are used in the gyms;
- 2) to find the time used by individuals in the health centres;
- 3) to find the seriousness of the individuals;

#### **What is meant by Health and Wellbeing in Individual's Life?**

Health or well-being is a condition of physical, mental and social prosperity wherein sickness and ailment are missing. An assortment of definitions has been utilized for various purposes after some time. Wellbeing can be advanced by empowering stimulating exercises, like customary actual exercise, and by diminishing or keeping away from unhealthful exercises or circumstances, like smoking or extreme pressure.

A few variables influencing wellbeing are because of individual decisions, like whether to take part in a high-hazard conduct, and others are because of primary causes, for example, regardless of whether the general public is organized such that makes it simpler or harder for individuals to get vital medical care administrations.

The importance of health and wellbeing has advanced after some time. With regards to the biomedical point of view, early meanings of wellbeing zeroed in on the topic of the body's capacity to work; health and wellbeing was viewed as a condition of ordinary capacity that could be disturbed every once in a while by illness.

An illustration of such a meaning of wellbeing is: "a state portrayed by anatomic, physiologic, and mental uprightness; capacity to perform by and by esteemed family, work, and local area jobs; capacity to manage physical, natural, mental, and social pressure". Then, at that point in

1948, in an extreme takeoff from past definitions, the World Health Organization (WHO)

mental, and social prosperity, and not only the shortfall of infection and infirmity".

Although this definition was invited by some as being inventive, it was likewise scrutinized as being ambiguous, unnecessarily expansive and was not understood as quantifiable. For quite a while, it was saved as an illogical ideal and most conversations of wellbeing got back to the reasonableness of the biomedical model.

Progress has been restricted to numerous targets, prompting worries about the adequacy of Healthy People in molding results with regards to a decentralized and awkward US wellbeing framework. Sound People 2020 give more unmistakable quality to wellbeing advancement and preventive methodologies and includes a meaningful center the significance of tending to social determinants of wellbeing. Another extended advanced interface works with use and scattering instead of cumbersome printed books as delivered previously. The effect of these progressions to Healthy People will be resolved in the coming years.

### **Research Methodology**

It is significant to understand the sentiments of the buyers when they enter the gym or health and fitness centres and wish for something that is running in their mind. Now this something may be a product, or a service or mixture of both of these.

The research methodology implemented for the designated study is provided by the internet research and comparison. An analysis is made herewith on the basis of information received from secondary resources. However a few of primary resources have also been researched to build up the conclusion. There has been no direct material or references made from the primary researches.

focused on the ideologies of the end consumer when they step into gym or health and fitness centres.

Secondary data is collated and worked out through different formats of literatures, which includes the articles published in journal, or annual reports published in various ezines, trade journals and data directly researched from the gym or health and fitness centres owners as it appears on the internet.

Information from the gym or health and fitness centres is collated, which form the part of research methodology in particular as well as the entire research paper.

Since the occurrence of Corona Pandemic there has been limited availability of the information available about the individuals visiting the gym or health and fitness centres.

Name of the Health and Fitness Centre	Features	Fitness Tools	Sensibility of the Exercisers	Time to Visit	Average Number of Visitors/Guests
<b>Chisel, Punjabi Bagh</b>	Yoga, Abt, Freestyle Training, Crush Combust, Functional Training, Cardio Kick Boxing, Zumba, High Intensity Workout, Core Blast	Adjustable bench, Barbell stand, Cable Crossover or Functional Trainer, Dumbbells stand, Decline Bench press, Exercise ball, Flat bench press, Indoor Rower, Incline bench press, Lat Pulling Down, LKey Dumbbells, Leg Press Hack Squad hammer, Leg Curl Extension, Olympic bar, Preacher Curl bench, Rubber coated Premium weight, Smith machine Weight plate stand, Treadmill, Gym bike, Elliptical trainer, Capsule pipe, Machines with pulley, Cable cross, Functional Trainer, Smith machine with a functional trainer, Hack squat, Hammer single station, Plates, Dumbbells and Gym accessories	<p><b>Young Males:</b></p> <p>Young males visit the fitness centre to build up their body and level up the muscle mass.</p> <p>Older males visit the health and fitness centre to keep the body in alignment</p> <p><b>Young Females:</b></p> <p>Females show the sensibility towards their body shape. They visit the mall not for building the body, but to keep the muscle tone in alignment.</p>	<p>The ideal time for visiting the malls is usually evenings after the close of the office hours.</p> <p>The young females visited the mall in the afternoon in groups.</p>	Located in the posh area. On Average 1000 to 2000 visitors/guests every month.
<b>Olympia, Greater Kailash 2</b>	Lunges, Pushups, Squats, Standing overhead dumbbell presses, Dumbbell rows, Single-leg deadlifts, Burpees Side planks, Planks Glute bridge. Cardio Kick Boxing, Zumba, High Intensity Workout, Core Blast	Adjustable bench, Barbell stand, Cable Crossover or Functional Trainer, Dumbbells stand, Decline Bench press, Exercise ball, Flat bench press Indoor Rower, Incline bench press, Lat Pulling Down, LKey Dumbbells, Leg Press Hack Squad hammer Leg Curl Extension, Olympic bar, Preacher Curl bench, Rubber coated Premium weight, Smith machine Weight plate stand, Treadmill, Gym bike, Elliptical trainer, Capsule pipe, Machines with pulley Cable cross, Functional Trainer, Smith machine with a functional trainer, Hack squat Hammer single station, Plates, Dumbbells and Gym accessories	<p><b>Young Males:</b></p> <p>Young males visit the fitness centre to build up their body and level up the muscle mass.</p> <p>Older males visit the health and fitness centre to keep the body in alignment</p> <p><b>Young Females:</b></p> <p>Females show the sensibility towards their body shape. They visit the mall not for building the body, but to keep the muscle tone in alignment.</p>	<p>The ideal time for visiting the malls is usually evenings after the close of the office hours.</p> <p>The young females visited the mall in the afternoon in groups.</p>	Located in the posh area. On Average 1000 to 2000 visitors/guests every month.
<b>Gold Gym, East of Kailash</b>	Cardio Kick Boxing, Zumba, High Intensity	Adjustable bench, Barbell stand, Cable	<b>Young Males:</b>	The ideal time for visiting the	Located in the posh area. On Average

	<p>Workout, Core Blast, Crush Combust, Functional Training,</p>	<p>Crossover or Functional Trainer, Dumbbells stand, Decline Bench press, Exercise ball, Flat bench press Indoor Rower, Incline bench press, Lat Pulling Down, LKey Dumbbells, Leg Press Hack Squad hammer Leg Curl Extension, Olympic bar, Preacher Curl bench, Rubber coated Premium weight, Smith machine Weight plate stand, Treadmill, Gym bike, Elliptical trainer, Capsule pipe, Machines with pulley Cable cross, Functional Trainer, Smith machine with a functional trainer, Hack squat Hammer single station, Plates, Dumbbells and Gym accessories</p>	<p>Young males visit the fitness centre to build up their body and level up the muscle mass.  Older males visit the health and fitness centre to keep the body in alignment  <b>Young Females:</b>  Females show the sensibility towards their body shape. They visit the mall not for building the body, but to keep the muscle tone in alignment.</p>	<p>malls is usually evenings after the close of the office hours.  The young females visited the mall in the afternoon in groups.</p>	<p>1500 to 3200 visitors/guests every month.</p>
<p><b>Athlesis Beyond Fitness, New Friends Colony</b></p>	<p>Squat, Leg press, Lunge, Leg extension, Leg curl, Hip Adductor, Bench press, Chest fly, Standing calf raise</p>	<p>Adjustable bench, Barbell stand, Cable Crossover or Functional Trainer, Dumbbells stand, Decline Bench press, Exercise ball, Flat bench press Indoor Rower, Incline bench press, Lat Pulling Down, LKey Dumbbells, Leg Press Hack Squad hammer Leg Curl Extension, Olympic bar, Preacher Curl bench, Rubber coated Premium weight, Smith machine Weight plate stand, Treadmill, Gym bike, Elliptical trainer, Capsule pipe, Machines with pulley Cable cross, Functional Trainer, Smith machine with a functional trainer, Hack squat Hammer single station, Plates, Dumbbells and Gym accessories</p>	<p><b>Young Males:</b>  Young males visit the fitness centre to build up their body and level up the muscle mass.  Older males visit the health and fitness centre to keep the body in alignment  <b>Young Females:</b>  Females show the sensibility towards their body shape. They visit the mall not for building the body, but to keep the muscle tone in alignment.</p>	<p>The ideal time for visiting the malls is usually evenings after the close of the office hours.  The young females visited the mall in the afternoon in groups.</p>	<p>Located in the posh area. On Average 2000 to 3500 visitors/guests every month.</p>
<p><b>Sports Fit, Sector 7, Dwarka</b></p>	<p>Crush Combust, Functional Training, Cardio Kick Boxing, Zumba, High Intensity Workout, Core Blast, Cardio Kick Boxing, Zumba, High Intensity Workout, Core Blast</p>	<p>Adjustable bench, Barbell stand, Cable Crossover or Functional Trainer, Dumbbells stand, Decline Bench press, Exercise ball, Flat bench press Indoor Rower, Incline bench press, Lat Pulling</p>	<p><b>Young Males:</b>  Young males visit the fitness centre to build up their body and level up the muscle mass.  Older males visit</p>	<p>The ideal time for visiting the malls is usually evenings after the close of the office hours.  The young females visited</p>	<p>On an average there are posh guests and visitors 1000 to 1500 shoppers every year</p>

Down, LKey Dumbbells,  
 Leg Press Hack Squad  
 hammer  
 Leg Curl Extension,  
 Olympic bar, Preacher  
 Curl bench, Rubber  
 coated Premium weight,  
 Smith machine  
 Weight plate stand,  
 Treadmill, Gym bike,  
 Elliptical trainer,  
 Capsule pipe, Machines  
 with pulley  
 Cable cross, Functional  
 Trainer, Smith machine  
 with a functional trainer,  
 Hack squat  
 Hammer single station,  
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**Young Females:**

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 alignment.

the mall in the  
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 group.

The health and fitness industry is mushrooming in small towns and this has eventually led to creation of awareness among the people. Now more and more number of people likes to join the gym and visit here for building their body or keeping themselves fit. The trend was not very common until few years ago.

The cognizance of healthcare and fitness has sprouted along every income group, in small towns as well as the cities. According to the Google searches, approximately 20 Million exclusive searches are related to the key phrase “Fitness near Me” and this is outstandingly superb.

Today, the fitness centers are offering state of the art equipment, which is also one of the reasons why people from all age groups are very much inclined to join these centers. Even the older people do not shy away from joining the main league of exercisers. The excitement in health and fitness centres sprouting in Delhi and NCR are classic example that people not only want maintain their body mass, but these centres are also working as full-fledged entertainment centres as well.

The usage of guests visiting these health and fitness centres is very high, and number is increasing surreptitiously with variation. Plenty of such centres charge money on monthly basis, while there are several others which have quarterly plan for the dedicated members.

A few of health and fitness centres like Sports Fit, Sector 7, Dwarka; Athlesis Beyond Fitness, New Friends Colony; Gold Gym, East of Kailash etc. offer custom designed services, and this is quite handy. Exercisers have got plenty of reasons now for better health and fitness near them.

Having a game plan before you enter the rec center can assist you with abstaining from meandering carelessly around while you choose what to do straightaway. In the event that the wellbeing and wellness focus isn't going out as per the arrangement of the exerciser, then, at that point there is a component of uncertainty. This uncertainty not just adds time to your exercise; it likewise makes it less effective. It's additionally a smart thought to have an arrangement B, simply on the off chance that the machine or floor space you were anticipating utilizing is taken. Continue on to different pieces of your exercise and return, or be outfitted in light of a reinforcement practice that uses distinctive hardware.

Get propelled with a strong exercise playlist, and this is the place where your wellbeing and wellness focus ought to be giving you dependable ideas. Get siphoned up en route to the exercise center and during your exercise with tunes that cause you to feel solid, incredible, and like you can do anything. In case you've been utilizing a similar ear buds since who knows when, redesign your sound quality and solace.

Put your telephone on flight mode. Fight the temptation to toll in on your gathering text or watch that Snapchat message. Your exercise is simply the time you will put resources into yourself, so turn your telephone on standalone mode to stay away from pointless interruption. On the off chance that you needn't bother with your telephone for your music or any exercise applications, leave it in the storage space in the gym or health and fitness centre.

It is additionally significant that the rec center administration helps the exerciser on the best way to start the activities in a methodical way. They should design the exercise with some unique stretches. Dynamic stretches are a center part of basically any warm-up. With dynamic extending, you'll be traveling through various stretches, instead of holding the stretch set up. This bit by bit raises your internal heat level and pulse and begins to heat up your muscles, preparing your body for movement. A dynamic warm-up likewise works on your scope of movement, so you can get further into each activity and receive the full reinforcing rewards of each move.

### **Conclusion**

In support of the conclusion of this research paper, it is found that people have become more conscious about their health and fitness in the last decade in India. Increasing use of gyms and health centres clearly demarcate that health consciousness has developed on an alarming scale in small towns besides the cosmopolitan and metropolitan towns. This development is also seen increasing in city clusters that have emerged in the hinterlands of Delhi and the NCR. The choice of health tools used by individuals varies and the amount of time spent is also variable, but the result is definitive.

### **Acknowledgements**

I am thankful to my teachers and gym and health fitness owners who provided me the support in material guidance and direction in completion of my research within the stipulated timeframe. The material for the research paper has been researched from the secondary resources and other publications. I acknowledge the information provided by the mall owners that helped a great deal in completion of the research paper in time.

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regular exercise is good for you, and it can help you lose weight. But if you are like many Americans, you are busy, you have a sedentary job, and you haven't yet changed your exercise habits. The good news is that it's never too late to start. You can start slowly, and find ways to fit more physical activity into your life. To get the most benefit, you should try to get the recommended amount of exercise for your age. If you can do it, the payoff is that you will feel better, help prevent or control many diseases, and likely even live longer.

What are the health benefits of exercise?

Regular exercise and physical activity may

Help you control your weight. Along with diet, exercise plays an important role in controlling your weight and preventing obesity. To maintain your weight, the calories you eat and drink must equal the energy you burn. To lose weight, you must use more calories than you eat and drink.

Reduce your risk of heart diseases. Exercise strengthens your heart and improves your circulation. The increased blood flow raises the oxygen levels in your body. This helps lower your risk of heart diseases such as high cholesterol, coronary artery disease, and heart attack. Regular exercise can also lower your blood pressure and triglyceride levels.

Help your body manage blood sugar and insulin levels. Exercise can lower your blood sugar level and help your insulin work better. This can cut down your risk for metabolic syndrome and type 2 diabetes. And if you already have one of those diseases, exercise can help you to manage it.

Help you quit smoking. Exercise may make it easier to quit smoking by reducing your cravings and withdrawal symptoms. It can also help limit the weight you might gain when you stop smoking.

Improve your mental health and mood. During exercise, your body releases chemicals that can improve your mood and make you feel more relaxed. This can help you deal with stress and reduce your risk of depression.

Help keep your thinking, learning, and judgment skills sharp as you age. Exercise stimulates your body to release proteins and other chemicals that improve the structure and function of your brain.

Strengthen your bones and muscles. Regular exercise can help kids and teens build strong bones. Later in life, it can also slow the loss of bone density that comes with age. Doing muscle-strengthening activities can help you increase or maintain your muscle mass and strength.

Reduce your risk of some cancers, including colon, breast , uterine, and lung cancer.

Improve your sleep. Exercise can help you to fall asleep faster and stay asleep longer.

Improve your sexual health. Regular exercise may lower the risk of erectile dysfunction (ED) in men. For those who already have ED, exercise may help improve their sexual function. In women, exercise may increase sexual arousal.

Increase your chances of living longer. Studies show that physical activity can reduce your risk of dying early from the leading causes of death, like heart disease and some cancers.

How can I make exercise a part of my regular routine?

Make everyday activities more active. Even small changes can help. You can take the stairs instead of the elevator. Walk down the hall to a coworker's office instead of sending an email. Wash the car yourself. Park further away from your destination.

Be active with friends and family. Having a workout partner may make you more likely to enjoy exercise. You can also plan social activities that involve exercise. You might also consider joining an exercise group or class, such as a dance class, hiking club, or volleyball team.

Keep track of your progress. Keeping a log of your activity or using a fitness tracker may help you set goals and stay motivated.

Make exercise more fun. Try listening to music or watching TV while you exercise. Also, mix things up a little bit - if you stick with just one type of exercise, you might get bored. Try doing a combination of activities.

Find activities that you can do even when the weather is bad. You can walk in a mall, climb stairs, or work out in a gym even if the weather stops you from exercising outside.

**You know exercise is good for you, but do you know how good? From boosting your mood to improving your sex life, find out how exercise can improve your life.**

By Mayo Clinic Staff

Want to feel better, have more energy and even add years to your life? Just exercise.

The health benefits of regular exercise and physical activity are hard to ignore. Everyone benefits from exercise, regardless of age, sex or physical ability.

Need more convincing to get moving? Check out these seven ways exercise can lead to a happier, healthier you.

Exercise can help prevent excess weight gain or help maintain weight loss. When you engage in physical activity, you burn calories. The more intense the activity, the more calories you burn.

Regular trips to the gym are great, but don't worry if you can't find a large chunk of time to exercise every day. Any amount of activity is better than none at all. To reap the benefits of exercise, just get more active throughout your day — take the stairs instead of the elevator or rev up your household chores. Consistency is key.

Worried about heart disease? Hoping to prevent high blood pressure? No matter what your current weight is, being active boosts high-density lipoprotein (HDL) cholesterol, the "good" cholesterol, and it decreases unhealthy triglycerides. This one-two punch keeps your blood flowing smoothly, which decreases your risk of cardiovascular diseases.

Regular exercise helps prevent or manage many health problems and concerns, including:

- Stroke
- Metabolic syndrome
- High blood pressure
- Type 2 diabetes
- Depression
- Anxiety
- Many types of cancer
- Arthritis
- Falls

It can also help improve cognitive function and helps lower the risk of death from all causes.

Need an emotional lift? Or need to blow off some steam after a stressful day? A gym session or brisk walk can help. Physical activity stimulates various brain chemicals that may leave you feeling happier, more relaxed and less anxious.

You may also feel better about your appearance and yourself when you exercise regularly, which can boost your confidence and improve your self-esteem.

Winded by grocery shopping or household chores? Regular physical activity can improve your muscle strength and boost your endurance.

Exercise delivers oxygen and nutrients to your tissues and helps your cardiovascular system work more efficiently. And when your heart and lung health improve, you have more energy to tackle daily chores.

Struggling to snooze? Regular physical activity can help you fall asleep faster, get better sleep and deepen your sleep. Just don't exercise too close to bedtime, or you may be too energized to go to sleep.

Do you feel too tired or too out of shape to enjoy physical intimacy? Regular physical activity can improve energy levels and increase your confidence about your physical appearance, which may boost your sex life.

But there's even more to it than that. Regular physical activity may enhance arousal for women. And men who exercise regularly are less likely to have problems with erectile dysfunction than are men who don't exercise.

Exercise and physical activity can be enjoyable. They give you a chance to unwind, enjoy the outdoors or simply engage in activities that make you happy. Physical activity can also help you connect with family or friends in a fun social setting.

So take a dance class, hit the hiking trails or join a soccer team. Find a physical activity you enjoy, and just do it. Bored? Try something new, or do something with friends or family.

Exercise and physical activity are great ways to feel better, boost your health and have fun. For most healthy adults, the Department of Health and Human Services recommends:

- At least 150 minutes a week of moderate aerobic activity or 75 minutes a week of vigorous aerobic activity, or a combination of moderate and vigorous activity. The guidelines suggest that you spread this exercise throughout the week. Examples include running, walking or swimming. Even small amounts of physical activity are helpful, and accumulated activity throughout the day adds up to provide health benefits.
- Strength training exercises for all major muscle groups at least two times a week. Examples include lifting free weights, using weight machines or doing body-weight training.

Spread your activities throughout the week. If you want to lose weight, meet specific fitness goals or get even more benefits, you may need to ramp up your moderate aerobic activity to 300 minutes or more a week.

Remember to check with your doctor before starting a new exercise program, especially if you have any concerns about your fitness, haven't exercised for a long time, have chronic health problems, such as heart disease, diabetes or arthritis.

Regular physical activity is one of the most important things you can do for your health.

[Everyone can experience the health benefits of physical activity](#) – age, abilities, ethnicity, shape, or size do not matter.

If you're not sure about becoming active or boosting your level of physical activity because you're afraid of getting hurt, the good news is that **moderate-intensity aerobic activity**, such as brisk walking, is generally **safe for most people**.

Read about the benefits for improving your [brain health](#), [weight management](#), [reducing disease](#), [strengthening your bones and muscles](#), and [improving your ability to do everyday activities](#).

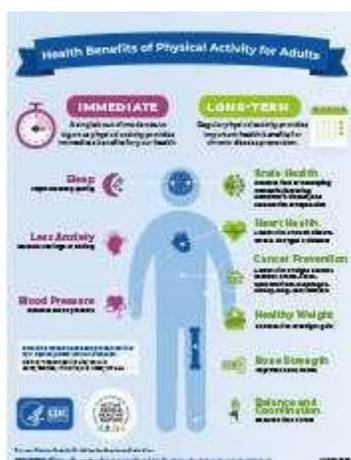
If you have not been physically active in a while, you may be wondering how to get started again. Find more tips [here](#) to get started with physical activity for a [healthy weight](#).

Learn more about [what works](#) and how physical activity can improve your health.

### Immediate Benefits

Some benefits of physical activity on [brain health pdf icon\[PDF-14.4MB\]external icon](#) happen right after a session of moderate-to-vigorous physical activity. Benefits include improved thinking or cognition for children 6 to 13 years of age and reduced short-term feelings of anxiety for adults. Regular physical activity can help keep your thinking, learning, and judgment skills sharp as you age. It can also reduce your risk of **depression** and **anxiety** and help you **sleep better**.

Learn more about the [immediate benefits pdf icon\[PDF-14.4MB\]external icon](#) of physical activity.



[Learn more about Health Benefits of Physical Activity for Adults](#)

Looking to get to or stay at a healthy weight? Both diet and physical activity play a critical role in maintaining a healthy body weight, losing excess body weight, or maintaining successful weight loss. You gain weight when you consume more calories through eating and drinking than the amount of calories you burn, including those burned during physical activity. It's important to [balance calories](#). When it comes to weight management, people vary greatly in how much physical activity they need. You may need to be more active than others to reach or maintain a healthy weight.

### Be Active: Every Bit Helps

Adults who sit less and do any amount of moderate-to-vigorous physical activity gain some health benefits. Learn more from the [Physical Activity Guidelines for Americans, 2nd Edition pdf icon\[PDF-15.2MB\]external icon](#).

**To maintain your weight:** Work your way up to 150 minutes a week of moderate-intensity aerobic activity (for example, 30 minutes a day, 5 days a week). Strong scientific evidence shows that physical activity can help you maintain your weight over time. However, the exact amount of physical activity needed to do this is not clear since it varies greatly from person to person. It's possible that you may need to do more than 150 minutes of moderate-intensity activity a week to maintain your weight.

**To lose weight and keep it off:** You will need a high amount of physical activity unless you also adjust your diet and reduce the amount of calories you're eating and drinking. Getting to and staying at a healthy weight requires both regular physical activity and a healthy eating plan. For more information about nutrition, physical activity, and weight loss, visit [Healthy Weight](#).

### Reduce Your Health Risk

#### Cardiovascular Disease

Heart disease and stroke are two of the leading causes of death in the United States. Following the recommendations and getting at least 150 minutes a week of moderate-intensity aerobic activity can put you at a lower risk for these diseases. You can reduce your risk even further with more physical activity. Regular physical activity can also lower your blood pressure and improve your cholesterol levels.

#### Type 2 Diabetes and Metabolic Syndrome

Regular physical activity can reduce your risk of developing type 2 diabetes and metabolic syndrome. Metabolic syndrome is some combination of too much fat around the waist, high blood pressure, low High Density Lipoproteins (HDL) cholesterol, high triglycerides, or high blood sugar. People start to see benefits at

Additional amounts of physical activity seem to lower risk even more.

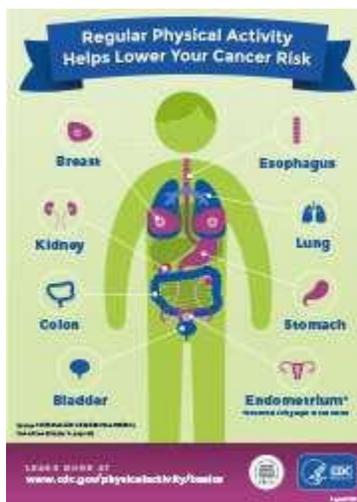
**Already have type 2 diabetes?** Regular physical activity can help you control your blood glucose levels. To find out more, visit [Diabetes and Me](#).

### Some Cancers

Being physically active lowers your risk for developing several commonly occurring cancers. Research shows that adults who participate in greater amounts of physical activity have reduced risks of developing cancers of the:

- Bladder
- Breast
- Colon (proximal and distal)
- Endometrium
- Esophagus (adenocarcinoma)
- Kidney
- Lung
- Stomach (cardia and non-cardia adenocarcinoma)

**Improve your quality of life.** If you are a cancer survivor, research shows that getting regular physical activity not only helps give you a better quality of life, but also improves your physical fitness.



[Learn more about Physical Activity and Cancer](#)  
[Top of Page](#)



As you age, it's important to protect your bones, joints, and muscles – they support your body and help you move. Keeping bones, joints, and muscles healthy can help ensure that you're able to do your daily activities and be physically active. Doing aerobic, muscle-strengthening, and bone-strengthening physical activity at a moderately-intense level can **slow the loss of bone density** that comes with age.

Hip fracture is a serious health condition that can have life-changing negative effects, especially if you're an older adult. Physically active people have a **lower risk of hip fracture** than inactive people.

Among older adults, physical activity also **reduces the risk of falling** and injuries from falls. Physical activity programs that include more than one type of physical activity are most successful at reducing falls and fall-related injuries. Different types of physical activity include aerobic, muscle strengthening, and balance physical activities. Also, weight bearing activities such as running, brisk walking, jumping jacks and strength training produce a force on the bones. These activities that can help promote bone growth and bone strength and reduce the risk of fall-related injuries and fractures.

Regular physical activity helps with **arthritis and other rheumatic conditions** affecting the joints. Doing 150 minutes a week of moderate-intensity aerobic physical activity, if able, plus muscle-strengthening activity improves your ability to manage pain and do everyday tasks and improves quality of life.

can help you increase or maintain your muscle mass and strength. This is important for older adults who experience reduced muscle mass and muscle strength with aging. Slowly increasing the amount of weight and number of repetitions you do as part of muscle strengthening activities will give you even more benefits, no matter your age.

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#### Improve Your Ability to do Daily Activities and Prevent Falls

A functional limitation is a loss of the ability to do everyday activities such as climbing stairs, grocery shopping, or playing with your grandchildren.

**How does this relate to physical activity?** If you're a physically active middle-aged or older adult, you have a lower risk of functional limitations than people who are inactive.

**Improve physical function and decrease the risk of falls.** For older adults, multicomponent physical activity is important to improve physical function and decrease the risk of falls or injury from a fall. **Multicomponent physical activity** is physical activity that includes more than one type of physical activity, such as aerobic, muscle strengthening, and balance training. Multicomponent physical activity can be done at home or in a community setting as part of a structured program.

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#### Increase Your Chances of Living Longer

Science shows that physical activity can reduce your risk of dying early from leading causes of death, like heart disease and some cancers. This is remarkable in two ways:

1. Only a few lifestyle choices have as large an impact on your health as physical activity. People who are physically active for about 150 minutes a week have a 33% lower risk of all-cause mortality than those who are physically inactive.
2. You don't have to do high amounts of activity or vigorous-intensity activity to reduce your risk of premature death. Benefits start to accumulate with any amount of moderate- or vigorous-intensity physical activity.

## Why Is Physical Activity Important?

Exercise and physical activity are good for just about everyone, including older adults. No matter your health and physical abilities, you can gain a lot by staying active. In fact, studies show that “taking it easy” is risky. Often, inactivity is more to blame than age when older people lose the ability to do things on their own. Lack of physical activity also can lead to more visits to the doctor, more hospitalizations, and more use of medicines for a variety of illnesses.

Including all [4 types of exercise](#) can benefit a wide range of areas of your life. Staying active can help you:

- Keep and improve your strength so you can stay independent
- Have more energy to do the things you want to do and reduce fatigue
- Improve your balance and lower risk of [falls and injuries from falls](#)
- [Manage and prevent some diseases](#) like arthritis, heart disease, stroke, type 2 diabetes, osteoporosis, and 8 types of cancer, including breast and colon cancer
- [Sleep better](#) at home
- Reduce levels of stress and anxiety
- Reach or [maintain a healthy weight](#) and reduce risk of excessive weight gain
- Control your [blood pressure](#)
- Possibly improve or maintain some aspects of [cognitive function](#), such as your ability to shift quickly between tasks or plan an activity
- Perk up your mood and reduce feelings of depression

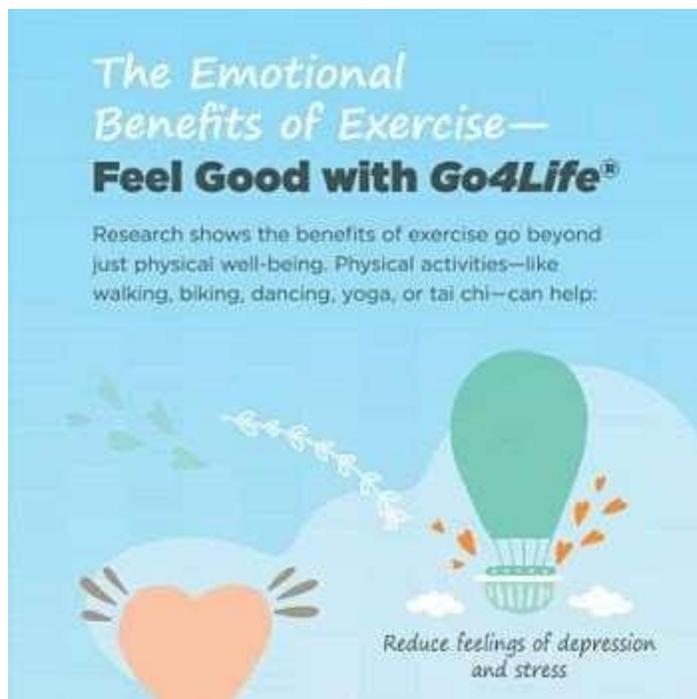
### Quick Tip

Being active can help prevent future [falls and fractures](#). For tips to help prevent falls at home, read [Fall-Proofing Your Home](#).

The [YMCA](#) offers evidence-based group exercise programs for older adults to improve [fitness](#) and [balance for falls prevention](#).

## Emotional Benefits of Exercise

Research has shown that exercise is not only good for your physical health, it also supports emotional and mental health. You can exercise with a friend and get the added benefit of emotional support. So, next time you're feeling down, anxious, or stressed, try to get up and start moving!



Read and share this [infographic](#) about the emotional benefits of exercise.

Physical activity can help:

- Reduce feelings of [depression](#) and stress, while improving your mood and overall emotional well-being
- Increase your energy level
- Improve [sleep](#)
- Empower you to feel more in control

In addition, exercise and physical activity may possibly improve or maintain some aspects of [cognitive function](#), such as your ability to shift quickly between tasks, plan an activity, and ignore irrelevant information.

Here are some exercise ideas to help you lift your mood:

- **Walking, bicycling, or dancing.** Endurance activities increase your breathing, get your heart pumping, and boost chemicals in your body that may improve mood.
- **Yoga.** This mind and body practice typically combines physical postures, breathing exercises, and relaxation.

- **Tai Chi.** This "moving meditation" involves shifting the body slowly, gently, and precisely, while breathing deeply.
- **Activities you enjoy.** Whether it's gardening, playing tennis, kicking around a soccer ball with your grandchildren, or something else, [choose an activity](#) you want to do, not one you have to do.

### The Top 10 Benefits of Regular Exercise

Exercise is defined as any movement that makes your muscles work and requires your body to burn calories.

There are many types of physical activity, including swimming, running, jogging, walking, and dancing, to name a few.

Being active has been shown to have many health benefits, both physically and mentally. It may even help you live longer (1Trusted Source).

Here are the top 10 ways regular exercise benefits your body and brain.

#### W2 Photography/Stocksy

##### 1. It can make you feel happier

Exercise has been shown to improve your mood and decrease feelings of depression, anxiety, and stress (2Trusted Source).

It produces changes in the parts of the brain that regulate stress and anxiety. It can also increase brain sensitivity for the hormones serotonin and norepinephrine, which relieve feelings of depression (3Trusted Source).

Additionally, exercise can increase the production of endorphins, which are known to help produce positive feelings and reduce the perception of pain (Trusted Source3Trusted Source).

Furthermore, exercise has been shown to reduce stress and improve symptoms of anxiety (3Trusted Source).

Interestingly, it doesn't matter how intense your workout is. It seems that your mood can benefit from exercise no matter the intensity of the physical activity.

In fact, a study in 24 women who had been diagnosed with depression showed that exercise of any intensity significantly decreased feelings of depression (4Trusted Source).

The effects of exercise on mood are so powerful that choosing to exercise (or not) even makes a difference over short periods.

One review of 19 studies found that active people who stopped exercising regularly experienced significant increases in symptoms of depression and anxiety, even after only a few weeks (5Trusted Source).

## SUMMARY

Exercising regularly can improve your mood and reduce feelings of anxiety and depression.

### 2. It can help with weight loss

Some studies have shown that inactivity is a major factor in weight gain and obesity (6Trusted Source, 7Trusted Source).

To understand the effect of exercise on weight reduction, it is important to understand the relationship between exercise and energy expenditure.

Your body spends energy in three ways:

digesting food

exercising

maintaining body functions like your heartbeat and breathing

While dieting, a reduced calorie intake will lower your metabolic rate, which can delay weight loss. On the contrary, regular exercise has been shown to increase your metabolic rate, which can burn more calories to help you lose weight (Trusted Source6Trusted Source, 7Trusted Source, 8Trusted Source).

Additionally, studies have shown that combining aerobic exercise with resistance training can maximize fat loss and muscle mass maintenance, which is essential for keeping the weight off (9Trusted Source, 10Trusted Source, 11Trusted Source).

## SUMMARY

Exercise is crucial to supporting a healthy metabolism and burning more calories per day. It also helps you maintain your muscle mass and weight loss.

### 3. It is good for your muscles and bones

Exercise plays a vital role in building and maintaining strong muscles and bones.

Activities like weightlifting can stimulate muscle building when paired with adequate protein intake.

This is because exercise helps release hormones that promote the ability of your muscles to absorb amino acids. This helps them grow and reduces their breakdown (12Trusted Source, 13Trusted Source).

As people age, they tend to lose muscle mass and function, which can lead to an increased risk of injury. Practicing regular physical activity is essential to reducing muscle loss and maintaining strength as you age (14Trusted Source).

Also, exercise helps build bone density when you're younger, in addition to helping prevent osteoporosis later in life (15Trusted Source).

Interestingly, some research suggests that high impact exercise, such as gymnastics or running, or odd impact sports, such as soccer and basketball, may help promote a higher bone density than non-impact sports like swimming and cycling (16Trusted Source).

## SUMMARY

Physical activity helps you build muscles and strong bones. It may also help prevent osteoporosis.

### 4. It can increase your energy levels

Exercise can be a real energy booster for many people, including those with various medical conditions (17Trusted Source, 18Trusted Source).

One older study found that 6 weeks of regular exercise reduced feelings of fatigue for 36 people who had reported persistent fatigue (19).

Furthermore, exercise can significantly increase energy levels for people with chronic fatigue syndrome (CFS) and other serious illnesses (20Trusted Source, 21Trusted Source).

In fact, exercise seems to be more effective at combating CFS than other treatments, including passive therapies like relaxation and stretching or no treatment at all (20Trusted Source).

Additionally, exercise has been shown to increase energy levels in people with other conditions like cancer (21Trusted Source).

## SUMMARY

Engaging in regular physical activity can increase your energy levels. This is true even in people with persistent fatigue and those with serious health conditions.

## HEALTHLINE CHALLENGE

Create a movement routine that you can do at home

Our Move Your Body Challenge has one exercise for 25 days to build a routine, no equipment needed.

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Your privacy is important to us

### 5. It can reduce your risk of chronic disease

Lack of regular physical activity is a primary cause of chronic disease (22Trusted Source).

Regular exercise has been shown to improve insulin sensitivity, heart health, and body composition. It can also decrease blood pressure and cholesterol levels (23Trusted Source, 24Trusted Source, 25Trusted Source, 26Trusted Source).

In contrast, a lack of regular exercise — even in the short term — can lead to significant increases in belly fat, which may increase the risk of type 2 diabetes and heart disease (22Trusted Source).

That's why regular physical activity is recommended to reduce belly fat and decrease the risk of developing these conditions (27Trusted Source).

## SUMMARY

Daily physical activity is essential to maintaining a healthy weight and reducing the risk of chronic disease.

### 6. It can help skin health

Your skin can be affected by the amount of oxidative stress in your body.

Oxidative stress occurs when the body's antioxidant defenses cannot completely repair the cell damage caused by compounds known as free radicals. This can damage the structure of the cells and negatively impact your skin.

Even though intense and exhaustive physical activity can contribute to oxidative damage, regular moderate exercise can actually increase your body's production of natural antioxidants, which help protect cells (28Trusted Source, 29Trusted Source).

In the same way, exercise can stimulate blood flow and induce skin cell adaptations that can help delay the appearance of skin aging (30Trusted Source).

#### SUMMARY

Moderate exercise can provide antioxidant protection and promote blood flow, which can protect your skin and delay signs of aging.

#### 7. It can help your brain health and memory

Exercise can improve brain function and protect memory and thinking skills.

To begin with, it increases your heart rate, which promotes the flow of blood and oxygen to your brain. It can also stimulate the production of hormones that enhance the growth of brain cells.

Plus, the ability of exercise to prevent chronic disease can translate into benefits for your brain, since its function can be affected by these diseases (31Trusted Source).

Regular physical activity is especially important in older adults since aging — combined with oxidative stress and inflammation — promotes changes in brain structure and function (32Trusted Source, 33Trusted Source).

Exercise has been shown to cause the hippocampus, a part of the brain that's vital for memory and learning, to grow in size, which may help improve mental function in older adults (32Trusted Source, 33Trusted Source, 34Trusted Source).

Lastly, exercise has been shown to reduce changes in the brain that can contribute to conditions like Alzheimer's disease and schizophrenia (35Trusted Source).

#### SUMMARY

Regular exercise improves blood flow to the brain and helps brain health and memory. Among older adults, it can help protect mental function.

#### 8. It can help with relaxation and sleep quality

With regard to sleep quality, the energy depletion that occurs during exercise stimulates recuperative processes during sleep (38Trusted Source).

Moreover, the increase in body temperature that occurs during exercise is thought to improve sleep quality by helping it drop during sleep (39Trusted Source).

Many studies on the effects of exercise on sleep have reached similar conclusions.

One review of six studies found that participating in an exercise training program helped improve self-reported sleep quality and reduced sleep latency, which is the amount of time it takes to fall asleep (40Trusted Source).

Another older study showed that 16 weeks of physical activity improved sleep quality and helped 17 people with insomnia sleep longer and more deeply than the control group. It also helped them feel more energized during the day (41Trusted Source).

What's more, engaging in regular exercise seems to be beneficial for older adults, who are often affected by sleep disorders (42Trusted Source, 43Trusted Source).

You can be flexible with the kind of exercise you choose. It appears that either aerobic exercise alone or aerobic exercise combined with resistance training can both improve sleep quality (44Trusted Source).

## SUMMARY

Regular physical activity, regardless of whether it is aerobic or a combination of aerobic and resistance training, can help you sleep better and feel more energized during the day.

### 9. It can reduce pain

Although chronic pain can be debilitating, exercise can actually help reduce it (45Trusted Source).

In fact, for many years, the recommendation for treating chronic pain was rest and inactivity. However, recent studies show that exercise helps relieve chronic pain (46Trusted Source).

In fact, one review of several studies found that exercise can help those with chronic pain reduce their pain and improve their quality of life (46Trusted Source).

Several studies also show that exercise can help control pain associated with various health conditions, including chronic low back pain, fibromyalgia, and chronic soft tissue shoulder disorder, to name a few (46Trusted Source).

Additionally, physical activity can also raise pain tolerance and decrease pain perception (47Trusted Source, 48Trusted Source).

## SUMMARY

Exercise has favorable effects on the pain associated with various conditions. It can also increase pain tolerance.

10. It can promote a better sex life

Exercise has been proven to boost sex drive (49Trusted Source, 50Trusted Source, 51Trusted Source).

Engaging in regular exercise can strengthen the heart, improve blood circulation, tone muscles, and enhance flexibility, all of which can improve your sex life (50Trusted Source).

Physical activity can also improve sexual performance and sexual pleasure while increasing the frequency of sexual activity (50Trusted Source, 52Trusted Source).

Interestingly enough, one study showed that regular exercise was associated with increased sexual function and desire in 405 postmenopausal women (53Trusted Source).

A review of 10 studies also found that exercising for at least 160 minutes per week over a 6-month period could help significantly improve erectile function in men (51Trusted Source).

What's more, one study found that a simple routine of a 6-minute walk around the house helped 41 men reduce their erectile dysfunction symptoms by 71% (54Trusted Source).

Another study demonstrated that women with polycystic ovary syndrome, which can reduce sex drive, increased their sex drive with regular resistance training for 16 weeks (55Trusted Source).

## SUMMARY

Exercise can help improve sexual desire, function, and performance in men and women. It can also help decrease the risk of erectile dysfunction in men.

The bottom line

Regular physical activity can increase the production of hormones that make you feel happier and help you sleep better.

It can also improve your skin's appearance, help you lose weight and keep it off, reduce the risk of chronic disease, and improve your sex life.

Whether you practice a specific sport or follow the guideline of 150 minutes of activity per week, you will inevitably improve your health in many ways

# Valmiki's Ram: A Personification Of Righteousness And Moral Development

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## Abstract:

Valmiki's Ram is an incarnation of lord Vishnu in human form. Rama's journey is imbued with symbolism. In Hindu Mythology life of lord Ram is a treasure that conceptualises and discerns the world with the idea of life. Rama's life is much more complex than a battle between good or evil. He is an exemplar who takes birth to incorporate both mortals and immortals. Rama is symbolised as 'Superior being' or the 'Enlightenment'. He takes life as it comes to him. He deals with his situations with his conduct. He is a virtuous human who adorns himself with his self control. He gives us solutions for our every question. He guides us how to live our life, how to triumph over desires and how to achieve inner peace. This paper pulls us back to our roots to push us forward in terms of morality and reality and to teach us that some things are not outdated but they are the

fundamentals of life. In modern times we all face dilemmas and fall prey to stress depression as we don't know how to deal with them. Ram through his journey tells us and sails us through these dilemmas by following virtues.

**Keywords :** Enlightenment, dharma, purushotam, virtue.

### **Introduction:**

The Ramayana is a sacred text of Hinduism. It is the story of Rama fighting the darkness (ignorance) with the light of virtue. The entire journey of Ram and his companions symbolically discusses duties, rights and social responsibilities of an individual. As a human, God Ram epitomizes the characteristics of an optimal person. He is considered as the sinew of dharma. He emphasises that one must pursue and live fully with a vision. He amalgamates awareness with actions which means we should be accountable for our actions. He teaches us that we should have control over our senses and we should come to a union of heart and head. Knowing Ram helps us interpret reality, solve problems and improvise our social behaviour. His story pervades the fabric of social life of the people As A.C. MacDonnell says “Probably no work of world literature, secular in its origin, has ever produced so profound an influence on the life and thought of the people as the Ramayana” The character of Ram is a storehouse of values. The values are deep seated in him and are universal and give us a positive solution to the problems or crisis of today. These crises are the odds in one's character and values. This paper is a humble attempt to highlight the mores of Rama through portrayal of his unusual valour, righteous heart and benevolence of mind by representing him as a moral guide, a problem solver and a human who with his endeavour becomes a living legend and a then a God. He is Purushottam and bears all the qualities which a man needs to possess in terms of morality. He overcomes all hardships of his life but doesn't lose his truth and virtue.

### **Analysis:**

Valmiki's Ram is not a supernatural being; he is a human with shortcomings and encounters moral dilemmas but who overcomes these by adhering to the righteous way of cosmic law. He is born for a purpose as we all are born for a cause. Valmiki's Ramayana states that all Devas pray to God Vishnu to relieve the world from Ravana's atrocities and Lord Vishnu replies as :- "Dismiss your fear : for you dear sake In battle will I smite him dead The cruel fiend, the immortal's dread.

Then, in the world of mortal men,  
Ten thousand years and hundreds ten  
I as a human king will reign,  
And guard the earth as my domain"

Canto XIV (Page 83-84)

This shows that Rama is an incarnation of God Vishnu in human form and is born to kill Ravana .But the main purpose of his birth as a 'Man' is to teach the world how a man should live righteously adhering to Dharma, which makes him an inspiration for mankind. Being an incarnation he leads his life as humanly as possible. He doesn't use any magical spell or not use a snap of finger to remove the obstacles or hardships rather face them with strong will and virtue. Today, we are facing all sorts of hardships and fall prey to negativity and mortification and expect some mighty creature will come from the sky and give us the way. Lord Ram tells us that it's we who can solve our problems with patience and look for solutions in a righteous way. Valmiki's Ram is a man who possesses all the qualities which a human should have. The first and foremost quality of man is being sensitive. Ram shows his sensitivity in each and every sphere of his life. He understands the values of the words of his father and quotes :

"Yea, for my father's promise sake  
I to the wood my way will take;

And dwell a lonely excel there  
In hermit dress with matted hair.”  
Amid all duties, Queen, I count  
This duty first and paramount,  
That sons, obedient, aye fulfil  
Their honoured father’s world and will’

Canto XIX (Page 395-397)

These lines impicts his duties and responsibilities as a son who suffers hardships just to keep the words of his father. He tells us how important relationships are.

Today, our major problem in this fast and growing world is that we have made ourselves confined to us and then we feel isolated and all alone. Here Rama teaches us the value of family system. We all have to face predicaments one day or another but there is always a way to cross it. As Franklin D Roosevelt has said, “Smooth Sea doesn’t make a skillful sailor”. This shows that hardships are must to make us perfect but what is important is to handle them gracefully. Second quality of a human is to know that violence is never a resolve. A man should never walk on the path of violence. Rama beautifully gives various chances to Ravana to surrender because he knows the aftermath of a war.

“Go Angad, Ravan’s presence seek,  
And thus my words of warning speak :  
This hour the Maithili lady bring;  
And, yielding while there yet is time,  
Seek, suppliant, pardon for the crime.”

Canto XLI( Page 1616)

Today, we are hearing various cases of terror and violence. The worst is domestic violence. Somewhere today's man does not have self control and shows vulnerability. However Rama always insists on respect for females. He refuses to fight with Tataka as she is a lady. But then Vishwamitra made him realise.

“Go Rama, smite this monster dead,  
Thy hand alone can overthrow,  
In all the worlds, this impious foe.  
Non let compassion lead they mind  
To shrink from blood of womankind”

Canto XVII( Page 129)

Sometimes we need to take difficult decisions in life. Here man should not lose his sense of righteousness. The third quality is to keep calm while taking difficult decisions. Rama has to take a very difficult decision about banishment of Mata Sita. Here Ram chooses the difficult path of self-sacrifice and sacrifices his love and keeps duties of king on priority. Ram teaches the leaders to not to concentrate on themselves alone but focus on your people. He tells them the loyalty of a leader is towards his people first, no matter if they have to lose someone dear to them .Fourthly, a human must possess the quality of forgiveness. Ram portrays this trait magnificently. After the death of Ravana he shows forgiveness and pays due respect to a deceased king.

“The warrior king has nobly died,  
Intrepid hero, firm through all,  
So fell he as the brave should fall;  
And pay the dues that yet remain”

Canto CXI( Page 1735)

Arrogance is no where around him and is down to earth despite being prince of Sooryavanshi dynasty and Ikshavaku clan .He gives respect to his enemies also. Throughout his journey he symbolically guides us how we should behave, what our ethics should be and how to live. He endures sufferings to teach us dignity and ethics and this makes him immortal to the world. Leading a life of virtue makes him great which gives us the capacity to remain true to our principles. He is one who is able to look good in others. Rama in his human form teaches us how one person should have devotion towards the task he is performing. He shows the importance of devotion to the world which is specifically a good quality of a human being. Valmiki's Ramayan quotes:

O Monarch, in thy son we find  
Do thou the godlike virtues hear  
Which Rama to our hearts endear.  
So richly blessed with graces, none  
In all the earth excels thy son  
He keeps each sense with strict control.

Canto II Book 2 (page 302)

Rama is a man with incomparable integrity, he is purushotam. He is already in the mind and soul of his people and he is always fair to them by treating them as family not subjects which is again a great quality of a human.

**Conclusion:**

Valmiki's Ram is the key to human moral inquisitions. In our everyday life we find ourselves surrounded by various obligations and questions. If we incorporate the teachings of God Ram we can sail through the rough seas of our life very easily. Life is unpredictable and has ups and downs. We should not lose hope, as it

is the beauty of it. He brings out the element of humanity and shows as principles of a good leader. He tries to tap into our potential by showing us the capability of man. He shows us that we need to forge our paths. If some forces can break us some can make us and then use them to get success. Family is our support system. No money, no assets can buy us the loyalty that a family gives. Asking for help should not be considered as weak. God Ram himself with the help of Vanaras is able to achieve his aims. He has taught us to come out from darkness within and transform to the real human being as Devdutt Pattanaik rightly said, “Ramayana has never been a tale of Rama’s life. It is a tale of how Ram lived for others. By telling his tale, we hope to inspire to live as Ram did”. Rama tells us that no human is inferior. We all are created equal by the God. It is the thoughts and the paths which we choose, makes the difference.

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## **RE EVALUATING THE PRE HISTORIC CULTURAL SEQUENCES AND FINDS IN MANIPUR BASED ON THE AVAILABLE SOURCES**

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### **Introduction:**

The evolution of human being from that of the primate to the modern men covers a long process and time. With the emergence of men pre-history began. Technologically, the pre-history centers round the Stone Age cultural pattern. Besides, the archaeological study is the only means to understand the evolution of these cultural changes. Unlike in other parts of the world, the archaeological study is a recent phenomenon in Manipur. However, due to the ceaseless efforts of local archaeological researchers revealed the presence of Stone Age cultural remains in different parts of the state. Surprisingly, the archaeological remains discovered so far clearly indicate the evidences of the presents of pre-historic culture in Manipur. According to the nature of material culture discovered the Stone Age culture found in Manipur may be divided into three major phases, viz. the Paleolithic, *Hoabinhian* (Mesolithic) and Neolithic. Besides, the material culture characterizing the three phases of Paleolithic period, viz. early or lower, middle and late or upper Paleolithic period found in Manipur. The *Hoabinhian* cultural remains found in Manipur also may be divided into two-early and late. On the basis of pottery culture found, the Neolithic period also can be sub-divided into corded ware culture, tripod ware culture and geometric ware culture. Moreover, the cultural finds

clearly indicates the gradual extension of Stone Age cultural pattern found in south-east Asia and China into this small state in ancient times.

**Key Words** 1. *Songbu*: A cave in the *Chandel* District of Manipur; 2. *Khangkhui*: A cave located in the *Ukhrul* District; 3. *Singtom*: An archaeological site situated in the *Chandel* District; 4. *Machi*: An archaeological site in *Chandel* District; 5. *Nongpok Keithelmanbi*: An archaeological site on the bank of the River *Thoubal* in *Thoubal* District; 6. *Tharon*: A cave in the *Tamenglong* District; 7. *Phunan*: An archaeological site situated in *Thoubal* District 8. *Napachik*: A small hillock near *Wangoon* village in *Bishnupur* District; 9. *Laimanai*: A Neolithic site located in *Thoubal* District.

The Earth is mother of all living beings. The evolution of human being from that of the primates to the modern men covers a long process and time. It is said that men appeared on the earth in the early Pleistocene period of the Quaternary. Generally, it is believed that Africa was the cradle of modern men. However, recently, new evidences of the early modern men are also begun to unearth in parts of China and South-East Asia as well. Some of the researchers are of the view that Asia was the original home of human beings.<sup>1</sup> With the emergence of men on this planet prehistory began. The term, 'Prehistory' denotes the earliest period of human history. It is the period that begins with the appearance of the human being and continues till the invention of writing. In other words, 'Prehistory' is all those happenings of the past associated with the 'activity of man' before the invention of writing. Therefore, this period is being described as 'text free' period of human history. In the words of Burkitt, a renowned scholar, prehistory is the subject which deals with "the story of man and everything that concerns him from that dim remote moment when he first emerges from his animal ancestry until the time when the existence of written record leads the investigator into the realm of history".<sup>2</sup>

Since, the prehistory deals with the unrecorded events or activity of human beings, archaeological studies are the only means to understand this period of history. Archaeology is a scientific discipline which studies history through the recovered artifacts and analysis of material culture discovered by systematic excavations. Unlike in other parts of the world, the archaeological study is a recent phenomenon in Manipur.<sup>3</sup> However, in Manipur, the archaeological findings have been reported since the early 1930s by W. Yumjao Singh, who was perhaps, the first scholar to start archaeological research in Manipur.<sup>4</sup> But, the findings are still remains in its infancy. After a gap of about three decades or so, one Okram Kumar Singh (O.K.Singh), a young trained archaeologist started a pioneering archaeological study undertaken in different locations of the state. He published the first report of archaeological findings in Manipur in 1969. It was because of his work that Manipur could be included in the map of the world archaeology.<sup>5</sup> In the words of Prof. Gangmumei Kabui, a renowned historian rightly observed that "It was

O.K. Singh, a young archaeologist of Manipur to whom credit should be given for a systematic archaeological excavation and our knowledge of the pre-history of Manipur is more or less based on his studies and excavations".<sup>6</sup> The material culture discovered so far during the course of his explorations and excavations clearly indicate the evidences of the presence of 'Stone Age Culture' in Manipur. According to the nature of stone culture discovered through archaeological findings, the 'Stone Age Culture' found in Manipur can broadly be divided into three major phases: the Paleolithic, the *Hoabinhian* (Mesolithic) and the Neolithic.<sup>7</sup> However, Dr. L. Kunjeswori Devi has the view that instead of the three phases, she prefers to use the term "Pre-Neolithic and Neolithic" only. The term 'Pre-Neolithic' where she intends to use comprises all that culture before the advent of the Neolithic people.<sup>8</sup> Generally, the changes in stone-age culture from one phase to another were very gradual, and people did not altogether give up the old material or technique even when they came to know of new ones.

Paleolithic Period in Manipur:

The word, 'Paleolithic' is derived from two Greek words, '*palaios*' means 'old' and '*lithos*' means 'stone'. In short, it means 'Old Stone Age'. The people of this age belonged to a very primitive stage of civilization. The general feature of life of the people of this period was characterized by the nature of stone tools they used. During the period, men barely managed to gather their food and lived on hunting by means of rough stone implements. They had no knowledge of cultivation and house building. They lived in natural caves. According to the nature of stone tools used, the Paleolithic period may be again sub-divided into three periods, viz. early or lower Paleolithic, middle Paleolithic and late or upper Paleolithic. However, the material culture discovered, and the time span thereof, is different from place to place. Though, the evidences of material culture discovered so far in Manipur are scanty, but surprisingly, materials characterizing of all the three Paleolithic periods are found in Manipur. The main Paleolithic sites are *Songbu* caves, *Khangkhui* caves and open-air sites at *Singtom*, *Machi* and *Nongpok Keithelmanbi*.

The Early or, Lower Paleolithic period is the first phase of 'Old Stone Age' which covers the greater part of the time span of the Paleolithic period. Its characteristic features are the use of hand axes, cleavers and choppers;<sup>9</sup> during these period stone tools were mainly used for chopping purposes. In Manipur the fossils of the early men have not been discovered till date. But the presence of prehistoric men in early or lower Paleolithic period is evident from the stone tools found from *Machi* Archaeological site in *Chandel* District of Manipur. The exploration of the site was done in the year 1974 by O.K. Singh. Among other, the most stunning findings of the exploration in this site is the discovery of a pebble chopper by unifacial flaking with direct stone hammer technique. The chopper measure 11.5x13.5 x4.1 cm.<sup>10</sup> Material of the artifact is Quartzite. It has a ventral surface with pebble cortex and its upper surface is fully flat and slightly rolled. Typo-technologically, it is being compared with

that of North West India, Himachal Pradesh and South Asia.<sup>11</sup> On the findings of *Machi* exploration, T.C. Sharma, a renowned scholar of prehistory is of the view that the pebble, chopper found there "could be considered as a landmark in Paleolithic archaeology of Manipur, as it confirms beyond doubt that Manipur was inhabited by stone age ancestors since the early stone age or the lower Paleolithic period".

Universally, the Middle Paleolithic period is being characterized by the industry based upon flakes. These flakes are found in different prehistoric sites all over the world with some regional variations. The principal tools of this period comprise different varieties of blades, points, borers and scrapers. In Manipur, the artifacts of this period are found in and around the *Songbu* caves in the *Chandel* District of Manipur. The cave was explored in the year 1983 by the State Archaeology Department, Govt. Manipur, under the leadership of O. K. Singh. It faces southward and a stream also flows in the north-west direction. The cave is of fine quartzite sandstone which measures 0.8 m. in height, 6.6 m. in breadth and the interior measures 1.8 m. During the course of exploration, many stone tools belonging to the middle Paleolithic period are found. The stone tools comprises of many scrapers, borer cum hollow scrapers, knife, flakes, blades etc. The tools were mainly made of sandstone and quartzite sandstone. Tools found so far in this site can broadly be divided into two types, viz. core and flake. The number of flake tools is more than that of core tools. The flake tools are of different sizes. The largest flake measures 18.8 x 15.7 x 2.7 cm. and on the nature of technique of use of flakes, O.K. Singh is of the view that "The main flake surface is always flat with different bulb of percussion. The nature of the flake scar suggests the use of controlled stone hammer technique".<sup>12</sup> Typo-technologically, the finds at the *Songbu* cave appears to be of 'an advanced Middle Paleolithic' period.<sup>13</sup>

The Late or Upper Paleolithic is the last phase of Paleolithic period which become less humid. The period also coincides with the last phase of the Ice Age when climate became comparatively warm. The characteristic feature of this period is the appearance of new flint industries and men of the modern type (*Homo sapiens*).<sup>14</sup> In this period, a variety of tools which served very specific purposes also began to be used. In Manipur, archaeological sites associated with this period have been discovered in places like *Khangkhui* caves, *Singtom* and *Nongpok Keithelmanbi*.

The *Khangkhui* caves are located at a distance of 11 km. to the south-east of *Ukhrul* District Headquarters. There are altogether four limestone caves of different shapes and sizes. It was in the year 1969 that O.K Singh conducted the first excavation at *Khangkhui* caves on scientific line. A Small stream also flows near the western foothill which made the site suitable for habitation and settlement.<sup>15</sup> From this excavation, many stone tools, bone tools and faunal remains were found. Among the stone tools so far discovered the following may be mentioned of, viz. pebble, chopper, spearhead, scrapers, blade, burins, borers, flakes, points, knife, tabular flakes and core tools. Most of the

tools are made of limestone.<sup>16</sup> Besides, many animal bones and teeth of herbivorous animals are also recovered. The bone industry comprises various types of tools such as points, scrapers, chisels, knife etc. The faunal remains of possibly that of *Cervus*, *Sus Bovide* and wild fowls were also discovered. The findings indicate, the people in this period might have known hunting and the presence of charred animal bones also a sign of the use of fire.<sup>17</sup> Typo-technologically, the culture at *Khangkhui* caves appears to be of late or upper-Paleolithic period. In the words of T.C. Sharma, "On the basis of cultural materials consisting of stone and bone tools in addition to faunal remains, it can be argued that *Khangkhui* caves yielded evidence of upper or late Paleolithic period, the first evidence of Pleistocene man in Manipur dating back to about 30,000 B.C."<sup>18</sup> *Singtom* is another archaeological site belonging to Upper Paleolithic period found in Manipur. It is also situated in the *Chandel* District of Manipur. The open-air site at *Singtom* is explored in the year 1989 by a team of explorer under the personal supervision of O.K. Singh. During the course of exploration, a number of stone tools of different types and sizes are found. The important artifacts consisted of a broken hand axe, different type of pebbles, flakes, blades etc.<sup>19</sup> All the tools are made of 'quartzite sandstone'. The *Nongpok Keithelmanbi* is the only archaeological site which revealed all the three phases of the Paleolithic followed by the *Hoabinhian* and then by the Neolithic remains have been found in successive sequence in Manipur. It is also one of the important sites of upper Paleolithic period found in Manipur. It is situated at a distance of 15 km. north-east of *Yairipok* town on the bank of the river *Thoubal* in the *Thoubal* District. The village is located at the foothill of a mountain range which encircled the eastern periphery of the Imphal Valley. The exploration on this site is done in 1982-84 under the supervision of O.K. Singh. Surprisingly, the exploration team could discover two phase of Stone Age culture belonging to Upper Paleolithic and that of *Hoabinhian*. This site is being categorized into three localities, viz. L(1), L(2) and L(3). Out of the three localities L(2) and L(3) belonged to the Upper Paleolithic, whereas, L(1) to that of *Hoabinhian*. During the course of this exploration, artifacts of different types and sizes are discovered;<sup>24</sup> among them mention may be made of choppers scrapers, blades, flakes, pebbles, core tools, etc. The material of the artifacts is mostly made of 'quartzite sandstone'. Technologically, they were prepared by using direct stone hammer technique.<sup>25</sup> The specific age of the different phases of Paleolithic stone culture found in Manipur is not known. For ascertaining the age of each period, a scientific testing of the artifacts discovered and further Research is needed. From the reported artifacts, it appears that during the Paleolithic period men began to roam about and settled in Manipur in the same manner ad about the same time as it did in other parts of South-East Asian countries. It seems that there is a close affinity with the Paleolithic culture of Manipur with of that South East Asia. According to O.K. Singh, the origin of the Paleolithic culture in Manipur cannot be determined without having a

thorough research work of the entire archaeological evidence of the South East Asia because of its similar cultural tradition of these areas.<sup>26</sup> He also pointed out the similarity of most of the artifacts found in Manipur with that of the stone culture found in parts of China and Southeast Asia. Typo-technologically, he tentatively assigned the time period of the Paleolithic culture (all the three periods) found in Manipur to that of the 'Late Pleistocene to Terminal Pleistocene.'<sup>27</sup>

The Upper Paleolithic period came to an end with the end of the Terminal Pleistocene in Manipur which coincides with the end of the Ice Age. The climate became warm and dry which was almost the same as the present day. The climatic changes brought about changes in fauna and flora and made it possible for human beings to move to new areas.<sup>28</sup> About this time, throughout South East Asia began to witness an intermediate stage in stone age culture, which is called '*Hoabinhian*'. The term, '*Hoabinhian*' is derived from the name of Vietnamese Province, *Hoa Binh* from where Madeleine Colani, a female French archaeologist discovered a new stone culture which intervened transitional phase between Paleolithic and Neolithic stone cultures. Later on, similar stone relics are also discovered in Thailand, Burma and other parts of Southeast Asia. The *Hoabinhian* culture is the Mesolithic cultural pattern of South East Asia. However, there is no evidence about the existence of the 'Mesolithic' culture as characterized by '*microliths*' in Manipur. The chief characteristic feature of the *Hoabinhian* culture is the 'pebble tool industry'.

Archaeological evidence reveal that people in *Hoabinhian* period are 'hunter-gatherers'. The word, 'hunter-gatherers' is the term used by anthropologists and archaeologists to describe a specific kind of life: simply, hunter-gatherer hunt game and collect foods rather than grow or tend crops. In short, it is the life that men enjoyed before the invention of agriculture. Regarding the stone tools, there are regional variations in the character of the 'tools industry' from one place to another.<sup>29</sup> Typologically, the *Hoabinhian* stone tools are the continuation of the pebble tool tradition of the Paleolithic culture, but there is evidence of technological degeneration in the making of stone tools. According to O. K. Singh, almost all the stone tools, except one pebble scraper, do not show extensive workmanship and which restricts only to the making of working edge.

The *Hoabinhian* culture in Manipur is being identified with the discovery of similar nature in the characteristics of stone tools assemblages found with that of South East Asia. There are two *Hoabinhian* archaeological sites which have been discovered so far in Manipur. They are found at both at caves and open-air sites, and represented by the stone artifacts from *Nongpok Keithelmanbi L (1)* and *Tharon* cave site.<sup>30</sup> On the basis of the nature of pebble tools, O.K. Singh divided the *Hoabinhian* culture in Manipur into two-early and late *Hoabinhian* periods.

Early *Hoabinhian* period in Manipur:

The *Nongpok Keithelmanbi* L (I) archaeological site belongs to the early *Hoabinhian* period in Manipur. It is located at a distance of about 2 km downstream towards the southern side of the *Keithelmanbi* market along the left bank of the *Thoubal* River. The characteristic feature of early *Hoabinhian* period in Manipur is the chipped pebble tools. In this site, the *Hoabinhian* culture is found in a "stratum below the corded ware culture and characterized by pebble tools, spited pebbles, pebble strikers and a few flakes and blade".<sup>31</sup> The finished tools consisted of chopper, pick, scraper and blade. According to OK Singh, by the presence of a large number of batter marked pebbles and a small smooth surfaced pebble, it appears that the *Hoabinhian* people at *Nongpok Keithelmanbi* might have pounded or crushed their food.<sup>32</sup> Further, he also suggested that the pick axe with used mark might have been used in gathering of edible roots, and which further suggested that some form of vegetative food might be used.<sup>33</sup> Similar 'cultural stratum' are also discovered in parts of Thailand, Malaya and other parts of South East Asia as well. On the basis of stratigraphy, the *Hoabinhian* culture at *Nongpok Keithelmanbi* is being tentatively dated between 6000 and 5000 B.C.<sup>34</sup>

The *Tharon* cave is also another important archaeological site of *Hoabinhian* culture found in Manipur. The artifacts found in this site represented the Late *Hoabinhian* period. The characteristic feature of this period is the edged ground pebble tools. The cave is located at a distance of about 5 km towards North of the *Tharon* village in *Tamenglong* District. The exploration of this cave was done in the year 1979 and again in 1981 under the initiative of the Department of State Archaeology, Govt. of Manipur. During the course of the exploration, five caves and some rock shelters were discovered. These caves are locally known as '*Kalemki*' meaning 'house of bat'. A small stream, '*Kalem-ki-magu*' also runs along the southern side of the caves. The rock type of the area is sandstone of Barail series. The floor of the caves are filled with sandstone slabs that fall from the roofs and walls, as a result, the height inside caves and rock shelters are low and no artifacts could be collected from inside. During the exploration a number of stone tools were discovered which consisted of edged ground pebble tools, flake tools, elliptical pebble with grinding faces etc. By the presence of edge-ground pebble tools at *Tharon* cave site, it is also clear that, those *Hoabinhian* men in Manipur knew the technique of grinding in making stone tools.<sup>36</sup> According to Dr. L. Kunjeswori Devi, "the collected artifacts have a close similarity with those of Thailand, Burma, Malaysia, Vietnam". The *Hoabinhian* culture at *Tharon* cave site is being tentatively dated between 5000 and 4000 B.C.

**Neolithic Period in Manipur:** The Neolithic period is the last phase of Stone Age culture. In this period also men had to depend on stone tools and implements. But implements differed much from those of the preceding ages. The word, 'Neolithic' is derived from two Greek words, '*Neo*' means 'New' and '*Lithos*' means Stone', which means 'New Stone Age'. During this period, men began to use a variety of stone tools. The chief characteristic feature of this

period is the use of 'tools and implements of polished stone'.<sup>39</sup> People in Neolithic period had made considerable advance towards civilization. Apart from natural shelter in caves and rock-shelters, they constructed dwellings, domesticated animals, and cultivated lands. They knew how to produce fire and the art of cooking. They occupied themselves with fishing and hunting. They made pottery by hand.

In Manipur, Neolithic culture is found both in the hill and valley areas. During this period, people particularly used stone axes. This cutting tool put to various uses by the people particularly clearing of jungles for habitation. According to O.K. Singh, from the distribution pattern of the finds of the Neolithic period, it appears that in Manipur the population became more during the Neolithic than the preceding periods. Neolithic pottery is found from four different sites at *Phunan, Napachik, Laimanai and Nongpok Keithelmanbi*. On the basis of pottery culture found, the Neolithic period in Manipur can be sub-divided into three successive cultural patterns, viz. Corded Ware Culture, Tripod Ware Culture and Geometric Ware Culture

The Corded Ware Culture is the earliest phase of Neolithic culture found in Manipur. This culture is found in the archaeological site of *Nongpok Keithelmanbi Locality (L)-1*. The culture is being characterized by the used of handmade and ill-fired pottery decorated with cord marks. In this archaeological site, corded ware overlies the *Hoabinhian* culture after a short break in its stratigraphy. Due to the absence of any other Neolithic characters, the Corded Ware Culture at *Nongpok Keithelmanbi L (1)* may be categorized as a 'sub-Neolithic' type as in other parts of the South East Asia. A radiometric dating from a charcoal sample shows that the Corded Ware Culture at this site is  $4,460 \pm 120$  years old (first half of the third Millennium BC).

**Tripod Ware Culture:**The Tripod Ware Culture in Manipur is represented by the archaeological sites of *Napachik* and *Laimanai*. This culture is characterized by the used of cord-marked pottery with tripod legs. Besides, this culture is also associated with ground Neolithic stone tools. *Napachik* is a small hillock in the northern part of *Wangoo* village, on the right bank of the Manipur River in *Bishnupur* District. It is one of the major archaeological sites of the Neolithic period. It was discovered in the year 1979 while leveling a homestead land. However, officially, the excavation was done in 1981 and again in 1985 by the Department of Archaeology, Govt. of Manipur. The site was dug up through eight layers. The cultural materials discovered from this site consist of choppers, scrapers, flakes, edged ground knife, grinding stone, ground and polished Celts and potsherd, tripod leg wares, plain and corded wares. A number of charcoal pieces and ash of reeds are also found. Besides, a large number of artifacts belonging to Neolithic culture have also been collected as stray finds from many parts in and around the site. The artifact assemblages suggest that the tripod ware culture was based on plant cultivation supplemented by fishing and hunting economy and people also knew the spinning of thread. The pottery might be used in cooking also.

According to O. K. Singh, typo-technologically, the cultural materials from *Napachik* can be sub-divided into two phases. The small chipped pebble tools and other *Hoabinhian* nature like stone tools represent the earlier phase; whereas, the fully ground Celt and handmade cord marked pottery and tripod vase represent the latter phase. The pottery culture of *Napachik* has affinity with that Neolithic culture of China. In the words of Dr. L. Kunjeswori Devi, “The pottery with tripod legs from *Napachik* is very much comparable with those found in Neolithic culture of China.” The tripod wares are the characteristic feature of the Chinese Neolithic culture. Regarding the age of the artifacts, a cord marked shred from this site was dated to 1450 B. C. by radiometric method.<sup>46</sup> *Laimanai* is also another Neolithic site which belonged to the Tripod Ware Culture. It is located at a distance of about 6 km towards the south-west of *Kakching* town in *Thoubal* District. The exploration work was done in the year 1990. The main items of stone artifacts collected from this site consisted of among others chipped Celt, chipped ground Celt, fully ground Celt, broken ring stone, flat pebble hammer, grinding stone, waste flakes and many unfinished ring stones.

#### **Conclusion:**

Thus, the story of early men in Manipur is largely shrouded into mystery. We have very scanty data about the early human settlers here. However, traces of Stone Age culture are found both in the hill and valley areas of Manipur. So far as the evidence goes, Manipur was also inhabited by Stone Age people since the Paleolithic period onwards. From the present knowledge of research, it appears that Manipur was settled by prehistoric men later than that of Southeast Asia and China, although, the *lithic* technology found in Manipur shows the same manner as it found in these countries. However, the sequence of the cultural trend shows the gradual expansion of the prehistoric men of South East Asia and China into Manipur in different phases. The possibility of this cultural migration is evident from the similarity of the relics found, the available cultural sequences and the close proximity of the regions with Manipur without much geographical barrier.

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**ABUL HASHIM AND EMANCIPATION OF THE  
BENGAL MUSLIM WOMEN**

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**Abstract:**

Abul Hashim, the most progressive-minded and erudite Muslim League leader of late-colonial Bengal, was a man of multifarious activities. He was an Islamic philosopher,<sup>1</sup> a lawyer, political leader-cum-activist, an editor, writer and above all a social reformer.<sup>2</sup> However, he has remained relatively a less known figure in the history of South Asia.<sup>3</sup> No extensive research work has been undertaken on him. Whatever has been written so far about him, is mainly about his political activities, especially his role as the general secretary of the BPML (1943-1947) in transforming it from an elite organization to a broad-based mass organization. But apart from liberating the Bengal League from the clutches of the 'reactionary group', he made a significant contribution to the Bengal Muslim society as a social reformer. Indeed, Hashim throughout his life worked for the weaker section of the society: the peasants, workers and most importantly, emancipation of women. Paradoxically, these aspects of his life, especially his endeavours for the promotion of education among the Muslim women and their emancipation have drawn far less academic attention than what

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<sup>1</sup> Bose, Neilesh. *Recasting the Region – Language, Culture and Islam in Colonial Bengal*, Oxford University Press, New Delhi, 2014, p. 237.

<sup>2</sup> Murshid, M. Tazeen, *The Sacred And The Secular : Bengal Muslim Discourses, 1871 – 1977*, Oxford University Press, Calcutta, 1995, p. 172.

<sup>3</sup> Kuwajima, Sho., *Muslims, Nation and the World- Life and Thought of Abul Hashim, Leader of the Bengal Muslim League*, LG Publishers Distributors, Delhi, 2015, p.1.

would seem warranted by its historical significance. This article here makes an attempt to examine his role in the emancipation of the Muslim women of Bengal in a situational context.

**Key Words:** *Abul Hashim, Emancipation, Muslim Women, Muslim League, Multi-nation theory, Social Reformer, Pakistan movement, Women Education*

### **Introduction**

Abul Hashim (1905-1974) was born in a nationalist family of Kashiara village in the district of Burdwan of modern West Bengal. His father, Abul Kasem, was a renowned Congress leader and an ardent follower of Surendranath Banerjee. A law graduate of Calcutta University, Hashim joined politics in 1936 following his father's death, to serve the country leaving his successful chosen profession of legal practice. He was different from that of other politicians with whom he worked like Maulana Akram Khan, Fazlul Huq, Suhrawardy, Khwaza Nazimuddin and others. In Ayesha Jalal's word, 'he was not cut of the same cloth, by conviction or style, as the oligarchs...'<sup>4</sup> Hashim did never support Jinnah's 'two nation theory', rather he preached the 'multi-nation theory.'<sup>5</sup> He believed that 'India is a sub-continent and not a country. India consists of many nations.' He supported the Lahore Resolution of 1940 of the All India Muslim League (AIML) because in it he saw his complete independence as a Muslim and as a Bengali.<sup>6</sup> Moreover, he believed that there was nothing communal in the Lahore Resolution since it did not contemplate partition of any country of India or partition of the Punjab or the Punjabis and partition of Bengal or of the Bengalis.<sup>7</sup> He was a staunch believer of linguistic-based nationalism. Indeed, Hashim was a 'nationalist' Muslim League politician who fought for the interests of the Bengalis where the Muslims were incidentally majority.

Hashim was elected to the post of General Secretary of the Bengal Provincial Muslim League (BPML) in 1943 and worked hard for the attainment of Pakistan according to his understanding. He was convinced that there would be two separate states for the Muslims, one in the western part of the country and other in the eastern part consisting of Assam and Bengal for the Bengali speaking people. Under his leadership, BPML emerged as a broad-based progressive democratic party. However, when partition became inevitable, Hashim made a last bid to keep Bengal united and tried to form United Independent Bengal but unfortunately it did not materialize. After partition, he served as the Leader of the Opposition in the Bengal Legislative Assembly but was forced to leave India in 1950 for Dacca following a communal riot in which his house was set ablaze by the

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<sup>4</sup> Jalal, Ayesha, *The Sole Spokesman, Jinnah, the Muslim League and the Demand for Pakistan*, Cambridge University Press, Delhi, Reprint 2017, p. 104.

<sup>5</sup> Hashim, Abul, *In Retrospection*, Subarna Publishers, Dacca, 1974, p. 23

<sup>6</sup> Ibid, p. 23.

<sup>7</sup> Ibid, p. 23

miscreants. In the early years of his migration to East Pakistan, Hashim was actively associated with the Language Movement and, even for this he was sentenced to jail for sixteen months by the Pakistani state for which he worked so hard to establish. Afterwards, he lost his interest in politics and then devoted his attention to the study and research of Islam.

Apart from playing a crucial role in the freedom movement of the country in the last decade preceding the partition of 1947, Hashim from his student life to till his last days worked for the emancipation of the Bengal Muslim women. The initiatives undertaken by him to emancipate the Bengal Muslim women can be discussed into three phases. From 1923 to 1936, as a social activist; from 1936 to 1950, as a political activist and after his retirement from active politics as an Islamic scholar from 1950 to till his death in 1974.

## II

It was largely due to the interaction of the Indian society, in the nineteenth century, with the British colonial power, Indian reformers became conscious about the emancipation of women. To a large extent it was the result of a comparative civilizational discourse of the colonial period. This gender question was a key issue for James Mill condemning Indian civilization in his *The History of British India*. Under such circumstances the newly emerging Hindu intelligentsia in Bengal also responded to this civilizational critique by advocating and supporting reforms to improve the status of women in Indian society.

The condition of Bengali Muslim women were more or less similar to their Hindu counterparts except for the case of *sati* system which was exclusively an anathema of Hindu reformers till its abolition in 1829. The reform movement among the Muslims, however, started a little later than that of the Bengali Hindus. One of the key factors responsible for this was that there was no formidable middle class in the Bengal Muslim community as the Muslims kept themselves aloof from learning Western education for a long time. In the absence of a substantial group of middle class, religious leaders came forward to rescue the Muslim community from its degraded position and thus started revivalist movements, like Faraizi and Wahabi. These movements instead of uplifting the socio-economic condition of the Bengal Muslims intensified their backwardness only.<sup>8</sup> It had no agenda of uplifting the Muslim society in terms of secular modern education or emancipation of the Muslim women.

However, by the mid-nineteenth century demand for English education among the Muslims of Bengal gradually increased<sup>9</sup> as economic condition

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<sup>8</sup> Mallick, Azizur Rahman, *British Policy And The Muslims In Bengal, 1757-1856*, Bangla Academy, Dacca, 1977, p.163.

<sup>9</sup> Ahmed, Rafiuddin, *The Bengal Muslims: 1871 -1906, A Quest for Identity*, Oxford University Press, New Delhi, 1981, p. 137.

of the Bengali Muslim peasants, mainly of the eastern part of Bengal, improved due to boom in jute production.<sup>10</sup> The government too adopted some favourable policies, especially after the publication of W.W. Hunter's *The Indian Mussalman*, for the advancement of Muslims in education and governments jobs. As a result, there emerged a small group of Western educated 'middle class' towards the last quarter of the nineteenth century. Though the size of western educated Muslim middle class gradually increased in the subsequent years, however, till the next two decades of the twentieth century, they could not mobilize the Muslim masses politically since their priority was to protect the interests of the upper class *ashraf* Muslims only. The *ashraf* leaders had little contact with the rural *atraf* or low born Muslims majority of whom were Bengali speaking.

#### **Social Activist Hashim and emancipation of the Muslim women**

It was only from the 1920's, there emerged a new Muslim middle class<sup>11</sup> who endeavoured to address socio-political issues like promotion of women education, protection of the interests of the *prajas*, marginal peasants and foundation of modern educational institutions. At the same time, there emerged a new *bhadramahila*, with the commencement of a critique of conventional notions like chastity, as well as the entry of women's into politics and public sphere.<sup>12</sup> Indeed, from the 1920's a redefinition of Bengal's identity started.

Bengali Muslim intellectuals like Nasiruddin Mohammad<sup>13</sup> emphatically argued for the promotion of Muslim women education and their emancipation. His *Mahila Saogat* created a platform for the voices of Muslim women. The establishment of Dacca University in 1923 and the beginning of *Buddhir Mukti Andolan*, (Emancipation of Intellect) in 1926, played a paramount role in infusing rational thought among the Bengali Muslim youths. Young Abul Hashim, then in his early 20s, fell in love with what were known as 'Western' subjects like sociology, political science, history, law and philosophy<sup>14</sup> and gradually became an avid reader which widened his mental horizon. This intellectual engagement injected in him the spirit of fighting against the orthodox Mullahs who opposed English education and stood as a barrier in the emancipation of the Muslim women. Inspired by all these developments, Hashim at the age of just twenty three years, instead of joining politics which was quite normal for him as he hailed from a politically oriented family, embarked into the activities

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<sup>10</sup> Chatterji, Joya, *Bengal Divided, Hindu Communalism and Partition, 1932-1947*; Cambridge University Press, New Delhi, Reprinted 2002, p. 70.

<sup>11</sup> Bhattacharya, Sabyasachi, *The Defining Moments in Bengal: 1920- 1947*, Oxford University Press, New Delhi, 2014, p.vii (Preface).

<sup>13</sup> Editor of *Saogat*, a leading Muslim Periodical published from Calcutta in 1918.

<sup>14</sup> Bose Neilesh, op. cit. p.241.

of social reform, especially in the task of emancipating the Muslim women's of Bengal which had enduring impact on the Muslim community. Hashim from the very beginning of his student life considered traditional Maktab and Madrassa education as a great barrier for the advancement of the community and so vehemently opposed it and even argued for its abolition and introduction of modern uniform education for all.<sup>15</sup> He was especially pained to see the deplorable condition of the Muslim women. They were denied the right to secular education whereas Islam declares acquiring knowledge or education as mandatory for all, men and women.<sup>16</sup> To remove this discrimination and promotion of education among the Muslim women, he launched a massive campaign in his district and formed a social organization, called Young Men's Muslim Association (YMA). He persuaded the Muslims of the Burdwan town to send their girls to the Christian Missionary High English School founded by the Missionaries. To set an example, Hashim admitted his wife, Akhter Mehr Banu Begum, cousin of H. S. Suhrawardy, in this school<sup>17</sup> despite strong objection from his father, Abul Kasem.

Hashim's ancestors, though, showed quite liberal attitude towards English and western education, compared to the other Urdu speaking urban *ashraf* Muslims, and opened the door of Western education for the male members but did not do that for the female members of their family. Rather they had to observe *purdah* system strictly.<sup>18</sup> Hashim in his memoirs, *In Retrospection*, termed the environment of his family as 'feudal.' Possibly, it was because of his ancestors orthodox approach towards women education. Hashim's paternal grandfather, Abdul Jabbar, (1837 - 1918), a class-mate of Bankimchandra Chattopadhyay and Deputy Magistrate by profession, opposed to the establishment of a school for Muslim girls.<sup>19</sup> Hashim's son Badruddin Umar, a renowned intellectual and political scientist of Bangladesh, writes that the female members of their family were never allowed to go to school.<sup>20</sup>

Hashim equally opposed the social custom of seclusion or *purdah* system of the Muslim women. Begum Rokeya Shakhawat Hossain, (1880-1932) pioneer of the emancipation of Muslim women, vividly portrayed the miserable picture of this *purdah* system in her much acclaimed book

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<sup>15</sup> Umar, Badruddin, Amar Pita ( My Father) in Syed Mansur Ahmad (ed.), Abul Hashim – Tnar Jibon O Samaya ( Abul Hashim: His Life and Time), Jatiya Sahitya Prakash, Dhaka, 2005, p.269.

<sup>16</sup>The Holy Quran, Surah Iqra, Chapter 30, Verse 96

<sup>17</sup> Hashim, Abul, op. cit., p. 15.

<sup>18</sup>Badruddin Umar, Amar Jibon, (My Life), Prothom Khondo ( First Part), Jatiya Sahitya Prakash, Dhaka, Third Edition,, 2014, p.23

<sup>19</sup> Ahmed, Rafiuddin, op. cit., p. 23.

<sup>20</sup>*Ibid*, p. 23.

*Aborodhbasni*.<sup>21</sup> To abolish this practice of 'purdah', or liberating the Muslim women from seclusion, under Hashim's initiative a resolution was taken in the first Annual Conference of YMA.<sup>22</sup> He considered the social custom of seclusion which confined the Muslim women within the four walls of their house as one of the main causes of their degraded position.

Hashim was a very pragmatic politician. Indeed, nationalism cannot afford to ignore women, especially when it comes to counting numbers. Since Hashim's aim was to organize Bengal League as 'a broad-based democratic and progressive political party', he left no stone unturned to bring the entire Muslim community of Bengal under the banner of the League. This is why immediately after taking charge of the party in 1943, in an address, he urged the League workers to reach out to every section of the society irrespective of caste, creed and gender. He said, 'Run about cities, towns and villages and organize your brothers and sisters ... and build up your thrones in the heart of every man woman by your service to humanity...' <sup>23</sup>. A leader with overtly socialist leanings, Hashim had the vision establishing an egalitarian society. In 1944, he published a 'Manifesto' with the help of Nikhil Chakraborty, a young Communist leader. It included all the essential features of an egalitarian society. It promised equal rights and opportunities for all, both men and women, in education, employment, health and other fields of life. <sup>24</sup> No other Muslim League leader came forward with such a progressive and revolutionary agenda for women empowerment.

In fact, Hashim's endeavours for emancipation of women was very much inconformity with the ideals of Pakistan movement. There was a feminist dimension to the Pakistan movement that has hardly ever been underscored. The emancipation of women would be something that Jinnah would repeat often in the course of Pakistan movement. Throughout the Pakistan movement the question of women emancipation figure in the speeches of Jinnah. He advised the Muslims to 'emancipate the women' for that was the key to progress.<sup>25</sup> Indeed, it was the women who formed the vanguard of popular movements, struggles and even in electoral battles. Both Hindu and Muslim women's took active part in politics especially after the emergence of Gandhi. It was in Lahore in 1931 that the Asian Women's Movement was born. However, by and large, Muslim women remained oblivious. It was Jinnah who galvanized the Muslim women into a veritable

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<sup>21</sup> See, Kader, Abdul., (ed). Rokeya Rachanavali ( Works of Begum Rokeya Sakhawat Hossain), Bangla Academy, Dhaka, First Reprint 1993, ( First Published in 1973), pp. 429 – 468).

<sup>22</sup> Abul Hashim, op., cit., p. 15.

<sup>23</sup> Hashim, Abul., Ibid., p.37.

<sup>24</sup> Op.cit, p. 79

<sup>25</sup> Quoted in Hamdani, Yasser Latif., Jinnah, A Life, Macmillan, London, 2020, p.195.

arm of the Muslim League. He had been ardently working for the suffrage movement in his student days in London. He was genuinely distressed to see the state of women in the Muslim community, something he alluded to on several occasions<sup>26</sup>. He famously said in 1944; ‘No nation can rise to the height of glory unless your women are side by side with you; we are victims of evil customs. It is a crime against humanity that our women are shut up within the four walls of the houses as prisoners. There is no sanction anywhere for the deplorable condition in which our women have to live’

Hashim in course of his extensive tour from the beginning of 1944, did his best to reach out to all sections of people to build up a strong base of the party. In fact, Hashim paved the way of ‘political empowerment’ of the Muslim women through the League platform. In the provincial election of 1946, two women candidate of the League, Anwara Khatoon, a well-educated woman and Mrs. Hakim were elected to the Bengal Legislative Assembly unopposed from Dacca-Narayanganj constituency and Calcutta Constituency respectively. There was another women candidate Mrs. Sultanuddin Ahmed in the fray.<sup>27</sup> Thus a remarkable change was noticed in the approach of the Bengal Muslims towards accepting the women in the domain of the males, the world of politics.

#### **Hashim as an Islamic Scholar and emancipation of Muslim women**

Hashim left India in 1950 in a broken heart for Dacca, and, stayed there till his death in 1974. The year 1950 was also very special to him as his first book, *The Creed of Islam or The Revolutionary Character of Kalima* was published in this year. In this ground-breaking book, he explained in detail how Islam has guarded the interests of the women. After his release from jail he gradually lost interest in politics and shifted his attention to the study of Islamic research. During this phase of his life, he continued to argue for the equal rights of the women and their emancipation. In his book, *The Creed of Islam* and in his later work, *As I See It*, he categorically supported the cause of women emancipation. He writes, ‘Islam has given due respect to the woman. She is not a chattel but a person with all its legal and social implications. She is known by her own name and not by her father’s or husband’s name.’<sup>28</sup> In Islam slander of women is a heinous crime and the punishment for that is extremely severe. In this connection, he cited the Sura ‘Noor’, verse 4, of the Quran. It says, “And those who launch a charge against chaste women ... flog them with eighty stripes and reject their evidence ... for such man are wicked transgressors.” Hashim there after writes that the Prophet raised the honour of women heaven high. Being a true believer, he believed ‘paradise lies at the feet of the mother.’

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<sup>26</sup>Hamdani, Yasser Latif, *Ibid*, p. 196.

<sup>27</sup>Hashim, Abul., *op., cit.*, pp. 100-101.

<sup>28</sup> Hashim, Abul, *As I See It*, Bangladesh Co-operative Book Society Ltd., Chittagong, 1997, p. 78.

Hashim being ‘a zealous missionary of Islam,’ legitimately championed the women’s right in property. Citing the verses of the Quran, he writes that in Islam female child enjoys the same status as that of a boy. She is legal heiress of her father, mother and children. Her property does not merge with that of her husband. She has the freedom of disposal of her property as she likes.<sup>29</sup> He believed in *ijtihad*, the practice of applying reason or practical knowledge in the absence of any clear-cut guidance from the Quran or hadith in day to day life of a follower of Islam. Quite arguably, he dismissed those customs prevalent in the Muslim society of the sub-continent which were not approved by the Quran. According to the Muslim Law of Inheritance if a mother or father of a child dies in the life time of his or her grandparents, then he or she would be disinherited from his or her mother or fathers property. He tried to prove that this law is inconsistent with the ideology of Islam. Hashim was in search of an opportunity to rectify this provision of the law and ultimately got it. In 1969, he was appointed as a member of the Advisory Council of Islamic Ideology in Pakistan. He submitted a proposal to the Council on the right of inheritance of the orphaned grandchildren. And the proposal was accepted and an Act was passed in 1969 giving the right of inheritance to orphaned grand children.<sup>30</sup>

### **Conclusion**

The success Hashim could not achieve in politics was compensated through his social reforms and his literary achievements; the book *The Creed of Islam* is considered an asset in contemporary Islamic thought. He undoubtedly emerged as a charismatic leader for the Bengalis. It’s fact that he did not reach the stature of a national leader unlike Jinnah but did enjoy the honour of being amongst the “Big Three” of the revolutionary Bengali leaders (H S Suhrawardy, Fazlul Huq). There is no denial of the fact that his efforts in the emancipation of Muslim women played a vital role in the modernization of the Muslim women’s of Bengal. His concern for the marginal and deprived sections of the society, an essential characteristic feature of a political leader reflects humanitarian aspects of his personality. Indeed, Hashim was far ahead of his time who played an important role in the self awakening of the Bengal masses. Time and again, his ideals were smashed out but since revolutions are born in the mind first, Hashim had already sown the seeds of that revolution for equality in the minds of the Bengali youth, who later became the flag bearers of Bengali Language movement which paved the way of the foundation of a modern nation state, Bangladesh, in 1971. Hence, posterity would remember him not only as a far-sighted political leader but also as a great social reformer and emancipator of Bengal Muslim women.

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<sup>30</sup> Hashim, Abul. *In Retrospection*, p. 12.



## **DEVELOPMENT AND STANDARDISATION OF A SCALE TO MEASURE TEACHER EFFECTIVENESS**

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### **Abstract:**

This paper explains the procedure of developing and standardizing a scale to measure teacher effectiveness of college teachers. After thorough review of literature, related to teacher effectiveness of college teachers and university teachers, nine areas are decided. Initially, 42 items are generated pertaining to teacher effectiveness belonging to all nine areas. The proper try-out is done on a group of 200 college teachers for carrying out the item analysis. 24 items with 'CR' values significant at the 0.05 level of significance are finally selected for the scale. The test-retest reliability and split-half reliability are established for the scale which are found 0.76 and 0.60 respectively. Face validity, cross-validity and item validity are established for scale. Norms are established on the sample of 350 college teachers on the scores of teacher effectiveness. The scale to measure teacher effectiveness developed and standardized can be used to study the teacher effectiveness of college teacher.

### **Introduction:**

Higher education institutions emphasize teaching, research and extension services, however the major focus may vary according to the nature of the higher education institutions. Even though Boyer (1990) recommended that teaching and research should have a better balance and that teaching should be viewed as a core requirement in higher education institution. Inadequate assessments of teaching quality still leaves room for further resolution. The problem of identification of effective teachers is, therefore, of prime importance for realizing desirable educational goals.

After thorough review of literature, related to teacher effectiveness of college teachers and university teachers, areas are decided. Literature encompasses numerous definitions and criteria regarding effective teaching and effective teachers. Scholars studied and gave definitions and criteria for assessing teacher effectiveness. For a summary of definitions of teaching effectiveness and criteria indicated by various researchers are given in the Table 1.

**Table 1 : Definition and Criteria of Teaching Effectiveness**

<b>Researcher, Date</b>	<b>Definition/ Criteria</b>
Sherman (1987)	Enthusiasm, clarity, preparation, organization, stimulating, and love of knowledge
Cashin (1989)	All the instructor behaviours that help students learn, the components of which include subject-matter mastery, curriculum development, course design, delivery of instruction, assessment of instruction, availability to students, and administrative requirements
Brophy (1986)	Time management, active teaching through discussions, follow-up assignments, and effective classroom management skills
Marsh (1982)	Value of learning, enthusiasm organization, group interaction, individual rapport, breadth of coverage, workload, grading and assignments
Wankat (2002)	Teaching that fosters student learning
Fiedler (2004)	Availability and accessibility during office hours and through emails, organization in terms of course objectives and the course content, methodology such as incorporating classroom discussions, encouraging questions from students, and using example

On the basis of review of related literature, areas are decided belonging to following teaching behavior categories –

- (i) Learning/Academic Value
- (ii) Instructor Enthusiasm
- (iii) Organization/Clarity
- (iv) Breadth of Coverage
- (v) Examination/Grading
- (vi) Group Interaction
- (vii) Individual Rapport
- (viii) Instructor Accessibility
- (ix) Communication Skills.

Shaw, Young, Schaffer, Mundfrom (2003) developed an instrument for addressing the validity of a Teacher Effectiveness Scale which comprised 12 items such as subject-matter knowledge, communication skills, enthusiasm, comfortable atmosphere, respectful of students, warm and friendly, motivate

and stimulate concern for learning, increased understanding, increased interest, course organization global item.

Kumar and Mutha (1999) constructed and standardized a Teacher Effectiveness scale. This scale consists of 69 items including areas such as academic, professional, social, emotional, moral, personality.

It is decided that only closed type items will be prepared in the scale. 42 items belonging to above nine categories are prepared. Extreme care is taken to word the items in order to avoid indication of hidden meaning for securing information. This first draft of scale is given to a group of 10 experts for opinion and comments. 42 items are screened and 32 items are retained after excluding items with overlapping and second draft of scale is developed. Second draft of scale is subjected to pre-tryout Pre-tryout is done to improve and modify the language difficulties. The 32 items are administered to a sample of 20 college teachers to check language difficulties. Minor changes are made in the language in some items as suggested by the college teachers. The proper tryout is done on a group of 200 college teachers for carrying out the item analysis. 27% of subjects with the highest scores and 27% of subjects with the lowest scores served as criterion groups (Garrett, 1961). Discriminating value for each item is then determined by calculating 'CR' on the basis of responses of upper and lower groups. Significant difference between 27% lower and 27% upper score on Teacher Effectiveness Scale on each item is shown in Table 2.

**Table-2 : Mean Difference Between Lower 27% and Upper 27% Items of Teacher Effectiveness Scale**

Items	't'	Items	't'	Items	't'
1.	2.02*	12.	2.50*	23.	1.49
2.	2.20*	13.	2.03*	24.	2.03*
3.	2.69**	14.	4.60**	25.	2.08*
4.	1.46	15.	3.98**	26.	3.57**
5.	2.20*	16.	5.80**	27.	2.07*
6.	2.30*	17.	3.85**	28.	1.57
7.	1.32	18.	1.46	29.	2.11*
8.	1.37	19.	2.69**	30.	1.69
9.	2.68**	20.	1.97	31.	2.70**
10.	3.63**	21.	2.50*	32.	2.57*
11.	6.91**	22.	2.60*		

\* Significant at 0.05 Level of Significance

\*\* Significant at 0.01 Level of Significance

24 items with 'CR' values significant at the 0.05 level of significance are finally selected for the scale.

Area-wise distribution of Teacher Effectiveness Scale items are given in Table 3.

**Table-3 : Area-Wise Distribution of Teacher Effectiveness Scale Items**

S.No.	Area	Item No.	Total Item
1.	Learning/Academic Value	1, 2, 3	3
2.	Instructor Enthusiasm	4, 5, 6	3
3.	Organization/Clarity	7, 8, 9	3
4.	Breadth of Coverage	10, 11, 12, 13, 14	5
5.	Examinations/Grading	15, 16	2
6.	Group Interaction	17, 18, 19	3
7.	Individual Rapport	20, 21	2
8.	Instructor Accessibility	22, 23	2
9.	Communication Skill	24	1
Total			24

**Reliability**

The test-retest reliability is established for the present scale by computing the coefficient of correlation between two sets of scores of same individual on Teacher Effectiveness Scale at different intervals (after 15 days) on a sample of 120 college teachers. Split-half reliability is also established.

Test-retest reliability and split-half reliability are shown in Table 4.

**Table -4 : Reliability of Teacher Effectiveness Scale**

S.No.	Reliability	N	R	Index of reliability
1.	Test-Retest Reliability	120	0.76	0.87
2.	Split-Half Reliability	120	0.60	0.77

**Validity**

The face validity of the scale is fairly high. The content validity is decided by modifying and rewording the items with the consultation of experts in the field. The scale is said to possess the cross validity since the sample selected for tryout of the items is not included in the establishment of reliability and validity of scale. This avoids the chance error of increasing the reliability coefficient. Item validity is established by selecting the items which had significant 'r' values on item total correlation. Item total correlation between score of each item and score of total items are carried out by using Karl Pearson's Coefficient of Correlation. Correlation is computed on the scores of 50 college teachers. Correlation coefficient between scores of each item and score of total items are given in Table 5.

**Table 5 : Item Total Correlation Between Score of Each Item and Score of Total Questionnaire**

Items	'r'	Items	'r'
1.	.28*	13.	.39**
2.	.36**	14.	.42**
3.	.29*	15.	.37**
4.	.33*	16.	.57**
5.	.35**	17.	.36**

6.	.30*	18.	.48**
7.	.27*	19.	.56**
8.	.32*	20.	.48**
9.	.28*	21.	.36**
10.	.39**	22.	.69**
11.	.45**	23.	.39**
12.	.58**	24.	.40**

\* Significant at 0.05 Level of Significance

\*\* Significant at 0.01 Level of Significance

All items are found significant at 0.05 level of significance. 14 items are found significant at 0.01 level of significance.

### Scoring

The Teacher Effectiveness Scale has 24 items and were positively worded. Items are given a score of '5', '4', '3', '2', '1' for most effective, more effective, average, less effective, least effective respectively. The sum of these gives the score of the teacher effectiveness for the subject. The total scores vary from 24 to 120, showing least teacher effectiveness to highest teacher effectiveness. Norms are established on the sample of 350 college teachers on the scores of Teacher Effectiveness. Norms are interpreted in the conventional manner. Norms are decided on the basis of normal probability curve. **Conclusion**

The scale to measure teacher effectiveness is developed and standardized. This scale can be used to study the teacher effectiveness of college teachers. Effective and ineffective teachers can be identified through this scale.

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**MARTHA NUSSBAUM'S DEFINITION OF  
OBJECTIFICATION IN KHALED HOSSEINI'S A  
THOUSAND SPLENDID SUNS**

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**Abstract:**

Objectification is a kind of thralldom in which women are expected to be silent like an object or a thing. It is a part of dehumanisation and the act of disavowing the humanity of others. Objectification is a notion central to feminist theory and it can be defined as seeing the women as an object primarily on sexual realm. In patriarchal society, especially fundamentalist countries like Afghanistan, women are viewed as an object. Based on this, the paper has been written bringing out Martha Nussbaum, an American philosopher's, objectification characteristics such as instrumentality, denial of autonomy, inertness, fungibility, violability, ownership and denial of subjectivity, and these factors are applied to Mariam, a female character, in *A Thousand Splendid Suns* by Khaled Hosseini. An analysis, through Nassbaum, shows how she has lost her space in her mother's family and also in her husband's family.

**Keywords:** *Autonomy, oppression, patriarchy, endurance, psychopath, freedom.*

Objectification calls attention to the denigratory status of women in a society where they are treated as mere objects of gratification. They are reckoned for sexual pleasure without giving significance to their thoughts and emotions. Thus, their status is reduced to a mere object that has physical existence. Their rights are denied and they are under the control of men, getting exploited and subjugated by them. They are viewed merely as a symbol of attraction and are demeaned even in their own families. The notion of objectification is focal to the feminist theory and the trauma that they undergo is phonated and penned by writers from time to time. Lundy Bancroft in her work *Why Does He Do That? Inside the Minds of Angry and Controlling Men* expresses her views on objectivity in the following manner:

Objectification is a critical reason why an abuser tends to get worse over time. As his conscience adapts to one level of cruelty – or violence – he builds to the next. By depersonalizing his partner, the abuser protects himself from the natural human emotions of guilt and empathy, so that he can sleep at night with a clear conscience. (Bancroft, 32)

Martha Nussbaum, an American Philosopher, advocates the freedom of women. She furthers her ideas on the concept of objectification which is an embodiment of a pragmatic philosophical approach which regards an activity rather than an absolute or ideal term known as instrumentalism. Nassbaum outlines seven characteristics of objectification such as instrumentality, denial of autonomy, inertness, fungibility, violability, ownership, and denial of subjectivity.

According to Nussbaum, Instrumentality, the first trait, is look upon women as mere objects and debilitated by the objectifier. Hosseini brings out this feature through Mariam in the following manner: “She was tired of being an instrument” (Hosseini, 28). Here, she also discusses how women are oppressed and treated as mere objects. Being a female, she is viewed to be a *harami*, a kind of curse by Nature itself. *Harami* in Arabic means sinful. Since childhood, she listens to her father calling her as a sinner, an illegitimate and a cursed child. Such harsh words linger around her ears continuously which in turn arouses in her a kind of internal conflict, self-doubt and psychological trauma and depression. Her illegitimate birth also leads to denial of social status and hence she suffers from inequality, suppression and discrimination. She seems to be unblinking and expressionless. The extreme depression and anxiety that she undergoes create a kind of stress and nervousness. This in turn brings a kind of emotional numbness. Thus, she becomes impassive, apathetic and shows lack of motivation towards what is happening around her own self. The impassiveness that she suffers from has been expressed in the following manner:

She understood then what Nana meant, that a *harami* was an unwanted thing; that she, Mariam was an illegitimate person who would never have legitimate claim to the things other people had, things such as love, family, home, acceptance. (Hosseini, 4)

Nussbaum discusses denial of autonomy as another objectification trait. It talks about the oppression and agony woman undergoes, when she is treated sans humanitarian attitude. It shows how women is denied of freedom, free will, independence, individualism and self-determination. Hosseini brings out this trait through Mariam, who at the age is fifteen, is married to a middle-aged man Rasheed which proves to be an excruciating experience to her. Being a psychopath, he is egocentric, lack of remorse or shame and does not show a kind of empathy towards women. His self-pride and reluctance, to learn from failure, punches Mariam to think in terms of him as cynical, narcissistic, callous, morally depraved and exhibits a manner of manipulation. He has a tendency to exploit his wife. His inability to differentiate between right and wrong proves him to be a sociopath. His dissimulation and aggressiveness towards his wife is expressed in the following manner: “But I’m a different breed of man, Mariam. Where I come from, one wrong look, one improper word, and blood is spilled” (Hosseini, 69).

When Hosseini talks about the nuptial relationship between Mariam and Rasheed, he has brought out how suspicion and misgiving that dwell in Rasheed prove to be despoliation. In fact, he is suffering from an oppositional defiant disorder. It is a condition whereby a person exhibits defiant, hostile, uncooperative, and annoying behaviour. Further, it is interesting to note that Rasheed has a suspicion that his wife Mariam is for a mutinous tie-up. This disrupts their everyday life including his relationship with family members. His lack of dissemination with his wife proves to be a hindrance to devise a solution to their predicaments. He also finds it difficult to claim a kind of reassurance from her as he feels it may be clingy. He does not, sad to note, possess conflict resolution skills. His superiority complex and uncooperative nature does not allow him to spend quality time with his wife. His skepticism regarding his wife’s trustworthiness is reflected in the following manner: “Suspicion and misgiving winked out of his eyes. He sat up straight and for a few brief moments he appeared merely thoughtful, like a ship captain informed of imminent mutiny taking his time to ponder his next move” (Hosseini, 336).

Nussbaum’s inertness, one more trait of objectification, highlights how woman remains passive and intimidated. Hosseini brings out this trait through Mariam who seems to be incapacitated and is always expected to be powerless, and remain under the control of her husband. Even her tutor teaches the qualities of inertness to her. Hosseini brings out the harmful effects of *Tahamul* (endurance) through Mullah Faizullah who is the *akhund* (tutor) to Mariam. He often advices her not to remonstrate against her parents and asks her to learn endure the pain and suffering. She compares her life with

snowflake that symbolises fragility in the following manner: “Each snowflake was a sigh heaved by an aggrieved woman somewhere in the world. ... As a reminder of how women like us suffer, she’d said how quietly we endure all that falls upon us” (Hosseini, 89).

Endurance is the strength, resilience or the ability of a person to tolerate adverse conditions like stress, fatigue and so on for a long period of time. Though Mariam faces inexplicable throbbing and excruciation at the hands of her parents, Mullah tries to convince her stating that it is inexorable. Thus, he intentionally or unintentionally seems to preach her the quality of endurance which in the long run may lead to myocardial fibrosis or atrial fibrillation. The truth of the said lines can be seen in the following manner: Only one skill. And it’s this: *tahamul*. Endure...it’s our lot in life, Mariam. Women like us. We endure. It’s all we have. Do you understand? Besides, they’ll laugh at you in school. They will. They’ll call you *harami*. They’ll say the most terrible things about you. (Hosseini, 18)

Nussbaum considers violability as anobjectification trait, whereby a person lacks integrity. Hosseini highlights this trait through Mariam’s mother, whose marriage with Jalal seems to be illegitimate. She feels repentant over her status in the society. She believes that Mariam’s birth as culpable and a crime that is worthy to be blamed. Her inability to share her suffering makes her helpless. She does not even have the freedom to lament aloud and so she frowns internally. She learns from her mother regarding the disgrace that she faced in the society and how she has been labelled as a pokeroot and weed that needs to be uprooted. She is viewed to be an allergic and addressed as a mugwort. Her pathetic situation in the society is articulated in the following manner: “I was a pokeroot. A mugwort. You too. And you weren’t even born yet” (Hosseini, 9).

Rasheed seems to be aggressive and abusive. Sexual behaviour or sexual act proves to be is a kind of violence, if it is forced upon a women or a child. Immanuel Kant in his *Lectures on Ethics* presents his opinion on objectification in the following manner: “Sexual love makes of the loved person and object of appetite: as soon as that appetite has been stilled, the person is cast aside as one cast away a lemon which has been sucked dry” (Kant, 163). Thus, sexual violence is another means of oppressing women in a patriarchal society. It is a crime committed deliberately with a goal of controlling and humiliating the victim. The aggressive behaviour of Rasheed has been observed in the following lines:

He was a man... his needs differed from hers... their coupling was still an exercise in tolerating pain. His appetite on the other hand, was fierce, sometimes bordering on a violent... the way he pinned her down ... Mariam knew that she could never talk to him... it was unmentionable. (Hosseini, 82)

Nussbaum’s objectification trait of denial of subjectivity brings out by Hosseini through Rasheed, who does not respect his wife’s feelings and emotions and treats her as a mere object. Simone de Beauvoir in her fiction

*The Second Sex* opines: “No one is more arrogant towards women, more aggressive or scornful, than a man who is anxious about his virility” (Beauvoir, 34). Rasheed has the tendency of finding fault his wife for blind reasons. His allegation mostly is unsubstantiated, groundless and tries to defame the character and reputation of his wife. Rasheed slanders Mariam on daily basis and he seems to suffer from confabulation, a kind of mental illness whereby a person possesses a kind of distorted, fabricated and misinterpreted memories regarding the self and the world. Confabulation is visible through certain characteristic features such as verbal statements or non-verbal gestures, an account of fantastic or semantic memory, actual experience inclusive of the present and the past. The person is not concerned about the errors that he has pointed out and is always ready to blame others. Hosseini brings out the accusing tendency predominant in Rasheed through in the following manner: “Like a compass needle that points north, a man’s accusing finger always finds a woman” (Hosseini, 7).

Thus, Rasheed is a nit-picker. Even he finds fault with even small or unimportant things. In Bible, fault finding is known as all flesh is of the dust. Whenever he criticises Mariam, it looks unreasonable and unfair. Without knowing that it may demoralise his wife and it seems he is deliberately looking for a mistake. This attitude of Rasheed is observed in the following manner: “Rasheed’s fault finding left her stricken in the kitchen with self-doubt” (Hosseini, 99).

Hosseini brings out the trait of ownership through Rasheed who prove to be decisive and has no concern or respect for others. He always has his emotions ramped up. His rattling character can be seen when he becomes irritable and explosive. To Mariam, anger management is a problem. She is sometimes feels shattered, when he comes out with emotional rage. She knows pretty well that he not only easily flares up, but also learn to use his anger to intimidate and manipulate Mariam into getting his way. His volatile and impulsive personality has been observed in the following words:

She lived in fear of his shifting moods, his volatile temperament, his insistence on steering even mundane exchanges down a confrontation path that, on occasion, he would resolve with punches, slaps, kicks, and sometimes try to make amends for with polluted apologies and sometimes not. (Hosseini, 97-98)

Nussbaum considers fungibility as a trait of objectification in which women are treated as mere objects or assert that is given in marriage to a man’s family. Nussbaum brings out how Rasheed treats her as a commodity, as insignificant and unimportant. He behaves as if she does not even exist and considers her as nothing, a philosophical term that generally denotes a state of non-existence. Nothingness may be associated with darkness, death, loneliness, lack of compassion, instability and emptiness. Mariam is simply alone, lonely and miserable where lack her true self in the empty and void. When one feels nothing, one may fall into the abyss and may be lost. Further,

with regard to marriage, cord is symbolic of the perpetual union of the bride and the groom. The expression cutting the cord describes necessary action to take when it is time to end a dependant relationship. Mariam takes back her power by cutting energy cords that had formed between herself, any person like her father, mother, husband or situation or thing that no longer serves her. Further, she realises that let her go call and cut all etheric cords that are no longer serving her purpose to her any cords attached that are not aligned with love and harmony which can be served, demolished and even destroyed. When someone wants to detach from negative energy one can cut cord. This has happened in the life of Mariam. “I cut the cord between us myself. That’s why I had a knife” (Hosseini, 11). Hosseini brings out this also through Mariam’s mother who easily resorts to cording. Thus, cording is the energetic result of an overwhelming situation, an effort to resolve some seemingly insurmountable situation.

Further, the childhood trauma that a person experiences has an impact throughout their lives. The emotional response that they undergo may be explosive or unpredictable. Mariam undergoes trauma since her childhood and this creates in her a kind of anxiety and depression. The United Nations Spotlight Initiative responds to all forms of violence against women and girl child and its objective is described in the following manner:

With a particular focus on domestic and family violence, sexual and gender-based violence and harmful practices, femicide, trafficking in human beings and sexual and economic (labour) exploitation. In line with the 2030 Agenda for Sustainable Development, the Initiative will fully integrate the principle of ‘leaving no one behind.

The crux of objectification has been brought out Hosseini through Rasheed who expects his wife to be submissive, pushing her to shrivel into a corner, hugging her knees, a pull of blood at her feet. With a supplicating voice, she solicits “It’s normal. Isn’t? Isn’t? isn’t it normal?” (Hosseini, 89). The Tricking mind of a women tells about her loss, grief and self-abasement. With a subjugating voice, she is expected to say to the patriarchal world ‘it is normal’. The idea of woman as destroyer is retained because it justifies man’s need to conquer and tame women as objects because the mechanistic model of patriarchy has been operated in the principles of control and power.

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**ANTHROPOCENTRISM TO BIOCENTRISM: AN  
ECOCRITICAL STUDY OF MAHASWETA DEVI'S *BITTER  
SOIL***

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**Abstract:**

Environmental decay due to unbridled development unleashed in the Postcolonial nations like India has resulted in ecological imbalance and many related issues. Ostensibly, the root cause of this eco-destruction is anthropocentrism, which in the wake of modernization and globalization has marginalized and oppressed the indigenous tribal communities. On the one hand capitalism results in rampant development leading to ecological deterioration. On the other hand the caste hierarchy exploits tribal communities in the Indian context. Taking a cue from the fallacious development, misogynistic capitalism and ecological deterioration, the present paper examines Mahasweta Devi's powerful and poignant short story collection *Bitter Soil* (1998) translated by Ipsita Chanda so as to investigate the catastrophic effects of environmental decadence on tribal, marginalization of tribal by the mainstream people and ecological imbalance through the theoretical underpinnings of Ecocriticism. Further, these short stories examine Devi's intent to initiate a shift from anthropocentric tendencies to biocentric, which regards 'biological egalitarianism' as its main tenet.

**Keywords:** environment, degradation, tribal, marginalization, development  
In Postcolonial nations like India industrialization and urbanization has caused environmental deterioration, which eventually affects the lives of the

indigenous tribal communities in manifold ways. As, developmental projects hijack tribal land for the construction of dams, mining projects and deforestation which in turn have dislocated them from their vicinities as well as catalyzes global warming, ozone layer depletion, air and water pollution as Swaranalatha Rangarajan (2014) aptly points that,

With factors like rapid growth, industrialization, and population boom, environmental conflicts have become more pronounced and revolve around competing claims. Sites of struggle range from forests, unethical mines, dam projects and displacement of tribals and agriculture-dependent poor people to land and resource depletion, pollution, decimation of biodiversity and species threat (p.527) Understandably, the exploitation of nature is the consequence of anthropocentric tendencies, which adheres to the superiority of humans over other beings and dominance of culture over nature. As J. Baird Callicott (1984) rightly professes that other than humans, all other beings are mere instruments,

An anthropocentric value theory (or axiology) by common consensus, centers intrinsic value on human beings and regards all other things, including other forms of life, as being only instrumentally valuable, i.e.; valuable only to the extent that they are means or instruments which may serve human beings. (p. 299)

The representation of nature and its plunder has been one of the recurring issues reflecting in the literary texts and discourses. Cheryll Glotfelty's (1996) pioneering theory, Ecocriticism holds immense significance in the context of 'earth-centered approach' to literary studies where Mahasweta Devi's *Bitter Soil* (1998) appears as a representative text.

Ecocriticism or "green" criticism as an interdisciplinary approach analyses the relationship of humans with the environment. Disseminating the urgency to rescue nature from the grip of the government and corporate's developmental projects is the agenda of this field of study.

Eco critics argue that the shift from anthropocentrism to biocentrism is the need of the contemporary times to break the myth of the dominance of human over other forms of life. rampant development, urbanization, modernization and neo-colonization are depleting the natural resources and degrading the natural environment. The changing ecological scenario in India and its consequences makes it obligatory for the Indian writers to address the issues related to environmental decadence in their texts. Indian women writers are primarily the environmental crusaders who have dealt with the ecological issues and their repercussions in their works aptly. Writers like Arundhati Roy, Mahasweta Devi, Sarah Joseph, Anuradha Roy, Anita Desai, Kiran Desai etc. have raised an alarm against the immeasurable eco-destruction in India and their catastrophic effects.

Mahasweta Devi, a social activist, an environmental crusader and a voice of the voiceless tribal closely examines the communion of tribal people

with nature in her various works and the impact of environmental deterioration upon them. She initiates to expose the corruptive government agencies and capitalists' cruel motives behind ecological degradation as she shares her agenda a writer and an activist where she highlights her intense concern for the marginalized tribal communities in an introduction to *Bitter Soil* (1998) "I have not written these stories to please my readers. If they get under the skin of these stories and feel as the writer feels that will be reward enough" (Devi, 1998, p.x). Therefore, it is imperative to closely investigate Mahasweta Devi's short story collection *Bitter Soil* (1998). The present paper is an attempt to delve into Devi's short story collection *Bitter Soil*(1998) translated by Ipsita Chanda to trace the ramifications of environment decay upon tribal communities, marginalization of tribal by the mainstream people and ecological imbalance through the theoretical underpinnings of ecocriticism. Further, these short stories examine the contrast between the livelihood and sustenance of mainstream upper castes and the tribal. Devi's *Bitter Soil*(1998) comprises of four short stories entitled 'Little Ones', 'Seeds', 'Witch' and 'Salt', which fairly deal with the issues of environmental injustice and its effects on environs. They all explicate the despair of the tribal caused by their displacement from their vicinities, exploitation of tribal women by capitalists, patriarchal consumerism interlinked with caste based hierarchies in the villages of Kuruda, Toru, Hesadi, Murhai, Lohri and Jhujhar. The inhabitants of these villages bear the enslavement of government policies and capitalists agendas. Constructions of dams, mining projects, deforestation and pollution of streams and rivers have impelled the plight of tribal people living in these villages.

The short story 'Little Ones' is set in Lohri (Ranchi), which traces the exploitation of Aghariya tribe, by the government agencies and moneylenders. The land here is infertile and is considered a desert, "The area is a burnt-desert. As if the earth here bears a fire of unbearable heat in her womb" (Devi, 1998, p.1). Devi compares the land of Lohri to the mother earth, which bears a fire in her womb. Aagariyas are primarily iron miners and believe that their three demons, Lohasur, Kilasur and Aagaiyasur reside in the hillock. They revolt to the government's project of mining of the iron ore in their vicinity and eventually vanish into the forests, as Devi says, "the Aagariyas of Kubha attacked and cut down everyone. Then they vanished into the jungle." (Devi, 1998, p.5). The development projects led by government has turned out retrogressive and for Agariyas, violence seems the only way of rescuing themselves, as Vandana Shiva (2010) aptly asserts,

Development could not but entail destruction for women, nature and subjugated cultures, which is why, throughout the Third World, women, peasants and tribal are struggling for liberation from 'development' just as they earlier struggled for liberation from colonization (p.2).

Therefore, malnourishment and starvation has made them pygmies

“continuously on the run, not being able to eat, most of us are dead now”(19). They are considered as ghost or inhumane by the mainstream people of the Lohri village, “people say it’s haunted by asur-bonga ghosts. Those little ones fleeing with the sacks were not like human children” (Devi, 1998, p.9). The title of the story ‘Little Ones’ symbolizes the dwarfness of Agariyas due to a lack of nutritional diet. The only source of water for them is from the hole left by the hill blast where the rainwater gets collected in the monsoon,

“after the rebellion of Kubha village, the hillock was blasted out of existence, a deep hole left in its place. Water collects there in the monsoon, lasts all year long. That’s where the water is from” (Devi,1998, p.13).

Agariayas exhibit their vengeance upon government by encircling relief officer, “Like crouching animals. Violence in their stance. As if they’ll spring any moment”(Devi,1998,p.19). Devi here compares them to mere animals. Agariyas manifest their revenge through violent measures as they aspire to make mainstream people acknowledge their existence, injustice done to them and their environment as they say, “we are not kids. we’re the Agariya tribe from the Kubha village...their penises rub against him, reminders that they are men, adult, Indian males” (Devi,1998, p.20). They have been bearing the parallel exploitation of their land and body, “Our bodies have shriveled and shrunk from lack of food. The men can only piss, they cant’ get get it up any more. Women cant’ bear children, so we steal relief” (Devi, 1998,p.20). Devi compares the infertile men and women with the infertile land, which can’t bear anything. The capitalists’ failure to take into account the plight of tribal communities stimulates their starvation and malnourishment which has led to their transformation into pygmies as Devi asserts,

Starvation over generations can reduce ordinary sized human beings to pygmies. Of course, the starving Agariyas are savagely angry at a system under which some people eat three meals a day while they are forced to starve! For I believe in anger, in justified violence, and so peel the mask off the face of the India which is projected by the Government, to expose its naked brutality, savagery, and caste and class exploitation; and place this India, a hydra headed monster, before a people’s court, the people being the oppressed millions. (Devi, 1998, p.ix)

The second short story “Seeds” exhibits the catastrophic scenario of Kuruda and Hesadi villages. The land here is “ uneven, arid, sun-baked. Grass doesn’t grow here even after the rains” (Devi, 1998, p.23). The story unveils the exploitation of tribal by the landowners who offers them barren land to cultivate as well as by not providing them enough wages. The tribal, Dulan Ganju is the protagonist of the short story who is an agricultural labourer exploited by the moneylender, Lachman Singh. All the moneylenders and landowners have their links with government, as Devi posits

“the government belongs to Lachman Singh, Daitari Singh, Hanuman

Misra. If such a garment is fleeced by someone who happens to be a Dulan Ganju, then the villagers are bound to be full of appreciation”(Devi, 1998, p.32).

Lachman gives infertile land to the tribal for his dual benefit. On the one hand he has presented himself as a compassionate and on the other hand gets rid of barren and infertile land, as Devi correctly delineates“ The gifting of land has many uses. Barren land can be get rid of. The recipients are bought over. One’s position with the sarkar becomes stronger”(Devi, 1998, p.27). Distribution of the barren land is the root cause of the wide gap between the tribal and the capitalists. Therefore, Dulan wittily makes his livelihood by eating seeds that government provides them. Moreover, he collects fertilizer from the government and sell it off, as Sanichari, Dulan’s daughter-in-law says to Dulan’s wife, “ He takes the money. Collects the fertilizer and sells it at Tohri itself. Hoists the sack of seeds onto his shoulder and brings it home”(Devi,1998,p.31). Vinay Kumar Srivastava(2006) aptly documents the plight of tribal who are defiled bythe capitalistic agencies,

“alas, their hopes were belied when development programmes, instead of ameliorating their condition, displaced them to barren lands, jeopardizing their life support-systems, and making them perpetually dependent upon the state for doles” (p. 49)

Lachamn Singh sets fire on the Dushad quarters as Karan Dushadinitaites the tribal people to revolt, “ Fires rage, people burn, huts collapse” (Devi, 1998, p.35). The tyranny of Lachman Singh is revealed through the words of Dulan when Lachman buries karan and Bulaki under his fields,

How easy! Two corpses on horseback! And those corpses must have been carried off arrogantly, from right under the TamadihDushad’s noses. Lachman knows there’s no need to hide them. Those who see won’t say anything. They have read the warning in Lachman’s sharp, silent gaze. He who opens his mouth will die. This has happened before. Will happen again. Once in a while, it is necessary to send the sky with the leaping flames and the screams of the dying, just to remind the harijans and untouchables that government laws, the appointment of officers and constitutional decrees are nothing (Devi, 1998, p.36-37).

Aloe and putush bushes blooms on the land under which Lachman buries Karan and Bulaki. Dulan asserts that Karan even after being killed by Lachman is alive again through the aloe and putush bushes, “ Karan and Bulaki are now those putush bushes and aloe plants! Tears strain his eyes.Karan, you haven’t dies even in death”(Devi, 1998, p.41). On holi festival, Dhatua, son of Dulan after getting intoxicated sings a song of depicting their plight, “wWhere has Karan gone? And Bulaki?Why is there no news of them? They are lost in the police files. Where is AsrafiHajam? And his brother Mohar?” (Devi, 1998, p. 44).

In order to retaliate the ruthless deeds of Lachman, Dulan uproots the aloe and putush bushes and sows seeds and claims Dulan is trying to make his son, Dhatua alive again as he says “Is it right for only wild, thorny underbush to grace their graves? So I sowed paddy, you see, shoot, burn, houses, kill people. You’ve harvested enough”(Devi, 1998,p.55). Dulan at the end of the story revenges on Lachman by burying him under the stones on the same land where he has buried Karan, Dhatua and Bulaki as he utters, “so, malik protector, you’re like the disgusting Oraon-Munda? Buried under stones? A stony grave?”(Devi, 1998,p.56). Devi states at the end of the short story that Dulan has used the bones and flesh as precious fertilizer to reap paddy as, “what an amazing joy there is in the ripe green paddy nourished on your flesh and bones! Because you will be seed. To be a seed is to stay alive... Dhatua I’ve turned you all into seed”(Devi, 1998,p.58).

The short story “Witch” depicts the annihilation proliferated in Hesadi and Murhaivillages as the ecological imbalance is thriving into these areas. Moreover, it presents the villages as a famine and drought struck regions. Devi’s short story highlights the victimization of tribal women whereas she traces how tribal women’s body has been captured by the patriarchal system. The people of Kuruda village consider *daini* (witch) as the source of their all-encompassing plight, “The *daini* was searching for a home at the time. Everything that happened along with the famine is due to the *daini*...cattle are dying; ravens are tilting off branches and whirling down, dead. All because of the *daini*”(Devi, 1998, p.60). The concept of *daini* is initiated by the pahaan Hanuman Misra of Tahar to overshadow the heinous deed of his son who has raped a tribal woman for his physical hunger, as Misraji says that has had a dream in which he sees a woman as a famine, “

A terrifying, naked woman uttered the words, ‘I am famine’, before floating away on a blood-soaked cloud. According to the panjika, she is a *daini*. This *daini* has to be found and driven away. If she is wounded, if she bleeds, or if she is burnt to death, a terrible calamity will be visited upon them (Devi, 1998,p.61)

The *daini* is in reality a human but Misraji’s son has impregnated her and leaves her in the forest labeling her as *adaini*. Starvation has made her eat feathers of birds and visualizing this villagers eventually judge her as a *daini*. The women of Hesadi and Murhai village bear exploitation meted out to them by men due to the suspicion of being a *daini*, “ All husbands-fathers-brothers-sons were compelled to keep watch upon the women” (Devi, 1998,p.63). Particularly pregnant and menstruating tribal women are suspected of being witches, “The kith and kin of menstruating and pregnant women marked their movements with suspicion. Black cows, goats and dogs were stoned for their colour” (Devi, 1998,p.90). Vandana Shiva and Maria Mies provide enough evidence to the above mentioned facts in their book *Ecofeminism* (2010) when they assert,

The capitalist patriarchal world system has led to the destructive tendencies that threaten life on earth. This system emerged, is built upon and maintains itself through the colonization of women, of “foreign” people and their lands; and of nature, which is gradually destroying (p.2).

Similarly, tribal land is also deteriorated, as it has been struck with famine, “Murhai village suffers from endemic hunger-starvation-famine-drought-bonded- labour- mahajan oppression etc” (Devi, 1998, p.71). And inhabitants of these villages blame the *daini* for their plight. But in reality it is the repercussion of the coal mining, which has degraded the land, as the impurities of the coal mining are intermixed with rivers and streams, “These people have no niche in man-made economic cycle. Brick kiln-colliery-Bakaro steel-timber industry-railroad-crops, fields- everything has made them redundant-” (Devi, 1998,p.117). Understandably, the disaster, which has struck the Hesadi and Murha village, is man-made.

The short story “Salt” is set in the backdrop of Jhujhar village in the lap of Palamau reserve Forest. The tribals residing here depend upon forests for their sustenance, “the villagers are allowed to graze cattle and goats in the forest, and pick sticks and twigs off the forest floor for firewood.” (Devi, 1998,p.126).

Uttamchand is the *bania* and moneylender of that village who outlaws the fundamental right of existence of the villagers by refusing to sell salt as he says “not by hand, or by bread, *nimak se marega*” (Devi, 1998, p.126). RajshreeTrivedi(2020) asserts that biological egalitarianism should be adhered to balance the ecological cycle,

“mutual co-existence and harmony are what the planet has offered unconditionally to all the species on the earth and the penalty for invading each other’s terrain or exploitation of resources is death which is the end of all agonies” (6).

The only road that connects the Jhujhar village to the rest of the world is a footpath. And treading on that a youth team comes to rescue tribals from the clutches of Uttamchand. Since PurtiMunda is one of vocal personality of the village the village elders decided to organize a puja at Haramdeo’s shrine and askshim to sell their two pet chickens to the forest guard and bring salt. The forest guard offers them a dark lumpy salt used by animals to lick, “It’s for the elephants and deer-what do they care about black or white? “ (Devi, 1998,p.132). Devi here tries to argue that the animals are better off than the tribal people. Purti despite of the elephant piss collects the salt-earth and return home. Ekoa, the banned elephant witnesses Purti and his fellows stealing salt-earth from the forest. So, he revenges on Purti by smashing him, “ When Purti turned around, it seemed to him as if the ancient Palamau fort itself was coming towards them” (Devi, 1998,p.145). The theft of salt-earth by Purti and fellows seems incomprehensible to the daroga as why would they steal salt

which is the cheapest commodity, “This matter of stealing salt-earth is so incomprehensible! A thing as cheap as salt!” (Devi, 1998,p.146). The above-mentioned incident throw light on the fact that it is inevitable to protect the ecology and even wild animals from the heinous motives and greed of humans.

Understandably, all the four short stories, ‘Little Ones’, ‘Seeds’, ‘Witch’ and ‘Salt’ have an undercurrent of ill humane treatment of natural resources that mother earth withholds in her womb. Greg Gaard(2004) claims that men when rape mother earth is actually plundering his environment for his greed, “ Gaia is well beyond our capacity to ‘destroy’- although we are making it horrible uncongenial for ourselves, our symbionts and other organisms we love” (p. 205). The short stories trace the ecological deterioration done by the flag bearer of development. All the short stories project the victims as tool for raising an alarm against the injustice done to their communities and their environment. The Aghariya tribes revolt against the mining of their hillocks, Dulan wreak vengeance upon Lachman Singh by burying him under the same land where he has buried his son and fellows. Moreover, he also initiates to grow plants onto that land to symbolize their existence. The witch in the short story “Witch” protests with the pelting of stones upon the villagers whenever they as she finds solace amidst nature when abandoned by the world. Perti and his fellows also tried to take an action against the moneylender by waging a revolt against him collectively with other tribal. Mahasweta Devi has intermingled her fictional word with some tints of historical facts, oral folklore of tribal, narratives and mythological facts. Devi with the portrayal of her such powerful short stories projects herself with moral and social responsibility to awake the ecological consciousness in her readers. Moreover, she has depicted her intent behind the select short story collection to necessitate the shift from anthropocentrism to biocentrism as it the need of the hour to maintain ecological balance.

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**DESIRE AS SEITY- ENLACING ACTION-BASED AND  
PLEASURE-BASED THEORIES IN ADAH IN *SECOND  
CLASS CITIZEN* AND RAKA IN *FIRE ON THE MOUNTAIN***

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**Abstract:** Desires are the ontologically independent of action, because they are non-trivial explainers of action. The desire theory clings to the fulfillment of desire that confers to one's happiness. Desiring is a state of mind that is commonly associated with a person, with the desire tends to act in certain ways, feeling and thinking in certain ways. In theories of desire, there are six types known as Action-Based, Pleasure-Based, Good-Based, Attention-Based, Learning-Based and Holistic-Based theories are researched. Based on these theories, Action-Based and Pleasure-Based theories are taken hold of and they are to be inquired after Adah in Buchi Emecheta's *Second Class Citizen* for Action-Based and Raka in *Fire on Mountain* by Anita Desai for Pleasure-Based theory.

**Keywords:** Dreams, education, desire, fire, domination, loneliness

Action theory considers issues such as motive, desire, purpose, deliberation, purpose, decision, intention and freewill. In Ludwig Wittgenstein's formulation, 'what is left over if I subtract the fact that my arm goes up from the fact that I raise my arm?' (Wittgenstein, 621). Action-Based theory

recognizes that action can be seen from three perspectives; social meaning, internal process, that is, the cognitive and emotions that guide and steer action; and the specific behavioral elements that actually comprise the external behavior, including language. Action are embedded in context, the person's engagement with circumstances with his/her own life and more specifically the joint actor's agentic engagement with circumstances of their life together prove to be crucial. Adah, in *Second Class Citizen* by Buchi Emecheta, is lauded by African culture. When she has a desire to go for schooling, it becomes greccue. When her inclination is viewed to be a sort of extrorse, her cognition and emotion propels her to go for schooling which she believes may bring an eleutherian existence.

Adah, being an African girl, this 'what-d'you-call it' is knocked backed. But, she has become 'jacelynn' to get her desire fulfilled through her actions. To her, African culture is donjon, and she finds it very difficult to disengage from it. For that, she has to call to arms her andragathia. Adah, a girl of subteen, hankering for going to school and to get her degree. Her culture forbids her to go to school, this desire is observed in the following lines, "The dream has by now assumed an image in her mind, it seemed to take life, to breath and to smile kindly at her" (Emecheta, 19). As a young child Adah, like any other child, likes to learn the skills of reading, writing, and the ability to think critically. Normally, school refusal usually goes along with disorders like separation, anxiety, depression or panic disorder. Cognitive behavioral therapy and exposure therapy are used to treat school refusal. But in the case of Adah, she has no such problems and as a normal child she is ready to have full of joy and laughter with other children and it is clear that only cultural belief proves to be a set back to her education. Some of the cultural customs, which deny her going are her early marriage, her denial of going to school, and this is observed by the writer in the following lines. "Adah's schooling would have been stopped, but somebody pointed out that the longer she stayed at school, the bigger the dowry her future husband would pay for her" (Emecheta, 17). African parents use certain phrases to convince their children, when they are reluctant to get married. They are a) You will grow up to love him, b) He will train you through school, c) He will take good care of you, d) The family needs money to survive. Adah knows pretty well that these phrases may never happen because she may be quickly put into enceinte to either frustrate or abandon her ambition and her dreams. In order to escape from monterious existence, she has applied for her admission to school without the knowledge of her parents. To her, leaning is not a plisky.

It is a matter of seriousness and desire. Her inclination of having proper schooling is reminded, when a comfed beneficiary from Zambia puts it 'if you are not educated, you are nothing'. Though Adah has inclination to have education, she is reminded of gender inequality, which comes as a sort of imbrication to her. It permeates all tears and level of living and learning. When patriarchal dominance is internalized in schools, it impedes African

girls to grow. This is observed when Adah has applied to school, “Immediately a group of three or four tough-looking boys came out from the back row and the biggest of them all swept” (Emecheta, 20). So it is clear, culture under the pretext of patriarchy callates Adah. It enlases her to have headway towards success in her life. Still, her tobbe proclivity extricates her from tychism. Fortunately, her lear at Methodist girls school takes her to a point where her desire has come true. This is observed by the writer about her success in the following manner.

She was very happy at the Methodist girl’s school...she was going to continue her education, she was going to go to Idadan University to read classics and she was going to teach at the end of it all. There was one thing she had not bargained for. To read for a degree, to read for the entrance examination, or even for more “A” levels, one needed a home. Not just any home where there would be trouble today and fights tomorrow, but a good, quite atmosphere where she could study in peace. (Emecheta, 23)

If Adah has Action-Based desire, Raka in *Fire on the Mountain* by Anita Desai may be intercalated her into Pleasure-Based young girl desire. Pleasure principle is the driving force which seeks immediate gratification of needs, wants, and urges. Galen strawson in his *Mental Reality* highlights two grounds in the following manner:

Galen Strawson defends a pleasure-based theory on two grounds: first, Strawson holds that being a desire *for* anything (or being a belief *about* anything or otherwise exhibiting intentionality) requires consciousness, and pleasure and displeasure are the states of consciousness most closely linked to desire. And second, Strawson holds that it is conceivable that there be creatures who would lack dispositions to act but who would have dispositions to feelings of pleasure and displeasure and that these creatures would seem to have desires for the things that would please them. (Strawson 1994).

Raka, who comes under second category of Strawson, is like young creature wants only one thing. She is to be left alone and pursue her own secret life as an eremitic, and is always guided by her instincts. She is viewed by the author ‘an impatient kernel, small, and explosive’. When her grandmother Nanda Kaul sees her for first time, she is benumbed by her appearance. This is observed in the following manner “One of those dark crickets, That leap up in fright but, Do not sing or a mosquito, Minute and fine, on thin Precarious legs” (Desai, 39). But, Nanda Kaul conceives that Raka has a mind of her own. She has a peculiar desire of reconnoitring ravine’s jackals prowl. Further, she goes on to unknown and mysterious expedition on her own and she broods over strange landscape silently and ignores the people around her. Raka visits carignano, and the unexpected arrival of Raka to this place comes in the way of desire to live like a recluse, far from the society. She does not want to involve herself in any responsibilities anymore. All she wants is to be alone, to have carignano to

herself. She wishes to entertain two: one is stillness and another one is quietude.

To Raka loneliness is not a pain. In fact, her transient loneliness is related to positive effects, including an increased focus on strength of relationship with her grandmother. Even Nanda, her grandmother, acknowledges this fact in the following manner, “Raka, you really are a great grand child of mine, aren’t you? You are more like me than any of my children or grandchildren. You are exactly like me Raka” (Desai, 64). Raka does not wish to go through any duty or obligation, like school discipline and obedience. She rejects everything and the very idea of disciplined life is odium. Nada herself wonders about her desires for rejection and loneliness. “At this total rejection, so natural, instinctive and effortless when compared with her own, planned and wilful rejection of the child.” (Desai, 17). To Raka, exploring ravine is a sort of benefit in terms of intellectual, social, emotional, and physical domains. The natural world of carignano is a sort of giant, open-ended learning laboratory to her. Nature provides too much for her to discover and interacting with natural environment. It also allows her to learn by doing and experimenting with ideas. In nature she thinks, questions and make hypothesis there by developing inquisitive mind. Raka, is a type of young creature, expresses her writ large desires openly. To conclude, desire provide any human being to share his/her dreams. They are expressed by the terms like wanting, wishing, longing or carving. Desire motivate a person with belief about which action to realize it Bernard William designed this desire approach and has brought out deliberating rationally. It is to deliberate one’s options. On the desire based view, if I can either go for a walk or bake a cake and after rational deliberation, I used to go for a walk, I thereby have a reason to go for a walk. Such is in the case of Raka, when she has to go in for a school or exploring nature, she has opted for exploring nature, which she has felt more conclusive for her to grow. Desire is very important to person’s well-being rather than perception or actuality. Thus, Adah and Raka have desire to attain their goals. Adah’s desire for schooling and Raka’s desire for roaming in ravines are nothing but their options or choices or preference among options. Being rational, though they are young, their preferences are consistent and allow themselves to determine the expected utility of the choices, or options given to them. The expected utility of action, in turn, is a kind of pleasure to them. If the utility is treated as pleasure, then decision theory is compatibility with any theory of desire, that hold pleasure to be the only thing desired. Both Adah and Raka have taken seriously choice worthiness and their desires hold as belief have brought to them a kind of solace.

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**ORGANIZATIONAL CULTURE AND MOTIVATIONAL  
EMPOWERMENT OF EMPLOYEES:  
CONCEPTUAL MODEL DEVELOPMENT**

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**Abstract:**

Employees are the most prized belongings for the organization and the existence of organizational culture has been proven to influence employees' career growth and the development of an organization. Motivational empowerment is influenced by the culture of the organization. Because it demonstrates the relationship between motivational factors and employee behavior. Employees are more fulfilled when they are given the framework to use their expertise to help the organization achieve its objectives.

A relationship-based approach and a value orientation are essential for those organizations whose core strength is human resources. Understanding the motivations and behaviors of organizations and employees who work within them is impossible without taking values into account. Organizational success depends on employees and their organizational selves being in balance.

Organizational Culture for Organizational Commitment when organizational values and goals align with their own, employees are happier, perform better, and are less likely to leave the company. The purpose of this research is to explain to the theoretical model the relationship between organizational culture and employee motivational empowerment with the necessary support of a positive organizational environment.

**Keywords:** Organizational Culture, organizational values, Motivational Empowerment

**Introduction:**

Employees coming from varied societal cultures have to accept one culture, which is organizational culture. Organizational culture can be defined as the glue that ties an organization together. Moreover, the improvement of an organization depends on how effectively and efficiently the employee perform. Employee behavior within an organization is defined as culture, as is the meaning that employees attach to those behaviors.

Barney (1986), defined "Organizational culture is defined as a complex mix of values, beliefs, assumptions, and symbols", and it determines the manner in which the organization performs its functions. Sinha (1990), defined "something that projects its employee's way of life and is a total of their heritage, tradition, and pattern of living."

Motivation is defined as a person's willingness to put effort into achieving organizational objectives. Furthermore, the word "motivation" comes from the word "move." It can be defined as an inner psychological state that initiates and guides an employee's behavior. It motivates us to take action. It exists within us at all times and is externalized through our activities.

Employee empowerment refers to a concept, attitude, or set of organizational and behavioral practises in which a corporation gives employees decision-making or approval authority (Pinchot, 2000). Empowerment refers to a collection of principles that empower self-managing teams and people to take control of their careers and futures (Pinchot, 2000).

Employee empowerment is among the most effective strategies for increasing the motivation of employees, their commitment to the organization, and their work satisfaction, and much research has gone into it. Empowerment encourages professional growth in terms of knowledge and skills, self-efficacy, and achievement, as well as lowers turnover among employees. The study to explain the relationship between organizational culture and motivational Empowerment of employees and their intention to quit carries relevance because job satisfaction is the basis for quality work.

- Organizational culture flows onto new employees through the procedure of socialization.
- Organizational culture determines the behavior at work.
- Organizational culture functions at different levels.

Organizational culture is an estimator of employees' effectiveness, efficiency, and work performance. The competing values framework differentiates organizational cultures in different organizations based on two significant factors: structure and focus. The structure ranges from flexibility to control. This aspect defines the difference between organizations based on either controlling the employee's actions in organizations or allowing flexibility to their workforce. The second factor, focus, is concerned with either an external or internal focus. An internal focus emphasizes internal factors such as

employee satisfaction, whereas an external focus emphasizes its relationship with the external environment. Based on these two dimensions, organizations can have various types of cultures such as the clan (promotes family orientation), adhocracy (opportunities towards creativity), the market (promotes competitiveness), and hierarchy culture (emphasizes on norms). Organizational culture facilitates proper communication and coordination gives a competitive advantage. Culture in terms of an organization refers to perception about an organization, its authority system, and the degree of employee involvement.. The preferred organizational cultures have been researched to differ across private and public organizations(Ramachandran, et al., 2011). The literature on culture types provides insight into achieving organizational goals by creating a strong culture (Ramachandran, et al 2011). Initiating, guiding, and maintaining goal-oriented behaviors is known as motivation. It is also the motivating factor behind human behavior. There are two types of motivation: intrinsic and extrinsic.

- 1- Extrinsic motivation is when a person is stirred by anything outside of himself, such as prizes, money, social recognition, or praise.
- 2- Intrinsic motivations arise inside the individual, and stimulation initiates adopting or varying behavior for personal satisfaction or fulfillment.

Thomas and Velthouse defined motivational Empowerment as increased intrinsic task motivation for fulfilling assigned tasks to the employees. They described four dimensions; competence, impact, meaningfulness, and choice. Spreitzer (1995) found that these components created a sense of empowerment discussed in various subjects such as psychology and management and is said to affect motivation, task performance, leadership, group processes, decision-making, and organizational design. The socio-structural perspective on empowerment views empowerment as being dependent on dimensions of the job, team design, and procedure and organizational policies (Maynard, et al. 2012). The motivational perspective is related to Bandura's work on self-efficacy and focuses on cognitive states. According to Zimmerman (1995), motivational Empowerment has three components:

- 1) There is an intrapersonal component, which involves cognitive evaluations.
- 2) An interaction component made up of crucial skills and knowledge
- 3) A behavioral component, which includes change-oriented, participative activities.

In an organization, employees with high motivational Empowerment are more confident in conceptual skills, abilities, assigned duties, and thinking abilities and have a more significant impact on organizational performance (Singh, 2019). Employee retention and job satisfaction have been researched to find that it is impacted by employee autonomy, Empowerment, organizational vision, leader's support, job security, and work environment. However, employee empowerment and retention have not been researched to the extent that employee empowerment and retention have been researched in the context

of a few business organizations. There is a dearth of literature on motivational Empowerment in organizations. This is why this research will bring to light new perspectives on motivational Empowerment in an organization and the main focus will be on the nature of motivation.

Asmawi and Mohan (2010), Organizational surroundings or climates can enable or inhibit employee empowerment. Various researchers have studied the empowerment of employees and suggested situations that have a vital role in the implementation of management and employee empowerment. A culture that encourages lightness and self-sufficiency with rewards for more participation is better suited to employee empowerment. Person – job fit framework explains the concept of organizational culture on motivational Empowerment. Various types of culture have various impacts on motivational Empowerment. Some researchers examined the culture at engineering colleges to determine its impact on the employees' intrinsic motivation (Sekar, P.C. and Narayanan, S.S.,2007). The study by Pradhan, Panda, and Jena(2017) has shown that Motivational Empowerment has a good impact on organizational commitment. As a result, researchers must focus more on different forms of organizational culture to determine the one that can boost the motivational Empowerment of the organization's overall management. Similarly, many researchers have observed the relationship between organizational learning and motivational Empowerment (Bohluli, 2004; Hashemi,2006). There is an information break regarding the relationships between organizational culture and motivational Empowerment, especially overall organizational performance. Therefore, this study is a theoretical-based model to define practical insights into the working culture in the organization.

This conceptual framework explains the inter-relate relationship among the variables. The relationship among the variables has been designed upon the sub-factor of organization culture, types of motivational empowerment, and the results of previous studies analysis of the relationship between culture, motivational Empowerment on employee retention.

Governance refers to the system that directs and controls organizations. It is concerned with the structure and processes used at the top of an organization for decision-making, accountability, control, and employee behaviour. Organizational strategies, forms, and practices are influenced by governance. The impact of governance on organizational forms and strategies, as well as interpersonal connections and organizational employee psychological states.

Culture can be attributed to reward systems, which are the processes by which incentives are distributed within an organization. The reward system conveys the standards and practices that employees should follow. On the other hand, it expresses the institutional response that employees can expect depending on their actions. Institutional Values, Institutional strategy, Institutional leadership, Governance and Reward are significant components of an organization's culture, and these values, strategy, leadership, governance and reward system are implicit determinants in maintaining and expressing

organizational cultural orientation at all levels. It is reflected in the overall quality process of the organization and becomes a determining factor in increasing employee retention. In an organization, organizational culture is valued.

Employee empowerment improves employee retention through intrinsic motivation, competency development, self-belief, perception of status, and work meaningfulness. These factors contributed to employee motivational empowerment. Organizational culture can be a powerful stimulus for Empowerment because it describes the link between culture factors and employee work behavior.

The integrated framework represents the interconnectedness of organizational culture and employee motivational empowerment that leads to employee retention.

**Conclusion:**

This paper describe the relationship between organizational culture and employee motivational Empowerment in various aspects . After a thorough review of the literature and research background, essential connected components of employee motivating Empowerment (**Intrinsic** motivation factor, Competency Development , Self-belief , Perception of status , Work meaningfulness )and factors for organizational culture (Institutional Values,**Institutional** strategy, Institutional leadership, Governance, Reward)are identified. Based on these primary dimensions a simple conceptual model has been provided. The relationship among the key independent and dependent variables, organizational culture and employee motivational empowerment, and the relationship between the dimensions of these independent and dependent variables, is clearly shown in this basic model. Motivated Employees are passionate about their jobs and play a significant role in the organization. When employees are willing to participate in organizational activities and enjoy their work, it is a positive indicator for empowering the organization. The relationships between organizational culture and employee motivational Empowerment is indispensable for any organization. This suggests that organizations support self-belief, perception of status, and provide intrinsic motivation to employees connected to the institutional values, strategies, governance, and reward systems that positively impact employee retention. Employee retention can be improved by constructive and effective organizational culture, which also provides a framework for the guidance of employees in an organization. Management is highly advised to create a supportive environment in every section of the organization to empower employees positively.

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**HOMO HOMINI LUPUS: SCANNING AND SCALING  
AGGRESSIONISM IN THE BIAFRAN WAR IN ADICHIE'S  
*HALF OF A YELLOW SUN***

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**Abstract**

The novel *Half of a Yellow Sun* set against the Nigerian Civil War is the second novel of Chimamanda Ngozi Adichie. The author captures the horrifying experiences of the Biafra war on its civilians. The novel is the winner of the 2007 Orange Broadband Prize for Fiction. The Biafra War which began on 6<sup>th</sup> July 1967 hinders the normal life of the people and also leads to mass killing. The premises are based on the philosophical theory Aggressionism and the Latin proverb *Homo Homini Lupus* meaning 'man is a wolf to a man'. The multiple conflicts in Nigeria led to aggressionism and the predatory instinct in man brought about the Nigerian Civil War. The author Adichie has thus captured violence, trauma, and sufferings in the novel that happened due to man's inhumanity. The paper explores the various sufferings

due to aggressionism faced by the five main characters Olanna, Kainene, Odenigbo, Ugwu and Richard during the war and its intensity which is felt even after three generations.

**Key Words:** Chimamanda Ngozi Adichie, Biafra War, Aggressionism, Homo Homini Lupus, predatory instinct.

Chimamanda Ngozi Adichie is a renowned Nigerian writer who grew popular globally through her novel *Purple Hibiscus*. Her second novel *Half of a Yellow Sun* gives a graphic representation of the Biafra War entwined with fiction. The novel unveils the horrendous effects of the Nigerian Civil War and the mass slaughtering of the Igbos in particular. This Genocide fiction demonstrates the political conflict and its implications that caused a huge catastrophe in Nigeria, where religion acted as a catalyst. This resulted in the Nigerian Civil War or the Biafra War that lasted for almost two and a half years and destroyed the lives of millions of civilians physically, mentally, and emotionally. Numerous families and relationships were wrecked in the course of the war and underwent humongous suffering and trauma.

Homo homini lupus est, is a Latin proverb meaning "A man is a wolf to another man," used by Plautus in his *Asinaria*. The proverb was later employed by Thomas Hobbes in his *De cive, Epistolae dicatoria*. A wolf is primarily intelligent, complex, cruel, aggressive, inhuman and predatory in nature. Human beings are compared to a wolves and situations relating to this are visible in the novel *Man Is Wolf to Man* is a popular memoir by Janusz Bardach once again the name is derived from the Latin proverb Homo Homini Lupus est that captured the events that took place during the World War II. The book voices out man's brutality to man. On the other hand, Aggressionism is a philosophical theory which claims that the only reason for war is human aggression, particularly wanting to attack members of one species.

While analysing the term aggressionism from a psycho analytical point of view, Freud claims that all homo sapiens from birth possess two basic drives that adds to personality development and behaviour: one Thanatos – the drive for aggression and the second one Eros- the drive for pleasure. Human beings were created basically to maintain peace and harmony in the world but Thanatos or destructive energy develops aggression towards one another. The nature of fighting in human beings is universal and this nature of fighting has been spoken widely in history. Then the question of peace is still debated largely because when there is a war then peace has to exist. When one fights it is natural to turn aggressive either against another or a group.

Taking all this into account the paper examines the genesis of the Biafran War that was fuelled by the aggressive behaviour of the

Nigerians and ethno-religious conflict. The paper applies horizontal analysis viz *Homo Homini Lupus* meaning “A man is a wolf to another man,” and the intensity of aggressionism that triggered the Biafran War. The paper along with aggressionism focuses on the cruelty and inhuman acts performed during the war.

The novel *Half of a Yellow Sun* written by Chimamanda Ngozi Adichie is set during the Nigerian Civil War. The war was fought between the Government of Nigeria and the secessionist state of Biafra (1966). Although Nigeria gained independence from the British, they were still under their influence which was detested by the Northern Nigerians. North Nigeria and South-East Nigeria clashed in their ideals which led to political, economic, religion and cultural strife. The tension created by the ethnic groups gave birth to Nigerian Civil War or the Biafra War that resulted in millions dying on both sides. War is an expression of the aggression instinct. It is unavoidable because humans have an inborn need to satisfy their aggressive urges. Peace is an aberration, a temporary period between wars. War has always been, and hence it will always be, with us (Adichie, 11). The Nigerian Civil War was of ethnic, cultural, political and religious conflict. South-East Nigeria, occupied majorly by the Igbos were comfortable in their new self and did not want to go back to their roots while Northern Nigeria wanted to undo westernization. There were also some traditional Igbos who still practice traditional Igbo culture and rituals.

Both the regions had multiple reasons for the war and it was complex in nature. Thus, both the regions stood at cross roads and men sought to resolve the problem through war. The novel captures the beastly nature of human beings wanting to hunt down each other inhumanly. Adichie through the eyes of Olanna, Odenigbo, Kainene and Ugwu draws the reader's attention to the 'wolf instinct' in human beings which was unleashed during the Nigerian Civil War. The author herself is an Igbo who revisits the Biafran War through the experiences of her grandparents and parents.

The root word of Aggressionism is aggression. According to Berkowitz (1993), aggression refers to goal-directed motor behaviour that has a deliberate intent to harm or injure another object or person (Berkowitz, 8). The Northern region held on to its ideal of cleansing the colonial residue which led them to slaughter the South Easterners who refused to give in to them. Similarly, a wolf fights for its territory and human beings too fight for territories to mark and maintain their identities. The Igbos were forced to retaliate to protect their land, family, children etc. Therefore, in protecting and defending their territories both the regions in Nigeria began to fight.

The novel shifts in time gradually revealing the tension between the two regions the North and the South through the character Odenigbo. He is a professor of Mathematics at Nsukka University who educates the house boy Ugwu about the rift happening between North and the South Nigeria which gives the readers a glimpse of the commencement of the Nigerian Civil War.

The author encapsulates the aggressive behaviour of man from the beginning to the end of the novel where each region combats cruelly massacring each other. Olanna witnesses the beastly killing at Kano where she finds her uncle Mbaezi, Auntie Ifeka and pregnant Arize slaughtered mercilessly. The author maps the aggression involved in killing Arize who is gang raped and her belly is cut open and hunted down by religious fanatics. The beastly act haunts Olanna throughout the novel and she is unable to forget the gory incident. She stopped when she saw the bodies. Uncle Mbaezi lay facedown in an ungainly twist, legs splayed. Something creamy-white oozed through the large gash on the back of his head. Auntie Ifeka lay on the veranda. The cuts on her naked body were smaller, dotting her arms and legs like slightly parted red lips. (Adichie, 147)

Millions of civilians are inexorably slaughtered in the Biafran War and many remained homeless as the soldiers burnt down their houses. Women undergo sexual harassment and bodily torture where women are raped and killed. Aerial Bombardments and Olanna's frightening experience on the train turns into a nightmare as she has witnessed many wounded Igbos terrified and shocked. They sit down soaked in blood and urine amidst the putrid smell in the air. Olanna watches the traumatising scene in silence and shock only later to witness a severed child's head dripping with blood in a calabash. The scene marks the beginning of the Nigerian Civil War and Olanna's panic. The violence against the Igbos is undoubtedly a genocide. The dark incident makes Olanna undergo a temporary paralysis and an episode of 'Dark Swoops'.

Everyday around 3000 to 5000 people were killed during the Nigerian Civil War. Adichie captures the rawness of the horrifying killing in the airport which is witnessed by Richard, a white journalist. He is shocked by the way they are blown up with guns splattering blood leaving the chests ridden by bullets. The inhuman act exercised on the innocent civilians is heart breaking to read. Similarly, the cruelty of war is elucidated in Chinelo Okparanta's novel *Under the Udala Tree* where the author states that "Of one Mr. Njoku, an Igbo man who was tied up with a rope, doused with petrol and then set on fire" (Okparanta, 14).

The iconography of inhuman act during the Biafran War evokes terrible pain and trauma in the readers. The aggressive act of blocking food supplies and stealing food turns everyone into a zombie which is an act of inhumane savagery. Many are killed due to starvation and especially children die of malnutrition Kwashiorkor. Kainene tries to feed the Biafran babies with protein tablets but she runs out of stock and is deeply saddened that she will not be able to save the children. The Refugee camps functioned rarely and mostly the supplies are ransacked by the vandals or by the Biafran soldiers themselves. The predatory instinct in human often surfaced which is evident when Olanna's meat tin can is snatched away by four soldiers. Olanna is unable to fight with soldiers as she has no physical and mental strength. She is frustrated that she is unable to fight and returns home empty handed. The men

pulling out food is a mere act of survival yet it reflects the predatory instinct in human beings. The soldiers' forces Ugwu participates in a gang rape which he regrets later in the novel.

Jo Groebel, Robert A. Hinde claims that 'Violence is the result of the aggressive drive' (Groebel, Hinde, 11). Violence involved in killing each other has no boundary which is visible during the aerial bombardment that wiped away thousands of people from the land. People constantly live in panic and uncertainty as they are not sure of when the air raids would happen. Kainene while fleeing from Port Harcourt witnesses her house boy Ikejide's body running headless after a piece of shrapnel cut off his head the incident leaves her shell shocked. Adichie's narration of the horrifying incidents through her characters voice out the intensity of aggressive behaviour that inhumanly took away the lives of the innocents. During Olanna and Odenigbo's wedding an air raid happens which leaves Ugwu with deep anguish as he witnesses a half burnt naked woman's body. The novel collectively speaks about the predatory instinct in human beings wanting to constantly kill each other. Ugwu recalls "A car was on fire; the body of a woman lay next to it, her clothes burnt off, flecks of pink all over her blackened skin, and when somebody covered it with a torn jute sack, Ugwu could still see the stiff, charcoal-black legs" (Adichie, 203).

Glassman claims that human aggression is an instinctive drive, one that springs from the person rather than the situation, and is therefore an unavoidable part of human life (Glassman, 2004). The saga of aggressiveness seems to run throughout the narration of the novel. The harrowing experience is portrayed through four characters belonging to different backgrounds. From Ugwu's narrations one gets a glimpse of the ghastly impact of being a soldier in the war. He is left perplexed by the harsh treatment that he experiences in the hands of his fellow soldiers "The skinny soldiers—with no boots, no uniforms, no half of a yellow sun on their sleeves—kicked and slapped and mocked Ugwu during physical training" (Adichie, 359). Ugwu is also forced by his fellow soldiers to indulge in a gang rape which he regrets immediately and feels ashamed of his behaviour.

He recalls how soldiers abducted children to work on the yam fields and when the children returned, they had huge cuts on their palms. Olanna is always cautious of her baby and her household boy Ugwu as she feared that they might be kidnapped. Soldiers exhibit their aggressiveness in the market place which is usually packed with women and children and they butchered them hard – heartedly.

Even after the war has ended the aggressive nature of the soldiers did not subside. When Odenigbo's family is returning to Nsukka they are stopped by the soldiers. The soldiers act barbaric they slap Odenigbo so hard on his face that he falls on the car and it so violent and unexpected. Likewise, a fragile man comes driving his car behind them is also stopped and is made to lie on the burning coal tar road and is flogged. "Lie down," the officer said.

The man lay down on the coal tar. The officer took a long cane and began to flog the man across his back and buttocks, ta-wai, ta-wai, ta-wai, and the man cried out something...” (Adichie, 417)

To conclude Aggressionism and the Latin proverb *Homo Homini Lupus* has been used to examine the effects of the Nigerian Civil War on the civilians. The novel vividly captures the predatory instincts that tears down one another in the cruellest way inflicting pain and suffering on each other. Human beings have become the victim to political aggressiveness and thus undergo traumatic experiences due to inhumaneness. The war has not been easy it has killed people in large on both sides thus the disaster has come to live in history books. Bloodshed, shelling, famine, blockades, Sexual harassment, Kwashiorkor tampered peoples’ living. This paper has tried to explore human beings’ aggressive behaviour and its implications in the Nigerian Civil War. In a similar way man becomes a wolf to another or to put it in a simpler way the predatory instinct is left untamed at times which results in inhumane acts, massacres and blood bath. Adichie in her discourse has thus highlighted the aggressive behaviour of human beings which results in unwarranted genocide.

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**EXPLORING DALIT REPRESENTATION IN IMAYAM'S *BEASTS OF BURDEN AND ARUMUGAM***

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**Abstract:**

Dalit Literature is the literature of the oppressed people, telling about their pains, agonies, disappointments, defeats, humiliations, oppressions, and depressions. It also speaks about their vibrant culture, dreams, and values. Convictions and their struggle for the annihilation of caste was carried out in order to build a casteless society. Like all writers, Dalit writers too have a cause and an agenda for their writing. This is because a Dalit writer faces more difficulties than writers belonging to the other castes, owing to their subaltern position with society, and especially, Dalit women confront more troubles than their male counterparts. Imayam is a prominent Indian novelist in Tamil, who has received several awards for his writings. The characters in *Beast of Burden* and *Arumugam* speak of their condition, sufferings, and struggles and the pain they undergo comes out through their speech. The present paper is an attempt to examine how dalits are represented in the society and the identity crisis faced by the Dalit people in the Tamil society as reflected in the works of Imayam, as he is using not his language but the language of his characters.

**Keywords:** Subalternity, marginalization, objectification, caste structure, subjugation.

Literature is a camera that captures not just moments but also emotions. It reveals the reality in its true colours, immersing people in nostalgic

occurrences and also mocks at the repercussive episodes. Dalit literature reverberates the melancholy of the marginalized, echoes the cries of oppressed women, demonstrates the plight of the destitute, marks the identity crisis of the anonymous people and records the revolution of the rebels. Significantly, the inceptions of Dalit's works should be pulled in the battle for social and financial change. This clarifies all parts of profound thought in Dalit's books. The Dalit writing is firmly identified with the expectation of the freedom for a bunch of individuals since they are not the casualties of social and financial disparities.

Caste ideology operates at a deeper level and the dynamics of caste and Dalit issues are closely linked with our ideas of identity and self. All Dalit writers in India wish that the people in India should show empathy with the pain of a Dalit. But to experience the pain of a Dalit what is needed is to unlearn the typical and usual response that we give to the lived experiences of a Dalit. And unlearning anything is the most difficult thing, especially when a society has to unlearn something. Iyamam, a major Tamil Dalit writer, suggests how Dalit women are forced to be used as commodities in order to hold off poverty and help themselves and their dependents to survive, in most of his novels. Ignorance, sexual harassments, poverty, anger towards rites and rituals, injustice and slavery are the main themes of Dalit Literature. These themes were also focused on Iyamam's novels. The explanations behind the utilizing realities are evidenced that, Dalit writers can uncover human suffering on the planet through their writings. The works crafted by Iyamam shows this point well.

Iyamam's novels *Koveru Kazhudhaigal (Beasts of Burden)* and *Arumugam* foregrounded the dominance of a particular Dalit communities often resulting in a duplication of the hegemonic caste structures of Hindu society among dalits and how this has percolated even among Dalits who have converted to Christianity. Iyamam's novels received hostile criticism on account of their critique of Parayar's dominance over Dalit communities who stand further way below in the caste ladder.

The novel *Beasts of Burden* is considered as one of the classic of modern Tamil literature especially in Dalit writing. The first and foremost striking feature of this novel is the portrayal of delicate caste structure among Dalits. Both the novels *Beasts of Burden* and *Arumugam* have one common feature that is sexual harassment to women by the upper caste. Iyamam's *Beasts of Burden* (1994) portrays Dalit communities, their lives, their culture and their legislative issues. In this novel, Iyamam depicts the predicament of lower-caste people who fall into double subjugation in the society. Iyamam criticizes the lower caste people who become counterfeit and battle against the individuals who are viewed as subordinates among Dalits.

The title *Koveru Kazhudhaigal* means 'mules', which have been utilized by the washer men to wash garments. It ironically refers to the washer men community and their predicament. This story is about the Poothurai

Vannaar Catholic family, who works among farming labourers in the Dalit province. The mules have the responsibility of carrying, which is a beast of burden. The story also depicts the economic changes occurring in the progress of the novel and developments taking place in the village, which are seen throughout the perspectives of the protagonist, Arokkyam. This story accentuates the monetary change achieved by the continuation of the novel and the advancement of the seventeenth town, just as a significant indication of the sufferings of washer men's community and the exploitation they meet within their own community.

Representation of Dalit women is an integral aspect of Tamil Dalit Literature in terms of space and voice granted to Dalit women characters. Dalit women characters are portrayed as lively, vibrant, earthy, witty and hard-working women who have inner strength to face crisis and work tirelessly at home and outside. Their songs, dances, community cooking at weddings bring out their innate talent. Imayam's *Beasts of Burden* carries within itself the grief and pain of the Dalits. Imayam has beautifully captured the ringing poignancy, the trials and tribulations of a washer woman, Arokkyam, who is trapped between the dilemmas of changing times. The vannaathi woman, Arokkyam, washes the clothes and serves the colony where the Dalits live. The novel discloses the intra-Dalit strife and the sorrows of the lowest of the low-born. Arokkyam's dilemma within changing systems of belief about the self and society captures the reader's interest. The voice of scriptural and patriarchal authority speaks through the mother character in the novel *Beast of Burden*. The mother character Arokkyam laments about their life in the society. The mother here is simply the medium of articulation minus subjective agency. She frames her identity and existence within this voice of scriptural and social authority.

The story revolves around the life of Arokkyam, depicting her sufferings and pains that are caused when her son Joseph moves away with his wife Sahayam. Her grief intensifies when her daughter, Mary, is seduced by Chadayan, the Kothukkaaran. As her first son Joseph is away from her, she doesn't want her second son to depart from her. Hence, she denies her second son Peter from becoming a priest. But then Peter elopes, bringing her more pain. The grief thickens by the death of Mary's husband, Diraviyaraj. When everyone is fortunate to frame his or her life to live independently, the Dalit's alone are so unfortunate that they gift their life with great devotion and diligence, unaware of the fact that surrendering oneself is slavery. This dependence on other people has paved the way for the Dalits to survive in a home without happiness and in a society without safety and security.

The Dalit people constitute a large segment of the population, and they have been forced to mobilize themselves in order to fight for their rights and justice in postcolonial India. Dalit human rights emerge in a national context but, they write about their own life explicitly referring to the atrocities that were committed on them in India; it also develops a notion of the human

subject that can be serviceable within multiple contexts of suffering. Indeed, the narrative tradition of recognizing the outcast human in India offers strong parallels with other such humans the world over. In its representation of suffering humans, Dalit writing generates abject type for possible appropriation by a global literary field for human rights. They invoke objectification - deliberately echoing objectification to signal social processes of economic and political oppression – modes of atrocity and injustice but also the representational process.

The next novel *Arumugam* (1999) is a tale of emotional bond between a mother and son woven together with strings of love, thrown from a secure, loving home into the cruel world, Arumugam learns that his perceptions of life are as unreal as wisps of smoke and finally he understands the reality of life. Iyayam in his novel *Arumugam* presents the people who are living around Pondicherry Auroville and their sufferings. It is in the recognition of the Dalit and the other that is the bearing witness to another Dalit that the protagonists of the Dalit narrative discover their own humanity. The primary witness proposes a programme for the community, nation, or even humanity. This is the ethics of primary witnessing to the survivors duty to remember. Iyayam writes in a formal style reporting the happenings and incidents with a complete lack of inhibition as he uses the colloquial conversational styles of the protagonists both in their reference to their work and in their exchange of banter between themselves.

In the novel *Arumugam*, the writer brings out different aspects through the conversion character. He explains that life is not same for all individuals in a society especially for Dalit the relationship between them and the upper class people, their way of life with the rules and regulations of Auroville, the ethics, the morals, the conventions, the beliefs, and traditions of life in the society. The characters, who are confined to a limited way of leading their life are not great thinkers or rebels but people who belong to the lower class. Iyayam criticizes the Indian dominant narrative forms and their language by exposing the duplicity of dominant discourses within the society generating a different history. Through their writings, the dalit writers reflect the narrative recovery of emotional life, pointing out the fault lines, conflicts, and repression within dominant historical narratives. Iyayam's narratives in the same way reveal that, even decades after political independence, social justice is still a dream for the Dalit.

Iyayam offers multiple voices within the ravings of the abused woman in order to foreground the Dalit condition in the novel *Arumugam*. *Arumugam*'s anguished voice narrating his trouble is the personal one. The reference to their local god, who will, he believes, avenge his humiliation, is the mythic voice. The historical voice is subsumed into these two when *Arumugam* expresses the poor Dalit's inability to be recognized as humans with dignity in the society. Their voices and the three contexts thus set out are, the personal, the historical-social and mythical.

In the novels *Beasts of Burden* and *Arumugam*, the writer takes different parts of evolving the character. He clarified that the existences are unique, their relationship with the class, their lifestyle and the standards of Auroville, moral gatherings, convictions and public customs particularly in Dalit. Individuals whose lives are confined are not extraordinary people or blasphemers, but rather detestable individuals. Iyamam censures the Indian story structure and language by uncovering the redundancy of acclaimed discourses in social orders that have made various chronicles. Dalit essayists exhibited the change of passionate life through their works and found some unacceptable lines, clashes and persecution in societal issues.

Dalit writing becomes an all – India phenomenon. Thus Dalit writing reformulates the caste question and reassesses the significance of colonialism and of missionary activity. It resists the reduction of caste to class or to non Brahminism and vividly describes and analyses the contemporary workings of caste power. So, Tamil Dalit Literature studies have to chart out its critical course of intervention as a tool to aid Tamil Dalit writer's agenda of working towards Dalit liberation or empowerment through writing.

Thus Iyamam's novels narrate the tales of the oppressed Dalit people. When the voice of the writers and their characters reaches the desired and required distance and readership, their voice will definitely be heard. The resistance that will follow may bring along with it the desired effect. Removing each and every stumbling block stands as a barrier in the way of attaining equality and dignity though a great task has already been started. Each and every attempt made by writers towards attaining that goal will become a beacon of light showing others the path and a milestone in their journey.

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**INTERPLAY OF NOSTALGIA AND ALIENATION IN  
CHITRA BANERJEE DIVAKARUNI'S *SISTER OF MY  
HEART AND THE VINE OF DESIRE***

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**Abstract:**

In the midst of all diasporic feelings lies the 'home' concept. The entire fulcrum of diaspora revolves over the axis such as conception, loss and re-possession. The diasporas, very often lose their identity as they are impelled to lead a life of 'in-between' condition. They are between a devil and a deep sea in their efforts in surmounting cultural issues and negotiating identities. What disturbs their lives is the tussle between rootedness and up rootedness. Hence, diaspora is connected to the concept of 'home', nostalgia, space, identity, hybridity, transculturalism, migration and transnationalism.

This article focuses on Chitra Banerjee Divakaruni's novels *Sister of My Heart* and its sequel *The Vine of Desire* from nostalgic perspective. An attempt is made to trace the influences made by Divakaruni's experiences in her writing and the manner in which she has portrayed cultural crisis in her works. The life journey of the cousin sisters Anju and Sudha is studied apart from the problems experienced by immigrant population which is torn between two kinds of living: one from the East and other from the West.

**Key Words: Immigrants, Home, Nostalgia, Diaspora**

Right from the days of colonization, India has been experiencing a sort of cultural crisis. As it was a colony of the British for two centuries, it reeled under tremendous western influence in administration. Further, the British imposed their language which brought along with it a huge cultural baggage.

Due to this trend, the nation experienced a decline in its traditional cultural practices. It made several writers and activists to express their concern about it. Before India became a colony of British, it had been following several cultures and religious practices. But during colonial days, the public felt their culture to be much inferior to the one followed in European countries. They discarded their traditional culture and adopted the alien one so as to project themselves as civilized individuals. This adoption of foreign culture created a crisis for the native culture. Homi Bhaba opined in this context that, “ the political moment of cultural difference emerges within the problem of colonial government mentality and eclipses the transparency between legibility and legitimate rule” ( Homi K. Bhaba 134). He opined further in the work named *The Location of Culture* thus:

“Yacabo! Yacabo! It is finished... finished’: these words stand out not for the platitudinous place of cultural diversity, but at the point of culture’s fading’. They display the alienation between the transformational myths of culture as language of universality and social generalization , and its tropic function as a repeated ‘ translation’ of incommensurable levels of living and meaning.” ( Homi K Bhaba 178)

The advent of globalization and its concomitant socio-economic practices have forced India to face yet another cultural crisis. These are issues pertaining to politics, economy, history, media and education. Among them, culture and immigration are right at the top. At present, the public in India are obsessed with capitalist formations that include individualism, consumerism and free market economy. The individuals are overly ambitious and they are into a rat race trying to fulfill their materialistic needs so as to lead a sophisticated life. This middleclass mind set has forced them to embrace an alien material culture at the expense of our spiritual traditional one. Cultural materialism has been the main focus of writers of the 20<sup>th</sup> and 21<sup>st</sup> centuries. They bring to limelight the political and cultural history of a particular period. Also, they delve into the decay of traditional culture and the space it enjoyed in their works.

Chitra Banerjee Divakaruni is a novelist who focuses on our cultural values and the lasting impacts of western culture. There are several other writers like her who focus on the same themes with marginal difference in their approaches. Since she is an immigrant, her works concentrate on the cultural crisis experienced by Indian immigrants. All her writings compare and contrast the life style of second generation settlers with the first generation migrants. It has to be understood that the second generation migrants were born and raised in an alien land and the characters in her novels are caught between the traditional values of their home country and the culture of the host nation. In fact, the second generation immigrants have a desire to follow their own culture as they have little or no desire to perpetuate the culture of their forefathers. When they discover parental imposition of native culture and denial of liberty to follow their own culture, they find themselves a confused

lot caught between two extremes namely: Indian ethos and Western culture. Divakaruni places her characters in such a situation and ventilates her feelings about her nation and culture through her writings. Bill Ashcroft expresses about her writing as follows: “the diasporic production of cultural meanings occurs in many years, such as contemporary music, film and dance, but writing is one of the most interesting and strategic ways in which Diaspora might disrupt the binary of local and global and problematize national, racial and ethnic formulation of identity” (*The Empire Writes Back* 218).

It is germane to find a definition for the word ‘culture’ here as it has many social connotations. Raymond Williams rightly opines it as one of the two or three most complicated words in English language. Andrew Milner says, “after all most of the work I was doing was in an area which people called culture’, even in the narrower sense, so that the term had a certain obviousness. But, you know the number of times I’ve wished that I had never heard of that damn word” (*Cultural Materialism* 3). Both the critics took efforts to study the cultural history and came out with different ideas. Andrew Milner defines culture as something that “runs between a generality and a particular general public sphere and a singular subculture” (Milner 4). In the words of Raymond Williams “. . . it ran between two generalities, the arts and the whole way of life” (Milner 4). In short, whenever individuals move out of their home culture, they find themselves caught between pulls and pressures of the competing cultures. It is a dilemma faced by diasporic communities in all parts of the globe.

This paper attempts to trace the influences made by Divakaruni’s experiences in her writing and the manner in which she has portrayed cultural crisis in her works. For carrying out this study, it is imperative to have a deeper understanding of Indian diaspora. It is understood that there are 1.7 million people from south Asia living in the USA. The census carried out in USA in 2010 states that the Asian American population is expected to reach 8.6 million in July 2050. From the census report, it is evident that it has been one of the rapidly growing communities in the USA.

The voyages of discovery during the end of the 15<sup>th</sup> century and throughout the 16<sup>th</sup> century accelerated geographical mobility of people worldwide. The first wave of migration started to European colonies because of mercantile economy, religious persecution and large scale unemployment back home in the 17<sup>th</sup> and the 18<sup>th</sup> centuries. The second wave of migration included slaves, refugees, exiles and indentured labourers in the 18<sup>th</sup> and the 19<sup>th</sup> centuries. The end of two World Wars and the independence of colonies spurred the third wave with many intellectuals, chiefly those who went as students, making the nations of their former colonizers as their own homes. This produced brain drain and robbed the former colonies of their intellectual wealth. The fourth wave of migration took place during the last decade of the 20<sup>th</sup> century because of globalization of trade and commerce and revolution in information and communication technology. This dislocation from their native

places is both mandatory and voluntary. Critics such as Gareth Griffiths, Bill Ashcroft and Helen Tiffin define diaspora as, “. . . the voluntary or forcible movement of the people from their homelands into new regions” (*The Empires Writes Back* 68). As a matter of fact, living in a foreign land is not living in actual sense, but it is only a mere existence trying to get assimilated with newer relations.

People who have migrated to foreign land always have this strong nostalgia for their homeland and its culture and traditions that were once integral to their daily life. This particular quality of longing for a way of life that is no more there has paved way for diasporic writing. The cultural alienation that they undergo in their uprooted state because of their racial, religious and linguistic differences has a telling effect on their everyday life. Any diasporic writing can be examined through these two distinctive frameworks. Chitra Banerjee Divakaruni belongs to the group of diasporic writers and in her novels she gives a telling account of the miseries of the immigrants and the hostile atmosphere they face through her protagonists. Her focus has become more intense on women immigrants the moment she left India. From there on, she started writing about the status of Indian women who live abroad. Chitra Banerjee Divakaruni is very much aware of the Indian cultural legacy and she gloats about the fact that she has inherited the customs of the most consistent human advancement. She is very smart in maintaining her cultural heritage. Though the present crop of Indian diasporic writers have been viewed as transcultural, transnational writers and are treated as novelists of both the countries, her desire to give a verbal expression about her diasporic identity has been clear.

Chitra Banerjee Divakaruni's novels are mostly set in the USA and they focus on day today life of Indian immigrants. In the novel *Sister of My Heart*, there are two women who share their challenges in life with each other and help each other in solving them. This helping tendency between them becomes a stumbling block in the married life of them. The novel delves into the life of Anju and Sudha, who are cousins. The entire novel is narrated in their own voices revealing their childhood, adolescence and early adulthood. Although the early part of the novel is set in the USA, subsequently the novel revolves around India and talks about the pressure felt by mothers who value Indian culture and the sisters who adapt to western culture. The novelist very diligently develops the characters' life in both the countries and makes minute changes in the plot exhibiting the values of human relationships in India. The narrative style enables an individual to understand the diasporic realities of locations as well as the attachment the novelist has towards her motherland. While studying the reason behind her choice of the subject matter, it is very well understood that she has been making attempt to educate and reconstruct the Indian society by helping individuals acquire knowledge about Indian culture. This attempt can be very well understood in the words of Homi Bhaba. He states, “. . . that it is from those who have suffered the sentence of

history-subjugation, domination, diaspora, displacement- that we learn our most enduring lessons for living and thinking” (*The Location of Culture* 172). A major part of the novel is set in south Asia and is burdened with diasporic awareness.

As Divakaruni’s novels have been situated both in India and America, it is imperative to have a discussion on the differences between cultures in these countries. American society is distinct and different from India as it is not as old as India. On the contrary, India has a long history and is blessed with several social reformers like Swami Vivekanandha who was one of the stalwarts of social renaissance in the 19<sup>th</sup> century. In the World Religious Parliament conducted at Chicago, he made the westerners sit up and listen with rapt attention to his discourse on religion. The listeners of his discourse carried an impressive opinion about India and its religions. In addition to it, it is well known that there is a whale of difference between eastern and western societies in terms of religious beliefs and practices followed. Say for example, Hinduism has immense belief in ‘karma’ and ‘rebirth’. This belief has instilled fear in the minds of Indians regarding things evil. The faith in multiple births, transmigration of the soul or metempsychosis is something unique to Hindu faith. Unlike the monotheistic religion of the West and the Islamic countries, Hindus worship a pantheon of gods and goddesses. In fact the deities are countless. Practices like worshipping the sun, doing yoga, chanting slokas from the Vedas, conducting marriage with the god of fire as witness, and ceremonies right from the birth to the death, including puberty rites are unique to the Hindu way of life. Veneration of animals, particularly the cow is very common in India. Taking annual pilgrimage to the abodes of Gods and ritual baths on sacred days in tanks and rivers that are marked as holy are part of religious duties. Days, weeks and months and even certain hours are regarded as auspicious to perform rites or start some good work. For someone steeped in Hindu beliefs and practices, the Western culture comes as a shock during the initial years of migration.

The novel *Sister of My Heart* makes a vivid discussion on opportunities and threats faced by women in a traditional Indian culture and it is compared with the modern world. The novel talks about a family dwelling in West Bengal and it is in a dilapidated state. Both Anju and Sudha are from a poorer background and the novelist focuses on the world around them. Both of them are clever, self-sufficient and practical. Being a master story teller, the novelist gives a pictorial account of the ordinary life and the dreams nurtured by them. All female characters in the novel work along with other characters so as to attain legitimate, equivalent and autonomous status. As a matter of fact, it carries an objective controlled action to liberate womenfolk from their dependence mindset. The bondage between the two siblings namely Anju and Sudha has been the crux of the novel and it is based on the novelist’s personal experience as a migrant.

The challenges before all womenfolk have been to find fulfillment for their longings, to find satisfaction in their life and career and to find equity in all situations and circumstances. Moreover, the marital discord between Sudha and Ramesh is of serious nature. Sudha even entertains the idea of parting ways with him along with her child Dayita. Her attitude is simply different from that of other Indian women who meekly submit to societal compulsions and patriarchal prescriptions. To break free from a sacred institution like marriage, she needs courage and hope to charter her life independently. The entire social framework embodies religion, myth, instruction and other social standards. The females need to get liberated from these shackles and maintain their status as individuals. Sudha is fortunate to have the complete backing of Ashok who happens to be her first love and he stands by her during her troubled times. Sudha's miseries do not end and Ashok offers unstinted support during her marriage, pregnancy and separation. America is expressed through the eyes of the sisters as follows:

“America has its own problems, she said, but at least it would give me the advantage of anonymity. No one in America would care that I was a daughter of the Chatterjees, or that I was divorced. I could design a new life, earn my own living, and give everything she needed. (*Sister of My Heart* 294).

The works of Divakaruni portray America as a comfortable place offering peace and prosperity to the migrants. She describes America in the most exalted terms as possible. In her perspective, it is a land of people with progressive thoughts whereas India is regressive needing redemption. She considers people moving from India to America to be fortunate as they are moving into a land of much promise.

While depicting her mother land, she gives importance to its culture and myth. In her opinion, the Indian women can gain prominence in America amidst the white population only by respecting her traditions. In an alien land like the USA, the Indian woman needs to reestablish her identity. This observation is very well found in her novels titled *Sister of My Heart* and *The Vine of Desire*. Between these two novels, *Sister of My Heart* carries several plots woven together in an artful manner. The novel brings out in a forceful manner the pressures experienced by Indian mothers who are sworn to the traditional Indian society and Indianism. The western theory has been the major focus of the novel. The novel talks about the circumstances leading to the birth of Anju and Sudha as well as their love relationship. As the novel moves, the readers have a very good understanding about the sister's euphoria, distresses, desire, misfortune, sadness and the vicissitudes. The novel *Sister of My Heart* enables the readers to acquire a thorough understanding of Indian family system. The novelist gives utmost importance to the specific nature of the females. In earlier days, women were brought up in an orthodox surrounding. They were forbidden from doing things like meeting strangers. The conservative and orthodox family values and practices were discussed threadbare in this work. However, things changed due to western education. In

the novel, both the sisters retain their connection with their mother land. The novelist expresses her mentality in her writings. Epics like *The Ramayana* and *The Mahabharata* were the sources very well used in *Sister of My Heart*. Divakaruni gives a pictorial description about Indian cultural heritage. She states that, “when a child is born, Bidhata Purush comes down to earth himself to decide, what its fate and fortune is to be religious ceremonials had a great attempt in describing Indian Phenomenon” (*Sister of My Heart* 15).

The plot is very simple and straight forward and concentrates on female characters. Through the life of Anju and Sudha, the novel very well depicts the traditional Indian life. The novel also talks about Dayita, the daughter of Sudha who becomes an orphan and it exhibits the will power of womanhood. In the novel, the union of the sisters is tested. The relationship between Sudha and Sunil become quarrelsome. Sudha experiences a nightmare and moves out of USA. In the life of Anju, her companion’s duplicity happens to be the dark drama. Her married life runs into rough weather and she decides to lead her life alone. Their affection surpasses all complications and Sunil has problems in prioritizing the needs of Sudha. In the opinion of Simon de Beauvoir, “once a woman is self-sufficient and ceases to be a parasite, the system based on her dependence crumbles; between her and universe there is no longer any need for a masculine mediator” (*The Second Sex* 689). The interesting part of the novel is in the way both Anju and Sudha get acclimatized to the western influence. The separation between them is explained in a subtle tone.

In all her novels, Chitra Banerjee Divakaruni does not say whether her characters are Indians or Americans. She goes on disseminating generalizations. Her novels probe into the genuine feelings of Indianness. The Indians, though naturalized as Americans, always remember their motherland and have fond memories about it. The novelist exhibits this attitude through Sunil in the novel. In a social gathering, Sunil comes across an American who talks ill of India. Unable to withstand this mudslinging, Sunil slaps him flat on his face. There are characters like Lalit, Trideep and Sara who also nurture the Indian idea of living. From her novels, the readers are able to understand the Indian style of living abroad. Sunil, Anju and Sudha are found to have these traits in them. Indianess and Indian sensibility find an incredible arrangement while Divakaruni exults in describing Indian traditions, customs and cultural goods. Even, Indian nourishments such as dal, parota, and pickle along with costumes like saree, kurta and pyjama are explained in detail. Flowers like jasmine, bangles, bindi and sindhur which are very common in India find detailed accounting in the novel.

Her next novel *The Vine of Desire* unravels the story of two youngsters who establish female freedom. The novelist considers the Indian female migration to the United States of America to be a kind of pleasant trip made and learning to lead a westernized life. Through the eyes of the characters, Divakaruni tells the story and gives vivid details about the country they have

left behind. The reader is left to wonder whether the novelist has yielded to the temptation of giving a pictorial description about India and its public. *The Vine of Desire* is the sequel to Chitra Banerjee Divakaruni's *Sister of my Heart*. The protagonists in the story are the two sisters Anju and Sudha born on the same day opening their eyes to the ill-fated death of their fathers also brothers' of the same family Gopal and Bijoy respectively, on a ruby exploration journey. The story revolves around the two women caught between hard core family traditions and the evolving modern thoughts of the 1980s. Anju migrates to America with her husband Sunil and Sudha stays in India with Ramesh. The distance does not separate them emotionally but only physically as the communication goes on through letters. The novel depicts the reunion of the two sisters in America. The sequel begins with a tragedy of miscarriage, emotion and trauma of the separation of son 'Prem' from her womb which ends in an abortion leaving Anju in bouts of depression. Sudha flees from her family to America. Anju feels the need for her sisterly support and feels obliged to stand by Sudha during her tormenting divorce. She decides "I want to bring Sudha to America" (*The Vine of Desire* 18). Sudha visits America with a hope to make a life for herself and her daughter Dayita. Divakaruni follows the trend, shows America as the land of opportunities and a refuge for all emotionally broken and mentally distressed women.

Divakaruni brings about the contrasting cultures of India and the US. The novel constantly focuses on the transculture; the characters seem to be shuttling between two worlds. Loss, alienation, rootlessness and dislocation are experienced by every immigrant. The expatriates initially try to adjust with the new culture and society into which they have joined. But something holds them back in the form of nostalgia for a way of life that is no longer possible. The sense of nostalgia is often seen among the dislocated and displaced people in most of the diaspora writings. In *Brick Lane*, *An American Brat*, *The Namesake*, *Disappearing Moon Café* and in *The Vine of Desire* one can find women characters leave their home to foreign countries after their marriage in order to settle in a new land with their unknown husbands.

Anju in *The Vine of Desire* migrates to America as Ashima in *The Namesake*. Both share a lonely life though the situations and problems differ. Anju, during her miscarriage yearns for someone to console her and liberate her from her intense loneliness. Anju's isolation reveals her acute nostalgia as well. The immigrants find themselves put out of place from the home society, they are upset emotionally and strive to remember and place themselves in a nostalgic past. There are frequent musings of the past memories, especially of the childhood days, people and surroundings. All through the story there are sentimental attachments well displayed by different characters. Anju in

this novel often finds talking to her unborn son; she names him “Prem” and to him she conveys the reminiscences of her childhood. She tells ‘Prem’ who is attached to the warmth of her womb. She journeys back in time and narrates instances of homesickness at the very memory of the old house, the white elephant of a mansion that had been in the Chatterjee family for generations: its crumbling marble facade, its peeling walls, the dark knots of its corridors, the brick terrace where she and Sudha went secretly at night to watch for falling stars to wish on. She senses pain as things change. She remembers even the smallest of the incidents in the past which she used to loath and hate as a child, but as an immigrant there is this terrible longing to retrieve the past.

In an interview to *The Telegraph* (13<sup>th</sup> March 2005), she says that women in particular responds to her work because she writes about them; women in love, women in difficulty, women in relationship. She wants people to relate to her characters so that they can feel their joy and pain, since it will be harder to be prejudiced when they meet them in real life.

Divakaruni portrays remarkable characters who build hope within themselves in an alien country. Here in the midst of different cultures the immigrants venture to set an identity battling against loneliness and overcoming tormenting emotions. They carefully discard their initial cultural shock and exhibit remarkable resilience. Divakaruni’s narration in *The Vine of Desire* is adroitly tailored from first person to second person and also to third person narration. The emotional communication through letters also expresses the family bonds, responsibilities and yearning for home. In fact, both the novels analyse and contrast the prevailing Indian mindset, attitude, prejudice and pride among the immigrants in a foreign country. Divakaruni, in short, gives an authentic pictorial description about the Indian community in an alien land and its ways of coming to terms with a newfound reality.

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## **KHUSHWANT SINGH ON WOMEN AND BEYOND**

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### **Abstract:**

In the present paper, I have attempted a critical analysis of the women characters in Khushwant Singh's novels: *Train to Pakistan*, *I Shall Not Hear the Nightingale and Delhi*, *The Company of Women*, *Women and Men in my Life*. The paper also attempts a portrayal of women in his short stories: *Karma*, *Black Jasmine*, *A Bride for the Sahib*, and *The Portrait of a Lady*. Some of the characters taken for study are Yasmeen, a Pakistani from *The Company of Women*, Nooran, a daughter of blind Muslim weaver from *Train to Pakistan*, Sabhrai from *I Shall not Hear the Nightingale*. Phoolan Devi, a bandit, Singh also portrays being a bandit, the revenge and massacre held in 1981. Indira Gandhi and Operation Blue Star and his return the award Padma Bhushan to show his condemns to the Golden temple issues. Mother Teresa helped the sick, disabled, abandoned, and the people cast away from society. Kaval Malik, Khushwant Singh's wife and so on.

**Keywords:** pedestal, docile, backbencher, vehemence, encounters, massacre, Operation Blue Star. Voluptuous, lustful, lusty, encounter, iconoclastic, hypocrisy, forthright, human traits

Khushwant Singh was a versatile personality as novelist, journalist, Member of Parliament, politician, translator, autobiographer, historian, story writer, essayist, and many more. He excelled in every field. Khushwant Singh was a man of principles; he never left the country of career. He was a professional

writer and wrote more than a hundred books. Many a time, he came into the limelight because of his controversial comments. He wore many hats. Undoubtedly he is one of the most distinguished writers of India.

In patriarchal society, the West and the East have been treated unequally and as an inferior sex. In a patriarchal set up of India, either woman is put on a pedestal and worshipped as Goddesses and are depicted as symbols of purity and keepers of tradition or degraded as sex objects. They are supposed to be and made to be traditional, religious, docile, obedient and subordinate to men. There is evidence even in the Vedas and the two Puranas (Epics), the Ramayana and the Mahabharatha, the women are restricted by social rules and norms. For example, the two classical characters of Sita and Drupati behave as ideal, obedient and docile wives to their husbands and as good mothers towards their children. They do not cross the boundaries that set up by their patriarchal societies. Submission to others is the only thing that patriarchal society expects from a woman, whether in India or the West. John Stuart Mill rightly points out, "All women are brought up from the very earliest years in the belief that their ideal of character is the very opposite to that of men; not self-will, and government by self-control, but submission, and yielding to the control of others."(45)

In a patriarchal society, a woman treated as a person dependent on others for her existence. For example, as an old woman, she has to depend on her children for her survival; in her girlhood, she has to depend on her parents, while when young, she is dependent on her husband. Men from time immemorial have not given women an individual identity in society. She restricted to a minor part of society. To use the words of J.S.Mill again:

"A place of subordination has been traditionally accorded to her at the behest of the male-dominated culture which ordains a grim existence for her. Self-abnegation, personal will dependability and denial of the right individuality made to her lot. Not self-assertion but self-denial, not self-awareness but role fulfillments are expected of her by society with its entrenched ideas of male dominance".(78)

A glance at the scene of Indo-Anglian literature shows us the impact of such a patriarchal society. Most male Indo-Anglian novelists have given a minor place to women in their novels and they portray them as restricted to the mere tradition. Khushwant Singh followed his predecessors in portraying his women characters in a similar mode.

Khushwant Singh presents to us two kinds of women characters, who are conventional, traditional, ardently religious or, in sharp contrast, women who are unfaithful, promiscuous and lascivious. The conventional women possess deep reverence for their religions and rituals, and like the classical heroines Savitri and Anusuya, they seem to symbolize deep spirituality and traditional idealness. Motherhood and love for children and reverence towards tradition is a hallmark of the virtuous women characters. They depicted as repositories of tradition and custom.

The first character taken for the study is Yasmeen from the novel *The Company of Women*. Mohan Kumar narrates this story. With a remarkable grasp of human nature, he has given a convincing and realistic portrayal. Singh treats all women in *The Company of Women* as narcotics.. The novel begins with its hero Mohan Kumar, a successful Delhi's businessman, breaking off with his wife and his everlasting "lust" efforts to set up a more flexible arrangement for appeasement of his physical needs. The initial endeavour begins at his home with the sweepers and extends to the wide world of lonely women beyond the neighbourhood to Princeton, having the most bizarre of his "triumph." in one night encounter with a devout Muslim woman from Pakistan. The novel chronologically presents the most erotic pictures of the nine women with whom the hero beds, including his wife. Of the eight on the description, one each is African, American, Kashmiri Pundit, Muslim, Dalit Hindu, Hindu Brahmin, Tamilian Christian, Goan Roman Catholic, Sri Lankan Buddhist and unnamed women of easy virtue in Bombay. Singh seems to have to extend the slogan that love and sex know no caste, class and community bar. He further confirms his belief that lust is more important than love: Love cannot last very long without lust. Lust has no time limit and is the proper foundation of love and affection. Living engaged in several sexual encounters, Mohan Kumar does not see anything wrong in adultery as it has some advantages. He thinks that adultery has some advantages also. He thinks that, in fact, adultery "did not destroy a marriage; quite often it proved to be a cementing factor, as in cases where the husband could not give his wife as much sex as she needed, or where the wife was frigid. It was silly to condemn adultery as sinful; it often saved marriages from collapsing. It could have saved his."

Khushwant is deeply aware of various social evils, oddities and eccentricities of society. He ironically highlights how their near relatives are sexually exploiting many minor girls sound social norms. Mohan's last physical contact happens with an unknown lady of about thirty in Bombay. She declined to disclose her name despite Mohan's request. The encounter proves fatal for him. The lady was suffering from the deadly disease AIDS. Mohan invites many lonely girls to come and have sex with him. This is not an isolated case or mere fictional imagination of Khushwant Singh. This is, in reality, happening in different parts of our country, especially in metropolitan cities. People from the elite or higher middle class now frequently invite men and women for a physical relationship. Such invitation is being made through a special 'add' column of certain sex magazines such as 'Fantasy', 'Bombayite', 'debonair' etc. Khushwant Singh ironically satirizes this truth through his present novel. Such cultural degradation causing AIDS in Urban and Metropolitan cities is Khushwant's main concern of the novel.

Social evils such as extramarital relation, incestuous sex, sexual exploitation of Dalits and minors, etc., are the novel's real heroes. The novel ends with the attempted suicide of Mohan by taking thirty sleeping pills at a

time. Some critics call the novel a 'fine fictional art'. Some others say 'that the novel is neither erotic nor funny, but it is, ultimately, a sad book'. Khushwant indeed ironically campaigns against the 'deadly disease', when shows Kumar getting AIDS, all in a matter of just six months from an unprotected sexual encounter in Mumbai and ultimately dies. Throughout the novel, he neither defies social norms, nor pays a moral price for his philandering. Mohan Kumar's relation with Dhanno continues for a long time. After her, he encountered Molly and Susanthika. Singh has never bothered about others. Mohan Kumar's relationship with several women during his study in New York shows that modern educational women are rapidly overcoming sex consciousness. The young are anxious or rather in a hurry to taste the forbidden apple. Hence there is a petite sex barrier between male and female in the west, and they enjoy ample freedom to work together on equal footing and discover the mystery of one another's body. Besides, this novel also explores the bitter truth about incest. Those girls, in most cases, are deflowered first by their close relatives. Susanthika is deflowered at the age of sixteen by her uncle, and Molly Gomes too met the same fate at her uncle's hands when she was barely fourteen. Boys were seduced by their aunts or older maid-servants. Mohan Kumar consoles himself that he has got a beddable wife as if to compensate for the loss of his daily sex with variations. His mental plane's concern in all relations with women is the same lust, but experiences with them are different. Singh treats all women in this novel as narcotics. He portrays the women in this novel as addicted to sex. They yield to men easily and are not concerned about any values as such. Women characters are ready to taste the forbidden fruit. Mohan met Yasmeen while attending classes in comparative religion; he describes her as being "A woman in salwar-kameez in her late thirties. She wore a lot of gold jewellery and was heavily made up. Since she did not wear a bindi, I presumed she was a Muslim. She sat in the front row. I always a backbencher" (Singh 20).

Yasmeen is a very different character. She was a bold woman and was notably the one who had much to say during discussions. It portrayed by her view on the Hindu religion, where at one point she launched a furious monologue upon a professor, where she says:

Hinduism is the only religion in the world that declares a section of its follower's outcasts by accident of birth. Hindus are the only people in the world who worship living human as godmen and god women. I am told that there are nearly five hundred such men and women who claim to be Bhagwan. They believe a dip in the Ganges washes away all their sins, so they can start sinning again! (Singh 22- 23)

"There was stunned silence" (Singh 23). Say Mohan on Yasmeen, who had spoken with such intensity. These lines also may portray Singh's satirical remark on religion, where he is inclined towards Atheism. Singh once said, "One can be a saintly person without believing in God and a detestable villain believing in him. In my personalised religion. There is no God!" (Nayar) He is

also said to have no belief in rebirth, reincarnation, day of judgement, heaven, hell, but has belief in death.

Yasmeen was a Pakistani woman but was not an anti-Indian. Her parent had lived in Srinagar. During the progress of the novel, she says that one day we will liberate Kashmir from India's clutches and I will return to Srinagar, which I have seen only in pictures" (Singh 26). This part of the novel shows the tensions that run across the borders even in the present day. There is also description of her love for Islam and how she fights it over with a Jew.

Singh's portrayal of religion depicted through Mohan's character, where he once says, "I'm happy in ignorance,' I replied. 'I don't have much patience with any religion. All I say is try not to injure anyone's feeling The rest is marginal. Gods, prophets, scriptures, rituals, pilgrimages mean very little to me" (Singh 31-32).

The next character is Nooran from the novel *Train to Pakistan*. The passages between Nooran and Juggut Singh's mother mostly touched upon the divide and the tensions between the Hindus and the Muslims during the partition in India. This is the novel that brings in the horror or the pain one experiences reading this part of the novel. It also shows the breaking up of the emotions and genuine feelings of being humane to each other during the partition hours. This is also revealed symbolically within the boundaries of possessiveness of place, objects, and of true love, when the character Imam Baksh went to his hurt and woke up Nooran saying, "Get up and pack. We have to go away tomorrow morning, he announced dramatically. 'Go away? Where?' I don't know ... Pakistan!" The girl sat up with a jerk. I will not go to Pakistan,' she said defiantly (Singh 50). This shows her love, in which she does not want to leave Juggut. Juggut and Nooran get in a relationship in the novel. Nooran comes to meet Juggut, but he was away, and she encounters his mother.

Juggut's mother, on the other hand, tells Nooran, ""You, a Muslim weaver's daughter, marry a Sikh peasant! Get out, or I will go and tell your father and the whole village. Go to Pakistan! Leave my Jugga alone (Singh 53). But even this strong character breaks apart to portray the tenderness possessed by the feminine gender, where at a point Singh writes, "Jugga's mother stood stiff, without a trace of emotion on her face. Inside, she felt a little weak and soft. 'I will tell Jugga" (Singh 53-54). By sensing the change in words. Nooran stopped crying. As revealed by Nooran areas, the feelings of possessiveness if she belonged to the house and the house to her, the charpoy she sat on the buffalo, Jugga's mother, all were hers. She could come back even if Jugga failed to turn up. She could tell them she was married. The thought of her father came like a dark cloud over her lunar hopes. (Singh 55)

These lines also portray male dominance in the figure of the father and the surrendering of the female gender to the male. With these on Nooran's mind, she hugged Juggut's mother passionately. Even Juggut's mother was in the same emotions that had filled in the mind of Nooran, for she sat there in

the charpoy staring into the dark for several hours. This is symbolic of the question of what are all our lives meant to be!

Jugga's mother in the novel *Train to Pakistan* exhorts her son when he goes out to the fields in the night. Her love for Nooran (the lover of Jugga) increased when the latter is on her way to a refugee camp. When the Muslims evacuated to the refugee camps, Nooran, before leaving for the refugee camp, goes to Jugga's house and finds Jugga's Mother. When the latter comes to know that Nooran is carrying Jugga's child in her womb, she comforts and consoles her as a concerned mother and sends her with hope. Meer Taqi's mother in the novel *Delhi* and Dalip Singh's mother in the story *Rape* are also similar characters.

We find a comparable patriarchal mode in depicting motherly women characters in other Indian English writers. Raja Rao, one of the pioneers of Indo-Anglian literature, also portrays such motherly figures. For example, in the novel *The Serpent and the Rope*, Rama's stepmother, despite her comparative youth, is still the unparalleled Indian mother. Though only two years older than the protagonist Rama, she is a good mother as any other mother figure in Indian Writing in English. In *Kanthapura* Moorthy's mother full of sacrifice and motherly love for her son, yet sticks to tradition and does not allow Moorthy inside her house after he visits the untouchable's house.

Another important attribute of these tradition-bound women in Khushwant Singh's work is their devotion to their husbands. Like Savitri, Draupadi and Sita's Puranic characters, they submit themselves to their husbands and remain loyal wives to them until their end. For example, though illiterate. Lachmi, in the short story *Karma*, shows deep reverence towards her husband and treats him as her God and master. When the railway coolie asks her, "Are you travelling alone, sister?" she replies, "No, I am with my master brother. He is in the waiting room. He travels first class. He is a vizier and a barrister, and meets so many officers and English men in the trains-" (*Karma* p.9).

Like her puranic counterparts, Sabhrai is completely devoted to her husband and is an obedient and exemplary wife. We find such kind of characters in the novels of R.K.Narayan too. In the novel, *The Dark Room*. Savitri, like Sabhrai, Kalyani and Lachmi, behaves like a good and submissive wife to her husband. She stands for love, sacrifice and other feminine qualities associated with traditional Indian women.

Conventional, eastern women are always deeply religious. In the story, *The Portrait of a Lady*," the narrator describes his grandmother as a deeply religious woman who expresses her infinite faith in God by constantly offering prayers. The reader always encounters her counting the beads of her rosary and reciting prayers in a monotonous voice. As the narrator says, "My grandmother always went to school with me because the school was attached to the temple. The priest taught us the alphabet and the morning prayer. While the children sat in rows on either side of the verandah singing the alphabet or

the prayer in a chorus, my grandmother, sat inside reading the scriptures" (the portrait of a Lady, 'p.30).

An orthodox Sikh widow, the grandmother "hobbled about the house in spotless white with one hand resting on her waist to balance her stoop" (*The Portrait of a Lady*, p.29). As a religious and peace-loving woman, she prefers vegetarian foods, and being a gracious woman shows compassion towards the lesser beings like the dogs and sparrows. While living in the village, she gives stale chappatis to the village dogs, and when she takes to a town, she feels contentment in feeding the sparrows. She also bears a motherly love towards her grandson when he stays in the village. Her devotion towards religion is so great that she feels sorry and depressed when she learns that the narrator was not taught Religion and Scriptures at his English school, even at the time of her death, she does not leave her rosary; "She lay peacefully in bed praying and telling her beads. Even before we could suspect, her lips stopped moving, and the rosary fell from her lifeless fingers' (p.31).

All the above characters portrayed as dependent people. They created as individual and independent. All women in the novels and the stories examined submit everything to their husbands or are completely dependent on their children. Khushwant Singh, like his contemporaries Raja Rao and R.K. Narayan, has followed the tradition of depicting women characters as being restricted to the ideal of Indian womanhood and tradition. All these writers have denied women's individuality and self-hood by depicting them as keepers and protectors of tradition and custom and repositories of purity and innocence.

In sharp contrast to the ideal' Indian women, Khushwant Singh presents women characters who appear to be 'unconventional'. They mostly disregard the traditional way of life and seek to subvert the restrictive and repressive norms that Indian society imposes on its women. However, what is unfortunate, as we shall presently see, is that Singh's depiction of these women borders on the vulgar and sometimes downright pornographic. The non-conventional or vicious women characters seem to be used as objects of sex to enchant readers.

In portraying the non-traditional characters, Khushwant Singh exaggerates the sexual desires that women have in general. From ancient times, women in our society have been compared to goddesses and sometimes worshipped with devotion. Women also have been depicted as beings who do not have sexual desires. In portraying women as goddesses and divine being, Indian novelists like R.K. Narayan and Raja Rao seem to have neglected this "human' part of women by depicting them as one-dimensionally religious and orthodox people. Khushwant Singh might suggest that when freedom gave to women like men, she can also prove that she is not inferior to men in any field, including sex. But in doing this, Khushwant Singh portrays them as sexual objects of sex by lavishly describing their physical beauty, sensual and sexual

transgressions in a manner that ultimately degrades them as human beings and robbing them of human dignity.

The next woman taken for the study is "The Venus of Churchgate" (Singh 57). Singh encountered while he was working as the editor of *The Illustrated Weekly* of India in Bombay. Singh describes this woman to be as "An uncommonly attractive girl, she was in her mid-twenties. Fair, beautifully proportioned, uncombed hair wildly scattered about her face, a dirty white dhoti untidily draped around her body" (Singh 58). She, in reality, was a beggar and a little mad. This statement proves that Singh notices all kinds of people, be it the rich and the poor. This incident also shows how these low people are used negatively by certain people of the society.

Singh says that the "maid in Bombay haunted me for the many days that I was away in Delhi" (Singh 60). When he returned to Bombay, he went to Churchgate, and there he saw the same paanwalas, bhelpuriwalas, but not the beggar. Singh asked the bhelpuriwala what had happened to the girl; with this question, the responder's eyes filled with tears and with a choked voice, he replied, "Saaleybharweyuthake lay Gaye (the bloody pimps abducted her)" (Singh 60). This statement shows the reality of the day, which is also an issue that prolongs in modern-day. In the short story, 'Black Jasmine.' Singh indulges himself in describing Martha Stack's beauty, concentrates more on Martha's body than any other aspect. The comparison of her buttocks to rounded water melons' and her breasts to unripe mangoes' and use of expressions like "very black and over. sized nipples," the fuzz of her pubic hair," "chocolate nude", etc. betrays Khushwant Singh's tendency to turn perfectly 'normal' stories into stale pornographic 'episodes'.

Santosh Sen's mother, in the short story *A Bride for the Sahib*, is depicted as an ideal mother and a traditional woman. Though her son is a WOG (Westernized Oriental Gentleman), she does not embrace the western way of life and instead restricts herself to the traditions and conventions.

Thus Khushwant sees women as of with no difference between the two polar that found in life. He uses Yasmeen to say about his views of religion, Nooran on the horrors of partition, the Venus of Church talk on the adverse effects faced by a woman in the society. Phoolan Devi goes a step into the world of how women suffer in the field of being a bandit. Indira Gandhi's other side, and finally the caring heart of a mother through Mother Teresa.

Singh also gives portrayals of women whom he holds in high esteem in his *The Portrait of a Lady*, he sketches his grandmother as an amicable, lovable and noble lady. Khushwant Singh was a keen observer of human traits. He has presented these human traits with his profound insight into the human mind. His portrayal of the women whom he encountered in real life is iconoclastic style. Singh's style is frank and forthright. In his unorthodox style, he hits out against hypocrisy. He is not prejudiced against woman; he presents a realistic scenario in his inimitable style. Singh also gives portrayals of women whom he holds in high esteem. In his *The Portrait of a*

*Lady*, he sketches his grandmother as an amicable, lovable and noble lady. This story is a sensitive character sketch. We can see women's personality, who can be called an embodiment of the finest elements of ancient Indian culture. Singh says that his grandmother was a highly religious person who never missed prayers. The first phase was the period of the author's early childhood. Both they shared a good friendship with each other. The second phase was the time the author and the grandmother moved to the city. This was a turning point in their friendship because they 'saw less each other. The third phase contains the author joined the university. She accepts her seclusion with silence. She spent her days spinning the wheel, reciting prayers and feeding the sparrows. She was a religious lady with a kind heart. Her one hand was always busy in telling the beads of her rosary. Khuswanth Singh writes with sympathy and understanding about the greatness of an old lady who was an embodiment of all that was best and finest in ancient Indian culture. He presents traditional, conservative women who found solace in sparrows after her grandson moved away from her.

In the novel *The Company of Women*, he treats women as voluptuous, lustful, lusty and throwing caution to the four winds. Again this is the sign of his extraordinary insight into human nature. These types of women characters also abound in modern society. Singh's style is frank and forthright. In his unorthodox style, he hits out against hypocrisy. He is not prejudiced against woman; he presents a realistic scenario in his inimitable style. Khushwant Singh was a keen observer of human traits. He has presented these human traits with his profound insight into the human mind. His portrayal of the women whom he encountered in real life is remarkable in this way.

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**SELF REALIZATION IN IRIS MURDOCH'S  
BRUNO'S DREAM**

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**Abstract:**

Self Identity is needed to all generally which is the expectation all human beings. Mostly People struggle to get identity. This Research Paper talks about the insecure life of Bruno. He feels emptiness in his life. His life is compelled by his surroundings psychologically he confuse himself as well as his life too he loses his happiness due to over thinking. His own dream only is the tool of his hectic life.

Literature shows the reality of the society. It pictures the world happenings. All the details and evidence are documented in the name of literature. it gives idea of living life .life is not easy in this competitive world . Everyone has their own image and identity but few people plan to create a big image or identity which is little hard. It is faced by all human beings. Money making is the vital part of day to day life. Most of the people spend more times to earn money for their needs. They miss valuable life time in earning money .there are some important elements in life like love , affection , care but they are missed due to money making . Love and care are basic of human life which shows the different from animal. Now days money minded are there in life. They go on thinking about money not family. They try to explore themselves in front of others as they wish whereas they family image goes on missing. Finally they realize their mistakes when they don't have ability to rectify all due to their old age. Same character we have in the name of Bruno who is the central character of Bruno's dream which was written by Iris Murdoch Murdoch is named writer of British literature. She has touch theme of human life related. in order to focus the reality , naturalism and morality , her characters are framed by her nicely . it explores the real characters of current

situation . When we read the writings of Murdoch, we can come across all kinds' familial situation and characters. That is why Murdoch plays a vital role in British literature. She stresses that they are not individual. Society is there. She has touched with her own personal experience. Her experience is shown clearly in her characterization. She teases her readers through her character to get awareness of life. Murdoch perceives herself as a realistic writer. She has moral vision of life. She insists her readers to follow goodness in every aspect of life. People of her generation accepted her way of presenting the life. She celebrates love and lives continuously. So Murdoch emerged as one of the most productive and influential British novelists of her generation

Bruno is the protagonist in *Brno's Dream* he feels more insecure due to his old age. He is caught with nothingness and dread. Here he suffers common imbalance and unrest. Ailing Bruno has been rejected existence. He is portrayed as a guilt-ridden invalid. He lives in the past. He remembers his nostalgia. Once he had nice relationship with his wife Janie, daughter Gwen, son Miles, Son in law- Danby, Diana, Lisa and Parvathi – his daughter in law. He faces numerous traumas and each fragment tells about the different realities which Bruno experience often. Sense of rejection is there. Here he was rejected by thankless relationship his life is ruined by Janie. Murdoch affects darkness into Bruno that infiltrates through him. Bed-ridden Bruno is in the process of self realization. He views himself in the reflection of his own unhappiness. His mind overflows with full of fear, frustration. He has illegal affair with Nigel.

Bruno is perplexed by the varying attitudes of Danby and Miles but Self realization is motivated to gather his fragmentary self's together affair with Nigel is example to read and understand the mind of Bruno. It is not merely love seeking attitude. He belongs to moderate category of self seeking personality. He realizes that his room is his prison. They could not give message. They could fail to post letters. There is a telephone but they could cut the wire. Bruno's suspicion is the depressed state of self realization. He faces unfortunate situation a lot. The Most remarkable aspect in Bruno's self realization is his effort to reconcile his life with his rationalizations of the past.

Lack of self identity is main reason for confused life of Bruno. It makes him to feel lot for not having unique image. Directly or indirectly his whole life goes towards in gaining an unique image so unknowingly he misses the importance of life as well as reality too. In order to create his expected image, he suffers more without understanding the real value of life. He has good family and all but he forgets all his family goodness. His unique quest is his problem. According to him, he has no faith and balance in his life. That is major problem .having dream is nice thing .but unwanted or out of our level is not good. He creates his own hectic situation in his life. Till his death, he feels guilty. No enemy is there only his mind and perspectives of the life gives this way. Murdoch pictures the character in dark mode. Darkness is created by

himself only. Thankless relationships are connected with Bruno. His misfortune, he has to deal with them in day to day life. This is really misfortune. He could not come across. His effort is useless in his situation. it is impossible to change his situation as his wish .When he looks back his eighty year old life full of emptiness, dreams and confused mind He was imprisoned in his own house where he suffers more .

Miles does not have affection on him as father. His father Bruno has kind heart and idea to see him. He is not ready to care his father who has more affection on him. He avoids meeting as well as caring him. It is biggest one o bear this kind of irresponsiveness. Loneliness is the crucial situation which is given by Miles. Bruno is compelled to lead lonely life .this is very hard time to manage. He calls miles to save him from loneliness. The response is nothing. He has been waiting for his son .but he refuses. Bruno gets anger when his son goes away from him. Miles also reflects his father's character.

It is common things of all human beings' life that people in their old age get struggle. They expect help and care from their family member due to their old age. But when they are in young age , they also did same mistake what they feel now . they failed to teach the life morality and philosophy to their children so only finally they face struggles . Morality and reality must be taught from the beginning of the life. Young generations are ready to follow what we teach them. Human beings generally works for money lot in their young hood after that they have more money in their old age which never fulfill their basic needs like love, affection and care . Here in this *Bruno's Dream*, The protagonist did the same mistake. Without understandings the reality and morality of life, they lead their life. They are ill-treated by their relations .Bruno spills forth tears of repentance, pursed by the fear of death. This emotional outburst is not merely impulsive. But it occurs to Bruno as long as awaited opportunity to purge the false selves. Nigel is administrator to Bruno's confidence. Self realization is made finally without strength in his mind.

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**ANALYSIS OF IMPACT OF NUTRIENT BASED SUBSIDY  
POLICY ON CONSUMPTION OF FERTILISERS IN  
BIHAR, ODISHA AND WEST BENGAL**

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**Abstract**

This research article tries to assess the impact of 'Nutrient Based Subsidy' policy on consumption of chemical fertilisers for the three states such as Bihar, Odisha and West Bengal during the period 2000-01 to 2019-20. The Bai-Perron test statistics technique has been chosen to fix the period 2013-14 as a significant break point. Now the time span has been divided into (i) prior to 'Nutrient Based Subsidy' Policy (2000-01 to 2012-13) and (ii) regime of 'Nutrient Based Subsidy' Policy (2013-14 to 2019-2020). The 'Spline function' approach has been considered to determine the growth rate of fertilisers' consumption into two regimes. From the results of descriptive statistics, it is observed that the consumption of chemical fertilisers in 'Nutrient Based Subsidy' regime has increased but the variation of fertilisers' consumption has reduced continuously. From the empirical analysis it is also noticed that the growth rate of fertilisers' consumption per hectare has been diminished significantly in the same regime. Which may imply, the 'Nutrient Based Subsidy' policy has succeeded to control imbalanced application of chemical fertilisers.

**Key words**

Intensive Strategy, Subsidy, Nutrient, Inorganic fertilisers, Farm

**Introduction**

The government of India had implemented the five years' economic plan since 1950-51 to boost up the economic condition of the country and the basic outlook of plans were growth, employment, self-reliance and social justice (Indian Economy-2016). But from the overall performance of first and second five-year plan, it is noticed that both economic plans neglected the agriculture, but the agricultural growth is the key limiting factor in the process of

economic development. This is also supported by the 'Gandhian Economists'. Accordingly, the planner selected the agriculture at the top priority level in third five-year plan. In this plan period the policy makers suggested the government to implement the seed-water-fertilisers technology in agriculture which is commonly known as green-revolution. (Indian Economy-2015). Besides, they also recommended that to reach the expected targeted growth rate of agriculture in each plan, definitely it is absolutely essential to raise the availability of various inputs such as irrigation, fertilizers, better and improved quality of hybrid seeds, pesticides, provision of finance, etc. (Indian Economy-2015).

But four important findings are observed in the Indian economy behind the name of development. Firstly, during last few years the growth of gross value added (GVA) at constant (2011-12) basic prices from crops was highly volatile compared to both industry and service sectors. Secondly, the share of both marginal (less than one hectare) and small (one to two hectares) farmers has risen continuously in our country. As for example during 2010-11 ratio of marginal and small farmers were 67.1 percent and 17.9 percent respectively and this figure has reached at 68.45 percent and 17.62 percent respectively during 2015-16. The small and marginal farmers who borrowed agricultural loan from different non-institutional sources paid high rate of interest which was normally thirty-six percent and above per annum. It happened mainly due to the failure of the public sector banks. Thirdly, by the name of "development" the prime agricultural land is being diverted to the big and powerful builders through the government. Fourthly, the poverty in the rural area is growing that ultimately creates a sense of despair and anger among the rural people who live in below the poverty line.

Thus it is showed that in one side "India is Shining" through the development of manufacturing and service sectors and booming financial markets. But on the other side, the development of agricultural sector is Deeping gloom. In that circumstance the second green revolution is one of the key techniques to overcome the Deeping Glooming condition of agriculture.

After realising above state conditions, for boosting up the yield of the crops within limited period to shrink the deficit of the food supply as per requirement of growing number of population, the utilisation of excessive doses of chemical fertilisers is only the first and end option with the high yielding seeds. In this regard, the agricultural scientists instructed that the ratio 4:2:1 is suitable for Nitrogen (N), Phosphorus (P) and Potassium (K) to maintain environmental stability and sustainability of fertility power of arable land. But as large chunk of farmers (90%) are in the category of small and marginal group and since agriculture is the only earning option, they were compelled to cross the suggested ration about utilisation of N, P and K that is stood at 9.7:2.9:1. Which is adversely affected the environment.

The three states West Bengal, Bihar and Odisha have been selected in this study to analyse the impact of the advance modern technology in agriculture.

In these states, the agricultural sector continues to contribute more than twenty percent to the Gross State Value Added (GSVA). The share of agricultural and allied sector to the Gross State Value Added (GSVA) was 23.53 percent, 22.30 percent and 21.38 percent respectively to the state of West Bengal, Bihar and Odisha during 2019-20 at the current price (Government of India-2020). Again the growth rate of Gross State Value Added (GSVA) in this sector was 4.74 percent, - 0.01 percent and 11.92 percent respectively for West Bengal, Bihar and Odisha during the same time period at constant (2011-12) prices (Government of India-2020). Among the study states, Bihar (1820.50 thousand tonnes) is in top position in terms of quantity of fertilisers consumptions during 2019-20 and it is followed by the West Bengal (1599.16 thousand tonnes) and Odisha (574.38 thousand tonnes). Another important statistics is that the farmers of West Bengal, Bihar and Odisha were used fertilisers in average 167.90 kg/hect, 245.25 kg/hect and 67.19 kg/hect respectively which were greater than that of the country level (133 kg/hect) in the year 2019-20. The average land sizes have reached at the critical situation in the country as a whole. An average size of land-holdings were 0.76 hectare, 0.39 hectare and 0.95 hectare for West Bengal, Bihar and Odisha which were lower than that of the country's (1.08 hectare) size of land-holdings (Government of India 2020) during 2015-16.

In Odisha, nearly 83.3 percent of state population were in rural areas (Census Report 2011) and out of total workers about 62 percent were directly engaged in agricultural in the form cultivators (23.40 percent) and agricultural labourers (38.43 percent). The percentage share of small and marginal land holdings have been increased continuously and about 93 percent of operational holdings belong to the category of small and marginal farmers (Government of Odisha 2020-21).

The agricultural sector accommodated more than 70 percent population of the state of Bihar. In this state the share of small and marginal farmers has been raised year to year and now nearly 97 percent of the land holdings were in small and marginal groups and they acquired nearly 76 percent of the total area of operational holdings during 2015-16 (Government of Bihar 2020)

The state of West Bengal occupies only 2.7 percent land of the country while nearly eight percent of the country population live in this state (Government of West Bengal-2017-18). In this state out of total population about 72.03 percent people live in rural area where as it was 70 percent of the country (Government of India 2011, as per Census). In West Bengal around 95.4 percent farmers were small and marginal farmers where as 78 percent of the country as a whole (Government of West Bengal 2011).

The new intensive agricultural strategies started its journey in the system of Indian agriculture from mid of sixty for achieving the targeted growth rate of crop production within shortest possible time-span. By the name of intensive technology, it is intended to that the farmers cross the scientific limiting ratio that is balance ratio of the application of chemical fertilisers (N: P: K), which

is adversely affected the environment. After realising such disgraceful situation of agriculture, therefore, to control the reverse impact of excessive dosages of inorganic fertilisers in the strategy of raising the yield of crops from different corner, the Nutrient Based Subsidy (NBS) policy was launched by the government of India from 1<sup>st</sup> April, 2010. In this circumstance, the following strategies are advocated by government under the umbrella of NBS. Such as (i) to ensure food security of Nation, (ii) to improve productivity of agriculture and (iii) to ensure maintaining the balance in the utilization fertilizers. Therefore, in the research article, the impact of NBS strategies on chemical fertilizers has been taken into consideration to the state of Bihar, Odisha, and West Bengal during the period from 2000-01 to 2019-20. In these states, more than eight percent marginal and small farmers are indebted households as for example, it was 98.5 percent (marginal 91.1 percent + small 7.4 percent), 96.7 percent (marginal 86.7 percent + small 10 percent), and 93.9 percent (marginal 78.7 percent + small 15.2 percent) for West Bengal, Bihar and Odisha respectively (National Statistical Office (NSO), (Jan-Dec 2013)) which was around 10 percent greater than that of India (82.00 percent = marginal 63.6 percent + small 18.4 percent). This type of agricultural structure compelled the small and marginal farmers to use excessive quantity of inorganic fertilizers to the agricultural field for different crops in order raise surplus by raising yield.

This is an empirical analysis and the necessary data have been collected from the book, 'Agricultural Statistics at a Glance', published by the Ministry of Agricultural and Farmers and Welfare by the Government of India.

Bai-Perron tool is better to find out the numbers of break to the model. In the case of multiple break analysis, Bai and Perron (2003) stated that at the initial stage the 'Double Maximum Tests' test statistics that is, un-weighted and weighted maximum test statistics such as  $UD_{\max} F_T(M, q)$  and  $WD_{\max} F_T(M, q)$  test statistics are suitable technique to find-out the presence of at least one break into the trend model. Therefore, it is appropriate to consider the sequential estimation technique for fixing the number of suitable structural breaks as per requirement in case empirical analysis. Thus, the Bai-Perron (2003) test statistics is appropriate to determine the numbers of preferable structural breaks and also their appropriate location. Before applying Bai-Perron (2003) methodology, the suitable residual diagnostics test statistics (correlogram-Q-Statistics) is considered to find the problem of serial correlation (autocorrelation). The stationary has been tested by 'Eviews' through levelling step. In this discussion, the data series intended for West Bengal and Odisha are stationary. But the data of Bihar and India are non-stationary. Therefore, the correlogram has been checked by taking lag (first difference). In this stage, as per the spike of autocorrelation and partial auto-correlation, the AR (1) has been considered for removing serial correlation (for Bihar and India).

Now in order to discuss the impact of ‘Nutrient Based Subsidy’ Policy on the application of chemical fertilisers to the field of agriculture during the period 2000-01 to 2019-20 in the state of West Bengal, Bihar and Odisha, the ‘Spline Function’ approach has been taken into consideration. Now for specifying the appropriate break point(s), the test statistics ‘Bai-Perron’ has been selected. The period 2013 that is, 2013-14 has been selected as a feasible significant break point by the Bai-Perron test statistics. Since, the NBS policy was implemented from 1<sup>st</sup> April, 2010, but it will take time to get actual and remarkable effect in agricultural field. On the basis of break point, the total time period has been classified into two sub-periods, such as (i) Prior to regime of NBS Policy (2000-01 to 2012-13) and (ii) Regime of NBS policy (2013-14 to 2019-20).

$$\left. \begin{array}{l} \text{Prior to regime of NBS Policy: } \ln Y_t = \alpha_1 + \beta_1 t + u_t \text{ for } t \leq 2012 \\ \text{Regime of NBS Policy: } \ln Y_t = \alpha_2 + \beta_2 t + u_t \text{ for } 2012 < t \leq 2019 \end{array} \right\} \dots(i)$$

As per the norms of the estimation procedure, the selected variables are  $w_{1t}$  and  $w_{2t}$ . Where

$$w_{1t} = t \quad (\forall t = 1, 2, \dots, 20); \quad \text{and} \quad w_{2t} = \begin{cases} 0 & \text{if } t \leq 2012 \\ t - 2012 & \text{if } 2012 < t \end{cases}$$

The new trend equation is:  
 $\ln Y_t = \alpha_1 + \delta_1 w_{1t} + \delta_2 w_{2t} + u_t \dots \dots \dots (ii)$

The rate of growth of the utilisation of fertilizers (N, P and K) at the different regimes ( $i = 1, 2$ ) can be determined with the help of following expression:

$$[\exp(\beta_i) - 1] * 100 \text{ where, } \beta_1 = \delta_1, \text{ and } \beta_2 = \delta_1 + \delta_2.$$

Again, the equation (ii) is basic equation to the calculation of growth rates for selected parameters into two regimes of fertilisers’ consumption (N, P and K). The variables which are taken for the rate of growth in two phases are  $w_{1t}$  and  $w_{2t}$  respectively. The growth rate of the entire period (2000-01 to 2019-20) has been calculated by fixing the equation (iii) that is

$$\ln Y = \alpha + \beta t + u_t \dots \dots \dots (iii)$$

**Discussion**

From Table-1 which represent the values of descriptive statistics of fertilisers consumption, it is clear that the farmers are highly interested to intensive strategies of cultivation.

**Table-1:** Descriptive Statistics of Fertilisers Consumption (Unit of Measurement: Kg/hectare)

Prior to NBS Policy (2000-01 to 2012-13) (Kg/Hectare)				
Descriptive Statistics	Bihar	Odisha	West Bengal	India
Mean	131.13	53.38	140.04	110.6
Standard Error	11.3	5.18	6.09	6.55
Median	135	50.85	135.35	108.4

Standard Deviation	39.14	17.95	21.1	22.69
Kurtosis	-1.87	6	-1.35	-1.43
Skewness	-0.01	2.17	0.36	0.39
Minimum	81	37.1	113.68	84.82
Maximum	180.6	103.7	172.9	146.3
Coefficient of Variation	29.85	33.62	15.07	20.51
Regime of NBS Policy (2013-14 to 2019-2020) (Kg/Hectare)				
	Bihar	Odisha	West Bengal	India
Mean	205.94	67.87	157.88	128.29
Standard Error	8.93	4.47	5.02	1.76
Median	204.95	64.9	161.15	129.3
Standard Deviation	25.27	12.64	14.19	4.98
Kurtosis	-0.79	4.72	3.55	1.09
Skewness	0.06	2.01	-1.65	-1.11
Minimum Value	169.9	57.1	126.9	118.5
Maximum Value	245.25	96.7	173.8	133.44
Coefficient of Variation	12.27	18.63	8.99	3.88

Source: Author own calculation on the basis of secondary data; N=Nitrogen, P=Phosphorus and K=Potassium

The quantity of fertilizers' application to arable land in the selected states has been increased to the regime of NBS policy. In this regard, few logical points intuitively may be noted that for growing up yield of crops within recommended period, they (small and marginal farmers) think that the chemical fertilizers' is only one suitable option for HYV seeds as agriculture is their basic earning field. It helps to secure their livelihood. Besides, due to modernisation in agriculture, the farmers have replaced not only old techniques of cultivation but also harvesting strategies by advanced technology, which has created severe scarcity of organic fertilizers such as animals' dung. Therefore, such environment of agriculture automatically compelled the farmers to accept the inorganic fertilizers as prime fertilizers to cultivate the various crops. As per table-1, it is noticed that the farmers of Bihar state have applied fertilizers in larger quantity to per hectare and it is followed by West Bengal, India and Odisha to the regime of NBS policy. Besides, there is more consistency to use of per hectare chemical fertilizers for all study states in the same regime. Among three states, the consistency to the quantity of per hectare utilisation of N, P and K is the lowest to the state of West Bengal and it is followed by Bihar and Odisha. Since, the agricultural environment of West Bengal is far better than that of both Bihar and Odisha in all respect, such as, type of crops, irrigated area, qualities of cultivable land, crop seasons, number commercial crops, availability of crop loan and also transport facilities.

**Table-2.** Growth Rate of Fertilisers Consumption during 2000 to 2020 at the different Phases of NBS Policy (Unit of Measurement: Kg/ hectare)

State	Prior to NBS Policy	Regime of NBS Policy	Entire Period (2000-01 to 2019)

	(2000-01 to 2012-13)	(2013-14 to 2019-20)	-2020
Bihar (BF)	7.12*	103.10	5.27*
Odisha (ODF)	6.61*	-1.64*	3.28*
West Bengal (WBF)	3.20*	-0.15*	1.87*
India (INDF)	4.63*	-0.84#	2.34@

\*represents high level significant, # represent significant at 2% level, @ represent significant 6.6%, Source: Author Own calculation on the basis of secondary data; N=Nitrogen, P=Phosphorus and K=Potassium

From the table -2 representing the growth rate of fertilisers' consumption during 2000 to 2020 at the different Phases of NBS Policy, it is observed that the growth rate of fertilisers consumption has been reduced during the regime of the NBS policy significantly for Odisha, West Bengal and India. This growth rate is also the lowest in comparison to the growth rate of entire study period (2000-01 to 2019-20). So it may be quoted that the main objectives of the government about the NBS policy has been succeeded. This policy (Nutrient Based Subsidy Policy) is a constructive part of agricultural policies to the government because it stimulates the farmers to maintain the balance in application of differ Nutrients of fertilizers such as N: P: K to the arable land. Because it is logically appropriate for maintaining sustainability to the fertility power of arable land. It also helps to maintain the sustainability in the quality of ground water.

### Conclusion

The present agricultural scenario compelled the farmers to catch up the lucrative role of chemical fertilisers to increase the productivity of crops within the recommended period. In this environment of cultivation, they are totally careless regarding the adverse effect of imbalanced application of fertilisers to arable land as well as the negative effect on the environment.

In this paper, the impact of NBS policy on utilisation of fertilisers has been analysed by 'Spline function' approach. Now to achieve this goal, first of all, the Bai-Perron (2003) test statistics has been considered to fix the significant break point. In this analysis the year 2013 that is 2013-14 is a significant break point. Therefore, the selected period has been divided in to two regimes. One is prior to NBS policy (2000-01 to 2012-13) and other the regime of NBS policy (2013-14 to 2019-20).

From the empirical analysis it is noticed that due to popularity of intensive strategies in agriculture, the farmers have used imbalance quantity of fertilizers to arable land during the regime of NBS policy. In this regard, few logical points intuitively may be noted that for growing up yield of crops within recommended period they think chemical fertilisers is only option. The state of Bihar is in top position and the state of Odisha is in bottom position in respect of quantity to the application of fertilisers. From empirical analysis it is found that the growth rate of fertilisers consumption has reduced during the

regime of the NBS policy significantly for Odisha, West Bengal and India. It is also the lowest in comparison to the growth rate of entire study period (2000-01 to 2019-20). Therefore, it is remarked that the NBS policy may be a little helpful for controlling the adverse effect of imbalanced use of inorganic fertilisers on the sustainability of environment. In this regard, the agricultural extension service will be a vital tool for insisting the farmers to test the quality of soil regularly before utilising the chemical fertilisers to different crops as per recommended scientific ratio of Nitrogen (N), Phosphorus (P), and Potassium (K).

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**CHANGING TRENDS IN MARRIAGE SYSTEM AND ITS  
IMPACT ON THE FAMILY IN TAMIL NADU THE  
FAMILY COURT PERSPECTIVE**

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**Abstract:**

Recent years have shown in an intense change in the sphere of marriage and family. The single most important factor which influence the family life is the quality of the marriage, The family has by common consent, been regarded as the most important and basic element of society. The need to preserve stability and continuity within the family, and to maintain the spirit of faith and confidence amongst its members is almost universally recognized. When the stability, faith and confidence are threatened by a dispute between family members the law is invoked. The very purpose of the family Court act is to promote conciliation efforts should be made to secure speedy settlement of disputes relating to marriage and family affairs and the connected matters.

**Key Words:** Marriage, family, Court, Act. Society,

**Introduction:** The last three decades of the 21<sup>st</sup> century Tamil Nadu state had made tremendous change in marriage and its impact on the family. This social problems in Tamil Nadu in the past did not receive the attention. Even after Independence though the National government accepted the 'welfare state' as its goal and was keen In tackling the various social problems confronting the country. Yet much could not be done immediately in solving these problems because of certain other important problems arises.

Ever since the Indian Constitution was adopted there has been several attempts at different levels, in Government and outside, to make justice easier and to make equal justice under law, a functional reality to all irrespective of one's sex, religion or economic level of living as guaranteed the Constitution. The family has, by common consent, been regarded as the most important and basic element of society. The need to preserve stability and continuity within the family, and to maintain the spirit of faith and confidence amongst its members, is almost universally recognize.

Marriage is an important part of family life a family arises as a result of marriage. The single most important factor which influences the quality of family life is the quality of the marriage that supports it. Marriage is a sacrament in Hinduism and other major religions. A great deal of importance was attached to marriage. The family is by far the most important primary group in society. According to Burgess and Locke have defined "Family as a group of persons united by ties of marriage, blood or adoption, constituting a single household; interacting and communicating with each other in respective social roles of husband and wife, mother and father, son and daughter, brother and sister; and creating and maintaining a common culture."<sup>1</sup> Family is the primary social institution and a pre-requisite unit of the society. Law and life are symbolic and the process of the former. Family arises as a result of marriage. The single most important factors which influence the family life is the quality of the marriage that support it. Marriage is a sacrament in the Hinduism and other major religion.<sup>2</sup>

**Forms of Marriage:**

**Polyandry:** One wife and plurality of husbands. It may be either fraternal polyandry where wife marrying brothers or non fraternal where the husbands need not be brothers.

**Polygamy:** More appropriately called polygyny, refers to one husband and many wives.

**Monogamy:** One man one wife.

**Hypergamy:** Marriage of daughter in superior family.

**Levirate:** Marrying childless widow of his brother.

**Sororate:** Marrying the sister of the deceased wife.

**Soral Polygyny:** Aman marrying several sisters.

**Anuloma marriage:** An inter caste marriage where an upper caste man marries a lower caste woman.

**Pratiloma Marriage:** An inter caste marriage where a lower caste man marries an upper caste woman.

**Concubinage:** A woman cohabiting with a man without marriage.

**Exogamy:** Marrying outside blood relationship.

**Endogamy:** Marrying within the blood relationship.<sup>3</sup>

Family and community seems to have more impact on our happiness than money and health. People with strong families who live in tight-knit and supportive communities are significantly happier than people whose families

are dysfunctional and who have never found a community to be part of marriage is particularly important. Repeated studies have found that there is very close correlation between good marriage and high subjective well being and between bad marriages and misery. Within the family are a matter of unconsciously conforming to traditional attitudes, of accepting roles which conform to the social values expressed in the mores. Most women are content to submerge their identity in adopting their husband's name. Without raising a question as to the underlying significance of the practice.

**Origin of the Family:**

It is difficult to trace the origin of the family, nor is it possible to accept any particular theory of its evolution. It may be noted that it did not come into existence all of a sudden and many factors with varying degrees contributed for its evolution. It was believed by some theorists like Morgan, Lobbok, Frazer that early stages of casual social promiscuity among women and men laid the seeds for the modern family. Realization of economic advantage in men being attached to the mother slowly developed the family system. Prior to the Industrial Revolution the daily life of most humans ran its course within three ancient frames; the nuclear family, the extended family and the local intimate community. An intimate community is a group of people who know one another well and depend on each other for survival.<sup>4</sup>

Family basically provides for home which will work as a giant shock absorber against emotional intensities, provides for warmth and affectionate relationship and sense of belonging. Recent years have shown in an intense change in the sphere of marriage and family. At present rapid industrialization, Proliferation of Multi National Companies, have created a distinct class of youngsters. The born of club culture encouraging the increased inter action and intimate relation across the gender, it causes the ending up of marriage. The primary causes for the marital discard for young couple areas follows:

Rise in violent behavior

Cruelty

Lack of trust on each other

Alcoholism and Gambling

Problems of adjustment, especially in joint family

Extra – marital affairs

Physical illness

Falling values

Hyper tension and

Lack of understanding.

All these alleged misunderstanding of either of the make overt and covert overtures with anyone, beyond the nuptial relationship and willful experiments to change the life partner, When the stability, faith and confidence are threatened by a dispute between the family members the law is invoked. An adjudication in matters concerning the family affects not only the immediate

parties to the proceeding, but also other members of the family. This led to a movement for the creation of family court in India. Family courts have been in existence for several decades in countries like United Kingdom, Japan, Australia and New Zealand etc., but the movement to establish Family Courts in India was initiated around 1958 by Smt. Durgabhai Deshmukh, the social worker from Maharashtra.<sup>6</sup>

The Committee on the Status of Women recommended in 1975 that all matters concerning ‘family’ should be dealt with separately.<sup>7</sup> The emphasis should be laid on conciliation and achieving socially desirable results with the elimination of rigid rules of procedure and evidences. The Law Commission in its 59<sup>th</sup> Report in the year 1974 had also stressed that, the courts ought to take an approach radically different from that adopted in ordinary civil proceedings and that reasonable efforts should be made towards settlement before the commencement of the trial.<sup>8</sup> The Code of Civil Procedure in 1976 which called for a different approach to some disputes and the need for effort to settle them expeditiously since existing courts were overburdened with a heavy backlog of cases and coupled with a tedious dilatory and technical procedure. The committee on the Status of Women in India in its report submitted in the Government of India emphasized the need to establish Family Court.<sup>9</sup>

The Family Court Bill was framed in 1984, this Bill provide for the establishment of Family Courts with a view to promote conciliation in, and secure speedy settlement of disputes relating to marriage and family affairs and for matters connected therewith.<sup>15</sup> The Parliament has passed the family Courts Act, 1984. Under the Act a. provide for establishment of Family Courts by the State Governments; b, make it obligatory on the State Governments to set up a Family Court in every city or town with a population exceeding one million.

The Family Court Act encourage and empowered various state governments to setup a Family Courts in all cities with a population of over one million people. The Ministry of Law Department of Justice is the Nodel Department concerned with the administration of the Act. As per the Family Court Rules of Tamil Nadu the first Family Court was started in Chennai in 1988. It was established on the following :<sup>12</sup>

S. No	Date	G.O. Nos	Courts
1.	03.10.1989		First Family Court <sup>13</sup>
2.	19. 04. 1990		I Additional Family Court <sup>14</sup>
3.	21.09. 1994	1123	II Additional Family Court <sup>15</sup>
4.	13.08.2010	719	III additional Family Court <sup>16</sup>
5.	15.07. 2011	392	Holyday Family Court <sup>17</sup>

It was followed by Madurai in 1992, in Coimbatore in 1995 and Salem in 1996. The primary duty of the Family Courts is to make efforts for settlement in every suit or proceeding, endeavor shall be made by Family Courts in the first instance, where it is possible to do so consistent with the nature and circumstances of the cases. The cases filed in five categories they are as follows:

- Original Petition;
- Original Suit;
- Maintenance Cases;
- Miscellaneous Petition;
- Interlocutory Application.<sup>17</sup>

The cases filed in Chennai Family Courts from the year 2001 to 2005 in the following order

S. No	Year	O.P	O.S	M.C	M.P
1.	2001	1960	146	307	952
2.	2002	2330	178	374	1173
3.	2003	2570	185	471	1337
4.	2004	2843	179	687	1681
5.	2005	2723	129	628	1630

The family Courts Act also covers areas of the following:

Hindu Marriage Act, 1955 ;Special Marriage act,1954;Hindu Adoption and Maintenance Act, 1956<sup>18</sup>;Parsi Marriage and Divorce Act,1936;Indian Divorce Act,1869 ;Christian Marriage Act,1972<sup>19</sup>;Dissolution of Muslim Marriage Act, 1939 ;Hindu Minority and Guardianship Act, 1956 ;Criminal procedure Code , 1973, Sec125,126,127 and 128 ;Guardians and Wards Act, 1890<sup>20</sup>

Every year shows that increasing of the filing cases. Due to the changing trends in family and marriage system affects the entire society. A marriage which is based on exclusively upon the dreaming and extravagant vagaries of romantic idealism without consideration of money, social position, cultural dissimilarities and parental objections, faces a tremendous handicap. The wives and husbands who are convinced that romantic happiness is the sole criterion of marriage are likely to think that something has happened when the edge has worn off first careless rapture. Family disorganization in the external manifestation may take the form of desertion, separation, divorce, physical violence or use of abuse language. But these manifestations are only the superficial symptoms of a break down in the intimate relationships within the family.

Status and role in marriage are also in a process of rapid change, as husband and wife are called upon to assume new social positions and play new parts in the society and family. The traditional pattern of family structure evolved with the time. But the situation has so altered by the rapid changes in the

technology that many former patterns no longer apply. Today the uncertainty and ambiguity of roles in the family mean that persons are unable to adjust to their marital obligations. They are never quite sure what their role actually are. The wife today faces the major confusion in status and role, not because of any temperamental weakness or genic incapability, but because her behavior has changed more drastically than that of man. The educated woman has undergone a considerable change regarding her role and status in society whereas the attitudes of the husband and of the in-laws towards her role and relationship in the family have remained comparatively unchanged.<sup>21</sup>

The Family Courts has increased the number of petition every year consistently the data for the year 2001- 2005 were enumerated the registers maintained by the family Court, Madurai, Tamil Nadu. The ratio of divorce petition filed under mutual consent was high, the consistently increase for the dissolution of marriage. The idea of the concept of divorce is very old and its origin is not traceable. In India being a vast country, the concept of divorce different from caste to caste and place to place.<sup>22</sup> In Hindu law, marriage being a pious obligation was treated as eternal, indissoluble, holy union. It is, in fact, treated as a tie which continue even after death. Divorce was not permitted even in extreme situations.<sup>23</sup>

Gender of Petition	2001	2002	2003	2004	2005	Total
Women	390	397	575	574	732	2666
Men	351	410	550	600	720	2631
Total	741	807	1125	1174	1452	5297

The statistics shows that the number of petitions has increased every year almost double in the 5 years. Though Counsellors and the and the Psychologist advocates the importance of family and society they never realize their position.<sup>24</sup>The family Court Act provided for the appointment of full time marriage counsellors for each court, According to their opinion of the family counsellor<sup>25</sup>, lack of commitment for marriage, failed expectations, conflict between individual, unhealthy relationship,ego clash, addictions and substance abuse, physical, sexual and emotional abuse, mismanagement conflict, poor communication, extra- marital relationship, lack of trust on each other dowry harassment, sexual in compatibility, physical illness, conflict with in-laws were expresses as the causes for the matrimonial disputes.<sup>26</sup>The socio-psychological change in the attitude of educated earning women have undergone a considerable change regarding her role and status in society. Whereas the attitudes of the educated woman have pointed out that the attitude of husband and of the in-laws towards her role and relationship in the family have remained unchanged.<sup>27</sup>Before ten years before 2000 Divorce cases were filed in Family Courts, Chennai. At present more than 8000 cases are still in the family court. IT Technocrats had failed in their marriage.

**Conclusion:** The current instability of marriage and family system is the cause for the increase in number of cases coming to the family courts. This was viewed as the outcome of many social and cultural changes of the recent times. The lack of preparation for marriage, hasty marriage, changing economic roles of husband and wife, economic independence of women, the growing individualism, emotional immaturity, economic insecurity, sexual incompatibility lack of respect for elders and in-laws, increasing alcoholism among men were attributed as the primary cause for these problems. The newly married couple, are seeking divorce within a year of their marriage The family court symbolize a very modest beginning showing an awareness that human consideration is paramount in family laws. Marriage is more than a sex relationship with prescription for caring for offspring. It is a functional relationship between two personalities involve some varied items as habits, friendship, aversion, property, ideals, attitudes, purposes and potentialities. When the husband and wife love each other their two personalities function more effectively, because of the marriage relationship. The most important aim of the family courts are achieving their goals in our society.

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## **THE STATUS OF WOMEN STREET VENDORS IN CHENNAI URBAN AREA**

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### **Abstract**

The women street vendors secure self-employment in the urban labour market. The women street vendors are vending the products of vegetables, fruits and flowers and who are travelling from the sub-urban area and adjacent rural area to urban area for street vending. The present researchers attempt to explore the socio-economic status, challenges and pre and post COVID-19 status of women street vendors in the Chennai Urban area. The data has been collected by interview with the structured questionnaire and convenient sampling method used to collect the data from 100 respondents. The majority of respondents having job satisfaction and continue to do the street vending further. This study focuses to identify the barriers and challenges for women street vendors and the outcome of the research will contribute to further research on the subject and policymakers and local authorities can understand the issues from the exact point of view and eliminate the barriers of women street vendors in their jurisdiction.

**Key Words:** Women, Street Vendors, Street Vending, Informal Sector.

### **Introduction**

The women street vendors are contributing good service to the public and the essential commodities are readily available in the nearby locality. The commodities are sold by the street vendors are mostly purchased on a day to day basis and generally available fresh commodities only. The women street vendors are significantly contributing to the economic conditions of their family and ensure the daily income source to their family. The women street vendors are independently purchasing their commodities, brought back to selling point and selling the entire goods by the evening irrespective of climatic conditions of hot air, cold waves, rain session and summer days and polluted air. The public is adopted to purchase small items from the big malls and online purchasing system and still, the women street vendors are performing the vending in the urban area.

The researcher has taken 100 samples through a convenient sampling method. The researcher collected the primary data through the questionnaire with the component of street vending employment and functional variables. The result was analyzed using the simple percentage method. This research and its results are only applicable to the respondents of the Chennai urban area in the category of Women Street Vendors and not applicable to any other places. It is not generalized, the results are subject to change by the personal experience in their street vending career of women and vending place of the respondents.

#### **Demographic Profile**

**Table – 1: Age of Women**

21-30	31-40	41-50	51-60	61-70	Total
34	42	19	4	1	100

The age profile of the respondents shows that the majority (42%) of street vendors are in the 31-40 years category and (34%) of women from the 21-30 years category. The table shows that (19%) of women from 41-50 years category, (4%) from 51-60 years category and (1%) women from above 60 years.

The study shows that (76%) of women from 21-40 years of age and (95%) of women from 21-50 years of age category in street vending.

**Table – 2: Residential area**

Urban	Sub-Urban	Rural	Total
27	52	21	100

The women vendors are from urban, suburban, and rural areas involving in street vending in an urban area. The study reveals that the maximum (52%) of women from Sub-urban area of the city. The second maximum (27%) of women from an urban area and the lowest (21%) of women from a rural area who are travelling to urban area for street vending and return to home on daily basis.

**Table – 3: Residential Status**

Own House	Rented House	Total
28	72	100

The majority (72%) of women street vendors are residing in the rented house and (28%) of women street vendors are having their own houses. The women vendors are spending a major portion of their income on paying rent of the residence.

**Table – 4: Educational Qualification**

Illiterate	Class 1 -5	Class 6-8	Class 9-10	Total
7	12	63	18	100

The majority of women vendors (63%) are studied in class 6-8 category and (18%) of respondents are studied in class 9-10 category. There are (81%) of respondents are in the classes between 6-10 standard. There are 12 respondents are from classes 1-5 and 7 respondents are Illiterate. The women vendors are having different levels of educational qualifications and few of them are illiterate and not facing any difficulties in buying and selling commodities in the public.

**Table – 5: Marital Status**

Unmarried	Married	Divorce	Widow	Total
18	55	14	13	100

The (55%) respondents are belonging to the married category, (18%) of respondents are unmarried category. There are (14%) of respondents are divorced and (14%) of respondents are widow.

**Table – 6: Dependents in Family**

1-2	3-4	5-6	Total
23	62	15	100

The majority (62%) of respondents are having the dependents of 3-4 persons in the family, followed (23%) of respondents are having dependents of 1-2 persons in the family and (15%) of respondents are having dependents of 5-6 persons in the family.

***Street Vending as a Career***

**Table – 7: Street Vending history**

1st Generation	2nd Generation	3rd Generation	Total
47	39	14	200

The majority (47%) of respondents are belonging to 1st Generation street vendors, (39%) of respondents are belonging to 2nd Generation street vendors, and (14%) of respondents are belonging to 3rd Generation street vendors.

**Table – 8: Type of Products**

Vegetables	Fruits	Flowers	Total
47	38	15	100

The majority (47%) of street vendors prefer the commodity of vegetable vending, (38%) of street vendors prefer the commodity of fruit vending, and (15%) of street vendors prefer the commodity of flower vending.

**Table – 9: Sales Pattern**

Sitting	Trolley	Total
86	14	100

The majority (86%) of street vendors prefer the sitting type of street vending and (14%) of street vendors prefer the trolley type of street vending for selling their commodities in street vending.

**Table – 10: Street Vending Hours**

3-4	5-6	7-8	9-10	11-12	Total
5	18	57	13	7	100

The street vending timing pattern is varying from vendors and the type of commodities they are selling. The present study reveals that most (57%) of street vendors are selling commodities 7-8 hours per day, (18%) of street vendors are selling commodities 5-6 hours, (13%) of street vendors are selling commodities 9-10 hours. The (7%) of street vendors are selling commodities 11-12 hours which is the maximum hours reported and (5%) of street vendors are selling commodities 3-4 hours per day reported lowest hours per day during this study.

**Table – 11: Assistance of family members in Street Vending**

Yes	No	Total
69	31	100

The majority (69%) of respondents are getting assistance from their family members by the way of purchasing commodities, dropping to vending place and pickup from vending place. On the other hand, (31%) of respondents are not getting any assistance from their family members in street vending

The street vendors are facing difficulty to procure daily commodities from the wholesale market and rural areas after the post lockdown period. During this survey, most (69%) of respondents are reported that they are facing problems for the availability of the commodities due to low cultivation, transportations issues, change of the location of the centralized veritable, fruit and flower market and instability in demand and supply chain disturbance after pandemic. The lower (16%) of respondents are stated that the availability of commodities has remained the same as earlier and (11%) of respondents are stated that the easy availability of the commodities.

## **Findings**

The age profile of the respondents shows that the majority (42%) of street vendors are in the 31-40 years category and (34%) of women from the 21-30 years category. The table shows that (19%) of women from 41-50 years category, (4%) from 51-60 years category and (1%) women from above 60 years.

1. The majority (76%) of women street vendors are belonging to the age group of 21-40 years in street vending and (19%) of women street vendors from 41-50 years category.
2. The (52%) of women street vendors from Sub-urban area, (27%) of women vendors from an urban area, and (21%) of women from rural area are involving the street vending in Urban area.
3. The majority (72%) of women street vendors are living in a rented house and (28%) of them residing in their own house. The literacy rate indicates that (63%) of respondents from class 6-8 category and (12%) vendors are in the primary level of education and (18%) of them from high school level education qualification. There are (7%) of illiteracy people who are doing street vending job.
4. The majority (72%) of women street vendors are residing in the rented house and (28%) of women street vendors are having their own houses. The women vendors are spending a major portion of their income on paying rent of the residence.
5. The (55%) respondents are belonging to the married category and the balance (45%) is contributed as (18%) of unmarried category, (14%) of divorced and (14%) of the widow. The dependents of family members are reported as (62%) of respondents having 3-4 persons in the family, (15%) of respondents having 5-6 persons in the family, and (62%) of respondents having 3-4 persons in the family.
6. (47%) of women vendors are 1st Generation street vendors, (39%) of respondents are 2nd Generation street vendors, and (14%) of women are 3rd Generation street vendors. The majority (47%) of street vendors are selling vegetables, (38%) of street vendors are selling fruits, and (15%) of street vendors selling flowers.
7. The (86%) of street vendors are sitting type of street vending and (14%) of street vendors prefer trolley type. (57%) of street vendors are selling commodities 7-8 hours per day, (18%) of respondents stay 5-6 hours, (13%) of women are selling commodities 9-10 hours. The (7%) of respondents are selling commodities 11-12 hours which is the maximum hours reported and (5%) of street vendors are selling commodities 3-4 hours per day reported lowest hours per day during this study. The majority (69%) of respondents are getting assistance from their family members and the remaining (31%) of respondents are not getting any assistance from their family members.

8. (43%) of respondents are earning Rs.301-400 and (18%) of respondents are earning Rs.401-600 per day. (13%) of respondents are earning Rs.601-800, (15%) of respondents are earning between Rs.801-1000. There are (11%) of respondents are earning between Rs.1001-1600 per day.
9. The (41%) of respondents are having the experience of 6-10 years category, and (34%) of respondents are having the experience of 1-5 years category, (15%) of respondents are belong to 11-15 years, (7%) of respondents are having the experience of 16-20 years category and (3%) of respondents are having the experience of above 20 years category.
10. The (39%) of respondents are travelling by train (27%) of respondents are prefer a walk, (23%) of respondents are prefer bus and (11%) of respondents are prefer share auto as the mode of travel to reach their selling point from the residence.
11. (54%) respondents are belonging to a family having an earning of 2 members, (33%) respondents are belonging to a family having an earning of 1 member, and (13%) respondents are belonging to a family having an earning of 3 members.
12. (59%) of street vendors are selling the remaining goods on the next day and (41%) of street vendors are selling the remaining goods at a discounted rate.
13. The (63%) of street vendors borrowed loan from private loan/money providers, (16%) respondents from Self Help Group (SHG), (12%) of respondents from personal savings, and (9%) of respondents are borrowing money from friends and relatives to execute the street vending.
14. The majority (54%) of involving street vendors due to lead the life, and (34%) of street vendors to support the family and (12%) of street vendors are engaging street vending due to financial crisis.
15. The majority (47%) of women vendors are reported that the public toilet facility is located far away, (41%) of women vendors are reported that the public toilets located too far away and (12%) of women vendors are reported that the public toiletis available nearby area.
16. The majority (73%) of street vendors are not having a bank account and only (27%) of women street vendors are having a bank account in their names.
17. (69%) of street vendors are reported that the purchase price of commodities is increased after the post lockdown period of the COVID-19 pandemic. (22%) of street vendors are reported that the purchase price of commodities has remained the same as pre-COVID-19 and (9%) of street vendors are reported that Purchase Price of

commodities is decreased in commodities of flowers due to a decrease in the demand.

18. The (59%) of street vendors are reported that they are selling the commodities remain the same as the pre-COVID-19 situation and no change in the pattern of selling the commodities. (18%) of the street vendors are reported that they can easily sell the products during the post lockdown period and (23%) of street vendors are expressed that they are facing difficulties to sell the commodities after post lockdown period.
19. (61%) of the street vendors are stated that the income level after the post lockdown period remains the same as earlier. (24%) of street vendors are stated that the income level has decreased after the post lockdown period and (15%) of street vendors are reported that the income level has increased after the post lockdown period.
20. The individual doing any kind of job should have job satisfaction irrespective of the job profile, income pattern, and educational qualification. This study reveals that (81%) women street vendors have stated that they are satisfied with the job and having a lot of hindrance of environmental issues and manmade issues and social causes. The least (19%) of respondents are not satisfied with the street vending career.
21. (86%) of women street vendors are expressed that they will continue the street vending in future which is being livelihood of them and (14%) of respondents are stated that they will change to some other profession and not likely to continue the street vending.

### **Conclusion**

Women street vendors were played important role in the COVID-19 period and bringing goods at doorsteps like vegetables and fruits. The lockdown period due to COVID-19 has adversely affected sources of livelihood as a result of which might have also consumed saving during this period. Therefore, is urgent to need to provide credit for working capital to resume their business recognizing this immediate requirement. The majority of women street did not have the license for street vending, due to a lack of knowledge and unaware of the procedures to avail of the license. If the authorities create more vending zones and make the formalities of the grant the license to the vendor's much easier, the women street vendors will be benefitted. The women vendors mostly depend the money on private people for the vending and banks are not offering a loan to street vendors. They borrow money with a high-interest rate from private people and returning money on daily basis. The bank loan facility for women street vendors will boost this category and they live a dignified life without any stress. The government needs to formulate various programs to address the need for women street vendors hassle-free manner.

The women street vendors have various challenges in a society like the competitiveness of neighbouring vendors, small & big shops, malls and increase the trends in online purchase. They are low wages earner and long been recognized as a driver of inequality. It has a direct link to wage inequality, lower-income, poor education outcomes and physical and mental health has been affected. The unpaid and invisible working hours has been exacerbated exponentially by COVID-19. Without adequate support, the long term cost of stretching, women works to patch up the holes in social protection and public service. Provision can be enormous so that immediate action is needed to guarantee continuity of care for those who need and recognize the women street vendors participation in the labour force.

They have been concerning weaker section to come to feed their daily bread so they are sellers, not a beggar. The women vendors are selling the goods and commodities having a low price but it does not mean they should be treated at a low level. Our society views them to be changed and treat them in a dignified manner. The impact of health pandemic can make it more difficult for receiving treatment and health service amongst women street vendors. Proper inclusion of making policy and schemes, concern needed immediate attention to women street vendors.

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**RECLAIMING ENVIRONMENT, REVISITING  
MALDEVELOPMENT: A COMPARATIVE STUDY OF  
T. S. ELIOT'S *THE WASTE LAND*  
AND SARAH JOSEPH'S *GIFT IN GREEN***

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**Abstract**

Environmental crisis as a global emergency has been dealt by writers, thinkers, and activists in manifold ways for centuries. Since the survival of the human race depends upon the environment, any activity detrimental to it ostensibly jeopardizes the future of the human race. Nevertheless, the evolution of the human race has ushered in the development of human civilization at the cost of the environment, which is one of the major paradoxes of development. Vandana Shiva equates this development to “maldevelopment” as it entails the destruction of the environment and is bereft of “the feminine, the conservation, the ecological principle”. Admittedly raising the ecological consciousness has been a major concern of writers across the globe – be it post-war environmental destruction, industrialisation, illegal dumping, landfills, deforestation, hazardous nuclear waste, or exploitation of the environment due to technological development. Taking a cue from this, this paper juxtaposes two powerful texts from two different centuries which are T. S. Eliot’s *The Waste Land* (1922) and Sarah Joseph’s *Gift in Green* (2011) to examine the issues related to the exploitation of the environment across time, space and culture. The paper explores fraught intersections between technologically driven development and environmental

hazards in the two texts where the writer's major concern is to reclaim the lost environment by revisiting maldevelopment by highlighting the inadequacies of the developmental model adopted by modern men. Nevertheless, both the texts while depicting the adverse impact of development, industrialisation, and urbanisation on humans and the environment ends on an optimistic and hopeful note that both human and environmental loss can be renewed if approached timely with the right intentions.

**Keywords:** environment, degradation, development, maldevelopment

The dysfunctional relationship of humans with the environment is universal and can be seen in all modern societies. However, in ancient societies men used to live in harmony with their environment but due to industrialisation, capitalisation, technological advancement, the bond of humans with the environment gets ruptured. All these contemporary advancements are undertaken in the name of the development of human society but this development leads to environmental exploitation. Therefore, a prominent ecofeminist of India, Vandana Shiva (2010) equates development to "maldevelopment" and argues "what is currently called development is essentially maldevelopment, based on the introduction or accentuation of the domination of man over nature and women" (p. 6). This domination of nature results in environmental deterioration which in turn adversely affects not only the physical health of human beings but also their spiritual life across cultures and time.

Comparative literary studies emphasize such intercultural connections as illustrated by Mathew Arnold, "Everywhere there is connexion, everywhere there is illustration: no single event, no single literature, inadequately comprehended except in its relation to other events, to other literatures" (qtd. in Sahin, 2016, p.6). Later, Rene Wellek (1970) while quoting the famous Van Tieghem's understanding of comparative literature states "the object of comparative literature is essentially the study of diverse literatures in their relations with one another" (p.15). This explicitly states that the relation between different literary works requires to be addressed while comparing two works. In a similar vein, the present paper aims to undertake the comparative study of two texts belonging to different times and spaces in order to bring out the relation of one with another regarding the representation of environment vis-à-vis maldevelopment. The texts under consideration are T S Eliot's *The Waste Land* (1922) and Sarah Joseph's *Gift in Green* (2011). This comparative study is important to showcase the universal human behavior that after almost nine decades *The Waste Land* (1922) echoes in *Gift in Green* (2011) in its representation of environmental crisis at the hands of humans and thus, depict similar ecological concerns of these two writers belonging to different periods and different cultures.

T. S. Eliot, a stalwart of modern literature, has incorporated diverse modernistic themes in his works. *The Waste Land* (1922) as a masterpiece of modernist literature is partially personal as well as having universal

undertones in which he has depicted the cultural problems of the twentieth-century of his own generation and more specifically of western civilization. Eliot laments the loss of values and corruption in modern times and the dominant tone along with lament is of nostalgia of the lost past. Along with moral and spiritual decline, one of the prominent themes in the text is the immense ecological degradation caused by the human activities in the race of material advancement and development which makes *The Waste Land* (1922) a critique of modern industrialization as maintained by Archana Parashar (2015)

One major theme that Eliot treats in detail is the role of technology and industrialization in the downfall of Western civilization. Unlike earlier modern poets such as Walt Whitman, Eliot uses *The Waste Land* to draw connections between the mechanization and technological advancement in everyday life and the degradation of human dignity. In this way, Eliot's poem can be read as a criticism of the Industrial Revolution and its effects on society. As Eliot radically juxtaposes these images of modern industrial society against allusions to mythology, he uses the disjointed and chaotic structure of *The Waste Land* to demonstrate the difficulty of finding meaning in the modern world. (p. 160)

On the other hand, Sarah Joseph is a contemporary South Indian writer and is a potent voice against marginalisation and oppression of the women and exploitation of the environment. Besides, she is equally renowned for her active role in environmental movements in South India along with her writings. Her novel *Gift in Green* (2011) that is originally written in Malayalam, is translated into English by Valson Thampu. This novel traces the story of the transformation of Aathi- a serene village surrounded by pristine water bodies into a degraded and decayed place as a result of developmental projects initiated in the village. However, not only Aathi but Joseph has depicted many other places in the novel that represents the adverse impact of human activities on the environment. In the words of Sarah Joseph, "*Gift in Green* has been forged in the furnace of my anguish: anguish at having to witness the corruption of the earth and water that sustain human life and a host of other lifeforms. It is also my protest against the murderous covetousness that despoils the future of the generations to come." (Joseph, 2011)

Sarah Joseph's *Gift in Green* (2011) echoes the issues taken up by Eliot in *The Waste Land* (1922) in many ways right from the concern for a peaceful man-nature relationship coupled with human domination over the environment. The very first similarity between the two texts is their mythical design and non-linear structure. Intertextuality as a common feature in both texts illustrates the flow of the past into the present. Both Eliot's and Joseph's allusion from medieval romances, Puranas, Quran, the Bible, Zen, and Sufi traditions reinforce the ancient human wisdom pertaining human- nature bond

and balance being made in ancient times regarding their relationship with the environment.

Moreover, the works are fraught with historical, political, social, spiritual, and environmental overtones. However, to reclaim environment in both the works will be undertaken to examine the concerns of the writers towards the environment and the attitude of people then and now in order to argue that despite so much human advancement and so-called development human beings are still the same and this development is basically maldevelopment. The post-war modern industrial society of *The Wasteland* (1922) that is concerned about its own selfish pursuits can be seen in the novel too but what makes the two texts dissimilar is the fact that in Aathi there still exists one section of society, spiritually enlightened who are conscious and aware of the fact that environmental degradation is threatening. The other section, motivated by Kumaran is only after their own selfish pursuits and treats nature as well as fellow human beings as means for achieving their ends.

*The Waste Land* (1922) depicts the spiritual degeneration along with the environmental degradation caused by modern industrial activities of man and the hopelessness in modern society but ends with a positive note that by imbibing the values enshrined in oriental philosophy the wasteland can be turned into fertile and prosperous land, this same kind of faith is shown by Vandana Shiva (2010) maintains, “ Recovering the feminine principle as respect for life in nature and society appears to be the only way forward, for men as well as women, in the North as well as the South” (p. 222). Therefore, the oriental philosophy that believes in reverence towards nature and recognises life in non-humans is required to be followed to restore the environmental crisis. *Gift in Green* (2011) shows the environmental crisis brought in by the developmental activities initiated by modern city men in the village Aathi and its impact on the environment and on the life of people. What makes both works comparable is the depiction of environmental degradation as a result of masculine activities. The first world war and industrialisation is modern men's endeavor that results in human loss as well as environmental loss in *The Waste Land* (1922) whereas developmental projects in the *Gift in Green* (1922) too are initiated by men that enormously affect the environment and human lives. These patriarchal practices and the ideology of assuming nature as passive in the developmental model results in crisis and the same is illustrated by Vandana Shiva (2011)

Patriarchal categories which understand destruction as ‘production’ and regeneration of life as “passivity” have generated a crisis of survival. Passivity, as an assumed category of the ‘nature’ of nature and of women, denies the activity of nature and life. Fragmentation and Uniformity as assumed categories of progress and development destroy the living forces which arise from relationships within the ‘web of life’ and the diversity in the elements and patterns of these relationships. (p. 3)

The literal meaning of wasteland suggests the land that is barren and has no value. And metaphorically, it represents the human beings who have lost all values and the corruption in modern civilization has reduced them to waste too as depicted in “The Burial of the Dead”

What are the roots that clutch, what branches grow  
Out of this stony rubbish? Son of man,  
You cannot say, or guess, for you know only  
A heap of broken images, where the sun beats,  
And the dead tree gives no shelter, the cricket no relief,  
And the dry stone no sound of water (Eliot, 2001, p.5)

These lines suggest the despair and gloominess of modern times that cannot be even comprehended by the mythical figures ‘son of god’, the current ecological chaos can only be observed and suggests the environmental exploitation like “the dead tree gives no shelter”, “heap of broken images” (Eliot, 2001, p.5) and scarcity of water. *Gift in Green* (2011) also provides the analysis of chaotic society as a result of environmental degradation where the picturesque and pristine landscape has been turned into ‘wastescape’ and ‘desertscape’. Now there are no water bodies in the village as they have turned into landfills and innocent villagers remember those past days and mourn for the loss.

Eliot postulated the Global environmental concerns in *The Waste Land* (1922) and becomes relevant to understand the present-day predicaments through the depiction of cities that are rendered unreal by Eliot and thus making them universal across time and space when he says in “What the Thunder Said”, “Falling towers//Jerusalem, Athens, Alexandria//Vienna London//Unreal” (Eliot, 2001, pp.17-18). This description of different cities parallels the description of different places in the novel. London, Vienna, Jerusalem, Athens, Alexandria are being presented as “unreal” (p.17) wherein inhabitants are living a mechanized life and the city is covered with brown fog as a result of pollution and immense industrialization. Similarly, in *Gift in Green* (2011), one of the characters Divya who lives in Mumbai narrates the plight of the people of Mumbai and their struggles for clean water to her brother as most of the water bodies are being polluted. In her words,

The water there is heavily chlorinated. Not good to drink. Or even to bathe with. Tea made with it makes you nauseous, it tastes so awful’, Divya complained. Drinking water had to be bought. Those who could not afford to buy safe water used tanker water for drinking and cooking. Every now and then an epidemic of vomiting and diarrhea broke out and lingered as though reluctant to leave Achhu had got the infection once. It nearly killed him. (pp. 30-31)

Furthermore, in the description of various places, the author brings to fore the havoc man has wrecked on the environment through the illustration of Mumbai, Chakkam Kandam, Guruvayoor, etc. The contrasting pictures of different places narrate the story of their destruction. For example, the contrast

between Chakkam Kandam and Aathi represents the dirtiness and wastescape of Chakkam Kandam and its impact on people and on the village collectively that no one wants their daughter to get married there because of the widespread filth and polluted water bodies. However, Aathi, a pristine and serene island before the arrival of Kumaran is inhabited with mangroves and people are living happily. The longing for the lost past is one of the themes of *The Waste Land* (1922) that can be analyzed in the novel also that how people of Chakkam Kandam still remembers the happy days of clean water bodies and untouched landscape as one of the villagers, Shailja's mother-in-law tells her about how her husband used to cultivate paddy field and the land was full of coconut and areca palms with backwaters adding to the beauty of the village. Zooming further into the novel, another character living in Chakkam Kandam Chandramohan laments,

Water is our only source of livelihood. If we have survived, it is because of Chakkam Kandam Kayal. She used to breed as much fish as we ever needed. We rushed to her when guests arrived. In ten minutes we could gather enough prawns with our bare hands to meet our needs. How carefree and contented we were! Today everyone hesitates even to touch what slimes in places of that water. It is doubtful if there are any fish. Even if they are, who will eat them? (Joseph, 2011, p. 95)

Similarly, the lifelessness around the river in the village, Aathi which used to be the symbol of prosperity and growth has become the symbol of decadence as the fishermen of Aathi starts complaining "Of late, the fishermen had been complaining continually. Ever since this thing began, baskets full of empty liquor bottles, plastic bags and rotting food had been accumulating in the mangrove forests" (Joseph, 2011, p.86). Joseph highlights various other anthropogenic activities that destroy nature like the disposal of medical waste through the character of Shailaja who suspects Sweeper Mary and asked her where does the medical waste go? And to her utter surprise, the sweeper replied 'to the bottom of the earth' (p.72). It is not only the medical wastes, placenta, umbilical cords, sanitary napkins that are being dumped on the earth's surface but "Besides Placentas and murdered fetuses, Shailaja saw, emerging from innumerable cracks and crevices, several limbs, swabs oozing with pus, blood clots, decomposed phlegm, chemical agents, plastic bottles and bags, garbage" (p.75)

Nevertheless, in both the texts water has been used as a metaphor to present the degradation and deterioration of the environment by the insatiable modern man. Eliot has presented what immense industrialization has done to the water bodies, "The river sweats /Oil and Tar" (p.14). Oil and Tar is the symbol of industrial waste that is drained recklessly in water bodies and the same can be analyzed in the novel too, thus universalizing the human attitude towards the environment over time, space and culture. "None of us ever eats or drinks anything here', the women said, their faces creasing with aversion. Shailaja was horrified. The wells, the ponds, the channels, the streams, and

backwaters, which spread like an ocean in front of the house, were all covered with layer upon layer of shit” (Joseph, 2011, p.80). The picture of dying mother earth is clearly visible in the closing lines of the third section in ‘The Fire Sermon’ as

Burning burning burning burning  
O lord thou pluckest me out  
O lord thou pluckest  
Burning (Eliot, 2001, p.15)

However, the beginning of the last section “What The Thunder Said” takes the readers towards the culmination of wasteland which is apocalyptic in many ways as the very source of life- water has become polluted and scarce.

Here is no water but only rock  
Rock and Wind and the sandy road  
The road winding above among the mountains  
Which are mountains of rock without water  
If there were only water we should stop and drink  
Amongst the rock one cannot stop or think  
If there were only water amongst the rock (Eliot, 2001, p.16)

Nonetheless, while juxtaposing the two texts it is equally important to trace the differences between the two works. So, what differentiates both texts is the presence of environmentally and spiritually enlightened people in *Gift in Green* (2011). In *The Waste Land* (1922), Eliot represents the entire modern society as corrupt who are socially and morally uprooted whereas in *Gift in Green* (2011) there is Kunjimathu, Shailaja, Dinakaran, Ponmani, etc who shows resistance and are aware of the fact that Kumaran’s development project would bring no prosperity in Aathi. Another feature that distinguishes the two texts is the representation of female characters. The female characters in *The Waste Land* (1922) are living mechanical life having no concerns with nature and living a loveless life just for the sake of living as Shamsie Farzana (2015) argued “Eliot's *The Wasteland* is an appropriate exemplar of a piece of literature which presents the punishing and painful realities of women's lives during the twentieth century, as well as their enslaved role during a repressive Victorian era” (p 62). In contrast, the female characters in *Gift in Green* (2011) are self-realistic and have a deep connection with nature as they strive hard to save the water bodies of Aathi because they are aware of the fact that the destruction of the environment ultimately leads to their destruction. Vandana Shiva (2010) has pertinently drawn an intense connection between Third World Women and Environment when she propounds:

Third World Women are bringing the concern with living and survival back to center-stage in human history. In recovering the chances for the survival of all life, they are laying the foundations for the recovery of the feminine principle in nature and society, and through it the recovery of the earth as sustainer and provider. (p.224)

Understandably, both the texts analysed in this paper give a clarion call to human beings to view the environmental devastation as an emergency failure that may land the human race in a metaphoric wasteland. Loss of environment not only leads to physical loss of humanity but spiritual and emotional loss too and the forces that degrade nature lead to the degradation of human relationships. So the preservation of the environment in this consumerist culture is required to restore the loss. Moreover, the symbol of water is widely used in both texts to establish that humans have a deep connection with it as mentioned in the novel “Water: the unending, ever-renewing fountain spring of life” (Joseph, 2011, p.44). However, the optimistic ending of Eliot’s *The Waste Land* (1922) and *Gift in Green* (2011) gives hope to humanity that by mending our ways both the environment and spiritual loss can be revived. The poem ends with the falling rain that is the symbol of growth and life and the voice of Brahma from the Upanishads traced in the thunder ‘Datta, Dayadhvam, Damyata’ – that is to give (to fellow beings and to nature), to sympathise (with humans as well as non-humans) and to control (selfish desires) and this hope in oriental philosophy is reflected in *Gift in Green* (2011) wherein one enlightened section of people has saved Aathi from becoming a dystopia. Ostensibly, towards the end of *Gift in Green* (2011) it is also the rain that washes away the foul smell, waste, and the projects initiated by Kumaran and the next day a new life in Aathi begins “The whisper of seeds sprouting in the dark//The aroma of clay from the Pokkali fields//And fingerlings playing in the waters of Aathi.” (p.348). Thus, the optimistic ending given by writers provides the much-needed hope and a way forward for the survival of humanity which is otherwise in jeopardy because of human-induced environmental crisis.

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## **IDENTIFYING THE VARIOUS SOCIAL GROUPS IN THE 'JĀTAKAS'**

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### **Abstract**

Caste is a highly contested question in the Indian academia. The Indian Caste System is a closed system of stratification, which means that a person's social status obligates to which caste they were born. There are limits on behavior and interaction with people from different social status.

It can be seen that the caste and identity formation are analyzed within the matrix of changing dimension of different hierarchical structures within the domains of socio-political and economic spheres. Caste is nurtured by the socio-cultural, economic and political condition of transitional time and space and institutionalized by the hierarchical values, ideology, and norms. This kind of Social Stratification distinguishes the Varna divided society found in the age of Buddha. In this background, my paper endeavors to explore the identity of caste group to bring in the evidence in the light of Buddhist texts, the 'Jātakas. By analyzing the various caste group, their experience, and identity by situating within the context of socio, political and economic sphere, we can discern how ideology, values, and norms circumscribed their roles and identity. Their identities and experiences were entangled in the manipulative strategy of the established hierarchical ideological structures. In this contextual analysis of the Jātakas stories tried to unravel these caste group which had a different identity with some freedom in the social and economic domain but were not fully detached from the socio-economic structures, of the dominant cultural system.

**Keywords:** *Varna, Occupational Identities, Social Stratifications, Hierarchical, Jātakas.*

**Introduction** A few sociologists, anthropologist and historians have written comprehensively and adequately on the caste. M.N. Srinivas (1959), G.S.

Ghurye (1969), Andre Beteille (1970), Celestin Bougle (1971), Richard Fick (1972), D.D. Kosambi (1956, 1975), R.S Sharma (1968, 1980), V. N. Jha (1991), N.K. Wagle (1966,1995) and Devanathan (1997), respectively touch the core of several themes related to caste in their books and numerous articles. Academicians like Romila Thapar (1984), Suvira Jaiswal (1991), Uma Chakravarti (1993), and Diane. P. Mines (2009) also show an awareness of the latest trends and development in disciplines like history, sociology and social anthropology regarding caste formation during the Sixth century BCE to third century CE. Different historians, sociologist, and scholars may define the association between caste and occupation as the crucial basis of caste during late nineteenth and early twentieth centuries. Though some argued that the real structure of caste is based on the rituals one practiced, while other group argued that it is based on occupation one should perform. Earlier, there were general associations between caste and occupation, that is, non-manual, ritual occupations were associated with superior caste while manual and menial occupations were associated with the lower caste. This association is true to a certain extent. However, it may change as per time and space.

#### **Historical Discourse**

Narendra

Wagle

<sup>1</sup> in “*Society at the time of Buddha*” conducts a comprehensive discussion of the social conditions, and considers *brāhmaṇa* and *kṣatriya* to be the real socially differentiated group but not the *vaiśya* and *śūdra*, as the lines between them were blurred. On their basis, Wagle concludes that *brāhmaṇas*, *buddhists*, and the *gahapatis* represent three social ranks. He also throws some light on the position of the *gamanis*. The various epithets and names applied to these functionaries disclose their tribal and military origin; the terms *Yoddhda*, *Assiroha*, *Hatthiroha*, *Asibandhaka*, for instance speak for them. The society at the time of Buddha had generally been categorized into Kshatriya, Brahmanas and Gahapatis using the term Kula for the unit of categorization<sup>2</sup>. The alternative scheme of these categories is invariably used in situations where the common people are present and represent a division of society into the domains of power, ritual, and the economy<sup>3</sup>. Regarding the society at the time of Buddha, Uma Chakravarti argues that Buddhist rejected the Brahmanical arrangements of fourfold division in society in which the inferior automatically served the superior and had different vision related to the caste system. She further said that with regard to his *varna* scheme anyone who possessed wealth, could employ other to work for him. Buddhist text also discarded the notion of the specific function of Shudras to serve the other three *varnas*. They indicated the existence of the notion of high and low for various social categories. Related to this evidence, it appears that there was no

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<sup>1</sup>Wagle, Narendra, *Society at the Time of the Buddha*, Popular Prakashan, Bombay, 1960, P.92.

<sup>2</sup> Uma Chakravarti., *Beyond the kings and the Brahmanas in Ancient India*, pp. 258

<sup>3</sup> *Ibid.*, pp. 305

complex system of ranking in the society. They formed a two-tier system of stratification as high and low appears in the context of *ajāti*, *kula*, *kamma*(work) and *sippa*(craft). Therefore, it appeared that there were high *jāti* and low *jāti*, high *kula* and low *kula*, high *kamma* and low *kamma* and high *sippa* and low *sippas*.

Categorizing the above *Kula*, *Kamma* and *Sippa* into high and low was based on certain principles with reference to the Buddhist system of ranking. According to which those who work for themselves were called as owner and producers are high and those who work for others were low. In this regard *Gahapati*, *Gopaka*, traders are high while flower sweeper, the bamboo worker is low. In another system of ranking, there is a division of high and low as per manual and non-manual work skill. In this regard, accounting, writing considered as high while basket maker, leather work, barber and so on were considered as low.

The primary identity of the individual dependent on their economic performance during the period of fifth century BCE to third century CE. There are various caste identities depicted in the society at the time of Buddha. In *Tittira Jātakas*<sup>4</sup>, represented the three classes looked upon as narrated in their order of succession as *Khattiyakulapabbajeto* (kshatriya), *Brahmanakula Gahapatikula pabbajito* (Brahmana and Gahapati).

These are divided hierarchically into broad caste categories such as Brahman, kshatriya, Gahapati (vaishya), the Artisans and the service classes and untouchables. Instead of their traditional vocations, they constituted a source of labor to meet the requirement of agriculture and other activities<sup>5</sup>. All the above three castes of Brahman, Kshatriya, Gahapati are in an equal position in the *Modichour Jātakas*<sup>6</sup>. *Varna Vyavastha* always presents in Indian society. In this tradition social system continuously running in the society at the time of Buddha. The specificity lies here to hold the system in such a manner in which if individual of one caste by choice adopt the occupation of another caste even though their varna could not be transformed. Under the present study, the various occupational groups represented in the *Jātakas*

#### **Occupational division**

Occupation may define as a set of activities designed to produce a livelihood. These activities decided a certain of a particular occupation. The most important term associated with it is *sippa* (craft). The society at the time of Buddha divided into two groups as *uccha* or *high sippa* and *low sippa*. The high *sippa* specified as counting(*ganana*), writing(*lekhana*), teaching and low *sippa* as leather worker(*cammakara*), potter(*kumbhakara*), reed-worker(*najakara*), the tailor(*pesakara*), and the barber(*nahapita*). In another place bowmen ship, agriculture, cattle rearing, trading and king's service

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<sup>4</sup> *Jātaka*, Vol. i, story no. 117, P. 260

<sup>5</sup> Thapar, R., *Tribe Caste and Religion in India*, 1977, pp.31

<sup>6</sup> *Jātaka*, Vol. ii, story no. 316, P. 118

differentiated from the *sippa*. ‘*Sippa*’ is a term used for both manual and non manual skills while craft is used for manual skill only. On the basis of this we defined the different categories of occupations practiced various occupations in the society at the time of Buddha:

### **Service occupations**

In *Mukha devaJātakas*<sup>7</sup>, *Kusa*<sup>8</sup>, *Gang mala*<sup>9</sup>, *Bhimsena (weaver), Jātakas*<sup>10</sup>, showed service groups. This includes washermen (*rajaka*), the painter (*cittakara*), the barber (*nahapita*), the weaver (*pesakara, tantavaya*), and cook (*alarika, suda*). But among them the most respected service occupation in instances is the *nahapita* (barber). Sometime he enjoyed a highly lucrative position in king’s court and sometime his *sippa* considered as low and is abused by angry mother queen as low born (*nihina-jacco*) and the remover of dirt (*malamajjano*). In order to refer the king by his name. His occupation is hereditary in character as his son follow the same craft when he is old. He was giving their services in exchange of food and money.

Another occupation considered as *pesakara* (weaver) as *low sippa*. In many instances he is described as poor (*daridra*). While the cook (*suda*) enjoys better position as compared to them. He provided his service to the king, in exchange received salary and clothing, house and even gratitude (*abhihara*) for good service. The last service attendant is (*nahapaka*) bath attendant. But among them both *nahapaka* and *rajakaputta* (son) work instead of them.

### **Artisans**

In *KusaJātakas*<sup>11</sup>, *Cullaka setthi*<sup>12</sup>, *Sutta vibhangaJātakas*<sup>13</sup>, shows from the stories there were different groups of artisans. It includes the reed-worker (*nalakara*), the potter (*kumbhakara*), carpenter (*palaganda*), goldsmith (*suvannakara*), metal-smith (*kammara*), vehicle-maker (*yanakara*), needlemaker (*sucikara*), gardener (*malakara*), silkproducer (*kosiyakara*), ivorymaker (*dantakara*) and so on.

*Nalakara* as basket maker and reed maker is differentiated from the vena. His craft is a *sippa*. They lived in a village of (*nalakara gama*) outside the city near forest. This might be because of need to collect reed from the forest.

*Kumbhakara* as the potter is the most important artisan in many instances. His craft is also considered as a *sippa*. His occupation was a *low sippa*. This was the only means of their livelihood. He also lived outside the city near rivers or ponds.

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<sup>7</sup>*Jātaka*, Vol. i, story no. 9, pp. 30-32.

<sup>8</sup>*Jātaka*, Vol. v, story no. 535, pp. 142-163.

<sup>9</sup>*Jātaka*, vol. iii, story no. 421, pp. 266-270.

<sup>10</sup>*Jātaka*, Vol. i, story no. 80, pp. 203-205.

<sup>11</sup>*Jātaka*, Vol. v, story no. 535, pp. 142-163.

<sup>12</sup>*Jātaka*, Vol. i, story no. 4, pp. 14-20.

<sup>13</sup>*Jātaka*, Vol. i, story no. 89, pp. 303-307.

*Yanakara* as the vehicle-maker, very little is known for him. It is shown that he dealt with the repairing of the wheel. The next artisan is *sucikara* as needle maker and is different from the needle vendor (*suci-vanijja*).

*Kammakara* identified as a metal-smith. He deals with the iron in shaping and modifying them. His position was also considered low as compared to the *Suvannakara* (gold-smith). He dealt with most prized metal. Here the poverty and low status contrasted with wealth and high social status.

The *palaganda* identifies as a carpenter. He also lived outside the city in his village. He dealt with the wood that was the reason lived near the forest. Next to them is the ivory-worker (*danta-kara*). His craft was also valuable and made needle and many accessories from an elephant tooth. He sold his items at the market near village to maintain his livelihood. He collected all his business material from the forest, like the carpenter he too lived near the forest in a village.

*Malakara* identified as a gardener. He provided his services in the king's court and some maintained their livelihood by selling vegetables in the city and village. Former position is considered respectful as compared to the village gardener. His craft is described by the king as *sippa*. And the work of the *puppha-chandaka* identified as flower-cutter as *low sippa*.

Next artisan is the *kosiyakara* as silk-worker. He dealt with the silk-rearing and making. He worked against the ethics and moral of Buddha, not to kill animals for the sake of his livelihood.

### **Professions**

*Mahasariipa*<sup>14</sup>, *Sarabhanga*<sup>15</sup>, *Padakushala Manav*<sup>16</sup>, *Digihitakosala Jātakas*<sup>17</sup> described the next group of occupation as profession. It included the doctor (*vejja bhissaka*), writing (*lekha*), money changing (*mudda*), accounting (*ganana*), teaching, rituals practicing, future teller and so on considered as high occupational groups. From the above occupation the profession of doctor appeared socially valued the most as *Jivaka*. His paternity is unknown. He adopted the profession besides his paternity. While the *Upali* former barber later on learned the *vinaya*. Both were ascribed as low birth. And adopted the occupation besides their paternity. But the barber was abused by the mother queen and the *jivak* as doctor liked by the people.

Thus, from the above instance it is shown that the profession opted by them makes the differences between the two and considered them as low and high. It shows that intellectual occupation considered as high. It includes the writing, accounting and dealing in money to be the best profession.

### **The Entertainers**

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<sup>14</sup> *Jātaka*, Vol. ii, story no. 212, P. 117.

<sup>15</sup> *Jātaka*, Vol. i, story no. 72, pp. 174-176.

<sup>16</sup> *Jātaka*, Vol. ii, story no. 156, pp. 13-16.

<sup>17</sup> *Jātaka*, Vol. i, story no. 137, pp. 293-296.

In *Dubbacca*<sup>18</sup>, *Bhervada Jātakas*<sup>19</sup>, *Sankha dhamana*<sup>20</sup> *Jātakas*, depicted the various group engaged in entertaining. Occupation of this group considered as respected in the society at the time of the Buddha. It includes the actor (*nata*), dancer (*nataka*), drummer (*kumbhatunika*), acrobat (*langhika*) women fortune teller (*ikk-hanika*), courtesan (*ganika*), magician (*sokajjayika*) and so on the chief entertainer. Amongst them the above four shows their art at fairs and other place. And sometime also shows in king's court. They received remuneration for their act from the audience. In contrast to that the low caste entertainer (*candela vamsika*) and his assistant (*antevasi*) were acrobat of different type. They were socially more inferior and poorer. They lived outside the city in their village.

### ***The king's service***

In *Sutta vibhanga*<sup>21</sup>, *Ajanna*<sup>22</sup>, *Kalaya Mutthi*<sup>23</sup>, *Kharassara*<sup>24</sup>, *Kuta Vanija*<sup>25</sup>, *Dhammaddhaja*, *Cullasutasoma*<sup>26</sup> *Jātakas*, and so on showed from the instances, the various kinds of skilled individual provided service to the king. They were categories in groups as follows: warrior class. It included *yodhavija* (bowmen ship), elephant riders (*hattarooha*), the cavalier (*assaroha*), the charioteers (*ratthika*), archers (*dhanugaha*), bearer (celaka), billeting officer (*calaka*), supply corps (*pindakavika*), fierce warriors (*ugga*), princes (*rajaputta*), veteran warrior (*pukkkhandino*), heroes (*sura*), warriors in buckskin (*cammayodhino*) and body disposer (*karanika*) and the *senapati* (chief of the army). They were specialized in the war.

The second groups supported the king in administration. It includes *rajaporisa*, ministers (*mahamacca*), the territorial governor (*ratthika*), the managers (*pettanikka*), the royal chamberlain (*thapati*), elephant trainer rider (*hattirooha*), cavaliers (*assaroha*), horse trainer (*assadhamaka*), policemen (*raja bhata*), jailor (*bandhanagarika*), the village headmen (*gama, gamini*), the store keeper of wood (*darugaha*), the village overseer (*gamika*), messenger (*duta*), and the slaves and their families (*dasa, dasi*), the workers (*kammakara*). Besides the above service groups there were other who provided their service as the barber, tailor, the cook and so on. They enjoyed highly lucrative position. They get good money and wealth in exchange of their service from the kings. Thus, from the above group it is to point that minister posses the highest power. They had the same power as the king. That is the reason which made their power divided as the minister of justice

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<sup>18</sup> *Jātaka*, Vol. i, story no. 116 P. 259.

<sup>19</sup> *Jātaka*, Vol. i, story no. 59, P.146.

<sup>20</sup> *Jātaka*, Vol. i, story no. 60, P.147.

<sup>21</sup> *Jātaka*, Vol. i, story no. 89, pp. 303-307.

<sup>22</sup> *Jātaka*, Vol. i, story no. 9, pp. 30-32.

<sup>23</sup> *Jātaka*, Vol. i, story no. 14, pp. 44-46.

<sup>24</sup> *Jātaka*, Vol. iv, story no. 463, pp. 86-90.

<sup>25</sup> *Jātaka*, Vol. iv, Story no. 484, pp. 175-177.

<sup>26</sup> *Jātaka*, Vol. ii, story no. 178, P. 55.

(*voharamahamacca*), treasurer (*ganaka mahamatta*), minister of all affairs (*sabbhatthakam maha matta*), and so on. The next important group is the *kammikas*, *gamika* and *rajabhatas*. They act as custom officer, tax collector and safeguard the property of the people respectively. Former collected the road tax or caravan security tax. The *rajabhatakas* service is not considered as low as depicted from the text. Moreover, they manage the highway and guided the people caravan. We find brahmana make his living from them.

#### **Trading and commercial activities**

In *Nigrodhamiga*<sup>27</sup>, *Kanha*<sup>28</sup>, *Pandara*<sup>29</sup>, *Khadiranga*<sup>30</sup>, *Jarudapana*<sup>31</sup>, *Serivanija*<sup>32</sup>, *Veri*<sup>33</sup>, *Godha*<sup>34</sup>, *Silavanaga*<sup>35</sup> *Jātakas*, showed from instances various trading groups. Trading played a vital role in the occupation. *Vanijja* is a term used for it and mention together with agriculture and cattle rearing. The occupation of trading considered as high (*ukkattha kammam*) as compared to the agriculture and cattle keeping. This occupation was followed by the Brahman, gahapati and the members of the extended kin group. Besides this big trading activities, a smaller trading also existed his important role in the society. They were runs by small shopkeeper at village or city level market. They sell meat and wine and so on. It depicted from many instances in the *Jātakas* the community of the hunter practiced the following trades are prohibited to do in future. Thus, it shows that killing of animals considered as low and cruel occupation (*kururakammanta*) in the eyes of the Buddha. He said that the fishermen who sells the fish remained the poor here and hereafter. And a butcher suffers in hell.

#### **Agriculture and cattle keeping**

*Ucchanga*<sup>36</sup>, *Dasabhraman*<sup>37</sup>, *Sudhabhojana*<sup>38</sup>, *Atthana*<sup>39</sup>, *Veri Jātakas*<sup>40</sup> depicted the various groups engaged in agriculture and cattle keeping. Earlier in peasant society agriculture considered as a most important productive source. But in the society at the time of Buddha it is practiced by the people of diverse social groups as per their situation requirement. It is depicted in many instances we find the Brahman Bharadvaja ploughing his land, which requires

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<sup>27</sup> *Jātaka*, Vol. i, story no. 12, pp. 36-41.

<sup>28</sup> *Jātaka*, Vol. iv, story no. 440, P. 7.

<sup>29</sup> *Jātaka*, Vol. v, story no. 518, P. 45.

<sup>30</sup> *Jātaka*, Vol. ii, story no. 191, P. 79.

<sup>31</sup> *Jātaka*, Vol. ii, story no. 249, P. 186.

<sup>32</sup> *Jātaka*, Vol. iii, story no. 320, pp. 44-46.

<sup>33</sup> *Jātaka*, Vol. ii, story no. 103, P. 245.

<sup>34</sup> *Jātaka*, Vol. iii, story no. 333, pp. 71-73.

<sup>35</sup> *Jātaka*, vol. iii, story no. 315, pp. 32-34

<sup>36</sup> *Jātaka*, Vol. iv. Story no. 484, pp. 175-177.

<sup>37</sup> *Jātaka*, Vol. iv, story no. 495, pp. 227-231.

<sup>38</sup> *Jātaka*, vol. iii, story no. 354, pp. 107-110.

<sup>39</sup> *Jātaka*, vol. v, story no. 532, pp. 169-173.

<sup>40</sup> *Jātaka*, Vol. ii, story no. 103, P. 245.

500 plough shares. Other instances we find that the Mallas of Kusinara referring to their gama kheta (agricultural lands). This shows that among the three occupation the agriculture considered as precedence over all. The association of each caste group with their occupation would be considered low in the society at the time of Buddha. As I have already point out that it was the *Kamma or sippa* that provided identity to the various caste group in the *Jātakas*. The important aspect of social and economic and political life reflected in the Buddhist text *Jātakas* cannot be explained by single caste-based framework. It is significant to look at the other various dimension in order to get the clear picture of society at the time of Buddha.

### **Conclusion**

From the above study, I made an attempt in my research paper to situate the identity of caste group with special reference to lower caste group in context to the Buddhist literature '*Jātakas*'. These are the collection of the stories related to the previous birth of the Buddha, written in verses and prose. Bodhisatta or the Buddha is shown in different character with different feeling and emotion. These stories are the main medium for communicating the Buddhist values, norms, and principles with the common people who were discarded from the other high culture tradition. It is in the form of the oral tradition and folk culture, reflected the changing socio-economic condition at the time of Buddha. The relation between the lower caste group and the master also exhibited a spectrum of variations, ranging from the oppressive treatment of long-term effective relationship. Within these nonlinear and flexible dimensions of relationship, few of them obtained independent identities detached from the matrix of hierarchical relationships. The representation of women workers was always portrayed in the context of the occupation that she provided to the masters, which sometimes takes the form of long-term effective relationship also<sup>41</sup>. This rendered them a kind of independent occupational, economic status and power.

Thus, it came to conclude that in Buddhist *Jātakas* we could see a contradiction in its narration of this group of caste and women workers. As egalitarian principles of Buddhism, it never tried to cast out the entrenched dominant tradition and their norms and values, alternatively it maintained a two-pronged effect. The narrative structure laid out the scope for the social mobility and not the social equality in the materialistic domain whereas it provided the space for both on the spiritual plane. Thus, Buddhism never wanted to topple the established structure of the society in its materialistic domain but it exalted the spiritual domain as a space of social equality devoid of any hierarchical unequal relationships.

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<sup>41</sup> Uma Chakravarti, *Beyond the kings and the Brahmanas in Ancient India*, pp.64.



**ECONOMIC ISSUES CONFRONTED BY  
BODO WOMEN AND EDUCATION**

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***Abstract***

This paper attempt to study the economic issues of Bodo Women and the role of education. Research studies in this context found that Bodo women are involved in different activities through which they try to make themselves economically independent such activities are-agriculture, animal husbandry, weaving, sewing, cooking, etc. But they are not much aware of scientific methods, techniques and ways of productivity, they use old -traditional ways of productivity. The role of education is very significant to improve the quality of life of women, eradicate the economic discrimination and make women independent. This study is theoretical in nature therefore, descriptive research method is used for this study. The objectives of the study are- I) To identify the Issues confronted by the Bodo women in their Society. ii) To identify the government plans and policies for women in Assam specifically for economic empowerment. iii) To analyze the importance of formal and vocational education for Bodo women. iv) To provide some suggestions for improving economic life of Bodo women.

**Key -words-** economic empowerment, education, discrimination, social context.

## **INTRODUCTION-**

Women constitute half of the world total population. In the context of Indian social scenario, the status of women in different fields such as-social, political, economy, cultural, education has been subject to many changes over the span of recorded Indian history. To make a modern Indian society women must be given equal opportunities in all fields of development along with men. To achieve this objective the Indian constitution prescribes some constitutional provisions which gives emphasis on women equality, gender equality, women status, women role, women education and all kinds of development of women.( Article 14) for equality,(article 15-1 ) for no discrimination by the state authority,(article 16 ) for equality of opportunity,(article 15-3) for special precautions for women and children,(article 39d) for equal pay for equal work,(article 51A) for renounces practices derogatory to the dignity of women etc are very significant in this regard. The Indian constitution not only guarantees the equality of women but also provides the power to the states to take legal actions against the activities which hamper women rights and status. Besides this, each state of India makes some strict laws and rules which can protect women but it cannot be said that women are free from all types of social- restrictions

The Bodos are considered as the largest majority group in Assam, they are recognized as a plain tribe in the 6<sup>th</sup> schedule of the Indian constitution. Bodo women play a crucial role to ensure sound society but still they are confronting with many socio-economic and personal problems. All kinds of development of Bodo are mostly dependent on economic independency of both men and women. From the previous it is found out that Bodo women are engaged themselves in different economic activities but this is not sufficient. To make them economically empowered much emphasis should be given to education of women. Through this study it is tried to analyze the different economic issues of Bodo women and the role of education in this context.

Deka, D.N. (2008) found out major findings through his research study as Bodo women have future positive prospects in economic and education sector, ABSU has been considered as potential platform for women, Bodo women are socially conscious and now women have joined in different public spheres which is considered as good sign of empowerment. The research study has suggested that governments effort for spreading education among women, help of financial institutions and political parties etc are very significant for making women truly empowered. Talukdar. (2012) in his study found that Bodo women take important role to develop the economic status of the Bodo community but still their poor educational status is standing as a barrier in their development. It is observed that the female literacy rate of Bodo women is not equal pace of progress with the women of non-tribal due to some socio-economic problem in spite of the government's multifarious endeavors through special stipends, scholarships, free education, and reservation seats for the female of Bodo community. Baishya, N. (2017) carried out an investigation

on Bodo people of Baksa district regarding literacy rate, government's initiatives on women health care facilities, gender-discrimination, women economic and social participation. Through this study it is analysed that male literacy rate of Baksa is 67% and female literacy rate is 53.4%. Regarding health care facilities around 70.32% women are not satisfied of government's health facilities. 56.45% women think that their status is inferior to men. In Baksa district, there are 62349 are female main workers and 215948 are male main workers. The study of the result clearly shows that there are lot differences between men and women of Bodo community in the context of different socio-economic aspects. Bodo women are involved in different economic activities such as-agriculture, weaving, sericulture, production of rice beer, engage in self-help group (Islary, E.2020).

From the above studies it can be analysed that Bodo women are involved in other some economic activities also these activities are-animal husbandry, sewing, cooking, fishing, embroidery etc. Though Bodo women are involved in different economic activities but it is not enough. They used traditional way of productivity. Bodo women are not so much aware about new scientific ways of economy. Many Bodo women in rural areas of Assam have made self-help group for their own benefit of finance. Bodo society is basically male-dominated society therefore, women financial contribution towards family is not given much recognition.**Data Collection:** Both the primary and secondary sources are used for this study like Government census-reports, governmental acts-policies, journals, books, thesis, dissertations etc. are used.

#### **Economic issues confronting by Bodo women –**

Through using oral interview schedule some evidences are collected which show that Bodo women still have to face many economic issues. The identified economic issues confronting by Bodo women are-

- a) Family income is almost dependent on the income of male members of the family.
- b) Women's income is not given due recognition in family environment.
- c) Women of Bodo society are not so much aware of new scientific skills and ways of productivity.
- d) Not given equal grant to women like men. It means gender-discrimination still exists in Bodo society in working situations.
- e) Women are basically busy in house-hold activities.
- f) Women are also involved in traditional ways of agricultural activities.
- g) Majority of Bodo women are busy in some special activities only such as-embroidery, sewing, animal husbandry, agriculture, making of rice-beer etc.
- h) Now Bodo village women make self-help groups and tries to take financial benefit from it.
- I) Bodo women have faced the problem of proper vocational and professional training.

j) Poverty, illiteracy, static social norms, old superstitious beliefs, male-dominated society etc are also the factors which hindrance in economic enhancement of Bodo women.

k) Lack of adequate knowledge for economic growth among the Bodo women.

**The different government policies for women empowerment-**

The ministry of women and child development of India has launched various schemes /programmes for women empowerment and development. These schemes are-

- I. Pradhan Mantri Mahila Shakti Kendra scheme-This scheme is for rural women and their empowerment and this scheme promotes community participation.
- II. Pradhan Mantri Matri Vandana yojana –This scheme is for improving better health and nutrition of pregnant women.
- III. National Creche Scheme- this scheme provides day care facilities for the working women of the different government sectors.
- IV. Ujjawala- it provides for prevention, rescue, rehabilitation, re-integration, re-patriation of victims trafficked for commercial sexual exploitation.
- V. SwardhaGreh- it provides relief and rehabilitation to destitute women and women in stress.
- VI. Rastriya MahilaKosh-it provides micro-financeto economicallypoor women for the purpose of their socio-economic development.
- VII. Some other Assam government schemes for women and their development,these are- Arundhati Scheme, Assam Orunodoi scheme, Atal Amrit Abhiyan Health Insurance Scheme, Sarothi, Swanirbhar Nari, Assam Abhinanadan education loan subsidy scheme etc.

Special Welfare scheme for ST candidates = Pre-Metric scholarship for STstudents, Assam Bikash Yojana &CM’s special employment generation programme, Grants for ST meritorious and brilliant students, Special Stipend for craftsman training etc.

**ROLE OF EDUCATION IN WOMEN ECONOMIC EMPOWERMENT-**

1. Education eradicates gender discrimination in the context of work and efficiency.
2. Education can remove the discrimination between power and work.
3. Education is very important for women to make them economically self-sufficient
4. Education can provide proper training of economic empowerment to women.
5. Education develops innate capabilities of women.
6. Education can develop proper skills of economic efficiency.
7. Education can make a truly modern society in where women can financially contribute equally along with men towards family and society.

8. Proper vocational education and training is very important for women for their economic development.
9. Education can enhance proper skills of economic efficiency, develop capabilities, make aware towards economic growth, develop scientific thinking and eradicate gender-discrimination in the economic sector. It means the role of education in economic empowerment is very important.

#### **SUGGESTIONS-**

1. Bodo women can develop their economic status if gender discrimination can be eradicated from the society. Creating a positive attitude among common masses is very important.
2. Role of social organizations both-formal and informal regarding women economic development is very significant. Strict legal policies must be utilized in proper way.
3. Spreading of adult education, non-formal education, open and distance mode of education is very important for women welfare so that every woman can take education at any age, government must take much initiatives in this regard.
4. Role of NGO's, social medias such as-T.V, radio, newspapers, magazines etc can take much initiatives so that women are aware towards their own rights and responsibilities.

#### **Conclusion-**

Women of Bodo society have an important contribution in the economic progress of that society. The utmost expansion of women education of Bodo society is necessary for the achievement of all sided development of the society. Studies have found that women education can be considered as an essential tool as it makes women economically efficient. Though the Bodo women are now conscious about their economic independency but it is not enough, the government must take some more special initiatives to create more awareness among women for their economic welfare which can help to utilize human resource in proper way.

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***EMPLOYEES PERCEPTION IN RELATION TO TRAINING  
AND DEVELOPMENT - A STUDY OF PUBLIC SECTOR  
BANKS IN THIRUVANANTHAPURAM DISTRICT***

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**Abstract**

Training and Development is the framework for helping bank employees to develop their personal and organizational skills, knowledge and abilities. The focus of all aspects of Human Resource Development is on developing the most superior work force so that the organization and individual employees can accomplish their work goals in service to customer. Transformation in the Indian Banking industry, ever increasing competition, fast moving and complex world of latest technology have compelled banks to think of and to adopt themselves to the changing banking environment. There is need to develop the competencies i.e. Skill, knowledge and attitude among the bank staff to make them more suitable to the changing conditions, through proper Training and Development programs. The present study aimed that to know the opinion on Training and Development at private sector banks employees.

**Keywords:** Training and Development, Banks, Employee performance, Employees.

**Introduction**

In competitive global business climate, Banking sector believe that human resources are their asset and their employees drive them forward and facilitate them in achieving the organizational objective in the present technological

world. Based on this idea companies invest a lot of money in the training and development programme for their employees to change their attitude in to optimistic mode and to empower their knowledge, technical skills and behavioural pattern. Most of the Banking firms believe that improved skills will help employees to improve their individual performance and it leads to increase in the operational efficiency and customer satisfaction. Therefore, Banking sector spend billions of rupees every year for employee training and development programmes. The costs are incurred for training which covers all types of training like formal as well as informal, on-the-job and off-the-job training. With this kind of huge investment for their human resource, Banking firms are very curious, in knowing if they realize maximum return on their investments, what kind of return they really realize, and what are the other opportunity costs).

Training is a set of activities designed to increase an individual's skills, knowledge and experience. It brings attitudinal change among the employees, increases the job involvement, organizational commitment and job satisfaction and in turn enhances employee performance . The success of any training programme largely depends upon the people who are identified for training. On one side, training could be of a greater value when employees acquire technical skills, knowledge and abilities to improve their individual job performance and sustain company's competitive edge. On the other side of the coin, Banking sector opined that it would be a great waste of capital investment, if the technical knowledge and skills acquired during training are not directly applied in the job performance and / or maintained over time to convert into higher productivity and better organizational performance to align with main objectives of the business. That is why a successful transfer of training should be of a paramount magnitude as of today, in which the Banking firms spend huge cost of expenditure in employee training.

Over the years, Indian Banking sector market offerings have evolved from application development and maintenance, to emerge as full service players providing various service to customers.

Source of data refers to the source or sources of relevant information to be tapped to fulfil the objectives of the research study

Secondary data have already been collected by someone else other than the researcher to address research problem other than the research problem at hand. Secondary data are cost effective and can be accessed through various offline as well as online sources promptly.

The study used primary data collected using a questionnaire containing both open and closed ended questions...The target population of study was all the employees in selected public sector Banks in Thiruvananthapuram district

For collecting primary data, proportionate stratified sampling technique will be employed in the study. The population for this study consists of Top level and middle level employees in selected public sector Banks in Thiruvananthapuram district. Sample size is 120 determined on the basis of

20 percentage of total population. Random sampling method was used for this study. The data analysis using SPSS 20 to measure the relationship and differences between variables were revealed. In doing the analysis for the collected data and to determine there was a significant relationship among the dependent and independent variables. The primary data collected by way of administering Questionnaire was analysed and interpreted by using various statistical tools and techniques. Both simple as well as advanced statistical techniques were applied to analyse the collected data. Advanced techniques such as chi-square test, and correlation and regression have been applied to analyses the data.

Null Hypothesis: There is no significance difference between demographic variables and responds opinion about training and development programs in Public sector banks.

**Table 1**  
**Chi-Square Tests**

	N	Chi-value	P-value	Significant value
Gender * Training. and Development	120	77.715	.153	0.05
Age * Training. and Development	120	140.365	.293	0.05
Education* Training. and Development	120	138.727	.327	0.05
Designation * Training. and Development	120	120.185	.761	0.05

**Gender \* Training**

The chi-square Value 77.715, and p value 0.153 accept H0 and hence, it can be inferred that there is no significance difference between gender and responds about training.

**Age \* Training**

The chi-square Value 140.365, and p value 0.293 accept H0 and hence, it can be inferred that there is no significance difference between age and responds about training.

**Education \* Training**

The chi-square Value 138.727, and p value 0.327 accept H0 and hence, it can be inferred that there is no significance difference between Education and responds about training.

**Designation \* Training**

The chi-square Value 120.185, and p value 0.761 accept H0 and hence, it can be inferred that there is no significance difference between designation and responds about training.

Null Hypothesis: There is no association between employee Performance and factors affecting training and development in Public sector banks.

		Trainin g Need analysis	Transfer of Training to the workplace	Training Designing and Implement ation	Training Evaluation	Perform ance
Training Need analysis	Pearson Correlation	1	.756(**)	.631(**)	.652(**)	.816(**)
	Sig. (2-tailed)		.000	.000	.000	.000
	N	120	120	120	120	120
Transfer of Training to the workplace	Pearson Correlation	.756(* *)	1	.823(**)	.859(**)	.937(**)
	Sig. (2-tailed)	.000		.000	.000	.000
	N	120	120	120	120	120
Training Designing and Implement ation	Pearson Correlation	.631(* *)	.823(**)	1	.909(**)	.930(**)
	Sig. (2-tailed)	.000	.000		.000	.000
	N	120	120	120	120	120
Training Evaluation	Pearson Correlation	.652(* *)	.859(**)	.909(**)	1	.955(**)
	Sig. (2-tailed)	.000	.000	.000		.000
	N	120	120	120	120	120
Productivity	Pearson Correlation	.816(* *)	.937(**)	.930(**)	.955(**)	1
	Sig. (2-tailed)	.000	.000	.000	.000	
	N	120	120	120	120	120

\*\* Correlation is significant at the 0.05 level (2-tailed).

#### **Analysis**

The association between Performance and factors affecting training and development in Public sector banks is exhibited in Table No.2. The factors

affecting training are Training Need Analysis, Transfer of Training to the workplace, Training Designing and Implementation and Training Evaluation. The table shows that there exists a high positive correlation between Training Need Analysis and Employee performance. The correlation coefficient was 0.756. Here the Sig. (2-tailed) value is .000. When the Sig. (2-tailed) value is less than the alpha value, we reject the null hypothesis and accept the alternative hypothesis. Thus, the correlation analysis proves that there is a significant positive association between productivity and Training Need Analysis.

The table shows that there exists a high positive correlation between Transfer of Training to the workplace and Employee performance. The correlation coefficient was 0.631. Here the Sig. (2-tailed) value is .000. When the Sig. (2-tailed) value is less than the alpha value, we reject the null hypothesis and accept the alternative hypothesis. Thus, the correlation analysis proves that there is a significant positive association between Employee performance and Transfer of Training to the workplace.

The table shows that there exists a high positive correlation between Training Designing and Implementation and Employee performance. The correlation coefficient was 0.652. Here the Sig. (2-tailed) value is .000. When the Sig. (2-tailed) value is less than the alpha value, we reject the null hypothesis and accept the alternative hypothesis. Thus, the correlation analysis proves that there is a significant positive association between Employee performance and Training Designing and Implementation.

The table shows that there exists a high positive correlation between Employee performance and factors affecting training. The correlation coefficient was 0.816. Here the Sig. (2-tailed) value is .000. When the Sig. (2-tailed) value is less than the alpha value, we reject the null hypothesis and accept the alternative hypothesis. Thus, the correlation analysis proves that there is a significant positive association between productivity and factors affecting training.

### **Suggestions**

Basic understanding of Training Need Analysis - Need analysis is a process by which an organization's training needs are identified and articulated. It is the starting point of the training process. Need analysis can identify an organization's goals and its effectiveness in reaching these goals.

Basic understanding of Training Designing and Implementation – Depending on the need analysis the basic objectives of the training will be identified which further leads to select the trainer, select the methods and techniques for the trainer and selection of trainer will be carried out. Basic understanding of Transfer of Training to the Workplace – The main goal of training is to ensure that employees perform their jobs very effectively. Basic understanding of positive effects of training - Companies can get the rewards of providing training for their employees because well-trained workers help increase productivity and profits.

Basic understanding of Training Evaluation – It is the systematic collection of information necessary to make effective training decisions related to the selection, doption, value and modification of various instructional activities.

Basic understanding of Information Technology in Training - Information technologies have affected every aspect of human activity and have a potential role to play in the field of education and training.

### **Conclusion**

There is enough evidence to show that employees who were trained on a regular basis are the ones who provide a higher quality services to the costumers. To develop an integrated and proactive training and development strategy there is requirement of coherent corporate culture rather than ad-hoc programs. In a service oriented industry such as banking, people are among the most important assets and a bank must efficiently manage its employees during every face of employment in this competitive area. It is that public sector banks undertake training and development programmer for their employees to increase their efficiency. Banks provide training programmer to enhance their knowledge and skills to satisfy the customers. Growth of banking sector in India is the result of skilled manpower which is the outcome of training and development.

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## **ANALYSIS OF BRICK STRUCTURES OF EARLY ASSAM**

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### **Abstract**

The early brick structures of Assam were scattered all over the landscape mostly in ruined and dilapidated condition therefore necessitating a detailed study before it gets obliterated. The present paper is an outcome of study of these brick structure ruins considering all possible archaeological and architectural parameters. A limited comparative study also is made with the nearby archaeological sites of Bangladesh and Myanmar.

**Keywords:** architecture, temple, plaque, Assam, iconography, brick, *Nagara*.

In Assam, brick structural remains of temples are found scattered everywhere. Their presence lending essence to the heritage of the native land and reflective of abstract and overlapping thought processes and spiritual bearing of the populace through generations. According to popular definition temple is a structure reserved for religious and spiritual activities such as prayer, sacrifices or analogous rites. But the Indian temples are not mere representative of the abode of gods and place of worship but also centre of knowledge, art, architecture and culture. Brick structures excavated and explored in Assam can be divided in five clusters. a) Goalpara b) Kamrup c) Tezpur d) Nagaon e) Golaghat

About the temple styles, there is no homogeneity in religious belief and practices of the two identified cultural region i.e. the western and eastern region. The extant temples and their religious affiliation, the deity or deities enshrined and the allied sculpture and other cult objects provide insights to the

nature of religious beliefs and practices. It is beyond doubt that in the region co existed many religions and indigenous cults; sometime between 5<sup>th</sup>-7<sup>th</sup> centuries there was a massive second wave of sanskritisation whose inference has been drawn from the land grant records during this period. Almost all the grants addresses territorial term as *pur*, *puri*, *pattana*, *bhumi* and *shetra* and the names of flora mentioned are in Sanskrit, not a single name of flora and fauna appearing in the grants (Sharma, 1978 ) bore local names. Early medieval patronage is a complex issue; so to understand it one has to understand the role of local community in temple building activities and their maintenance. Though these communities did not always donate lands or huge sum of money, their participation in daily worship and their offering of ritual objects like flower, *dipa* (lamp), *dhupa* (incense), *naivedya* (food) played a major role in the maintenance of the temple. Also *nritya* (dance) and *vadya* (instrumental music) were two important aspect of temple worship, which in all probability were offered by local communities. The long survival of the religious shrines depended on periodical repairs, restoration and proper maintenance. This need was also fulfilled by the local community. It's a known fact that daily worship and maintenance of a temple is as important as its construction and this was largely dependent on the local communities who lived in and around the temple rather than on the royal patron.

The various brick structures located in the Brahmaputra valley show certain similarity and differences based on their location and relative correspondence to other sites. Architecturally, earlier temples are small, squarely and symmetric with exquisite sculptural carvings on certain parts. The earlier temples like Dah Parbatia are highly symmetric and conform to the parameters prevailing to temple architecture in central India, with simple plan and high *adhithan* (platform). Arguably, Dah Parbatia has highest *adhithan* in the region in its time and can be postulated as post-Gupta *Nagar* architecture in Brahmaputra valley possibly by the masons and artisans displaced during the Hun turmoil or the ruler of the area invited artisans for its construction. However, the architecture of Dah Parbatia shows very limited regional influence in its architecture and sculptural art. Sculpturally it cannot be compared with any site in Assam and it remains the sculptural epitome. A phenomenon almost universal in Brahmaputra valley is to raise temples of stone on ravaged brick structures specially in the plain areas. Location wise the structures of Goalpara region are located on the bank of rivers and streams, Guwahati region on hills and ponds, and Kopili-Jamuna region on ponds and rivers.

Table 1. Architectural Arrangement of Brick Structure of Brahmaputra Valley

Temple/Site	Building Material	Orientation	Presiding Deity	Form (garbha)	Garbha Side	Approach direction

Baitbari I	brick	east-west		pancharatha		
Baitbari II	brick		shiva	octagonal	Centre	8 sides
Madan Kamdev	brick and stone	various		rectangular	Varied	varied
Paglatek	brick and stone	unknown	shiva		unknown	unknown
Kakojana	brick	east-west		offset top		
Ganesh Temple	brick and stone	east-west	shiva	rectangular	West	east
Surya Pahar I	brick	east-west		triratha/ rectangular	West	east
Surya Pahar II	brick and stone	east-west		square	East	west and east
Dah Parbatiya	brick and stone	east-west	shiva	square	West	east
Garh Dou I	brick	east-west	shiva	offset top	West	east
Garh Dou II	brick	east-west		offset top	West	east
Bamgaon	brick	north-south	unknown	unknown	North	south
Rajbari I	brick and stone	east-west	shiva	square	East	west
Rajbari II	brick and stone	east-west	shiva	square	East	west
Rajbari III	brick and stone	east-west	unknown	square	East	west
Na Nath I	brick and stone	east-west	shiva	square	West	east
Na Nath II	brick and stone	east-west	shiva	square	West	east
Na Nath III	brick and stone	east-west	shiva	square	West	east
Na Nath IV	brick and stone	east-west	shiva	square	West	East
Na Nath V	brick and stone	east-west	shiva	square	West	east
Na Nath VI	brick and stone	west-east	shiva	square	East	west
Na Nath VII	brick and stone	west-east	shiva	square	East	west
Na Nath VIII	brick and stone	west-east	shiva	square	East	west
Na Nath IX	brick and stone	west-east	shiva	square	East	west

Mikirati I	brick	south-north	shiva	rectangular	North	South
Amtola	Brick and stone		shiva?			

Table 2. Broad features of early structures of Brahmaputra Valley.

Parameters		%
Alignment	east-west	64
	west-east	16
	north-south	4
	south-north	4
	unknown	12
Material of construction	Brick	32
	Brick and stone	68
Presiding diety	Shiva	72
	others	28
Garbha forms	Square	56
	Rectangular	12
	octagonal	4
	unknown	28

Table 3. Diagnostic features of brick structures of Brahmaputra valley, Assam (in metres)

Temple	Plan	Dimension LXB	Garbha Size (LXB)	Garbha wall Thickness	Mandapa	Mandapa wall (thickness)	Garbha entrance (width)	Mandapa entrance (width)	Outer wall (prakara) I & II LXB
Baitbari I	Pancharatha	8.9X5.2			3X4		3.6	4X3	
Baitbari II	Octagonal	13X13	6.90X6.9	60 cm	2.7X2.7	20 CM			
Madan Kamdev									
Paglatek	wall								
Kakoijana	Rectangular	Broken ?X8.5	4.46X4.30			90 cm	<2		10.9X8.5 unknown
Ganesh	Rectangular	32X19	7.6X6						

Temple	r/ Triratha								
Surya Pahar I	Rectangular	37.85X19.50	6.9X6.9	1.5					2.5
Surya Pahar II	Rectangular	42.90X31.70	Stone						
Dah Parbatiya	Rectangular	24X11.5	2.4X2.5	1.3	8.4X7.8	1.8	1.0	1.1	1.8
Garh DouI I	Rectangular	21.6X14	8.20X8.20		7.2X10	2.0	4.2	4	2.0
Garh DouI II	Rectangular	21.76X13.6	9X9.5		8X10	2.0	3.95	3	2.0
Bamgaon	Rectangular	22?X18	NA	NA	7.5approx X6.1	1.3	3	3.1	
Rajbari I	Rectangular	11.4X6.7	2.2X2.3	2.1 sides 2.35 rear	4.5X4.0	1.26	1.1	1.1	
Rajbari II	Rectangular	18.2X8.0	4.6X4.3		5.15X5.5	1.26	1.3	1.5	
Rajbari III	Squarish	11.10X9.30	4.5X3.3		6.8X6.2	2.1 east side 1.3 sides		1.6	
Na Nath I	Rectangular	17X11	2.20X2.10			1.05			
Na Nath II	Rectangular	17X9.7	2.20X2.10		5.3X4.5	1.10	1.30		
Na Nath III	Rectangular	19.5X8.8	2.20X2.20		11X6.3	1.30	1.2		
Na Nath IV	Rectangular	15X11.5	2.18X2.28		5.5X4.5	1.10	1.0		
Na Nath V	Rectangular	20X11.40	2.0X2.0		5.4X4.8	1.10	1.2		
Na Nath VI	Rectangular		2.20X1.50						
Na Nath VII	Rectangular	19.4X10	2.35X2.33		12.2X7.2	90 cm	1.4		
Na Nath VIII	Rectangular	11X8.3	2.10X1.60		5.4X6.2	1.0	1.6		
Na Nath IX/	Rectangular		2.20X2.20			1.30	1.2		

Kenduguri									
Mikirati	Rect.	16X10	3X1.85		9.2X6.8				
Amtola	Square								

Table 4. Comparison of Northern Indian Nagara Temples and Assam Temples upto 1200AD.

<i>Diagnostic element</i>	<i>Northern temple style/Nagara</i>	<i>Assam group- Phase III</i>
Material of construction	Brick and stone, predominantly stone	Both but predominantly bricks
Shikhara	The superstructure above the cornice level	All are grounded
Roofs of axial addition to the shrine	Successive series of towers of the pitha	Superstructure not available for assessment
Elevation of the axial addition	Open mandapa type with porched balconies or entrances.	Open mandapa sometimes with mukhamandapa
Mandapa	Present	Present
Mahamandapa	Optional	Absent
Mukhamandapa	Optional seldom present	Optional
Pranala	Not very typical. May be open channel on floor level or underground.	Upper plinth level
Vertical plumb line of the cornice ( <i>manasutra</i> )	Well outside	Not available for assessment
Ceiling	Wide range of ornamentations	Not available for assessment
Dhvaja	Optional. May be on top on the shrine.	Outside on the entrance/ top of the shrine.
Superstructure above ground floor	Single mass	Diminishing top
Broad plinth	Mostly present.	
Prakaras	Optional.	Mostly present
Toranas	Often as entrance	Unknown

	features	
Door	Very elaborate and ornate	Some with stone sculptured jambs
Main deity made of	Mostly of stone	All of stone so far
Dvarapalas	Small sized	Only one found, its small at Da Parbatiya

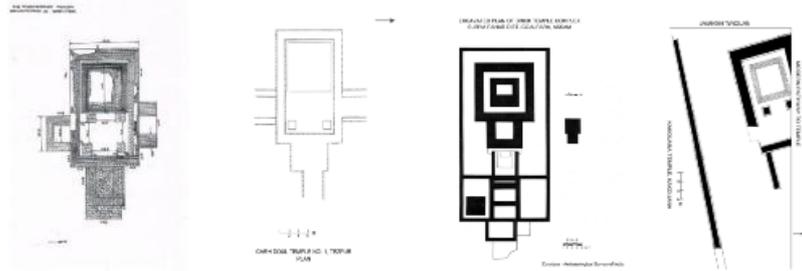


Fig. 1. Comparative plans of Garh DouI I & II, Surya Pahar and Kakoijana.

So far as the general layout is concerned, the brick structure of lower course of Brahmaputra have two ramparts (outer and inner) in case of Surya Pahar, Kakoijana, and Tamreshwar while the structure of Kopili Jamuna valley lack this feature whereas the structure of Garh DouI and Dubarani (Doiyang Dhansiri valley) has a single rampart. Another characteristic of all the structures is that the superstructure is absent. The layout and plan of Garbhagriha of Kakoijana (Bongaigaon) and Garhdoul bears a stern resemblance. However, in Garh DouI the enclosure wall (prakaar) is absent. It is also observed that the main plinth of the Garbhagriha of both Kakoijana and Garh DouI has several projections (Singha, 2021).

**Moulded Bricks and Plaques:** Moulded bricks are used alongside the plain ones. Moulded bricks are used in adorning the outer walls to beautify the structures and break the monotony of similar looking structures. Moulded bricks were made with hand moulds. Moulded bricks combined with plaques gave the structure different architectural perspective and dimension. Modern Bangladesh was a nerve centre of Buddhism under the aegis of Varmans and then Palas from 7<sup>th</sup> to 12<sup>th</sup> century and it is during this period that Buddhism was propagated to south-east Asia.

Table 5. Comparative Sizes of Plaques from Assam, Bengal and Myanmar Sites (Rao, 2014).

Site ↓ Sizes→ (in cms)	Plaque size 1 (max)	Plaque size 2 (min)	remarks
Baitbari	48X26.5X5.5	39X23X3	varying size
East and W Petleik	40X38X13		
Ananda temple,	36X32X7		

Bagan			
Mangalazeidi	38X34x10		
Paharpur	40.6X30.5X6.35	35.5X20.3X21.6	varying size
Ananda Vihar, Comilla	101X53X15.2	38X30.5X12.7	varying size

The depiction recovered from Baitbari are of *Ganesha, Brahma, Vinadhara, Kali, Ugra tara, Vaisnavi, Manasa, Uma Maheswara Arjuna in penance* and other *tantric* figures ( Sharma, 2003: 43-73). The plaques of Paharpur are thematically closer to Baitbari with predominantly Buddhist and Hindu icons. The iconography in Baitbari seems to have been influenced by Buddhist plastic art initially which later on gradually Hindu sculptures dominated the representation. Plaques are also procured from Surya Pahar, Bamgaon, Na Nath; the plaques of Na Nath are smaller in size than those found in Baitbari and Bamgaon. The typical feature of Bamgaon plaques are that they are yellowish in colour, even bricks from this site are of yellowish colour. Moulded bricks are important building material for ornate and elaborate brick edifices. Structurally they have the similar uses like general bricks as they are same building blocks with weight bearing properties. The use of these bricks is to beautify the outer walls of the structure. Elsewhere in Bihar, Bengal, Tripura, Bangladesh and Myanmar moulded bricks are profusely used in construction during 8<sup>th</sup> to 12<sup>th</sup> century. Moulded bricks are employed for two purposes, structural and decorative, sometimes serving both functions. Moulded bricks are mostly used on the outer face of the structure at its basal part. Due to the elaborate nature of their structures, brick was preferred in the Buddhist construction. Bricks moulded in various designs have been yielded from various sites of Assam. Some of the designs are popular and common whereas some are rare.

Fig 2. Types of brick mouldings from Brahmaputra valley.



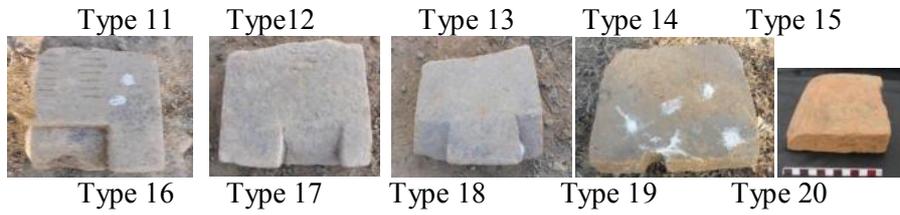


Table 6. Table Depicting Occurrence Type of Moulded Bricks.

Type→ Site↓	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Surya Pahar																				
Paglatek		Y		Y																
Kakoijana		Y	Y												Y					
Madan Kamdev																				
Garh Doul	Y		Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Da Parvatiya																				
Bamgaon	Y	Y	Y	Y					Y											
Mhadeosa I		Y																		
Rajbari																				
Dek Dua	Y	Y	Y	Y					Y											
Mikirati																				
Amtola			Y				Y													
Ambari																				

Y= Yes

So far twenty different types of moulded bricks are yielded from excavations and surveys from the sites under the purview of this study. As far as the types of moulded bricks are concerned the site of Bamgaon has yielded more than 5 types of mouldings of different designs, whereas in Garh Doul 17 types of moulding are used and in Paglatek and Kakoijana 3 designs have been reported so far. About the designs Type 2 and Type 3 are most popular design appearing in the five sites. Type 1, 4 and 9 appears in each of the three sites. Some of the mouldings have Buddhist connotation and that linkage can be established in more than one way. Firstly Assam (western) had always been under the Aryan zone of influence from its earliest period and politically it was ruled by kings based in Bengal or west Assam. Secondly the proselytizing and assimilating nature of Buddhism and Brahmanical Hinduism kept the region adventured throughout the past by missionaries, traders and adventurers alike.

In the Buddhist monasteries of Bangladesh and Bengal few similar mouldings can be seen, however in Assam these moulded bricks are yielded in debris and never *in situ* where it was intended in the structure, recent excavation at Dek Dua in Goalpara however throw some light to where it was originally intended. The site of Dek Dua present the most elaborate terracotta work so far from the region however the excavation report is still to be published by the Directorate of Archaeology. The type 2 and Type 3 bricks were profusely used in the monasteries of Somapura in Paharpur, Naogaon Bangladesh.

**Bonding and laying patterns:** Strength of a brick structure depends on the bonding of the bricks and the binding material. The stretcher bond pattern was widely used in construction in Brahmaputra valley, sometimes with running stretcher bonds. The mortar used in the construction is mud mortar or red soil which has good binding properties. All the sites show certain preference for stretcher bond method.

**Associated assemblages:** Pottery consist mostly of the associated assemblages, along with the structure they form the chunk of materials to establish linkages among the various structures. Almost all the sites yielded coins of colonial period specially *annas*. These coins are yielded from Paglatek, Kakoijana, Surya Pahar, Ambari, Jaljali, Madan Kamdev, Mahadeosal, Garh Doul and the Hojai sites

Fig 3. Important pottery for indexing and comparative study



Table 7. Occurrence of Few Common types of Pottery in Assam Sites

Site↓	Type→	1	2	3	4	5
Surya Pahar		Y	Y	Y	Y(P)	
Paglatek		Y		Y	Y(P)	
Kakoijana						
Madan Kamdev						
Garh Doul						
Da Parvatiya						
Bamgaon						
Mahadeosal		Y	Y	Y	Y	Y
Rajbari						
Dek Dua		Y		Y		
Mikirati						
Amtola					Y	
Ambari		Y	Y	Y	Y	

Baitbari		Y		Y(P)	
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Throughout red ware is the dominant pottery as most of the sites are religious in nature; the pottery generally are ritualistic and offering wares. Introduction of new pottery can be traced periodically which becomes signatures of the given period and the population. The Paglatek Phase I and Mahadeosal Phase I is similar to the Phase II of Ambari with similar pottery with appearance of mica washed pottery. This phase is marked by so called 'Ambari wares' from Mahadeosal and Ambari, both the site shows striking similarity of pottery. These two sites produced lot of other shapes which otherwise will not be considered as conventional usual shapes. Shapes yielded are all common shapes lota, pot, bowls etc.

Ambari ware pottery was followed by celadon and glazed wares. However occurrence of glazed wares is limited in fact it neither was nor recovered beyond Ambari (Guwahati).

**Chronology:** Assessment of chronology was the most complicated part of the present study. This assessment is based on three parameters namely brick size and stratigraphy, sculptural art and associated assemblage predominantly pottery. The structures of Brahmaputra valley were constructed in three phases. The first phase was the earliest phase of which we have limited structural evidence and they represent the early historical period. The second phase is from 6<sup>th</sup> to 8<sup>th</sup> century and the third is from 9<sup>th</sup> to 12<sup>th</sup> century. The first phase structure include the period-I structure of Ambari, as we can see that the period I structure of Ambari was an ablution tank with Sunga-Kushana character however we can assume that this structure went out of use due to the subsequent rise in water table and its steps got submerged. This phase is all brick phase. Structure contemporary to Ambari Phase I is not identified so far in the valley. It is widely believed that Buddhists accompanied the traders and traders, being Jaina and Buddhist found it their moral duty to help them in their missionary zeal. The second phase from 6<sup>th</sup> to 8<sup>th</sup> century show the twin tide of Brahmanical Hinduism and Buddhism and it was marked with still predominant use of brick and limited use of stone. Political situation in this period is stable Varmans ruled this period with firmness and during this period Kamarupa succeeded to come out from the stereotype of the place being inhabited by dangerous animals and cannibals and of prohibited land. Various Buddhist missionaries set foot here during this time. The marked feature of structures of this phase is Buddhist structures with Hindu influences and vice versa along with limited Jaina elements infused.

The preceding Gupta rule made a tremendous socio-cultural impact upon the valley and the Huna invasion during later Gupta period triggered migration of various people including artisans and sculptors to Bengal and to Assam afterwards the reason sculptural art of Bengal and Assam for certain period had classical bearing and within a generation or so these classical offshoot diffused into local art form. These two regions came under the political

influence of Pala in Bengal and Malechchha in Kamarupa. However Palas patronized Buddhism and Shaivism also flourished in the kingdom and in Kamarupa polytheism with predominance of Shaivism flourished during the Malechchha period. The third phase is marked by stone built temples. There was a clear shift from brick to stone in this phase. This period also is marked by infusion of tantric elements in the sculptural art. The temples of this phase are influenced by the Orissan school. The third phase show the rise of Tantric features in the construction, not much new spots were identified for constructing structures. During this phase the fallen brick structures were renovated or rebuild with stone at the same spot. Almost all the stone temples of this phase show brick temple evidence in its basement.

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**SOON IT WOULD BE TOO HOT: A READING OF J.G.  
BALLARD'S *THE DROWNED WORLD* AND *THE WIND*  
FROM NOWHERE**

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**Abstract:**

Ecological changes that have subsequently resulted in catastrophic breakdowns in the ecosystem have astounded environmentalists, and hence environmental studies pertinent to ecology have evolved into a remarkable field of investigation and academic interest. Examining two early novels of J.G. Ballard, viz. *The Wind from Nowhere* (1961) and *The Drowned World* (1962), the research paper endeavours to detail the catastrophic devastation wrought by climatic variations and deteriorating natural ecosystems, as well as their cumulative implications on humanity and the non-human realm. Additionally, it intends to critically examine the novels in order to comprehend the portrayal of catastrophic imagery that is fictionalised in order to make the audience visualise the enormity of environmental crises and thereby evoke eco-consciousness.

**Keywords:** cli-fi, climate change, global warming, nature, slow violence

Literature has long served as a medium for understanding the complex relationship between humans and the non-human world. However, in light of the recent ecological shifts that have caused the ecosystem to become seriously unbalanced, the various environmentalists and ecocritics now view ecological studies as an essential subject, notably climate change. The repercussions of anthropogenic global warming are becoming increasingly evident with each passing day throughout the planet. Most recently, global warming has resulted in the melting of ice caps throughout the world, the rising of ocean and sea levels, the extinction and migration of many species,

the loss of biodiversity, the occurrence of extreme droughts and catastrophic floods, and the like. With the extreme unpredictability of COVID-19 in this century, Amitav Ghosh(2016), while talking about climate change in his latest book, maintains, “we are now in an era that will be defined precisely by events that appear, by our current standards of normalcy, highly improbable” (p. 32). This improbability underscores the critical need of approaching climate change through the perspective of a precisely defined genre, which the mainstream canon of literature has disregarded.

Robert Macfarlane (2005) has expressed concern about the paucity of art that addressed the subject of climate change when he states, “Where are the novels, the plays, the poems, the songs, the libretti, of this massive contemporary anxiety?” (para. 7). Nevertheless, it has been a decade since climate fiction became increasingly popular, and the publishing industry has seen a significant increase in a wide range of literature reflecting this shifting trend. From Kim Stanley Robinson’s *New York 2140* (2017) to Barbara Kingsolver’s *Flight Behavior* (2012) to Amitav Ghosh’s *Gun Island* (2019), these cli-fi novels look at how human actions cause environmental disruption as a result of global warming.

It is worth noting that climate change-themed narratives reflect the rise in global warming and altering climatic patterns as a result of industrialization since its inception. J.G. Ballard earned recognition as a science fiction writer who dealt with climate change with the publication of his disaster narratives in the 1960s. J.G. Ballard was an English novelist, essayist, and short-story writer best known for his contributions to the New Wave of science fiction. Ballard’s writings are distinguished by their literary uniqueness, which has given rise to the epithet ‘Ballardian’. Specifically, according to the Collins English Dictionary, this is referred to as “resembling or suggestive of the conditions described in J. G. Ballard’s novels and stories, especially [dystopian modernity](#), bleak man-made landscapes and the psychological effects of technological, social or environmental developments” (“Ballardian”, n.d.). For this article, it will examine how Ballard represents the ecological catastrophe by employing the motifs of gigantic hurricane winds in *The Wind from Nowhere* and increasing temperatures in *The Drowned World* that wreak devastation over the planet due to climate change.

Notably, disquieting news about natural catastrophes such as severe winds, extreme storms, roaring tornadoes, typhoons, and cyclones has increasingly intensified in recent years. Indistinguishably, Ballard’s debut novel, *The Wind from Nowhere*, recounts the incidents of strong hurricane winds destroying everything and leaving nothing but ruins in its path. An all-encompassing storm with winds that are violent and uncontrollable, destroying nearly every physical structure in its path and leaving humans helpless and causing countless fatalities. Ballard describes the terrible strength of the wind right from the early passages of the novels when he asserts:

Correspondingly, in *The Drowned World*, his second published novel, Ballard depicts a post-apocalyptic vision with gloomy scenes of the flooded city of London impacted by global climate warming. Since much of the planet would be no longer habitable for humans, the survivors make their way to the North to survive in order to resist the harsh temperatures. Ballard unfolds the ruined city as “The bulk of the city had long since vanished, and only the steel-supported buildings of the central commercial and financial areas had survived the encroaching floodwaters. The brick houses and single-storey factories of the suburbs had disappeared completely below the drifting tides of silt” (Ballard, 1962, p. 11). In this odd new world with altered climate change, Dr. Robert Kerans, the central protagonist and the Biological Testing Station project coordinator, sets out to explore the evolutionary characteristics of swiftly mutated plants and animals. Along with post-apocalyptic projection, the novel reveals the characters’ dysfunctional psyches and their reactions to the rapid and catastrophic events that occur in their surroundings.

The frailty of human beings and their survival is the recurring subject in both novels, with nature turning violent toward humans, who are primarily attributable to degrading environmental practices. In this regard, Bill McKibben (1989) laments:

This home of ours, the blessed hunk of rock and sky and biology that we were born onto, becomes each day a less complex and a more violent place; its rhythms of season and storm shifted and shattered. We didn’t create this world but we are busy creating it. . . This buzzing, blooming, mysterious, cruel, lovely globe of mountain, sea, city, forest; of fish and wolf and bug and man; of carbon and hydrogen and nitrogen- it has come unbalanced in our short moment on it. It’s mostly us now. (p. xxiii)

With the humans at the centre, human civilization has transcended nature as a consequence of scientific advances and technological progress, and the connection between nature and culture has thus deteriorated in the era of so-called modernization, thus making the planet uninhabitable. Ballard deftly depicts the repercussions of catastrophe on humans attempting to survive the ecological catastrophe in the novel *The Wind from Nowhere* when he writes, “They were the helpless victims of a deep-rooted optimism about their right to survival, their dominance of the natural order which would guarantee them against everything but their own folly, that they had made gross assumptions about their own superiority” (Ballard, 1961, p. 77). There are numerous incidents in the novel when climate change has rendered numerous locales and regions uninhabitable during the course of the stories, conveying a mood and tone of melancholy and hopelessness among the characters in the face of climate change.

The author’s artistic faculty constructs devastating imaginable visions of the world by emphasizing the catastrophic challenges of survival for the characters in the ongoing threat of global climate change in both novels. Unfortunately, the vision of climate change is sometimes ignored and attracts

less attention from the global masses. Indeed, we never perceive or encounter global warming, but only its spatial and temporal representations. By and large, cli-fi authors write with artistic faculty, which is responsible mainly for perceiving the imperceptible and Ballards' novels are no exceptions. In this regard, Antonia Mehnert asserts:

While portraying humans' intricate relationship with the planet and thereby teasing out the anthropogenic dimension of global warming, climate change fiction inevitably also deals with ethical questions about humankind's responsibility in this unprecedented crisis. Finally, in depicting climate change, writers also have to engage with a variety of representational challenges such as the phenomenon's global scale and long, slow process of unfolding. (p. 38)

Furthermore, Nixon has turned his attention to global climate change as slow violence, which he defines as "a violence that occurs gradually and out of sight, a violence of delayed destruction that is dispersed across time and space, an attritional violence that is typically not viewed as violence at all" (p. 2). In view of the long-term anthropogenic implications, Ballard, in both novels, ingeniously represents the slow violence underlying climate change. His representation of the ramifications of climate change seeps through different times and across spaces (land and water). Nixon is of the view that slow violence is "rather incremental and accretive, its calamitous repercussions playing out across a range of temporal scales." (p. 2)

Interestingly, Jim Clarke (2013) maintains that "before there was climate change, there was nonetheless climate fiction" (p. 9). Before climate fiction, there was still apprehension about the prospect of climate change, and Clarke acknowledges that human activities are to blame for global warming. Ballard, in his novels as well, plays with the after-effects of climate change resulting from anthropogenic causes characterizing slow violence on human and non-human worlds. The resultant disastrous settings in Ballard's novels are an attempt to recognise the effects of slow violence in the future that is yet to be experienced. In the novels under consideration, Ballard explores the global ramifications of slow violence not only on a particular community or region but also vocalizes the effects of climate change on the global scale. The exceedingly upsetting images of a chaotic world due to extreme temperatures are the subject of the novel *The Drowned World* when Ballard writes, "All over the world, mean temperatures rose by a few degrees each year. The majority of tropical areas rapidly became uninhabitable, entire populations migrating north or south from temperatures of a hundred and thirty and a hundred and forty degrees." (Ballard, 1962, p. 13)

In a similar vein, *The Wind from Nowhere* represents the entire planet surviving a dystopian future with casualties everywhere. The fictitious city of London gets impacted by catastrophic winds as a result of global warming, and the characters in the novel deal with the challenges they face as well as the complications that come their way. Ballard describes a gloomy picture of

desolation with individuals clinging to life in cellars as a result of the disaster. Remarkably, Ballard has given a plethora of stunning imageries of socio-cultural breakdown to stress the nature and extent of the hurricane winds from the beginning of the novel.

For Ballard, the impact of global warming serves as a critical domain for his novels' narrative voice. With the use of symbols of water and wind, the tremendous heat in *The Drowned World* and the stormy winds in *The Wind from Nowhere* demonstrate the severity of global warming. Climate change is expected to have significant implications on a multitude of socio-cultural contexts, ranging from the regional to the planetary scale. In today's post-catastrophic world, the issues related to ecology are a stark warning that we may confront similar calamities as envisioned in the novels if the anthropogenic mindset persists. While exploring the thematic concerns in his book, Gregory Stephenson (1991) opines:

Ballard's novels of cataclysm represent a response and a rebuke to the scientific-materialist orientation of our age, and to the meretriciousness and rapaciousness of our technological-commercial culture. They further serve to awaken our consciousness to a new awareness of our identities, interpreting our equivocal and unsuspected motives. (p. 62)

While it is undeniable that global climate change has been significantly influenced by human anthropogenic activity as represented by the characters of Strangman in *The Drowned World* and Hardoon in *The Wind from Nowhere*, the solution is in the hands of humans, who may prevent the most catastrophic consequences from occurring. With regard to their evocation and urgency, the challenges highlighted by Ballard in both novels necessitate both scientific and literary insights to ignite climate consciousness before the deep sleep turns lethal and the planet is doomed to never wake up.

Until the closing pages of the novel *The Wind from Nowhere*, the characters are seen as hostages of nature's wrath who fight tooth and nail to survive the catastrophic winds. The personified death of antagonist characters in the novel, like Hardoon in the climax scene, exemplifies nature's triumph over human supremacy and the characters like Maitland, Lanyon, Patricia survive the disaster. In parallel, in *The Drowned World*, the author seems hopeful by showing the need for human consciousness to curb the change in climate despite extreme temperatures through the character of Kerans, who denies leaving the inundated city despite the catastrophic events and battles to survive throughout the novel. Ballard tries to show how different human actions lead toward different endings and fortunes and envisions a future society more conscious of the natural surroundings than ever before.

Climate change is a serious threat in the contemporary scenario, and the writers of cli-fi are expected to represent contemporary climate concerns through the medium of literary discourse. The challenges like ecological issues, catastrophic natural disasters, the post effects of the ultra modernized and urbanized world embarking toward planetary destruction could better be

envisioned through cli-fi narratives. In the mad rush towards modernity, mankind has become distinctively different from nature and has annihilated the natural world. Cli-fi, in this way, could help establish an ethical responsibility on the human race by showcasing the plausible and probable future that has been overlooked frequently in the name of advancement. In particular, the spectacular display of Ballard's imagination in the novels offers the worst conceivable vision of the world as a whole by extending existing crises into their worst-case scenarios in the near or distant future.

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**A CASE STUDY OF ORGANISED AND UNORGANISED  
CLUSTERS OF KANPUR LEATHER INDUSTRY**

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**Abstract:**

This paper is a case study of a small section of leather industry in India. Indian leather industries are divided into 5 major broad clusters; Kanpur, Mumbai, Delhi, Kolkata and Chennai. In this paper an attempt is made to have an in-depth analysis of Kanpur cluster of leather industry. This paper has been conceptualized mainly on primary data, that is, on the basis of information gathered through Council of Leather Export (CLE) , Tannery visits and interviews on various visits done. An overview of the Kanpur cluster of leather industry was gathered from CLE and later on, on the advice of the regional director of CLE, Kanpur visits were done to different tanneries to understand the ground reality. It is important to note here that all agents of information gathering were extremely cooperative in giving insightful information. The paper uses content analysis method for interpretation. All information gathered were interpreted unbiasedly. The paper has been concluded with a few suggestions given on the basis of personal understanding of the situation.

**Key words:** Leather, Kanpur, Council of Leather Export, Organised cluster, unorganised cluster

**Introduction**

The leather manufactured in the city of Kanpur holds relevance and prestige for its history of more than three centuries now. In 1840, saddlery made in Kanpur was sent to England in a fair where it was liked by all. This gave boost to the art of craftsmanship of leather in Kanpur. The first factory was established in 1855, which was a Harness and Saddlery factory (defence sector) which gave birth to a number of finished product industries in Kanpur. In the initial years raw leather was exported to England which later on exported finished items back to the country. But in due course of time it was realised that this exercise caused a lot of expense in the transportation costs. Thus, as a result of which leather goods began to be made locally. The most demanded goods manufactured by the city were belts, shoes and other useful products for soldiers and horses. With rapid industrialisation of the city; the city earned its title of being 'Manchester of East' Kanpur city is famous for its saddlery and harness product manufacturing. The business of saddlery manufacturing started during the British empire, which was then intended to cater towards the need of army. Later on, the demand for saddlery and harness product kept on increasing, especially in the European countries. Kanpur specialises in vegetable tanned buffalo hides. Saddlery manufactured in Kanpur cluster is 100% export oriented. On an average about 12.50 million pieces of Harness and Saddlery items are sold annually. Saddlery manufactured in Kanpur has also received GI (Geographical Indication) for all over India.

Apart from saddlery manufacturing, Kanpur tanners and manufacturers have diversified their operation modules by manufacturing leather footwear, footwear related components, leather garments, leather gloves and other finished leather products. Manufacturers are getting good value orders for manufacturing wide segment of leather products. One of the major reason for the city manufacturers to have this fortune of manufacturing varieties of leather products is that the city has abundance of raw material in the form of buffalo leather tanning as Kanpur is world famous for being a city with maximum livestock population of buffalo.

The council of leather export (CLE) is an autonomous non-profit organisation, which is entrusted with export promotion activities and the development of the Indian leather industry. About 3500 companies manufacturing/exporting leather and leather products are members of the council. CLE takes care of coordination between government and the industrial units, handling problems and grievances of industries, facilitating substantial international exposure for leather industry. Formal meetings and interviews have been done with Regional Director of Council of Leather Export, Kanpur regional office during the period of January,2020 to December 2021. On the advice of CLE Kanpur regional director a small scale pilot survey was done on various tanneries across the city in order to have an overview of the operation structure of Kanpur cluster of leather industry. Upon site visit it was observed that small scale tanneries are in the Jajmau area of Kanpur, where there are many small

tanning units catering mainly saddlery based order. The technique and style of operation was traditional in this area as machineries and drums for dyeing purposes are old pattern. This segment of industries are extremely vulnerable as any disruption in any economic or non-economic activities in the industrial sector impacts this segment directly. A verbal interview was conducted in around 5 industries in this segment to enquire about the problems they are facing in operations. Some of the common problems faced by this segment are:

- Financial dependency on export promoting organisations
- Operational restricting regulations laid down by National Green Tribunal (NGT) for environmental compliance adherence
- Lack of wastage management system in the area
- Stiff internal competition

A few images taken on site of Jajmau area are added beneath:



Makhdoom tannery

Visited on 28.01.2021



Gujrat Tannery

Visited on 10.02.2021

On the other hand industrial units operating in Unnao, Banthar and Kanpur Dehat are much more organised in terms of operational working capabilities as they have machineries that are upgraded. This was observed after visiting around 5 tannery units in these areas. This segment of industries of Kanpur cater towards large scale business orders of leather products from mainly international markets. The industries in these regions are lesser in number but they are based on large scale supplies and orders. Therefore, as per on site observation industries in these regions comparatively more revenue yielding towards industrial income of the overall state. But, this segment faces its share of problems. Some of the common problems noted through verbal interview by this segment are:

- Environmental compliance laid down by National Green Tribunal (NGT) have intensified in this segment due to large scale production. As leather industry is categorised as high polluting industry due to high quantity of chromium discharge. In a recent event of actions, National Green Tribunal (NGT) had instructed industrial units to restrict

production functioning at 50% capacity, regardless of them being large or small scale. Chennai is an example of a successful leather cluster as it is able to attract many international brands and has become a major hub of manufacturing quality finished leather goods. Kanpur is still lacking behind in this regard as most of the international brands now a days expect manufacturers to abide by environmental norms along with producing quality products.

- Declining global demand due to stiff international competitors. As industrial units in India lack in innovation, research, development and designing capabilities, the competitors take advantage of that and offer upgraded and better quality products to retailers to capture complete market. For example, China and Vietnam are prominent markets that are competing with Indian market
- There is an evident lack of designing creativity as manufacturing concept is based on the idea of copying the sample as it is.
- Order driven industry has a lot of fixed maintenance cost when the unit is not getting enough orders. This eventually impacts consistency in performance of the industry

A few images taken on site at Unnao area are added beneath:



Crescent tannery-Visited on 16.10.2021



Crescent Tannery-Visited on 14.12.2021

Therefore, after the complete pilot survey and insight from Council of Leather Export (CLE) regional director, it was conceptualized that the leather industry in Kanpur is divided into two broad categories:

1. Organized Cluster: This cluster has an organized approach in terms of marketing, manufacturing, development and willingness to adapt environmental norms. This covers region of Unnao, Banthar and Kanpur Dehat.
2. Unorganized Cluster: This cluster has mainly small tanners operating with traditional patterns of working, relying mainly on government funding. This covers region of Jajmau area of Kanpur.

Furthermore, upon evaluating literature review related to Kanpur cluster of leather industry it was discovered that a lot of data analysis and research work has been conducted on the unorganised cluster of Kanpur leather industry.

Whereas, substantially lesser work has been done on the organized cluster; presuming that this segment of industries need less/no assistance as they are operating on a large scale. But, in fact the organized cluster has better potential for growth and development of the overall leather industry.

Organized cluster of Kanpur leather industry includes basically large scale industries which get bigger orders of production and have more prospects to contribute towards growth through export earnings for the state and eventually the country's industrial income. Some of the prominent prospects observed in this segment of industry are as follows:

1. This segment of industries have the opportunity to reap maximum benefit from government support and funding as under the recently launch) for 2017-2020, the government has funded in upgradation of Common Effluent Treatment Plant across all leather clusters to enable them to meet the prescribed pollution control discharge norms. Moreover, the 'Make in India' government of India initiative to promote India's manufacturing sector by facilitating investment, innovation and protect intellectual property and build best in class manufacturing infrastructure. Also ODOP (One District One Product) initiative by the state government had also laid emphasis on Kanpur, Hamirpur and Agra. IDLS (Integrated Development Leather sector) scheme of Council of leather export aids leather industrialist by providing subsidies for machineries. Large scale industries get 30% subsidy of total value whereas, small to medium scale get only 20% subsidy of the total value. Now benefits like these provided by the government can be fruitful only if the industrialist are aware and willing to take initiative for getting federal benefits.
2. International promotion groups have also recently shifted their focus to Indian industrial units sighting the strengths and potential in this section of industries. For instance, LWG (Leather Working Group) is a multi-stakeholder group which aims to develop and maintain environmental compliance and performance capabilities of leather manufacturers. It integrates brands, supplier, retailers and leading technical experts within the leather industry. LWG involves major brands like ZARA, H &M, Addidas and these brand specify that they will only work with manufacturers having LWG certification (abiding by environmental norms) LWG certification also has certain ratings like Gold, Silver and Bronze.

Therefore, there are great prospects for this segment of industries by abiding to protocols and norms set by these groups to achieve dual benefit; abiding by environmental norms and manufacturing a good standard product to become a member of this group and attract international brands and buyers. This shall eventually facilitate to make Kanpur a manufacturing hub.

**Conclusion:**

After interpreting the cluster bifurcation of Kanpur cluster of leather industry it can be concluded that both the cluster of the city have their share of economic contributions towards the state and national industrial income but since one cluster (unorganised cluster) has had a lot of research work done for research problem investigation and the other cluster (organised cluster) has had comparatively lesser research problem investigation done so it is important to throw a light on the organised clusters growth prospects as this cluster is already contributing well towards export earnings and with a little more focus and aid this cluster will grow more. The unorganised cluster (Jajmau area) has density of industries operating on small and medium scale over a very long period of time. They majorly lack on the aspect of environmental awareness and business ethics as they hide their overall production volume to the authorities as they are assigned to produce a set volume of produce but instead they are producing more than their prescribed share (this insight was received while interviewing the regional director of CLE) This has a dual impact; one on environmental degradation and secondly losing respect in the eyes of the monitoring authorities as they shall doubt their business ethics in the long run. Therefore, a major chunk of their problems shall be solved if this cluster becomes more aware of environmental degradation and become honest about their producing volume. Environmental compliance awareness is very important for sustenance as not only it is impacting the health of the local public as all the waste disposal of the industrial waste is done on adjoining water bodies which eventually is consumed by locals but it is important to be focused as adhering to the environmental compliance will help in gaining business as more and more brands around the world are trying to work with manufacturing units that are taking care of waste management. The organised cluster on the other hand needs to keep focusing on attracting more international brands to get orders from them by adhering to their norms and protocols as once these brands start doing business with this cluster, they will eventually make them their manufacturing hub. Being a manufacturing hub for any international brand will aid in sustaining in the manufacturing business for long.

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## **IMMIGRATION PATTERNS OF SUGARCANE CUTTERS IN PUNE DISTRICT OF MAHARSHTRA**

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### **Abstract**

In general, uneven development is the basic cause of migration. This is explained in terms of 'pull' & 'push' factors. Migration takes place from less developed regions to more prosperous areas. Deprived people from all over the world have tendency to migrate to areas with employment opportunities for livelihood. This research paper is focusing on the seasonal migration patterns of sugarcane cutters in Pune district of Maharashtra. The study is carried out at four sugar factories, out of eighteen in Pune district. Pune district is well advanced in industry, agriculture, transport, trade, etc. The study is made by collecting both primary data by interviews of sugarcane cutters with schedule at sugar factory sites, along with secondary data. The Gravity Model of John Stewart is applied to understand migration patterns in Pune district. The study also come up with some solutions to curb the seasonal migration not only in Pune but in Maharashtra state.

**Keywords:** Immigration, Emigration, Gravity Model, Migration Index, Migration Patterns,

### **Introduction**

Migration is not always a permanent migration; it can be for a stipulated period so that the migrant again returns back to source region from destination after some time. This phenomenon is called 'seasonal, cyclical or oscillatory migration'. This migration ranges from few months to a season. It mainly happens in the rural parts of the country. Migrants from different socio-economic background migrate to seek employment. This employment is distributed in unorganized sectors of economy like agriculture, fishing, animal husbandry, construction, services and footloose industry. Rural labors are

forced to migrate due to social and economic hardship especially as most of the migrants are socially backward, the landless laborers and the poor and unskilled laborers (Breman, Jan 1979). Deshingkar, Priya and Start, Daniel (2003) in their studies of seasonal migrants of Andhra Pradesh and Madhya Pradesh finds seasonal migration as strategy of living of poor and social exclusive people. They studied patterns of seasonal migration, background of migrants and their economic condition. Keshri, Kunal and Bhagat, R. B. (2012) studied regional pattern of temporary or seasonal migration in India. They discussed the socio-economic condition of migrants with reference to caste, religion, education, landholdings etc.

The quantitative and qualitative analysis of migration process is done by many scholars. The first ever theory was credited to Ravenstein (1885) where he studied the inter-country movement of migrants within Britain in 19<sup>th</sup> century. The Gravity model was welcome addition from John Stewart where he applied Newton's Law of Gravitation to migration, where he formulized the role of population size and distance of settlements in determining spatial interaction. David Karamera et. al (2000) in their studies showcase the influence of political, economic and demographic factors on the size and composition of migrants flow to USA and Canada by modified Gravity Model. Raul Ramos and Jordi Surinach (2013) studied the flow of international migrants from European Neighborhood countries (ENC) to European union (UN) in past and future. Hye Jin Park et. al (2018) have applied generalized gravity model to study marriage patterns between the bride and the groom clans of Korea by applying geographical and clan information with census data. These studies encouraged the author to use gravity model in seasonal migration studies in Pune district with modified nature. This research has been conducted in four sugar factory sites by direct visit and interviews of sugarcane cutters in Pune district of Maharashtra.

### **1. STUDY OF MIGRATION INDEX IN BHIMASHANKAR CO-OP SUGAR FACTORY**

Bhimashankar co-op. sugar factory is situated in Pargaon Bk. of Ambegaon tehsil in northern part of Pune district. The study of migration process is made with the sample size of 150 sugarcane cutter families comprising 532 migrants from different districts of Maharashtra to the factory. The distance between sugar factory and native villages are measured with Google Map. The populations of villages are taken from census of 2011.

$$\text{Ashti Tehsil (MI)} = 1 \times \frac{6487 \times 1360}{144} = 63,016.57$$

$$\text{Patoda Tehsil (MI)} = 1 \times \frac{6487 \times 1813}{175} = 67,205.32$$

$$\text{Shirur Kasar Tehsil (MI)} = 1 \times \frac{6487 \times 1240}{168} = 47,880.23$$

$$\text{Beed Tehsil (MI)} = 1 \times \frac{6487 \times 1332}{200} = 43,203.42$$

$$\text{Pathardi Tehsil (MI)} = 1 \times \frac{6487 \times 1190}{140} = 55,139.50$$

$$\begin{aligned} \text{Shevgaon Tehsil (MI)} &= 1 \times \frac{6487 \times 1072}{149} = 46,671.57 \\ \text{Jamkhed Tehsil (MI)} &= 1 \times \frac{6487 \times 1170}{158} = 48,036.64 \\ \text{Parner Tehsil (MI)} &= 1 \times \frac{6487 \times 609}{63} = 62,707.66 \\ \text{Karjat Tehsil (MI)} &= 1 \times \frac{6487 \times 1034}{135} = 49,685.61 \\ \text{Rahuri Tehsil (MI)} &= 1 \times \frac{6487 \times 679}{92} = 47,876.88 \\ \text{Chalisgaon Tehsil (MI)} &= 1 \times \frac{6487 \times 1565}{200} = 50,760.77 \\ \text{Pachora Tehsil (MI)} &= 1 \times \frac{6487 \times 1788}{240} = 48,328.15 \\ \text{Jalgaon Tehsil (MI)} &= 1 \times \frac{6487 \times 1460}{284} = 33,348.66 \\ \text{Nandgaon Tehsil (MI)} &= 1 \times \frac{6487 \times 1201}{183} = 42,573.15 \\ \text{Ghansawangi Tehsil (MI)} &= 1 \times \frac{6487 \times 1060}{231} = 32,575.41 \\ \text{Kannad Tehsil (MI)} &= 1 \times \frac{6487 \times 741}{193} = 24,906.04 \\ \text{Vashi Tehsil (MI)} &= 1 \times \frac{6487 \times 1626}{211} = 49,989.86 \\ \text{Dhule Tehsil (MI)} &= 1 \times \frac{6487 \times 1700}{240} = 47,947.39 \end{aligned}$$

The application of Gravity Model to migration data shows the maximum results as per the expectation of formula. The Table1 showcase that the values derived for each tehsil is positively correlated to the actual migrants to the factory. The highest migration volume figure is derived for Patoda tehsil is 67,205.32 which represents the highest migrant families of 40 to the Bhimashankar factory. The Pathardi tehsil has migration volume figure of 55139.50 represented by 36 families at factory, while Ashti tehsil has migration volume figure is 63,016.57 which represents 29 migrant families to factory. The figures of Ghansawangi and Kannad tehsil are 32575.41 & 24906.04 respectively represents only one migrant family. There are some exceptions with the migration volume figure, tehsils like Jamkhed, Karjat, Rahuri, Parner and Vashi have high volume figures but they have only one migrant family to Bhimashankar sugar factory. It is because the native villages have high population or distance to factory is less.

**Table 1 : Tehsil-Wise Mi And Actual Migrants At Bhimashankar Co-Op Factory**

Sr. No.	Tehsil	Migration Volume (MI)	Actual Migrant Families at factory
1	Patoda	67205.32	40
2	Pathardi	55139.50	36
3	Ashti	63016.57	29
4	Shevgaon	46671.57	8
5	Chalisgaon	50760.77	8
6	Dhule	47947.39	8

7	Shirur Kasar	47880.23	5
8	Pachora	48328.15	3
9	Nandgaon	42573.15	3
10	Jalgaon	33348.66	2
11	Beed	43203.42	1
12	Jamkhed	48036.64	1
13	Parner	62707.66	1
14	Karjat	49685.61	1
15	Rahuri	47876.88	1
16	Ghansawangi	32575.41	1
17	Kannad	24906.04	1
18	Vashi	49989.86	1

Source: Field Work 2021

## 2. MIGRATION VOLUME OF SUGAR FACTORIES IN PUNE DISTRICT

The migration volume figures for each district are derived by getting averages of MI for all tehsils having migrants in that district. The high migration volume positively represents high number of migrant families from concerning district. In Bhimashankar factory 56,228.96 figure represents 75 migrant families, like wise 24906.04 figure represents only one family. In Sant Tukaram factory, 39,799.00 represents 77 families while 16,203.75 figure indicates only one family. In Malegaon factory MI 34,440.33 figure represents 114 families and 10,195.69 figure only two families. Venkateshkrupa factory 47,965.61 figure indicates 67 families while 17,883.25 indicates only one family. There are some exceptions to these figures.

**Table 2:** District-Wise Mi And Actual Migrants at Sugar Factories In Pune District

Sr. No	Sugar Factory	Districts	Average Migration Volume (MI)	Actual Migrant Families to Factory
1	Bhimashankar Co-op Sugar Factory	Beed	56,228.96	75
		Ahmednagar	51,686.31	48
		Jalgaon	44,145.86	13
		Dhule	42,706.08	8
		Nashik	42,573.15	3
		Jalna	32,575.41	1
		Aurangabad	24,906.04	1
		Osmanabad	49,989.86	1
2	Sant Tukaram Co-op. Sugar Factory	Ahmednagar	39,799.00	77
		Beed	35,402.35	68
		Jalgaon	21,353.68	3
		Jalna	16,203.75	1
		Nashik	20,094.62	1

3	Malegaon Co-op. Sugar Factory	Beed	34,440.33	114
		Ahmednagar	27,969.01	13
		Jalgaon	14,524.16	9
		Aurangabad	13,725.22	7
		Nashik	10,195.69	3
		Osmanabad	24,052.48	2
4	Venkateshkrupa Sugar Mill Pvt. Ltd.	Pune	87,804.37	1
		Ahmednagar	47,965.61	67
		Jalgaon	47,410.88	45
		Beed	44,143.11	21
		Nashik	30,245.28	10
		Aurangabad	40,455.96	6
	Jalna	17,883.25	1	

Source: Field Work 2021

### 3. Migration patterns of sugarcane cutters in Pune district

Sugarcane cutters in Maharashtra are mainly belongs to the rain shadow areas of Marathwada, Khandesh and eastern parts of western Maharashtra. The districts like Beed, Osmanabad, Latur, Ahmednagar, Aurangabad, Jalna, Dhule, Jalgaon, etc. are main suppliers of sugarcane cutters to the sugar factories in Maharashtra. The main migration pattern is Rural to Rural, labors from rural areas migrate to sugar factory sites in rural areas. People from this area have adopted a strategy of seasonal migration during dry season to sugar factory sites in Western Maharashtra for many decades. They come back around April to their native villages and start agricultural practice.

#### Inter-district migration in Pune district

The study revealed that almost 99% sugarcane cutter families are from outside the Pune district. They mainly belong to the districts of Beed, Ahmednagar, Jalgaon, Aurangabad, Nashik, Jalna, Osmanabad, etc. It is visible from Table 3 that maximum 278 families i.e. 46.33% of total sample sugarcane cutters families are from Beed district alone. They are mainly concentrated (41%) in Malegaon Sahakari Sakhar Karkhana, Shivnagar (Baramati). It followed by 205 families (34.16%) are from Ahmednagar district. They are concentrated in Sant Tukaram SSK, Kasarsai (Mulshi). Jalgaon district accounts for 70 families with 11.66% of total sample sugarcane cutters in Pune district. Only 3 families i.e. 0.5% of sample size is from Jalna & Osmanabad district. It is evident that maximum sugarcane cutters are from Beed district which is known as economically and socially backward district of Maharashtra.

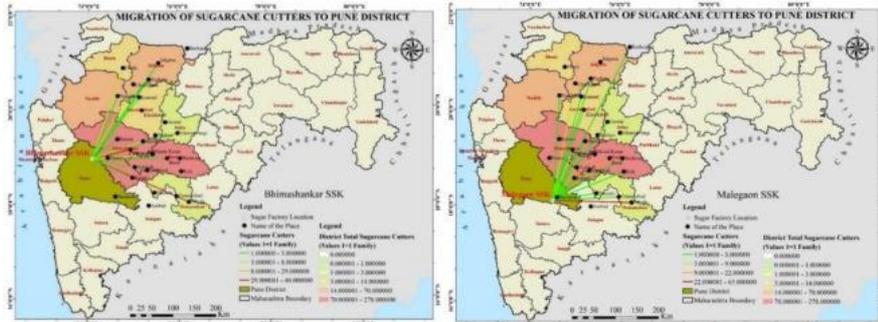
**Table 3: District-Wise Migration Of Sugarcane Cutters To Pune District**

District	Sugar Factory					
	1	2	3	4	Total Families	% to Total Families

Ahmednagar	48	77	13	67	205	34.16
Aurangabad	1	0	7	6	14	2.33
Beed	75	68	114	21	278	46.33
Dhule	8	0	0	0	8	1.33
Jalgaon	13	3	9	45	70	11.66
Jalna	1	1	0	1	3	0.5
Nashik	3	1	3	10	17	2.83
Osmanabad	1	0	2	0	3	0.5
Pune	0	0	1	0	1	0.16
Burhanpur	0	0	1	0	1	0.16
Total	150	150	150	150	600	100

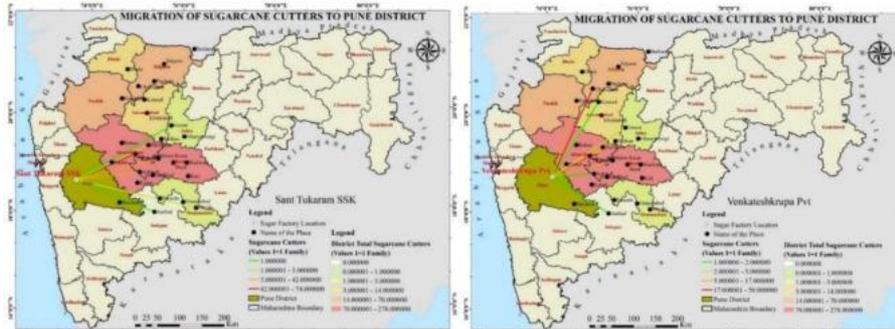
Source: Field work 2021

Map 1 : Bhimashankar Co-op. Sugar Factory. Map 2 : Malegaon Co-op. Sugar Factory



Source: Field Work 2021. Source: Field Work 202

Map 3 : Sant Tukaram Co-op. Sugar Factory. Map 4: Venkateshkrupa Pvt. Sugar Factory



Source: Field Work 2021

Source: Field Work 2021

### INTRA-District migration in Pune district

Intra-district sugarcane cutting migrant means families within the Pune district migrates seasonally to sugar factories within Pune district. It is observed at Malegaon Sahakari Sakhar Karkhana, Shivnagar. There is one family belonging to same Baramati tehsil of Pune district found at factory site.

**Table 4: Tehsil-Wise Migration Of Sugarcane Cutters To Sugar Factories**

Tehsil	Sugar Factory					
	1	2	3	4	Total Families	% to Total Families
Ambad	0	1	0	1	2	0.33
Ashti	29	42	7	2	80	13.33
Baramati	0	0	1	0	1	0.16
Beed	1	0	22	0	23	3.83
Chalisgaon	8	0	6	42	56	9.33
Dhule	8	0	0	0	8	1.33
Gevrai	0	1	3	3	7	1.16
Ghansawangi	1	0	0	0	1	0.16
Jalgaon	2	0	0	3	5	0.83
Jamkhed	1	0	2	0	3	0.50
Kannad	1	0	3	1	5	0.83
Kaij	0	0	2	0	2	0.33
Karjat	1	0	1	0	2	0.33
Khultabad	0	0	1	0	1	0.16
Nandgaon	3	0	3	10	16	2.66
Osmanabad	1	0	1	0	2	0.33
Pachora	3	0	3	0	6	1
Paranda	0	0	1	0	1	0.16
Parner	1	0	0	0	1	0.16
Paithan	0	0	3	5	8	1.33
Pathardi	36	74	9	50	169	28.16
Patoda	40	3	63	0	106	17.66
Rahuri	1	0	0	0	1	0.16
Shirur Kasar	5	22	16	16	59	9.83
Shevgaon	8	3	1	17	29	4.83
Wadavani	0	0	1	0	1	0.16
Burhanpur	0	0	1	0	1	0.16
<b>Total</b>	150	150	150	150	600	100

Source: Field work Note: 1-Bhimashankar SSK, 2-Sant Tukaram SSK, 3-Malegaon SSK, 4-Venkateshkrupa Pvt.

From Table 4, it is clear that there are sugarcane cutters from 27 tehsils of various districts of Maharashtra in Pune district. Pathardi tehsils in Ahmednagar district has maximum 169 families which accounts 28.16% of total sample families. They are mainly settled at Sant Tukaram SSK, Kasarsai. It is followed by Patoda tehsil with 106 families (17.66%) and Ashti tehsil with 80 families (13.33%). Around 9% families are from Chalisgaon and Shirur Kasar tehsils. There is only one family (0.16%) from Baramati, Ghansawangi, Khultabad, Paranda, Parner and Rahuri tehsil. As the Pathardi, Ashti, Patoda and Chalisgaon tehsils are having low rainfall and economically

underdeveloped, people from these tehsils migrate as seasonal sugarcane cutters to various sugar factories.

### **Conclusion**

Seasonal migration is a widespread phenomenon in Maharashtra. It is mainly occurring from rain shadow and economically backward areas to more progressed areas of Maharashtra. It is apparent from the study that out of total sugarcane cutter migrant, 46.33% belongs to Beed district, followed by Ahmednagar with 34.16%. Jalgaon district ranks third with 11.66% of total migrants. Districts like Osmanabad and Jalna have only 0.5% share in migrants. In migration pattern we can see that inter-district pattern is dominant in Pune district. The solution for this problem is decentralisation of industry to offer employment in those areas. Proper infrastructure like electricity, roads should be built by government, so industries can be attracted in those areas. Some tax concession should be given by government to those industries which are setting plants in such backward areas.

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**DALIT WOMEN'S RESISTANCE AND REBELLION: AN ANALYSIS OF  
BAMA'S SANGATI AND SELECT MEDIA NARRATIVES**

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**Abstract**

Double marginalization of women is a talked-about issue that hinders her liberty and rather adds to her clutches. This becomes evident when one reads the dared-voices of the Indian Dalit women writers like Faustina Mary Fatima Rani (famously known as Bama Faustina) in her life- narratives *Karukku* (1992) and *Sangati* (1994). How Bama attempted to relocate her status as a Dalit woman and voiced her identity is worthy of research, added with the fact that she has paved the way for more Dalit writers, especially women. This paper shall also make a humble attempt to analyze the resistance of Dalit women from 1980's to the present.

**Keywords:** *Sangati*, Resistance Literature, Bama, Dalit Literature  
Who is Dalit? According to Prof. Aravinda Malagatti:

The people who are economically, socially and politically exploited from centuries, unable to live in the society of human beings have been living outside the village depending on lower level of occupation, and unable to spell out their names, lived as "untouchables" are regarded as Dalits (qtd. in Kargi 17).

Dalits are the marginalized section of society who for centuries have occupied the lowest lamina of the Indian society and have always been considered 'outcastes' in the graded caste system. They have been deprived of any inclusion be it socially, politically, economically, or culturally. The entire oeuvre of Dalit literature deliberates around the structural domination of the

caste system. Dalit feminism, in particular, voices not only the structural domination of caste but also the gender, for Dalit women are dual victims of hegemony as well as of phallogocentric system.

Robert Frost's idea of double marginalization in his poem "A Servant to Servants" in 1914 is universal and all-encompassing. We apply this fact of double- removal from liberty to Dalit women in this study because Dalit women share the same plight for being a Dalit and also being a woman. Their suppression on the social and domestic level is throttling to their path of emancipation, betterment, and happiness. On a societal front, this feeling of being put at the back and behind others is explored by the subaltern writers like Bama, Urmila Pawar, Shantabai Kamble and many more. Bama has written two autobiographical narratives – *Karukku* (1992) and *Sangati* (1994) among many other stories to voice out the impoverished and pitiable conditions of Dalits. While the former is personal in nature and deals with "Bama centric" events as a Dalit Christian, *Sangati* takes the story up to a larger level and address the community at large. Even the characters of *Sangati* are her own community members. This paper does not only look at *Sangati* as a narrative of the voiceless and a part of resistance literature that is even applicable for today's Dalits, but also studies the present status of the Dalit women of India, to outline the improvements made in the social framework.

To 'resist' means to withstand or oppose any powerful force by some manner. Resistance literature includes dramas, novels, poetry or visual arts that narrates the act of resisting oppression of any sort. This art form allows movements to communicate within the exploited subaltern social subcultures and help preserve stories of resistance that has a long history. Long back, the suppressed groups shall often document the tortures inflicted on them. For example, in the American abolitionism, a large number of poems, newspaper articles were written to increase enthusiasm to collect people for a protest against slavery. The slave literature also falls under the category of resistance literature. So, in literary studies, resistance literature is one of the genres that are socio-political in nature and attempts to resist the dominant ideologies. Barbara Harlow's book *Resistance Literature* (1987) provides a detailed insight into this sub-field of socio-cultural literary studies. The point being proven is that literary creation and analysis can help in emerging newer concepts of political, social, and cultural resistance. Women's suffrage, the awareness related to feminism, and especially Black Feminism and other forms of social set-ups, all fall under this category. They all are resisting the dominant ideologies in some or the other manner. Many resistance literature writers have created a stir in their respective circles. James Baldwin, the American writer who addresses race, sexuality, and morality has moved many civil rights and gay celebration events. Alice Walker did the same for the civil rights movement regarding Black Feminism. Art Spiegelman uses resistance

literature to address the issue of trauma and stigma related to Holocaust movement denial narratives.

Bama Faustina is a similar name for Dalit rights activism in India. Her writings have highlighted the excluded status of Dalits and how they lack any power to live a decent life. By translating Bama's works into English, Lakshmi Holmstrom has established Bama's distinct voice in the Indian literary circle. Bama was born in 1958 to a poor landless family and her father served the Indian military. She owes her education to her father who somehow knew that Dalit's emancipation is laid in their education. Education helped her to free herself from the clutches of casteism and oppression. Highlighting the importance of education in her life, Nirupama Dutt in her article "Caste in her Own Image" (2003) quotes Bama- "I read Tamil writers like Jayakantan, Akhilan, Mani and Parthasarthy. In college, I read my favorites - Kahlil Gibran and Rabindranath Tagore. I didn't have many books to read so I read the same ones again and again" (para 6). Thus, education helped her to 'resist' the casteist forces, making her fight against Indian caste oppression in its own way. Her literature clearly falls under that of resistance.

Indian society is inflicted with the social categorization of caste. This system is strictly hierarchal, meaning a baby born to a Dalit couple will automatically inherit their 'Dalit' caste. They are marginalized based on the Hindu notions of physical pollution and impurity and are denied all rights civil, cultural, political, social, economic. Most of them are poor and are dependent on others for a livelihood because of meager resources. Despite various initiatives, many fall below the poverty line and lack in literacy and education, trapping them in the vicious circle of illiteracy, unemployment, impoverished life, low access to healthcare and high mortality, and no emancipation. Structural discrimination, physical segregation, downtrodden lives amidst filth, and inhabitable conditions further their oppression because even for the slightest of efforts to improve, they need money for which they work as domestic cleaners, etc. They, thus, fall under the category of what Gayatri Spivak calls 'subaltern' – who are low in rank or status. Anthony Faramelli in his 2010 article called "Can you Represent the Subaltern?" says that Spivak clarifies the true meaning of 'subaltern' as:

Subaltern is not just a classy word for oppressed, for Other, for somebody who's not getting a piece of the pie.... In postcolonial terms, everything that has limited or no access to the cultural imperialism is subaltern—a space of difference. Now who would say that's just the oppressed? The working class is oppressed. It's not subaltern.... Many people want to claim subalternity. They are the least interesting and the most dangerous. I mean, just by being a discriminated-against minority on the university campus, they don't need the word 'subaltern' They should see what the mechanics of the discrimination are. They're within the hegemonic discourse wanting a piece of the pie and not

being allowed, so let them speak, use the hegemonic discourse. They should not call themselves subaltern. (Faramelli)

The beauty of *Sangati* must be first understood through the meaning of autobiography and how *Karukku* is different from its following story *Sangati*. While both the novels are life-narratives 'about' Bama's world, the former voices out Bama's life, and the latter gives identity to many other Dalit women through its narrative technique. This makes *Sangati* a reading about Dalit women and not just Bama. Its patrilineal, virilocal and patriarchal social set-up is directly challenged and it is pleasantly surprising to see that even the downtrodden women in their own way have resisted and, in some cases, subverted a society where women have always been attached with men of their family for any matter of their existence. The fact is that though women are domestically central, they are yet socially marginalized; they are culturally active but yet socially victimized. In this relation, the meaning of 'domestic violence' is highlighted in Bama's narrative using many narrators in form of live characters. It is the story of the whole community of Paraiya women who are neighbours, friends, or family but they are all in a collective struggle against patriarchy more than caste. The meaning of *Sangati* is events and it is a collection of many anecdotes that Bama recollects, she says in the acknowledgment of her book:

My mind is crowded with many anecdotes: stories not only about the sorrows and tears of Dalit women, but also about their lively and rebellious culture, their eagerness not to let life crush or shatter them, but to swim vigorously against the tide; about the self-confidence and self-respect that enables them to leap over threatening adversities by laughing at and ridiculing them; about their passion to live life with vitality, truth, and enjoyment; about their hard labour. (ix)

*Sangati* voices out many complexities – physical, verbal, emotional, and sexual – those women face as a matter of the control of the victim patriarchal strategy. Be it Dalit women being paid less than men for the same amount of work, their struggle with childcare, the games they play as children, or women not being allowed to voice their opinions during the village meeting is just to name a few. Bama says,

The position of women is both pitiful and humiliating, really. In the fields they have to escape from upper-caste men's molestations. At church they must lick the priest's shoes and be his slaves while he threatens them with tales of God, Heaven, and hell. Even when they go their own homes, before they have had a chance to cook some kanji or lie down and rest a little, they have to submit themselves to their husband's torment. (35)

There are a lot of narrations voiced by the characters, like in the case of the story of Pecchiamma who marries twice. This power of ending her 'own' marriage is shocking yet empowering for women, especially Dalit women. Even women of upper caste needed the grit to take such a step. Then

there is the story of Pey (about the ghost that only possesses a woman) that is narrated by Bama's Patti, Vellaiamma that talks about superstitions, cultural beliefs, machismo, and the death of her daughter (murdered by Patti's own son-in-law) highlighting women oppression. Bama believes that in order for things to change, women need to demonstrate strength and stand up for themselves. She says,

It's like the proverb that says, if a man sees a terrified dog, he is bound to chase it. If we continue to be frightened, everyone will take advantage of us. If we stand up for ourselves without caring whether we die or survive, they'll creep away with their tails between their legs. (66)

Patti's story brings the fact to the limelight that one of the many reasons of Dalit men's violence is that they do not get to show their machismo to the outside world and when left with no place of their ego- display, they find their wives easier and vulnerable options. It can also be believed that these women get less sleep and no rest which drives them to irritability, verbal abuse, and quarrelling behaviour revealed in their language which is repulsively abusive. Similarly, in the story of Marypillai we learn how lucky she feels to be born in the family of a low caste for she is saved from the rules and regulations that the women of the upper caste face. Bama shares the fact that in their own community the groom's family also partake in the marriage expenditure and the groom gives money to the bride's father and marries the daughter, contrasting this practice with the dowry system that throttles the upper castes:

It's only on the surface that they look so good, really. It isn't that easy for them to get their daughters settled. They have to cover the girls' necks with jewellery, give them cash in their hands, and write off property and land in their names. Even after all this do you think the girls are happy in their new homes? Their in-laws keep on complaining that this and that is not enough, and they torment the girls. (112)

In *Sangati*, Bama showcases the ability of the Dalit women to "independently" think, earn their own money and operate their domestic lives – she shows the Dalit women walk out of marriage, remarry, change religion, strongly assert their voice and in this process end up as 'brown women saving other brown women' because they know their brown- men will not help them. This validates the comparison we stated with Frost's "A Servant to Servants" but in a modern feminist subservient manner. The style of narrative technique adds a charm to *Sangati*. It is imprinting how Dalit women have their own strong-willed and independent thinking mind that helps them establish their own 'voice' through Bama's pen. She becomes a journalist and paints vivid images of her co- Dalit community members leaving the readers with a pungent impression of the community whilst giving us time to contemplate the wrongs of our social gender/ caste- system. *Sangati* becomes a meta-narrative that involves, like an anthology, the lives of many Dalit women, inspiring and

paining both. This presentation of the social history and culture of Dalit women of Tamil Nadu makes the narrative special among the Tamil cultural literature circles.

The New Indian Express newspaper reports on 26th December 2020 the present condition of Nagapattinam district of Tamil Nadu. CPI(M) state secretary K Balakrishnan said that the Dalits continue to face atrocities. He says,

The situation which existed for Dalit farm labourers 52 years ago has not changed a bit. Dalits are still subject to limitless cruelty. We will strive to remove obstructions created by Varnashrama Dharma” (New Indian Xpress).

Shambhavi Raj in her article “#DalitLivesMatter: Why Are Atrocities Against Dalits on the Rise?” point out the fact that the Covid pandemic has become a newer excuse for practicing untouchability. The fact of virus-protection and social distancing has led to certain sections twisting the norms of a pandemic to promote casteism – “The virus is frightening and it is pushing people’s prejudices and ignorance to the forefront leading to scapegoating of marginalized populations” (para 1). Shambhavi Raj recounts for the purpose of proving the practice of untouchability an incident from upper-caste Corona patients from Nainital and Uttar Pradesh. These upper-caste patients were admitted in the hospital but they refused to eat food because it was cooked by the hospital’s cook who was a Dalit and “Such incidences of refusal to eat food have been reported in several other states” (para 5). Raj also narrates of gender-based subjection. Dr.Payal Tadvi, a medical practitioner committed suicide because she was mentally tortured and harassed on the basis of her caste.

Gautham Subramanyam in his article “In India, Dalits still feel bottom of the caste ladder” (2020), shares the fact that in the 2018 report of the NCRB (National Crime Records Bureau), 42793 cases were registered by Dalits for the atrocities inflicted upon them, “meaning a Dalit was a target of crime, on average, every 15 minutes. The number of cases has increased 66 percent over the last decade” and even today “beyond police violence, inter-caste violence is also widespread. The triggers can be acts as innocuous as entering a temple or falling in love”. The report also shows violence against Dalits actively existing in the Indian states of Bihar, Tamil Nadu, Maharashtra, Uttar Pradesh, Gujrat and Jharkhand etc. The Una (a town in Gujrat) violence case of public naked- marching of a Dalit family of seven on the alleged slaughtering of a cow shows the dehumanizing punishments the non-Dalit communities can stoop down too. A national strike was announced in India on 2<sup>nd</sup> April, 2018 by the Dalits against the Supreme Court diluting some provisions of the Atrocities Act which galvanised the government to the extent of the SC recalling its own judgement. About their status today, a United States survey called “Caste in the United States” conducted in 2016 revealed some shocking findings about the oppression in which Dalits lived even in the United States:

a) 25% of Dalits who responded said they had faced verbal or physical assault based on their caste, b) one in three Dalit students report being discriminated against during their education, c) two out of three Dalits surveyed reported being treated unfairly at their workplace, d) 60% of Dalits report experiencing caste- based derogatory jokes or comments, e) 40% Dalits and 16% Shudras are made to feel unwelcome at their place of worship because of their caste f) over 40% of Dalits respondents have reported being rejected in a romantic partnership on the basis of their caste etc. (equalitylabs.org). These findings are shocking.

So, when the servant of the servants in Frost's poem "A Servant to Servants" says that "there's nothing but a voice-like left inside" is because she has double work to do; one that the society expects her to and the other that her own household expects her to do – what one refers to as double-marginalization. Frost's woman says it in other words, "He (doctor) thinks I'll be all right with doctoring. But it's not medicine Lowe is the only doctor dared to say so – it's rest I want" because she is exasperated with physical toiling at the double level. Her pain continues, "From cooking meals for hungry hired men and washing dishes after them – from doing things over and over that just won't stay done" (Frost). This poem also most explicitly reveals the fact that men "by his shouts at night" make his wife's life miserable.

Certain social structural changes must be introduced and enforced like a common cremation ground, allowing Dalits to worship in the same temples as Brahmins, etc. The #MeToo movement in India was initiated by a Dalit woman, says Ruth Manorama in the article "Dalit Women in Politics" (2019). Many women have appreciated the fact that their involvement/ participation in politics is essential for their betterment. In India's politics, there has been no Dalit prime minister till date, just a woman chief minister of Uttar Pradesh and now a male CM for Punjab. It is important for Dalits to increase their presence in the political paradigm, especially women so that a hopeful vision is planted at the very rudimentary level using the highest power of politics.

*Karukku* (especially) and *Sangati* have already made their way into the syllabi of many universities and their courses on Dalit literature, marginal literature, feminist/ subaltern literature etc. These narratives have at least created a sense of boldness and identity so much so that a Dalit rape survivor in Uttar Pradesh has fought vehemently against her rape. Four upper-caste men preyed upon her honor and threatened her with to viral her rape video if she told anyone. Her father suffered a fatal heart attack while one of the trials and her brother is running for his life fearing the upper caste's life-threatening violence. Refusing a handsome sum of 9,72,000 as settlement, she chose to fight for justice saying "I want them in jail. Then everyone watching will know that people can get punished for this", shared the article by Think Change India in 2015. Surprisingly, she has got her rapists put behind the bars and there have been no rape cases in her village. In a country where rape

victims are humiliated with no fault of their own, sex crimes are overlooked, this girl's example is inspiring for society at large.

Then, in the cases where the victims lack voices, there is no dearth of external sources of encouragement in the form of NGOs that help the victims come out in the open and voice out their trauma. One such bravery is shown by a victim who understood the need for a detailed police report. The NGOs volunteer Ms. Pradeep recounts the episode of the Dalit victim's valour and the entire narrative of Pradeep becomes all the more important because Pradeep herself was a rape survivor around 1992. Divya Arya in her article "The Dalit activist fighting for rape survivors" (2021) in BBC shares: "Ms. Pradeep stresses boosting the morale of the survivor and helping her understand the need for a detailed police complaint. That instinct came from her own experience of loneliness as a survivor of child sexual abuse, she said. She was just four years old when she was sexually assaulted by four men in her neighbourhood" (Arya). Pradeep is fighting for Dalit women's rights for three decades and also co-founded the National Council of Women Leaders. The success of such initiatives is proven by the fact that the reports of cases of rapes in Dalits have seen a steep rise by 50% in the last decade.

The emancipation of Dalit women is also seen in the case of a 60 years old rape victim of Tamil Nadu who rose to "restore her SC name" with honour, as reported by Arun Janardhanan in the newspaper Indian Express in 2015. The state of Tamil Nadu is already infamous for its crime against the lower castes. The article elucidates the day of rape in her life and how hard it was to recoup from the trauma. The height of iniquity was seen when the police filed her complaint under simply Tamil Nadu Protection of Women Harassment Act instead of the SC/ST Prevention of Atrocities Act, 1989 knowing the fact clearly that the latter provided stricter and enhanced forms of punishments. Arun Janardhanan shares:

Her lawyer R Krishnan says, "That was the stage police altered her name, removing a letter in the FIR and cooking up a forged community certificate to project her as from a backward Christian community. After I showed the alterations to the district collector, he ordered a probe by the revenue divisional officer. They found that she belongs to the Scheduled Caste Pallar community," he says (Janardhanan)

The case was registered finally, but it took her a lot of struggles at such an age; her courage paid off though. This profound rise in their voices is commendable but it also highlights the reality that their exploitation still exists. Similar stories of Dalit victims raising voices are on a rise and this reflects the reality that the condition of Dalits is improving. Whether they get justice or not is a different area of study, the focus here is on the naked truth of more women shouting out their stories. Once this increases, there will surely be a higher rate of convictions.

Western feminism has affected the status of Indian women with Dalit women no exception. Even though there has been not much decline in Dalit treatment, but women, in general, have shown betterment in terms of education and financial stability. The proliferation of Dalit literature, on top of it, has brought the question of identity to the forefront and women are grasping it well. The contemporary Dalit discourse goes beyond the defined realms of social spheres and challenges the interactions of intersectionality. While earlier caste-inflicted women could hardly raise a voice, now they have access to legal aid, financial independence, and social respect in its basic form. Erik Fraser in “The Dalits of India: Education and Development” (2014) says:

The Dalits have experienced a bit of progress in establishing an equal position in Indian society. Under the Poona Pact, a reserved number of seats in the national legislature were reserved for Dalit candidates only who would be elected based solely on the votes of their Dalit constituents ... Their movement has also been encouraged by slow societal shifts towards a greater acceptance of Dalit equality and a greater role played by local and international nongovernmental organizations ... The Dalit population continues to struggle for equality, though the progress of the past few decades shows hope for an improved level of equality within Indian society. (Frazer)

Some benefits of government policies and social programs for women which have been designed to increase the primary education rate are noticeable in society but still, the Dalit population still remains much lower in literacy than that of the rest of India. The growth rate is slight and modest, but at least the direction is laid. As already highlighted, the mere fact that these women have mustered courage and honed skills of grit and determination is commendable. The earlier generations never dreamt of such fights for justice. Their desire for education and awareness about the places of justice clearly shows their condition is improving and progressing at both personal and social levels.

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**SCIENTIFIC EXPLANATION OF FASTING (UPAVASA)  
IN YOGA FOR PURIFICATION**

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**Abstract**

Yoga is a science of life. It gives wisdom about life, protection of health and way to achieve Samadhi. Yoga prescribed eight folded paths to achieve the aim of life. i.e. liberation. The second limb is niyama, which have five parts, Tapas is one of them, actions which are practice while doing our Swa-Dharma (practicing own duties) such as individual's unique duties, responsibilities and righteousness is known as Tapas. To achieve righteousness fasting is prescribed. Fasting is considered as one of the purification actions which is needed for healthy body and mind. Many researchers have found that fasting activated autophagy. Yoshinori Ohsumi a known Japanese cell biologist who had won Nobel Prize in Medicine in 2016 for his work, how cell rejuvenate themselves is known as autophagy. Many published studies have shown the affirmative effect of fasting on neuroprotection and longevity.

Key Words- Fasting, Upavas, Yoga, Niyam, Tapas, Autophagy

**Introduction**

According to yoga the ultimate aim of a person is liberation which can be achieved by samadhi and to achieve the aim the important element is stable and healthy body. Yogashchittavrittinirodhah (1,2) According to Maharishi Patanjali in Yoga-Sutra chapter -1 (verse-2) restrain the chitta from fluctuation or modification is Yoga. There is certain action which are prescribed to achieve it. We will discuss one part in this research. {1}

**concept of Niyama**

shauchasantoshatapahsvadhyayeshvarapranidhanani niyamah (2,32)

According to Yoga-Sutra chapter-2 (verse-32) it is been said that Niyama is divided in to five parts, souch (Maintaining the purity), Santosh (contentment), Tapas (purification action), Swadhyaya (reading text and analysis) and Ishwar-pranidhana (Surrender to divine). Every part has its importance but focus will be there on Tapas (purification action). {2}

**Importance of tapas (purification action)**

kayendriyasiddhirashuddhikshayat tapasah (2,43)

By the process of tapas (purification action), when the impurities are destroyed then physical body and senses become perfect. Purification action is been performed to destroy the dirt of veil of impurities. After the destruction of this veil of impurities our physical body perform best of his potential and the senses remains in control.

The question arises what is tapas (purification action)? It can be understood, all those actions which are practice while doing our Swa-Dharma (practicing own duties) such as individual's unique duties, responsibilities and righteousness is known as tapas. One of those action is fasting. While practicing fasting properly the debris of the physical body and sense organ is destroyed and the body of Yoga-Sadhaka (yoga practitioner) remains healthy, clean and light and that person can attain various siddhis (extra ordinary powers). {3} Fasting (upavasa) means giving up the desire, anger, delusion etc. to do our Swa-dharma and follow the path of truthfulness. As said "complete dissociation from sinful act (mind and body) and association of virtuousness or refined qualities or persons of refined qualities can be understood as upavasa not the emaciation of body (Charak Samhita Sutrasthna, 1/6). Fasting is of two types as per Vachaspatyama, one is 'vaidha' (lawful fasting) and another is 'avaidh' (unlawful fasting) (Vachaspatyama, 1322). Ayurveda has very detail analysis about it.

The prevailing wisdom in today's world when we fast, we feel sleepy or tired and we think we need energy and want to eat food or energy bars. when we eat or drink it, we are supposed to get energy and it's not true always. when we go and take food or an energy bar, we suddenly feel great that's because we're a junkie. we just got high just took a shot that boosted our brains dopamine and we felt better. It's because we are a sugar junkie, that's why we felt good. Biochemically there's no parameter that is measured in the person to say that person is lacking energy and now he took this energy shots or an energy bar he feels great. Do something's changed in body?

Various study shows no, nothing has been changed as shown in animals nor in human beings. clearly there's no biochemical change going on, none whatsoever it's all mental. Let's understand what happens, when we are junkie, whenever we eat sugar or simple carbohydrates and we get that high it goes to the dopamine center in the brain produces all that dope in cityward center and we get addicted to it and then we need it and then we feel better.

when we are fasting also, we're feeling tired and fatigued and there are reasons for that but taking another shot of sugar or taking another energy bar is not the solution. It's nothing to do with that, it's the reward center and eventually after a few days when we will come out of that habit, same as we take an alcoholic person and put him in a room and when he can't drink anymore after a few days' person won't crave anymore. It's all craving so one thing is a biochemical craving the second thing is Pavlovian reflexes.

Its mind game lets understand it, its timetable, we want to eat are we hungry no, I'm not hungry but I want to eat it's time to eat its evening or morning, it's our behavior and behavior is incongruent of physiology. Our brain has interfered our body and we stopped listening to our body. Why did we stop listening to the body? It's because we were told to stop listening to our body. By whom we were told, by the advertisement, press, media, people around us, parents maybe friends that we have to eat five times maybe six times a day. This knowledge is totally false we don't have to eat six times a day we don't need to have that calorie input all the time. Homo sapiens are about two and fifty million years old. About twelve thousand years ago, we have changed and we started going into agriculture so until then we were the Paleolithic being and we eat mostly meat some vegetables and drink lots of water. when we are Paleolithic being none of us are such fantastic hunters that we could hunt and kill and eat every three hours. For all those years (millions of years) we generated genetics and that genetics is what we still have found because it was evolved over two million years.

In the last twelve thousand years we became more intelligent and started agriculture, now our food changed so when we into agriculture did our genetics keep up with the two million years of genetic change the answer is hardly, because it takes another two million years to develop a new genetic package. We did not change genetically as our diet change, but we continued to be an agricultural society because the population grew and we need food, so agriculture was easier. In the last 200 years we change our diet again and now we are industrialized and start eating processed foods vegetables seed oils.

To understand this, if we look at our entire evolution as 24 hours, that food only came to us in the last 10 milliseconds, how do we expect our body to respond genetically and hormonally to that food that we only just introduced to our genetics. Paleolithic being eat maybe once a day and he eat during the day time because if we try to eat at night time where the caucus is outside i.e. dangerous animals we remain in our cage and even we don't drink water in the night because we don't have latest facility.

So, our body is made to fast. we should be fasting and feasting as well because if there was no food around and if our sugar level just went down and our energy go down then we'll be dead in 24 hours because we're going to get cramps and we'll just crawl down and we just going to get terrible and die. But this is not the case you don't die it means fasting does not kill people in fact we were used to of fasting from Paleolithic age. In fact, when we're sick, we

fast when we have the flu we don't eat. when our pets are sick didn't eat, we don't see our dog running and eating his food he stays in the corner and does not eat. There's a wisdom in that and that wisdom is the physiology. Physiology of the body is saying that he knows eating is dangerous eating takes up a lot of energy. If we put in about a hundred calories of food into our body it takes about 60 to 70 calories of our body to digest that food and then we get a little excess. So eating is an energy consuming activity but most of us don't think of it. Let's understand biochemistry of body, we stop eating in the first 12 hours, our bodies understand no food coming out now it's going to wipe up all the glycogen that is in our liver and in our muscles that's a normal process. Now body going to use glycogen so our sugar level or our glucose levels will be maintained. Question arises what about protein? we got plenty protein in our body, what about vitamins so a normal body got at least a month's worth of vitamins in the body. When we eat, we store in the form of fat and that fat should be utilized now so for the first 12 hours we not going to use the fat. In fact, we are going to use our glycogen stores, we feel ok and our sugar level will not go down its a key concept. we can fast for seven days our blood sugar will come down but we will not become hypoglycemic and have an attack unless we're on insulin or we're taking diabetes medications. Question arises how does the body keep the sugar? Let's understand it in the first 12 hours, we get glycogen and after 12 hours we get gluconeogenesis that means new glucose is being made. Gluconeogenesis, whereas that glucose comes from, it comes from protein but it's not the protein in the muscles. protein is always being turned over in our body, but this time the protein that's normally going to turn over turns into blue so our glucose level is maintained for another 12 hours or so. During this next 12 hours as a small increase in ketosis. It's an important concept so I am explaining it, where does ketosis come from?

when insulin level goes down then body understand it and the insulin levels must drop so the insulin levels are now low because we're not eating. when our insulin level is high, we store energy and when our insulin levels are low, we pull energy out of the fats. Through the hormonal action we know hormone sensitive lipase and the action of LPL, fat stores open up because our insulin level is low so the fats start being devoured the fat gets converted to triglycerides and fatty acids the fatty acids flood the bloodstream as we don't utilize it directly so fatty acids go to our liver and in the liver our fatty acids get converted to ketones there's two ketones 3-beta-hydroxybutyrate acid (3HB) and acetoacetate acid these two ketones now go up and ketones can be utilized by the body and this is the great breakthrough. I want to tell that ketones can be utilized by every cell of our body including our brain.

We were told that the brain is an obligate glucose utilizer and can only utilize glucose it's absolutely wrong there was a study done in Britain where what they did is that they brought the blood sugar down to 30 but they pump patient full of ketones all was fine. we should be having convulsion in the brain can

utilize ketones after a seven-day fast, 70% of the energy utilization of the brain is through ketones and the brain likes it. There are even studies to show that, when the brain utilizes the ketones it is a cleaner burn. It burns more cleanly. what happens if there is a slow increase in the ketones which actually starts around 18 hours and gradually goes up and up, so by 24 hours, we have some ketones maybe 10 to 15 % of our entire energy source is now going to be ketones.

How are we going to feel with ketones? Answer is very fine without any problem, because ketones are giving all the energy that we need then let's say another 12 hours go, at the 35 hours the ketones go even higher and higher and by 3 days we're really beginning to get even better and even higher, so by the fifth day of fasting we enjoy the process. If we've been on a low-carb diet low sugar diet we will go into ketogenesis earlier than somebody who eats a lot of sugar because it's got a whole bunch of glycogens in the liver. Because glycogen burn first before we start burning ketones. {6}

I'm will take an example 24 hours, our insulin levels have been low and now we eat our next meal we're only going to make very less insulin. we can make a much less amount of insulin so our body is going to deal with that meal differently then had we eaten in a fed state. so, eating after a fast is metabolized totally different than eating in a fed state. What will happen is that we produce less and less insulin even in the next few days as we fasted one day. Paleolithic being, especially after 18 hours the epinephrine levels increase and our adrenaline levels go up and cortisol levels go up. Our metabolic rate goes up we start feeling better more bushy-tailed, bright-eyed because we are looking for our next kill. If we walk out there with our eyes droopy how we're going to see the kill? Here our energy is very high, we pumped up our metabolic rate is high, we more alert, awake and we will get what we want to kill.

There's another thing that happens when we're fast, we produce a stuff called B-brain-derived neurotropic factor. so, what happens is that the body starts producing a hormone that goes to our brain and tells our brain switch on and we actually make new brain cells. No drug is there which can produce new brain cell only fasting situation make new brain cells. As nature wants to teach us that the cell, we got into the situation learn from it remember it and behave according to situation. Fasting also produces growth hormone. If we're fast just a one and half to two days the study shows we produced a two thousand percent increase in our growth hormone production in a man and thirteen thousand in a woman, so it is the best way to boost our growth hormone level too. {7}

when we're fasting so growth hormone increases, about 20 to 24 to 48 hours, if we really want to get the full benefit of growth hormone now there's a condition called autophagy. Autophagy starts actually at about 18 hours and then gradually increases and its maximum at 3 days.

#### **CONCEPT OF AUTOPHAGY**

Now let's understand autophagy, Yoshinori Ohsumi a known Japanese cell biologist who had won Nobel Prize in Medicine in 2016 for his work, how cell rejuvenate them self which is known as autophagy, during fasting the cells break down proteins and other cellular component and use them to supply energy to the body. When we are nutrient deficient at time of fasting like this body senses that there are no nutrients coming in and there's thing called mTOR. mTOR levels go really low this is a protein kinesis in the body and that turns on autophagy. what turns autophagy is mTOR levels are high, what causes mTOR levels to go high is because of mostly eating proteins. what eating do, it takes protein to our cells and the cell has a lipoprotein membrane around it and there's all the intracellular organelles in it, but in the course of time those cells and the intracellular organelles, some of them become redundant there's.

During fasting protein which was lying around as a garbage and old intracellular organelles and some proteinaceous materials that are just lying on in the cytoplasm, so the body says I need energy that time, cell need to recycle itself, and it takes those intracellular organelle, breaks them down and exports it out of the cell. Once it is exported from the cell into the bloodstream and body got some new building blocks and the body utilizes it. Now body starts utilizing our interest cellular organelles so we're recycling our self. so, our cell doesn't die it goes into a state of recycling and we recycle our mitochondria as well.

what happens is the cell is now going to be deplete of its old non-functional parts and repair, so we basically rejuvenate ourselves. If we're constantly eating what will happen? Simply we will not rejuvenate those cells. Now we are functioning better more resilient to disease, it's like a reset switch like a rebooting mechanism. Now when we eat because now, we have autophagy, a signal goes from those cells to the bone marrow that my intracellular organelles were used, when we get new ones or new supplies send them to cells. Concept of new stem cells comes here, now bone marrow when we eat makes stem cells which rejuvenate the whole-body including brain. {8}

#### **CONCLUSION**

We need to harness nature's way of giving stem cells to our body. If we want plenty of growth hormone or stem cell in natural way the most efficient way is to do fasting (upavasa) and it does not cost any money. By fasting or intermittent fasting person become healthy, more resilient to disease, strong and immunity of body increases. Studies over humans in animals says fasting boost the growth hormone and further which boost our stem cells this has been well-documented. There is no drug which can produce new brain cell only fasting situation make new brain cells will makes us mentally strong that is the concept of Tapas (purification action). Fasting is the purification action which is been performed to destroy the dirt of veil of impurities as mention in Yoga. In Tapas the debris of the physical body and sense organ is destroyed and the body of Yoga-Sadhaka (yoga practitioner) remains healthy, clean and light the

same concept is scientifically stated. From Paleolithic being we are used to fasting and it needs to be followed now to attain the maximum benefit. So, before we put anything new in our mouth, we need to decide it keeping in mind about our genetic. If body is light and healthy then we can achieve samadhi and can fulfill the purpose of life.

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**PRE IMPLANTATION GENETIC DIAGNOSIS IN THE  
CASE OF SAVIOR  
SIBLING: ETHICAL MORAL ISSUES**

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**Abstract**

The development in the field of assisted reproduction technology brings new hope to individuals and families dealing with life-threatening diseases. Let us imagine that a child is born with a life-threatening heritable disease and the only way to cure the disease is the umbilical cord stem cell, bone, or blood marrow transplantation from a genetically matched child. This is where the concept of a saviour sibling emerges. With the help of new technologies such as In Vitro Fertilisation (IVF) and Preimplantation Genetic Diagnosis (PGD), a saviour child is created to save the elder sibling. Thus, a saviour sibling is a genetically matched child specifically designed to cure the disease of the existing sibling. In conceiving the saviour child, PGD plays an important role; the process is used to select the genetically similar embryo prior to the implantation in the womb of a woman. The use of PGD for the creation of a saviour sibling raises some moral and ethical issues. This article analyses the procedure of PGD, its regulation and the legal position of the PGD in countries like the USA, UK, and India and discusses the issues and challenges relating to the savior sibling.

**Keywords:** in vitro fertilization, designer babies, assisted reproductive technology

**Introduction**

The PGD technology has become an integral part of the Assisted  
Reproductive Technology (ART)

<sup>1</sup> procedure. The testing can be used to select positive traits to be present in the child and neglect the embryos with serious genetic diseases or disabilities.<sup>2</sup> This diagnosis is primarily used to identify serious heritable disorders, such as cystic fibrosis or Tay-Sachs. However, this technique is used for more controversial purposes, such as selecting a child whose tissues can be used to save the sick child and selecting a child of a particular sex. The use of PGD technology involves several moral questions, as it involves the question as to what extent the parents should enjoy reproductive liberty. The term saviour sibling is used for the cases where parents of a sick child wish to conceive another child so that the tissue of the child can be used to provide treatment for the sick sibling.<sup>3</sup> The Cambridge dictionary defines it as; ‘saviour sibling is a child who is born with particular genes that have been chosen to treat an older brother or sister who has a disease.

In other words, we can say that a saviour sibling refers to the creation of a genetically matched child to that of the ill child to provide biological materials such as blood, bone marrow, or even organs to a fatally ill sibling. The saviour sibling is conceived either by taking the chance with traditional procreation or by IVF technology. IVF (In vitro fertilization) is a process of fertilisation where an egg is fused with the sperm outside the human body in a laboratory. Once the embryo is formed, it is placed in the uterus of the woman. However, before implanting the embryo in the uterus the zygotes are tested for genetic compatibility (human leukocyte antigen (HAL) typing), using a pre implantation genetic diagnosis (PGD), and only zygotes that are congenial with the ill child are implanted in the uterus.

PGD is the genetic profiling of embryos prior to their implantation in the uterus. The PGD involves the screening of the embryos to select the embryos which do not carry disabilities like that of the ill child. This requires an assessment of the different embryos to see if they carry desirable or undesirable characteristics. The PGD is usually done on a single cell removed from an embryo of about eight cells in development. An inspection is made of the removed cell. If the cell is free from genetic defect then the remaining cells of the embryos are implanted into the uterus and the remaining seven cells continue to divide and it giving rise to a child without a specific genetic defect<sup>4</sup>, present in the elder sibling of the child. It is important to note that PGD

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<sup>1</sup> It refers to fertility treatments and procedures that can help with difficulties or an inability to conceive children. ART techniques involve the manipulation of eggs, sperm, or embryos to increase the likelihood of a successful pregnancy.

<sup>2</sup> Mark Walker, “Designer Babies and Harm to Supernumerary Embryos” 45 *University of Illinois Press* 349 (2008).

<sup>3</sup> Jonathan Herring, *Medical Law and Ethics* 383 Oxford University Press, New York, 3<sup>rd</sup> edn., 2010

<sup>4</sup> *Ibid.*

testing is not used to analyze every embryo with the notion that each embryo is normal. It is only used to identify the absence of a specific defect similar to that of the ill child. The PGD is not used for creating the designer baby. With the help of the PGD technique, it becomes possible to select an embryo to create a child who will be compatible for the use of the blood, bone marrow, or even organ transplantation for its sibling.

Reproductive endocrinologists developed Pre implantation genetic diagnosis in England in the mid-1980. It was initially developed to identify genetic defects in embryos of women undergoing IVF. The procedure involves removing a single cell from a six-to-eight-cell-stage embryo. The cell is evaluated in a genetics laboratory. Embryos are not damaged by this procedure and make new cells to replace the one removed. Evaluation of the cell can determine if the embryo from which it came has evidence of genetic abnormalities. If it does, the embryo is discarded. If it is normal, it can be transferred to the egg donor's uterus.

Preimplantation genetic diagnosis (PGD) involves genetically tested cells or two after removal from an early embryo. This technique was first successfully used in 1989. The usual procedure for couples using IVF is to create a number of embryos and implant them two at a time into a woman. The question here is whether it is permissible to select from the embryos created which will be implanted. There is generally no objection to a selection being made on the basis of which embryos are most likely to survive birth, but more controversially a couple who are at risk of having a child with a genetic disability may wish to select an embryo that does not carry that disability. This requires an assessment of the different embryos to see if they carry desirable or undesirable characteristics. This process is known as preimplantation genetic diagnosis (PGD). Infertile couples that use PGD have fewer children with genetic disorders than those who do not use PGD. Nevertheless, many people believe that the use of PGD is morally wrong. They believe that life begins when a sperm fertilizes an egg and that discarding a genetically defective embryo is a type of murder. Others object to PGD because it allows for gender selection. PGD is the single most accurate way of ensuring the sex of a fetus..

## **LEGAL ANALYSIS OF SOME COUNTRIES**

### **I. LEGAL POSITION IN THE USA**

Adam Nash a baby boy born in October 2000, was the world's first savior child born in the United States through the PGD technology to save his elder sister Molly who was suffering from Fanconi anemia (FA). The only known solution for FA today is hematopoietic stem cell (HSC) transplantation, which requires a donor with a perfect genetic match who can replace the damaged immune system. With the help of the PGD technology, Adam Nash was born with a perfect genetic match and the umbilical cord blood stem cells from the Nash were used to treat his sister. With the success of the Nash case, the demand for the PGD has increased in the US to transplant stem cells to cure sick siblings. The USA is lagging behind the European countries to enact any law or issue any robust guidelines or standards governing the use or creation

of saviour siblings.<sup>5</sup> Indeed, there are no formal federal restrictions in the United States that deal with the use of PGD. As a result, contemporary PGD applications, such as the production of a saviour sibling, are left to the discretion of doctors and patients.

The US Congress has enacted the Fertility Clinic Success Rate and Certification Act, 1992. The objective of the act was to keep records of the success rates of ART in fertility clinics in the United States. However, the states are left with the discretion of whether or not to implement the scheme. Due to this flexibility, no state has adopted the model program entirely. However, the scheme does not consider a saviour sibling. Yet, the US government does not play a substantial role in the process and regulation of IVF, PGD, or decisions regarding saviour siblings.

In the absence of any regulatory framework in the USA, some professional groups like the American Society for Reproductive Medicine, the American Congress of Obstetricians and Gynecologists, and the American College of Medical Genetics have made some guidelines concerning the use of IVF and PGD, but such guidelines are of little relevance. Importantly, these organisations have yet to take a formal position on saviour siblings, and as a result, their advice manuals do not adequately address saviour siblings.

## **II. LEGAL POSITION IN THE UK**

The United Kingdom was the first country in the world that laid down the regulatory framework for IVF. In 1990 the parliament of the UK enacted the Human Fertilization and Embryology Act which regulates IVF and donor insemination in the country. Initially, the act does not deal with the PGD directly but created the Human Fertilization and Embryology Authority (HFEA), which has the power to license clinics for particular uses of PGD. The licence given by the authority for the use of PGD was uncontroversial in the first ten years of the HFEA's existence. The controversy emerged in 2004 when the HFEA granted permission to the Hashmi's to go for PGD to conceive the saviour child so that stem cells can be used to cure the Zain Hashmi, who was born with beta-thalassemia. In 2005 Josephine Quintavalle brought an action against the HFEA, arguing that the HFEA could not license the tissue-typing of embryos under the 1990 Act. The House of Lords unanimously ruled that HFEA has the authority to issue such a license and rejected the challenge from a group that argued such 'designer babies' violated their licensing authority. After the judgment of the Quintavalle case, the parliament of the UK amended HFE Act in 2008. After the amendment, the creation of saviour siblings is legally permissible, subject to certain qualifications. Paragraph 1ZA(1)(d) of Schedule 2 allows testing where: "a person ("the sibling") who is the child of the persons whose gametes are used to bring about the creation of the embryo (or of either of those persons) suffers from a serious medical condition that could be treated by umbilical cord blood stem cells, bone marrow or other tissue of any resulting child, establishing

whether the tissue of any resulting child would be compatible with that of the sibling.” There are, however, limitations on the use of PGD for the use of selecting ‘saviour sibling’. First, the statute makes it clear that it can only be used in the case of siblings.<sup>6</sup> Secondly, the statute makes it clear that the selection cannot be made if it is planted that the whole organ is to be donated. Thus, tissue typing can only be licensed if the intended recipient and the prospective donor are siblings, and the intended recipient suffers from a medical condition that could be treated by the umbilical cord blood stem cells, bone marrow, or other tissue (excluding the whole organ) from a donor sibling.<sup>7</sup>

### III. LEGAL POSITION IN INDIA

Unlike the UK, India lacks any specific legislation governing the saviour sibling. But in 2021, the Government of India enacted the Assisted Reproductive Technology (Regulation) Act, to regulate the Assisted Reproductive Technology (ART) procedure in the country. However, the Act is silent regarding the provisions of the saviour sibling. But the act does allow the PGD under certain conditions. Pre-implantation Genetic testing shall be used to screen the human embryo for known, pre-existing, heritable, or genetic diseases only.<sup>8</sup> Though, there is no direct law on the saviour sibling, but there are certain other laws that can be interpreted in respect of the saviour sibling. As per Rule 5(3)(g) of Transplantation of the Human Organs and Tissues Rule, 2014 minor is not permitted to donate a living organ or tissue except on exceptional medical grounds and with prior approval of the appropriate authority, appointed under Section 13 of the Transplantation of Human Organs Act, 1994. The Delhi High Court dealt with the issue of organ donation in *Anshita Bansal v. Secretary Ministry of Health and Family Welfare &ors.* ruled that “there is no complete prohibition in a minor donating an organ or tissue prior to attaining majority. Donation is permissible but in exceptional circumstances and accordance with the rules.” The court ordered to constitute a committee of two senior doctors and the committee shall render its advice to the respondent.

#### A Case Study of Kavya Solanki

India’s first saviour child, Kavya Solanki was conceived by her parents for bone marrow transplantation, to save her brother Abhijeet Solanki who was diagnosed with thalassemia major. An inherited blood disorder, causes the body to have less hemoglobin and fewer red blood cells in the patient, which, in turn, affected the supply of oxygen in the body. The only cure for thalassemia is bone marrow transplantation and the average life span of a thalassemia patient is 25-30 years. The birth of Kavya has brought a ray of

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<sup>6</sup> *Supra note 6* at 384.

<sup>7</sup> Shaun D. Pattinson, *Medical Law and Ethics* 295 (Thomson Reuters, India, 4<sup>th</sup> edn., 2017).

<sup>8</sup> The Assisted Reproductive Technology (Regulation) Act, 2021 (No. 42 of 2021), s. 25 (1).

hope and a source of joy to her parents Sahdev singh Solanki and Aparna Solanki. Both of them have a thalassemia minor and had a healthy elder daughter Namrata Solanki and a son Abhijeet Solanki who was born in November 2013. After his birth, the parents of Abhijeet notice that he had slow growth than that of a normal child. In the 10 months, the doctors found that Abhijeet is suffering from thalassemia major, and to live a normal life he required a blood transfusion every 20-22 days.

To develop a basic understanding and the possible cure for thalassemia, Mr. Solanki started reading the available literature and also searched for the available treatment to cure thalassemia. In his research, he also consulted the various medical experts and sought their advice. After extensive research, he found that the bone marrow transplant is only the permanent cure for the disease. Mr. Solanki consulted the doctors for the bone marrow transplantation and after the test, the doctors found that neither family member had a bone marrow similar to that of the Abhijeet. Mr. Solanki started searching for the bone marrow tissue similar to that of Abhijeet. Meanwhile, in 2016 the Christian Medical College, Vellore informed him that they found a bone marrow tissue match in the United States. But the cost to import the bone marrow was so high (5 million – 10 million Rs.), and the success rate of the transplantation would be 20-30% because a bone marrow was from an unrelated donor. Mr. Solanki agreed to take such a risk. But in the year 2017, Mr. Solanki came across an article on ‘saviour sibling’, so he approached Dr. Manish Banker (India’s best-known fertility specialist). Dr. Banker uses PGD technology to develop a thalassemia-free fetus for Abhijeet treatment. To create a thalassemia-free fetus, 18 embryos were created, and each embryo went through the PGD. It took nearly 6 months to find the perfect match, when the match was found the fetus was planted in Mrs. Solanki’s womb.

After 9 months of the fetus plantation, India’s first saviour sibling, Kavya Solanki was born in October 2018. Before initiating a bone marrow transplantation, the doctors have waited for 16-18 months so that Kavya could gain weight up to 10-12 kg. The bone marrow transplantation was done on 17<sup>th</sup> March 2020 at Sankalp – CIMS Center for Paediatric Bone Marrow Transplantation, Ahmedabad under the supervision of Dr. Deepa Trivedi. During the procedure, 150 to 200 ml of bone marrow was harvested from kavya’s pelvic region in an hour-long operation and then given to Abhijeet through transplantation. By the time Abhijeet has gone through 80 blood transfusions in his life. After the operation, Dr. Deepa Trivedi kept them under the supervision and found that Kavya’s haemoglobin level had dipped a bit and there was localised pain for a few days in the pelvic region from where the marrow was extracted, but after a few days, she’s fully healed. While in the case of Abhijeet the doctors found that after 6 months of the operation, Abhijeet does not need any blood transfusion and his haemoglobin count was normal. And the doctor declared that the Abhijeet is cured. In an interview, Mr. Solanki said, “we love Kavya even more than our other children. She’s

not just our child, she's also our family's saviour. We'll be grateful to her forever".

## **ETHICAL ISSUES**

### **I. Saviour child as a commodity:**

Whenever the saviour sibling is born the first question which appears in the mind is whether the child was really wanted or merely created as a medical commodity." Dr. Lord Robert Winston, a fertility expert, described generating children to donate cells for an elder sibling as "using an unborn child as a commodity." And he believes that bringing children into the world on a conditional basis is bad. The critics argue that it is unethical to create a child as a means to an end. The classic aphorism of Immanuel Kant, "Never use people as a means, but always treat them as an end," provides intellectual support for this issue.

Those who disagree with this viewpoint argue that when parents decide to have saviour children, they do so for a variety of reasons and expectations. They further argue that Kant's dictum was misinterpreted, as it does not stop people from being used as means, but it does prohibit them from being used mainly or solely as means. What would be considered unacceptable from a Kantian standpoint is having a child purely for the sake of furthering some goal and then discarding the saviour child when the purpose is achieved.

### **II. Making a Designer Babies**

The second argument against the creation of saviour siblings is that, allowing the deliberate creation of saviour siblings will lead to the acceptance of "designer babies." The aim is that this procedure will pave the way for parents to use embryo testing to select specific features for their children, such as eye colour, hair colour, athleticism, or height of the child. If PGD technology becomes an accessible medical practice, a division will emerge between those who can afford the service and those who cannot. As a result, economic inequalities may evolve into genetic divisions, with social distinctions separating enhanced from non-enhanced people. This is a straightforward argument based on the fear of technological overuse.

The Council on Ethical and Judicial Affairs of the USA released a statement in 1994 opposing the use of PGD for selecting specific traits to be present in the unborn child. The use of PGD to design a baby is strictly prohibited by law in countries like the UK, India, etc, but what about the countries like the USA, Israel, etc. where PGD is not regulated by the law.

But the supporter argues that saviour siblings should also be banned because it also involves the selection of the particular traits (embryos), as in the case of designer babies. But the above view is rejected and argued that the saviour child is created for a different purpose than that of the designer babies.

### **III. Physical Health Issues**

The major ethical issue with the saviour sibling is the physical health of the unborn child. One cannot be 100 per cent sure that the PGD is not physically harmful to the selected embryo. The Lancet published the report in 2001 and claim that "embryo biopsy for PGD does not seem to produce adverse physical

effects in the short term, but it is too early to exclude the possibility of later effects. The saviour child is created to extract the umbilical cord stem cell or the blood or bone marrow, what if the procedure wasn't successful for the first time. The saviour child has to undergo a subsequent number of painful operations for the extraction of the blood or bone marrow to cure the elder sibling. As already discussed, the PGD technology is to select the embryo which can be a potential donor. To date, no studies have been done on the long-term implications of the PGD on the health of the saviour child. It is possible to harm the embryo itself because the testing involves extracting one or more cells from the embryo. The life of the saviour child is put at risk when the organ is harvested, it can lead to a lifetime of specialised care and health issues.

#### **IV. Psychological Harm**

The critics of the saviour child raised the concern that the child might suffer psychological or emotional harm from the knowledge that they are conceived to save another's life. The critics also argue that the child might develop a lack of self-confidence as a result of believing that his or her parents only wanted him or her to assist in the treatment of older siblings. There are also fears that if the transplant is unsuccessful, the child may feel guilty, or that they would be pressured to undertake repeated transfusions or perhaps organ donation in the future.

#### **V. Risk of Eugenics**

Some scholars argue that by selecting embryos, we put our genetic diversity at risk and expose the human race to unforeseen dangers. If the human society is more biologically or genotypically homogeneous then it is more vulnerable to ecological destruction. But such contention is rejected by Boyle and Savulescu as they are of the view that due to the financial cost of the procedure the number of requests for the PGD is likely to remain limited. The selection of the particular traits in the child raises the concern about eugenics at a family and societal level. The practice of eugenics is harmful to society, the state is duty-bound to regulate the use of PGD so that its misuse can be prevented.

#### **Conclusion**

It's vital to remember that saviour siblings usually allow a sick child to live a longer and healthier life. Not only does this benefit the kid, but it also benefits the entire family unit. It is the PGD technology that offers the possibility to have a child that can save a sick sibling. From the above discussion, two areas of consensus seem to emerge, one advocated the creation of the saviour child, while the other condemn the procedure on ethical grounds, claiming that the child will be used as a commodity, or has to suffer physical or psychological harm, etc. While condemning the procedure one must give due weightage to the life of a sick child, as there is no indication that the saviour child will be harmed. In the absence of any legal framework for PGD in the USA, the doctors and the clinics are free to make life-impacting moral and ethical decisions. If PGD is not regulated the clinics can use the technology to create designer babies, resulting in the division of the

society. HFE Authority has the power to regulate assisted reproductive technology. After the judgment of the Quintavalle case, the UK parliament has amended the HFE Act in 2008, thus legally authorizing the creation of saviour siblings with certain restrictions. The countries like India and USA should enact the law to prevent the misuse of the technology and to keep a check on the practice of medical tourism. Lastly, the use of IVF and PGD in the case of a saviour child should be regulated on a case-by-case basis, as each case is unique in its own way and required a proper evaluation. Based on the above discussions the following suggestions can be made to incorporate into the law regulating PGD:

1. PGD should not be used to screen every normal embryo. Its use should be restricted to identify specific defects.
2. PGD should not be used for making a designer baby.
3. PGD should be used for patients who have a high risk of miscarriage.
4. PGD should be used only after informed consent about the abnormalities and potential risks.
5. There should be a strict mechanism for using the PGD only in cases of savior sibling.



COMPULSORY LICENCE AND THE THREE STEP TEST: A  
CRITICAL ANALYSIS OF THE  
INDIAN COPYRIGHT ACT, 1957

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**Abstract**

The compulsory licencing system, which is one of the non-voluntary licences, usually places the owner in an abnormal position of having almost no direct control over how his composition or work can subsequently be exploited. This compulsory licence system under the copyright was devised as a compromise measure to protect composers' rights while ensuring that the public would not suffer at the hands of those in a position to monopolise the works under the Berne Convention. However, with the TRIPS regime, the scope for invoking such limitations and exceptions have been narrowed down due to the restrictive constructions in Article 13. In the light of the Berne Convention, this paper attempts to examine the scope of the compulsory licenses vis-à-vis three-step of Article 13 of the TRIPS in detail by discussing the provisions of the Indian Copyright Act, 1957 in detail.

**Keywords:** Copyright, Access to Works, Three-Step Test, Compulsory Licence, Non-Voluntary Licence

**Introduction**

Ownership of copyright grants a bundle of exclusive rights such as the right to reproduce, distribute, perform, display his creation, communicate to the public, prepare derivative works, etc., by which owners of the copyright enjoy a limited monopoly to reap the economic returns. These exclusive rights inevitably restrict the free flow of information/dissemination of the works, ultimately affecting the users' interest. If the works are not accessible by the public, it is not only the free flow of the information, furthering of creativity is also hampered. Thus, the economic interest of the copyright holders and the interest of the users/general public are conflicting with each other, which

would not pave the way for achieving the intended objectives of the copyright system. To balance these two conflicting interests, some limitations and exceptions to the exclusive rights have been placed as an inbuilt mechanism to ensure the persistence of creativity in society. Among these limitations and exceptions, the compulsory licence is one of the potential tools to harmonise the conflicting interests. (Gopalakrishnan, 2014)

The Berne Convention, at first Internationally, introduced the non-voluntary licencing system through Article 13(1). However, the scope and application of the same have been very limited only to the work of sound records. As per the provision, the compulsory licence can be invoked only when the sound record comprises musical and literary works. Therefore, if the sound record has already been made available through a normal mode of exploitation to reap the economic benefits, the authority can grant a compulsory licence for recording the musical work and literary work. When the compulsory licence has been granted to make the work available to the public at an affordable price, it shall substantially affect the usual mechanical reproduction of the work by the owners or by the authorised persons. Thereby the copyright holders' economic interest is substantially influenced. However, this mechanical reproduction right granted through the compulsory licence, in any way, shall not affect the moral rights of the authors. Even though there can be some alterations to the original works only for adaptation purposes, such alteration should not affect the integrity of the original work. This process safeguards authors' moral rights when the compulsory licence is invoked. (Ricketson, 2006) Therefore, from the above, it could be summarised that the compulsory licence places the copyright owners in the out of the normal position having direct control over how their compositions may subsequently be recorded or used. (Lewinski, 2008)

Further, Article 11 *bis* of Berne deals with the compulsory licence for broadcasting. It is a matter of national legislatures to decide the conditions to issue a compulsory licence for broadcasting. (Ginsburg, 2015) In addition, there should be prescribed procedures to be followed while invoking the compulsory licence for broadcasting. However, this shall not affect the authors' moral and equitable remuneration rights.

When the Triple Test was first introduced in 1967 under Berne Article 9(2), many countries objected to such insertion. (Ricketson, 2015) Berne's Triple Test was aimed to cover and regulate the exceptions to the reproduction right alone. Since Article 9(2) does not refer to other convention provisions, their operation is unaffected by Article 9(2). Further, it conveys that the exceptions available under other provisions of the Berne are excluded from Article 9(2) and its conditions. (Lewinski, 2008) India proposed an addition to the fourth paragraph to allow compulsory licence by saying that such provision is inevitable to ensure that monopolistic interest would not hamper the dissemination of the works available to the public. As this is the position under Berne, let us examine the compulsory licence provided under the TRIPS.

### **TRIPS and Compulsory Licence**

In the present context, TRIPS is the sole multilateral-international intellectual property document incorporating Berne Article 1 to 21 and the Paris Convention to protect Industrial Property, 1883. Incorporating Berne Article 1 to 21 into TRIPS means that it covers only the text of the said articles and not the entire Berne acquis relating to these articles. Because Berne's acquis provides some exceptions to the developing countries concerning reproduction rights. There is no such exception expressly stated under TRIPS. TRIPS has incorporated the 'Triple Test' as a whole. The only difference between Berne and TRIPS is that Berne gives importance to the authors, but TRIPS says owners of the work. It means the interest of the actual holder of the work shall be taken care of rather than addressing the authors' interest. Touse the compulsory licencing system, the only available provision under TRIPS is Article 13. (Gervais, 2003) It has also incorporated the same provisions as Article 9(2) of the Berne. The Triple Test under the TRIPS reads as follows:

1. The reproduction must be for specific and limited purposes. It means it is allowed only in special circumstances or special cases.
2. It should not conflict with the normal exploitation of the works.
3. It should not unreasonably prejudice the legitimate interest of the authors.

As per the first condition, any limitation or exception should be specific or special and unique circumstances. It means "not only should the use in question be before 'a quite specific purpose', that there must also be 'something special' about this purpose. In this context, the special means that it is justified by some apparent reason of the public or some other exceptional circumstances. If so, these conditions cannot be complied with by any non-voluntary licencing systems. The same is the case with compulsory licences as well. However, this 'certain special case' can be understood based on national law and public policy exceptions. Invoking of compulsory licence could be well within the ambit of any 'public policy'. Thus, such an interpretation would very well accommodate the compulsory licence within the first step.

The second step is that any limitations or exceptions should not conflict with the work's normal exploitation. The usual interpretation of the work's normal exploitation is that those forms of exploitation that currently generate significant or tangible economic returns to the holders should not be affected. It means any limitations and exceptions should not influence or come in direct conflict with the normal exploitation of the work in question. In the case of any non-voluntary licence, any of those forms of exploitation would impact or conflict with the ordinary course of exploitation of the right holders. (Gervais, 2003) Therefore, it could be well stated that the limitation cannot be imposed without affecting the normal exploitation of the authors or owners. Thus, the compulsory licence would also have an adverse impact on the normal exploitation of the right holders.

The third step envisages that the limitations on the exclusive rights shall not unreasonably prejudice the authors' interests. Though the compulsory licence

would inevitably invade into the legitimate interest of the right holder, providing compensation or an equitable remuneration would address the concern. Due to the equitable remuneration system, the compulsory licencing system shall comply with the third step. Therefore, this will not affect the third step.

Though the compulsory licence would justify the 1<sup>st</sup> and the 3<sup>rd</sup> steps, the 2<sup>nd</sup> step will not. As there is a requirement of fulfilling all the three steps cumulatively, a compulsory licence cannot fulfil all the three steps as stated; it cannot meet the 'three-step test' requirements. Thus, one can conclude that TRIPS does not expressly provide space for accommodating the compulsory licencing system. However, the TRIPS does accommodate the same indirectly as it has incorporated the provisions of the Berne Convention, i.e., from Article 1 to 21, the compulsory licencing scheme which has been well articulated within the Berne becomes an integral part of the TRIPS too. (Gervais, 2003) Therefore, from the overall reading of TRIPS with the Berne Provisions, it could be well concluded that though the TRIPS does not expressly address the issue of compulsory licence, the Berne Convention, the same has been well covered within it. Thus, the Compulsory licence under the copyright regime is well within the TRIPS framework.

#### **Compulsory Licence Provisions in Indian Copyright Act**

In India, the history of compulsory license provision could be traced from 1911 through the Imperial Copyright Act. (Suthersanen, 2013) The 1911 Act had a provision for the invoking compulsory license for the works that were withheld from the public. The same provision has been retained in Indian Act with limiting its scope only to the Indian works. (Agitha, 2013) As of now, chapter 6 of the Copyright Act deals with various licencing forms of copyright works. There are three provisions dealing with compulsory licences. There are two more provisions dealing with statutory licences. Let us examine the compulsory licence provisions in detail.

Section 31 of the Act deals with works withheld from the public. This provision can be invoked when the owner of the copyrighted work has withheld his work from the public by way of refusing to give licence to re-publication of the work or refused to allow performance in public, a complaint can be made to the Appellate Board to issue compulsory licence at any time. Further, it says the same can be invoked if the author refuses to allow the work's communication to the public by broadcast or sound recording. The procedure under section 31(1) is that the complainant should have approached the original owner of the work to make use of his work, and the same has been rejected. If so, he can make an application under section 31. After receiving such applications, Appellate Board shall proceed with the hearing, enquiry and direct the registrar to grant or refuse to grant compulsory licence. The amount of compensation shall be determined by the Appellate Board, and the same shall be made to the owner of the copyright.

In a nutshell, it could be summarised that section 31 states that the said work should have been withheld from the public for invoking the compulsory

licence. This provision applies to all types of economic rights of the copyright holders, such as reproduction right, right to republish, right to communicate by broadcasting and making sound recording rights. Before the 2012 Amendment, this provision was available only for the 'Indian works'. Pre 2012 version insisted that the works in question should have been Indian works for invoking the compulsory licence under this provision. Thereby, the provision excluded the foreign works from the ambit of compulsory licence. However, there was no such international obligation to differentiate the Indian works with foreign work as far as the compulsory licence was concerned.

The sole purpose of keeping the provision is to bring the works available and accessible to the public. Such unwarranted discrimination was criticised that foreign works were extended with advantage. By the 2012 Amendment, the same has been taken care of, and the Indian and foreign works are put at the same level. If any work is withheld from the public, then the same could be subjected to section 31. As a result of the amendment, one could argue that the Copyright Act paves the way for invoking compulsory licence if the works are available and accessible at an affordable price for furthering creativity in society. Unreasonable or excessive pricing of the works or any accessible forms would also be understood as withheld from the public, and thus, compulsory licence provision could also be invoked.

Further analysing the two categories specified in section 31, i.e., 31(1)(a) & 31(1)(b), it is much evident that section 31(1)(a) is to make available the work to the public which has been withheld from the public. This has been aimed to serve the public interest. In the case of section 31(1)(b), irrespective of whether the work has been withheld from the public or not, on the complainant's subjective satisfaction, the compulsory licence application can be made. It means it regulates trade activities in the name of compulsory licencing. Considering section 31 in the light of the three-step test, it could be well summarised that section 31(1)(a) can very well comply with the three-step test as it is much concerned about the concerning public interest. However, the same is not the case with section 31(1)(b). It cannot comply with the three-step test as there are not many public interest concerns compared with section 31(1)(a). Though it does not fulfil Article 13 of TRIPS requirements, the same is well within the scope and ambit of the Berne Articles 11 *bis* and 13. Therefore, from the above discussion, it could be concluded concerning section 31 that the same is well in compliance with TRIPS.

Section 31A speaks about the Compulsory licence in unpublished or published works where the author is dead or unknown or cannot be traced or are withheld from the public, anyone can apply to issue a compulsory licence to publish or communicate the works to the public or translate the work to any language. The intention of the legislature has been spelt out in the enactment clause itself. The works withheld from the public due to the non-traceability of authors or the author are unknown. The provision has been brought in to make the works available to the public in such circumstances.

The procedure for invoking compulsory licence under this provision is that before making an application, he has to make a publication in the daily newspapers. One publication should be in English, and at least one should be in the local language of the local newspaper of the concerned area. If it relates to the translation of a work, he has to propose his intention in the regional language. The application should be made with the appropriate form, and a copy of the notice and fee should be attached with the application. After holding the enquiry, the Appellate Board may direct the registrar to grant compulsory licence subject to a royalty payment. If the author is dead, the Central Government may ask the legal heirs or executives of the author to publish such work within the specified period. If they fail to do so, a compulsory licence shall be issued.

Similar to section 31, the pre-2012 version of this provision was only confined to Indian works that were unpublished. Thereby the unpublished foreign works were excluded. Even the published works of which the authors were not traceable or unknown were also kept outside the purview of the Act. Only through the 2012 Amendment have these rectification measures been brought in. Thus, the current provision facilitates access to the works withheld from the public due to anonymity and traceability without differentiating between Indian and foreign works.

This category of compulsory licence would be on some special cases where the published or unpublished works have been withheld from the public, this also fulfils the first requirement of the three-step test. However, it would not fulfil the other requirement of the three-step test. However, as stated, though it does not fulfil Article 13 of TRIPS requirements, the same is well within the scope and ambit of the Berne Articles 11 *bis* and 13. Therefore, from the above discussion, it could be concluded concerning section 31A that the same is well in compliance with TRIPS.

#### **Compulsory Licence for the Benefit of Disabled**

A newly introduced provision through the 2012 Amendment Act, i.e., Section 31B, another compulsory licence has been introduced to benefit differently-abled to access and enjoy the copyright works. (Gopalakrishnan, 2014) This enables the entities or organisations involved in the betterment of the differently-abled people on a non-profit basis to approach the Appellate Board for the grant of compulsory licencing. The provision does not insist that any minimum time period be expired for invoking this licence. Further, applications filed should be disposed off within two months. This category of compulsory licence would also be in some special cases where the accessibility of the works by the differently-abled persons is in question. Therefore this also fulfils the first requirement of the 'three-step test'. However, it would not fulfil the other requirement of the three-step test. However, as stated, Though it does not fulfil Article 13 of TRIPS requirements, the same is well within the scope and ambit of the Berne Articles 11 *bis* and 13. Therefore, from the above discussion, it could be

concluded with respect to section 31A that the same is well in compliance with TRIPS.

### **Some Non-Voluntary Licences Other than Compulsory Licences**

As far as translation is concerned, there is a separate licencing practice spelt out in section 32 of the Act. It insists on invoking the non-voluntary licence after the expiration of 7 years. After the said seven years period, the Appellate Board could be approached for the grant of licence. This is a general provision. However, after the expiry of 3 years from the first publication, this licencing model could be invoked for teaching, scholarship or research. Further, it states that If the translation is in a language not in general use in a developed country, such application can be entertained after the expiry of one year. In the above-said cases, the application should be made in the appropriate form with the proposed retail price of the work and fees. After holding an enquiry, the Appellate Board may direct the registrar to grant a compulsory licence. However, such licence shall not extend to the exportation of goods other than India.

Section 32A of the Copyright Act deals with another non-voluntary licence to reproduce and publish works for certain purposes. Suppose the copies of such editions are not made available in India or have not been put on sale in India for six months, after the expiration of the relevant period, from the first publication. In that case, anyone may apply to the appellate board. The licence may be granted subject to the conditions mentioned in the section. Section 32B says about the termination of the non-voluntary licences granted under section 32(1A) if the owner or authorised person publishes a translation of work in the same language with the same content and at a reasonable price, the non-voluntary licence may be terminated. Before making such termination, three-month notice should be given. After the expiry of three months, such non-voluntary licence so granted shall be revoked. However, this revocation shall not affect the copies made at the time of non-voluntary licence. It means such copies shall be allowed to be sold in the market. Though there are a few more provisions on statutory licencing, as they do not fall under the ambit of this paper, they are not discussed. However, it is worth pointing out that all the non-voluntary licences could not pass through the triple test. However, they could do very well with the ambit of TRIPS as they comply with Berne Convention.

### **Conclusion**

From the above, it is apparent that the Indian copyright Act has a set of compulsory licencing provisions along with other forms of the non-voluntary licences. Prior to 2012, the compulsory licensing provision were the some unwarranted restrictions like 'invoking after the expiration of specified period' or 'invoking was possible only with respect to Indian works'. As stated above, they were inserted without any international obligations. However, through the Copyright Amendment Act, the same obstacles or unwarranted insertions have been omitted and paved way for the smooth implementation irrespective of being Indian or foreign works. At the same time, sometimes limitations are

available in sections 32, 32A. Such a time period is not necessary because there is no international mandate on the part of India to have such limitations while granting the compulsory licence. These provisions had been incorporated from the Berne appendix, which benefits developing countries. However, the TRIPS has not incorporated the same, and we may say that they cannot comply with TRIPS. Even after the considerable period of time, we have been merely travelling with the copyright legal framework without invoking any of these provisions. There have been the few occasions in which Indian Courts have had the opportunity of examining broadcasting related compulsory or non-voluntary licences. However, they could not make use of the provisions effectively. (*ENIL v. SCIL*, 2008) Almost, these compulsory licence provisions have been left unused. The ongoing litigation before the Delhi High Court against sci-hub has opened the academic discourse on invoking compulsory licence to the literatures that are not affordable to Academic community. Govt should explore academic licensing formula to tackle this affordability issue. This could be achieved through 'one nation – one licence policy'.

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## **OMANDURAR – THE FACE OF REDDI COMMUNITY**

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Gardon Allport gives the classic definition of personality. According to him, personality is the dynamic organization, within the individual, of those psycho-physical systems, that determine the unique adjustment to his environment. In other words, personality is all about the unique response of an individual to a given challenge from the environment. In this sense, every individual has a personality. What distinguishes a leading personality from the ordinary personalities in a group is the ability of the extraordinary personality to establish a vision, set goals, motivate people and obtain their commitments, to achieve the goals and realize the vision.

<sup>1</sup> These leading personalities are individuals within a group, 'who have influence, who provide focus, co-ordination and direction for the activities of the group'.<sup>2</sup> In other words, they are the face of the group. In communication theory, they are called the Icons<sup>3</sup> Icon is a sign, that describes or resembles the object. For example, when somebody mentions the abbreviation, OPR, immediately one could recall the Reddi Community.<sup>4</sup>

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<sup>1</sup> Organizational Behavior, ICFAI Center for Management Research, Hyderabad, 2004, p. 238.

<sup>2</sup> James Watson and Anne Hill, A Dictionary of Communication, Universal Book Stall, New Delhi, pp. 95-96.

<sup>3</sup> Jim Blythe, Marketing Communications, Pearson. Education Limited, England, 2000, p.4.

<sup>4</sup> C.S. Peirce, M. Blonsky (Ed), On Signs, Johns Hopkins University Press U.K, 1985.

An outstanding example of an iconic personality, among the Reddis of Tamil Nadu, was Omandur Peria Vazhaivu Ramasamy Reddiar, fondly referred to as the 'OPR', who was an activist in the national movement for freedom and also the first Premier of the independent Madras Presidency, from March 23, 1947 to April 6, 1949. He was generally considered to be the southern edition of Mahatma Gandhi of all India stature because both pursued 'Saintly, employed non-violent methodology to pursue the struggle for political independence and realize social justice. Both were not enamoured of any office. When Lal Bahadur sastri offered governorship to OPR, he declined similarly, Gandhi also did not choose to accept the presidantship of the congress, save once. OPR passionately participated in the national movement, led by Gandhi and he was responsible for the successful implementation of Gandhi's call for boycott of foreign products, toddy shops, for organizing salt satyagraha etc.. Gandhi's dream of building a new India, based on village industries, was fully endorsed by OPR. The only difference between them, was that Ramasamy Reddiar was born an agriculturist and he supported the village movement while Gandhi was a fully westernised gentleman, trained to be a barrister in London and turned towards village autonomy through his search for a non-violent model of economy, which J.C. Kumarappa would call the Economy of Permanence.<sup>5</sup> Just as Gandhi did not allow his family commitments to distract him from serving the public cause, Ramasamy Reddiar also did not get distracted by the death of his wife nor the death of his only son. Both lived the Dharma of a Brahmachari and spent their mortal life for the enduring cause of the nation.

His limited knowledge of English language engendered a lot of speculation when he was elected the leader of the legislative party. Ramasamy Reddiar defeated Prakasam to the post of congress party in Tamil Nadu. In the year 1947, it was believed that only a leader, who was proficient in the English language, could operate as the Premier of the Madras Presidency and therefore, many expected OPR to remain party leader and nominate someone else as the premier. But he surprised everyone by accepting the post of premier. When OPR first met the Governor, regarding the formation of the Ministry, he was accompanied by C.Subramaniam and M.Baktavatchalam. During the subsequent meetings with Archibald Nye, the Governor, C.Subramaniam expected a call from OPR. But Ramasamy Reddiar boldly met the Governor and held his own in the conversation with the Governor in the English language. It was this bold step by OPR to accept the premiership, despite the limited knowledge of English that paved the way for Kumarasamy Raja and Kamarajar to accept the office, without any reservation.

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<sup>5</sup>J.C. Kumarappa, Economy of Permanence, Sarva Seva Sangh Prakasham, Varanasi, 2017, p.30.

Even when he was premier, he would read the files, written in the English language by ICS officers and would make relevant remarks in English, without consulting any officer. On one occasion, when he noted on the file, in my opinion, with the wrong spelling of the word, opinion, his Personal Secretary, P.V. Krishayya, pointed out the mistake. Ramasamy responded with a smart answer. He said that 'It is O.K. Type the note the way I have written because the officer concerned, has only asked for my opinion and not whether I knew the spelling of opinion'.<sup>6</sup>

It is said that when the Ali brothers returned from London, Gandhi honoured them with a hand woven cotton shawl. When Ali brothers asked Gandhi about the hand woven shawl, Gandhi replied that it was khadi. Gandhi also explained that Khadi means Dignity, which comes from Indians, economically standing on their own legs. In other words, in the Gandhian discourse, khadi represented the honour of India.<sup>7</sup> Omandur Periaavazhaivu Ramasamy Reddiar, popularly referred to as OPR, was a dyed-in-the-wool Gandhian and no wonder OPR wore only khadi clothes. Since OPR considered Khadi to be sacred, he washed his own clothes. During the period of 1924, when Gandhi was engaged in the campaign for Khadi, OPR was so devoted to Gandhi that he carried khaddar products on his shoulders and went about selling them on the streets. OPR, a man of extensive landed property, responded to the call of Gandhi to popularise Khadi and vended Khadi products on the streets. This was possible because OPR, like Gandhi, did not believe in material possessions or birth-based status. Just as Gandhi pursued saintly politics, OPR also was an advocate of saintly politics. Both believed in abdicating self interest and working for the upliftment of the Indian masses, through the new economic model, called the Economy of Permanence.

Ramasamy Reddiar, being a sincere Gandhian, did not consider carrying Khadi cloth on his shoulders for marketing them, as a burden but a sacred duty. When Gandhi wanted to promote Khadi, he formed the All India Spinners Association in the year 1925. There was a branch in Madras also. In the year 1939, when this branch in Madras had an unsold stock, worth seven lakhs of rupees, at a time when a sovereign of gold was sold at rupees 13. At this juncture, it was Ramasamy Reddiar, the Gandhian, who devised a strategy to clear the dead stock. When OPR became the Premier of the Madras Presidency and continued to be the First Premier of Madras Presidency of India, he created a marketing division for Khadi sales, in every government department. Thus Ramasamy Reddiar totally supported Gandhi's Khadi promotion programme. All officials, connected with Khadi and all teachers, connected with Basic Education, were ordered to be trained in the art of operating the spinning wheel (charka).

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<sup>6</sup>Vivasaya Mudalamichar (Agriculturist Chief Minister), (Tamil), Kasturba Gandhi Kanyaa Gurukulam, Chennai, 1979, p.260

<sup>7</sup>Souvenir on Omandur Birth Centenary, p. 133.

Ramasamy Reddiar understood the value of Khadi in the context of national movement. According to Lisa N. Trivedi, in a largely illiterate and multi-lingual, South Asian context, Gandhi's Khadi Movement adopted visual medium of expression, to disseminate messages, forge national consciousness and map the geographical and political boundaries of newly invented nation.<sup>8</sup> Bean also concurred with this observation and maintained that by wearing loins cloth, Gandhi transcended the limitations of language in a multi-lingual country.<sup>9</sup> According to Chakrabarty, this visual vocabulary was an attempt to stop the drain from India and reverse the trend of colonial exploitation by the British Raj in India.<sup>10</sup> In the year 1948, Khadi Development Conference was organized at the secretariat in Madras and private manufacturers of Khadi also participated. It was at this conference that Omandur ordered the private manufacturers also to produce Khadi.

Omandur Ramsamy Reddiar was actively associated with the activities of Gandhi Niketan Ashram at T.Kallupatti in the District of Madurai. It was the brain child of G.Venkatachalapathy and R.Guruswamy, sincere followers of Gandhi, who wanted to introduce the Village Swaraj as visualized by Gandhi. It was Omandur Ramsamy Reddiar who gave concrete shape to the dream project at T. Kallupatti in the District of Madurai. This project of village swaraj has an interesting history. As stated earlier, Gandhi first valorised the Charka for manufacturing Khadi, which was deemed to be a response to British colonialism and also a strategy to empower the impoverished masses. It was J.C. Kumarappa, who argued with Gandhi, that he had been over emphasizing the Khadi and instead he advocated the resuscitation of village industries for rural reconstruction. As stated earlier, Gandhi had already formed the All India Spinners Association in 1925. Since he was convinced by the arguments of J.C. Kumarappa on the revival of village industries, he organized the All India Village Industries in 1934, under the leadership of J.C. Kumarappa, an academician – turned – Gandhian. Its office was located at Maganvadi in Wardha.

The Gandhian idea of Village Movement, under the auspices of the All India Village Industries Association (AIVIA), was presented as an alternative developmental model, to both capitalism, which was founded on predatory economics and communism, which valorised unhealthy levels of centralisation and regimentation. The AIVIA undertook research, production, training and publication. It supported village industries like flour grinding, oil pressing, gur

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<sup>8</sup> Lisa N. Trivedi, Visually Mapping the Nation: Swadeshi Politics in Nationalist India, 1920-1930, *The Journal of Asian Studies* – 62 No. 1, February, 2003, pp.11-41.

<sup>9</sup> Susan Bean, *Gandhi and Khadi-The Fabric of Indian Independence*, 1989.

<sup>10</sup> Dipesh Chakrabarty, *Clothing the Political Man: A Reading of the Use of Khadi*, The Institute of Postcolonial Studies, 2001.

making, bee keeping, growing cotton, leather tanning, soap making, paper making, pottery, converting human excreta into manure etc.<sup>11</sup>

The Gandhi Niketan at T. Kallupatti, reputed to be the Maganvadi of South India, was the place where the founder of AIVIA, J.C. Kumarappa, spent the last days of his mortal life and breathed his last breath on January 30, 1960, exactly the same day on which his Guru, Gandhi, was shot dead twelve years ago. Omandur Ramasamy Reddiar took a lot of interest in the training programme, designed for the Gram Sevaks (Village Workers). Reddiar found that the trainees needed more grounding in Tamil language without which these Gram Sevaks could not establish rapport with the target audience. Hence he requested R.B. Sethu Pillai, a great scholar in Tamil language, to teach these trainees the finer points of the Tamil language, which has a rich literary tradition.<sup>12</sup>

Since Omandur Ramasamy Reddiar was passionately committed to the Gandhian alternative development model, he organized a conference to facilitate the progress of the constructive programmes of Gandhi. It is worth recording that Reddiar had invited J.C. Kumarappa, the man who had exposed the exploitative nature of British imperialism in India, through his famous paper on public finance and the spirit behind the village industries movement. K.Venkatachalapathi, the founder of Gandhi Niketan at T. Kallupatti, Kelappan, a Gandhian from Kerala, G.Ramachandran, founder of Kasturba Gram, A.Vaidyanatha Iyer of Madurai, a leading personality in the temple entry movement, N.M.R.Subbaraman, known as the Madurai Gandhi, Dr.Gurupadam etc were invited to the Conference, for the stated purpose of suggesting a strategy to implement the village swaraj, as visualised by Gandhi. One of the important outcomes of the conference on Gandhian village swaraj was that Omandur appointed K. Venkatachalapathi, the founder of Gandhi Niketan at T.Kallupatti, as the Assistant Commissioner for the development of village industries. Further, Reddiar also organized another round of training programme, for those who had undergone training programme one year earlier. It was a kind of refresher programme. Reddiar appointed R. Gurusamy, the co-founder of Gandhi Niketan at T.Kallupatti, to be responsible for conducting annual refresher programmes, to sustain their enthusiasm for this task of village regeneration and also to equip them with necessary inputs for effective implementation of the village industries movement. When S.K.Dey, Minister for Social Development, the Government of India, visited the Gandhi Niketan at T.Kallupatti, he was surprised to find the development works and the availability of infrastructure. It is worth recording that this laudable performance was possible mostly by the intervention of Reddiar, who supported the village programmes enthusiastically. When J.C. Kumarappa suggested infrastructural facilities like rooms for trainees, class

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<sup>11</sup> J.C. Kumarappa, Economy of Permanence, Sarva Seva Sangh Prakashan, Varanasi, 2017, pp.144-153.

<sup>12</sup> Souvenir on Omandur Birth Centenary, p.103.

rooms etc, Omandur Ramasamy Reddiar provided these facilities for the successful conduct of training programmes.

Hence Omandur Ramasamy Reddiar, being a Gandhian, extended prohibition of alcoholic drinks, to the entire Madras Presidency also.<sup>13</sup> This policy decision was in consonance with the Gandhian Economics of Service according to which consumption of alcoholic beverages is a case of self indulgence and a drunkard is rendered physically incapable of doing any work, either for himself or for altruistic purpose.<sup>14</sup> In the Gandhian utopia of village swaraj, self control<sup>15</sup> is valorised and a drunkard loses control over himself in the alcohol-induced state of stupor. While Omandur Ramasamy Reddiar enforced prohibition in the entire length and breadth of the Madras Presidency, he was empathetic to the plight of the ex-addicts. Hence he also organised alternative programmes, to ease the desperation of the ex-addicts. He organized mobile vans, to supply tea, free of cost, to the poor people and also launched awareness campaign, among the ex-addicts, to switch over 'to the cup that cheers but does not inebriate.' Omandur also arranged for dramas, street plays and musical shows, to impress upon the ex-addicts the advantages of being teetotalers. Further, Omandur also introduced the ancient, rustic games like Sadu Kudu, Kizhi Thattu etc, to keep the minds of ex-addicts engaged because it is mostly the idle men who become addicts to alcohol.

Though Omandur Ramasamy Reddiar did not smoke, he did not treat smokers like outcasts. But smokers did not dare smoke before him. When an ICS officer was smoking on the verandah, he hastily put the lighted cigarette in his coat pocket, when he heard that OPR was walking towards his direction. When the Premier approached him, he raised his hand to wish him. Only then he realized that his coat pocket was on fire. But when Cariappa, the retired General, called on him, he wanted his permission to smoke. Omandur politely replied that since he did not smoke, he could not offer him a regular ash tray. But he could offer a tumbler, half full of water, as an alternative ash tray. This reveals his personality to be flexible enough to move with smokers also even though he was not a smoker.<sup>16</sup> A Similar trait could be observed in Gandhi also, who offered meat to his non-vegetarian guests even though he was a strict vegetarian.

Omandur Ramasamy Reddiar, a Gandhian, did not stop with the implementation of the constructive programmes of Gandhi like Khadi etc and he enthusiastically participated in the Gandhi inspired political programmes also. Due to his active participation in the political programmes of Gandhi, he had to suffer four terms of incarceration. The first jail term was imposed on

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<sup>13</sup> Somalay, op. cit, p. 238.

<sup>14</sup>J.C. Kumarppa, Economy of Permanence, p.14.

<sup>15</sup> M.K. Gandhi, Village Swaraj, compiled by H.M.Vyas, Navajivan Publishing, House, Ahmedabad, 1962,p.138 (Taken from Young India, 27-5-1926, p. 190).

<sup>16</sup> Somalay, op. cit, p. 117.

him for participating in the famous programme of Salt Satyagraha,<sup>17</sup> initiated by Gandhi in Dandi, in the year 1930 and followed by a similar programme, under the leadership of Rajaji, at Vedaranyam.

The third stint of imprisonment was suffered by Omandur Ramasamy Reddiar during the period of individual satyagraha. Gandhi designated Vinobhave to launch the individual satyagraha<sup>18</sup> He was immediately arrested on the grounds that Vinobhave indulged in acts injurious to the war efforts of the Imperial Government. The arrest of Vinobhave provoked thousands of people to take up individual satyagraha and 30,000 people were arrested all over India. It was against this background that Omandur Ramasamy Reddiar was arrested under Section 38, Sub-section 5 of the Defense of India Act. Omandur was awarded imprisonment for one year.

In this connection, the role of Omandur Ramasamy Reddiar in preventing the import of cloves from South Africa is worth mentioning. As mentioned earlier, the racist South African government had humiliated and brutally treated the indentured labourers from India. In the year 1936, the Indian labourers, working in the plantations of cloves, were subjected to inhuman treatment by the white owners of plantations. Hence the Indian National Congress formed a Committee, under the leadership of Sardar Patel, to initiate appropriate action against the white owners of clove plantations. The Committee decided to boycott the import of cloves from South Africa and teach the white owners a lesson. The dock workers at Bombay and Madras blocked the unloading of cloves at their ports. Hence they tried to offload the cloves at the port in Pondicherry, which was then a French colony. At this juncture, it was Omandur Reddiar who organized the port workers to block the import of cloves. As a result, the ship had to return to South Africa. Even when the authorities at the port offered extra money to unload the cloves, workers, fired by the spirit of nationalism, refused to oblige the authorities. In this campaign against the import of cloves at Pondicherry, Omandur was greatly helped by S.R. Subramaniam, a leader of the communist party and V.Subbaiah. Thus Omandur Ramasamy Reddiar proved that he was the undisputed leader of the District of South Arcot, extending up to Pondicherry.

It was Omandur who was responsible for organizing individual satyagraha in the District of South Arcot. He mobilized volunteers in places like Chidambaram, Cuddalore, Villuppuram and Tindivanam. The level of his leadership could be measured by the fact that the individual satyagraha programme was more vigorous in the District of South Arcot than in any other part of Madras Presidency. It is reported that the sale of foreign textiles was totally stopped thanks to the vigorous pursuit of individual satyagraha, by Omandur and his companion satyagrahis.

The fourth stint of jail term was experienced by Omandur Ramasamy Reddiar during the final thrust for independence, under the Quit India

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<sup>17</sup>Souvenir on Omandur Birth Centenary, p. 81.

<sup>18</sup>Somalay, op.cit,p.77

Movement, initiated by Gandhi. Ramasamy Reddiar was taken into preventive custody. He was awarded a 12 month long jail term.

It is interesting to recall that Omandur Ramasamy Reddiar read books during his jail term just as Gandhi spent his stay in the jail by reading books. Gandhi read Ruskin's 'Unto This Last', Tolstoy, Plato, Gita etc, during his first period of incarceration in a South African prison in the year 1908 and during his second period of incarceration, Gandhi read Thoreau's essay on civil disobedience.<sup>19</sup> Similarly Omandur also read books during his jail term but with one major difference. Ramasamy Reddiar read only religious books like Arutsudar Vallalaar by Sri. Swami Suddananda Bharathi, Palani Sthala Varalaaru, Sri Ramana Naarpathu and some nationalist books like Namadu Thaa Naadu by Swami Vivekanandar, Manitha Vazhkaiyum Gandhi Adigalum by V. Kalyana Sunderanaar etc... He also read a book of poems by Bharathi. All his jail mates like T.R. Arunachalam, recorded that Omandur was very fond of reading. During his period of incarceration, Omandur would never miss a class on Thirukkural, arranged by Avinasilingam Chettiar or the class on Economics, conducted by R. Venkataram. When Omandur was in the Central Jail at Trichy, he would regularly attend the exposition of Thirukkural, by Rajaji, in the year 1930.

Omandur Reddiar sent a circular, to instruct the officials to ignore any recommendation by an elected member of the Assembly and take decisions only on the basis of the procedures. Even when congress party members requested Omandur to withdraw the circular, which was damaging to the dignity of the members of the Assembly, he refused to withdraw the controversial circular.<sup>20</sup>

While Omandur ruffled the feathers of the legislators, through the impugned circular, banning the legislators from interfering with the officials, he also antagonised heads of Hindu Mutts also, by introducing amendments to the Hindu Religious Endowment Bill. Mutts were endowed with rich properties and they were governed by Mutts, which were autonomous. Omandur was annoyed that the huge properties, endowed to Mutts, were exploited to the advantage of a few and it was this widespread prevalence of corrupt practices that helped E.V.R. to promote atheism in Tamil Nadu. When Omandur visited Vedaranyam, he found that the 16,000 acre property of the temple, could fetch only a paltry income of rupees 75,000. Hence Omandur introduced amendments to the Hindu Religious Endowment Bill, according to which the Board, which was monitoring these temples, with no real powers, became a regular Department of the Government and jewels of the temples were registered and leasing of temple properties was not to be a loss to the temples.<sup>21</sup>

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<sup>19</sup> Anuradha Ray, op.cit, pp.56 to 57.

<sup>20</sup> Somalay, op. cit, p.351

<sup>21</sup> Viduthalai January 3, 1949.

When opposition to Omandurar was increasing due to his no nonsense approach, he decided to quit on April 6, 1949. Omandur Ramasamy Reddiar, just like Gandhi, pursued saintly politics but after his voluntary retirement from politics on April 6, 1949, he became a full-fledged saint and returned to the life of ashram. Vidhuthalai, the party organ of Dravida Kazhagam of EVR, sadly wished him 'goodbye' in its editorial<sup>22</sup> and declared him to be another victim at the altar of Brahminism.

Omandurar decided to spend the rest of his life, after the exit from politics, in Vadalur. Omandurar developed interest in Vallalar of Vadalur, when he read about him in the book, 'Manitha Vashkaiyum, Gandhi Adigalum, by Thiru.Vee.Kaa. Soon this incipient interest grew into glowing passion for the simple teachings of Vallalar. After the exit from political life in 1949, he decided to form his own ashram at Vadalur, with the help of Swamy Sudhananda Bharathiar. Omandurar formed the kind of Gurukulam he was dreaming of and called it Suddha Sanmarga Sangham. It was registered on June 18, 1951, with Swamy Sudhananda Bharthiyar as the President. The objectives of this Sangham were to create an ashram, where facilities could be provided to train selfless workers in the ways of Suddha Sanmargam, The sangham was designed to attain self-sufficiency (Economy of Permanence), values of wellbeing based on traditional medicines, to print the sayings of Vallalar, Yogi Sudhananda Bharathiyar etc, to move with the rural population in the neighborhood and help them in times of crisis like famine, and to promote village industries. In short, the Gurukulam, founded by Omandurar at Vadalur, resembled the Gandhi's ashram at Sabarmati and also accommodated the principles of Economy of Permanence, expounded J.C. Kumarappa, a close associate of Gandhi. Thus Omandurar shaped his life philosophy after the principles of Gandhi and he was truly the South Indian version of Gandhi, the Mahatma. In a way, Omandur Ramasamy Reddiar outdid Gandhi because Omandurar took up the political office of Premiership of Madras Presidency and proved that one could be a saint even in the midst of political rivalry and corrupt politicians as well as corrupt bureaucrats. As explained earlier, Omandur was more Gandhian than Gandhi himself. However, Omandur Periyavzhaiivu Ramasamy Reddiar, the first Chief Minister of Madras Presidency when India woke up to the freedom of August 15, 1947, remains a forgotten hero not only among the general population of Tamil Nadu but also among the Reddi community. May be his incorruptible public life does not go down well with the present generation, which has taken corruption of public life for granted.

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<sup>22</sup> Viduthalai, April 6, 1949.



## **IMMORALITY & PUBLIC POLICY UNDER LAW OF CONTRACT**

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### **Abstract:**

According to Indian law of Contract, the object and consideration of the contract shall be lawful; even if the part of the object or consideration is unlawful then whole agreement will be void. There are various grounds on the basis of which an agreement can be declared as unlawful which have been mentioned under section 23 of the Indian Contract Act 1872. This paper will discuss particularly about two things i.e. Immorality and Public Policy which has been mentioned U/s 23 of the Indian Contract Act, on the basis of which, an agreement can be declared as void. An attempt has been made here to analyze the provisions in reference of Indian law as well as in reference of English law.

### **Introduction:**

Only those agreements become contract which is enforceable by law, this can be concluded by the meaning of Contract which is given U/s 2(h) of the Indian Contract Act. Agreements having lawful objects & considerations are enforceable by law.

“The consideration or object of an agreement is lawful, unless it is forbidden by law, or is of such nature that, if permitted, it would defeat the provisions of any law, or is fraudulent, or involves or implies, injury to the person or property of another, or the Court regards it as immoral, or opposed to public policy. In each of these cases, the consideration or object of an agreement is said to be unlawful. Every agreement of which the object or consideration is unlawful is void.”<sup>1</sup>

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<sup>1</sup> Section 23 of the Indian Contract Act 1872

Sometimes the word ‘object & consideration’ are used at the place of each other but in Section 23 of the Indian Contract Act both the words have distinct meaning. Here the word object is used in the reference of motive or purpose of the agreement, & consideration is used for something in return.

This Article will further explain about the immorality & public policy in detail.

### **Immoral**

The term immoral is not defined in the Act, but it can be explained as something which is generally against the prevailing norms, values, principles & standards of the society. According to the dictionary<sup>2</sup> meaning the word immoral means morally wrong or outside society’s standards of acceptable, honest, and moral behaviour. What will be the immoral for the society it may change from time to time, For example, live-in-relationship was earlier immoral in the context of the Indian society but now gradually society is accepting this kind of relationships. Any immoral agreement will not amount to a valid contract because law doesn’t allow enforcing an immoral agreement. There is a Latin maxim “*Ex dolo malo non oritur action*” which means the Court will not help a person who found his cause of action on an immoral act. What will be the moral or immoral will be decided by the Court in every cases. But there are certain acts which are regarded as immoral from time long back till now and perhaps will always be regarded as immoral.

**Anson** in his Law of Contracts states at P. 222 “The only aspect of immorality which Court of Law have dealt is sexual immorality.....”<sup>3</sup>

Supreme Court of India in the case of *Gherulal Parakh v. Mahadeodas*<sup>4</sup> Explained the word immoral as; “The word “immoral” is a very comprehensive word. Ordinarily it takes in every aspect of personal conduct deviating from the standard norms of life. It may also be said that what is repugnant to good conscience is immoral. Its varying content depends upon time, place and the stage of civilization of a particular society.

In short, no universal standard can be laid down and any law based on such fluid concept defeats its own purpose. The provisions of S.23 of the Contract Act indicate the legislative intention to give it a restricted meaning. Its juxtaposition with an equally illusive concept, public policy, indicates that it is used in a restricted sense; otherwise there would be overlapping of the two concepts. In its wide sense what is immoral may be against public policy, ‘for public policy covers political, social and economic ground of objection. Decided cases and authoritative text-book’ writers, therefore, confined it, with every justification, only to sexual immorality. The other – limitation imposed on the word by the statute, namely, “the court regards it as immoral”, brings out the idea that it is also a branch of the common law like the doctrine of

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<sup>2</sup> Cambridge Dictionary

<sup>3</sup> *Gherulal Parakh v. Mahadeodas Maiya & Others.*, 1959

<sup>4</sup> 1959 AIR 781, 1959 SCR Supl. (2) 406

public policy, and, therefore should be confined to the Principles recognized and settled by Courts.”

Court cited some instances: settlements in consideration of concubinage, contracts of sale or hire of things to be used in a brothel or by a prostitute for purposes incidental to her profession, agreements to pay money for future illicit cohabitations, promises in regard to marriage for consideration or contracts facilitating divorce are held to be void on the ground that the object is immoral. Supreme Court further made observation that no case has been brought to the notice of the Court where it has been applied to any head other than sexual immorality; precedents confine the concept of immorality only to the concept of sexual immorality. The concept and scope of immorality further explained by the Delhi High Court and widened its ambit in the case of Union of India v. M/S. N.K. Garg & Co.<sup>5</sup> Court observed that “*in case where there is illegal/wrongful holding on to the principal amounts payable to another person for long period. The aforesaid wrongful/illegal action will thus simultaneously be both immoral and /or against public policy*”.

*Illustration*<sup>6</sup> A agrees to let her daughter to hire to B for concubinage. The agreement is void, because it is immoral, though the letting may not be punishable under the Indian Penal Code (45 of 1860).

#### **(1) Interference in marital relations**

Interfering in any marital relations in any way is considered as one of the immoral act. Thus any agreement to interfere in marital relations shall be held as void on the ground of immorality. In a case where a man advanced certain sum of money to a married woman so that she may obtain divorce from her husband & subsequently marry him(the man), it was held that such agreement is void on the ground of immorality & the man could not recover the amount back.<sup>7</sup> In the same way, if a married man enters into an agreement with a woman to marry her after the death of his wife or after getting divorce from his wife then this agreement shall be void.<sup>8</sup> If the woman does not know that the man is already married then also agreement shall be void but the woman can bring action for breach and can claim damages.<sup>9</sup>

#### **(2) Agreement regarding prostitution**

Any agreement with a prostitute to facilitate her, a helping hand to carry on her services is an immoral act; therefore such agreement shall be void on this ground. If a person agreed to provide his house on rent to a prostitute even after knowing the fact that the house will be used for providing the services of the prostitution, such agreement shall be void on the ground of immorality & the man cannot recover the amount of rent.<sup>10</sup> However, if the person was unaware of the purpose even then agreement will be void but he is entitled to

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<sup>5</sup> 2015, Delhi High Court

<sup>6</sup> Illustration (k) to Section 23 of Indian Contract Act 1872

<sup>7</sup> Bai Bijli v. Nasa Nagar, (1885) 10 Bom).

<sup>8</sup> Wilson v. Kornbai, (1908) 1 K.B. 279

<sup>9</sup> Shaw v. Shaw, (1954) 2 Q.B. 429

<sup>10</sup> Gaurinath Mukherjee v. Madhumani Peshkar, 25 ALR 252

recover the amount of the rent.<sup>11</sup> If loan has been given, some articles, horse carriage or car has been given or hired or sold to a prostitute for helping her in her profession, such agreement shall be void & no amount /articles/ horse carriage/ car can be recovered or taken back.<sup>12</sup>

### **(3) Past or future cohabitation**

A promise to pay for past illicit cohabitation is held to be enforceable in English law if it is made under seal. If it has not been made under seal then it would not be enforceable.<sup>13</sup> Under Indian Law the issue of past cohabitation is controversial issue.

If past cohabitation was adulterous then in many cases it has been declared unenforceable as earlier adultery was an offence under section 497 of IPC, but now adultery is not an offence as Sec. 497 has been declared as unconstitutional by the Supreme Court of India in Joseph Shine v. Union of India, 2018 case. In the cases, where, past cohabitation was not adulterous, some High Courts have held it enforceable while some other high Courts have held it unenforceable. Where an agreement was made to pay for the past cohabitation with a motive to continue such cohabitation even in the future, such an agreement was held to be against the public policy.<sup>14</sup>

An agreement to pay for the future cohabitation is always unenforceable under English Law as well as under Indian Law.

### **(4) Dancing Girls**

It was held in a case<sup>15</sup> that giving or promising to give help to a dancing girl is not immoral. Court also observed that singing is a distinct mode of obtaining a livelihood which is not necessarily connected with prostitution.

### **Public Policy**

The agreements are unlawful & void if the consideration or object of such agreements are against the public policy. The term “public policy” is not defined in the statute; neither any precise definition can be given to the term. Whether the agreement is according to the public policy or against the public policy it is decided by the Court. The doctrine of public policy is based on a latin maxim “*ex turpi causa non oritur actio*” which means “an agreement which opposes public policy would be void and of no use.” The determination of what is contrary to the so called policy of the law necessarily varies from time to time. Many transactions are upheld now which in a former generation would have been avoided as contrary to the supposed policy of the law.”

Earl of Halsbury made observations<sup>16</sup>; “I deny that any Court can invent a new head of public policy; so a contract for marriage brokerage, the creation of a perpetuity, a contract in restraint of trade, a gaming or wagering contract, the

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<sup>11</sup> Sultan v. Naner, 1877 Punj Rec No. 64

<sup>12</sup> Rajendra Nath Das v. Abdul Hakim Khan, A.I.R. 1918 Cal. 399 ,  
Pearce v. Brooks, (1866) L.R. 1 Ex. 213,

<sup>13</sup> Beaumont v. Reeves, (1846) 8 QB 483

<sup>14</sup> Alice Mary Hill v William Clarke, ILR (1905) 27 All 266

<sup>15</sup> Khubchand v. Beram & Ors. (1889) ILR 13 Bom 150

<sup>16</sup> Janson v. Driefontein Consolidated Mines Ltd., 1902, AC 484

assisting of the King's enemies ; are all unlawful things and contrary to the public policy." According to Lord Halsbury the categories of public policy are closed. Lord Atkin could not agree with Lord Halsbury's observation that categories of public policy are closed, according to Lord Atkin "the doctrine of public policy should be invoked only in clear cases in which harm to the public is substantially incontestable.."<sup>17</sup>

Borough J. In the case of *Richardson v. Mellish*<sup>18</sup> observed against the public policy by saying, "it is a very unruly horse, and when once you get astride it, you never know where it will carry you".

Lord Denning<sup>19</sup> expressed his opinion against the aforesaid view and observed that if control of the unruly horse is given in the hand of a good rider then he can manage well. Supreme Court of India explained the doctrine of public policy in the case of *Gherulal Parakh v. Mahadeodas*<sup>20</sup> as;

"The doctrine of public policy may be summarised thus: Public policy or the policy of the law is an illusive concept; it has been described as an "untrustworthy guide", "variable quality", "unruly horse", etc.; the primary duty of a court of a law is to enforce a promise which the parties have made and to uphold the sanctity of contract which forms the basis of society; but in certain cases, the Court may relieve them of their duty on a rule founded on what is called the public policy; for want of better words Lord Atkin describes that something done contrary to public policy is a harmful thing; but the doctrine is extended not only to harmful cases but also to harmful tendencies; this doctrine of public policy is only a branch of common law, and just like any other branch of common law, it is governed by precedents; the principles have been crystallised under different heads and though it is permissible for courts to expound and apply them to different situations, it should only be invoked in clear and incontestable cases of harm to the public; though the heads are not closed and though theoretically it may be permissible to evolve a new head under exceptional circumstances of a changing world, it is advisable in the interest of stability of society not to make any attempt to discover new heads in these days."

The Supreme Court in the case of *State of Rajasthan v. Basant Nahata*<sup>21</sup> observed that "it would not, in our opinion, be correct to contend that public policy is capable of being given a precise definition. What is 'opposed to public policy' would be a matter depending upon the nature of the transaction." The Court further stated that when "opposed to public policy" is a defence for a contract then the Court should consider the following points while deciding the validity of the contract:

- a) Pleading in terms of Order VI, Rule of the Code of Civil Procedure
- b) Statute governing the case

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<sup>17</sup> *Fender v John Mildmay*, 1938 AC 1, 723(HL)

<sup>18</sup> (1824) 2 Bing 229, 252; 130 ER 294

<sup>19</sup> *Anderbar Town Football Club v. Football Ass. Ltd.*, (1970) 3 WLR 1021

<sup>20</sup> AIR 1959 SC 781; (1959) 2 SCR 406

<sup>21</sup> A.I.R. 2005 S.C. 3401

- c) Provisions of Part III and IV of the Constitution of India
- d) Expert evidence, if any
- e) The materials brought on record of the case
- f) Other relevant factors, if any.

In *Chitty on contracts*, it is stated<sup>22</sup>:

Objects which on grounds of public policy invalidate contracts may, for convenience, be generally classified into five groups:

1. Objects which are illegal by common law or by legislation
2. Objects injurious to good government either in the field of domestic or foreign affairs
3. Objects which interfere with the proper working of the machinery of justice
4. Objects injurious to marriage and morality
5. Objects economically against the public interest

This classification is adopted primarily for case of exposition. Certain cases do not fit clearly into any of these five categories.

### **Agreements opposed to public policy**

#### **(1) Agreement to stifle prosecution**

Agreements which are entered into with an object to stifle prosecution shall be void on the ground of 'against the public policy'. To prevent crime & protect the society against crime and criminality is one of the important objectives of the criminal justice system. Prosecuting and punishing the guilty person is an essential step towards prevention of crime. Thus, an agreement to withdraw pending prosecution or to not initiate prosecution against a guilty person would defeat the objective of criminal justice system & shall be void. Such agreements are called agreement to stifle prosecution. The underlying principle is "you shall not make a trade of a felony."

#### **Illustration<sup>23</sup>**

A promises B to drop a prosecution which he has instituted against B for robbery and B promises to restore the value of the things taken. The agreement is void, as its object is unlawful. There are certain offences referred as compoundable offence<sup>24</sup> and offences compoundable with the leave of the Court, parties can enter into an agreement to not prosecute or to withdraw the prosecution for the offences of former category and for the later one, permission of the Court is required. Another category of offence is non-compoundable offences for which no Court of law can give permission to compound it. In the case of *Narasimharaju v. Gurumurthy Raju* the honourable Supreme Court held that "If a person sets the machinery of the Criminal Law into action on the allegation that the opponent has committed a non-compoundable offence and by the use of this coercive criminal process he compels the opponent to enter into an agreement, that agreement would be

<sup>22</sup> 28<sup>th</sup> edition, at Page 838

<sup>23</sup> Illustration (h) of Section 23 of the Indian Contract Act

<sup>24</sup> Section 320 of Criminal Procedure Code, 1973

treated as invalid for the reason that its consideration is opposed to public policy.” Mukherji J. Has observed<sup>25</sup> “no Court of law can countenance or give effect to an agreement which attempts to take the administration of law out of the hands of the judges and put it in the hands of private individuals.”

Privy Council has observed in the case of *Bhowanipur Banking Corporation Ltd. v Sreemati Durgesh Nandini Dasi*<sup>26</sup>

“In dealing with the question as to whether the consideration for the agreement is opposed to public policy or not, it is immaterial that the debt in respect of which an agreement is made for the illegal consideration was real, nor is it necessary to prove that a crime in fact had been committed. All that is necessary to prove in such a case is “that each party should understand that the one is making his, promise in exchange or part exchange for the promise of the other not to prosecute or continue prosecuting.””

The fact of the case is that, a mortgage bond was executed by respondent in favour of the bank as part of the consideration for bank’s promise to withdraw criminal proceedings which was instituted by it against the mortgager’s (respondent’s) husband. Mortgage bond was held invalid by the Privy Council. Their Lordships observed that the whether the debt exist in real or not would not matter at all because the consideration for the execution of the mortgage was against the public policy so, it will become illegal and void.

If an agreement is entered into before filing of any criminal complaint but enforced after filing of complaint and subsequently complaint was withdrawn then such agreement will not be void, neither would it be held as made to stifle prosecution.<sup>27</sup>

## **(2) Agreement of maintenance and Champerty**

Maintenance means helping any party of suit for continuance the litigation in which he himself has no justified personal or legal interest.

Maintenance is genus of which champerty is species. Champerty is an agreement in which a person provides help to the any party of the suit without any justified interest on the condition that he will share the gains or proceeds of the suit which he is maintaining. In the case of *Ram Coomar Coondoo v. Chunder Canto Mookerjee* Privy Council held that law of maintenance and champerty of England is not adopted in totality in India. In India these agreements are not void if they are not against the public policy. Agreement of champerty would not be void-ab-initio in India if the agreement is for taking reasonable share of proceedings or property. An agreement according to which an advocate will take his fees from client only after winning the case<sup>28</sup> was held void on the ground of against the public policy. A case<sup>29</sup> in which, it was agreed that the person will give  $\frac{3}{4}$  share of the property in dispute to the financier, was held void and court observed that it was unconscionable bargain.

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<sup>25</sup> *Sudhindra Kumar v. Ganesh Chandra*, ILR (1939) 1 Cal 241, 250

<sup>26</sup> (1941) 54 LW 529:

<sup>27</sup> *Ouseph Poulo v Catholic Union Bank Ltd.*, AIR 1965 SC 166, 1964 SCR (7) 745

<sup>28</sup> *Kothi Jai Ram v. Vishwanath*, AIR 1925 Bom. 470

<sup>29</sup> *Nuthaki Venkataswami v. Katta Nagi Reddy*, AIR 1962, A.P. 457

An agreement for giving  $\frac{1}{4}$  share of the disputed property to the person who is providing help in litigation was held valid.<sup>30</sup> The fact that agreement of giving or receiving for how much share of the proceeding will be valid it may vary from case to case, and it is the responsibility of the court to decide whether the agreement is valid or not.

### **(3) Interference with the course of justice**

Any agreement with the object to create hindrance in the smooth functioning of the justice system or to use kind of influence on judges or judicial officers is void.

In the case of *Bhagwan Dat Shastri & Anr. v. Raja Ram*<sup>31</sup>, there was an agreement according which plaintiff would perform a 'puja' (anushthan) for the defendant's win in an ongoing suit and in consideration of this defendant agreed to give  $\frac{1}{10}$ <sup>th</sup> of the decree amount. This suit was brought for the recovery of this amount.

Court held that this agreement is void as its purpose is to influence the judges' mind by performing puja.

### **(4) Trading agreement with enemy**

After the declaration of war between two countries, it is against the public policy to enter into trade agreement for both the country with each other.

Even if the agreement has been entered into before the declaration of war it cannot be executed after the declaration.

Such agreement is permissible only with the permission of the Government.

### **(5) Trafficking in public offices**

An agreement to buy or sell public offices for oneself or for others is against the public policy and shall be void.

#### **Illustration<sup>32</sup>**

'A' promises to obtain for 'B' an employment in the public service and 'B' promises to pay Rs. 1000 to 'A'. The agreement is void, as the consideration for it is unlawful. An agreement to pay certain amount to a person in consideration of procuring the title of knighthood, was held void and against the public policy. The person cannot recover the amount back.<sup>33</sup>

### **(6) Marriage brokerage contract**

Marriage brokerage contract means a contract entered into to procure marriage for someone in consideration of certain money or property.

In the case of *Gopi Tihadi v. Gokhei Panda and Anr.*<sup>34</sup> Orrisa HC explained that "a marriage brokerage contract is a contract to remunerate a third person in consideration of his negotiating a marriage & as such is contrary to public policy and cannot be enforced." In the case of *Dholidas Ishvar v. Fulchand Chagga*<sup>35</sup> it was held that a contract by which mother/father or guardian was

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<sup>30</sup> Valluri Ramanamma v. Marina Viranna (1931)

<sup>31</sup> AIR 1927 All 406

<sup>32</sup> Illustration (f) to Section 23 of the Indian Contract Act, 1872

<sup>33</sup> Parkinson v. College of Ambulance Ltd. (1925) 2 K.B. 1

<sup>34</sup> AIR 1954 Ori 17

<sup>35</sup> 22 B. 658, (1898)

to be paid money in consideration of their agreement of giving their daughter or son in marriage was against public policy and could not be enforced in a Court of law. It was held in many cases<sup>36</sup> that payment made under an agreement for procuring the marriage for someone, can be recovered back if marriage couldn't be solemnized due to any reason. However, if, the marriage has been solemnized, the paid amount cannot be taken back.<sup>37</sup>

### **Conclusion**

The word immorality and public policy has not been defined anywhere in the statute but with the help of various judicial decisions and interpretations the meaning of the words has settled and various classification has also been made, which is explained above. Any agreement which falls in the ambit of immorality or against the public policy will be void.

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<sup>36</sup> Hermann v. Charlesworth (1905) 2 K.B. 123, Gulabchand v. Fulbai, (1909) 33 Bom. 411

<sup>37</sup> Alsidas v. Punamchand, A.I.R. 1944 Nag. 535



**RAREST OF RARE DOCTRINE AND ITS APPLICABILITY**

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**Abstract**

The maximum punishment that may be inflicted upon someone's loss of life. Though death punishment has been used in the past, it is no longer used now. utilized nearly each a part of the global, seventy percent plus of the global's international locations having eliminated the death penalty in regulation or exercise in cutting-edge period. Nonetheless, the death penalty is still used. currently exist in lots of components of the global. The Indian Penal Code includes positive prescription offences loss of life. The legality of loss and the penalty as a punishment of life the sentence was upheld. via way of means of the Supreme Court. To byskip a loss of life a penalty imposed on a criminal, a tribulation courtroom docket's based at the doctrine of, and instances of every case individually.

**Keywords :** capital punishment , constitutionality , culprits of crimes

**Introduction**

Indian judiciary has mentioned its perspectives concerning dying penalty by way of the aid of using ruling out in Bacchan singh vs nation of Punjab that the dying penalty ought to be limited to the "rarest of uncommon" instances, this view of Supreme Court become very lots favoring to limit the usage of capital punishment to penalize the criminals, however this view of maximum courtroom docket become contradicted by way of the aid of using the rules by way of the aid of using growing the variety of crimes for which capital punishment's awarded. Death penalty's a now no longer a obligatory punishment, and ought to be resorted to most effective if the Court's pressured by way of a case concerning the "rarest of the uncommon" instances in which

loss of life penalty's important to repair the collective sense of right, and wrong of the state. The precept "Rarest of rare" has its origin within the example of *Bachan Singh v. State of Punjab*, & similarly advanced via different landmark decisions together by way of *Macchi Singh & Ors. v. State of Punjab* in which the Highest Judicature mounted numerous pointers for evoke the "Rarest of Rare" precept. Nevertheless, the significance of this rule had questioned positioned to impeach as maximum of the evolved global has get rid of loss of life penalty as a shape of penalty. In a contemporary-day ideology of maximum significance that the punishment method within the crook judicature gadget transitions from punitive to reformative, requires termination of loss of life punishment were growing interpretation the rarest of uncommon doctrine unreasonable within the twenty first century's democratic society. In *Bachan Singh* case Supreme Court expressed a few remarkable motives referring to wrongdoing, and crook in which. In segment 163, *Bacchan Singh* in addition noted: "...in determining the scope of the field or the appropriate sentencing for certain acts, such as on below sec 302 of Penal Code, courtroom docket ought now no longer bind its thought "chiefly" or simply to the occasions related to the unique wrongdoing, moreover supply due interest to the occasions of the crook. When determining matters involving capital penalty, the Court follows this doctrine, taking into account all other circumstances and If the circumstances of the case show that the case fits within the scope of this Doctrine, which is stunning and mind-boggling, and that the conduct of such a crime is an exception, the Court, taking into account the sensitivity or seriousness of the case, renders a verdict of capital sentence. Later on as in line by way of the possibility's within the society, and alternate within the nature, and way of doing a crime. Because of that during this regard regulation should have taken exclusive form in crook justice machine of India. It become an possibility to the best courtroom docket of India to in addition give an explanation for within the decision of *Santosh Kumar Bariyar vs State of Maharashtra*. To give an explanation for this in addition: "The rarest of uncommon dictum serves as a guiding principle in implementing sec 354(3), and entrenches the coverage that existence imprisonment's the guideline of thumb, and dying punishment's an exception. It's a settled regulation of interpretation that exceptions are to be construed narrowly. That being the case, the rarest of uncommon dictum locations an first-rate burden at the courtroom docket, in case it selects dying penalty as the popular penalty, to perform an goal evaluation of statistics to meet the exceptions ingrained within the rarest of uncommon dictum." Constitution in reality states that "No man or woman will be disadvantaged of Right to existence until executed following due technique of regulation" however Capital punishment denies due technique of regulation. Its imposition's continually irrevocable – for all time depriving an man or woman of the possibility to gain from new proof or new legal guidelines that could warrant the reversal of a conviction, or the placing apart of a dying sentence. When the outcomes are existence, and dying, we want to call for the identical

widespread for our machine of justice as we'd for our airlines. It's valuable pillars of our crook justice machine that it's miles higher than many responsible humans move unfastened. than that one harmless need to suffer. Let us mirror to make sure that we're being simply. Let us pause to be positive we do now no longer kill a unmarried harmless man or woman. This's absolutely now no longer an excessive amount of to invite for a civilized society." Since the reinstatement of the present day dying penalty, many humans were free of dying row due to the fact they have been. Hence I assume it's miles very hard to head in element that what result in the versions in sentence in such instances. What it need to be?"s it crime"? Or "crook" or the "choose"? In the 1982 Supreme Court taken into consideration all occasions regarding each crime, and crook. Again in 1983 the Supreme Court has modified its measurement, and declared for rarestrs of the uncommon that courtroom docket need to attention at the crime, and now no longer at the crook . As a ways as challenge to the statutory definition of the rarest of the uncommon doctrine Indian legislative machine has now no longer modified however best courtroom docket of India has grew to become its view, and took every other course it has commuted the dying sentence for rape, and homicide of a 1 12 months, and six months vintage woman to existence sentence. Also there are exclusive assumptions of this doctrine as to whilst the collective moral sense of society's shocked; which differs from choose to choose or benches to benches which represent case to case... When the outcomes are existence, and dying, we want to call for the identical widespread for our machine of justice. It's valuable pillars of our crook justice machine that it's miles higher than "many responsible humans move unfastened than that one harmless need to suffer.

**Meaning of the Doctrine of Rarest of uncommon:**

The Doctrine "rarest of uncommon case" has its starting place in 1983 in a highest Court Decision, Machhi Singh v. State of Punjab<sup>438</sup>. This judgment tailed the courtroom docket's in advance choice in Bachan Singh v. State of Punjab<sup>439</sup> (1982), in it supported the constitutional validity of capital punishment however brought a caveat this's now famous, if possibly not possible to pin down exactly that dying sentences might be accorded most effective withinside the "rarest of uncommon instances".. The best courtroom docket of India has mentioned the components for the rarest of the uncommon case on occasion a few suggestions has given in identity of rarest of uncommon instances like; "The motives why the network as an entire does now no longer approve the humanistic approach meditated in dying sentence in no case doctrine aren't a ways to seek."Thiat should only be done in the moist extremed of circumsstances if there is no other optiion,' said the decision says the dictum of the "rarest of rare doctrine". Bachan Singh (above) proposed using the death sentence as a final option when the alternative punishment of life imprisonment would be fruitless and useless. As will be described in greater detail later, punishment of death is fundamentally distinct

from other methods of penalization. It is remarkable in that it is completely irreversible.

Firstly, the very humanistic organization's built on the foundation for existence precept. When a social unit of the network infringes this very precept by way of the aid of using killing every other member, the society might not experience itself sure by way of the aid of using the fetters of this doctrine.

Secondly, it must be found out that each member of the network's capable of stay by way of protection by way of out his or her very own existence being endangered due to the protecting arm of the network, and due to the guideline of thumb of regulation enforced by way of the aid of using it. The sheer existence of the rule of thumb of regulation, as well as the threat of being handed to an e-e book, acts as a deterrent to those who have no qualms about murdering others if it serves their purposes. Scope:

As in line by way of Indian prison machine until 1973, Judges have been required to nation motives for now no longer awarding a dying Sentence, and who prefer the change sentence of existence imprisonment, in a capital offence. Hence judges have been making dying sentence the 'rule', and existence imprisonment the 'exception In Jag Mohan Singh v. St of U.P. xiii "The Supreme Court upheld the dying consequences Constitutionality, locating that it become now no longer simply a deterrent, however a token of emphatic Disapproval of the crime by way of the aid of using the society. In this situation Hon'ble the Court felt that India couldn't chance Experimenting by way of the abolition of dying penalty,, and any mistakes in sentencing might be corrected by way of the aid of using appeals to better courts. But, the Court articulated a widespread that the dying penalty become the slim exception,, and now no longer the guideline of thumb in sentencing. The occasions of the case needed to compel it, to guard nation security, public order or public interest." Thereafter as in line by way of new modifications in Indian prison machine the accused has proper of pre-sentence listening to, and obliged the courtroom docket to nation unique motives for awarding the dying penalty in preference to opportunity time period of existence imprisonment. The discount of dying sentence to existence withinside the Priyadarshini Mateo decision displays the churned-up withinside the SC in latest years at the sheer uncertainty of its very own "rarest of uncommon" doctrine. Even when death sentences are being handed down in a number of homicide cases, ostensibly in song as a "call for justice from society," There was a flurry of verdicts the SC admitting that the management of the "rarest of uncommon" doctrine's damaged by way of "chaos", "subjectiveness", and "capriciousness". This doctrine, the courtroom docket should take advantage to dying penalty most effective withinside the "rarest of uncommon" state of affairs whilst the opportunity choice of existence sentence, after drafting up a stability sheet of "diminish, and anxious elements",s "actual forbid". In the Matto case, the SC spared Santos Kumar Singh from going to the instrument of execution on the idea of its end that diminishing elements consider anxious elements given the inherent subjectivity of each of these components, the weight given to each of

them is discretionary, murmuring of self-doubt from the SC have grown roaring in latest ages as a response to an more, and more more blood-thirsty public opinion, meditated by way of the aid of using a hyper ventilating media.

The maximum punishment that may be inflicted upon someone's dying. Human existence's treasured, and precious, and there may be no humane manner to kill someone, despite the fact that that dying's available in shape of punishment. Infliction of dying penalty's regularly capricious, and continually irrevocable thus, for all time withhold an man or woman of the possibility to gain from new proof or new legal guidelines that can result in a conviction being overturned or the death sentence being abolished . Though past times, death sentence has been utilized in nearly each a portion of the global, extra than seventy % of the global's international locations have declined demise punishment in regulation , exercise in cutting-edge periods. Yet, demise penalty currently seen in lots of elements of the global, particularly in lots of 1/3 global international locations, and international locations by way of dictatorial leadership.

According to Amnesty International, as a minimum 2,307 dying conviction in fifty six international locations in 2019, a moderate lower from the full of 2,531 pronounced in 2018. At least 26,604 human beings had been sentenced to dying globally in 2019 (amnesty.org, 2019). Death penalty continues to be legitimate in India however best in fantastic cases. Certain offences are included in the Indian Penal Code. demise as a form of punishment. A few examples of such infractions encompass sec 121 (waging struggle towards the State), sec 302 (murder), sec 364A (kidnaping by way of ransom) amongst others. Other statutes awarding demise penalty encompass The Commission of Sati (Pre-vention) Act, 1987, and The Narcotic Drugs, and Psychotropic Substances Act, 1985, etc. The legality of the death punishment was questioned within the landmark case of (JAGMOHAN SINGH V STATE OF UP, 1973) in which The SC maintained the legitimacy of capital punishment in cases when there are motivations no longer simply a deterrent. However, it is a symbol of societal rejection of crime. . It become located via way of means of the no regulation may be imposed, according to the Supreme Court. which abridges the proper to existence of someone until it's far affordable, and in public interest. If the complete manner for a crook trial below the Code of Criminal Procedure, 1973 if the imposition of a death sentence is legal, then the method in which it is imposed by regulation cannot be considered unconstitutional. However, in order to keep the number of death sentences handed down to prisoners to a minimum, Indian courts have relied on the concept of the "rarest of unusual situations" in deciding crimes that carry the death penalty..

#### **RAREST OF THE RARE DOCTRINE**

An ordeal courtroom docket is founded on the notion of doctrine's reach is unclear; instead, the concept has evolved through time as a result of judicial version. A sentence of death is given down at the judges' discretion. The facts

of the case requisite be such that the Bench is left with no other alternative except to impose the death penalty in order to maintain social order and control. While determining whether a case justifies the death sentence for the crime committed, the Bench must consider the cruelty and barbarity of the crime committed, the magnitude of the act, the public abomination, and the society's desire for justice in contrast to the prisoner.

A death sentence is handed down after each case's fact and circumstances are examined independently. If the circumstances surrounding the crime are in any way favourable, the sentence may be reduced, but a judge cannot bypass a judgement of death under the "rarest of unusual" precept during an ordeal for an offence punishable by death. A judge upon his discretion may also skip a life sentence simply if the records suggest heinous instances primarily based totally on which the offender has devoted the crime. As a result, while determining the sentence for death, it must be meticulously and thoroughly evaluated to see if the judicial execution is commensurate to the gravity of the crime. It deters crime and has a societal deterrent impact.

The precept of Rarest of rare has its rootage within the decision of *Bachchan Singh v. State of Punjab*. In this case, the SC via way of means of a 4:1 majority decision the "Rarest of rare" via way of means of enforcing the constraints on death execution. The judges trusted the judgments of *Jagmohan Singh v State of Uttar Pradesh*, and *Rajendra Prasad v State of Uttar Pradesh*. It was discovered that when someone is given a death sentence, he loses his right to life, so abridging his basic right. However, if a hardened criminal's deadly activity repeatedly, deliberately, and threateningly jeopardises society safety, his enjoyment of vital rights can be rightfully revoked. The following ideas had been laid down within the case:

The intense punishment of death can now no longer be imposed besides in gravest instances of intense guilt;

Before deciding on the death penalty, the 'offender's' cases must be evaluated with the 'crime's' cases.

The rule of thumb is life imprisonment, with the death penalty being an exception. To put it another way, a death sentence should be issued only when life imprisonment appears to be an insufficient penalty in light of the circumstances of the crime, and only if the option to impose a death sentence is available. Imprisonment for life can't be rigorously based on the type and circumstances of the offence, as well as all other relevant circumstances.

The Highest Court located that death punishment constitutionality, and may be obligatory in most effective in rarest of uncommon conditions in which an opportunity of punishment's excluded. However, the scope of the phrase Rarest of rare changed into left undefined, and the doctrine has developed for the duration of the years through judicial interpretation.

In *Mithu Singh vs State of Punjab* 1983 The Supreme Court reiterated that death penalty is now no longer a obligatory social control, and have to be resorted to simply if the Bench is confused by way of a case concerning the "rarest of

the rare” occasions in which demise penalty's essential to repair the collective judgment of right, and wrong of the society. The courtroom docket liaid empasis on the guideline of thumb that lifestyles imprisonment's the norm while demise penalty's an exception,

.The Court determined in case of Mithu Singh that the following considerations must be considered while delivering a demise sentence: –

- Method of murder fee
- Need for fee of execution
- The character of the crime is antisocial or socially reprehensible.
- Crime's magnitude
- Personality of Homicide Victim

The Court determined that the suggestions in Bachan Singh's case Will must be culled out along those pointers, and carried out to the data of every character case wherein the query of enforcing of dying sentences arises.

In **(SANTOSH KUMAR SATISHBHUSHAN BARIYAR V STATE OF MAHARASTRA, 2009)** SC Affirmed the "Rarest of rare" precept, & held that suitable penalization to decided on a cased-with aid of using-case foundation.

The loss of life sentence isn't to be offered shop withinside the rarest of uncommon’ case wherein reform isn't possible.The Court also established that there is no consistency of past record within the "rarest of unusual circumstances," and that in most instances, the death sentence has been affirmed or denied to be upheld by means of the Court without any criminal precept being laid down.

The foundation of drawbacks of the doctrine with inside the unclearness withinside the software of the doctrine. This principle developed to present however, this theory has been misread and misunderstood in several occasions by employing the court in making decision as well as the general public in understanding its true meaning and spirit. This may be definitely observed in **(DHANAJAY CHATTERJI V STATE OF WEST BENGAL, 1994)** . **(UTTAR PRADESH V KUMUDI LAL, 1999)** Both instances worried young girl’s rape, and homicide but the highest Court reported unique verdicts. Dhananjay Chatterjee changed into sentenced to loss of life. The Court in Kumodi Laal case did not talk over the loss of life penalty at the suspect for the rape, and homicide of fourteen-yeear-vintage female child.

### **Conclusion**

Calls to abolish the death penalty in its entirety were rising, making the theory unworkable in a democratic society in the twenty-first century. In its 262nd The Death Penalty Reepport, the Law Commision had highlighted that – “...The capital punishment employer because it operates in India, consequently perpetrates in any other case outlawed punitive practices that inflict pain, affliction, and torture that's regularly a ways past the most struggling authorized via way of means of Article 21. The debilitating results of this complicated development obligatory to prisoners what can most effective be known as a residing loss of life.

The loss of life penalty does now no longer function the penological purpose of deterrence any greater than lifestyles captivity.... specializing in loss of life penalty because the last degree of Victim justice, restorative justice, and rehabilitative justice are all undervalued..The Committee hence recommends that the loss of life penalty be get rid of all crimes aside from terrorism associated offences, and waging war.” (THE REPORT OF LAW COMMISSION, 2015).

over a current political system it's of maximum significance that the method of penalization withinside the crook justice machine shifts from retributory to reformatory. Social control must receive in any such manner at the crook had to proportionally paid for the crime, and in a manner such that the existence of that crook, and the society's saved non violent, and consonant. The reason of penalization must be to “improve the perpetrator as a human, in order that he might also additionally emerge as a everyday law-abiding member of the network as soon as again. As Maartin Luither King said – “regressive violence for violence multiplies violence, including deeper darkness to a night time not yet without celestial body”.

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## **ASSIDUOUS CONCINNITY OF SCIENCE AND RELIGION IN RICHARD MORGAN'S *ALTERED CARBON***

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### **Abstract:**

Literature consistently portrayed religion as a mythologized mode apparently in the past. In such a way, it creates an impact in literary criticism, perceiving religion as a symbol. Science fiction, while connecting literature and science, also portrays the essence of religious ideas and beliefs. The article showcases the two contrasting images, religion and science, in Richard Morgan's *Altered Carbon*. It delineates the hidden religious aspects of Neo-Catholicism, beliefs, philosophies and ideas of the characters. It witnesses how the characters of the novel, despite all the technological advancements, adhere to the religious faiths. It also depicts the consequences of the religious actions in the scientific world that takes place in the novel. The article emphasizes the non-separateness between religious ideology and scientific advancements with reference to the human and techno realm.

**Keywords:** Religion, Science-fiction, Neo-Catholicism, Posthumanism, Technology

History was the primary concern of English literature at the beginning of the twenty-first century. In the late twenty-first century, writers were not interested in looking back in history, but rather in moving forward. Writers such as David Mitchell, Michel Faber, and Ian McEwan imagined future eras influenced by technology and sophistication. In the nineteenth and early twentieth centuries, technology enabled more scenes in fiction. Writers advanced not only in terms of ideas, but also in terms of style and technique. There was, however, some imitation of earlier literary styles and techniques.

The evolution of science fiction can be traced back to the history of mankind and their lifestyles. Great writers such as H.G.Wells and Mary Shelly have contributed to the legacy of science fiction. The advancement of science and technology prompted the authors to think far beyond the realm of possibility. This idea not only provided a description of human society, but also discussed how science and technology could affect human society. Science fiction writers examined Victorian reality from a scientific standpoint. Many intriguing themes emerged at the turn of the twentieth century. Utopias, dystopias, time travel, and space travel were among the most popular themes. Science fiction evolved in a new direction soon after World War II.

Religion, according to common definitions of science fiction, is the most alien to its concerns. Science fiction is a genre that frequently asks philosophical problems, such as what technology will be available in the future. It employs exaggeration to raise questions about awareness, morality, and the bonds that link society. One of the fundamental issues is the role of religion in society. When religion is discussed openly in popular science fiction films, it is at best unclear. When spirituality is spoken, however, the power of any microscopic thing in the system immediately contradicts it. Religion is more of a technique of building mystique about the JEDI than it is an examination into what happens when so many diverse races and religious systems come together. While Greek religion had a long-lasting influence on key genres of ancient writing, the Christian faith's influence on Western literature is far more pronounced and far-reaching. However, there is a significant distinction between Classical Greek literature and Christian writing. The former is generally indicative of a religious ethos specific to one civilization, whilst the latter is far from being the creation of a single group. Even the language and structure of Christian canonical literature are influenced by previous religious contexts, particularly the Jewish and Greco-Roman. It is hardly strange that Catholic contemplative practices and Protestant biblical poetics would unite to generate an abundance of the greatest Christian devotional poetry in the late English Renaissance. Many science fictions however, are embedded in speculative fiction traditions strongly associated with the religious fantasy, and contemporary science fiction retrieved a strong interest in several mystical and spiritual themes and visuals. Modern science fiction typically explores age-old theoretical questions related to metaphysics and theology.

Speculative fiction has a tendency to go beyond the purely empirical issues that pragmatic scientists are concerned with. Whether the thrust of the narrative is toward reconciliation or conflict, the antagonism of the scientific and religious imaginations is evident in practically all late-nineteenth-century and early-twentieth-century speculative fiction. These fictions are heightened by controversies regarding Darwinian Evolution, socialism, and humanism. As a result of modern science, science fiction depicts modern reality with the discovery of new technology and its potential to illustrate man-made acts, and sometimes more. Richard Morgan, who was born in the United States, is one

such author. He is a British science fiction and fantasy novelist who has written dark fantasies on occasion. His writings are largely dystopian contributions to literature, with settings in a futuristic world. His writing style for science fiction or fantasy books provides a fresh perspective on reading such novels in a more realistic and futuristic aspect.

Morgan published his debut novel, *Altered Carbon*, in 2002. The novel combines cyberpunk and hardboiled detective science fiction themes. The novel was eventually made into a film and a television series titled *Altered Carbon*, which aired on Netflix in 2018. After *Altered Carbon*, he authored *Broken Angels*, which was released in 2003. It's a combination of bloody science fiction and war fiction. Richard Morgan has authored another work, *Market Forces*. It was originally intended to be a short story, but it evolved into a novel. The novel is a battle between those who believe in determinism and those who believe in free will. Those in the clouds with all the power, of course, do not believe in determinism. The impoverished on the ground have a tendency to do so, because their lives are mostly governed outside, not by Gods, but by Meths, politicians, and the police, among other things. From the perspective of someone impoverished, defenceless, and unaware of influences impacting their existence, it's simpler to blame a single entity, God, because it's such a complicated web of control and tyranny. There is no one to blame, and it becomes a simple myth of how the world actually works.

Morgan depicts a fantastic and violent topic in which alterations in the human psyche and society are depicted as a result of tremendous expansion and progress in science and technology. Characters in science fiction will be exceptionally well-developed. Takeshi appears to be a loyal individual to his family, friends, people, and the organization to which he is engaged in *Altered Carbon*. It is clear that no one in his community can break his loyal quality, even if they have ceased to be loyal to him. Despite the fact that Morgan provides a grandiose view of posthumanism and technology, he never fails to provide us with a familial and religious basis in it. Kovacs thus pledges himself to both the organization and his sister. However, his devotion is finally destroyed when he learns that the organization sold her to the Yakuza.

Takeshi Kovacs is an intellectual individual with a more verbal vocabulary and a little school in him. His knowledge of things makes us feel curious about him. His acts show how a normal man with intellect tries to figure out why he is struggling. His passion for understanding the meaning and purpose of life's consequences was both courageous and witty. Richard Morgan depicts the conflict between the intellect and the body in the face of violence and terror. Morgan places the people in his science fiction in a way that does not disrupt or progress the plot. Reileen is one such character that takes on the worst characteristics of a meth addict. Morgan portrays Reileen as manipulating and arrogant, despite the fact that she is manipulative and arrogant.

Kristin Ortega works for the Bay City Police Department. Because she is a Neo-Catholic, her cortical stack is coded in such a way that it can never be

resleeved. Ortega wants to be against the truth of being unable to escape bodily death as the tale progresses. As a result, she abandons her religious claims. She has been assigned and is dedicated to locating and solving Laurens Bancroft's murder. Ortega lends his support to Kovacs in making such a commitment. She is of Mexican ancestry and comes from a deeply religious family. Ortega lost her father while she was quite young, giving her the opportunity to denounce Neo-Catholicism. She is in a love relationship with her former coworker, Elias Ryker. Kristin Ortega, who had been on Earth, is a tough human and someone who is committed to her profession. Unlike Kovacs and Reileen, Ortega's character is never in conflict, yet she nonetheless serves as a developmental activity. She is thought to be quite forceful and cold to the vulnerability that occurs. Her function as a loveable person is restricted primarily to her friends and family. As Kovacs is sleeved in the body of her old boyfriend Elias Ryker, a tangled connection develops between him and Ortega. She even believes Kovacs has something up his sleeve considering Bancroft's insistence on projecting her negatively. With a frigid disdain, she attempts to distinguish between Takeshi and Elias. Through Kristin Ortega, Richard Morgan attempts to convey an idealistic perspective. With the presence of Ortega and her family, a familial attitude is established. She is close to her family, particularly her mother, although their connection has been strained as a result of Ortega's religious renunciation.

The Christian morality is one of the acquiring and exercising virtues. Human virtues can be acquired in a variety of ways. They are gained by the repeated performance of virtuous actions, which establishes a pattern of virtuous conduct. There is a bidirectional link between virtue and actions because virtue, as an internal reality, predisposes us to behave morally decent ways in the exterior world. However, it is through doing good deeds in the real world that we nurture and expand our virtue. Christian morality opines such human virtues as,

Human virtues form the soul with the habits of mind and will that support moral behavior, control passions, and avoid sin. Virtues guide our conduct according to the dictates of faith and reason, leading us toward freedom based on self-control and toward joy in living a good moral life. Compassion, responsibility, a sense of duty, self-discipline and restraint, honesty, loyalty, friendship, courage, and persistence are examples of desirable virtues for sustaining a moral life. (Archdiocese of Saint Paul and Minneapolis)

The narrative incorporates human virtues such as trust, hope, loyalty, capitalism, and leadership. Morgan assigns a virtue to each character to play a role in the plot. Poe gradually gains Elizabeth Eliot's trust as he enables her to reconstruct herself. Only because of Poe does she regain her confidence. As a result, she transforms from a selfless young lady to a more forceful and hostile cold personality. Elizabeth's change may be seen at the moment where she kills guards and a patron at Head of the Clouds. She strives to save her parents, as well as Ortega and Takeshi. Finally, the use of virtual reality is

examined in depth in relation to Elizabeth's strengths and limitations. She attempts to recognize her mother Irene despite the fact that she is cross-sleeved, revealing that she has an incredible ability to distinguish sleeves and individuals. Morgan explains the conditions of his imagined world as,

There's a plant on Harlan's World called belaweed, grows in the sea and on most shorelines too. Dry it out, treat it with chemicals and you can make something like cotton from it. During the Settlement Newpest was the belacotton capital of the World. Conditions on the mills were pretty bad even back then, and when the Quellists turned everything upside down it got worse. The belacotton industry went into decline and there was massive unemployment, unrelieved poverty and fuck all the Unsettlers could do about it. They were revolutionaries, not economists. (Morgan 251)

Mister Leung is Reileen Kawahara's hitman and personal enforcer. His faith in cortical stacks and people who employ them is divine. He believes they are the ones who will spread the holy doctrine. He is well-known for his invention, which allows him to conceal his identity from all sorts of electronic surveillance. He is both religious and a psychopath. He thinks that everything occurs for the benefit of a greater power. He, like Takeshi, is devoted to Kawahara. He regards Reileen as a god-like figure and follows everything she says. He is a tough adversary with martial arts abilities. Leung is extremely effective at defeating many opponents at once. He is as calm as he is focused on his aims.

Elias Ryker, a Bay City Police Department officer, is similar to Ortega. He was Kristin Ortega's former lover. Ryker is Mary Lou Henchy's childhood acquaintance who is alleged to have committed suicide. Ryker goes insane in his pursuit of the truth about his friend's death. He behaves so differently that he may even investigate a senior administrator with impunity. He feels that religious coding is the result of a plot, and Mary Lou is unable to convert to NeoCatholicism. Reileen Kawahara, on the other hand, kidnaps and murders Ryker. Kawahara believes he is the sole impediment to applying religious coding to murder victims in order to conceal her business and misdeeds. Laurens Bancroft then buys Ryker's sleeve, and so Kovacs obtains the sleeve.

Apart from significant technical developments, Richard Morgan employs a biblical reference known as Meth. Meth is the one who lives for several lifetimes. The notion of sleeving and resleeving to new bodies is only available to the wealthy. Laurence Bancroft, a former Meth user, is one such wealthy individual. He is the only one who can consistently afford the sleeve technology of virtual immortality. Unlike in the human realm, death comes only when the stack is destroyed. Even when the stack is destroyed, the awareness, according to Richard Morgan, may be re-sleeved. This is only conceivable if the world's wealthy begin to retain copies of their thoughts in distant storage. Resolution-653 is described as a proposition by Richard Morgan which he describes with a reference in the novel as,

Ortega was standing in the doorway wearing a NO TO RESOLUTION 653 T-shirt on which the NO had been stylistically daubed out with a red cross and overwritten with a definitive YES in the same colour. The columns of her naked legs disappeared under the T-shirt as if they might conceivably go on for ever inside. (Morgan 304)

It is concerned with the law that overrides religious coding in order for the sleeve to be tested even after the death of the Catholics. Because Neo-C coding does not allow humans to resurrect after death and hence cannot be tested, Reileen illegally switches her workers' codes to Neo-C in the novel. Takeshi Kovacs works hard to have Resolution-653 enacted and contributes to the resolution of Bancroft's death. He also solves the enigma of Rawlings' virus, which is the cause of Laurence Bancroft's suicide. Morgan thus transports us to faraway realms in order to make us think about how we live in the world, which turns out to be a massive allegory.

In *Altered Carbon*, scientific progress is so redefined. However, racial, religious, and social class divisions persist. Religious coding is engaged in the cortical stacking process, but Neo Catholicism never allows re-sleeving. They assume that because the soul travels to heaven, it cannot be re-sleeved. This type of religious coding is being used in virtual reality. The terminators believe that murdering Catholics is a simple task. As a result, the sleeve killing is regarded a lesser crime, while the destruction of the stack is far more heinous. Since Catholicism is limited to the earth, Takeshi is oblivious of the term itself. The Catholic Church opposes not just resleeving after death, but also any technology that would remove the human spirit from the body. It incorporates needlecasting, the use of Synth bodies, and cloning. For many of these highly religious organisations, simply existing is a source of misery. Because of the afterlife, death is an important aspect of their beliefs. In the instance of Neocatholicism, people use religious coding to prevent their cortical stack from resleeving or spinning up. Morgan also highlights the existence of Islam through a number of occurrences. It comes from the soil. Takeshi and his colleagues were previously sent to a planet populated primarily by Muslims.

Jihadists opposed to the UNIP are also referred in the storyline. Kristin Ortega is fathered by a character named Samir Abboud, who is of Islamic origin. Apart from religion, there is a semi-religious group known as The Renouncers that operates in Harlan's universe. Poe, the artificial intelligence and proprietor of The Raven Hotel, finds out about the renouncers. Members of this specific organisation practise renunciation of all personal fortune, family, and friends. They are oblivious to the actual world and prefer to live in Virtual Reality. The impact of religion in such scientific world can be put into discourse. John C. Hawley opines such coherence of literature and religious discourse as,

But if meaning is only demonstrated in the actual telling of stories, many of our contemporaries would protest that such subjective testimonials are hardly acceptable as unbiased evidence of Ultimate

meaning. No one historian can step beyond the web in which she or he lives, nor can anyone know everything related even to one given moment. His historical method inevitably selects the correlations and mutual influences it chooses to foreground as meaningful "glue." (Hawley 231)

Morgan uses practically all of the five senses to create a well-rounded atmosphere that seems authentic and relevant to the scientific as well as religious world. He explains Bay City, which is located on North America's western shore. He describes it as a megalopolis that was formerly known as San Francisco. The city has a population of ten million inhabitants. It is the continent's cultural, financial, commercial, and economic centre. The area is populated by a large number of wealthy persons known as Meths. They live in the city sector known as The Aerium, which is located above the clouds and is made up of skyscrapers. Richard Morgan provides an ultramodern perspective on the city. Tall towers with a tech appearance are used, while people are housed in shipping containers. The Aerium is where the Meths used to reside. Morgan depicts the area with high towers, thus there is no reason to be concerned about the city's congestion. The Bancrofts dwell at The Aerium's Suntouch House.

Head in the Clouds is the most luxurious floating house over the Bay City. Reileen Kawahara is claimed to be the proprietor of the Head in the Clouds in *Altered Carbon*. It caters to all Meths by providing them with illicit sexual fetishes. This house becomes the focal point for all illicit activities, sexual delights, and vices. As a result, it is popularly referred to as the Satellite of Sin. Meths would routinely visit the residence, raping, torturing, and killing the men, women, and children that lived there. All of the sex workers here are really young and don't wear sleeves. They think they can be resleeved at any cost, even if they have been horribly tortured and slain. The unfortunate reality is that their stacks are Neo-C coded and thus cannot be resleeved after death, which they are unaware of. Every heinous deed committed by the Meths is done for their sadistic pleasure.

The extensive analysis, explanation, and narrative of Richard Morgan's novels *Altered Carbon* thus provides the impression of being posthuman fiction and religious fiction in the minds of readers. As a result, it boosts science fiction's visionary and theological image. It is sensed through the readers' curiosity, which is purposefully piqued by the author using posthumanism and spiritual beliefs and approaches. The influence of the text's stern and detailed examination caused the novel's protagonists to progress in futuristic, technical and religious directions. It explains how the presence of religion as well as posthuman components has altered the lives of people. Humans and aliens have different perspectives on life and death. Human existence has been enhanced by the development of advanced technologies. *Altered Carbon* demonstrates such sophistication successfully. Although it is impossible to analyze every element of cyberpunk, it is critical to maintain the system of planets with their acknowledged borders in order to ensure reality.

Initially, the article discusses both posthuman and religious notions as represented by Richard Morgan in *Altered Carbon*.

The novel *Altered Carbon* is based on speculative ideology, in which the logic of present society, its politics, culture, religion and technology are tested to their limits. Morgan's work creates an imagined future rather than predicting the future in the literal sense. Science fiction authors, rather than prophets, will always be the ones who envisage the future. The narrative of *Altered Carbon*, on the other hand, investigates humanity's future. The novel's storyline, theme, and characters interact with religious and technological settings. As a result, the combination of religious writing and posthumanism finally depicts the proximity of the mind and body through the use of technology. The novel is based on the posthuman concept that people can coexist with robots via the human intellect, which appears to be feasible. The plot also has a lot of ebbs and flows. Despite the fact that the protagonist is built via recognisable human behaviours, the narrative becomes distinct and unexpected. Thus the author's depiction of each circumstance is incredibly accurate and credible. The blending and exposing of scenes captures the spirit of reality. The history of posthumanism and its research provide diverse opinions concerning the storyline's imagination and output. Morgan develops an universe in which the human characters and non-human beings are inextricably linked.

The storyline thus depicts human and religious traits such as loyalty, affability, love, compassion, and familial feelings, which maintains the novel incredibly realistic. Takeshi Kovacs and Reileen Kawahara are brothers and sisters. However, Reileen develops feelings for Kovacs, which is thought to be incestuous. Richard Morgan handles the human vices of being deceived, betraying others, and envy in a better way to promote the positive and bad viewpoints of human existence. The examination of the cyber world provides a realistic view of human civilization, which has not lost its common and essential behaviours. The majority of the novel's characters are dedicated to their positions and jobs. Each character has the potential to serve, protest, and withhold from the author. The biblical allusion to Meth demonstrates the level of science's growth to that of religious thinking.

Thus, immortality is derived from science and religious codes. The Elders truly demonstrate the value of physical power. They have also come upon virtual reality. Many minor characters contribute to the plot through their evolving reactions. Poe, the artificial intelligence, aids Kovacs in whatever way he can. His feelings toward other humans are completely indifferent. Medical services and biological demands are prominently displayed with the assistance of several main and minor characters. Any difficulties that a person has to go through are scarcely taken into deeper consideration, resulting in an unexpectedly nasty and violent picture. Psychological well-being has nearly always been spread equitably across the characters. The author handles human vices and virtues with care. They are braided with great care so that they do not interfere with the novel's philosophical and religious undertones. Richard

Morgan creates the narrative that is destined for greatness. Character transformations are both skilled and acceptable.

To continue the failure of the ethical method, illegal hacking, programming, and needlecasting are added. Some characters appear briefly and have little impact on the storyline. Communication, health, warfare, the government, and other institutions and religious ideas are being devoured by technology. When confronted with a threatening scenario, even the most devout individuals might be transformed into psychopaths. Laurens Bancroft, the novel's meth, is a man of great wealth and political power. In Meth society, the power to control everything and everyone is elevated. Morgan's narrative is thus regarded to be both technically sound and realistic. His approach to spread philosophical and sociological ideas is highly profound. Morgan's writing style is as obvious as it would be for his contemporaries. His grandiose use of religious atmosphere also supports metaphorical notions such as the socialist novel. The survival of the cortical stack, rather than the human body, is the dichotomy between life and death. In terms of law and order, sleeve technology and religious coding are polar opposites. Morgan's envisaged universe hence constantly related to the power to manage religious beliefs and technology.

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## **RELEVANCY OF DOCUMENTARY EVIDENCE IN INDIA**

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### **Abstract:**

Reports imply all documents created under the watchful eye of the courtroom and for their view of archives created. Public reports and private archives are the two fundamental sorts of documents. Essential confirmations are more dependable and best proof consider by official courtroom. Without essential proof, auxiliary proof is what the witnesses were given based on his own viewpoint. Thus, that archive is composed which is a narrative proof. Sections 91 and 92 absolved oral proof by narrative proof. Oral confirmation can't be subbed in that frame of mind of composed documents where the composed archive exists in proof of specific exchanges of offense alluded to in Section 91 as composed declaration, more certain and more solid than oral proof.

**Keywords:** Documents, transaction, evidence, offence, provision

### **Introduction:**

The Indian Evidence Act has been revised by goodness of section 92 of Information Technology Act, 2000. Section 3 of the Act was altered and the expression "all archives created for the examination of the court" was snubbed by "All reports including electronic documents delivered for the review of the court". In connection with narrative proof, the phrasing of section 59 which states "content of archives" has been subbed to "content of reports or electronic documents" and section 65A and 65B, which depict the strategy to create electronic proof in courts during criminal preliminaries and the tolerability of the equivalent. These sections limit the gamble of misrepresentation of computerized proof through different expectations. All proof comes to the Court either as a proclamation of an observer or

explanation of a report, i.e., oral or narrative. The maxim "narrative proof" as it is characterized in section 3 (LAL, 2020) methods all proof created for the assessment of the court. The motivation behind delivering reports is to depend upon the reality of the assertion contained therein. The subject of narrative proof is managed the focuses that,-

1. How are reports to be demonstrated,
2. What are assumptions about the different sorts of reports, and
3. Exclusion of oral proof by narrative proof. 62 of The Indian Evidence Act, 1872 characterizes essential proof. It implies the actual report created for the review of the court. As indicated by the clarifications given under Section 62 essential proof likewise implies where various documents are completely made by one uniform cycle, as on account of printing, lithography or photography, each is the essential proof of items; at the same time, where there are duplicates of a typical unique, they are not essential proof of the items in the first. For instance For the situation of a check, the principal check is endorsed by cabinet so it is essential proof against him, and the counter foil might be endorsed by the payee of the check so it will be essential proof against the payee.

Section 63 of The Indian Evidence Act, 1872 arrangements with auxiliary proof which incorporates -Optional proof of the items in composed instruments can't be given, except if there is some lawful reason for non-creation of the first. Further, optional proof must be given when the essential proof or the actual record is allowable. Optional proof can't be given of a record when the first is viewed as in allowable. On the off chance that a deed of gift is prohibited in proof for need of enlistment, no auxiliary proof of the deed can be given in a suit to recuperate the talented property.

Section 74 characterizes the public reports;

1. Public documents kept in Sovereign power (to be specific, the parliament and the authoritative get together)
2. Held under the authority bodies and councils and
3. Under open officials, legal, chief, authoritative or of any piece of India and of unfamiliar country

Section 75 characterizes that any remaining reports are private documents

- These sorts of reports are kept under the hands of a hidden individual
- Guaranteed duplicates don't present in private guardianship

It is an archives which is use by private individual for their deals and interchanges d) tin private record, there is no such insurance..

In demonstrating archive, 3 things should be demonstrated,

1. Existence of the archive,
2. Condition of the archive,
3. Contents of the archive.

Section 59<sup>3</sup> gives that among these three; just the items in the record can't be demonstrated by oral proof. In this way, the presence and state of the report can be demonstrated by oral proof which is considered as optional proof u/s

63. Yet, when a reality is expected to be demonstrated by report, the principal necessity of regulation is that the actual record i.e., the first archive ought to be created in the Court. Section 64 runs as that the archives should be demonstrated by essential proof. Furthermore, the essential proof means the actual report (S-62). However, a similar section puts an exemption as well.

As per Section 2(1) (t) of the Information Technology Act, an e data is "information, record or information produced, picture or sound put away, got or sent in an electronic structure or miniature film or PC created miniature fiche". Section 65A and 65B of The Evidence Act (Malik, 2021), 1872 states that-

1. Data created by an individual who is having a legitimate command over the PC's utilization.
2. The electronic record contained should be routinely taken care of onto the PC.
3. The PC should be in appropriate use or in the exactness of documents,
4. Recording should repeat the data appropriately and such data took care of into the PC in the normal course of movement.

Section 65B sets out the above-notice conditions, it expresses that electronic record should contain a certified assertion and it should be endorsed by the official responsible for the administration of related exercises.

The Indian Proof Demonstration shows this norm in Ch. II, which reports, from ss.6 to 55, those real factors that are viewed as pertinent to a system. With respect to electronic confirmation, it is ss.22A and 47A of the Proof Act<sup>4</sup> that are of phenomenal importance. Segment 22A gives that oral attestations in regards to the things in the electronic record wouldn't be relevant aside from assuming the genuine legitimacy of the record is being alluded to. In like manner, when an issue influences a person's high level signature, the evaluation of the affirming power which gave the mechanized imprint is perceived to be an appropriate truth as indicated by s.47A. Various segments of the Proof Demonstration that game plan with electronic verification are segments 34, 5 35, 6 and 39.7 Assumptions about diaries in electronic form,<sup>8</sup> electronic agreements,<sup>9</sup> electronic reports and automated signatures,<sup>10</sup> messages<sup>11</sup> and as to electronic records (more settled that five years)<sup>12</sup> furthermore find a spot in the Proof Demonstration. Segment 131 is about the circumstance when another person, who is in charge of reports and electronic records, could decline to make it under the watchful eye of court.

Section 65B (4) (GAUR, 2017) specifically, requires an endorsement which needs to make reference to the electronic record containing the part, the way of creation of the record, the points of interest of the gadget utilized in delivering the record and be endorsed by an individual involving a capable situation comparable to the gadget to be delivered alongside the proof when it is submitted. This prerequisite has gone under investigation throughout the long term, with different decisions giving contradicting perspectives on the part which has brought about an extremely agitated position of regulation. The law on the issue is as yet hazy

Assuming there ought to be an event of Anvar P.V vs. P.K. Basheer and ors the High Court has resolved the disputes arising out of the different conflicting choices as well as the arrangements with being happened in the different High Courts and the Starter Courts concerning the value of electronic Confirmations. The Court has translated Segment 22A, 45A, 59, 65A and 65B of the Proof Demonstration and held that discretionary data in Cd/DVD/Pen Drive are not permissible without an announcement U/s 65 B(4) of Proof Demonstration. It has been explained that electronic verification without confirmation U/s 65B can't be exhibited by oral evidence and moreover the evaluation of the expert U/s 45A Proof Demonstration can't be gone to make such electronic evidence adequate.

Nevertheless, in case of Sonu v. Region of Haryana, the high court couldn't resist the urge to go against Anvar case and wouldn't be restricted by it. By clashing with a seat of higher strength and examining its authenticity, they made one more component to the issue. The Court presumed that it was not keen to apply this case brilliantly as it would provoke the re-opening of many closed cases yet furthermore felt that it couldn't make the approaching choice and in like manner gave it to be picked by another seat of more conspicuous strength. The effect of this case is that Anvar v. Basheer has been brought into question and its restricting worth on future cases doesn't know. Further, by setting out that the agreeableness of evidence couldn't be tended to in the analytical stage; the Court restricted mitigation in all cases wherein the decency was not tested at starter. Similarly. In another case of Shafhi Mohammad v. The Territory of Himachal Pradesh(Shafhi Mohammad vs The state of himachal pradesh, 2017 ), The Court couldn't resist the urge to go against the Anvar case on the pin that the Segments 65A and 65B were a completed code on the subject of cutting edge verification. It held that the necessities of Segment 65B were just procedural in nature and that they may be free or certain considering a genuine worry for value, and expecting the Court was content with the validity of the evidence, it could relax the methods considering current real factors considering a genuine worry for value.

In recently referenced case the middle issue was whether video graphy of the area of wrongdoing or scene of recovery during assessment should be critical to propel trust in the verification? Over the range of hearing for the circumstance stress was imparted on the subject of relevance of state under Segment 65B(4) of the Proof Demonstration to such an extent that expecting a decree was given in evidence, a confirmation was normal to the extent that the said arrangement from an individual involving a capable situation comparable to activity of the pertinent gadget or the administration of applicable exercises.

It was presented that assuming the electronic proof was a not in pertinent and delivered by an individual care of the gadget from which the electronic record was produced, necessity of such declaration couldn't be required.

On account of Tomaso Bruno and Anr. v. State of U.P. Supreme court

vindicated the appellants based on the indictment neglecting to illustrate CCTV film. The impact of non-creation of not illustrating the best proof, is seen by the Court as material concealment which prompts an unfavorable derivation under Section 114(g) of the Evidence Act. It is critical to take note of that the thinking of the Court isn't restricted to the shortfall of CCTV film.

Segment 2(i) portrays PC as "any device or any other high speed data taking care of device or system which performs reliable, calculating, and memory limits by controls of electronic, appealing or optical main impetuses, and consolidates all data, yield, dealing with, limit, PC programming, or correspondence workplaces which are related or associated with the PC in a PC structure or PC association". This definition integrates the phones moreover. It infers that SMS/WhatsApp message would be reasonable under the authority court for the chronicles are adequate under the Segment 65 of Indian Proof Demonstration, 1872. Regardless, it requirements to fulfill four conditions referred to in the segment before it will in general be considered as a record. Such conditions are a) the PC that conveyed it likely been used regularly at the hour of making of such electronic files; (ii) the kind of information contained in the PC ought to be so much that it is reliably and normally gave to the electronic device; (iii) the PC should be in fitting condition and ought to work properly at time of development of electronic record; and, (iv) the duplicate copy ought to be an age of the main electronic record. It is presently well established by the court that SMS, MMS and messages are adequate. In Province of Delhi v. Mohd. Afzal and Others, it was held that electronic reports are admissible. It furthermore cleared he uncertainty that regardless of whether there is an extent of abuse of framework or disappointment of working framework or addition as to influence the exactness of such electronic information then the onus on the individual is testing such electronic information. The court said that simple hypothetical and general misgivings can't clarify proof unacceptable in court. The Delhi High Court held that any report got as forward on WhatsApp can't be treated as archive without the Original or duplicate of the Original.

No man can be prosecuted for an offense where the speculation of his obligation isn't any more plausible than the theory of his blamelessness.

In a criminal starter the degree of probability of culpability should be especially higher-almost amounting to a sureness than in a typical system, and, expecting there is littlest reasonable or logical chance of trustworthiness of a reprimanded, the upside of it ought to be given to him. Regardless, that is a truly exceptional thing from battling that even where the commitment to demonstrate any cases, say of showing an extraordinary case, is on the reprovved, the term exhibited should be differently and more liberally perceived than when the commitment to demonstrate any cases is on the prosecution. The Verification Show, doesn't consider and doesn't set out that the satisfaction as would be considered normal to be caused in the mind of a

sensible man preceding circling back to or enduring the arraignment story is to be of a substitute kind or degree from the satisfaction which is required when the accused needs to deliver the weight which is given event to feel hesitations about him by regulation. The standard of proof expected in political choice matters in it is something almost identical to exhibit degenerate practice as that for a criminal offense. The Onus of proof never moves to the charged, and they are under no obligation to exhibit their faultlessness or refer to verification with all due regard or proposition any expression. In a typical case it is the commitment of the get-togethers to put under the watchful eye of the Court s they think best, while in a crook case it is the commitment of the Court to invite exceedingly significant confirmation on record and to see that value is done.<sup>26</sup> In criminal fundamental, it is for the court to choose the subject of the culpability of the condemned moreover, it ought to do this upon the evidence before it, unreservedly of decisions in a typical suit between comparative social events. A judgment or statement isn't suitable in confirmation in that frame of mind which is generally expected, and, when in doubt, a judgment is basically reasonable to show its date and genuine result.

### **Conclusion**

Oral proof has lesser worth than narrative proof. Court will undoubtedly acknowledge the narrative proof. Be that as it may, oral proof might take in thought. It is additionally need some authentication .In momentarily presented that two kinds of proof are given by the gatherings by the same token oral and narrative proof. In courtroom the worth of narrative proof is higher than narrative proof. Since the law generally requires the best proof oral proof is a proof is a proof which is bound to the words articulation verbal or oral. Where as essential proof is the first report which is introduced to the official courtroom for its review. Direct proof is the best proof to be demonstrated of reality to be demonstrated. However, essential proof in specific cases is the best proof in all cases. There narrative proof avoid and excludes the oral proof and beats the oral proof while submitting the proof in as observers in official courtroom .The individual giving direct proof accessible for interrogation for testing its veracity. Henceforth, that record is composed which is a narrative proof .Sections 91 and 92 absolved oral proof by narrative proof. Oral verification can't be subbed in that frame of mind of composed documents where the composed archive exists in proof of specific exchanges of offense alluded to in Section 91 as composed declaration , more certain and more dependable than oral proof.

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## **AN EMPIRICAL ANALYSIS OF EARNINGS QUALITY OF PUBLIC SECTOR BANKS IN INDIA**

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### **Abstract:**

The banking sector in India is a largely growing sector. The ability of the banks is judged on the parameter of earning quality. It determines the profitability of the banks. This study analyzed the earning quality of Public Sector Banks in India for 5 years. The research is based on secondary data. Which was used for the study are collected from the websites and annual reports of the public sector banks. Out of the total 20 public sector banks, 18 public sector banks were selected for the study period of the study from 2014 to 2019. The quality of earnings of public sector banks was analyzed using Net Profit Margin, Return on Equity, Interest Income to Total Income ratios with their ranks. The results of the study revealed that Indian Bank was in the first position in Net Profit Margin, State bank of India was in the top rank in Return on Equity, Punjab and Sind Bank come first in Interest Income to Total Income, In average Group Rank State Bank of India has held the first position.

**Keywords:** Earnings Quality, Public Sector Banks, Banks in India, Return on Equity, Net Interest Margin

### **Introduction:**

The Indian banking sector is most likely blooming sector. It is also stated to as the foremost and most commanding industry of the Indian economic system. In this system, more than 75% of market share is hold by the public sector banks. There are 20 public sector banks in India, as on 2019. For analysis of earning quality researcher taken 18 public sector banks excluding Allahabad Bank (Merged in Indian Bank) and Corporation Bank (Amalgamated in Union Bank of India) because of merger.

Sustainable growth of the bank depends on the quality of earnings and the competency of the bank to maintain this quality and earn progressively. It is an indicator of profitability of banks. To increase its stakeholders' profit is an ultimate aim of any bank. A significant part of a bank's revenue is generated through fee-based activities such as business consulting, treasury, investing, etc. The quality of earnings will also aid the bank in executing activities like dividend payment, maintaining adequate level of capital, taking up growth and diversification strategies and maintaining a competitive attitude.

In addition to the sources of earning, following dimensions also decide the financial performance of the banks.

- i. trend, level, and constancy of earnings,
  - ii. quality and sources of earnings.
  - iii. Capability to extend capital through retained earnings.
  - iv. exposure to market risks.
  - v. provisions for credit losses.
- Sound earnings stimulate the confidence of depositors, investors, creditors, and the public at large.

The following ratios measure the Earnings Quality:

**a) Net Profit Margin (NPR):**

Earnings quality in banks is measured by the truly important parameter Net profit margin. Increasing profits is the best index that the bank can pay dividends due to which the share price will be on the rising trend. Stakeholders look at the net profit margin thoroughly because it signifies the quality of the bank that's reflected in its ability in converting revenue into earnings available for shareholders. It's declared as a percentage of income that's subtracted from total bank income after deducting all operating expenditures, interest, taxes, and preferred stock dividends (excluding common stock dividends). A high Net Profit Margin clearly signifies that the bank has stable and steady earnings.

**b) Return on Equity (ROE):**

The return on equity (ROE), also known as return on investment (ROI), is a sound measure of return since it's the product of the operating performance, debt-equity operation, and asset turnover of the bank. ROE measures how much the shareholders earned for their investment in the bank. This ratio indicates how profitable a bank is by comparing its net income to its average shareholder's equity. However, it's suitable to produce fresh earnings that accrue to shareholders as increased equity, If a bank can mobilize deposits at a lower rate and advance these to clients to create higher returns than the cost of deposits.

The higher the ratio percentage, the more efficient the bank is in earnings and utilizing its equity base to create better returns is to investors.

**c) Net Interest Margin (NIM):**

For the performance analysis of banks Net Interest margin is an important parameter. It is the excess of interest income over the interest expended as a

percentage of total assets. It tells about the ability of the bank to keep the interest on deposits low and interest on advance high. It is an important measure of a bank's basic income (income from the lending business). A higher NIM indicates a better result compared to total assets.

**d) Interest Spread (IS):**

Interest spread is the difference between yield and cost of borrowing, where the rate of return is the interest income on the assets that accrue interest, and the cost of the loan is the interest expense that is calculated on the liabilities that accrues interest. The bank does not exceed or meet its interest rate obligations. The higher the margin, the greater the likelihood that the bank will be profitable. The lower the margin, the less profitable the bank is. While the federal rate plays an important role in determining the interest rate at which an institution awards immediate funds, open market activities ultimately shape the interest rate differential.

**e) Interest Income to Total Income Ratio (INTINC/ Tot INC Ratio) :**

Interest Income Over Total Income indicates the bank's ability to generate interest income on its advances. Interest income is an important source of income for banks, so this ratio calculates the percentage of income from loan business to total income. From the bank a year later. Ideally, the bank wants a high index because it shows the regularity of income and represents the bank's income in the context of normal banking activities.

A significant part of a bank's revenue is generated through fee-based activities such as business consulting, treasury, investing, etc. The quality of earnings will also aid the bank in executing activities like dividend payment, maintaining an adequate level of capital, taking up growth and diversification strategies, and maintaining a competitive attitude. The following ratios measure the Earnings Quality of the Public Sector Banks.

**Table No. 1. Net Profit Margin of Public Sector Banks (2015-19):**

Sr.No.	Name of the Bank	2014-15	2015-16	2016-17	2017-18	2018-19	Average	Rank
1	Andhra Bank	3.57	2.81	0.86	-16.77	-13.28	-4.56	9
2	Bank of India	3.59	-13.65	-17.01	-33.33	-44.68	-21.02	17
3	Bank of Baroda	7.17	-11.00	2.82	-4.83	0.77	-1.01	4
4	Bank of Maharashtra	3.30	0.72	-10.12	-9.09	-38.59	-10.76	14
5	Canara Bank	5.60	-5.75	2.29	-8.76	0.65	-1.19	5
6	Central Bank of India	2.14	-5.10	-8.86	-19.15	-22.52	-10.70	13
7	Indian Bank	5.84	3.94	7.70	6.45	1.53	5.09	1
8	Indian Overseas Bank	-1.74	-11.12	-14.80	-29.08	-17.12	-14.77	15
9	IDBI Bank Limited	2.72	-11.61	-16.13	-27.42	-59.58	-22.41	18

10	Oriental Bank of Commerce	3.52	0.71	-5.16	-29.10	0.27	-5.95	10
11	Punjab & Sind Bank	1.35	3.64	2.30	-8.72	-5.79	-1.44	6
12	Punjab National Bank	5.87	-7.44	2.36	-21.59	-17.00	-7.56	12
13	State Bank of India	7.49	5.19	4.97	-2.47	0.31	3.10	3
14	Syndicate Bank	6.42	-6.39	1.36	-13.10	-10.81	-4.51	8
15	UCO Bank	5.33	-13.89	-10.04	-29.30	-27.27	-15.03	16
16	Union Bank of India	5.00	3.77	1.48	-13.90	-7.65	-2.26	7
17	IDFC First Bank Ltd	0.00	11.52	10.68	8.55	-15.09	3.13	2
18	United Bank of India	2.15	-2.47	1.89	-13.78	-21.16	-6.68	11

(Source: Author's own calculation from Banks Annual report for FY 2015-2019)

This table showed the average Net Profit Margin ratio associated with the public sector banks for five years. This ratio was found highest in the case of Indian Bank (5.09), followed by IDFC First Bank Ltd (3.031), State Bank of India (3.10). Whereas this ratio was found lowest in IDBI Bank Ltd(-22.41) followed by Bank of India (-21.02), UCO Bank (-15.03).

**Table No.2. Return on Equity of Public Sector Banks (2015-19):**

Sr. No.	Name of the Bank	2014-15	2015-16	2016-17	2017-18	2018-19	Average	Rank
1	Andhra Bank	1.78	1.75	1.79	1.88	1.59	1.76	3
2	Bank of India	6.70	-26.10	-7.78	-31.07	-24.57	-16.56	17
3	Bank of Baroda	9.21	-17.64	4.53	-7.64	1.18	-2.07	15
4	Bank of Maharashtra	6.68	1.39	-24.92	-42.43	-207.99	-53.45	18
5	Canara Bank	11.06	-10.69	4.15	-16.74	1.40	-2.16	16
6	Central Bank of India	1.62	1.57	1.59	1.48	1.32	1.52	8.5
7	Indian Bank	1.16	1.11	1.06	1.06	1.09	1.10	13
8	Indian Overseas Bank	1.67	1.66	1.68	1.63	1.33	1.60	4
9	IDBI Bank Limited	1.32	1.13	1.37	1.42	0.67	1.18	12
10	Oriental Bank of Commerce	1.60	1.47	1.50	1.71	1.09	1.47	10
11	Punjab & Sind Bank	1.61	1.54	1.42	1.38	1.65	1.52	8.5
12	Punjab National Bank	1.34	1.39	1.34	1.38	1.31	1.35	11

13	State Bank of India	11.17	7.74	7.25	-3.78	0.48	4.57	1
14	Syndicate Bank	1.82	2.08	1.87	1.65	1.45	1.77	2
15	UCO Bank	1.70	1.74	1.59	1.54	1.15	1.54	7
16	Union Bank of India	1.80	1.57	1.61	1.50	1.46	1.59	5
17	IDFC First Bank Ltd	0.00	0.30	0.65	0.66	0.71	0.46	14
18	United Bank of India	2.05	1.95	1.59	1.22	0.95	1.55	6

(Source: Author's own calculation from Banks Annual report for FY 2015-2019)

In this table Return on Equity ratio for the Public Sector Banks over the last five years is calculated. This ratio was found highest in State Bank of India (4.57) followed by Syndicate Bank (1.77), Andhra Bank(1.76). In contrast, this ratio was found lowest in Bank of Maharashtra (-53.45) followed by Bank of India (-16.56), Canara Bank (-2.16).

**Table No. 3. Interest Income to Total Income of Public Sector Banks (2015-19):**

Sr.No.	Name of the Bank	2014-15	2015-16	2016-17	2017-18	2018-19	Average	Rank
1	Andhra Bank	0.92	0.92	0.89	0.88	0.90	4.51	4
2	Bank of India	0.91	0.92	0.85	0.87	0.89	4.44	8
3	Bank of Baroda	0.91	0.90	0.86	0.87	0.89	4.43	9
4	Bank of Maharashtra	0.93	0.93	0.89	0.88	0.88	4.50	5
5	Canara Bank	0.91	0.90	0.85	0.86	0.88	4.38	12
6	Central Bank of India	0.93	0.93	0.90	0.90	0.90	4.56	2
7	Indian Bank	0.92	0.90	0.88	0.88	0.91	4.49	6
8	Indian Overseas Bank	0.92	0.90	0.85	0.83	0.81	4.31	14
9	IDBI Bank Limited	0.88	0.89	0.87	0.77	0.87	4.27	15
10	Oriental Bank of Commerce	0.90	0.92	0.87	0.86	0.87	4.42	10.5
11	Punjab & Sind Bank	0.95	0.95	0.93	0.93	0.91	4.68	1
12	Punjab National Bank	0.89	0.89	0.84	0.84	0.87	4.33	13
13	State Bank of India	0.87	0.85	0.83	0.83	0.87	4.26	16
14	Syndicate Bank	0.91	0.90	0.87	0.89	0.91	4.48	7
15	UCO Bank	0.91	0.92	0.89	0.93	0.90	4.54	3

16	Union Bank of India	0.90	0.90	0.87	0.87	0.88	4.42	10.5
17	IDFC First Bank Ltd	0.00	0.90	0.89	0.89	0.93	3.61	18
18	United Bank of India	0.85	0.87	0.81	0.79	0.78	4.11	17

(Source: Author's own calculation from Banks Annual report for FY 2015-2019)

This table shows the interest income to total income ratio of Public Sector Banks which indicates the ability of the bank in generating income from its lending. This ratio was found uppermost in Punjab & Sind Bank (4.68) followed by Central Bank of India (4.56), UCO Bank (4.54). Also, this ratio was found bottommost IDFC First Bank Ltd (3.61) followed by United Bank of India (4.11), State Bank of India(4.26).

**Table No. 4. Earning Quality of Public Sector Banks (2015-19):**

Sr.No.	Bank	Net Profit Margin		Return on Equity		Interest Income to Total Income		Group	
		Avg	Rank	Avg	Rank	Avg	Rank	Avg	Rank
1	Andhra Bank	-4.56	9	1.76	3	0.90	4	-0.63	7
2	Bank of India	-21.02	17	-16.56	17	0.89	8	-12.23	17
3	Bank of Baroda	-1.01	4	-2.07	15	0.89	9	-0.73	8
4	Bank of Maharashtra	-10.76	14	-53.45	18	0.90	5	-21.10	18
5	Canara Bank	-1.19	5	-2.16	16	0.88	12	-0.83	9
6	Central Bank of India	-10.70	13	1.52	8.5	0.91	2	-2.75	13
7	Indian Bank	5.09	1	1.30	12	0.90	6	2.43	2
8	Indian Overseas Bank	-14.77	15	1.60	4	0.86	14	-4.11	14
9	IDBI Bank Limited	-22.41	18	1.18	13	0.85	15	-6.79	16
10	Oriental Bank of Commerce	-5.95	10	1.47	10	0.88	10	-1.20	10
11	Punjab & Sind Bank	-1.44	6	1.52	8.5	0.94	1	0.34	4
12	Punjab National Bank	-7.56	12	1.35	11	0.87	13	-1.78	12
13	State Bank of India	3.10	3	4.57	1	0.85	16	2.84	1
14	Syndicate Bank	-4.51	8	1.77	2	0.90	7	-0.61	6
15	UCO Bank	-15.03	16	1.54	7	0.91	3	-4.19	15

16	Union Bank of India	-2.26	7	1.59	5	0.88	11	0.07	5
17	IDFC First Bank Ltd	3.13	2	0.46	14	0.72	18	1.44	3
18	United Bank of India	-6.68	11	1.55	6	0.82	17	-1.43	11

(Source: Author's own calculation from Banks Annual report for FY 2015-2019)

table No. 4 reveals that the quality of earnings represents the sustainability and growth of future earnings, its capability to maintain quality and earn consistently. State Bank of India has held the first position with a group average of 2.84 and Bank of Maharashtra stood the last position with a group average of -21.10 because of its lower Net profit margin and Return on equity ratio.

#### **Results of the study:**

**Net Profit Margin ratio indicates** Indian Bank was in the first position with the highest average net profit margin of 5.09, followed by IDFC First Bank (3.13%) and State Bank of India (3.09). IDBI Bank Ltd. In the last position with the least average net profit margin of -22.40. **Return on Equity shows**, State bank of India was in the top rank with the highest average return on equity with 4.57 %, followed by Syndicate Bank (1.77 %) and Andhra Bank (1.75 %). Bank of Maharashtra was in the lowest position with an average of -53.45%. **Interest Income to Total Income ratio point out**, Punjab and Sind Bank come first with an average rate of 0.93, followed by the Central Bank of India (0.91) and UCO Bank (0.90). **However, ranking of earning quality among the public sector banks**, State Bank of India has held the first position with a group average of 2.84 and Bank of Maharashtra stood in the last position with a group average of -21.10 because of its lower Net profit margin and return on equity ratio.

#### **Conclusion:**

Bank contributes an important role within the economic process of a nation by inserting and steering all the financial services. Earning quality is an important element for banks to perform their financial obligations strongly. Therefore, each banking entity must keep watch on its sources of income. the quality of earnings represents the sustainability and growth of future earnings, its capability to take care of quality and earn consistently. It found that state bank of India has held the first position with a group average of 2.84 and Bank of Maharashtra stood in the last position with a group average of -21.10 because of its lower net profit margin and Return on equity ratio. The study suggested that the banks should increase the interest and non-interest income through the complete utilization of the resources and improve operational efficiency.

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**DIGITAL LEADERSHIP: NEED FOR STAKEHOLDERS OF  
EDUCATION IN THE CHANGING PARADIGM OF THE  
21<sup>ST</sup> CENTURY**

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**Abstract**

The pandemic has created the largest disruption in face-to-face teaching. E-learning is the only way to innovate and implement alternative educational systems and assessment strategies on track. But to be able to transact online teaching, there is a need for digital skills with digital leadership skills among stakeholders of education. All the more, digital leadership is significant for first-time users, especially challenges brought by the pandemic situation. This research article will encourage and motivate the stakeholders of education to develop digital leadership characteristics in order to wisely use their space and opportunities to bring about significant changes in school culture, as well as a positive impact on the educational system. To foster leadership practise and the processes involved in teaching and learning, digital leadership must be grounded in practise. It is necessary to realign educational stakeholders, not only to address difficulties but also to reposition themselves, in order to prepare students for the future by equipping them with digital competencies and leadership.

**Introduction** The pandemic has led to shifts in the ways of teaching learning activities, communicating, collaborating, problem-solving, and consuming

digital content. The unprecedented challenges posed by the pandemic have placed stakeholders in a position to reflect upon the effectiveness of the teaching learning process and leadership to cultivate competent learners equipped to thrive and survive in a digital era. New digital tools have popped up faster than ever. The way of teaching and learning has changed rapidly. Do the learners know how to adapt to these shifts to lead meaningful, sustainable changes in schools? Schools and the education of children should undergo an extensive digital transformation to be able to meet the needs of the younger generation and their digitalized future (Iivari, et al., 2020). The increasing domains of technology in the teaching and learning process desperately need digital leadership to improve the pedagogy and communication with students and colleagues. All the stakeholders in education (principal, teachers, students, and staff) are required to develop digital technology skills, including digital technology-focused leadership characteristics (Yusof, Yaakob & Ibrahim, 2019). Thus, in order to achieve educational transformation, stakeholders in education must make use of these skills in order to enhance the academic performance of students through the utilisation of digital technology. Digital leadership has therefore become imperative in order to cultivate a school culture with the changing paradigm of the 21<sup>st</sup> century.

The concept of digital leadership is a rethinking, reconceptualising, and renovating of the concept of leadership in the context of the technological revolution, which takes digital technology as its centre and is reshaping society and the international landscape. Digital leadership is the ability that individuals or organisations should have in the era of the digital world to lead others, teams, or entire organisations to give full play to digital thinking by leveraging digital insight, digital decision-making, digital implementation, and digital guidance to ensure that their goals are achieved (Peng, 2021). It consists of a dynamic composition of digital skills, mindsets, and behaviours that lead to establishing direction, influencing others, and initiating sustainable changes that enhance school culture through the strategic and advanced use of the latest technology. Sheninger, 2019). Digital leadership is not about the use of flashy tools. It is a strategic mindset that leverages available resources to improve school culture in the direction of quality education. To attain the learning goals, digital leadership is concerned with providing direction in terms of digital education through improving access, capacitating peers, making informed decisions, and cultivating creativity (Brown et al., 2016). Digital leadership focuses on three important areas: effective integration of digital technology; critical reflection on technology; and fostering digital leadership for the digital age. Yusof (2019) proposed two dimensions—communication and school climate—as well as several functions that can be used in school-based digital leadership practises. Leaders in the 21st century need to know how to use digital technology so they can create a good digital environment for teachers and students and improve their own knowledge, skills, and mastery of digital technology and the new way of communicating

virtually. The pillars of digital leadership are the specific areas that pave the way to improving or enhancing the school culture through the purposeful use of digital technology. Leaders need to be the catalysts for the change, and pillars of digital leadership pave the way. Each is necessary for transforming and maintaining a positive culture in its own way.

#### **Student Engagement & learning**

Today, students spend much of their time surrounded by and using technology. To make them competent enough, there is a need to design the learning environment for the students that supports multi-tasking, random access to information and resources, frequent feedback and suggestions (Prensky, 2001). Leaders must understand that schools should reflect real life and provide opportunities for students to use real-world tools to complete real-world tasks (Sheninger, 2019). To ensure efficacy in digital learning, changes to pedagogical and instructional design must be made in accordance with technology. The current educational paradigm requires new approaches and pedagogical strategies based on digital technology. Leaders need to give priority attention to what changes the configuration of learning space in educational centres should undergo (Marta, 2019). It is essential to establish a healthy relationship between classroom design and the use of technology to enhance (access to information, motivation, immediacy, personalisation, communication, etc.) the learning space and environment. Leaders must begin to establish a plan to create classrooms that are more reflective of the real world and improvised learners must use technology in progressive ways.

Leaders' professional development can play an important role in improving the quality of the teaching-learning process (Liu & Hallinger, 2018). Technology has huge potential to enhance professional development. Using technology in the school setting requires training (to develop the knowledge and skills to apply the tools) and professional development (to understand and apply the technology in instruction and school management). Thus, teachers, staff, and students need continuous training and professional development in order to make the best use of technology in schools.

Communication is an important leadership potential, and the digital age has revolutionised people's communication styles. Communication, in general, is a mechanism for people to connect via information, news, emotions, and so on. However, people's communication styles have changed, resulting in new communication opportunities and obstacles. In the digital age, leaders must change their communication strategies to be more dynamic.

**Public Relationships** This section outlines how headers can create a favourable public relations platform using various digital media platforms to share the positive aspects of their work. We need to understand that the behaviour of people's ways of communication and working styles is rapidly changing due to more reliance on technology. Our educational stakeholders are required to make use of the power of digital technology in order to fulfil their legal obligations in a manner that is open to scrutiny, meaningful, engaging,

and inspirational for students. As a consequence, there is an urgent need to embrace digital leadership, which means digitising public services via the strategic use of governments' digital assets in order to increase citizen participation and improve social, economic, political, and environmental progress. Leaders can leverage social media tools to create a positive brand presence that emphasises the positive aspects of school culture, increases community pride and helps to attract and retain families when they are looking for where to send their children to school (Sheninger, 2014).

It is important for leaders to consistently seek out ways to improve existing programs, resources, and professional learning opportunities. Priority should be given to equipping the technological ecosystem for youths to develop the necessary skills for global success. Two components are required to integrate digital leadership into the curriculum: digital education and digital education leadership. The primary goal is to integrate digital technology to improve communications with stakeholders, improve public relations, create a positive brand presence, discover opportunities, transform learning spaces, and assist educators in growing professionally.

#### **Strategies to improve digital leadership**

During the fight against the pandemic, we faced the arduous task of 're-shaping' information dissemination as well as supply management and distribution in the context of the teaching-learning process. The reasons were not only a lack of technical capacity but also a backwardness in digital leadership that led to inadequate and limited application of the available resources and technology. Recently, the Government of India has introduced e-Governance for the effective and progressive use of information and communication technology (ICT) for providing government services, exchange of information, transactions, and integration of previously existing services and information portal. The concept of e-Governance increased the citizens' expectations of the government to solve the previously complex existing system of administration and services. It is therefore necessary to launch a campaign of digital literacy training to spread knowledge of digital technology, foster digital thinking and enhance digital leadership. At a time when digital transformations are taking place, leadership should be competent as well as change their working methods in the digital direction with a transformative digital vision towards digital governance.

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## **RECONSTRUCTING SELF IMAGES IN GLORIA NAYLOR AND MANJU KAPUR**

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### **Abstract:**

The female self is seen on the verge of Shift as gets revealed in the studies made during post-independence times. In this regard, the women writers are gaining much recognition due to their emphasis to study the self of the women protagonists. Undoubtedly, the conflicts are perennial but the strategy to combat with 'Self' and 'Society' differs from individual to individual. In this regard, the women novelists namely Gloria Naylor and ManjuKapur have been taken to study the exploration of selves in their respective novels namely *The Women of Brewster Place* and *Bailey's Café, A Married Woman & Difficult Daughters*. The blend of two authors with different cultural contexts would help in forming a better viewpoint about the changing images of 'Self' to get a rightful approach to rectify the wrong perception prevalent in the societies with respect to women.

Through their female characters namely Astha, Peeplika, Mattie, Esther, Eve, Sadie, Virmati, Eda and Kasturi, the twin authors have tried to do mind mapping of various female protagonists who have been confronted with dilemmas throughout their existence in this male dominated world. They try to idealize their dreams within the social framework. We come to know about two different cultural contexts during post-colonial period, where the treatment of women is taken altogether different. They assume different

responsibilities for 'Self-Fulfillment'. They are constantly on the verge of losing their morality. With growing times, the rigidity of being charged with sex-taboo goes at the back side of the mind of the female protagonists. They try to listen to their inner voices, thereby breaking the conventionality and do not follow patriarchy. They act thoughtfully and do confront with the quintessential question of survival. Thus, the images of Women are seen in a flux and truly indicate towards the feministic vision of both Indian and Afro-American female writers. The coping strategy of the protagonists differ to in order to make a fine balance to their lives and hence forth the 'Self-Image' also gets reconstructed.

Key Words: Perennial, Mapping, Dilemmas, Patriarchy, Existence, Feministic & Self-Image.

**Introduction:-**The early twentieth century writers glorified the beauty of the black colour and showed that they were proud of their black identity. The modern black novelists focus on the complexity of the individual attainment of his self as it is submerged in the false selves stacked on it by the destructive images and typecasts of the society. The Afro-American fiction basically deals with the mistreatment of the black particularly sexual exploitation of the black women and loyalty to the country which never gave them a chance to enjoy the basic principles of liberty, equality, and justice enshrined in its constitution. The antagonism of the white American culture induces the blacks to search for dignity and identity. The American Negro came into sight from this exceptional situation in America-a person self-esteemed, self-confident with a complete identity and as good as an individual as any white.

A black American is a Negro and an American as well. The origins of Afro-American culture do not propose appearance of any diverse social culture and institutions but a network of social relationship of a group and the actions of the members generally correspond to one another. An Afro-American is thus an exaggerated American. Their identity is denied not only by the white men but also by the black men. The Negro in America has happened to develop an identity for himself which exists without a regular past. Their domestic designs are varied, but still show women's edged alternatives in a patriarchal society. Black women in America are triply burdened and this burden curbs them from a fuller and significant participation in American society.

The theory of Feminine Aesthetics gives a new dimension to the understanding of female psyche. "For the Indian woman the home had been the entire world for many centuries." Woman is torn between cultural conditioning as a woman and feministic aspirations for autonomy and selfhood.

"Why do we travel not in straight lines but in circles?" Do we come to the same point again and again?"

The educated Indian woman is living in the suffocating atmosphere of deep psychic repression, economic exploitation and the tyranny of obsolete conventions and rituals. Yet she carries the indelible imprint of Indian

sensibility and culture in her blood and consciousness. Daring attempts by woman to break the laws lead to nothing but fear and guilt. She sometimes becomes powerless to conquer her own consciousness. In this battle of Self-predicament, she emerges herself in a new image that is Self-contradictory.

**Self Image in ManjuKapur:-**The impact of education becomes prominent in the three generations women in the novel 'Difficult Daughters' by ManjuKapur where Ida seems to formulate altogether a different image as a daughter whose ideological variation brings for her lack of acceptability and distort the traditional image of a daughter who is only obedient to fulfil the age-old practices who gets married in a well to do family to uphold the family honour. The new education and the life of Kasturi generate a new urge and emotion in Virmatito get herself free from the bondage of patriarchy that denies or deserts her freedom and choice. Her marriage is final with Inderjit but is postponed because of the death of her father. She does not think of the marriage and child bearing just after the high school qualification. She falls in love with the romantic oxford-returned professor Harish Chandra who lives next door and is already married. Thus, Virmati's self-affirmation leads a turning point in her life and in a way she draws a new image of herself before her family and creates contradiction in her daughter's mind Ida. Ida does not like to be a replica of her mother and imbibes the values at her own pace.

In ManjuKapur's 'A Married woman' the protagonist is seen torn between duty and responsibility, faith and fact, history and contemporaneity, public ethos and personal ethics, Astha thinks, "tired women cannot make good wives" (154), She fights for her self-assertions. Unlike many unmarried girls she had her infatuations of adolescent love for Bunty, a boy of another colony and for Rohan who left for overseas for a better career. But her real story of love and marriage started with Hemant, the son of a successful government official in Delhi. Soon after marriage Astha gets disillusioned about human nature in general and politics of the country in particular. Sharing her feeling, "we should struggle with her, agonize together with her about her choices and weep with her once she has made them."

Astha's family affairs are also not so good and nothing is right with her. As a married woman she becomes an enduring wife and sacrificing mother. Her temperamental incompatibility with her corporate thinking husband compels her to play the role of mother and father for her children. This denies her self-fulfilment and leads to the collapse of the institution of marriage. Discontentment leads her to defiance and restlessness. Her anxiety, discomfort, loneliness and isolation don't encourage her to give voice to her unhappiness over her troubled relationship, rather it prompts her to develop the feelings of guilt, negativity and lack of self-esteem in facing the challenges in her life. Astha understands that a married woman's place in the family is taken to be that of an unpaid servant or a slave and the thought of divorce brings social and economic death in her Indian status. She realizes for herself that, "A willing body at night, a willing pair of hands and feet in the day and

an obedient mouth.”(231) If Astha becomes the victim of male passion, Pipeelika becomes the victim of communal riot and for the mistakes in history. While the lesbian attempts drag Pipeelika to the world of forgetfulness, Astha takes a sweet revenge on her husband. In this act of vengeance, unnatural sex, little excitement, little impatience and much imagination, she has a big jerk in her mind and this cripples her married life. Astha is Kapur’s New Woman, “conscious, introspective, educated, wants to carve a life for herself, to some extent she even conveys a personal vision of womanhood by violating current social codes.”She canonizes and commemorates her insulted feminine sensibility raising the male tantrum to socially transform a society.

Thus, ManjuKapur embedded in feminism has well made her point of view clear that a woman’s basic solidarity needs to be tackled in relation to the socio-cultural situation.“ A woman should be aware, self-controlled, strong-willed, self-reliant and rational, having faith in the inner strength of womanhood. A meaningful change can be brought only from within by being free in the deeper psychic sense.”

**Self-Image in Gloria Naylor:-**InAfro-American context, during post-colonial times, the women writes are telling the real stories, stories of their own lives and struggles. This has made them even stronger and since they are progressing on the way to a more activist feminist stand. An ardent appeal for this is made by Virginia Wolf through her essay *A Room of One’s Own* (1929). Zora Neal Hurston wrote *Their Eyes were Watching God* in 1937. It was an ethnically supported journeying of black female selfhood and proved world-shattering. As a result, it paved the path for many upcoming writers.Fiction in the late 1970’s and 1980’s broke the ascendancy of poetry and drama. During this new period women were the primary writers Toni Morrison, Gayle Jones, Alice Walker, Toni Cade Bambara, Paul Marshall and Gloria Naylor. Glorification of the African women by the African writers in colonial and post-colonial Africa gave rise to woman as an icon but it frequently channels to stereotyping her role and contradicting her position outside her home.

The black woman at the intersection of the sharp blades of the swords of race, sex and class is relegated to the inferior position of denominators that influence group membership. And therefore, she remains neglected and unnoticeable in the ‘dominant, mute, passive and suppressive’ American society. Naylor’s fourth novel *Bailey’s café* is composed of several mini-plots. Each chapter details the life struggle of a different character. From these collective stories the reader confronts once again the depths of human struggle and survival despite the odds. *Bailey’s Café* serves as a sanctuary for those who have been forsaken or who have been denied the solace of human compassion. It is a way station where customers are left to their own devices without interference from others. They can interact if they wish, or they can sit quietly to contemplate their condition. Because the customers have been exploited either emotionally or physically, *Bailey’s* offers them a place where

they can try to function unmolested until they can figure out their next alternative. Throughout the stories what echoes is female subjectivity to male desires.

Gloria Naylor's novel 'The Women of Brewster Place' interweaves the story about seven women in a squalid urban neighbourhood, just when she began her graduate work at Yale. This novel introduced the privileged Americans to the struggles and sufferings of those who will never see the American Dream because for them survival itself is victory. There are different stories about different women in the novel. Each story is linked to the next in some way or the other. These women whether Mattie Michael, Etta, Mae Johnson, Kishwana Browne, Lucielia, Kora Lee or Theresa or Lorraine all go through difficult circumstances in their lives, they face several problems and with the support of each other finally survive in life. These women are the residents of Brewster Place, which according to the author is 'the bastard child of several clandestine meetings...' Like its residents the place is now neglected and aloof from the main city by a wall.

Mattie Michael when declares her pregnancy before her father is beaten badly and does not expect her father to understand the real cause of her pregnancy. His attitude is a complete contrast to that of his wife, the mother of Mattie, when Mattie says,

Oh! Mama, I 'm so ashamed.' her mother replies, 'Ain't nothing to be shamed of havin' a baby is the most natural thing there is .... What's going on in your belly now ain't nothing to hang your head about-you remember that.'

This incidence clearly indicates how differently men and women look at the same issue of child bearing. After the showdown with her father Mattie decides to leave her hometown. She goes to Ashville in North Carolina and works day and night to bring up her son, Basil, all alone, supported by her inner strength. Her only dream and reality now is to give the best of life to her son. Another resident of Brewster Place is Kishwana Browne, who rebels against her middle class parents to realize and assert her black hood. She dwells at Brewster Place to accomplish this purpose and to help the other Blacks living there. Kishwana's mother understands the feelings of her daughter but does not support her because she has no doubt regarding her identity. According to her,

.... She is alive because of the blood of proud people who never scraped or begged or apologized for what they were. They lived asking only one thing of this world.... to be allowed to be. And I (the mother) learned through the blood of this people that black isn't beautiful and it isn't ugly....black is! It is not kinky hair and it is not straight hair....it just is!

There are immeasurable slum streets like Brewster, streets will prolong to be criticised and to die but there will be other streets to whose decay the women of Brewster will adhere. Though misapprehensions about factual motherhood are moreover apparent, there is habitually a glorification of motherhood and of

women who are in distress but will struggle and survive exclusively for their children. Thus, black women turn over all the fallacies associated with them. The female protagonists of Gloria Naylor like any other black women are doubly oppressed. This subjugation they have to face both in their home and outside their homes. Therefore, in these cases the struggle is not for acquirement of mere quality but for acceptance as human beings. Through her stories Naylor also presents that the Afro-American would not have been able to survive as a race without the female values of commonality, sharing and nurturing. The Afro-American women had to bond with each other in order to survive and prove their selves.

Conclusion:-Man is a social animal. He is constantly seen in a flux. He is considered as the harbinger of cultural legacy. ManjuKapur's heroines are assertive who dare to break the threshold and achieve self-accomplishments despite facing a lot of contradictions. They are able to establish their unique identities and fit themselves into different roles as daughters, mothers and wives. Their journey of creating a new self -image is not an easy one but they made it possible through their struggle with self and society. On the contrary, the women in Afro-American culture have to face triple jeopardy and they are able to cherish their identities not within the family convention. They are taken for commodities by their male counterparts and in an alien culture. They are constantly seen struggling through their experiences and are able to heal their tormented selves through sisterhood and compassion which gives a meaning for their survival and are able to create motherly image that itself becomes iconic.

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**INTRODUCING DOGRI FOLK SONGS:  
A PEEP INTO THE REPOSITORY OF LIFE**

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The term folklore is comprised of two terms, that is folk and lore. Folk refers to the regional people and lore means stories. So, folklore refers to the stories of people of a particular region or area. It also defines popular beliefs, faiths and ways of life. In its current meaning folklore includes myths, legends, folktales, jokes, proverbs, riddles, chants, charms, blessings, curses, oaths, insults, retorts, taunts, tongue-twisters, greeting and leave-taking formulas. It also includes folk costume, folk dance, folk drama, folk arts, folk belief, folk medicine, folk instrumental music, folk song, folk similes etc.

Though the study of folklore gained importance in the nineteenth century but the interest in it can be dated back to the ancient times when the works of Herodotus, Livy and Pliny made references to popular beliefs and practices in ancient Greece and Rome. Indian literature played a vital role in the upholding and propagation of folklore. Sama Veda, to name one, can be considered as one of the oldest forms of folk music that has survived through the ages. India is a culturally enriched country with each region having its peculiar folklore.

Folklore in Jammu, likewise, has its own uniqueness and distinctiveness. The *Duggarland* today is known for its rich culture, heritage and traditions. According to Shivanath, "Dogri folk literature is universal in two ways: Firstly, its subjects are universal and the strands in which these subjects are woven are common, and secondly, it appears in the same forms all

over Duggar” (9). In Jammu also, there are differences in case of language, lifestyle, customs, physical features, behaviour. Still, it is interesting to find a fundamental unity among all the divergent cultures prevailing in each region or political unit. Dr. Seema Sharma in her Doctoral thesis writes “...It is interesting to study an emotional synthesis in the diverse elements and this issues forth in music, dances, rituals and ceremonies at places of worship, *dargahas* and shrines of faquirs and saints” (25).

The folklore elements in the Jammu region encompass folk songs, folk dances, ballads, folk tales, folk epics, idioms and phrases, enchantment and witchcraft and folk theatre. The folk songs of Jammu are the preferred form of oral literature in the region. Every aspect of the socio-cultural and religious life of the people of the Jammu region is found manifested in their folk songs. These songs are divided as religious songs, ceremonial songs, seasonal songs, festival songs, lullabies, play songs, and workers’ songs. Commenting on the nature of Dogri folk songs Narain and Baru were of the opinion Dogri folk songs are living repositories of human emotions and they help us understand the Dogra minds and their lifestyles in a clear manner” (26). One finds a wide variety of Dogri folk songs in Jammu. Beginning with the religious folk songs which are further divided into; *Bhishanpatte*, *Bhainta*, *Aarti*, *Gujari*.

*Bhishanpatte* or *Vaishnav Pad* are like bhajans, which are sung in praise of Lord Krishna or His incarnation in the form of their miraculous acts and descriptions of their lives. *Bhishanpatte* and *Bhainta* have the same structure and they are parallel in rhyme and subject matter as both are associated with admiration of God. An example of *Bhishanpata* is:

No one is able to understand you, Lord Krishna, (He is known for playing mesmerizing flute)

I have searched for you in the fairs, asked the gypsies too...

(Translation, *Duggar ka Sanskriti Itihas*, 537-538)

The above-mentioned song glorifies God whose mysterious deeds and secrets are beyond human perception.

There are very enthralling *Dogri* folk songs, directly linked with sowing and reaping and other rural jobs. The songs stimulate the workers with a particular beat or a refrain. *Gharlohdi* is one of the types of songs, sung while people are doing arduous work so that they stay energetic and motivated. An example of this type from *Dogri Lok Geet* volume seventeen is as under:

Say, young man – go ahead!

Live long- go ahead!...

Apply the force- go ahead!... (163)

On festivals like ‘*Lohri*’ and ‘*Rut Rade*’, songs and couplets are sung to express the curiosity, joy and pleasure of people celebrating them together.

To quote from *Dogri Lok Geet* volume fifteen:

Lohri has come, brother Lohri has come,

Everywhere peanuts and jaggery candies have come!

(Translation 33)

There are satirical verses called ‘*Tapkolian*’ to mock others. These may be called non-sense verses because the words are twisted in a way that they sound meaningless. There are folk songs connected with the cycle of seasons which makes them more joyous. *Dholru* are songs sung on the occasion of the change of season. An example of *Dholru* from *Dogri Lok Geet* volume fifteen is as under:

First the name of Lord Ram will be taken,  
Who has created this world...

(Translation 60)

There are satirical verses called ‘*Tapkolian*’ to mock others. These may be called non-sense verses because the words are twisted in a way that they sound meaningless. There are folk songs connected with the cycle of seasons which makes them more joyous. *Dholru* are songs sung on the occasion of the change of season. An example of *Dholru* from *Dogri Lok Geet* volume fifteen is as under:

First the name of Lord Ram will be taken,  
Who has created this world...

It is the religion that is always hailed! (60)

There are ceremonial songs like *Suhag* (on the marriage of a girl), *Ghodi* (on the marriage of a boy), *Doli* (when the bride is about to leave).

An example of *Suhag* from *Dogri Lok Geet* volume eleven is as under:

We are like sparrows my father, we will fly!

Our flight is very long, which place shall we to go? (Translation 6)

On the birth of a *child* (male), *mundan* (head shaving ceremony of the child), *sutra* (tying the auspicious thread to make the child part of a particular clan), going on a pilgrimage and occupying a newly built house; songs are sung to congratulate and these are called ‘*Vadhais*’ (*Bihaiyan*). An example of a *Vadhais* or *Bihaiyan* from *Duggar da Sanskritik Itihasis* as under:

My sister-in-law has given birth to a diamond, a son is born,  
What gifts will you offer to your sister-in-law (*nanad*), my dear sister-in-law! (Translation, 529)

*Sithanis* are also known as *Bolian* which are sung in an innocuous manner against the bridegroom and his relatives by the family members of the bride. The following example from *Dogri Lok Geet* volume ten brings out the essence of such ceremonial songs:

Mangoes have ripened and buds have grown on the stems,  
My Brother-in-law has gone to sell his mother! (Translation 223)

Like *Sithanis*, there are also folk songs known as *Chhand*, sung by the bridegroom on being forced by the bride’s friends to tease the bride and her relatives.

*Luhani* and *Palla* are folk songs sung on death. *Luhani* is also called *Luhan*. Women of a particular class called ‘*marasan*’ sing these songs while women of the house beat their chests.

For Example: Cut the sandalwood tree,

Build a long casket please...

(Translation, *Duggar da SanskritikItihas*, 531)

*Bhakhis* a famous Dogri folk song form in Jammu. It is sung in a group and not assisted by musical rhythm. The rhythm arises out of the innate emotions of the singers. One famous *Bhakh* of *Duggarland* from *Dogri Lok Geet* volume eleven is as under:

I offer you thin fried bread dear, puffed fried I also offer,

Be my lover the nomad of the hills! (Translation 209)

While elaborating *Dogri* folk songs, *Dogri* folk ballads called *Karakand Bar* deserve special reference here. Lakshmi Chand and Sansar Baruwrite, "...these ballads are more authentic than history as they have arrested life in its actual gestures. They have given us a verisimilitude of reality and are the ever fresh and complete pictures of by-gone times" (47). *Karkan* are sung by the bards in reverence of the sacrifices of some saints and martyrs of Dogra land. On the other hand, *Bar* is a distorted form of the Hindi word '*Bir*' which means brave or chivalrous. Since these ballads treat the theme of gallantry and adventure, they are called '*Baran*.' The stirring lines of the Dogri '*Bar*' describe the sacrifice, valour, courage and skill of renowned heroes in the battle.

A peep into these Dogri folk songs help us understand that these folk songs are a rich compendium of joy and solace with a wide variety of songs corresponding to various aspects of life. Dogras' love for poetry and music is so deep that they are seen singing these songs not only during life, birth and death but in each moment of life; from working in the field to playing in the ground, from celebrating loneliness to rejoicing in togetherness, from worshipping folk deities to showing reverence for the Vedic cult. It also highlights the fact that Dogras are musical to the core. Being tired of the days' work when *Dogra* men and women sing these songs, their echoes can be heard far and wide. When one goes through *Dogri* folk songs, they make one dive into the *rasas* present in these folk songs.

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## **PUBLIC HEALTH POLICY AND FIVE YEAR PLANS (1951-1961)- A HISTORICAL STUDY**

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### **Abstract**

Right to health as declared by the Supreme Court in India is part of fundamental right of the individual to his/her life and liberty. The World Health Organization (WHO) defined health as “a state of complete physical, mental, and social well-being and not merely an absence of disease or infirmity”. In 1950, Government of India set up a well-organized body known as Planning Commission to formulate national plans for the development of the country. As the ultimate aim of economic development plan is to raise the level of living of the population, high hygiene is promote the national growth and also change human life styles to live. As such, National Health Planning is an essential and integral part of national development. In order to determine the National Health Policy, it is necessary to take up a thorough examination and survey of the health situation of the country. Once the survey and analyse is completed the health problems must be categorized for priority of action, general targets and objectives have to be set up for the attainment of specific achievements in a specified time. As it regards planning for economic and social development and for health, that economic and social planning came from forefront in USSR plan in 1929. The objectives of this article, to study about the contribution of Five Year Plan to Public Health, to find out what were the health programmes implemented, and to explain the growth level of

people's health through Five Year Plan. This article used methodology is adopted for the present study in historical descriptive and analytical.

**Keywords:** Health, Human Life, National Health Planning and Economic and Social Planning.

### **Introduction**

Five Year Plans are centralized and integrated national economic programs. Joseph Stalin implemented the Five Year Plan in the Soviet Union in the late 1920s. Most communist states and several capitalist countries subsequently have adopted them. India and China both continue to use Five Year Plans, although India renamed its National Institution for Transforming India (Niti Aayog) by the Prime Minister of Narendra Modi in 1 January 2015. Influx of refugees, severe food shortage and mounting inflation confronted the Country at the onset of the Five Year Plan. The main objectives of five year plan is

- i) To improve living standards of the people of India
- ii) To increasing production and offering opportunities to all for employment in the service of community and
- iii) To promote the health condition and health education to the people of India.

In 1947, India attained independence, state and district boundaries were reorganized and development schemes to afford medical and public health were submitted the Five Year Plan.

<sup>1</sup> This article focus on first two Five Year Plan from 1951 to 1956 and 1956 to 1961, all the Five Year Plan given important to public health so it is vast area of study, hence this study focus only two Five Year Plans, now we are in Twelfth Plan Year is processing. They did great job in first two Five Year Plans to grow national development. They spent 274 crores amount of money to health schemes for develop and secure the people from ailments.<sup>2</sup>

The concept of Planning in India came in 1938 during the Indian National Congress constituted the National Planning Committee under the chairmanship of former first Prime Minister Jawaharlal Nehru. Before few years back in 1933, the Medical Council of India (MCI) was established and in 1940, the post of Director General (DG) medical services was renamed as Director General Health Services and the post of Public Health Commissioner. In 1943, a committee under Joseph Bore was constituted to examine the state of health in India and to submit a blueprint for action. In 1946, this committee submitted its three-volume Health Survey and Development Report. The Bore Committee made certain important recommendations, based on principles that must guide a health system being close with to the people. It ambitious architecture consisting of one bed for every 550 people and one

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<sup>1</sup> Rajkumar, W.S., *Health Administration in Tamil Nadu with Reference to Primary Health Care*, Madras, 1983, p.112.

<sup>2</sup> Rao, K.N., *India and World Health*, University of Madras, Madras, 1968, pp. 63-64.

doctor for every 4,600 people to be the unit of implementation. The conference of provincial ministers held in the same year, endorsed the major recommendations of the Bhole Committee but diluted the proposed coverage norms. Instead, it resolved to make plans for establishing a health centre for every 40,000 people, 30 beds for every five centre's, 200 beds in every district and support traditional medical practice, it provide safe water to 50% of the population in the next 20 years and 100 per cent in 35 years. The conference also accepted the recommendation to merge the two departments to medical services and public health. This meant amalgamating medical treatment for acute care for sick patients along with public health that essentially deals with population or community health such as infectious diseases.<sup>3</sup>

#### **FIRST FIVE YEAR PLAN (1951-1956)**

In the first Five Year Plan, for schemes of medical relief and education, rural and urban water supplies, anti-malarial measures, family planning there was an expenditure of Rs. 142 crores.<sup>4</sup> At the time of commencement of first Five Year Plan, the population of India was officially recorded in 356,879,394 people.<sup>5</sup> First Five Year Plan was based on Harrod – Domar Model (classical Keynesian model of economic growth) it is used in development economics to explain an economy's growth rate in terms of the level of saving and productivity of capital.<sup>6</sup>

The Government of India organized a Medical Education Conference in 1955, which considered the proceedings of the world medical education conference recommendations with special reference to the country's need and recommended major reforms in medical education in India. The second Medical Education Conference convened by the ministry of health at New Delhi in 1959, recommended again the early establishment of full-time teaching units, increased scales of salaries to medical teachers for the encouragement of post-graduate medical education and research and recommended measures to meet the inadequacy of teachers, especially in nonclinical subjects, such as extension of the age of retirement, employment of retired teachers, offering of fellowships for training in teaching, relaxation of conditions of appointment of qualified teacher, integrated scheme of fellowships for training abroad, with a recommendation to the universities to relax the domiciliary restrictions in the award of post-graduate degree.

Water supply and drainage works under the public health plan comprise mostly measures for improving drinking water supply, the provision

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<sup>3</sup> Sujatha Rao K., *Do WE Care? India's Health System*, Oxford University Press, New Delhi, 2017, pp. 9-10.

<sup>4</sup> Rao, K.N., *Op. cit.*, p.83.

<sup>5</sup> Robert H. Amundson, *India's Third Five Year Plan 1961-1966*, Review of Social Economy, vol.22, 1964, p.87.

<sup>6</sup> Harrod, Roy F, *An Essay in Dynamic Theory*, Wiley on behalf of the Royal Economic Society, Oxford, 1939, p.14.

for urban and rural areas Rs. 12.12 and Rs. 11.37, crores respectively, Madras and Bombay account for a major share of the programme.

Rajkumari (Princess) Amrit Kaur, former Health Minister of India and long-time secretary of Mohandas K. Gandhi, One of her great campaigns as Minister of Health were against malaria, one of the great killers of Asia. The Prime Minister Nehru offered her the portfolio of health in his first government. Malaria is the most important public health problem in India. It has been estimate that about a million deaths are caused in India every year by malaria among the 100 million people who suffer from this disease. The economic loss is estimated at several hundred crores of rupees every year. Malaria is spread by the malaria parasites.<sup>7</sup> The plasmodium is carried out from the victim of Malaria to a healthy person through the bite of certain species of the female anopheles mosquito. National Malaria Control Programme started in 1953.<sup>8</sup> It has not been possible to extend protection to entire population in malarious areas due to lack of adequate finance, staff, equipment and supplies.<sup>9</sup> So far only about 30 million out of the 200 million populations exposed to malaria have benefited by the existing malaria control schemes.<sup>10</sup> These operations are to be carried out by 125 field malaria control teams organized and directed by the state Directorates of health services. The plan includes the construction of a D.D.T. plant to supplement by the Government of India with the WHO and UNICEF assistance, in ensure sufficient supply of DDT at reduced costs to meet the needs of the country. In 1954, the Indian government issued a postage stamp to mark the intensification of anti-malarial efforts under the Five Year Plan, funded and orchestrated by the WHO and the American Economic Cooperation.<sup>11</sup> As a result malaria was reduced after few years later in 1965.<sup>12</sup>

Filariasis disease is widely prevalent in India particularly in some of the coastal regions, with high humidity and moderately heavy rain fall. The National Filariasis control programme was launched in the country in 1957-58.<sup>13</sup> Tuberculosis is a major public health problem next in importance only to malaria. While accurate date are not available, it estimated that about 5,00,000 deaths occur even year and about two million people suffer from active

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<sup>7</sup> Ministry of Health and Family Welfare in India, New Delhi, 1978, p. 7.

<sup>8</sup> Usha Banerjee, *Health Administration in Metro poles*, New Delhi, 1976, p. 92.

<sup>9</sup> Shiv Lal (ed.) *Status of Malaria in India*, Journal of Indian Academy of Clinical Medicine, Vol.5, no.1, p. 21.

<sup>10</sup> Strategic plan for malaria control in India 2012-2017, Ministry of Health & Family Welfare Government of India, Delhi, p. 20.

<sup>11</sup> Deepak Kumar and Raj Sekhar Basu, *Medical Encounters in British India*, Oxford University Press, 2013, p. 107.

<sup>12</sup> Ministry of Health and family Welfare, Primary Health Centers Training Guide, Part IV, New Delhi, 1981, p. 13

<sup>13</sup> Report of Health Condition in Tamil Nadu State, Madras, 1970, p. 7.

disease. Besides, it causes a mass of human misery. Measures needed to combat tuberculosis may be classified as general and special. These include improvement of nutrition, housing, sanitation each involving very large scale commitments. Under the special measures may be mentioned the provision of isolation and treatment of the sufferer and introduction of preventive measures. The Government of India have entered into an agreement with the UNICEF and the WHO to carry out a countrywide BCG programme. As a result reduce the mortality from tuberculosis.<sup>14</sup> Leprosy is estimated that the number of cases of leprosy in the country is probably at least one million. The highly endemic areas of leprosy in India are certain parts of west Bengal, Orissa, Madras and Travancore-Cochin. The anti-leprosy work is being carried out largely by voluntary organizations. Lately, State Governments and even local authorities have started the establishment of in-patients accommodation for leprosy. The total accommodation available is about 14,000 beds for the whole country. The Hind Kusht Niwaran Sangh and Gandhi memorial Trust has established a leprosy Committee and taken up work in earnest. Children are much more susceptible to leprosy than others and every effort should be made during home visits by the doctors and others to impress this fact on the people and to secure those children are safeguarded.

#### **SECOND FIVE YEAR PLAN (1956-1961)**

India's second Five Year Plan commenced on 1st April 1956. Largely under the Prime Minister personal direction, but the final document presented to parliament on May 15, 1956, was based substantially on the original estimates.<sup>15</sup> The main aim of health programmes during the second Five Year Plan (1956-61) is to expand existing health services, to bring them increasingly within the reach of all the people and to promote a progressive improvement in the level of national health. During the second Five Year Plan the population of India, recorded at 438,000,000 people.<sup>16</sup> The specific objectives are

- i) Establishment of institutional facilities to the people both locally and in surrounding territories,
- ii) Developments of technical manpower,
- iii) The first step in improvement of Public Health, institution of measures to control communicable diseases
- iv) An active campaign for environmental hygiene and

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<sup>14</sup> Leena V. Gangolli, (ed.), *Review of Health Care of India*, Centre for Enquiry into Health and Allied themes, Mumbai, 2005, p. 28.

<sup>15</sup> Da Costa, E.P.W., *India's New Five Year Plan*, Council of Foreign Relations, Vol.34, 1956, p.665.

<sup>16</sup> Census of India 1971, *Pocket Book Population Statistics*, Census Centenary, New Delhi, 1972, p. 18.

- v) Family planning and other supporting programmes for raising the standard of health of the people.<sup>17</sup>

This article indicate about planning commission contribute to health as growth to national economic development. Economic loss caused by the casualties of the victims. The period from 1951 to 1961 was marked both by progress and reverses in specific areas. Significant advances were made in agricultural production, Land reform programmes and Health. In health, hospital beds increase 65% and Doctors (practicing) also increased at the time of second five year plan as that 25%.<sup>18</sup> In providing hospital facilities the aspects to be kept in view are quantity, distribution, integration and quality. A coordinated hospital system with its free flow of medical services and patients should help to provide satisfactory medical care both in urban and rural areas. The provision of separate accommodation for cases of acute communicable diseases, as such cases takes up at present a great deal of bed space in existing general hospitals. It is estimated that in 1951 there were 8,600 medical institutions in the country with about 113,000 beds, in 1955-56 the number of institutions may be about 10,000 with about 125,000 beds. The plan provides about Rs. 43 crores for augmenting and improving hospital services, including staff, accommodation, equipment and supplies.<sup>19</sup>

Health unit's programme for extending the national extension service to the entire rural population, the establishment of primary health units in as many development blocks as possible is a necessary step towards providing an integrated preventive and curative medical service in rural areas. The plan provides about Rs. 23 crores for this programme.<sup>20</sup>

To evaluate the progress made in the first two plans and draw up recommendations for future path of development of health services the Mudaliar Committee was set up in 1959. The report of the committee recorded that disease control programmes had some substantial achievements in controlling certain virulent epidemic diseases. Malaria was considered to be under control. During the second Five Year Plan it is proposed to establish and expend about 200 tuberculosis clinics. The object is to provide one clinic at least in each district, preferably at its headquarters.<sup>21</sup> About 4000 beds are likely to be added during the second plan.

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<sup>17</sup> The Government of India Planning Commission, Second Five Year Plan, Government of India Press, 1956,

p. 7.

<sup>18</sup> Robert H. Amundson, *Op. cit.*, pp.89-90.

<sup>19</sup> Selwyn Stanley (ed.), *Social Problems in India Perspectives for Intervention*, Allied Publications PVT. Limited, New Delhi, 2004, p. 253.

<sup>20</sup> Milton I. Roemer, *National Health Systems of the World*, Vol.II, Oxford University Press, New York, 1993, p.160.

<sup>21</sup> Report of Tuberculosis Prevalence and Mortality, Directorate of Medical Services, Madras, 1980, p. 7.

Leprosy, according to estimate made by a committee appointed by the Government of India in 1953 for the control of leprosy, there are not less than 1.5 million persons suffering from leprosy. The first step was the establishment of a Central Leprosy Teaching and Research Institute at Chingleput in Madras for the training of leprosy workers and for research on problems relating to leprosy. The second step was to launch a leprosy control programme. The futility of attempting isolation of leprosy cases in special leprosy homes.<sup>22</sup> Nutrition is the most important single factor in the Maintenance of health. The increasing the production of protective foods such as milk, eggs, fish, meat, fruits and green vegetables for the development of nutrition level in the human body. To provide mid-day meals for school-going children should also be made.<sup>23</sup>

Family Welfare Programme which was implemented since 1956 on the lines prescribed by the Central Government.<sup>24</sup> To reduce the population, family planning programme was implemented in the States. Family Planning means having children by choice and it is possible not to have child when the parents do not want it. Thus if the couples desire they can prevent conception by using the Family Planning methods. The aim of family planning programme was to reduce the birth rate 25 per 1000. Grants from state funds were given to municipality, voluntary organization, Madurai Corporation, Madras Corporation and Gandhi gram Institute of Rural Health Family Planning in Tamil Nadu.<sup>25</sup>

Public Health Education is important in producing high-quality, effective public health professionals who can contribute towards achieving the health goals. The establishment of the All India Institute of Hygiene and Public Health, Kolkata, in December 1932, making it is the oldest school of public health in south Asia was a welcome development toward imparting public health education in India. The institute was established with a generous donation from the Rockefeller Foundation in USA with an objective to develop health manpower by providing postgraduate (training) facilities of the highest order and to conduct research directed towards the solution of various problems of health and diseases in the community.<sup>26</sup> During the second five year plan the Mudaliar Committee further sought to strengthen public education in the country by recommending schools of public health in every state to train medical officers, public health nurses, maternity and child welfare workers, public health engineers and sanitarians, dieticians,

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<sup>22</sup> Goel, S.G., Health Care Administration Levels and Aspects, New Delhi, 1981, p. 62.

<sup>23</sup> Selwyn Stanley, *Op. cit.*, pp.233-234.

<sup>24</sup> Tami Arasu, Monthly Magazine, Madras, December, 1983, p. 26.

<sup>25</sup> Tamil Arasu, Monthly Magazine, Madras, January, 1986, p. 20.

<sup>26</sup> Himansha Negandhi (et al), *History and Evolution of Public Health Education in India*, Indian Journal of Public Health, Vol.56, Issue 1, January-March, 2012, p.13.

epidemiologists, nutrition workers, malariologists and field workers in Central and State.

Planning commission is most important among the national development plan, at the time of India's independence. Free India Government has task to reorganized and made new India. The main task was implemented of Five Year Plan particularly in public health. The people of India suffered by many dangerous diseases like communicable and non- communicable diseases, hence the Government of India expending to the public health and eliminated many diseases from India with the help of UNICEF, WHO and Rockefeller foundation. They also did infrastructure developments such as dispensaries, hospitals, rise of beds in hospitals and promote health research and education in India. The present Government of India reducing the mortality rate with the help of mention the above. The public health is backbone of our nation hence, the Government giving all the facilities to all the people of India. This article significant only two Five Year Plans because of vast area hence, future studies focus on remaining the Five Year Plans particularly in public health.



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## **ANALYSIS OF BRICK STRUCTURES OF EARLY ASSAM**

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### **Abstract**

The early brick structures of Assam were scattered all over the landscape mostly in ruined and dilapidated condition therefore necessitating a detailed study before it gets obliterated. The present paper is an outcome of study of these brick structure ruins considering all possible archaeological and architectural parameters. A limited comparative study also is made with the nearby archaeological sites of Bangladesh and Myanmar.

**Keywords:** architecture, temple, plaque, Assam, iconography, brick, *Nagara*.

In Assam, brick structural remains of temples are found scattered everywhere. Their presence lending essence to the heritage of the native land and reflective of abstract and overlapping thought processes and spiritual bearing of the populace through generations. According to popular definition temple is a structure reserved for religious and spiritual activities such as prayer, sacrifices or analogous rites. But the Indian temples are not mere representative of the abode of gods and place of worship but also centre of knowledge, art, architecture and culture. Brick structures excavated and explored in Assam can be divided in five clusters. a) Goalpara b) Kamrup c) Tezpur d) Nagaon e) Golaghat

About the temple styles, there is no homogeneity in religious belief and practices of the two identified cultural region i.e. the western and eastern region. The extant temples and their religious affiliation, the deity or deities enshrined and the allied sculpture and other cult objects provide insights to the nature of religious beliefs and practices. It is beyond doubt that in the region co existed many religions and indigenous cults; sometime between 5<sup>th</sup>-7<sup>th</sup> centuries there was a massive second wave of sanskritisation whose inference has been drawn from the land grant records during this period. Almost all the grants addresses territorial term as *pur*, *puri*, *pattana*, *bhumi* and *shetra* and the names of flora mentioned are in Sanskrit, not a

single name of flora and fauna appearing in the grants (Sharma, 1978 ) bore local names. Early medieval patronage is a complex issue; so to understand it one has to understand the role of local community in temple building activities and their maintenance. Though these communities did not always donate lands or huge sum of money, their participation in daily worship and their offering of ritual objects like flower, *dipa* (lamp), *dhupa* (incense), *naivedya* (food) played a major role in the maintenance of the temple. Also *nritya* (dance) and *vadya* (instrumental music) were two important aspect of temple worship, which in all probability were offered by local communities. The long survival of the religious shrines depended on periodical repairs, restoration and proper maintenance. This need was also fulfilled by the local community. It's a known fact that daily worship and maintenance of a temple is as important as its construction and this was largely dependent on the local communities who lived in and around the temple rather than on the royal patron.

The various brick structures located in the Brahmaputra valley show certain similarity and differences based on their location and relative correspondence to other sites. Architecturally, earlier temples are small, squarely and symmetric with exquisite sculptural carvings on certain parts. The earlier temples like Dah Parbatia are highly symmetric and conform to the parameters prevailing to temple architecture in central India, with simple plan and high *adhithan* (platform). Arguably, Dah Parbatia has highest *adhithan* in the region in its time and can be postulated as post-Gupta *Nagar* architecture in Brahmaputra valley possibly by the masons and artisans displaced during the Hun turmoil or the ruler of the area invited artisans for its construction. However, the architecture of Dah Parbatia shows very limited regional influence in its architecture and sculptural art. Sculpturally it cannot be compared with any site in Assam and it remains the sculptural epitome. A phenomenon almost universal in Brahmaputra valley is to raise temples of stone on ravaged brick structures specially in the plain areas. Location wise the structures of Goalpara region are located on the bank of rivers and streams, Guwahati region on hills and ponds, and Kopili-Jamuna region on ponds and rivers.

Table 1. Architectural Arrangement of Brick Structure of Brahmaputra Valley

Temple/Site	Building Material	Orientation	Presiding Deity	Form (garbha)	Garbha Side	Approach direction
Baitbari I	Brick	east-west		pancharatha		
Baitbari II	Brick		shiva	octagonal	centre	8 sides
Madan Kamdev	brick and stone	various		rectangular	varied	Varied
Paglatek	brick and stone	unknown	shiva		unknown	Unknown
Kakojjana	Brick	east-west		offset top		
Ganesh Temple	brick and stone	east-west	shiva	rectangular	west	East
Surya Pahar I	Brick	east-west		triratha/ rectangular	west	East
Surya Pahar II	brick and stone	east-west		square	east	west and east
Dah Parbatiya	brick and stone	east-west	shiva	square	west	East
Garh DouI I	Brick	east-west	shiva	offset top	west	East
Garh DouI II	Brick	east-west		offset top	west	East

Bamgaon	Brick	north-south	unknown	unknown	north	South
Rajbari I	brick and stone	east-west	shiva	square	east	West
Rajbari II	brick and stone	east-west	shiva	square	east	West
Rajbari III	brick and stone	east-west	unknown	square	east	West
Na Nath I	brick and stone	east-west	shiva	square	west	East
Na Nath II	brick and stone	east-west	shiva	square	west	East
Na Nath III	brick and stone	east-west	shiva	square	west	East
Na Nath IV	brick and stone	east-west	shiva	square	west	East
Na Nath V	brick and stone	east-west	shiva	square	west	East
Na Nath VI	brick and stone	west-east	shiva	square	east	West
Na Nath VII	brick and stone	west-east	shiva	square	east	West
Na Nath VIII	brick and stone	west-east	shiva	square	east	West
Na Nath IX	brick and stone	west-east	shiva	square	east	West
Mikirati I	Brick	south-north	shiva	rectangular	north	South
Amtola	Brick and stone		shiva?			

Table 2. Broad features of early structures of Brahmaputra Valley.

Parameters		%
Alignment	east-west	64
	west-east	16
	north-south	4
	south-north	4
	unknown	12
Material of construction	Brick	32
	Brick and stone	68
Presiding diety	Shiva	72
	others	28
Garbha forms	Square	56
	Rectangular	12
	octagonal	4
	unknown	28

Table 3. Diagnostic features of brick structures of Brahmaputra valley, Assam (in metres)

Temple	Plan	Dimension LXB	Garbha Size (LXB)	Garbha wall thickness	Mandapa	Mandapa wall (thickness)	Garbha entrance (width)	Mandapa entrance (width)	Outer wall (prakar) I & II LXB
Baitbari I	Pancharatha	8.9X5.2			3X4		3.6	4X3	
Baitbari II	Octagonal	13X13	6.90X6.9	0 cm	2.7X2.7	20 cm			
Madan Kamdev									

Paglatek	Wall								
Kakojjana	Rectangular	Broken 2X8.5	4.46X4.30			90 cm	<2		10.9 X8.5
Ganesh Temple	Rectangular/ Triratha	32X19	7.6X6						
Surya Pahar I	Rectangular	37.85X 19.50	6.9X6.9	5					2.5
Surya Pahar II	Rectangular	42.90X31. 70	Stone						
Dah Parbatiya	Rectangular	24X11.5	2.4X2.5	3	8.4X7.8	1.8	1.0	1.1	1.8
Garh Doul I	Rectangular	21.6X14	8.20X8.20		7.2X10	2.0	<4.2	4	2.0
Garh Doul II	Rectangular	21.7X13.6	9X9.5		8X10	2.0	<3.9 5	3	2.0
Bamgaon	Rectangular	22?X18	NA	A	7.5appro x.X6.1	1.3	<3	3.1	
Rajbari I	Rectangular	11.4X6.7	2.2X2.3	1 sides 35 rear	4.5X4.0	1.26	1.1	1.1	
Rajbari II	Rectangular	18.2X8.0	4.6X4.3		5.15X5.5	1.26	1.3	1.5	
Rajbari III	Squarish	11.10X9.3 0	4.5X3.3		6.8X6.2	2.1 east side 1.3 sides		1.6	
Na Nath I	Rectangular	17X11	2.20X2.10			1.05			
Na Nath II	Rectangular	17X9.7	2.20X2.10		5.3X4.5	1.10	1.30		
Na Nath III	Rectangular	19.5X8.8	2.20X2.20		11X6.3	1.30	1.2		
Na Nath IV	Rectangular	15X11.5	2.18X 2.28		5.5X4.5	1.10	1.0		
Na Nath V	Rectangular	20X11.40	2.0X2.0		5.4X4.8	1.10	1.2		
Na Nath VI	Rectangular		2.20X1.50						
Na Nath VII	Rectangular	19.4X10	2.35X2.33		12.2X7.2	90 cm	1.4		
Na Nath VIII	Rectangular	11X8.3	2.10X1.60		5.4X6.2	1.0	1.6		
NaNath IX /Kenduguri	Rectangular		2.20X2.20			1.30	1.2		
Mikirati	Rect.	16X10	3X1.85		9.2X6.8				
Amtola	Square								

Table 4. Comparison of Northern Indian Nagara Temples and Assam Temples upto 1200AD.

<i>Diagnostic element</i>	<i>Northern temple style/Nagara</i>	<i>Assam group- Phase III</i>
Material of construction	Brick and stone, predominantly stone	Both but predominantly bricks
Shikhara	The superstructure above the cornice level	All are grounded

Roofs of axial addition to the shrine	Successive series of towers of the pitha	Superstructure not available for assessment
Elevation of the axial addition	Open mandapa type with porched balconies or entrances.	Open mandapa sometimes with mukhamandapa
Mandapa	Present	Present
Mahamandapa	Optional	Absent
Mukhamandapa	Optional seldom present	Optional
Pranala	Not very typical. May be open channel on floor level or underground.	Upper plinth level
Vertical plumb line of the cornice ( <i>manasutra</i> )	Well outside	Not available for assessment
Ceiling	Wide range of ornagements	Not available for assessment
Dhvaja	Optional. May be on top on the shrine.	Outside on the entrance/top of the shrine.
Superstructure above ground floor	Single mass	Diminishing top
Broad plinth	Mostly present.	
Prakaras	Optional.	Mostly present
Toranas	Often as entrance features	Unknown
Door	Very elaborate and ornate	Some with stone sculptured jambs
Main deity made of	Mostly of stone	All of stone so far
Dvarapalas	Small sized	Only one found, its small at Da Parbatiya

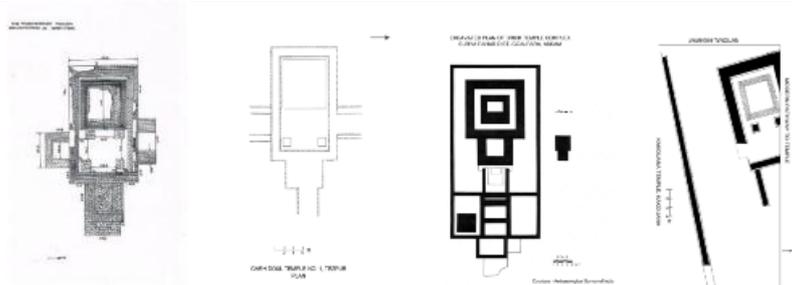


Fig. 1. Comparative plans of Garh Dou I & II, Surya Pahar and Kakoijana.

So far as the general layout is concerned, the brick structure of lower course of Brahmaputra have two ramparts (outer and inner) in case of Surya Pahar, Kakoijana, and Tamreshwar while the structure of Kopili Jamuna valley lack this feature whereas the structure of Garh Dou and Dubarani (Doiyang Dhansiri valley) has a single rampart. Another characteristic of all the structures is that the superstructure is absent.

The layout and plan of Garbhagriha of Kakoijana (Bongaigaon) and Garhdoul bears a stern resemblance. However, in Garh Doul the enclosure wall (prakaar) is absent. It is also observed that the main plinth of the Garbhagriha of both Kakoijana and Garh Doul has several projections (Singha, 2021).

**Moulded Bricks and Plaques:** Moulded bricks are used alongside the plain ones. Moulded bricks are used in adorning the outer walls to beautify the structures and break the monotony of similar looking structures. Moulded bricks were made with hand moulds. Moulded bricks combined with plaques gave the structure different architectural perspective and dimension. Modern Bangladesh was a nerve centre of Buddhism under the aegis of Varmans and then Palas from 7<sup>th</sup> to 12<sup>th</sup> century and it is during this period that Buddhism was propagated to south-east Asia.

Table 5. Comparative Sizes of Plaques from Assam, Bengal and Myanmar Sites (Rao, 2014).

Site ↓ Sizes→ (in cms)	Plaque size 1 (max)	Plaque size 2 (min)	Remarks
Baitbari	48X26.5X5.5	39X23X3	varying size
East and W Petleik	40X38X13		
Ananda temple, Bagan	36X32X7		
Mangalazeidi	38X34x10		
Paharpur	40.6X30.5X6.35	35.5X20.3X21.6	varying size
Ananda Vihar, Comilla	101X53X15.2	38X30.5X12.7	varying size

The depiction recovered from Baitbari are of *Ganesh, Brahma, Vinadhara, Kali, Ugra tara, Vaisnavi, Manasa, Uma Maheswara Arjuna in penance* and other *tantric* figures ( Sharma, 2003: 43-73). The plaques of Paharpur are thematically closer to Baitbari with predominantly Buddhist and Hindu icons.

The iconography in Baitbari seems to have been influenced by Buddhist plastic art initially which later on gradually Hindu sculptures dominated the representation. Plaques are also procured from Surya Pahar, Bamgaon, Na Nath; the plaques of Na Nath are smaller in size than those found in Baitbari and Bamgaon. The typical feature of Bamgaon plaques are that they are yellowish in colour, even bricks from this site are of yellowish colour.

Moulded bricks are important building material for ornate and elaborate brick edifices. Structurally they have the similar uses like general bricks as they are same building blocks with weight bearing properties. The use of these bricks is to beautify the outer walls of the structure. Elsewhere in Bihar, Bengal, Tripura, Bangladesh and Myanmar moulded bricks are profusely used in construction during 8<sup>th</sup> to 12<sup>th</sup> century. Moulded bricks are employed for two purposes, structural and decorative, sometimes serving both functions. Moulded bricks are mostly used on the outer face of the structure at its basal part. Due to the elaborate nature of their structures, brick was preferred in the Buddhist construction. Bricks moulded in various designs have been yielded from various sites of Assam. Some of the designs are popular and common whereas some are rare.

Fig 2. Types of brick mouldings from Brahmaputra valley.

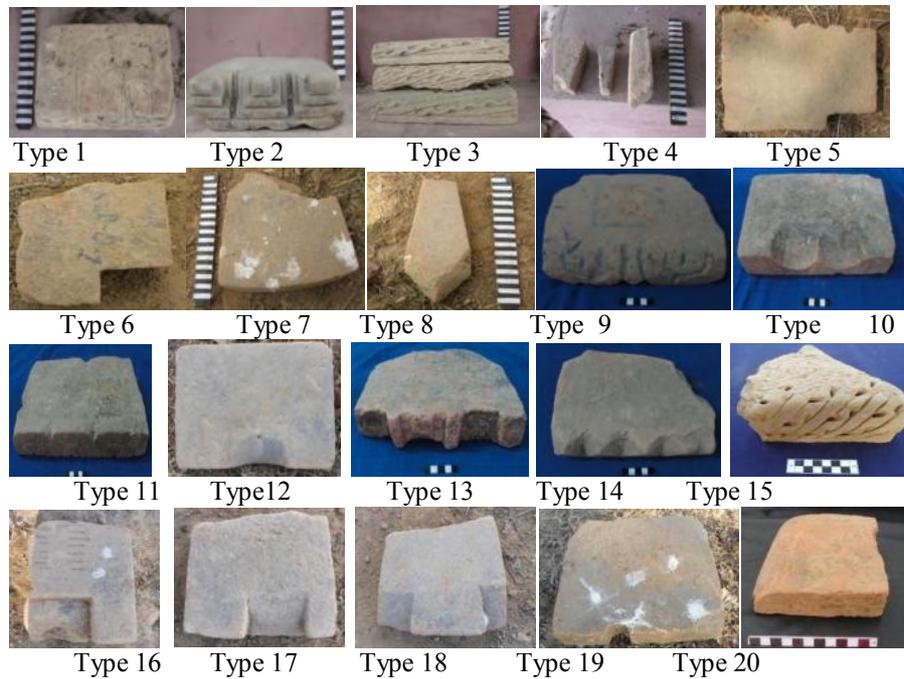


Table 6. Table Depicting Occurrence Type of Moulded Bricks.

Type→ Site↓	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Surya Pahar																				
Paglatek		Y		Y											Y					
Kakojjana		Y	Y												Y					
Madan Kamdev																				
Garh Doul	Y		Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y
Da Parvatiya																				
Bamgaon	Y	Y	Y	Y					Y											
Mhadeosal		Y																		
Rajbari																				
Dek Dua	Y	Y	Y	Y					Y											
Mikirati																				
Amtola			Y				Y													
Ambari																				

Y= Yes

So far twenty different types of moulded bricks are yielded from excavations and surveys from the sites under the purview of this study. As far as the types of moulded bricks are concerned the site of Bamgaon has yielded more than 5 types of mouldings of different designs, whereas in Garh Doul 17 types of moulding are used and in

Paglatek and Kakoijana 3 designs have been reported so far. About the designs Type 2 and Type 3 are most popular design appearing in the five sites. Type 1, 4 and 9 appears in each of the three sites. Some of the mouldings have Buddhist connotation and that linkage can be established in more than one way. Firstly Assam (western) had always been under the Aryan zone of influence from its earliest period and politically it was ruled by kings based in Bengal or west Assam. Secondly the proselytizing and assimilating nature of Buddhism and Brahmanical Hinduism kept the region adventured throughout the past by missionaries, traders and adventurers alike.

In the Buddhist monasteries of Bangladesh and Bengal few similar mouldings can be seen, however in Assam these moulded bricks are yielded in debris and never in *in situ* where it was intended in the structure, recent excavation at Dek Dua in Goalpara however throw some light to where it was originally intended. The site of Dek Dua present the most elaborate terracotta work so far from the region however the excavation report is still to be published by the Directorate of Archaeology. The type 2 and Type 3 bricks were profusely used in the monasteries of Somapura in Paharpur, Naogaon Bangladesh.

**Bonding and laying patterns:** Strength of a brick structure depends on the bonding of the bricks and the binding material. The stretcher bond pattern was widely used in construction in Brahmaputra valley, sometimes with running stretcher bonds. The mortar used in the construction is mud mortar or red soil which has good binding properties. All the sites show certain preference for stretcher bond method.

**Associated assemblages:** Pottery consist mostly of the associated assemblages, along with the structure they form the chunk of materials to establish linkages among the various structures. Almost all the sites yielded coins of colonial period specially *annas*. These coins are yielded from Paglatek, Kakoijana, Surya Pahar, Ambari, Jaljali, Madan Kamdev, Mahadeosal, Garh Doul and the Hojai sites

Fig 3. Important pottery for indexing and comparative study



Type 1 Type 2 Type 3 Type 4(mica washed) and plain (P) Type 5

Table 7. Occurrence of Few Common types of Pottery in Assam Sites

Site↓	Type→	1	2	3	4	5
Surya Pahar		Y	Y	Y	Y(P)	
Paglatek		Y		Y	Y(P)	
Kakoijana						
Madan Kamdev						
Garh Doul						
Da Parvatiya						
Bamgaon						
Mahadeosal		Y	Y	Y	Y	Y
Rajbari						
Dek Dua		Y		Y		

Mikirati					
Amtola				Y	
Ambari	Y	Y	Y	Y	
Baitbari		Y		Y(P)	

Throughout red ware is the dominant pottery as most of the sites are religious in nature; the pottery generally are ritualistic and offering wares. Introduction of new pottery can be traced periodically which becomes signatures of the given period and the population. The Paglatek Phase I and Mahadeosal Phase I is similar to the Phase II of Ambari with similar pottery with appearance of mica washed pottery. This phase is marked by so called 'Ambari wares' from Mahadeosal and Ambari, both the site shows striking similarity of pottery. These two sites produced lot of other shapes which otherwise will not be considered as conventional usual shapes. Shapes yielded are all common shapes lota, pot, bowls etc.

Ambari ware pottery was followed by celadon and glazed wares. However occurrence of glazed wares is limited in fact it neither was nor recovered beyond Ambari (Guwahati).

**Chronology:** Assessment of chronology was the most complicated part of the present study. This assessment is based on three parameters namely brick size and stratigraphy, sculptural art and associated assemblage predominantly pottery. The structures of Brahmaputra valley were constructed in three phases. The first phase was the earliest phase of which we have limited structural evidence and they represent the early historical period. The second phase is from 6<sup>th</sup> to 8<sup>th</sup> century and the third is from 9<sup>th</sup> to 12<sup>th</sup> century. The first phase structure include the period-I structure of Ambari, as we can see that the period I structure of Ambari was an ablution tank with Sunga- Kushana character however we can assume that this structure went out of use due to the subsequent rise in water table and its steps got submerged. This phase is all brick phase. Structure contemporary to Ambari Phase I is not identified so far in the valley. It is widely believed that Buddhists accompanied the traders and traders, being Jaina and Buddhist found it their moral duty to help them in their missionary zeal. The second phase from 6<sup>th</sup> to 8<sup>th</sup> century show the twin tide of Brahmanical Hinduism and Buddhism and it was marked with still predominant use of brick and limited use of stone. Political situation in this period is stable Varmans ruled this period with firmness and during this period Kamarupa succeeded to come out from the stereotype of the place being inhabited by dangerous animals and cannibals and of prohibited land. Various Buddhist missionaries set foot here during this time. The marked feature of structures of this phase is Buddhist structures with Hindu influences and vice versa along with limited Jaina elements infused.

The preceding Gupta rule made a tremendous socio-cultural impact upon the valley and the Huna invasion during later Gupta period triggered migration of various people including artisans and sculptors to Bengal and to Assam afterwards the reason sculptural art of Bengal and Assam for certain period had classical bearing and within a generation or so these classical offshoot diffused into local art form. These two regions came under the political influence of Pala in Bengal and Malechchha in Kamarupa. However Palas patronized Buddhism and Shaivism also flourished in the kingdom and in Kamarupa polytheism with predominance of Shaivism flourished during the Malechchha period.

The third phase is marked by stone built temples. There was a clear shift from brick to stone in this phase. This period also is marked by infusion of tantric elements in the sculptural art. The temples of this phase are influenced by the Orissan school. The third phase show the rise of Tantric features in the construction, not much new spots were identified for constructing structures. During this phase the fallen brick structures were renovated or rebuild with stone at the same spot. Almost all the stone temples of this phase show brick temple evidence in its basement.

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## PSYCHOLOGICAL ASPECTS OF RAPE AND ITS CONSEQUENCES

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### **Abstract**

Sexual brutality has a genuine and different outcome for the emotional wellness of women. At the psychological level, such brutality becomes a cause for some radical changes in the self-perception of the victim, which eventually affects her relationship with her family and close friends. It along these lines adversely affects the casualty's impression of herself, of occasions, and others. The victim's perception about her past, present and future also gets adversely affected by such incidents. In terms of societal impact, such an act defames the victim with the effect of depriving her of the basic avenues of economic well-being and defenestrating her and even her family members from the 'normal strata' of the society This article examines these outcomes of sexual cruelty on the emotional well-being of woman, particularly the people who are casualties during outfitted clashes.

**Key Words:** woman, trauma, brutality, rape, assault, security, violations, psychological effects.

### **Introduction**

Rape is the most surprising and crude manner of displaying how considerably women are mistreated and demeaned. It destroys the complete bodily and intellectual stability of an individual and, reduces her existence to simply a corpse. it is extraordinarily disrespectful toward vital freedoms which each and every one is assured below the Article 21 of the constitution. Rape within

India was dealt with as the most abhorrent crime toward females and it is a social hassle. At the same time as the range of reported sexual violence instances are surprisingly low and differentiated, in each 10 minutes a female is sexually assaulted however the case isn't always reported. in line in the National Crime Facts Bureau, 24,206 sexual assault instances had been reported in India in 2011. Youngsters are defenseless in this awful act and more than 7200 young humans were raped in India. According to a survey, maximum of young people was simply mistreated, & these crimes were rather prevalent. The survivors of sexual attack suffer from diverse psychological consequences which includes anxiety disorder, ingesting disorder, sleep problem, depression, PTSD and self-harm

All around the globe, the phrase "Raptus," that is the normal term for attack, was used for wild robbery, implemented to each asset and person within the Roman tradition. It became indistinguishable among kidnapping and kidnapping or assaulting a female. Assaulting a female was considered theft of a female in opposition to her consent or the consent of her parent or people who had actual authority over her. The damage induced to the female was amusingly, handled as an incorrect towards her father or partner, females being a side problem. The assault on females changed into unavoidable situation within the length of early Roman, in spite of the reality that Roman recommendations at that point considered it as unwanted act. Rape was most usually communicated as stuprum, a sexual conduct aided by means of mercilessness or tension, within the English language of "forced intercourse". Assault was considered as and resource to battles, which follows as a long way as possible back to the times whilst mass attack of females as a restorative measure put together by means of the militaries after powerfully getting into a metropolis which was taken by way of Troops from Greece, Persia, or Rome. Rape, in addition to fighting, was prohibited by subsequent monarchs' strategic codices, and this prohibition included rationale for condemning and murdering aggressors during the Hundred Years' War.

The vast majority of Muslim professionals are well aware that a female is prohibited from having intercourse may face no punishment under Islamic criminal standards. in line with a Sunni hadith, the subject for executing assault is ended, there's no offense on the person being mentioned, neither is there any ordinary subject credited to her.

The assault guideline under the IPC had been amended several times. (Gaur, 2015) Sections 376 (2), Custodial Rape, 376 (A), Marital Rape, 376 (B to D), Sexual Intercourse but not Assault, were introduced to the law in 1983. As per according to the Criminal Regulation Amendment Act (1983), It is illegal to expose the identity of a rape victim. Regardless, this Act exists. remains aware about assault, it presents diverse new characterizations of offense of intercourse by way of individuals in custodial scenario including managers of disaster facilities, remand houses, confinement places of work, in addition

police department administrators with females in the guardianship. Such findings of custodial assault, a promise to show whatever lies with men and anticipating a female loss gives something that she was unable to consent to, which the court could recognise. The punishment for 'custodial sexual assault' or sexual assault is a minimum of ten years in prison, and the crime is non bailable & cognizable. Rape by a male of spouse residing freely from him in an affirmation for division or under any tradition or practice without her permission is punishable by custody for two years. That is a punishable offence with a bailable fine.

Conferring to the Supreme Court's 2012 decision, assault fundamentals must finish in two months, determined by guideline. The Apex Court ordered to "very well agree" existing standards while citing them to prevent "transferring" through extreme lengthy excusals. Section 309 of the Criminal Procedure Code 1973 declares that in all trials, lawsuits must be held as soon as probable, and that once the investigation of witnesses commences, it can advance forward one day at a time until all witnesses have been investigated. The Cr.P.C. states that "the solicitation or primer will, very far, be finalized in a duration of 2 months from date of inception of the investigation of witnesses" such cases that fall under Section 376 (punishment for ravishment) & associated crimes within Sections 376 A to D of the IPC, 1860. Setback from sexual assault encounters, mental injury, which need to be talked as to offer assist to permit her to modify to the harm suffered and to maintain over her close by and lengthy time period desires so that she will lead a good natural lifecycle.

Section 375 of the Indian Penal Code has been reprimanded for a variety of reasons, including requests for oral intercourse, homosexuality, and entry through new things in the meaning of rape that would never have possibly been in conflict with many safeguarded courses of movement, regular price, or real worth. For certain, even international guiding principle by means of and by using declares that rape can be identified by way of the "sexual entry, penile penetration, but furthermore splitting the distinction, robust, coercive use of pressure in opposition to the person being noted, or the access by way of any article, yet moderate." Emphasis on these guides of movement is not planned to lure, but to present the person being mentioned and not the criminal, the upside of doubt.

The section 376 in overseeing rape, in a tremendously limited place that sets out, an offense of sexual assault within the intimate relation stances for reason that the partner be below 12 years of age, anticipating she be a few places inside the scope of 12 and 15 years, an offense is submitted, anyhow, less certified, appealing minor reprimand. as soon as, the age crosses past what many might bear in mind feasible there may be no valid affirmation of the punishment. The exchange towards marital rape commenced with female activists in the United States bringing up their voices at some point of the 1970s for abolition of marital rape prohibition rationalization & growth

affirmation of equal safety to female. Meaning of permission for each person decision can not be over emphasized. Even while married, female can defend her right to life and opportunity, and her body. The majority of Western countries have made marital rape illegal.

#### INDIA'S RAPE PREVENTION GUIDELINES

Rape suggestions in India begin from very foundation of Indian Penal Code (IPC) in 1860 (45 of 1860) included in Sec 375 and 376. As per Sec 375, a male is said to have carried out rape if, apart from for the condition here after excluded, he has sexual relations with a female in any of the five following scenarios: (1) in opposition to her interest, (2) with out her permission, (3) with her agreement, while her permission was gained by putting her or any individual in whom she is concerned in fear of loss of life or harm, (4) along with her consent while the individual is aware that he is not her spouse, & her consent is given while she recognizes that he is any other male to whom she believes she's lawfully married, (5) through her express permission while she is unable to give such permission at the time to comprehend character & outcomes of that to which she offers consent owing to unsoundness of mind, use of alcohol, administration by him personally, via other, any stupefying or objectionable matter. (6) without or with her consent while she is under the age of 16. This classification describes that penetration is necessary to encompass the intercourse essentially to rape crime. This offers an exemption that sex via male along his spouse, not being below 15 years of age will no longer be taken into consideration as rape.

Section 376 offers punishment to Rape. As established by the section, anyone commits rape maybe sentenced to custody for a period of 7 to 10 years or for life, along with fine, except if a female raped by her partner is below 12 years of age, in this case he maybe sentenced to detention for a period of two years, and a fine, or both.

#### Rape Law Reforms Introduced by Nirbhaya Verdict

The said ruling is one of the milestone decisions of India which has gotten many reforms in the rape laws of India as it was the most horrifying incident. The victim Jyoti Singh was a 23-year-old student along with her companion took a transport at Munirka to arrive at Dwarka, in Delhi. Various body part alongside aspirations and yearnings of humble community young lady were obliterated an insatiable evening on 16 Dec, 2012, the rapists and attackers brutally assaulted and gang-raped her. A three-judge bench, through a constant verdict, maintained the Delhi High Court ruling that had decided with the Trial Court. Akshaya Kumar, Mukesh, Vinay Sharma and Pawan were executed for the severity they had displayed against the females of this nation. (Mukesh & Anr vs State For Nct Of Delhi & Ors, 2014)

#### Changes Introduced After Nirbhaya Case:

The Criminal Amendment Act, 2013 is likewise famously alluded as the Anti-Rape Act. As per this change, offenses like voyeurism and stalking were included into the meaning of assault. Base sentence was converted from seven

years to ten years. It makes changes within IPC, IEA, and Code of Criminal Procedure, 1973 on guidelines associated with sexual offenses. The crime of Rape under Section 375 of IPC, have stated both penile and non-penile expansion in genuine openings of a female by a man a crime. The explanation is thoroughly explained few perspectives, by acts such as invasion of penis, or anything or any part of body to any degree, into a woman's vagina, mouth, urethra, or butt, or forcing her do so with another person, or smearing of mouth to sexual organs (Cunnilingus or fellatio) deprived of the woman's consent or will laying out the offence of rape. Base sentence was increased to 20 years in cases where the victim died or was in a vegetative state.

After this case, another flaw in the framework was discovered because one of the accused was an adolescent. According to the Juvenile Justice Act of 2015, the age for being tried as amature for vehement crimes such as sexual assault was reduced from 18 to 16 years.

Panel gave broad proposals viewing staying away from marital rape and rape committed by means of instruction of void relationships.

People marry for certain, reasons like authentic, social, financial, significant, and religious needs. In India, companion's occupation has commonly been seen as agreeable condition for marriage. Marital Rape is considered hallowed sex is seen as sign of God. Sexual intercourse has been viewed as compulsory in a nuptial. Seeing marriage as a commitment of trust and affection, person rehearses sexual uniqueness by means imaginable. The Indian Penal Code through its Section 375 assents this, "Sex by a male with his significant other, companion is not below 15 years of age, isn't sexual assault." along these lines; Marital Rape isn't a crime not with standing the modifications, guideline directive reports, & latest guidelines.

This has been battled that asserting marital rape as a crime will bring "the capacity for demolishing the reinforcement of marriage." The dispute acknowledges that marriage a association didn't rely upon shared consent and decency. This concept denies a person's critical right over his or her body, whether male or female. All else being equal, the spouse's body is regarded as property, despite her consent. The marital rape will be dealt with under Section 498A of the Indian Penal Code ("illogical sexual direct from the life partner") under the Protection of Women from Domestic Violence Act 2005. (PWDVA). The said Reform went into effect in 2006, and it truly safeguards against marital sexual assault, various types of carnal abuse, & harmful domestic behaviour.

Rape has to be displaced by using the term 'assault'

According to Sec 375 of IPC asserts that sexual intercourse must include wide range of penetration. Penile/vaginal relationships.

As per the judgement of Sakshi v. Union of India and Others [2004 (5) SCC 518], physical assault on any portion of the body needs to considered as sexual assault

Sexual Assault's guidelines had been made fair-minded for safeguarding assault of teenagers has overlooked with the aid of guiding principle

A latest infraction, primarily under Section 376E with head Punishment for repeat offenders was added.

Section 509 of the IPC was attempted for modification in order to provide a more severe punishment when the specified section's offence is engaged with sexual connotations Exception (2) of IPC Section 375 must be removed. Compelled sex from man through his partner must be dealt with in the same way that any mercilessness by a partner towards the married woman is considered a crime. Section 376 A was also deleted for the same reason.

The Domestic Violence Act of 2005 (DVA) provides solutions for which section 498A of the Indian Penal Code (IPC) currently provides illegal fixes, whilst maintaining what is going on with the problem of marital rape in persevering with neglect.

Section 498A expresses vehemently that, in order to protect females from outrageous sexual lead by way of the life companion, there may be no well-known of degree or understanding for the courts, of 'debasement' or 'unnatural,' within the definition's inner secure spousal relations. Is preposterous intercourse interest absurd? Isn't taking prior permission a requirement? Is tying the knot a licence to sexual assault? (DK, 2007) This is one of the questions that must be addressed. Section 3 of the DVA "Physical assault, sexual assault, verbal and emotional abuse, and financial abuse" are all examples of domestic violence.

It excuses sexual abuse in a married or live-in relationship because it is dangerous and disastrous. There is no compelling cause to the zero in on risk of selection of a woman's necessities. It's far approximately the chief association of the intimate basis that notwithstanding being married, she holds a specific popularity, wherein she would not want to admire each real concept no matter the way the manner of her partner.

On examining a young person, it was seen that sexual abuse incites dangerous thoughts such as self-deprecating harm, depression etc. Sexual assault & different forms of assault on a young person can have long and short-term consequences, together with psychopathology later in lifetime. Anxiety symptoms, PTSD, distress, dietary issues, low self-esteem, psychotic disorder, and strain issues, as well as overall mental hopelessness & issues like summarization, sorrow, continuous pain, sexualized behaviour, school/learning issues; and lead issues such as substance abuse, horrible direct, culpability, and suicidality. Aside from legal stimulation, what is essentially required is a period of care, 'Helping society to consider females as an integral part of society, and their existence should be respected,' which will aid in the improvement of society and the attainment of amicability. It is nearly as critical as taking legal action to protect women's respect and opportunities.

Rape isn't like another offence., most events go unreported despite many efforts made, laws introduced. The arraignment of rape isn't like other typical

criminal offences. There is an incredible emphasis on the individual and motivation of the complainant. Assault is especially slanderous; an assault loss (especially if the victim was a virgin) may be perceived as "hurt" by society. Victims may experience withdrawal, be abandoned by friends and family, be barred from marrying, divorcee married, or even killed. This is referred to as discretionary victimisation.

#### Conclusion

Overcomes of sexual maltreatment experience are various mental impacts alongside a range of physical and mental issues bringing about higher medical care use. Survey shows that rape causes various mental issues, such as nervousness issues, PTSD, dietary problems, and intentional self-harm. Survivor's experience assorted adverse consequences of rape; there is no rundown of regular "side effects" they ought to show. Such effects influence not just the physical and psychological wellness of survivors yet in addition their relation with family, companions, accomplices, partners, etc. Further exploration is important to all the more likely get the pathogenesis of mental issues in overcomers of rape. Research is additionally expected to decide proof-based administration of overcomers of sexual maltreatment adapting to long haul psychological wellness.

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**COLONEL H. S. OLCOTT - THE MORNING STAR OF  
PANCHAMAR (DALITS) EDUCATION IN MADRAS  
(1894-1907)**

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**Abstract**

In the 19th century, India met a lot of religious and social reformers on caste and religion. All the reformers created their own social background except Theosophical Society (T.S), the only worldwide organization which was created by H. S. Olcott, who was a charismatic leader of the Theosophical world, president and co-founder of the T.S. He believed Hinduism but opposed caste-based society. His caste opposed ideas were easily accepted by Tamil Dalit Social reformer Pandit C. Iyothidasa. Their relationship created new Dalit consciousness in Colonial Tamil Nadu. Olcott Educational ideas started a way of Dalit literacy movement in Madras. He successfully implemented new education methods and midday meals scheme in Madras. This article is about Olcott Panchama Education Schemes (O.P.E.S) in old Madras.

**Key words:** Theosophical Society, H. S. Olcott, Education, Pariahs, Dalit.

**Introduction**

In nineteenth century western education was slowly spreading in India, which was promoted by two agencies. First one is Government and the second one is non-Government. Socio-Religious reform movements, are parts of non-government movements. During the period, Dalits were totally neglected of all social right, particularly in education. This situation was the reason for the emergence of many social and religious reform movements, such as Brahmo Samaj, Arya Samaj, Ramakrishna Mission and Theosophical Society (T.S). Among them, T.S was a movement which paved way for spiritual reforms in India. The role of co-founder of

this society, Colonel Henry Steel Olcott, in Dalits social and educational development in Madras is quite impressive.

H. S. Olcott met for the first time Madame H.P Blavatsky on September, 1874 in New York. Where the society was started in 1875. The society was a non-sectarian body of seekers of truth aimed to promote universal brotherhood. The founders changed the society headquarter from New York to Bombay (India) in February 1879. In December, 1882 it was moved from Bombay to Adyar in Madras. This relocation to Madras helped Olcott to understand Dalits social and economic conditions. In 1882, Olcott and Blawatsky undertook an extensive tour of Tamil Nadu. They visited Trichinopoly, Madura, Tanjore, Kumbakonam, Cuddalore, Mayvaram, Vilupuram, Coimbatore, Nilgiris, Nagapatinam, Tuticorian, Tinneveli and Pondicherry. They opened branches of their society in various places of Tamil Nadu .

Pandit C. Iyothee Thassar and H. S. Olcott

Pandit. C. Iyothee Thassar was a charismatic Dalit leader of contemporary Olcott . In 1882, Thassar met Olcott and Blawatsky in Nilgiri with his cousin Erattaimalai Srinivasan. In 1884, Olcott organized society's annual meeting and many scholars from different parts of India and other nations participated. Thassar and his cousin also joined. This conference created new thoughts on Buddhism. Thassar stated that he had his first insight into the Buddhist origins of outcastes from an old palm-leaf manuscript titled Narada Purana Sungai Thelivu. Also, Buddhism helped the new relationship between two leaders. IyotheeThassar started Sakaya Buddhist Society in 1898, with the support and encouragement of Olcott. Later, the name of the society was changed to South Indian Buddhist Society. A meeting was held in Madras on June 8th, 1898. Olcott and the two Buddhist priests spoke, and an appeal was made for support to IyodheeThassar Dalit movement. It may be emphatically said that Thasa received inspiration and help from Olcott. During the period Ven. Dharmapala made the Buddhist revivalism particularly the Tamil Dalit society.

H. S. Olcott's Idea of Panchama Education Scheme (P.E.S)

On 30th September, 1892, J.H.A.Tremenheere, the I.C.S of Chengalpattu District, submitted a report to the Revenue Board of Madras Government, which exposed the Dalit education levels in TiruvallurTaluk. Out of 303 villages, even a Pariah living in more than 200 hundred villages, could not read and write. In 272 villages, there was no single Parayars child at school .Olcott understand the lack of education, then he created the P.E.S in 1894 .Olcott was a pioneer work for educating the poor children from the marginalized sections of the society. The concept, that through education, the underprivileged and deprived can be enabled to stand on their own feet and fight for what is due to them was formulated and given a practical shape by him much before similar work was started by Mahatma Gandhi and Dr. B. R. Ambedkar. Several schools were started in and around old Madras.

In June, 1894, Olcott opened the first school, named Panchama Free School, near the society headquarter. The funds for the establishment and maintenance of this school were largely provided by the European and American friends of Olcott. At first, 55 pupil were admitted. In 1898, a second school was opened, it was named as H.B.Blavatsky Memorial Free School at Kodambakkam. Next year, 1899, the third school was started under the name of Domoder Free School at Teynampet. In 1901

fourth school was opened in Mylapore, and it was called Tiruvalluvar Free School. On 1st May, 1906 the fifth School was started at Krishnapet.

H.S.Olcott was introducing housekeeping, cooking and management studies to his schools. He taught the boys to cook, mend clothes, to manage household accounts, so that they would get employment opportunities. In 1898, S.E.Palmer came to Madras; she helped for the development of these school curriculum, she was an experienced teacher. Olcott appointed Palmer as General Superintendent of Panchama Free Schools. She introduced for the first time elementary schools in Madras with the ideas of kindergarten. These five schools for Dalits children became more advanced in their methods than the schools in the city for other caste children. In 1901, the annual report submitted by her showed that the total pupils receiving instruction in the schools as of 20th December, 1901, was 384-534 boys and 150 girls. The number of teachers who worked in the school was sixteen. Unfortunately, Palmer returned to America. In 1909, the T.S movement was growing stronger. The Olcott Panchama Schools, under Miss Kofel's devoted care, were all, that could be desired. The Madras Corporation had built another school for them, and a technical department had been opened. Schools had been opened for similar children in various places, by the Sons of India Lodges. In addition to this, the Sons and Daughters of India were doing useful work in many directions, training the young in the duties of citizenship. The Central Hindu College (C. H. C.) for Sons of India had two schools, one for poor children and one in the evening, for servants. According to R.S.Basu, Colonel H.S.Olcott, assisted by the American Theosophists, tried to introduce the kindergarten pattern of instruction in the Panchama Schools. Those kindergarten pattern were to stimulate Dalit pupils to help increase students' attendance. All the five schools took special care in children's health and education.

#### The Growth of Panchama Schools

Colonel Olcott stipulated that school should not charge fees, the school hours were to be convenient for the occupations of the domestic servants and others who might seek education. Tamil (reading, writing and correct spelling) as well as arithmetic, English speaking and Hindustani speaking were to be taught.

The education of the depressed classes was also going forward, and the Olcott Panchama Free Schools are noble movement of their founder. They are regarded as model primary schools in the Presidency, and teachers from other towns were sent to these school to learn their methods. Miss C.Kofel, the invaluable Superintendent of Panchama Schools, built her movement in kindergartens. Another important educationalist Mrs.N.A.Courtright, the superintendent of the Olcott Panchams Free Schools, she also wrote a book on How We Teach The Pariah. This work was published in July, 1906. In it an interesting account of the system of education at the Olcott Panchama Free Schools has been written.

The Sidhanta Deepika noted, 'well aware of the noble work that is being done in the Olcott Panchama Free Schools; but we are not sure that it is so well known that the latest and most progressive methods of teaching are employed in these schools and have been carried almost to perfection with great enthusiasm and practical wisdom under the able and energetic guidance of Mrs.N.A.Courtright. On the whole we believe that under the able supervision of Mrs.Courtright an easy and natural system of teaching is adopted in the schools which should be followed in all the primary schools of the country. It would be very long however before we shall have as supervisions of our primary schools by such enthusiastic and sympathetic persons as

Mrs. Courtright or have our primary school teachers persons with the spirit and skill in the methods of teaching adopted in the OlcottPanchama Schools.’

The first point to be settled, after one has decided to open a school, is the nature of the pupils to be educated therein. It is a hypothesis of scientists who have investigated the subject, that the inherited physical trait of the child limits and prescribes his possibilities; that each nerve fiber and convolution of the brain helps to fix this boundary of mental capacity, from a biological standpoint. Mrs. Courtright was justified of concluding that the possibilities and the limitations in the mental training of the child are largely, if not almost entirely a matter of the child’s ancestry; that an organism which is the product of untold ages of evolution of the more purely physical, will inherit body rather than brain, or body with brain in an embryonic stage, which will require many generations of progressively ascending attempts at growth and development before it embodies a latent capacity for sustained mental power, or even for any mental vigour beyond the simple and rudimentary; if this be so, then no system of education destined to fit the future rulers and citizens of a country adequately to play their destined part on the stage of life, can afford to overlook its fundamental significance.

The details of method and work in P.E.S, Courtright was taken additional effort on improving English knowledge development programs. In view of the child’s own future necessities, then, it becomes a valuable and a practical kindness to teach him English tongue. The Madras Educational Code has, in the past, restricted Primary Schools to beginning the study of English with the Third Standard. This rule would completely shut out the majority of Panchamas, since the majority leaves school before completing the Standard. Indeed, the English recitations are among the most attractive features of the schools, and are the most difficult adequately to describe. It would be almost as sensible to attempt to train children to perform acrobatic feats before they had gained sufficient muscular control to stand alone or to guide their own steps to some objective point, as it is to commence the education of infant pupils by training them to make letters and figures. Take the Tamil alphabet for illustration. Each letter is composed either of straight lines at various angles or of spirals and curves, or else it is a combination of lines with these parts of circles. The Teachers are aware that to draw either straight lines or spirals or circles requires considerable muscular control, as well as knowledge of form, to say nothing of an eye-training sufficient to observe inaccuracies of outline and proportion. No child should be allowed to use either slate or book until he has undergone a preliminary training, first of the fundamental and then of the accessory muscles.

The lowest Standard or Kindergarten Standard pupil studied following on:

1. Chalk Drill- at the blackboard
2. Clay Modeling
3. Leaf Work
4. Games and Songs
5. Conversation and Questions.

Mrs.N.A.Courtright, personally took the responsibility of sending two little girls, who had completed the 4th standard in H.P.B.Memorial School, to a Government school teaching the higher grades. They have both just completed the First Form with great credit to themselves. In attending that higher grade school, these girls have, for the few hours of school each day, been transplanted into an environment totally different from their wretchedly poor homes and one might well

feel repaid for any effort on their behalf just to observe the great change in them in over a short year. She molded and well trained on Dalit girls education, she was discussed with her schools pupils parents, important on girls education because most of parents arranged for their daughters' marriage. The "Olcott Panchama Free Schools" collectively were awarded for teachers' and pupils' work, a large medal with certificate of "Excellent," for leaf-work, clay modelling, plaster of Paris caste, chalk drawings on brown paper, and brush-work. Besides, The Superintendent Mrs.N.A.Courtright received a "School Prize," an "Elementary Teacher's Prize" and six "Certificates." All the year the Training Class was held regularly, doing much good work. The Teacher Institute will be held in the beginning of January, under the direction of Mr.H.S.Duncan, The Government Inspector of Schools, III. Circle; Department of Public Instruction thus showing their recognition of the work. Mr.Orange, the Director-General of Public Instruction for India, after having seen O.P.F.S service and work, expressed himself very favorably about it.

H. S. Olcott well appreciated on Mrs.N.A.Courtright work on Dalit educational development, his annual report was surprising to us as it can be to anybody, that these poor, despised Pariahs of Madras should have made a record of a percentage of passes to candidates, never before known in India. In 1903, 116 pupils appeared in government exams, everyone passed as perfect in every one of the subjects. It was easy to see the success of Mrs. Courtright's came to have a strong influence towards remodeled system of teaching hitherto followed in the schools of Madras Presidency. The total of passes for the Lower Primary Schools 95 %, one school – the Olcott – passed its pupils cent percent, in the compulsory subjects, and in the optional subjects also, with a single exception- one Second Standard child failed in drawing, and optional subject- and each class was examined in as many subjects as the Government permitted. Throughout the year the work of the staff and teachers and the superintendent has been entirely directed to educate the pupils, in each and every subject. As far as possible books were not used by the pupils; they were referred to necessary first hand observation; but the endeavor has been to direct the attention of the pupils to discover facts for themselves. One of the most interesting and important feature of this school, in 1904 , has been the observation trips to the sea, the Adyar river and to St.Thomas's Mount, to study geographical points and features; also the Museum, the Zoo, the Botanical Gardens, and to the important buildings and places of educational interest in the city. The Head Master of the Olcott and the Damodar Schools have looked up to a few of the boys who completed the 4th standard within the past three years (1901, 1902, 1903) in their respective schools, with this result; 10 boys employed as peons and chokras (servants for Europeans), 10 continued their education in advanced schools; 2 are teachers in the Olcott School, 6 are employed in various shops under European management. The interested friends always supported schools development, they continued to send contributions to the Food Fund. It will be pleased to learn that for the year past, two rice cake per day have been given to the pupils in the Infant Standard at the H.P.B.Memorial School. The Head Master reports the total number of food doles to be Rs.6, 553, in the year 1904. The usual distribution of rice to all the pupils has been continued in the H.P.B –their poorest school. The meals provided for 2820 pupils attending collectively. Owing to failure of the winter monsoon, a famine was considered to be inevitable; hence there was a plea for large contributions from friends for the purchase of food for Olcott school pupils to cover during the period of dryness.

H. S. Olcott well understood on the Dalit pupil's difficulties faced for the food. As the children of Panchama Schools are often weak from lack of food, and the parents made a great sacrifice in allowing them to come to school, a little encouragement is given by a monthly distribution of a cupful of raw rice to each child, thus ensuring one full meal in the month. The Society also introduced the free-midday meals schemes to improve attendance in these schools. This society was encouraged to continue support to Dalits students. P.E.S curriculum based on creating employees, it helped to develop Dalit lifestyle, yet number of Pariah young generations slowly came to joining government and non-government jobs. When Dalit children became old enough to help support the family by their little earning they are often withdrawn from school, their wage-earnings being frequently not more than half an anna, (Anna is one of the old Indian money) is equal to British half-penny or the American cent. Olcott implemented a free food scheme with free education, which tried to eradicate Dalits food problems, yet, pupil's enrollment increased. He has compiled a statistical and historical narrative of Dalits, this unhappy race, with illustrations showing what their ancestors had been, many centuries ago, and by what methods of savage cruelty they had been compelled to relinquish their faith as Buddhists, Jains and adopted the Hindu religion. Olcott made a monograph book on The Poor Pariah and sent to his other Branches and friends supposed sympathizers, the society has received gifts and money. After H.S.Olcott's death, the society's authority was changed to Mrs. Annie Besant. Besant has emerged as one of the most important social and political activist in India. In 1893 for first time she came on as asocial worker to India.

#### **Conclusion**

H. S. Olcott was a pioneer thinker for Dalits welfare. He was an inspiring servant of mankind. His educational service only benefited Madras region, unfortunately, this scheme could not spread to other parts of Tamil Nadu. His educational ideas created a new generation of Dalit emancipation. He could not accept caste order society, therefore he believed in education eradicating caste discrimination. Pandit. C. Iyothidasa and Olcott's relationship helped Dalit society going to positive result of her colonial Tamil Nadu. After Olcott's leadership, P.E.S was slowly going down. Even today one school continues to serve its educational service in Adyar.

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**A COMPARATIVE STUDY ON ACADEMIC  
ACHIEVEMENTS OF 10<sup>TH</sup> GRADE STUDENTS IN  
SONITPUR AND LAKHIMPUR DISTRICT OF ASSAM  
INDIA**

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**Abstract**

The present study aimed to investigate the academic achievements of 10<sup>th</sup> grade students in Sonitpur and Lakhimpur district of Assam. In this regard 20 secondary schools were selected randomly used descriptive method. Results of the study revealed that the academic performance of the 10<sup>th</sup> grade students of Lakhimpur district is better than the Sonitpur district of Assam. Otherwise, the academic performance of male and female 10<sup>th</sup> grade students of Lakhimpur district is better than the Sonitpur district. When comparison was made between the selected districts, significant difference was found among Sonitpur and Lakhimpur district of Assam.

**Key Words:** Academic achievement, 10<sup>th</sup> grade students, male, female, Assam

**Introduction**

In the present era the world is becoming very competitive. The prime factor that plays a vital role in one's progress or the factor associated with one's progress is 'quality of performance'. Every parent wants to see their child to be in the apex of the performance ladder. This desire of parents or expectations of the society for a high level of achievement puts a lot of pressure on teachers, students, and in general the system of education. In fact, it appears as if the whole system of education revolves around the academic achievement of the students, though a variety of other outcomes are also expected from the system. Therefore a school put its maximum effort to help

the students for their better academic achievement. The importance of academic or scholastic achievement has hoisted important questions for educational research on causes that promotes students achievement and how does the different causes act as a factor that contribute towards the child's academic achievement.

Academic achievement is related to the acquisition of principles and generalizations and the capacity to perform efficiency. Assessment of academic performance has been largely confined to the evaluation in terms of information, knowledge and understanding. The term academic achievement refers to 'performance in school in a standardized series of educational test' (Good 1974). Trow (1959) defined academic achievement as "knowledge attaining ability or degree of competence in school tasks usually measured by standardized tests and expressed in a grade or units based on pupils' performance". The problem selected for the purpose of the present study is as follows- "A comparative study on Academic Achievements of 10<sup>th</sup> grade students in Sonitpur and Lakhimpur district of Assam".

The researcher has conducted his study on the basis of the following objectives-

- To study the academic achievement of 10<sup>th</sup> grade students in Sonitpur and Lakhimpur district of Assam.
- To study the academic achievement of male 10<sup>th</sup> grade students in Sonitpur and Lakhimpur district of Assam.
- To study the academic achievement of female 10<sup>th</sup> gradestudents in Sonitpur and Lakhimpur district of Assam.

The following hypotheses have been constructed to achieve the objectives of the study-

- There is no significant difference in the academic achievement of 10<sup>th</sup> grade students in Sonitpur and Lakhimpur district of Assam.
- There is no significant difference in the academic achievement of male 10<sup>th</sup> grade students in Sonitpur and Lakhimpur district of Assam.
- There is no significant difference in the academic achievement of female secondary school students in Sonitpur and Lakhimpur district of Assam.

In present study Descriptive Survey Method was employed to find out the academic achievement of 10<sup>th</sup> grade male and female students in Sonitpur and Lakhimpur District of Assam by using following statistical techniques i.e., Mean, Standard Deviation followed by t-test. For the present study, the investigator selected a sample of 40 secondary schools from two selected districts (20 schools from each district) by adopting random sampling technique.

### **Discussion and Results**

**Objective:**To study the academic achievement of 10<sup>th</sup> grade students in Sonitpur and Lakhimpur district of Assam.

**H1:** There is no significant difference in the academic achievement of 10<sup>th</sup> grade students in Sonitpur and Lakhimpur district of Assam.

**Table-1:** Year wise summary of academic achievement mean scores, standard deviation and t-value of 10<sup>th</sup> grade students of Sonitpur and Lakhimpur district of Assam.

Year	Districts	N	M	SD	SE <sub>D</sub>	df	t-value
2010-11	Sonitpur	689	235.53	72.18	4.02	1347	6.33*
	Lakhimpur	660	261.01	75.62			
2011-12	Sonitpur	658	204.89	75.24	3.75	1342	18.26*
	Lakhimpur	686	273.32	61.73			
2012-13	Sonitpur	583	229.76	70.89	3.95	1269	4.82*
	Lakhimpur	688	248.78	69.54			
2013-14	Sonitpur	548	222.80	77.79	4.08	1244	9.63*
	Lakhimpur	698	262.08	66.03			

\*Significant at 0.05 levels

**Interpretation:**

The table shows that the calculated t-values came out to be 6.33, 18.26, 4.82 and 9.63 for the years 2010-11, 2011-12, 2012-13 and 2013-14 respectively. All these values are greater than the t-value 1.96 at .05 levels of confidence for 1347, 1342, 1269 and 1244df. Therefore, the formulated hypothesis gets rejected. This shows that the academic achievement of 10<sup>th</sup> grade students differs significantly in Sonitpur and Lakhimpur district of Assam. The table clearly indicates that the academic performance of the 10<sup>th</sup> grade students of Lakhimpur district is better than the Sonitpur district of Assam in these four academic years.

**Objective:** To study the academic achievement of male 10<sup>th</sup> grade students in Sonitpur and Lakhimpur district of Assam.

**H2:** There is no significant difference in the academic achievement of male 10<sup>th</sup> grade students in Sonitpur and Lakhimpur district of Assam.

**Table-2:** Year wise summary of academic achievement mean score, SD and t-value of 10<sup>th</sup> grade male students of Sonitpur and Lakhimpur district of Assam.

Year	Districts	N	M	SD	SE <sub>D</sub>	df	t-value
2010-11	Sonitpur	357	230.13	73.07	5.77	665	4.86*
	Lakhimpur	310	258.14	75.63			
2011-12	Sonitpur	363	199.98	72.16	5.16	702	13.62*
	Lakhimpur	341	270.21	64.10			
2012-13	Sonitpur	339	222.38	69.18	5.26	681	4.80*
	Lakhimpur	344	247.67	68.35			
2013-14	Sonitpur	278	221.45	77.56	5.64	609	7.10*
	Lakhimpur	333	261.50	61.84			

**\*Significant at 0.05 levels**

The table indicates that the calculated t-values in following four years came out to be 4.86, 13.62, 4.80 and 7.10 for the years 2010-11, 2011-12, 2012-13 and 2013-14 respectively. From the table, it is observed that all these calculated values are greater than the criterion t-value 1.96 at .05 level of confidence for 665, 702, 681 and 609 df. Therefore, the formulated hypothesis gets rejected. Thus, it shows that the academic achievement of 10<sup>th</sup> grade male secondary school students differ in Sonitpur and Lakhimpur district of Assam. However, the academic performance of male 10<sup>th</sup> grade students of Lakhimpur district is better than the Sonitpur district of Assam in above mentioned years.

**Objective:** To study the academic achievement of female 10<sup>th</sup> grade students in Sonitpur and Lakhimpur district of Assam.

**H3:** There is no significant difference in the academic achievement of female 10<sup>th</sup> grade students in Sonitpur and Lakhimpur district of Assam.

**Table-3:** Year wise summary of academic achievement mean score, SD and t-value of female 10<sup>th</sup> grade students in Sonitpur and Lakhimpur district of Assam.

Year	Districts	N	M	SD	SEd	df	t-value
2010-11	Sonitpur	332	241.33	70.87	5.62	680	3.95*
	Lakhimpur	350	263.55	75.64			
2011-12	Sonitpur	295	210.93	78.57	5.46	638	11.99*
	Lakhimpur	345	276.39	59.22			
2012-13	Sonitpur	244	240.00	72.10	5.97	586	1.66
	Lakhimpur	344	249.90	70.80			
2013-14	Sonitpur	270	224.20	78.15	5.89	633	6.52*
	Lakhimpur	365	262.61	69.72			

**\*Significant at 0.05 levels**

The above table shows that the calculated t-values in these years came out to be 3.95, 11.99, 1.66 and 6.52 for the years 2010-11, 2011-12, 2012-13 and 2013-14 respectively. The calculated t-values 3.95, 11.99 and 6.52 for the year 2010-11, 2011-12 and 2013-14 came out to be greater than the t-value (table value) 1.96 at .05 level of confidence for 680, 638 and 633 df. Thus, the formulated hypothesis gets rejected for these years. It shows that the academic achievement of female 10<sup>th</sup> grade students differ in Sonitpur and Lakhimpur district of Assam. However the calculated t-value 1.66 for the year 2012-13 is lesser than the criterion t-value 1.96 at .05 level of confidence for 586 df. Thus, the hypothesis of the study gets accepted in the year 2012-13.

**Conclusion**

The table clearly depicted that the performance of the 10<sup>th</sup> grade students of Lakhimpur district was better than the performance of the 10<sup>th</sup> grade students of Sonitpur district of Assam in these four academic years. The

overall academic achievement of 10<sup>th</sup> grade students in Sonitpur district was gradually increased, however the academic achievement of Lakhimpur district was fluctuated. Otherwise, the academic performance of male and female 10<sup>th</sup> grade students of Lakhimpur district is better than the Sonitpur district of Assam in these four years. When comparison was made between the selected districts, significant difference was found among Sonitpur and Lakhimpur district of Assam.

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**INDIRECT TAX REFORM AND ITS IMPACT ON THE  
TEXTILE CLUSTER OF RAJASTHAN**

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**Abstract:** Goods and Services tax is path breaking tax reforms in the History of India. It is one of the most thoughtful and well discussed tax reforms. It has not only changed the incidence of Indirect taxes but it has also been claimed that GST insured that tax evasion can be brought to minimum. Almost all the sector of Indian economy is brought under indirect tax regime after introduction of GST. There are certain sectors of Indian economy which were earlier exempted or taxed at minimum rates, they have also been brought under this new regime. One such sector is cotton textile industries. Textile processing is a dominant segment across the textile Industry. Considering the important contribution of textile sector in India economy the authors have conducted a empirical study in the three major Textile cluster of Rajasthan to understand the impact of this new legal reform in different aspect of their business. This paper focuses on the highlighting the difference between the old and the new tax regime, what are the advantages and loopholes of the new regime and how have the textile industry perceive it. It further takes into consideration the views of tax experts and the judgments of the courts with respect to various provision of GST which are applicable to textile sector.

**Keywords:** textile cluster, textile processing, Inverted duty credit, Input tax credit, Hand Processing Unit, Power Processing Unit

**Introduction:**

Textile processing can be divided into 4 major part: Spinning, Weaving, Dyeing and finishing and Garment Manufacturing. In the present paper we will be focusing on the third Step i.e, Dyeing, Printing and finishing industry and impact of GST on it<sup>1</sup>. Rajasthan is one of the leading textile producer of India. There are many textile cluster in Rajasthan namely Balotra, Bhilawara, Jodhpur and Pali. The Pali (Marwar) District of Rajasthan is a major processing hub where Printing, Dyeing and finishing is done at mass scale. It accommodates over 800 textile processing units that employ about 50 per cent of the city's population. The region has been a textile hub since the 1970s, with an annual turnover of over Rs 7,000 crore. The industries are dealing in both the fabrics: Cotton as well as synthetic. On the basis on the equipment used the cluster can be divided into Hand Processing unit and Power Processing unit. Most of the unit in the area falls under the criteria of SME units. These units majorly focuses on manufacturing of sarees, blouse pieces, Rubia etc. Before introduction of GST all the cotton units were exempted from paying indirect taxes. After GST the final goods of this industry was put under bracket of 5%.When GST was launched, like any other textile cluster Pali also faced lots of strikes and band called by the Trader and Manufacturer. Therefore it is very important to analyse the impact of GST on the Textile processing unit of Pali.

Universe: The 4 major textile processing cluster i.e., Bhilawara, Jodhpur, Balotra and Pali of Rajasthan.

Study Population: All three cluster of Pali District i.e, Mandiya Raod Industrial Area Phase 1, Phase 2 and Punaita Industrial Area.

Sample Size: 70 textile processing unit of the three clusters.

Sampling technique: Snowball Sampling technique has been used to for the collection of samples.

Tools: The researcher visited 40 factories in all the three cluster and interviewed the managers. Telephonic interviews were also conducted for 30 factories. A well drafted questionnaire were used to collect the first hand data. To review the authenticity of the data the researcher met two major CA firms practicing in the city. There expert opinion in the technical aspect of the law is also discussed in the paper.

Variables (Questions):

VAR1: Whether there is any changes in the turn over of the business?

VAR2: Whether there is any lay off in the factory due to GST?

VAR3: Whether there is any reduction in the wages due to GST?

VAR 4: Whether there is any increase in the price of the goods due to GST?

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<sup>1</sup> Gopalakrishnan N (2018) Economic and Environmental Policy Issues in Indian Textile and Apparel Industries, 10

VAR 5: Whether there is any increase in the cost of compliance after implementation of GST?

VAR 6: Do you think GST regime is a better tax regime than the old one?

VAR7: Do you think there is any impact on tax evasion in the new tax regime?

VAR 8: Whether GST has reduced harassment by tax official?

VAR 9: Do you think cash transaction has been minimized after GST?

**Findings:**

For the purpose of analysis of the data spss is used. Factor analysis has been done to reach a conclusion.

Profile of samples:

Business	Profile
25	Job work (Dyeing and printing)
20	Finishing
25	Trader

The researcher has collected a sample size of 70 for the pilot study. The Industry Profile is:

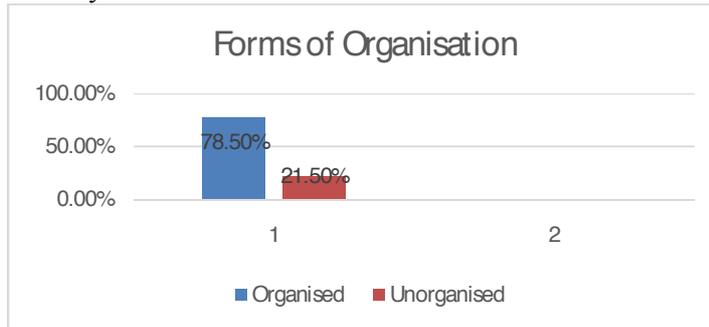


Chart - Form of Organization

Form of organization /ownership: Out of the total sample 78.5% of the samples are working under organized sector where as rest 21.5% are working under unorganized sector.

Table 1.

**KMO and Bartlett's Test**

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.617
Bartlett's Test of Sphericity	Approx. Chi-Square	83.358
	df	36
	Sig.	.000

The results extracted through factor analysis are shown in KMO and Bartlett's Test in Table 1 which reflects KMO and Bartlett's Test with sampling adequacy .617 which shows  $KMO > 0.5$  that means sample is adequate, Bartlett's value is equal 0.05 is valid for Factor Analysis and the significant value in the data is .000 which means the data is valid for the Factor Analysis.

Total Variance Explained of the exhaustive 9 variables and factors with Eigen value of 1 or more than 1 as Eigen Value. According to analysis it has been noticed that there are a total of 4 factors with 1 or more than 1 as Eigen value.

**Rotated Component Matrix<sup>a</sup>**

	Component			
	Benefits of GST	Impact of Labour	Impact on the business	Reduction in Cash Transaction
VAR 7	.860	.034	-.152	-.066
VAR 6	.827	-.136	.066	.126
VAR 8	.805	-.043	-.076	-.006
VAR 2	.019	.746	.265	.233
VAR 3	-.148	.720	-.190	-.338
VAR 1	-.129	.062	.659	-.282
VAR 5	.076	-.419	.590	-.111
VAR 4	.085	-.148	-.582	-.251
VAR 9	.016	.002	-.087	.888

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 9 iterations.

In Table As the factor in 4 components were interpreted on what they signify. As the factors are clear in the component matrix with 9 iterations, it is reflected that VAR 7,6 and 8 have high loadings of .860, .827 and .805 for component 1 which is 'Benefits of GST'. These factors combined explain for 23.599 percentage of variance. The factor 2 is combination of VAR 2 and 3 with loadings of .746, .720 are two high for component 'Impact on Labour'. These factors combined explain of 14.411 percentage of variance. Consequently with a view to capture the core of VAR 1, 5 and 4 have high loadings of .659, .590 and -.582 for the component 3 which is 'Impact on the business'. The factors combined explain for 14.096 percentage of variance. Similarly, factor 4 is VAR 9 with the loading of .888 for the component 4 which is 'Reduction in Cash Transaction'. The factor explain for 12.585 percentage of variance.

From the above survey conducted for the purpose of evaluation of GST on the textile processing unit of the author has used factor analysis to reduce the above mentioned Nine VAR into 4 groups after fulfilling the basic requirement. The First group comes under the head of 'Benefits of GST' with three variables; the second group comes under 'Impact on Labour' with two variables; the third group comes under 'Impact on the Business' in which three variables are present and the fourth group comes under 'reduction in cash transaction' which represents only one variable. From the reverse component matrix we can analysis 4 major factors. First factor suggests the benefits that the respondent claim from the GST. VAR 6, VAR, 7 and VAR 8 forms the

part of this matrix which suggests that GST is preferred as old tax regime, it has reduced tax evasion and it has also put a restriction to harassment by the tax official. Second factor suggest the impact of GST on labour and their wages. VAR 2 and VAR 3 gives us the information on this. The matrix suggests that neither the percentage of labourer nor their wages has been impacted due to GST. But the limitation of this analysis is that the information has been sought from the businessman. Third factor comprises of VAR 1, VAR 4 and VAR 5. In this particular matrix suggests the Impact of GST on business. The respondent claim that there is positive change in the turn over and an increase in the cost of compliance due to GST but at the same time they also suggested increase in the cost of product due to GST. Lastly matrix four comprises of VAR 9 and from the loading it can be stated that the respondent agrees to the fact that there is reduction in the cash transaction after implementation of GST.

**Legal Analysis:**

The researcher identifies 70 different factories dealing with different aspect of textile processing. This units deals with cotton textile processing. From the very first stage supply of cotton is taxable under GST. Though the farmer is not liable for registration under GST but the buyer of raw cotton s liable to pay GST @ 5% under Reverse Charge Mechanism (RCM).<sup>2</sup> As far as sarees are considered they are charged at 5% even at the final stage as they fall under the bracket of fabric and not apparel. Under old structure output of fabric processing units were not subject to any tax and therefore they were not eligible to claim Input tax Credit (ITC) on the raw material used for the processing of fabric like chemicals, colour etc. Therefore though the respondents in the study were taxed under the new law but they have been also given an opportunity to claim ITC on the tax paid on the Inputs. At the advent of GST the Manufacture under this segment were taxed @ 5% and the job worker who are very important aspect of the industry were charged at 18%. Since the rate charged on the services of Job worker was 18% and that on the out put was 5% it created the problem of inverted duty credit. As a result of which huge gap started occurring in the working capital of the principal because refunds were not provided in the extra tax paid while availing the job work services. The policy created hue and cry among the job worker and the small industries. To solve this crisis situation the government on the recommendation of GST Council reduced the rate on job work services to 5%.<sup>3</sup>Other drawback faced by this sector is refunds on Inverted duty credits were restricted till July 2018 and further the unused ITC for the first year was lapsed on July 31<sup>st</sup> 2018. The power of the Central Government under Section 54(3) of the CGST Act was challenged before Gujurat High Court in a writ

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<sup>2</sup>Section 9(3) and 9(4) of CGST Act read with heading 5201 of HSN Code.

<sup>3</sup>Notification No. 11/2017-Central Tax (Rate) dated 28thJune 2017 on the following services which was further amended by Notification No 20/2017 – Central Tax (Rate) Dated 22<sup>nd</sup> August 2017.

against the circular passed by the CG that allowed the lapse of the accumulated unutilized ITC lying in electronic credit ledger balance as on 31.07.2018. The petitioner suggested that this provision only empowers the Government to notify the goods and services that are not entitled for refund of ITC accumulated on account of inverted rate structure<sup>4</sup>. Gujarat High Court held that<sup>5</sup>

“The section 17(4) and sec. 18(4) of the CGST Act provides for the lapsing of the ITC respectively. Thus there were no want of legislature in this aspect. Further section 54(3) does not provide for any inherent power to the Central Government to provide for the lapsing of the under utilized ITC accumulated on account of inverted rate structure. Any delegated legislation has to be in conformity with the parent law. And therefore Notification No. 05/2017- C.T. (Rate) dated 28.06.2017, as amended by Notification No. 20/2018- C.T. (Rate) dated 26.07.2018 which prescribed for lapsing of ITC, has exceeded the power delegated under Section 54(3)(ii) of the CGST Act. Therefore the court declares proviso (ii) of the opening paragraph of the Notification No.05/2017- C.T. (Rate) dated 28.06.2017, inserted vide Notification No.20/2018- C.T. (Rate) dated 26.07.2018, is ex-facie invalid and liable to be struck down as being without any authority of law.”

The order has been challenged in Supreme Court of India and the matter is still under *subjudice*. To corroborate the information received by the respondent 2 C A firms of the town were approached who suggested following:

1. It is the first time that Textile processing units were brought under Indirect tax scheme.
2. Inverted duty credit existed in this sector.
3. The GST was a well intended tax structure but there exist a problem of working capital blockage because ITC actually adjusted in future sale. Also where there is an option of ITC refunds (in case of inverted duty credit) there is a lot of delays which further led to blockage of working capital.
4. The manufacturer has to pay GST under reverse charge mechanism in case of transportation as most of the transporters are not registered under GST.
5. Frequent changes in the GST policy by the government is also one of the problems faced by the industries working under textile processing.

The CA suggested that the small competitors may have faced some hardship in the earlier years but today the GST is actually working smoothly for the business. It has helped in controlling tax evasion as there is a check and balance mechanism in all the stages of value addition. They also suggested that GST will also help in controlling direct tax evasion as cash transaction is discouraged.

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<sup>4</sup>CGST Act not provides for Lapse of ITC for inverted rate structure: HC

<sup>5</sup> Shabnam Petrofils Pvt. Ltd. Vs Union of India (Gujarat High Court), Special Civil Application No. 16213 Of 2018, 17/07/2019

**Conclusion:**

After considering various existing literature, Primary data and views of tax expert it can be concluded that GST is a well intended legal reform that will benefit the textile processing industry as whole. It has though increased the compliance burden of the registered person but at the same time it has helped them in claiming ITC on the raw material and services sought during manufacturing. Also under GST ITC is not only available on intermediate goods and services but also on the capital goods which were not available in the old structure. The GST as a regime intended on financial inclusion and aims to end the parallel cash economy that led to tax evasion. Since the physical compliance was shifted to virtual platform there is reduction in the unnecessary harassment by the tax official. But at the same time frequent changes in the slab rate, heading, sub heading and other regulation made by GST Council and CBIC which create unnecessary problems while filing GST. To achieve the intended reforms in long run the GST council and Government should pluck these loopholes and make this law more smooth and people friendly.



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**FEAR FORBIDS FLIGHT OF EDNA IN  
*THE AWAKENING* BY KATE CHOPIN**

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**Abstract**

Women's minds are ingrained with social fear to forbid them in various arenas and activities of life so that they can be conscripted into gender-specific roles in shadow of man. The individuality is denied to women as the facilitation of felicity will dilute the authority of master man. Kate Chopin in her novella, *The Awakening* unveils the sizzling and simmering self of a woman who craves for cognizance of her unnoticed, pent-up feelings.

In the novella, Edna Pontellier is a married woman of elite background who craves for an individual space of her own making; in perusal of autonomy, she tries artistic pursuits to earn money and independence. The fear to defy Patriarchy by sailing on unripe artistic endeavours along with her obsession to be self-reliant culminates into oblivion and she succumbs to the sea to exercise her first and final choice. Edna fails in every employment as fear forbids her flight to autonomy.

**Key Words:** Artistic Endeavours, Autonomy, Patriarchy, Sizzling.

**Introduction:**

Edna is a woman of elite background, lives in a mansion and rolls in leisure and luxury. Chopin flings a question to the readers: why does a woman of affluent home take a flight and from what and what fear forbids her? Chopin's interest lies in the revelation of what is generally hushed under the carpet to maintain the facade of contentment and composure among women. She feels that this apparent contentment covers the crazy commotion, a woman suffers when she is denied her right and reservation over her own self, in name of marriage, she is given to a man who carves out her future curtailing her to a

chosen design. Choice makes us human and denial of choice is unpalatable to a thinking woman and compulsory compliance is what Edna takes flight from. Women have a talent for survival and since centuries, they have thrived on precaution and prevarication, strategy to escape man's wrath. Edna is an aware woman who is honest enough to claim her individuality on her own terms and by her own efforts. Even in her natal home, her father exercised authority and fear to control females and this upbringing generated such strong a fear in her that her flight is unsuccessful to throw her in the sea. Edna's surrender to the sea proves her weariness before stifling social forces but also triggers an idea that women too, can fly if they venture and may be seriously if they strive sincerely.

### **Research Methods: Psychoanalysis, Feminism**

#### **Analysis and Discussion:**

Freud in his work "civilization and its discontents", explains liberal and instinctual human behaviour which here can explain the demeanour of Edna. Edna's "feeling of happiness is derived from the satisfaction of a wild instinctual impulse untamed by the ego is incomparably more intense than that derived from sating an instinct that has been tamed" (160).

Cynthia Wolff in her work, "Thanatos and Eros" specifies that "Chopin understands the connection between Edna's longing for suffusion, fulfilment, incorporation and the very earliest attempts to identity" (450).

In the light of these observations, it can be inferred that Edna, governed by her human instinct tries to carve out her identity in a world where no identity is allowed to the women, they are clubbed under umbrella of gender.

Edna like her male counterparts wants to fly high, realize her ambition of autonomy, self-worth and independence in every walk of life. She is an obedient daughter and wife but servile behavior and subservient roles are not her choice. Chopin explains: "Mrs. Pontellier was not a woman given to confidences ... with a mantle of reserve" (14). Edna is no ordinary woman to be curtailed in conventional roles but she is one who questions and argues but in silence for fear of check. Edna is an aware and thinking woman whose "activities are arrested by the absorbed expression which seemed to have seized and fixed every feature into a statuesque repose" (Chopin 16).

Deep thinking in leisure hours blended with strictness of her father and indifference and aloofness of her husband stimulates her inner recesses to assess her role in entire scheme of cosmos than to assimilate herself in conventional roles as animals have done since centuries. Edna like humans wants to drift apart from instinctual habit to follow the herd for security; she tries to be curious, to be experimental through art and earning, she strives to gain social entity.

Edna was uncomfortable with her authoritative father, matron like and manipulative sisters In her natal family and with her husband too, "she was not accustomed to an outward and spoken expression of affection, either in

herself or in others” (Chopin 17). Her marriage was her “violent opposition of her father...we need to seek no further for the motives which led her to accept Monsieur Pontellier for her husband” (Chopin 19).

Emily Toth finds autobiographical streaks in *The Awakening*; Edna, like Chopin, is “in constant pursuit of solitude, independence, and an identity apart from her children and apart from the men who always admired her” (62). Edna inherits the gene-pool of her father and emulates her father as a symbol of authority and applause whom all members appreciate for attention and appeasement; like her father, she wants to have autonomy and authority but not with audacity and avaricious abilities.

Concealment and compliance, the feminine virtues of stratagem and skills are not approved by her and she practices silence, prefers sizzling and simmering speechlessness to expression which intensify her fears up to greater momentum. The fear of caution, the fear of failure in social duties, the fear of compromised morality take a toll upon her mental health in such a way that she prefers sacrifice and surrender to the sea than to strike a considerable understanding with the family members.

In “The Power of Horror”, Julia Kristeva states that “phobia bears the marks of the frailty of the subject’s signifying system (35) here, Edna signifies the individuality of her gender but her frailty, her phobia about claim of autonomy inculcated in her since her infancy terrifies her so much so that she loses her composure to handle her flight from conscription of conventions. Edna shifts to pigeon house for “feeling of freedom and independence ...instinct prompted her to put away her husband’s bounty in casting off her allegiance” (Chopin 76).

Edna’s intention to acquire accomplishment and ability is pure and genuine but her devices and employments are not fully equipped to facilitate her with required dividends. She senses her handicap in financial and social dealings but the way to remove this subservience is not comprehensible to her. She responds to her husband’s indifference by her detachment and alienation, shifts in a small house arranged by her small income, she conveniently, forgets that to acquire such independence, she has tarnished the social image of her husband as her dwelling place is attached to his status which he prioritizes at any cost.

Edna’s activities are so unsocial that they invite a serious displeasure of her husband and society. Edna receives an awareness that her amorous attention to her male friends is unsocial and her lack of absorbed attention to domestic duties is disqualifying to her role. She confides in her friend, Alcee Arobin :

I am going to pull myself together for a while and think ---try to determine what character of a woman I am ;...I don’t know. By all the codes which I am acquainted with, I am a devilishly wicked specimen of the sex .But some way I cannot convince myself that I am .I must think about it. (Chopin 79)

Edna like her husband has both male and female friends who inspire her in business, art, companionship and understanding of life. She also believes in career through art and speculations at race-course, she creates her own space but her mind is imbued with fear that her stance will not be entertained by her family and society. In Chopin's times; society, axiomatically, assumed that women were contented and complacent in their homes and with their husbands and there was no exigency for them to create any separate future or home or identity.

Edna's gesture appears to be assertive and detrimental to the propagation of male hegemony and Patriarchy. Jules Chametzky states that "awakened by a realization of her sensuous self, Edna Pontellier grows in self-awareness and autonomy. But it is a lonely and isolated autonomy that exacts a terrible price" (56).

Edna enjoys material advantages of money and perusal of art not as profession but as a hobby but her fear and doubt about her potential, its exercise and the pressure of conventions forbid her flight to destination of her choice, moreover, she just wants to flee from stifling social prejudice for women but in oblivion of her destination.

Edna has been conditioned to her domestic roles since infancy and an interminable, incomprehensible fear is also induced in her, in case she tries a breakaway from constraints of Patriarchy. Chopin mentions the mechanical mental state of Edna : "she would ,through habit ,have yielded to his desire, not with any sense of submission or obedience to his compelling wishes, but unthinkably, as we walk, move, sit, stand, go through the daily treadmill of the life which has been portioned out to us" (Chopin 30).

Edna is conditioned and cautioned to follow the dictates of her master as religious inscriptions ----sacred binding on her soul dragging her down to grave of her dreams and hopes. Her marriage, she finds, closes "the portals forever behind her upon the realm of romance and dreams" (Chopin 19). Edna is devoid of her dreams and is duped by the duplicity of social agencies which cover-up the servile status of a woman by camouflage of wife-hood.

Edna in company of Madame Reisz gains confidence and tries to follow her footsteps. She tries artistic endeavours to liberate herself from the tangled mass of her dreams and mangled remains of her resolve and resilience. She perceives :

Her will has blazed up, stubborn and resistant.... and feel like one who awakens gradually out of a dream, a delicious, grotesque, impossible dream, to feel again the realities pressing into her soul...she is disturbed with dreams that were intangible that eluded her, leaving only an impression upon her half-awakened senses of something unattainable...she blindly follow whatever impulse moves her ...free her soul... (Chopin 31-32)

In the following lines the courage, spirit and the fear of Edna can be easily perceived She tries to save her from the slavery like the animals and wants to

grow like humans but the onerous onus of social constraints creates a confusion and chaos in her mind to make her impulsive not decisive in her actions and she leads herself to a chosen solace but not in the world of mortals rather in element of nature (sea-water) that comforts, soothes the senses and offers a fluid, fecund, feminine frame to her for eternal rest without disfiguring or disorienting her.

Edna has been a motherless child, she has never received affection from her father and in her unmarried life, her sisters too were not on amiable, amicable or even agreeable terms with her so she finds solace in company of her friends --- Mesdames Reisz and Ratignolle, the latter warns her about her unsocial behaviour and the former alienates herself from Edna as she does not find Edna serious and sincere with the practice of art and severely scolds her: "Ah! An artist! You have pretensions madame...the artist must possess a courageous soul ...courageous, ma foi (indeed)! The brave soul. The soul that dares and defies..." (Chopin 61).

Edna feels in her heart that she cannot defy the social shackles like Reisz as she is not an accomplished artist; Reisz is deeply applauded for her talent of music, Chopin notices: "her playing had aroused a fever of enthusiasm. What passion! I have always said no one could play Chopin(music) like Mlle Reisz !that last prelude! Bon Dieu! It shakes a man!" (Chopin 26)

This appreciation Edna is sure not to receive in her life as she fails to settle in matrimony ---- a, rebellion against father not a passion for a chosen man; she also fails in art of painting as she starts it, as a sign and signal for her rebellion against the authority of her husband and for her autonomy, is not driven by the passion for painting. Any art ascribes accomplishment on the artist only when she accords her alertness, acumen, agility and absolute ability to the service of art, Edna lacks the potential and dedication of art and gets disenchanted, Chopin notices; "she seemed to be no longer feeling her way, working... with sureness and ease...devoid of ambition and not striving towards accomplishment..." (Chopin 70).

Edna's greatest fear lies in her non-compliance to conventions like Reisz but like her, she cannot sail on her talent of art. She shuns her children and domestic duties for her emotional and artistic requirements and the children are away from her, may be forever; her sentimental dalliance with two men may make her husband desert her with no subsistence. Edna wants to carve out her niche in her pigeon house but, this impulsive decision without consent and approval of her authoritative husband unnerves her. Chopin notices:

A feverish anxiety attended her every action in that direction. There was no moments of deliberation, no interval of repose between the thought and its fulfilment...within the precincts of her home she felt like one who has entered and lingered within the portals of some forbidden temple in which a thousand muffled voices bade her be

gone...whatever was her own in the house, everything which she acquired aside from her husband's bounty, she caused to be transported to new house, supplying simple, meagre deficiencies from her own resources. (Chopin 80)

Here, the fear of Edna is strikingly visible in all her adventures and activities. Her master and his influence over her in absentia makes an unseen pressure on her and forces her to do what she detests the most. Elizabeth recommends that Edna's awakening lies in "her growing rejection of the prescribed social role of woman, namely the acquiescent creature of her designated lord and guardian (Genovese 262). Edna happily performs all her domestic duties, loves her children and never contradicts her husband.

Chopin notices: "Edna took him (her son) in her arms, and seating herself in the rocker, began to coddle and caress him, calling him all manners of tender names, soothing him to sleep" (38). Edna is irritated by the compulsive roles, the acquiescence in such roles and unquestionable authority of the the lordship of the master, man. She believes in equal treatment due from one human to the other human. She wants herself to be treated like a human not as a secondary gender, woman. She realizes that she is in a dependent role because she is not earning, not having any career, has no material possession or home and above all, every decision of family is taken by her husband. He treats her as her personal property not as a companion to foster her growth. Chopin reveals: "what folly! To bathe at such an hour in such heat! exclaimed Mr Pontellier... you are burnt beyond recognition" he added, looking at his wife as one looks at a valuable piece of personal property which has suffered much damage" (4).

Her father's advice to her husband to correct her also offends her. Chopin also notes: "authority, coercion are what is needed. Put your foot down good and hard; the only way to manage a wife. Take my word for it ...the colonel was perhaps unaware that he had coerced his own wife into her grave" (68). Edna is baffled by her father's comments as he not only controlled her freewill himself when she was in his care but also recommends now the same nasty suggestion to his son- in- law.

Edna wants to be a good wife, daughter as she welcomes her father well, she is ready to sacrifice her everything for her family and children but not her inner 'self,' her soul. She confides in her friend, Adele "I would give my life for my children, but I would not give myself" (Chopin 46). Edna faces conflict between her growth of self, her soul and her social roles curtailing her human instinct.

Her fear to defy the mega institution of Patriarchy tells upon her confidence and she succumbs to the sea as even in the fear of punishment, she can neither retreat from her conviction nor she can execute her fragile and ill-equipped plans of independence and autonomy.

**Conclusion:**

Edna is a woman of elite taste and temperament. Dr Mandelet also finds “Mrs Pontellier to be especially peculiar...don’t contradict her” (Chopin 64), he advises to Edna’s husband. Edna despite differences, has been agreeable with her father and like him, she frames and asserts her individual opinion about people and events. Her assertion and resistance are distasteful to the male members and they find her aberrant as her husband takes doctor’s counsel to understand her problem.

There is nothing unusual about Edna, her only objective is to to make an individual space of her choice. Her choice is neither understood nor entertained by male hegemony and the indifference and evasion of men in her family force her to try independent home and career. Edna has not dedicated several years in service of art like Madame Reisz so her talent is not fully realized and accomplished as it is started not as a service or worship of art but to evade the pain and pangs of loneliness and neglect. Edna strives very hard but fails as her fear to counterattack encroaching social forces forbids her flight to her dreamy destination.

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## **REALIZING THE GOAL OF ATMANIRBHAR BHARAT THROUGH INTELLECTUAL PROPERTY RIGHTS**

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### **Abstract**

India's journey to become a global leader can only be realized by perusing policies that are competitive, efficient and resilient but most importantly policies which promote self-sustenance and self-generating ideas which can be culminated in the governmental initiative of Atmanirbhar Bharat. This initiative aims in uplifting the economy, encouraging domestic production, encouraging innovations and generating growth and self-reliance. However, the growth of industries in manufacturing and service sector will not be enough without innovation. Also, adequate protection of such innovation is important and this is where the need of Intellectual property rights like the copyright, patent, trademark and geographical indication is felt. IPRs plays a great role in developmental aspects as it provides exclusive rights to the owner of the property encouraging the innovation and creation along with protection from being exploited in the market by a third party. Modern IPRs with innovator friendly policies of government can help maximize the potential for IPRs to raise dynamic competition and in context of developing country like India, local captures of economic value have the capacity to stimulate broader rural development and poverty removal making it self-reliant. This paper focuses on the role of Intellectual property rights to achieve atmanirbharbharat (self-reliant India).

**Keywords:** Atmanirbhar, Intellectual Property Rights, Economy, Innovation.

### **Introduction**

Atmanirbhar is a step towards nation-building. Development involves several dimensions and economic growth is not the only development required. India is growing through all such dimensions including economic development,

reduction of poverty, and employment opportunities. India is a part of the global value chain and to continue that status India's importing and exporting mechanism is relevant. Self-reliance is not about the boycott of foreign products and remain ideal but the concept of Vasudhaiva Kutubakam, the world is one. In the 21<sup>st</sup> century the word Vasudhaiva Kutubakam has been used in many parlances and hence became a mantra but if we apply the realist prism to understand the meaning we see peaceful construct free from all kinds of power which encourage the social, political and military ability of individuals to meet their own needs as well as the need of the state. It is high time to rejuvenate Vasudeva Kutumbakam and here Intellectual property rights serve as a tool to achieve the objective and benefit the public at large. It has a positive impact on the processes of economic development and progress, which are often hindered by various circumstances. A strong intellectual property (IP) regime would help the development, foster beneficial change, improving formative opportunities making India self-reliant. So it is very important to study and analyze the role of various branches of IP and study the challenges in bringing a dynamic change.

#### **Types of Intellectual Property Rights and its Role**

Intellectual property protection has gained prominence at the national as well as international levels. Governments around the world are adopting the IP policies and this is evidenced from the empirical testing from several countries and period, however, there is a dearth of information about the IPR laws, policy-making and its relationship with the country's development. Developed countries are already having better public visibility of IPRs so it is time for developing countries particularly India which is full of economists, practitioners, social scientists, inventors, innovators who can contribute to the growth of the country. Intellectual property is the intangible property and legal right over such property is given under Article 300 A of the Indian Constitution. Also, entry 49, List I of the seventh schedule provides parliament with the power to make laws over the subject of IPR that is patent innovation copyright, design, trademark, geographical indications, plant variety, etc.

Intellectual property<sup>6</sup> is broadly classified into:

- i) Industrial property which includes patent, design, trademark, geographical indications, service marks
- ii) Copyright

The Trade-Related Aspects of Intellectual Property Rights (TRIPS) signifies patent as the right that is given to any person who invents new products or process, improvements made to products that was already invented. Such rights are exclusive for a limited period that is twenty years. The owner gets various

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<sup>6</sup> Bhandari, M. K. Law relating to Intellectual Property Rights. Central law Publisher, 2021

rights such as right to grant licenses for the use of others, right to sell his property and lot more. The three essential ingredient required for grant of patent are Novelty, Inventive step, Non-obviousness. Governments has the power to refuse the grant of patents for following reasons:

- Article 27.2 -inventions whose commercial exploitation may be detrimental to human, animal or plant life or health
- Article 27.3 diagnostic, therapeutic and surgical methods for treating animals or humans
- Article 27.3 certain plant and animal inventions

The Indian Patent Act 1911 gives a provision for grant of compulsory license under Article 84 to prevent the misuse of patent by the patent holder.

The human mind is like a powerful bird, given the wings of freedom it will fly beyond imagination and bring new inventions. The idea may be great but such ideas need nurturing until the final result is made therefore ideal environment for nurturing would be fruitful and such innovation needs to be protected. IPR plays a great role in protecting such inventions, also, the government of India has taken initiatives like 'Make in India', 'Startup India', and 'Atal Innovation Mission' to encourage innovation. According to Section 13 of Copyright Act, 1957 copyright is an exclusive right given to authors relating to the following subject matter: Original literary, dramatic, artistic, and musical work, Cinematograph film Sound recording. These rights open up opportunities for the author to enter various agreements including reproduction agreements. Another advantage that copyright provides is a bundle of rights like the right of translation, adaptation, abridgment, right of public performance etc. It has the capability of protecting the substantial part of the work so its significance can be witnessed in the computer, entertainment music, literary fields. The copyright law aims to uplift authors, artists composers to create original work by giving exclusive rights for limited period and earn profit by exploiting their own work. For the protection of copyright owned by its nationals in other countries Berne Convention and Universal Convention made effort and India being a member of both, gets protected. India has also signed the General Agreement on Tariff and Trade (GAAT) and entered the global market economy.<sup>1</sup> Copyright prevails in original literary work. Article 10.1 of the TRIPS Agreement provides that computer programs shall be protected as literary works. It should not be confused with software patent granted in India as copyright is over computer programs, tables and compilations. Copyright does not prevail over just ideas but expressed ideas in form of print or writing. Therefore, any work to be original should be result of substantial independent skills, creative labour and judgment.<sup>7</sup> Copyright subsist in concept that is fledged with detail but there is no copyright for events. When we say creation of human mind the original

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<sup>7</sup> Kumar Ahuja, Virendra. Law Relating to Intellectual Property Rights, Lexis Nexis, 2007

dramatic work can be such creation and get protection under copyright law. It can include recitation, choreographic work, scenic arrangement but excludes cinematograph films. Musical works including the graphical notation falls under the umbrella of copyright protection however, something intended to be sung or spoken is not included. Sound recording is protected under a different category of copyright, artistic work covers many works like painting, sculpture, drawing, photography, work of architecture, and artistic craftsmanship. The intellectual property establishes a balance of interests between public goods and private interests, it takes care of availability of things by using the doctrine of 'Fair use' which provides private usage of things protected under copyright law but subject to some condition that the use should be fair like for research, education, scientific purpose, social purpose etc. Copyright law encourages the production and distribution of work by safeguarding them with economic as well as moral right of publisher, artist, authors. Copyright protection generates automatically on creation of work. The economic value of the work is like reward to the creator but with the growing digital world there is a risk to the work as reproduction or copied version has become easy and distribution has become a work of seconds, So copyright law here ensures that the value of the work goes only to the right holder of the work or subject matter. Therefore, such legal safeguards and legislative measures are necessary for the nation to develop the economic sector. The copyright intensive industries in India are predominantly the media-entertainment industry and the publishing industry that provide greatly towards the economic growth of the country. Sectors such as software and IT also have started heavily to rely upon copyright registration for the protection of their codes and expressions.

### **Trademark**

Early humans used symbol to represent words and concepts, they have a strong effect on the culture of business as well as brand longevity. The first interaction that happens between company and consumer is the logo. Also, it is said that vision memory is the long-term memory and has a massive storage capacity so any kind of sign, symbol leaves an imprint in mind. Symbols are in large number in market today, sometimes looks similar. So, to help consumer get the desired product, trademark laws define the quality, quantity, sign, variety etc. Various sign can be protected as trademark: a word or its combinations, colours, symbols, the packaging, sound etc. The essentials for obtaining trademark is that the mark should not be confusing or similar to same category of goods and services. It helps in protecting and building the reputation of business. The trademark law provides for legal as well as economic benefits to its users. Firstly, a registered trademark holds value and may grow over time, hence called as valuable asset. Secondly, registering brand under trademark law will give a person the legal right to enforce action against anyone who violates their intellectual assets. Also, the trademark holder will be entitled to publicly display the brand is secured by applying

registered trademark symbol. This encourages a business to grow without fear and ability to pursue legal action, if deemed necessary. Thirdly, registered trademark can be utilized as a marketing tool, once registered the symbol can be used which gives a validity and creates trust in customers. Fourthly, trademark registration is also beneficial for licensing agreement or transfer of business, however, there are other benefits of registration too such as global registration that means registration in India creates a base for registration outside India<sup>8</sup>

### **Geographical Indication**

Geographical indication is a sign used on products that signifies geographical origin, quality, reputation or characteristics that are capable of being assigned to that place. It tells the consumer about the origin of the product and its uniqueness. Such tags are given in handmade products, agricultural products, industrial products, food items. These are known as sui generis protection. GI tags provide the right only to the registered persons. Other than the legal protection, it provides for exclusive right which protects from the unauthorized users. Any association of persons, producers or organization can be a registered user. A GI registration is given for a term of ten years with a renewal for another ten years on payment of the renewal fee. The concept of 'vocal for local' which is taken as a mantra in contemporary period has its origin in Gandhian era when India's goods were exploited. Therefore, in order to achieve the goal of vocal for local, the local producers need to be aware of the benefits that IP rights provide to get protection under the legal regime. So, the producers and the startups should focus on such products and include them to get the benefits. Another initiative of UP state government is the 'One District One Product' to encourage the art and craft which would promote the Micro, Small and Medium enterprises. Example Arunachal Orange, Khasi mandarin of Meghalaya etc. The application for GI can be filed by any union of persons or producers or any organisation or authority concerned with goods. The procedure starts with application to registrar followed by examination, acceptance or rejection, advertising in the GI journal.

### **Plant variety**

Plant variety commonly known as breeders right accorded to the breeder of a new variety. Any person who discovers a new plant variety or develops it can apply for the protection. Article 27 (3)(b) of the TRIPS Agreement, makes it compulsory for every member-state of the WTO to introduce such protection through domestic legislation. The protection is given on the basis of newness, distinctness from any existing variety, stability and uniformity. The Plant Variety Protection and Farmers Rights (PPVFR) Act, 2001 provides protection and give the rights of farmers as breeders, plant conservators, and as consumers or users of seeds. The uniformity as mentioned above is relaxed,

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<sup>8</sup> Narayana, P. Intellectual Property Rights. Eastern Law House. New Delhi, 2015

permitting double the number of off-types like it permitted for other categories of variety. To become a holder of such right the farm size does not hold any relevance as it is applicable to all categories of farmers. Plant variety laws are considered threatening by farmers at the local level, so they need to understand that IPR, agriculture and sustainable development are interrelated so a balance of competing needs and societal innovation with rewards will be fruitful.<sup>9</sup>

### **Empowering India through Traditional Knowledge protection**

India is a rich country with various desert, hills, mountains, forest, grassland. It also presents three hotspot- western ghat, the Himalayas and the Indo Burma and many more as a result India is rich in traditional knowledge. Traditional knowledge has its roots in the culture, such knowledge includes the medicinal knowledge, agriculture related expression of folklore be it dance, music artwork etc which originated from intellectual activity. Such kind of knowledges are basically related with biological resources and it has the capacity to benefit the public at large by techniques or process. This helps the biotech in research and development. So the communities who are practicing such knowledge should get a share of profit whenever made. The younger generations from such community can start joint venture for conservation and utilization of resources and equitable sharing. The convention on bio diversity that is The Biological diversity Act, 2002 ensures the promotion of traditional knowledge is protected through specific laws and encourage the practice of such knowledge. The convention also ensures fair and equitable benefit for use of such knowledge. Another tool that was developed for defensive protection is the traditional knowledge digital library. This tool consists of documentation relating to knowledge of Ayurveda, Yoga, Unani, Siddha in five languages. This aims at preventing the traditional knowledge for unfair patent. India's thirty percent population is dependent directly on biological resources for food, natural medicine etc. During the covid pandemic when the world had no vaccine or solution India used the traditional methods of mixing herbs to make a drink called 'kadha' which benefited as immunity booster thus leveling local developmental needs with ecology to ease the nexus of poverty, population explosion and environmental degradation. North East India presents a captivating and unique context for ecology based new development and solutions, which combine traditional wisdom with contemporary ideas. Living root bridges in Meghalaya provides for such relationship between Khasi tribes and forest, which gives realistic plans for the future. These show the essential human value of living with sensitivity and respect for all life.<sup>10</sup>

### **IP success leading to increase in Self reliance**

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<sup>9</sup> Ministry of Commerce and Industry, Department for Promotion of Industry and Internal Trade, Press Note No. 4 (2020),

<sup>10</sup> Sengupta, Nirmal. Knowledge in Modern India: Preservation, Promotion, Ethical Access and Benefit Sharing Mechanisms, Springer 15 October, 2018

- In India, where health treatment and life-saving medicines are expensive CIPLA, a pharmaceutical company based in India stated their goal to make India self-sufficient in health care and ensure that no patient shall be refused to have access of high-quality and affordable medicine and to support and achieve such they have fully utilized the patent system.
- Apple vs. Samsung: There had been a long fight between the famous companies Apple and Samsung. Samsung was accused of by apple of copying its idea of smartphones. This had been the most prominent case for the past decade linked to patent infringement of smartphones. Finally, the jury ordered Samsung to pay Apple for infringement of the patents. In India many startups have emerged and IP helps such startup to compete with large companies.
- The Indian Patent Act has been criticized on its time-consuming process for patent grant but with the introduction of expedient examination by the Amendment Act of 2003 and 2019 Indian Space Research Organization (ISRO) has been granted a patent in a time period of eight months by the Indian Patent Office, such positive changes in patent application and patent grants encouraged more patent filings in the future.
- Women are calculated to be less participating in the business arena, though various study shows that women are good innovators and inventors. In order to encourage such patent, rules are made where the patent seeker is a female or if any one applicant is female than such application gets some advantage or faster process. Women Scientist Scheme-C (KIRAN IPR) scheme contribute to 10% of active patent agents in India as it provides to women who have interest in science and technology a training program in IPR. Such created a suitable environment for women who were not able to pursue their interest resulting in human resources for science and technology. Another instance 'Darjeeling tea' was granted the GI status in October 2004 and it is the first application to be registered in India as a GI. Such tag helped in women employees in tea estate and also increased foreign export.
- The famous fabric of Madhya Pradesh Chanderi Silk was seen in Commonwealth Games, 2010 held at Delhi, winners were offered 'angavastram' that was crafted from Chanderi Silk. There was an order value worth Rs. 50 lakhs that resulted in large revenue for the weavers.

### **Legal Framework for Protection of Intellectual Property**

The Patent Act, 1970

This Act replaced the Patent and Designs Act 1911. However after signing various international agreements like TRIPS, Paris Convention and Patent Corporation Treaty, it was under obligation to change some of its provision

in order to cope up with such international dealings. On March 1999 patents amendment came and the second phase of such amendments was brought in patentable subjects and section 39 was reintroduced. India now is governed by the patent Act 1970 with amendment by 2005, patents Act 2006 rules and 2019. The patent head office is located in Kolkata and has branches too. The patent filing procedure starts with filing patent search, application, publication, examination, objection and finally grant of patent.

The Trademark Act, 1999

The trade mark act was based on common law system before 1940. Later trademark and merchandise Act came in 1958 but got repealed by Trademark Act 1999 which is the present legislation governing India with effect from 2003 as it complies with the provision of TRIPS. The procedure for registration of trademark is firstly Trademark search followed by Trademark application, consisting of all details of the owner, class of the mark, description of goods, trademark examination, publication and registration.

The Copyright Act, 1957

The first copyright Act came in the year 1847 during the rule of East India Company, post-independence the copyright Act 1957 came into force. The copyright Act was amended many times in the year 1983, 1984, 1992, 1994, 1999, 2012. The copyright amendment rules were introduced in 2021. Though copyright generates automatically, registration gives a better protection to the work if infringed by violator.

The Design Act, 2000

The history can be traced in the British period when the first Patent and Design Act 1872 came in force, later The Design Act 2011 came in compliance with TRIPS and many changes in the definition of articles, design, registration, quantum of penalty, period of registration from five to ten years were made. India was with no laws for geographical indication until 1999 but the cases relating to basmati rice, turmeric and neem brought a huge concern for India which brought the Geographical Indication Act 1999 with objective to prohibit an unauthorized person from misusing indications and also help consumer from any confusion. It also aims to promote exports of the goods. Indian goods having GI tag.

### **Conclusion**

India is known as the fastest growing nation and to keep that pace there is dire necessity of a framework which encourages people to enhance creativity and build new opportunities. Intellectual Property laws serve as a base for such invention, innovation, creativity resulting in social, economic and cultural development of the nation and enhancing the concept Vocal for Local into Vocal for Local and Local to Global. Therefore, a positive relationship of human effort with Intellectual property rights is utmost necessary to make India Atmanirbhar.



**NEW HISTORICIST READING OF ALEX  
RUTHERFORD'S MUGHAL HISTORICAL FICTION  
*RAIDERS FROM THE NORTH***

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**Abstract**

In the postmodern times, history as a discipline has been a venue for challenging interrogations. The factuality of facts, historical sources were questioned by the postmodern philosophers of history. They have argued for a more flexible and inclusive history. Novelists of historical fiction has ventured to recreate history through their works. Historiographic metafiction rereads history from various angles and emphasized the pluralistic nature of history. New Historicism prefers both the literary and the historical elements of a text. Alex Rutherford rereads the life and times of Babur in the historical novel *Raiders from the North*. This paper makes an attempt to understand the unique blending of facts and fiction in this novel. The study contextualises the novel with the theoretical background of New Historicism.

**Key Words:** Historical fiction, New Historicism, Plurality of history, historiography

**Introduction**

In the postmodern scenario, history as a discipline turned to be multicentric and interpersonal. A paradigm shift happened in the case of historical representation. The philosophers of history have argued for a more pluralistic, inclusive and argumentative history. They interpreted history as an amalgamation of fact, fiction and fabrication. For them a rereading of history is an unavoidable act in order to do justice to the representation of the past. The horizon of historical enquiry has widened in the recent times and reexamination of historiography revealed new insights. The emergence of

historiographic metafiction in the 20<sup>th</sup> century is the consequence of the postmodern philosophy which believed in the deconstruction of the traditional academic history. The validity of the historical sources and the factuality of historical facts were doubtful. Historical fiction imagines a more possible past and it reconstructs the interpretation of past in multiple ways. Galda and Cullinan relate fiction about the past as an interesting genre consisting of "imaginative stories grounded in the facts of our past" (205). They further add that:

Historical fiction differs from nonfiction in that it not only presents facts or re-creates a time and place, but also weaves the facts into a fictional story. Historical fiction is realistic-the events could have occurred and people portrayed could have lived-but it differs from contemporary realistic fiction in that the stories are set in the past rather than the present. (205)

This paper examines the New Historicist strategy in the analysis of historical fiction *Raiders from the North* written by Alex Rutherford. Through a unique interblend of fact and fiction, Rutherford has innovatively reinterpreted the Grand Mughal Empire. It looks at the way historical fiction reconstructs the past by providing an imaginary past through fiction. Alex Rutherford establishes an argumentative past through *Empire of the Moghul Series*. Plurality and multiplicity should be maintained as the touch stones of history as a discipline. Historical novelists create plurality of the past through their fictions to incorporate divergent voices or the unheard past. Rushdie writes about the ambiguity in history as: "History is always ambiguous. Facts are hard to establish and capable of being given many meanings. Reality is built on our prejudices, misconceptions, and ignorance as well as our perceptiveness and knowledge. (Imaginary Homelands 25).

Rutherford's novel in this series presents the magnificent Mughal reign in manifold ways and presents the challenging questions about the Grand Narrative of history. Alex Rutherford is the pen name of the couple writers Diana Preston and Michael Preston. They studied at the University of Oxford. Both of them wrote fiction and nonfiction under the Pseudonym of Alex Rutherford. This couple writers are global travellers and visited more than 140 countries. These travels across the world have given them the inputs for their fictions and non-fictions. India was one of their the favourite countries to write about. Both of them were enamoured by the magnificent Taj Mahal, which instilled them to create fictions about Mughal Empire. Alex Rutherford has spent almost two years in India researching every private and public aspects of the Mughal rule in India, examining the chronicles, battles, deaths, executions, diaries, and letters. These searches revealed before them the persuasive and gripping tales of the Mughal times.

Rutherford 's internationally best-selling series *Empire of the Moghul* depicts the rise and fall of the great Mughal Empire, the social scenario of the time, and the inner politics of the court that is beyond the purview of the historians. In their interview with *The Hindu*, Alex Rutherford revealed their mechanism

of writing together as: “We have always enjoyed working together, and we found that the process came relatively naturally. A real bonus is that writing can sometimes be a lonely business. It is great to have someone to share the highs and lows and talk through difficulties with. It’s harder for two writers to get writer’s block than one.”

*The Empire of the Moghul* series is a quintet. The novels in this series are, *Raiders from the North*, *Brothers at War*, *Ruler of the World*, *The Tainted Throne*, *The Serpent’s Tooth*, and *Traitors in the Shadow*. Through the novels in this series, Rutherford reconstructs the life and times of six major Mughal Emperors. The nonfiction works written under the pseudonym Alex Rutherford include, *A Pirate of Exquisite Mind: Explorer, Naturalist, and Buccaneer*, *The Life of William Dampier*, *Taj Mahal: Passion and Genius at the Heart of the Moghul Empire*, and *A Teardrop on the Cheek of Time: The Story of the Taj Mahal*.

Alex Rutherford has gone through all the available historical sources while reconstructing the Mughal world. While going through these resources, Rutherford recognised the inevitability of rereading the Mughal past. Historian Abul Faisi’s (1551-1602) *Akbarnama* is a prime historical record about the reign of Akbar. Babur’s autobiography, the first Islamic autobiography *Baburnama* evokes a living picture of the commencement of Mughal rule in India. Badauni, a noted historian and an orthodox Muslim of the Mughal court writes critically about the secular policies adopted by Akbar. *Tuzuk I Jahangiri*, the memoir written by Jahangir is a significant source to explore the dynamics of Jahangir’s time. Gulbadan Begum, the daughter of Humayun wrote *Humayunnama*, an account about the reign of Emperor Humayun gives a detailed account of the position of royal women in the court and their significance. ShahJahan’s eldest daughter Princess Jahanara Begum’s autobiographical Sufi treatise *Risala-i-Sahibiyah* gives the pen picture of the impact of Sufi order among the Mughal Emperors and queens.

The first novel in the series is *Raiders from the North*, which tells the compelling and exuberant history of Babur, the founder of the Empire in India. Babur is a daring conqueror and a descendant of Genghis Khan and Tamburlaine of Central Asia. The novel traces all facets of Mughal reign in India; the complete life of Babur, the imperial women, significance of Babur’s mother and grandmother in the administration, court life, preparations of war, political decisions, annexations, religious beliefs, climate, rivers, water sources, luxuries of court lives, women’s quarters, cuisines, the flora and fauna of the Mughal world and so on. Rutherford’s *Raiders from the North* gives a tenable social history of the time. New Historicist reading gives equal importance to the literary and historical narratives. As historical fiction is an intermix of fact and fiction, it supplements the academic history too. New Historicism perceives literary works as potential source to recreate history. It was a new reading strategy propagated by Stephen Greenblatt and Louis Montross.

New Historicism rose to the limelight with Stephen J. Greenblatt's publication of *Renaissance Self-Fashioning: From More to Shakespeare* (1980). His other works that studied the undercurrents of power relations in the Renaissance culture and act as a catalyst to the New Historicist movements include *The Forms of Power and the Power of Forms in the Renaissance* (1982), *Shakespearean Negotiations: The Circulation of Social Energy in Renaissance England* (1988), *Learning to Curse* (1990) and *Marvellous Possession: The Wonder of the New World* (1991). The chief theoretical artifice to understand the polyphonic nature of historiography was laid down by New Historicism and Cultural Materialism, postmodernism, and the ideas put forward by Foucault. The practitioners of New Historicism and Cultural Materialism believed that the past can be chiselled from various sources as Brannigan says, "legal, medical and penal documents, anecdotes, travel writings, ethnological and anthropological narratives and of course literary texts!" (3). While writing *Empire of the Moghul Series*, apart from official sources, Rutherford has depended upon autobiographies, biographies and other court records. New Historicist alleged literary texts as active by products of the socio- historical condition of its time. New Historicists and Cultural Materialists see literature as a powerful tool to study the past. For them, — literary texts are vehicles of power which act as useful objects of study in that they contain the same potential for power and subversion as existing in society generally. For them, the past constitutes the present and literature becomes a domain of politics.

H.Aram Veerer in *New Historicism* has identified and listed the key assumptions of New Historicism as:

- 1) that every expressive act is embedded in a network of material practices;
- 2) that every act of unmasking, critique, and opposition uses the tools it condemns risks falling prey to the practice it exposes;
- 3) that literary and non-literary texts circulate inseparably;
- 4) that no discourse, imaginative or archival gives access to unchanging truths nor express inalterable human nature;
- 5) Finally, a historical method and a language adequate to describe culture under capitalism participate in the economy they describe. (xi)

When Rutherford recreated the life and times of Babur in *Raiders from the North* The most trusted source was Babur's autobiography *Baburnama*. In this personal memoir Babur has a break from 1508 to 1519. Historiographers filled this gap with a poetical recreation just as novelists do. In *Raiders from the North*, Rutherford presents Babur as constantly resorts to his mother and his grandmother Khanzada Begum, his sister for taking political decisions. The novel commences by describing the greatness and achievement of Babur's father and the heroic legacy of their ancestor Timur. Some historians portray Timur as a barbarian, but in the novel, he is presented as a generous and honest war hero, "not that Timur was barbarian my son" (4).

The narrative of the novel *The Raiders from the North* begins in Central Asia in 1494. Babur was compelled to be the boy king at the age of twelve after the

unexpected demise of his father. With the help of his mother and grandmother, Babur ruled the country. But soon he lost power and became a king without a kingdom. From Kabul Babur turned his eyes towards Hindustan. He made several attempts to conquer it, but his fifth attempt was successful. In 1525, Babur's army could overthrow the Lodi Dynasty led by Ibrahim Lodi. Subsequently, Babur could achieve decisive victories against Rajputs and Afghans. Babur laid the foundation for Mughal dynasty. But his immense contributions in the growth and strengthening of Mughal dynasty came to a sudden end with the death of Babur on 28<sup>th</sup> December 1530, he was only forty-seven years then. Babur was very compassionate and a very charismatic character. His unique autobiographical sketch *Baburnama* is evidence of his literary skills and scholastic accomplishments and it is a true classic of world literature.

Babur gives a vivid description of his home places like Ferghana, Samarkand, and Kabul in his memoir. Alex Rutherford while giving the pen picture of Babur's early life uses these descriptions of his memoir as a source. Rutherford describes the beautiful nature of Samarkand in *Raiders from the North*: "...and Samarkand lay on the great Silk Route between China and Persia, surrounded by fertile fruit orchards and the fields of wheat and cotton, the richest of all the Timurid possessions. It's a very name meant Fat City while the Zarafshan River, which ran past its walls was called Gold Bearing".(37). Rutherford describes the natural beauty, eco system, birds and animals of Samarkand.

...and Samarkand lay on the great Silk Route between China and Persia, surrounded by fertile fruit orchards and the fields of wheat and cotton, the richest of all the Timurid possessions. It's a very name meant Fat City while the Zarafshan River, which ran past its walls was called Gold Bearing.

Alex Rutherford heavily depended upon the available historical sources for the reconstruction of the Mughal world. As an afterword to the novel Alex Rutherford writes about the composition of the novel, "I have described the principal events in their historical sequence, though condensing, combining or omitting some incidents and compressing some timescales"(491). At the same time Rutherford explains the poetic license in the creation of the novel as;

Babur's grandmother Esan Daulat – whose advice he says in the Baburnama, he relied on upon his youth -his mother KutlughNigar and his sister Khanzada all existed, as did his traitorous half-brother Jahangir. Babur's father indeed fell to his death from his dovecote at Akhsi when the battlements collapsed beneath him. Similarly, Babur's main enemies – Shah Ismail of Persia, Sulthan Ibrahim of Delhi, and Uzbek warlord Shaibani Khan, who did carry off Khanzada, are also historical. However, I have used the liberties afforded to historical novelists to flesh out some of the other characters or to create new ones based on the combination of real people important in Babur's life. Wazir Khan and Baisanghar fall into these categories, as indeed does Baburi – though in his memoirs Babur fondly of a market boy of that name. (492)

Alex Rutherford has contextualised their historical fictions with history, historical narrativity, and history fiction interface as an all-in-one mixture with a pluralistic narrative paradigm. Literary texts which reflect the socio historical background of the society is capable to generate history of that time. They created a kaleidoscopic aesthetic experience for the readers. These writers present themselves in the different historical context of Mughal India, revealing an extensive polychromatic view of the grand, colourful, and yet cast down the history of the Great Mughal Empire. *Raiders from the North* presents a veritable experience of Mughal world. It portrays the domestic as well as the public domain of the Mughal world. The novel unravels the charismatic personality of Babur and the challenges that he faced while establishing a robust dynasty in India.

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**PROSPECTS AND IMPEDIMENTS OF CONFLICT  
RESOLUTION IN ASSAM WITH SPECIAL REFERENCE  
TO U.L.F.A.**

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**Abstract:**

Conflict is a part of most of the states of modern time. With the passage of time conflict changes its nature. In case of India there are problem of insurgency in most of its parts. The insurgency in India starts soon after it got independence from the British's. The insurgency in North-East India is one of the oldest problems confronting modern India. Due to cultural differences and ignorance insurgency started in the region in early 90's. Assam which is very much part and parcel of the North-EastIndia, witnessed its first insurgent group in the name of United Liberation Front of Asom (ULFA) in April, 1979. After almost four decade the ULFA conflict is not yet fully solved though there is talk going on in between some of the members of ULFA and government. The present paper will try to look into the various prospects and impediments of the peace process in Assam with special reference to ULFA conflict.

**Key Words:** Conflict, State, Peace, ULFA, Civil Society

**Introduction**

Conflict is an inherent and ubiquitous element of human society. There is no human group or society in which life moves along in harmony at all times. Individuals do not always do what society expects them to do, and they frequently behave in ways that disrupt the social order. Every society is aware of the repercussions of unresolved conflicts. Consequently, every human group has developed informal and formal mechanisms to bring about conflict resolution. According to classical conflict resolution theory, "conflict is an intrinsic aspect of social change, but the way we deal with conflict is a matter of habit and choice". (Ramsbotham, Woodhouse, Miall. 2005:13)Though

conflict is always there between state and non-state actors, sometimes these conflicts resulted in violent incidents' and movements, which can be referred as insurgent movements. These insurgent movements created law and order problems and tried to change the existing system of the state. The problem of insurgency is one of the most significant questions confronting modern states. Although the problem of insurgency can be found in most of the countries in the world, the nature of the insurgency is not always the same. It has differed in form and intensity in various parts of the world at different times. It is seen that those who resort to insurgency almost seeks to overthrow the existing social, economic or political order and replace it by one of their choice.(Eriksson, Wallenstein, 2003: 593-602.)

The Ahoms ruled Assam for more than 600 years. In this long period, Assam has developed its own culture and political beliefs. Emergence of Sankardev and the Neo Voishnavite movement brought a lot of changes to the Assamese society. A greater Assamese nationality emerged in that period itself. In Assam the ULFA took birth in 7<sup>th</sup> April, 1979 as the first insurgent group of Assam. Most of the members of that time belonged to Asom Jatiyotabadi Yubo Chatra Parisad (AJYCP). The group was banned under the Unlawful Activities (Prevention) Act, 1967, by the government of India as it demands a sovereign Assam. The geographical difference from the main land India, strong desire of some tribal groups to make an independent state before India's Independence, the breakdown of Ahom Kingdom, immigration, the growing nationalist feelings amongst the middle class of Assam, the nature of India's central government, feeling of deprivation of the people of Assam and the various movements against imperialism in other parts of the world are some of the most important reasons of the birth of ULFA. The demand of an independent Nagaland by the people of Nagaland also played an important role in creating the feeling of alienation in the minds of a large section of peoples from Assam. In the 1970s when the Naxalite movement was very strong in India, Assam also came under its influence. Many educated youth of Assam were attracted to the ideology of ULFA and during the period 1985-87 more than 500 members joined ULFA including girls. Many people got their training in Kachin. ULFA established a very good relation with National Socialist Council of Nagaland (NSCN) which is being regarded as the mother of all insurgent movements of North-East. The first connection of ULFA with undivided NSCN was established in 1982 in an interior village of Ukhrul District of Manipur where the NSCN agreed to provide training to the ULFA cadres. By 1985, ULFA became a popular name among the youth of Assam. ULFA's relationship with AJYCP to begin with, was the most important factor behind such popularity. It is through various branches of AJYCP that ULFA became a household name in Assam. According to one estimate, by the time Assam Accord was signed, ULFA had a total strength of 1,500 cadres. Till date there was three massive army operation was done by the Indian army against

ULFA, these operations weakened ULFA to quite a large extent but not able to eradicate it completely. For the interest of the people of Assam it is very important to resolve the ULFA issue with peace processes, as the use of violence from both government and ULFA harasses the common masses.

**Objective of the study:**

1. To study the necessity of the peace process with ULFA
2. To study the prospects and impediments of the ongoing peace process.

**Methodology:**

The methodology for this study is primarily descriptive and analytical. The data for the study was collected from primary and secondary sources. The Primary data has been collected through interviews with civil society members and ULFA leaders. The Secondary sources include books, articles, newspapers, magazines and journals that present commentaries of Civil Society, ULFA and Government policies. Qualitative analysis of the data was done

Conflict directed against the state and the state's responses to such conflicts are a processual couple. Each shapes the other in a continuing process of unequal reciprocation of experience and apprehension. (Ray: 1991:14) To resolve various kinds of conflicts, the state's possible choices can be categorized as conflict regulation, conflict repression and conflict resolution. The government of India has its own methods and techniques in dealing with the various insurgent movements. Using of military and para military forces are the most important technique of the Indian government against the insurgents. The Union as well as the States Government of India takes these movements of secessionism with serious concern. They treat these issues as a great threat towards the national integration of India. The central government of India believes in tackling these issues with strong hands and no mercy is shown against those who engage in these kinds of activities. The government of India takes these issues as anti-state and anti-integration. These activities are being banned through various laws passed by the Indian parliament. Union government gives strict instructions to the state governments to deal strongly with insurgent movements. To fight against the insurgency led by ULFA government of India strikes with the following army operations-  
Operation Bajrang in 1990:

This is the first army operation launched against ULFA when they started targeting the tea lobby of Assam. This operation was unsuccessful as the ULFA leaders and cadres went underground. The mass support helped ULFA at that time. They got the information about the operation from the people enmeshed in the bureaucracy beforehand. This Operation shows the nexus between ULFA and the government officials. An hour before the Operation was launched ULFA leaders were informed about the Operation. The strong network of ULFA with the officials including Assam police helped ULFA in surviving at that time. The wide range of connection with the state government helped ULFA members safely hide out from it.

Operation Rhino in 1991:

The second Army Operation against ULFA regarded as a success from the point of view of the government. This Operation was launched when ULFA started killing and kidnapping the engineers from the ONGC and OIL. Most of the ULFA camps were destroyed, many cadres were being killed.

Operation All-Clear in 2001:

In 2001 Indian Army with the help of Royal Bhutan Army started Operation against ULFA in the forest of Bhutan. It was one of the most successful operations of Indian Army against ULFA. Most of the ULFA leaders were arrested or get killed. This was the biggest Army Operation against ULFA. Most of the ULFA camps which were situated in the deep forest of Bhutan were destroyed.

The army operations worsen the situation in Assam and ULFA became more aggressive which led to gross human rights violation and created severe law and order situation in Assam. After a decade long violence and terror The Indian government was successful in arresting the top brass of ULFA leaders in Bangladesh. The change in Bangladesh politics with the leadership of Sheikh Hasina of Awami League as the prime minister of it helped Indian government in attaining some diplomatic relations with its neighboring country. After the arrest of almost all the senior members of ULFA excluding its Commander-in-chief Paresh Barua, the central government putted them behind the bars. The civil society of Assam competes against this decision of the government. They wanted both the conflicting parties to sit in the negotiation table for the greater and sustainable peace in Assam. At first both government and arrested ULFA leaders were rejecting the view of the civil society on their own ground, but with the strong intervention of the Assamese intellectual section with the leadership of Prof. Hiren Gohain central government and ULFA leaders agrees to the peace talk. The talk started from 2012 which is still continuing without any prior outcome.

#### **Responses of ULFA towards peace process:**

ULFA was totally broken after the third Army Operation. In the year 2005, ULFA initiated talks with the government of India from its own side and formed People's Consultative Groups (PCG). The discussion between PCG and government of India ended into a failure after having three rounds of talks, as both the Government and ULFA violated the norms of the peace process. Another peace initiative was taken up by the 28 battalion of ULFA in the year 2008 when the battalion announces cease fire with the Government. (Mahanta, 2013:148) The A and C company of the battalion declared cease-fire with the government and the cadres of the groups started living in the designated camps of Kakopathar. The most important event which changed the position as well as divided ULFA in to two sections happened when the top brass of ULFA leaders including its Chairmen, Deputy Commander-in- Chief, Foreign Secretary and Finance Secretary were arrested by Bangladesh Army in the

border areas of Bangladesh in the year 2010. The arrested leaders were handed over to India are now indulging in peace process where the Commander-in-Chief of ULFA Paresh Baruah who is still subversive and opposes the talks and declares the other group as unconstitutional according to the constitution of ULFA. Irrespective of the opposition comes from some of the radical ULFA members; most of the senior leaders of the group are indulging themselves with the peace process started by the government of India with the help of the civil society of Assam.

**The prospects and impediments in the peace process:**

Though the peace process is going on in between Government of India and the leaders of ULFA there are many obstructions in its success. The ongoing peace process between Government and ULFA is the most anticipated issue for the people of Assam. This is the first peace process where the ULFA leaders are directly involved in the four decades of ULFA history. Though there were many initiatives to start a peace process between ULFA and government not a single initiative was successful yet. The pressures from the civil society of Assam upon the ULFA leaders, arrest of top brass of ULFA are the most important factors for this development.

The present peace process brings lot of hope not only for the people of Assam but also for the ULFA leaders who are engaged in the peace process. The approach taken by the ULFA leaders can be regarded as a positive sign for the peace process. Since 1990, the government has taken initiative to start the peace talk. In this regard some success was achieved by the government when some sections of the ULFA leader came forward to talk. The most positive impact is that it able to bring the ULFA to the negotiation table without any pre-conditions. There is a growing weariness among the common people of the state and an increasing demand for peace. The civil society intervention has brought about a sea change in peace process of Assam. Suffice it to say that in order to restore peace in Assam, the active participation of these civil society organizations is essential and the various civil society organizations are moving in the right direction in spite of the various structural constraints. Thus, the involvement of civil society organization in the peace process is considered as necessary and a positive step in order to restore peace in Assam.

Yet, this view is fundamentally at odds with the position favored by the Assamese public, which is that the conflict must be settled through negotiations and compromise. Despite ample evidence of a significantly weakened ULFA, no one expects a sudden outbreak of peace in Assam. This presents us with a paradox of sorts-continued conflict irrespective of the government's military success against the armed insurgent group and the groups own internal weakening. Even though the Operation All Clear was a severe setback to ULFA, however, it could not write ULFA's epitaph. (Mahanta, 2013:112)

Now the state is applying diplomatic tools to solve the issue. It agreed to the demands of the civil society groups to release the ULFA leaders from the jail so that they can freely join the peace process. This approach of the state brings a positive environment for the peace process. Despite this attitude of the state some allegations are also there about the role of the state in the whole peace process. Delaying in the peace process can be seen as one of the impediments of the peace process. The peace process has already crossed 10 years but till now no constructive outcome is there. The reluctance shown by the government in the process creates doubts in the minds of the people of Assam as well as the ULFA leaders who are involved in the process. On the other hand government has its own reasons for the delaying of the peace process. But on the other hand government is denied deliberate delaying of the process. As there is a change in the central government so the process delayed due to some official concern.

The weak role of government of Assam is also regarded as one of the major impediments in the conflict resolution process with ULFA. According to the constitution of India solving a matter of dispute with the insurgents comes under the central list which is why the government of Assam is not eligible to intervene in the process. In India the state government can only prepare the grounds for talk; once the peace process starts it is being handled by the central government.

The absence of ULFA's Commander in chief Paresh Barua in the peace process can be regarded as the most important impediment of the peace process. He is continuously taking stand against this peace talk. The government and the ULFA pro talk group are inviting him to join the peace process but he refused to come out without discussing the matter of sovereignty. The non-compromising attitude of Paresh Baruah divides ULFA into two groups. There are very chances of creating disturbances from his side to make the process unsuccessful. Peace process would be in right tract only when the whole group of ULFA comes forward to hold direct talk with the government. The division between ULFA can create more tensions in the coming years. To mobilize each and every cadres of the group is more important. The people who are still in the path of violence should also understand the reality. The people who are now indulging in peace process are arrested people, but to bring the other members of the group is more important and challenging. Without the participation of all the members of ULFA the process will remain incomplete. If the process fails it will strengthen the hands of Paresh Baruah.

Many observers and analysts contend that the ULFA's decision to enter the peace process is a significant move. However, the impediments to peace process bring a big question mark in the success of it. There is a need of the Union and Assam government to remain cautious on the possibility of the anti-talk ULFA faction led by Paresh Baruah Commander in Chief who engaged in violent activities in order to derail the peace process of Assam. A

negotiated settlement to the ULFA problem is possible only when there is an abandonment of certain demands, from both sides. If the ULFA gives up the issue of sovereignty and manage it within the constitutional framework, peace is possible as per the government. Furthermore, the ULFA also must be sincere and abjure violence. On the other hand, the government must also give up some of its hard steps, like the army operations; though risky, it would make easier to facilitate direct talks with the group. The previous talks were unproductive as both sides relentlessly pursued confidence destroying measures, such as political violence on ULFA's part and counterinsurgency operations by the government. Thus, there was little chance of building the kind of trust necessary for the talks to succeed.

**Conclusion:**

The peace process can be a successful one if both the parties come to an agreement. The role of the Indian government is more important here. The process can be faster if the government wishes. The participation of the state government of Assam can also speed up the whole process; the state government is restricted to take part in any peace talks with the rebel groups as national security comes under the central list of Indian constitution. But for the durable peace in Assam this constraint can be lessened. The issues which are been raised by ULFA apart from sovereignty of Assam are the basic demands of the people of Assam which can be solved within a short period of time. To remove all the impediments to the peace process, both state and ULFA have to work together as it will have a major implication on the lives of the people of Assam. The ongoing peace process which is a most awaited one for the people of Assam can end a forty decades old conflict between the ULFA and the government.

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## **KUWAIT AND GULF WAR: A HISTORICAL CONTEXT**

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### **Abstract**

Kuwait is a Sovereign Republic but as described in the preceding chapter1 Saddam Hussein left no stone unturned to bring it under his tyrannical rule. He claimed Kuwait as an integral part of Iraq. In 1965, Iraq's foreign minister discussed his Government's demand with the Kuwait's Foreign Minister. Iraq wanted that Kuwait should atleast give up the two islands of Warba and Bebyan and territory that Kuwait occupied close to Iraq's unmarked border. At that time Kuwait's Foreign Minister refused the demand saying that his Government might agree to the idea of renting Warba island to Iraq for 99 years. Prom 1974 to 1977, several meetings were held between Iraq and Kuwait, but none of them reached fruition. The Sheikhs of Kuwait under prodding from Washington, wanted to change the character of the area adjacent to the Iraqi border by setting up police posts, farms, plantations, embankments and drilling of Wells 'to pump out Oil from Iraqi Oil Fields of Rumaila. Algiers Summit of 1988 added fuel to the fire. The Iraqi Foreign Minister informed the Kuwaitis that Saddam Hussein desired to solve the Iraqi-Kuwait border issue once and for all. The offer was evaded by the Kuwaitis. All these factors were piling up as explosives.

**Key words:** Kuwait, Gulf war, Oil fields

### **Introduction**

In meantime Iraq was reeling under financial problem. At the Baghdad Arab Summit. Saddam told his peers from other Arab Countries that a drop in oil prices by one dollar a barrel would cast Iraq one billion dollar a year. Iraqi officials now contend that only hours after the Jedd ah meeting of representatives of Saudi Arabia, Kuwait and U.A.E. when it was decided that oil price should be fixed at \$18 a barrel, Kuwait said that it would ask for an increased quota at October 1990, OPEC meeting to assure the U05. and

Britain that Jeddeh decision Was not final. The truth is that the average Oil production by the Arab States is 14 million barrels a day. The deterioration of prices between 1981-1990 led to a loss by the Arabs of nearly 500 billion barrels, 89 billion of which was suffered by Iraq alone.

“Iraqi anger against Kuwait further rested on the premise that the latter was extracting oil from the Iraqi side of Rumails field to the extent of \$2,400 million at the prices prevailing between 1980 and 1990. Iraq presently wants every dollar it can save, considering that during its eight—year war with Iran it spent \$102 billion in purchasing arms from the West. During the Iran War the West gained both ways.<sup>11</sup>

The opulence and glitter of Kuwait attracted Saddam and he invaded Kuwait bring about pillage of Kuwait at exorbitant scale : “Saddam ordered his men to bring home everything undamaged. The pillage had been at the two levels: at the level of occupation government for National gain and at the level of Iraqi Troops for individual gain.<sup>12</sup> The Iraqi soldiers took full advantage of Saddam’s vendict. They toolted the royal palace, plundered the Central Bank of Kuwait, carted off the food stock pile to Iraq and stripped the country bare, The hungry Iraqi soldiers shot and ate every edible animal in Kuwait’s city zoo. The Iraqi’s were not considerate to the sick even. Saddam ordered his troops to adopt scorched earth tactics in Kuwait. Before Iraqi invasion Kuwait had been pumping crude oil from nearly 1000 oil wells, Saddam’s agents put 500 of them on fire and damaged the rest of them completely. Saddam used oil as a war-weapon and declared an unholy wax upon the ecosystem of the Gulf and the entire West-Asian region. He ordered his men to open the spigots of Kuwaits main super tanker and more than one billion litres of oil found its way into the Gulf. “Saddam wanted to achieve a number of objectives by this unprecedented oil spill:

- (a) to spoil the chances of an amphibious invasion by the US marines upon Kuwait;
- (b) to force Saudi Arabia to shut down its desalination plants on the Gulf, thus cutting the supply of drinking water to the Eastern province of Saudi Arabia and the Allied forces encamped in the Area;
- (c) To compel Saudi Arabia to close down its power stations and oil refineries on the Gulf by denying them a proper supply of sea water for cooling purposes; and
- (d) to spread eco terror in the entire region by causing risk of life for millions of creatures that inhabit the Gulf region.<sup>13</sup>

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<sup>11</sup>. Khanna O.P.: *Disastrous War in Gulf : Ruins, Myths & Miscalculations*, The Competition Master : March, 1991, P : 556.

<sup>12</sup>. Mittal N.S.: *An Unfinished War : Saddam Under Sieze* New Delhi, 1991, P 77

<sup>13</sup>. Mittal N.S.: *An Unfinished War : Saddam Under Siege*, New Delhi, 1991, P : 78

AS Saddam failed to acquire the desired Oil Fields of Rumaila and two islands on long lease from Kuwait by fair means; I he stooped to foul means and acquired his objectives at the cost of innocent lives.

Iraq's occupation of Kuwait in such a manner was opposed by Security Council.

“There have been 12 Security Council resolutions against Iraq following its unprovoked occupation of Kuwait on August 2, 1990. However, Israel which has always been condemned internationally due to its defiance of the UN Charter and resolutions, should not be an example to be followed by Iraq. Aggression can never be rectified by another aggression.<sup>14</sup>

In August 1990, many resolutions were passed by President Bush. The UN Security Council called its member countries to impose economic and Military sanctions against Iraq. It was believed that Iraq would be pressurized by UN to withdraw its forces from Kuwait.

The US and the British forces became alert even before the Security Council asked Iraqi President to take out his forces from Kuwait and said that, “the UN member states could otherwise use all necessary measures to secure the objective. The US has stated that all necessary measures include the use of Military forces.<sup>15</sup>

In the meantime, Saddam Hussein had taken all necessary measures to create terror in Kuwait. He put into execution his home policy in Kuwait too.

“It is estimated that more than 200 Kuwaitis had been murdered by the Iraqi intelligence and troops. According to Mrs. Awadi, an authority on international law, more than 100,000 Kuwaitis had been taken away to Iraq as hostages and about 17,000 detained in Prisoners of War Camps.<sup>16</sup>

Saddam Hussein acted as a hypocrite on the issue of the withdrawal of Iraqi army from Kuwait. Saddam Hussein refused to comply with the directives of the US President and declared that he would not be dictated by the US or any other nation regarding the dates for talks while President Bush agreed to change the dates for commencing talks, President Saddam Hussein announced on January 4, his willingness to start talks in Geneva, Saddam Hussein sought an assurance that the U.S. would not launch a military strike against Iraq while Mr. Bush insisted on Iraq's unconditional pull-out from Kuwait. The deadline of January 15, 1991, for withdrawal of Iraqi forces was not observed by President Saddam Hussein. The month of July 1990, had already sown the seeds of Gulf War. The forcible entry of Iraqi troops in Kuwait, Saddam's forcible acquisition of the Oil Fields of Rumaila and the

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<sup>14</sup>. Khanna O.P.: *Disastrous War in Gulf: Ruins, Myths & Miscalculations*, The Competition Master : March, 1991, P : 557.

<sup>15</sup>. Khanna O.P.: *Disastrous War in Gulf: Ruins, Myths & Miscalculations*, The Competition Master: March, 1991, P : 558.

<sup>16</sup>. Mittal N.S.: *An Unfinished War : Saddam Under Siege*, New Delhi, 1991, P : 78.

efforts of U.N. Security Council to likenate Kuwait, aggravated the situation further. In October 1990, the Iraqi Offer to sell Oil at half rates added fuel to the fire. Russia and France stressed on settling the Gulf crisis peacefully while “The U.S. Senate passed 96—3, a resolution supporting Military Deployment in the Gulf.<sup>17</sup> The month of November and December 1990 set the pot of hot-question boiling to a great extent. The first sixteen days of new year came as premonition of War. All efforts to end the cold war with a peace treaty failed to pacify the blood-thirsty Saddam Hussein. Various efforts were made to establish peace between Iraq and U.S. which are enumerated below :

- (a) UN Secretary General Javier Perez de Cuellar meets with President Hussein in Baghdad.
- (b) Perez de Cuellar says he had not made any ‘progress’ during his talks with Hussein. Bush signs the congressional resolution authorising use of force against Iraq.
- (c) UN Security Council dead locked over French peace plan.
- (d) De Cuellar asked for an Iraqi commitment to Kuwait to pull-out in return for a promise of a comprehensive UN review of the Palestine issue.
- (e) President Bush starts hostilities against Iraq.<sup>18</sup>

Ultimately, the darkness of January 18, 1991 was enlightened by the operation Desert Storm for which “President Bush declared, there are times in life when we confront values worth dying for. This is one such time. At this Saddam’s retout Was, Should the Americans become. embroiled, we will make them swim in their Blood, God willing.<sup>19</sup>

**Conclusion:**

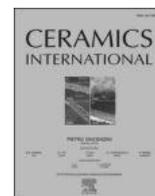
As the Gulf War took momentum, five of the Arab nations- Algeria, Morocco, Tunisia, Libya and Moritania put forth an earnest appeal to the UN Security Council to call for a cease fire But Saddam turned down their request in a high-handed manner. By February the Gulf War had engulfed the peace of the whole world. Those who were directly involved lived in constant fear of death while the others involved indirectly with War apprehended the destruction of Mother Earth. Saddam adopted certain measures for open purchase of Military weapons from Russia and believed in clandestine purchase of arms and apprehended from the West, specially from the U.S. Saddam Hussein sneaked away 5% of Iraq’s Oil Currency and deposited it in secret Swiss Banks. This money was utilized for purchasing Military hardware on clandestine ground.

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<sup>18</sup>. Ibid, Jan. 19, 1991.

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# A review on challenges, recent progress and applications of silica nanoparticles based superhydrophobic coatings

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## ABSTRACT

Over the past few decades, the study of superhydrophobic coatings (SHCs) gained the significant interest of worldwide researchers due to their tremendous applications in various sectors including, the metal industry, membrane industry, automation, structures, marine, defense, and medicines. The literature is full of review papers on the basics of SHCs, their synthesis methods, and their applications. But, minimal reviews are available on silica nanoparticles-based SHCs. However, silica nanoparticles are well-known material for SHCs due to their abundance, economical, transparency and ease of surface modification by various surface-functionalizing agents compared to other nanomaterials. Furthermore, silica nanoparticles are the most preferred material for the generation of nano-level roughness in the coatings to exhibit superhydrophobicity. Therefore, there is a great need to work in this direction. This work is dedicated to the challenges, recent progress and applications of silica nanoparticles-based superhydrophobic coatings.

## 1. Introduction

In the past few decades, superhydrophobic (SH) surfaces gained significant attention from researchers around the globe due to their tremendous applications in various sectors including, the metal industry, membrane industry, automation, structures, marine, defense, and medicines. The water repellent properties of SH surfaces are an effective area of exploration. The water droplets can bounce and slide off easily over the SH surfaces due to low contact angle (CA) hysteresis [1–4]. Superhydrophobicity can be achieved by controlling two crucial parameters such as (i) surface energy and (ii) surface geometrical structure. Surface energy and hydrophobicity are inversely proportional to each other. The chemical compositions of a solid surface decide its surface energy and significantly influences its wetting behavior [5]. Under certain circumstances, diminishing the surface energy is not enough to achieve superhydrophobicity. This concept was realized long back by Nishino et al. [6], who reported the  $-CF_3$ - terminated smooth surface with the lowest free energy exhibits good hydrophobicity with a maximum CA of  $120^\circ$  only. So, that surface cannot be converted into SH surface without introducing new features in it. However, the novel element in terms of micro-nano hierarchical roughness and low surface

energy jointly can enhance the CA angle beyond  $150^\circ$ , converting the hydrophobic surface into a SH surface. Therefore, the dust accumulation problem on solar panels can be solved effectively by coating the solar cell cover glass with SHCs. Due to the superhydrophobicity, the adhesive force between water and solid surface is significantly reduced and makes the collection of dust particles easy for the water droplets during their rolling off from the surface. The rolling of water droplets with dust particles clears the solid surface and this phenomenon is known as the self-cleaning mechanism of the SH surfaces. The micro-nano hierarchical roughness can be created by introducing nanostructures into the surface material [7,8]. Over the past few decades, SH surfaces have been prepared using a variety of nanostructures such as nanoparticles, carbon nanotubes (CNTs) and nanoflakes. Due to the presence of nanostructures, such surfaces generates nano-level roughness and their surface energy can be reduced by using low surface energy functionalizing agents [7–11].

According to Wenzel, the liquid follows the surface roughness. The liquid drops create good contact almost at all the points of the solid surface that means it completely fills and wets the grooves of the rough solid surface [12]. According to Cassie and Baxter, low CA hysteresis and high water CA on a surface consisting of nano-pores are owing to air

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trapped between these nano-pores. The entrapped air in nano-pores leads to the generation of a layer of air between the liquid and solid surface, resulting in a shrinking contact area between them. The trapped air reduces the bonding of a subsequent layer of dust and significantly diminishes dust accumulation on the solid surface. Hence, the SH nanocomposite coatings on solid surfaces show anti-dust deposition potential. Some low surface energy materials like tetra-fluoro-ethylene and organo-poly-siloxane, which modify polymer-based coatings, demonstrated a significant reduction in dust deposition and can be considered as efficient candidates for self-cleaning coatings. For energy conversion devices, like a solar panel, an indestructible and eco-friendly coating can be employed as the inherent coating to sustain its efficiency by obstructing the dust deposition. Besides the durability of the coating, optical transparency is also crucial for the solar panel because with the increase in transmission of solar radiation, solar efficiency increases. The SH coatings exhibit surface roughness, which can cause the scattering of light and thereby hampers the efficiency of solar panels. Superhydrophobicity and transparency are contradictory properties. Therefore to develop transparent superhydrophobic coatings for solar panels, a precise balance between surface roughness and transparency of the coating is essential.

However, silica nanoparticles are well-known material for SHCs due to their abundance, economical, transparency and ease of surface modification by various surface-functionalizing agents compared to other nanomaterials [13–19]. However, hardly any reviews are available in the literature focused on silica nanoparticles-based superhydrophobic coatings. Therefore, in the present work, the challenges, recent progress and applications of silica nanoparticles based superhydrophobic coatings are presented.

## 2. Challenges in the development of SHCs

Over the past few years, the development in the field of SHCs is quite impressive due to their wide range of applications in various sectors. However, the adoption of developed SHCs in the real world is limited due to various challenges with the coatings [20]. Some major challenges associated with the SHCs are described below:

- (a) **Surface strength and stability:** In the modern technical era, synthesis of the SHCs is not an issue. The main problem is maintaining and ensuring surface strength and stability when the coatings are exposed to harsh environmental situations. As the hydrostatic pressure-induced underwater at a depth of a few meters is enough to weaken the stability of the surface of the coating supporting the shift from Cassie to Wenzel state of the coating. Till now, no mechanism has evoked which can annul this change. Coating strength preservation is a significant concern for photovoltaic cells and self-cleaning windows. Abrasion and degradation of the coating lead to contamination and loss of the superhydrophobicity of the coating [21]. Moreover, SH coatings start degrading under harsh conditions [22,23]. Further research is needed to improve the strength and stability of SH surfaces to enhance their industrial and research relevance.
- (b) **Mechanical robustness and durability:** Usually, mechanical characteristics of smooth surfaces are better than uneven or rough surfaces. To attain a perfect SH structure similar to a set of needles or a pillars-like design approachable but exhibit inadequate stiffness that is not appropriate for robust applications. The required stiffness can be attained through a hemisphere-like structure, but that increases the area of contact, which becomes an issue for SH characteristics [22,24]. Micro-nano structures are mostly used to develop the SH surfaces that exhibit sensitivity towards the mechanical strain or stretch. The friction produced on the coatings due to rain, dirt and strong winds for a longer duration can destroy SH coatings easily. Passive regeneration and active repairing methods are suitable to control such damage.

Moreover, further research is imperative for the synthesis of such robust SH coatings [25,26].

- (c) **Multi-functionality relevance:** For some applications, it becomes challenging to combine both SH character and surface functionality simultaneously. For instance, in the optical industry, high transparency of components is a primary requirement. But, for transparent SHCs, light scattering is a severe concern because of the roughness of the coatings. If the roughness of the SHC is larger than 100 nm then the superhydrophobicity will increase but transparency will decrease and vice-versa. The visible light has a wavelength in the range of 400 nm–750 nm, but transparent SHC requires surface roughness less than 100 nm [25, 27–29]. Therefore, a precise balance between surface roughness and transparency of the coating is essential to achieve the multi-functionality of the SHCs.
- (d) **Defining new physical quantities:** Novel techniques are desired to measure the properties of SHCs. For instance, the CA fails to define the abrasion of liquid droplets over the surface, which demands the measurement of the physical quantity that explains irregular scaling and abrasion. Another quantity known as slip length can be defined as the ratio of surface velocity to surface shear rate that also needs to be defined in the case of SHCs. Moreover, further research is desired to obtain more physical quantities to know more about SHCs.
- (e) **Expensive materials:** Generally, the precursors required to produce SHCs are expensive. Even the transition processes for obtaining micron to nano topography desired for SHCs are costly. Some methods such as photolithography used to produce SHCs are expensive [30]. Some methods are cheap but produce non-durable SHCs. The overall expenditure to fabricate robust SHCs for large surfaces is quite costly. Therefore, there is a need to identify low-cost materials and methods to produce economical SHCs for large scale.
- (f) **Precipitation:** if the temperature goes down even from dew level to the point where condensation happens over the SHC, then the SHC becomes wet, leading to a transparent layer to behave as a non-repellent coating. SHCs repel water, which is a well-known concept but can they repel water vapors? Such issues need to be resolved by further research in this area.
- (g) **Air arrest issue:** Air trapped in micro/nano grooves of a SHC can be removed or reduced via exposing the coatings underwater jets with high pressure. The entrapped air can be removed via two techniques one is a confined creek of water, and another is wearing away of the surface submerged in water. It is well-known that superhydrophobicity is a surface characteristic, so a minor surface intrusion can create imperfections at the contact site [31]. Thus, permanent air capturing in micro/nano grooves is required via the self-healing coating concept to maintain the superhydrophobicity for longer duration.

## 3. Progress in silica nanoparticles based SHCs

Over the past few decades, an active investigation on SHCs has been performed due to their wide range of applications [32–36]. SHCs have been developed using a variety of synthesis methods, such as plasma treatment [37–41], lithography [14,30,37,42–44], sol-gel process [13, 45–53], chemical vapor deposition [54–58], electrospinning [52, 59–65], and colloidal assemblies [66–70]. However, the stability and durability of SHCs are critical to their widespread use. Researchers and manufacturers have used various nanoparticles such as silica, zinc oxide, alumina, titania, etc. to synthesize robust, stable and durable SHCs [13, 58,71–93]. In the present scenario, the selection of SiO<sub>2</sub> nanoparticles to synthesize SHCs are most preferred due to its abundance, economical, transparency and ease of converting it to superhydrophobic material. Therefore, in this review article, silica nanoparticles-based SHCs are reviewed and discussed in detail. Processing methods and properties of

silica nanoparticles-based SHCs are presented in Table 1.

Liu et al. [94] reported a simple and innovative sol-gel route to generate SH coating on a glass substrate using raspberry-like silica nanoparticles for self-cleaning application. A schematic illustration displaying the preparation of hydrophobic SiO<sub>2</sub> particles, SHC, and self-cleaning with water jet impact test is shown in Fig. 1. The coating was synthesized via fluoroalkoxysilane, which was allowed to condensate in ethanol at ambient temperature. Fig. 1(a–c) is displaying the optical photograph of raspberry, raspberry fruit-like silica particle and SH behavior of the coating. The water droplets on the developed coating revealed a spherical shape, with a CA of  $152 \pm 2^\circ$  and SA of  $10 \pm 0.5^\circ$  presenting the superhydrophobic character as shown in Fig. 1(d). The deposited dirt particles on the SHCs were efficiently cleaned by sliding water droplets. Fig. 1(e) illustrates the self-cleaning mechanism via the rapidly buckling of particles by water droplets due to low SA on SHC (Fig. 1(f)).

During the mechanical durability test, the SHC was exposed to a stream of the water jet for 30 s continuously (Fig. 1(g)) that indicating the easy repulsion of the water stream due to the SH nature of the surface. After the water jet impact test, the SEM images revealed negligible damage to the SHC at the micron level (Fig. 1(i)). However, during the increased exposure of water jet (120 s) the coating becomes unstable (Fig. 1(h)), resulting in wetting of the coated surface with decreased WCA of  $105^\circ$ , as clearly visible in the SEM Images (Fig. 1(j)). To stabilize the developed SHC, more research is needed in terms of optimizing nanoparticle size.

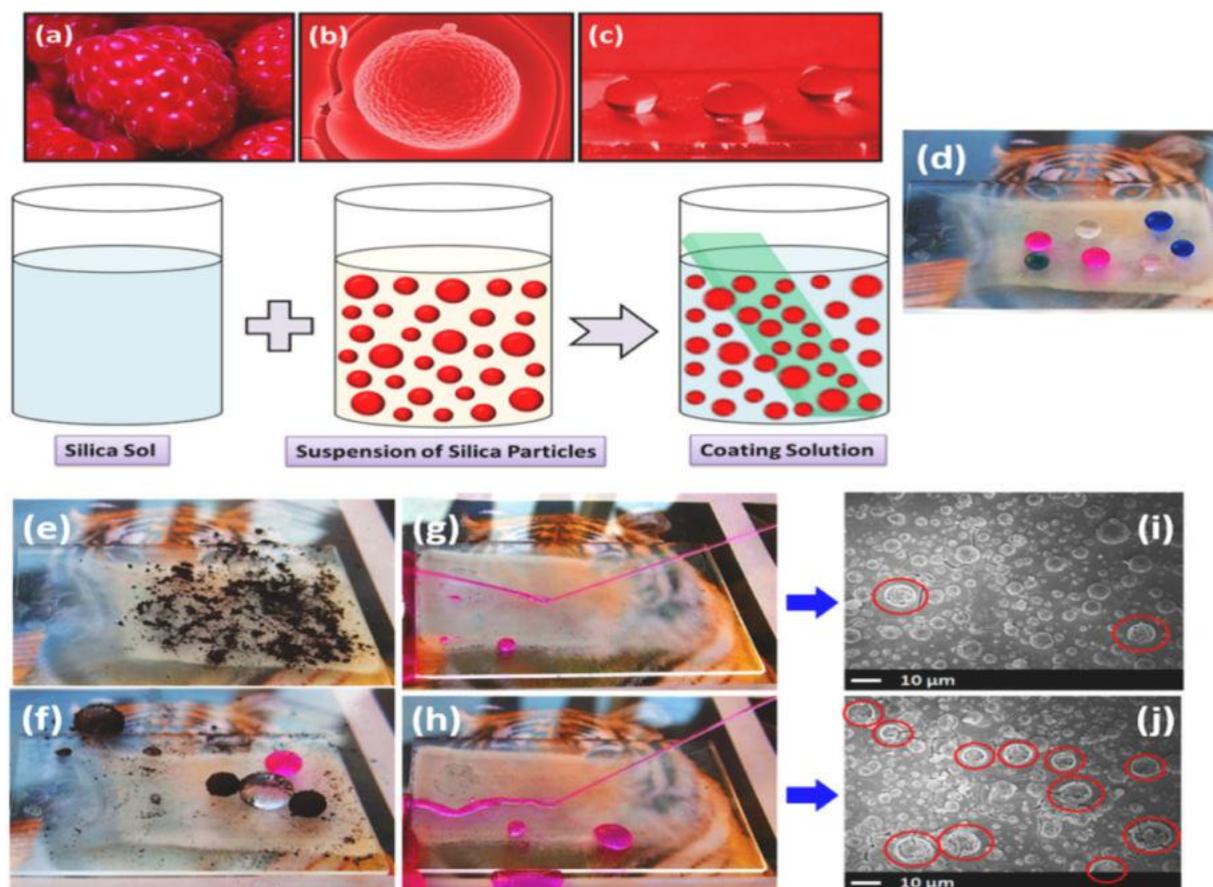
In another study, Mahato et al. [47] reported the preparation of environment-friendly highly hydrophobic coating on glass substrate using polystyrene (PS) as the base matrix. A silane agent 3-mercaptopropyltrimethoxy was used as an accumulating agent to obtain expected surface roughness. Another silane agent, chloro-trimethyl silane, was used to prepare the coating. Fig. 2 shows 2D and 3D AFM images of

PS/SiO<sub>2</sub> coatings with a 1% and a 5% content of SiO<sub>2</sub> nanoparticles. Fig. 2(a) shows an estimated roughness of 5 nm for PS/SiO<sub>2</sub>(1%). However, the significant rise in surface roughness shown in Fig. 2(b) for PS/SiO<sub>2</sub>(5%) suggests that surface roughness increases up to an optimal concentration of silica nanoparticles. It's not possible to increase CA any further without treating the nanoparticles or coating the surface with low-energy materials. However, the durability of the developed coating was not investigated.

In another study, Cui et al. [95] reported a novel and environment-friendly PVDF-PDA-SiO<sub>2</sub> membrane. To create the PVDF-PDA-SiO<sub>2</sub> nanostructure surface, phase inversion was used to coat polyvinylidene fluoride (PVDF) with polydopamine surface-modified with SiO<sub>2</sub>. Nanocomposites with polydopamine coatings have improved long-term stability as well as homogeneous SiO<sub>2</sub> dispersion on the membrane surface. Because of its unique micro nanostructure and pore-induced capillarity, the developed coating exhibits advanced super-hydrophilic/underwater superoleophobic characteristics as well as stunning antifouling oil performance. The hydrophobicity of several films was evaluated using the WCA values presented in Fig. 3. Purified PVDF has a WCA of  $132 \pm 2^\circ$  when mixed with 5  $\mu$ L of air-borne water, demonstrating that PVDF has a very hydrophobic membrane surface due to the enormous quantity of fluorine bonded to it as shown in Fig. 3(a). With a layer of dopamine on top of the film represented in Fig. 3(b), the film transitioned from hydrophobic to hydrophilic, with a WCA of about  $87 \pm 2^\circ$ , showing the dramatic recovery in the film's hydrophilic character from the film's hydrophobic character. Within 9 s of contact with a water drop on the PVDF-PDA-SiO<sub>2</sub> nanostructure surface, WCA dropped to  $0^\circ$  from  $18 \pm 2^\circ$ , demonstrating the material's remarkable hydrophilic nature as shown in Fig. 3(c). A novel micro-nano structure in the PVDF-PDA-SiO<sub>2</sub> nanostructure film provided exceptional hydrophilicity. A high value of CA at  $154 \pm 2^\circ$  was found in Fig. 3(d) having 5  $\mu$ L of dichloroethane, and images showed no change in CA as the exposure

**Table 1**  
Processing method and properties of silica nanoparticles based SHCs.

Processing Method	Nano particles	Functionalizing Agents	Contact Angle ( $^\circ$ )	Sliding Angle ( $^\circ$ )	Properties	References
Sol-gel	Raspberry like SiO <sub>2</sub>	fluoroalkoxysilane	$152 \pm 2^\circ$	$10 \pm 0.5^\circ$	Transparency, mechanical durability, self-cleaning	[94]
Sol-gel	Spherical SiO <sub>2</sub>	Chloro-trimethyl silane	$>140^\circ$	–	Wettability	[47]
Phase inversion	SiO <sub>2</sub>	poly-dopamine	$154 \pm 2^\circ$	–	oil-water separation	[95]
Sol-gel electro-decomposition	Al <sub>2</sub> O <sub>3</sub> -KH560-SiO <sub>2</sub>	–	$158.3^\circ$	–	Anti-corrosion	[96]
Sol-gel dip coating	SiO <sub>2</sub>	$\gamma$ -Aminopropyltriethoxysilane	$155^\circ$	$<2^\circ$	Transparency, Thermal stability, self-cleaning	[97]
Two-step sol-gel dip coating	SiO <sub>2</sub>	methyltrimethoxysilane	$>161^\circ \pm 2^\circ$	$<7^\circ \pm 2^\circ$	Anti-corrosion	[98]
Air spray method	Metal silicates with SiO <sub>2</sub> , TiO <sub>2</sub>	–	$156.8^\circ$	$28^\circ$	Fluorine free superhydrophobic coatings	[99]
UV cross-linking	Hydrophobic fumed SiO <sub>2</sub>	polydimethylsiloxane	$160^\circ$	–	Durable superhydrophobicity	[100]
Wet chemical and dip coating	SiO <sub>2</sub> -CuO	polydimethylsiloxane	$146^\circ \pm 6^\circ$	–	Antibacterial and Corrosion Resistance	[101]
Solution immersion	SiO <sub>2</sub>	polyfluoroalkoxy	$153.5^\circ \pm 1^\circ$	–	Wear-resistant superhydrophobic coatings	[102]
Drop coating	SiO <sub>2</sub>	Chlorotrimethylsilane and Octadecyltrichlorosilane	$156^\circ \pm 1^\circ$	–	Superhydrophobicity and oil/water separation	[103]
Spray coating	SiO <sub>2</sub> , TiO <sub>2</sub> , and aluminum stearate	–	$152.5^\circ$	–	Corrosion resistance superhydrophobic coating	[104]
One-step electrospinning	SiO <sub>2</sub>	Methyl silicone oil	$151.6^\circ \pm 1.7^\circ$	$7.4^\circ \pm 1.2^\circ$	Oil-water separation	[105]
Solvent assisted spray coating	SiO <sub>2</sub>	–	$169.7^\circ$	–	Durable superhydrophobicity	[106]
Solvent assisted spin coating	SiO <sub>2</sub>	Hexadecyltrimethoxysilane	$150^\circ$	–	anti-corrosion	[107]
Painting-scrapping method	SiO <sub>2</sub>	Triethoxy-1H,1H,2H,2H-tridecafluoro-n-octylsilane	$153.6^\circ$	–	Robust and Anticorrosive Superhydrophobic Coatings	[108]
Dipping and spraying technique	SiO <sub>2</sub>	Octadecyltrichlorosilane	$161^\circ \pm 1^\circ$	$2^\circ \pm 1^\circ$	Anti-corrosion	[109]
Spraying method	CNT-SiO <sub>2</sub>	Triethoxy1H,1H,2H,2H-tridecafluoro-n-octylsilane	$156^\circ$	–	Superhydrophobic and conductive coating	[110]



**Fig. 1.** Schematic illustration of the preparation of hydrophobic  $\text{SiO}_2$  particles and SHC. (a) Optical photograph of raspberry, (b) raspberry fruit like silica particle, (c) SH behavior of the coating, (d) optical photograph of colorful water droplets on the SHC, (e) optical image of dust-covered SHC, (f) optical image of self-cleaned SHC with water droplets. Water jet impact testing image of SHC after (g) 30 s and (h) 120 s with their corresponding SEM images (i) and (j) [94].

period increased. This proves that nano-films are also antifouling. According to the results, the new nanostructure film possessed hydrophilic and superoleophobic properties, both of which are beneficial for improving oil-water emulsion separation.

Further, the mechanical stability of the PVDF-PDA- $\text{SiO}_2$  membrane was examined, and the membrane demonstrated outstanding efficiency of 98% even after ten cycles of dichloroethane-water emulsions devoid of surfactants and stabilized by surfactants.

In another work, Zhao et al. [96] reported durable anticorrosive SHCs for metals. They introduced an efficient method to develop SHCs. To make composite nanoparticles with a positive charge, several ultra-filtration criteria were utilized. The smooth surface of the steel substrate was converted to a rough surface with micro-nano level roughness by the sol-gel electro-decomposition technique. To customize the surface, researchers employed a fluorine-free reagent stearic acid with decreasing surface energy. Non-coated metal surface revealed a uniform surface with a WCA of  $69^\circ$  that is hydrophilic. However, the metal surface coated with modified  $\text{Al}_2\text{O}_3$ -KH560- $\text{SiO}_2$  shows a WCA of  $158.3^\circ$  indicating its superhydrophobic character. Film thickness was controlled by electrodeposition time. The electrodeposition time significantly affected the microstructure and roughness of the coating. Fig. 4(a) represents the electrodeposition time effectiveness on the super-hydrophobic character of the surface. The CA increases as the surface roughness increases, reaching  $158.3^\circ$  from  $147.5^\circ$ , but then it drops to  $144.6^\circ$ , which might be the consequence of a change in its roughness, as seen in Fig. 4(b and c). The nanoparticle deposition on metal was reduced because of the short deposition times, and the resulting surface roughness was unable to withstand water drops. Moreover, if deposition time increases, a large number of nanoparticles

were deposited on the metal surface, developing a thick layer that decreases the WCA presented in Fig. 4(c–f). The nanoparticle deposited metal substrate exhibited the highest CA of  $158.3^\circ$ . Later, (a.c.) impedance and polarization curves were used to assess the coating's anti-adhesion property in corrosive liquid. The specimens exhibited good SH properties at depositions of 3 min. However, the superhydrophobicity and surface deformation of the coated substrates occurred after 120 days in a corrosive environment exhibiting the excellent durability of the coating in a corrosive environment for a few months.

In another interesting work, Xu et al. [97] reported the preparation of a highly transparent, stable superhydrophobic coating via a facile sol-gel dip-coating route. Silica colloid particles of 60 nm were aggregated via  $\gamma$ -Aminopropyltriethoxysilane (APS) aggregating agent. Superhydrophobicity with high transparency and good thermal stability ( $20$ – $90^\circ\text{C}$ ) was achieved in a single coating. The surface features, transparency, and superhydrophobicity of the coating were tuned by controlling the concentration of the APS. An optimal quantity of APS (0.36%) results in a CA of  $155^\circ$ , with SA  $< 2^\circ$  and maximum transmittance of 88%. Optical images of water droplets on superhydrophobic coatings consisting different concentrations of APS (0.12%, 0.36%, 0.48% and 0.6%) are depicted in Fig. 5(a–d). However, the sliding of water droplets on the corresponding coatings (tilted at an angle less than  $2^\circ$ ) is displayed in Fig. 5(e–h).

The results indicate good thermal stability of the transparent superhydrophobic coatings useful for various optical applications.

Parale et al. [98] reported a simplistic and cost-effective method for preparing SHCs on various metal surfaces through a sol-gel/dip-coating method at ambient temperature. The root-mean-square (RMS) surface

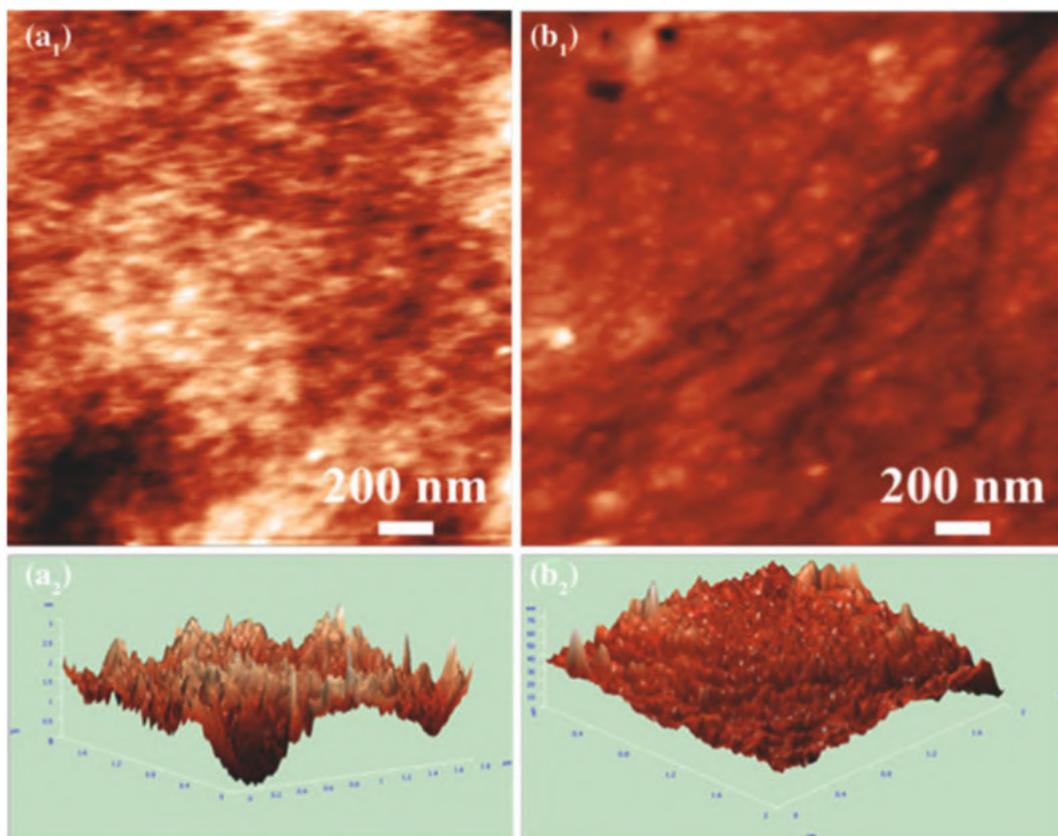


Fig. 2. AFM 2D and 3D pictures of (a) PS/SiO<sub>2</sub> (1%) and (b) PS/SiO<sub>2</sub> (5%) coatings [47].

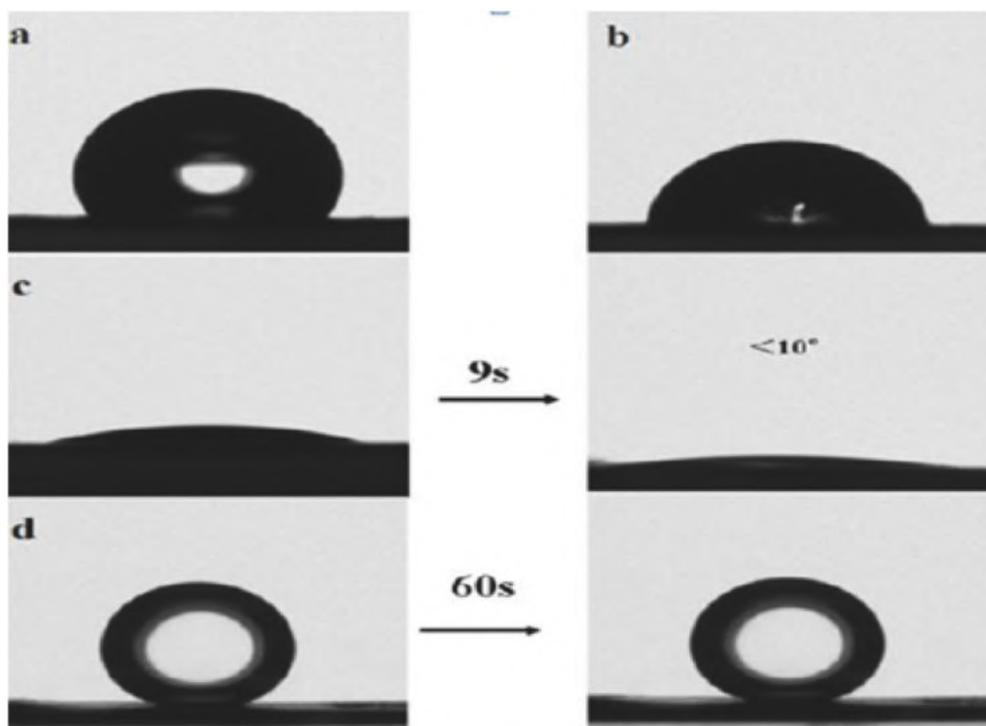
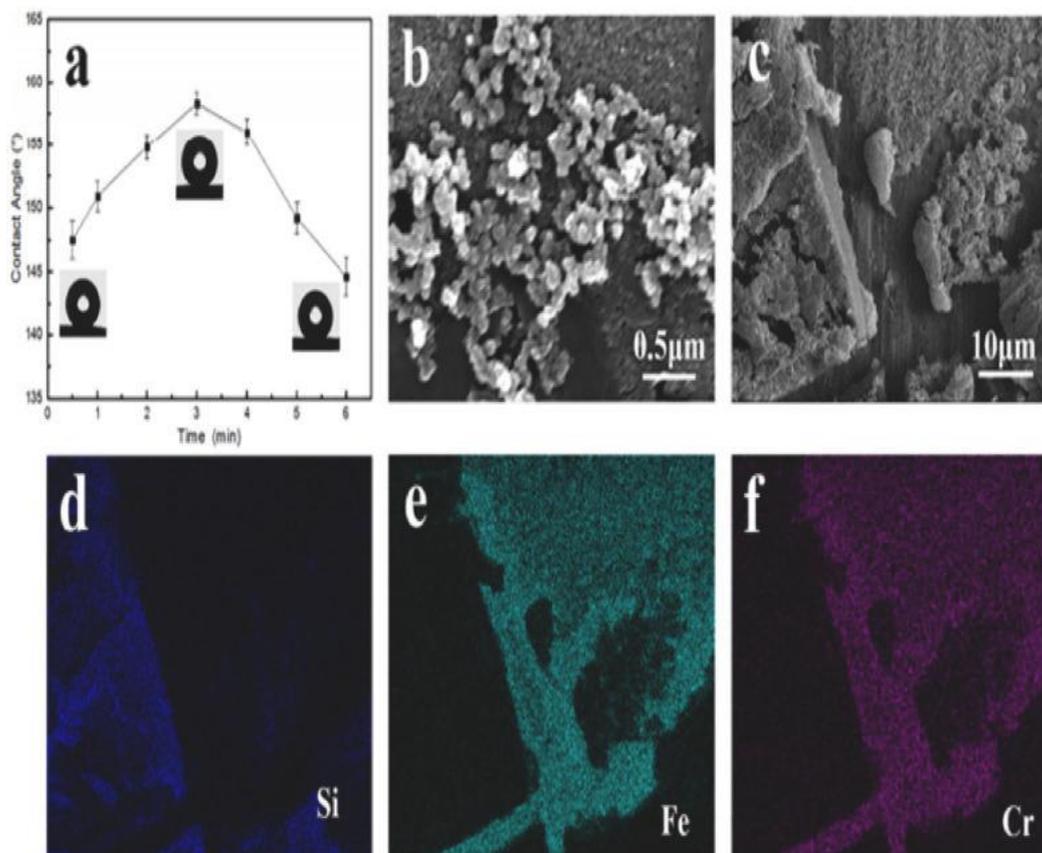


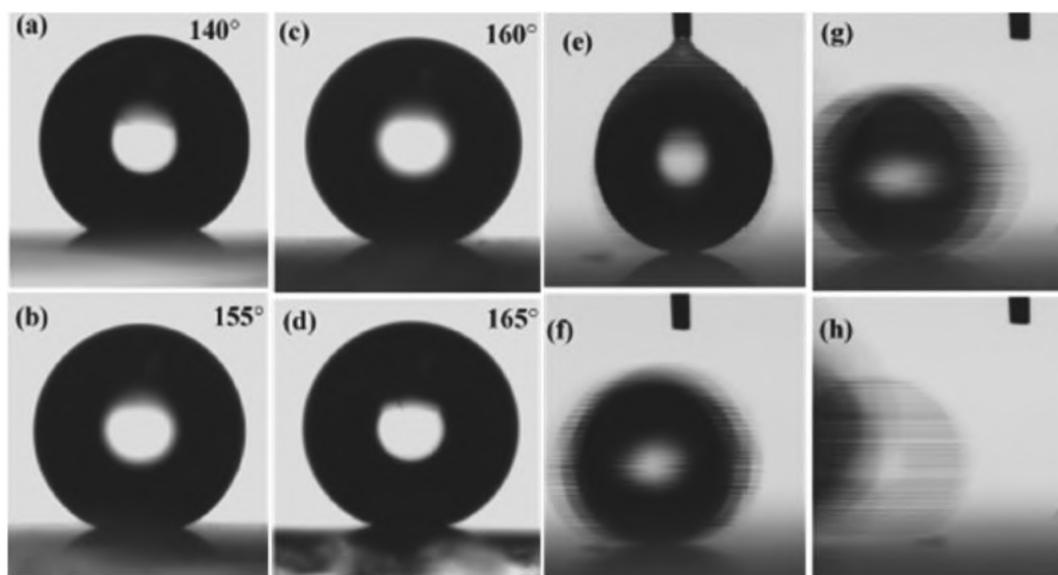
Fig. 3. The WCA of (a) PVDF, (b) PVDF-PDA, and (c) PVDF-PDA-SiO<sub>2</sub> films, (d) underwater oil contact angles of PVDF-PDA-SiO<sub>2</sub> film [95].

roughness of 10.67, 15.06, and 0.41  $\mu\text{m}$  was obtained for different metal substrates layered with silica such as aluminium, copper, and bronze, respectively. The rough surfaces were found responsible for the

superhydrophobicity of the coated metals. Moreover, the silica nanoparticles did not exhibit any aggregation revealed by FESEM images of the substrates, as shown in Fig. 6. All the coated metal substrates exhibit



**Fig. 4.** (a) The variation in a WCA with the deposition time of nanoparticles, (b) SEM analysis at 0.5 min deposition, (c) 6 min deposition, (d) Si particle, (e) Fe particle (f) Cr particle with 6 min deposition [96].



**Fig. 5.** Optical images of water droplets on superhydrophobic coatings consisting different concentrations of APS (a) 0.12%, (b) 0.36%, (c) 0.48% and (d) 0.6%. The sliding of water droplets on the corresponding coatings (e–h) 0.6% (tilted at an angle less than 2°) [97].

$CA > 150^\circ$ . The FESEM micrographs presented that the coated surfaces were rough and had porous deformations. Additionally, anticorrosive properties were investigated through a chemical aging test. They have demonstrated direct exposure of metal surface layered with the film under corrosion species. Their sol-gel-derived coatings show anti-corrosion efficiency when exposed to 50% of HCl mixture for 100 h.

Moreover, the exposure of the coating for about 120 h in acid results in reduced WCA by  $10^\circ$  to  $15^\circ$ . They demonstrated merged surface shows large CAs due to an air/water interface that exhibits SH characteristics.

Anitha et al. [99] reported Salvinia-inspired fluorine-free SHCs via the introduction of nano  $\text{SiO}_2$ ,  $\text{TiO}_2$ , and aluminum stearate with metal silicates in silicone resin. The air spray method was used to prepare

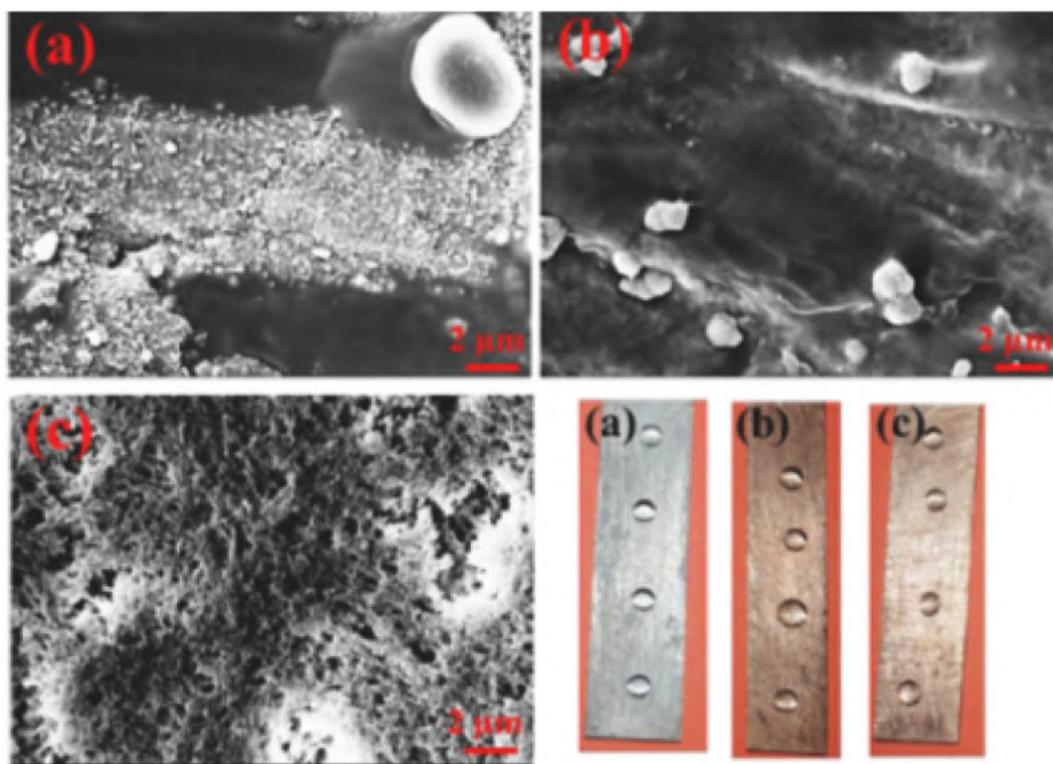


Fig. 6. FESEM images of silica nanoparticles consisting of layers over (a) aluminum, (b) bronze, (c), and copper substrates [98].

coatings of various compositions on mild steel. Virgin resin exhibits hydrophobic nature with a CA of  $93.5^\circ$  and SA of  $60^\circ$ . On introducing metal silicates and nano-silica, nano-titania, and aluminium stearate, the CA increases to  $156.8^\circ$ , and SA is reduced to  $28^\circ$ . Pigments with physical and chemical intimacy were found responsible for generating SHCs. A polymer binder helps pigments and additives to stay bound. Salvinia effect was found responsible for attaching liquid drops, which were applied to synthesize and accumulate silica pigments that exhibit hydrophilicity for cobalt silicate, copper silicate, iron silicate, and nickel silicate with WCA of  $62.0^\circ$ ,  $65.5^\circ$ ,  $84.6^\circ$ , and  $66.1^\circ$ , respectively. The hydrophilicity present among silicates was because of hydroxyl chains. The micro/nano dual roughness of the films was achieved by incorporating micro and nanoparticles which were found responsible for imparting SH property to the films. Additionally, anti-corrosion, adherence, water intake, and water vapor diffusion studies of the developed films were performed and it was realized that the films are reliable up to a certain extent and can be utilized for practical applications.

Fourmentin et al. [100] reported the synthesis of fluorine-free bio-stimulated silica packed cross-linked photo polyurethane-acrylate (PUA) nanostructure films. The loading of silica from 0 to 60 wt%, element composition and surface deformation at various scales including wetting properties of nanocomposite films were investigated. Fig. 7(a) shows different wettability characteristics of PUA nanocomposite based on silica content. The low content of silica up to 30 wt% exhibits the hydrophilic character of the nanocomposite, this is the Wenzel regime (Fig. 7(b)). However, silica content of 40 wt% shows prominent polar characteristics with micron-size roughness not enough to generate superhydrophobicity. However, the silica content of more than 50 wt% is found responsible for the superhydrophobic character of the nanocomposite with a WCA larger than  $150^\circ$ . The introduction of polydimethylsiloxane (PDMS) in the nanocomposite films increases the deformation of the nanostructure surface and hydrophobicity. The surface of nanocomposite films rotated through  $90^\circ$  revealed that the water drops sticking with the surface (Fig. 7(b)), such unusual wetting

behavior is the Cassie regime, and it shows the “rose petal effect”. The nanocomposite films with 60 wt% silica show zero water and coating interactions; this can be linked to variation from the Wenzel region to Cassie-Baxter region (Fig. 7(b)). In this regime, the adhesive nature of water decreases. For the surface of the coating, air cavities are produced in two scales – among primary silica that is nano-scale and fused silica that is micro-scale. At this level, water can't get inside air cavities that decrease major water contact regions over the surface. Roughness exposed to water is zero. Synthesized slippery and sticky nanostructure films showed long-lasting wettability performances.

Tavakoli et al. [101] reported the preparation of hydrophobic nanostructure of poly-dimethyl-siloxane (PDMS)- $\text{SiO}_2$ -CuO. A wet chemical technique was employed followed by a dip-coating process to prepare CuO and  $\text{SiO}_2$  nanopowders consisting of PDMS- $\text{SiO}_2$ -CuO (PSC) coatings. The developed superhydrophobic coating turns steel into biological compatible, anticorrosive, and anti-bacterial. Accumulating silica content enhances a WCA to  $89.5^\circ$ . Moreover, the WCA was promoted to  $142.8^\circ$  with the increase of CuO particle to  $<2$  wt% because of the surface roughness. The PDMS- $\text{SiO}_2$ -1wt%-Cu (PSC1) showed the highest hydrophobic behavior with a WCA  $146.8^\circ$ . However, PSC-0.5 wt% coating offers a maximum adhesive capability that is almost equivalent to a PDMS film as CuO accumulates more than silane content over the surface. The increase in CuO content up to 1 wt% (PSC-1 wt%) results in a magnificent reduction of corrosion current ( $I_{\text{corr}}$ ) values, and adding CuO content improves surface roughness from 1.14 to 2.49  $\mu\text{m}$ . Hence air can be trapped between microchannels under the coating to safeguard the surface from corrosion. However, the accumulation of CuO increases and develops micro openings over the surface. That deformation helps the corroded mixture get diffused in coating and reaches the steel surface to increase corrosion. The merging of CuO nanoparticles  $<2$  wt% enhanced the anti-corrosion property of steel. The developed PDMS- $\text{SiO}_2$ -CuO nanostructure coating is also useful in biomedical implants. However, the stability studies of the coating were not performed which is very much desired for their practical applications.

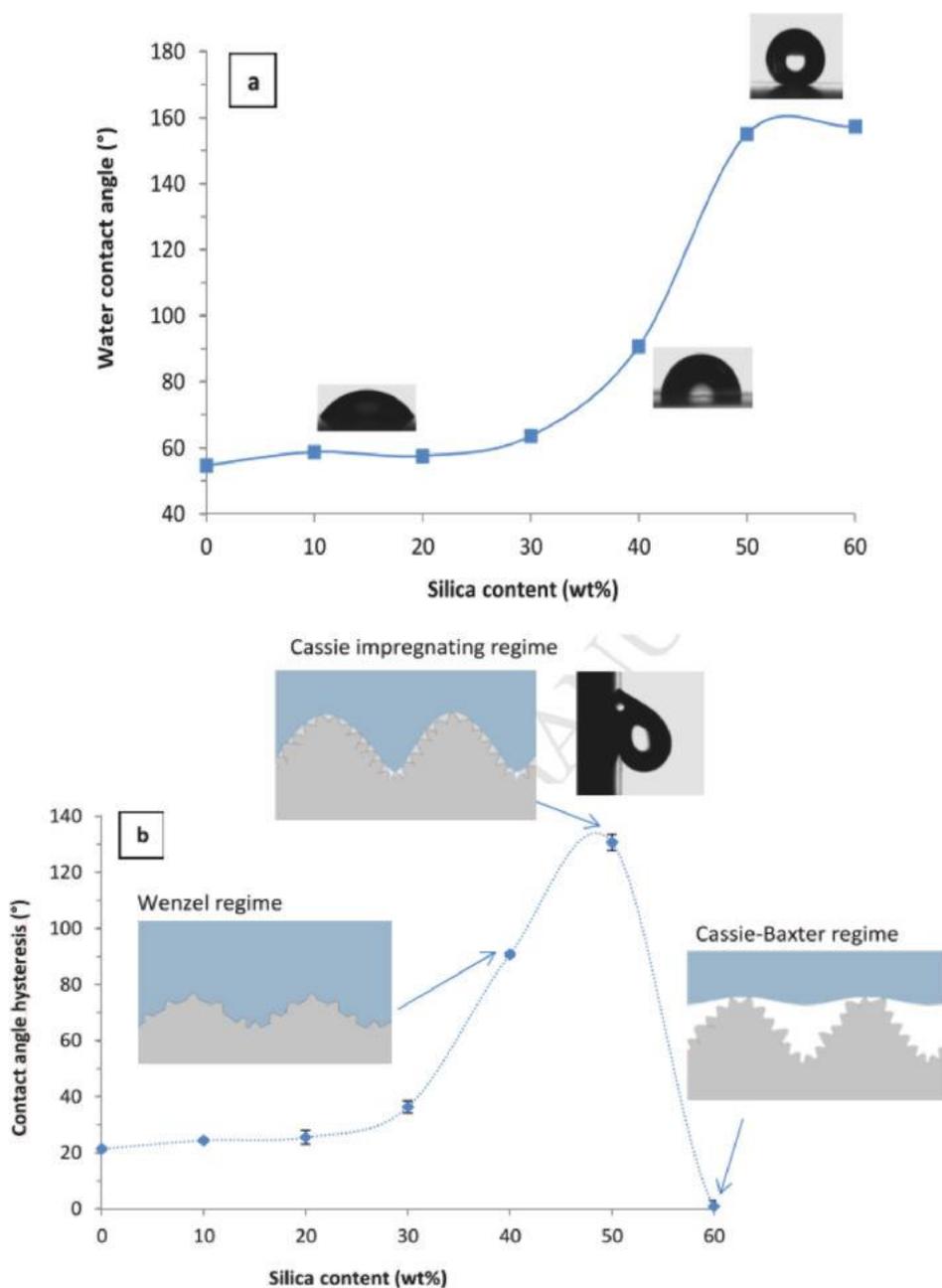


Fig. 7. (a) The variation of WCA with silica particle content, (b) the WCA hysteresis versus silica particle content. A graphic presentation of wettability systems [100].

Wang et al. [102] reported the integration of cotton fiber fabric epoxy composites: the composites containing hydrophobic nano  $\text{SiO}_2$ , polyfluoroalkoxy (PFA), and polyurethane (PU) to develop long-lasting wear-resistant SHC. Fig. 8(a and b) revealed surface morphologies of plain cotton fabrics and cotton fabrics processed through etching, and cotton with hydrophobicity was observed through SEM, which indicates that plain cotton had a closely packed structure and having stuck out the fabric. That shows some roughness of fiber, but the magnified picture shows raw cotton having an even surface. Fig. 8(c) tells that a chemically-etched cotton structure can entrap air in good quantity so that water drops can be rolled off. Fig. 8(d) reveals that pits above fiber contributed towards micro-scale roughness. So, the cotton processed through etching can exhibit super hydrophilicity (Fig. 8(e)). The hydrophobic cotton shows a rough surface having a PDMS cluster among gaps. But that doesn't create any variation to the rough surface of the etched and processed fabric (Fig. 8(f)). Such deformation of the surface

and less surface energy makes cotton more water repellent. Fig. 8(g and h) showed that the WCA of prepared films increases with increasing the value of PFA. With PFA as a single component in the epoxy mixture, nano-film had no SH characteristics and weak anti-corrosion property. However, PFA and silica in the epoxy mixture jointly showed SH characteristics but without corrosion resistance properties. However, mixing PU in the epoxy mixture with PFA and silica exhibits anticorrosive properties but with a small WCA. The PFA decreases the surface energy and helps to make a graded structure for increasing surface roughness, and makes the combination responsible for SH characteristics. At the same time, the presence of PU in the SHC offers good corrosion resistance. The relation between the WCA versus pH of the SHC is shown in Fig. 9. The findings show that pH change has no impact on the SHC's wetting capabilities. As a result, the developed coating has exceptional corrosion resistance even under extreme circumstances. Such anti-corrosion superhydrophobic coatings are of great interest to the

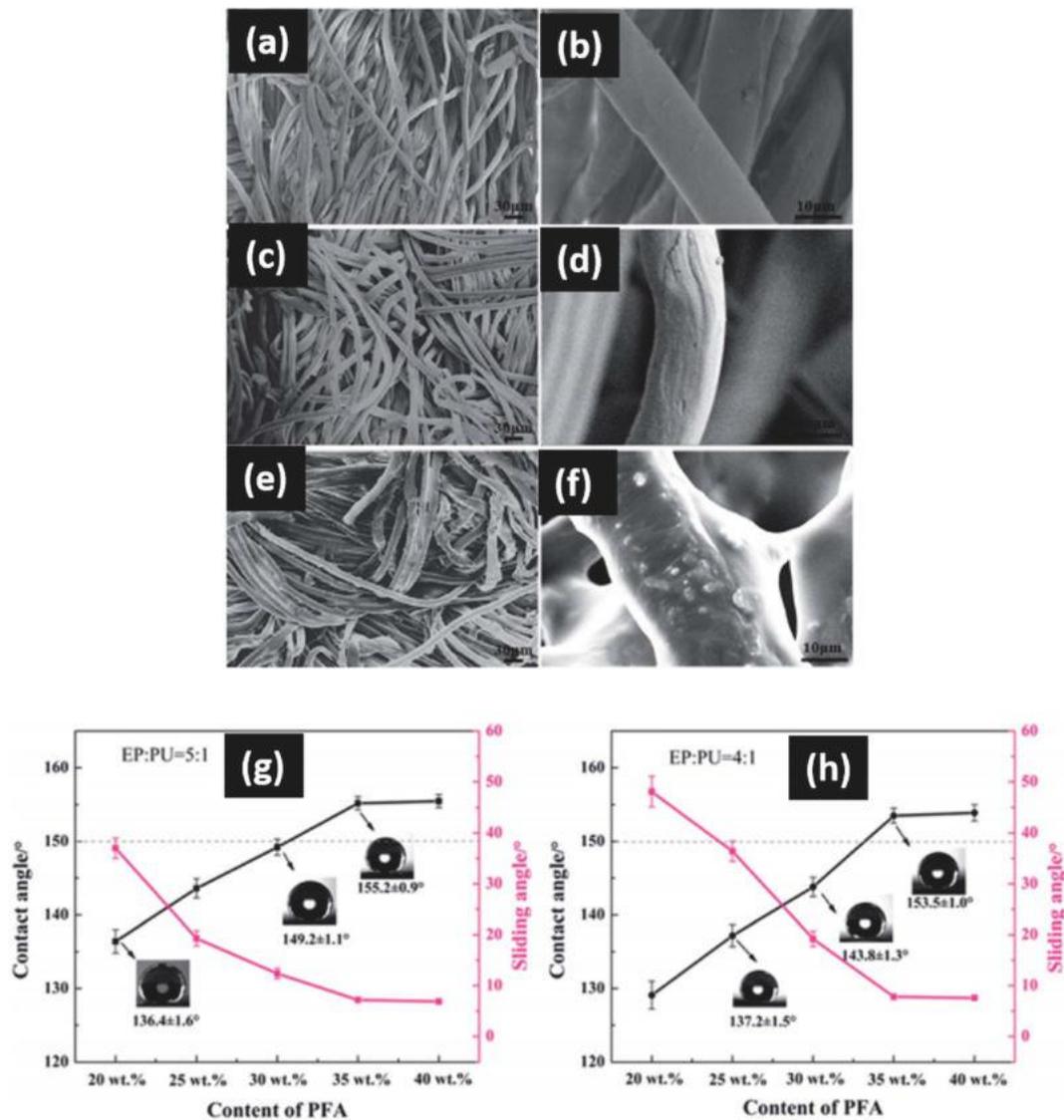


Fig. 8. SEM images of (a) as received cotton fabric, (c) E-fabric and (e) S-E-fabric, and (b), (d), (f) are the corresponding magnified images of (a), (c), and (e), respectively. The variation of CA of fiber fabric/epoxy composites coatings is affected by the content of PFA and ratios of EP/PU ((g) 5: 1, (h) 4: 1) [102].

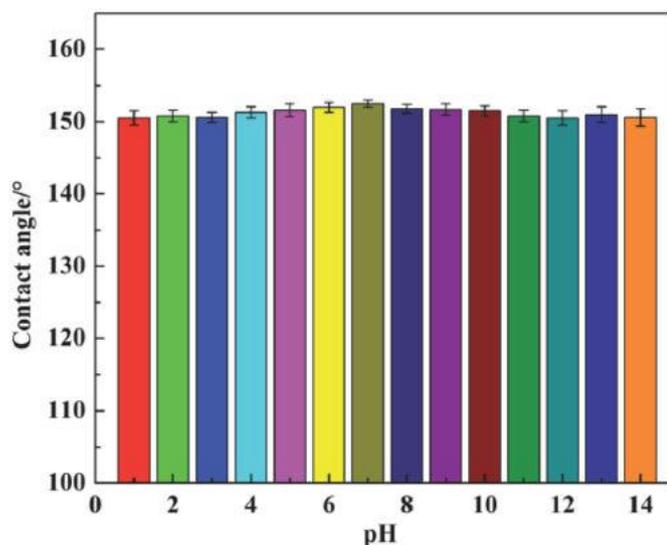
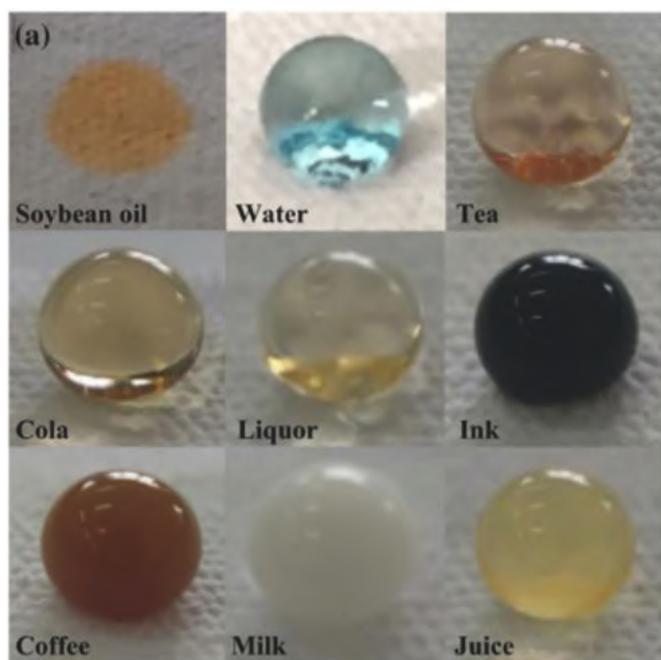


Fig. 9. The relation between the WCA versus pH of the SHC [102].

industry if their fabrication cost can be minimized.

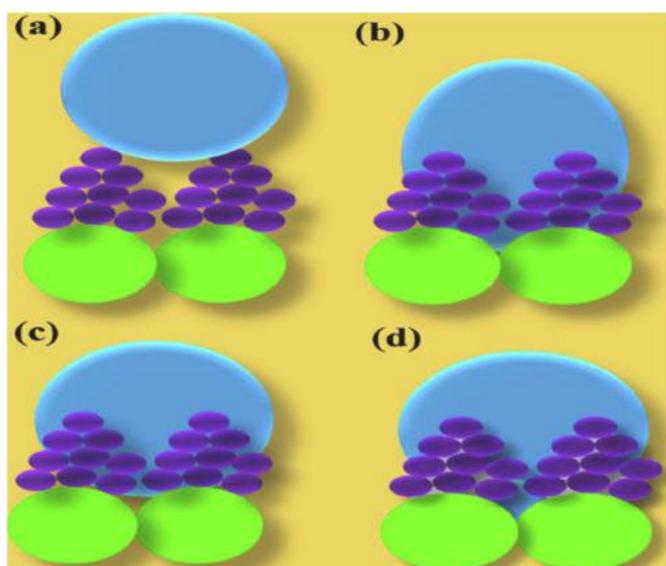
Seeharaj et al. [103] discovered a simple method for silanizing SH silica (SiO<sub>2</sub>) surfaces by employing double alkylsilanes as silanized. In the cotton fabric, the dual silanization was shown to reduce the surface energy while increasing the hierarchical micro-nano-scale roughness. To produce a CA of 156° ± 1°, a dual silanized SiO<sub>2</sub>/polystyrene (PS) composite was applied to the cotton fabric in a 2:1 ratio. As a result, the fiber gains superhydrophobicity. Water repellency and oil/water separation capacity were found to be exceptional with the newly designed cotton fabric-based filters due to their reusability. Fig. 10 depicts the wetting behavior of superhydrophobic cotton fabric filters following a drop test with soybean oil, water, tea, cola, liquor, ink, coffee, milk, and juice. After the soybean oil test, the surface becomes flat and the oil is filtered through the top layer of the test tube instantly. Droplets of a spherical form, on the other hand, will roll down an inclined surface. In order to be effective in oil/water separation, the designed filters must have a superoleophilic and superhydrophobic nature. The developed silica consisting filters have the potential to be treated as reliable filters for recovery of various oils.

Anitha et al. [104] reported the preparation of fluorine-free SHCs using various particle-sized silica. Different compositions of various sized silica accompanying nano titania and aluminum stearate blended



**Fig. 10.** Images of soybean oil, water, tea, cola, liquor, ink, coffee, milk, and juice droplets on superhydrophobic cotton fabric filters [103].

in a matrix of silicone adhesive to synthesize the SHCs. The developed coating revealed a WCA of  $152.5^\circ$  with micro-nano roughness that enhances adhesion, abrasion, and impact resistance of the coating. The coating was fabricated by evaporating the solvent during spraying. Water immersion analysis was performed to estimate the lifetime of air trapped in the coating. The results showed that SA decline due to the increased content of bigger size nanoparticles. However, the SA increases with the increase of small-sized nanoparticles, leading to the different wetting states as displayed in Fig. 11. Additionally, almost all the coatings presented outstanding corrosion resistance that can stand up to 1000 h of salt spray test. This research contributes to a better understanding of dual-scale roughness as well as the manufacturing of SH surfaces with optimal design and a stable Cassie-Baxter interface.



**Fig. 11.** The various wetting regimes involved in multi-scale roughness (a) Micro-nano scale Cassie Regime, (b) Micro-nano scale Wenzel regime, (c) Micro Cassie-nano Wenzel regime (d) Micro-Wenzel-nano Cassie regime [104].

The developed coating can be treated as a highly reliable corrosion-resistant SHC and is very useful for industrial applications.

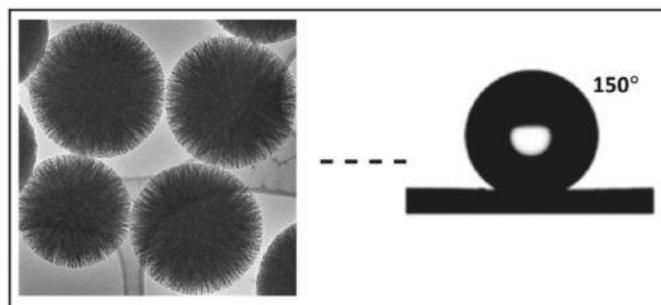
Fihri et al. [107] reported a facile method for the development of fibrous SH silica using economic and adaptable criteria. Alkyl chains can change the hydrophilic character of silica nanoparticles to hydrophobic ones. But unique deformation of the silica sustains even after alteration with alkoxy-silane reagents. The roughness of the surfaces was achieved using micro nano-structured particles trapping on the surface of adhesive. A high-resolution TEM image of hydrophobic nanoparticles and an optical image of CA of superhydrophobic coating are shown in Fig. 12.

Additionally, the SHC is found long-lasting and stable against corrosion tests. Developed SHCs show firm water resistance surfaces, admirable durability, and an anti-corrosion surface. It was reported that air-filled voids in the coating behave like dielectric that is a parallel plate capacitor and safeguard the transferring of electrons from electrolytes to a surface of the carbon steel. That enhances the anti-corrosion characteristics of the SHC.

Gao et al. [110] reported the fabrication of hierarchical fluorinated carbon nanotube (F-CNT)/SiO<sub>2</sub> nanostructure-based SHC on an elastic tape via a facile spraying method. The corrosion resistance of SHCs was evaluated by submerging them in a liquid solution with pH values ranging between 1 and 13. While the pH changes, the WCA remains above  $150^\circ$ , indicating the anti-corrosive capability of the coatings. The endurance of the anticorrosive layer was examined using black elastic tape coated with F-CNT/SiO<sub>2</sub> and immersed in a strongly acidic solution (pH = 1). The results demonstrate that the WCAs and surface conductivity of the SHCs have a minor variation (Fig. 13(a and b)). Further, Fig. 13(c) shows that strain on elastic tape increases from 0% to 100% with no change in the WCA which remains above  $150^\circ$ . Even after repeated sandpaper abrasion, the coating maintains its superhydrophobic properties, demonstrating its long-term durability as shown in Fig. 13(d).

In another work, Zhang et al. [105] reported a one-step electro-spinning method to fabricate hydrophobic polycaprolactone (PCL) membrane with a hierarchical structure. They anticipated enhancing the hydrophobicity of the PCL membrane by embedding liquid methyl silicone (MSO) and hydrophobic silica (SiO<sub>2</sub>) nanoparticles. As a result, they achieved a WCA of  $151.6^\circ \pm 1.7^\circ$  and SA of  $7.4^\circ \pm 1.2^\circ$  for PCL/MSO/SiO<sub>2</sub> composite membrane by generating outstanding surface roughness as well as air-pocket ability on the membranes. Additionally, the developed membrane displayed adequate oil adsorption and oil-water separation. The developed superhydrophobic membrane showed good reliability in terms of oil-water separation application.

Cui et al. [106] reported a new approach of interlinking nano SiO<sub>2</sub> and multiple branched hydrophobic polymer such as poly(dimethylolbutanoic acid-glycidyl ester of versatic acid) (poly(di-MBA-TM10)) to develop a SHC. An embedding approach was employed to develop the SHC which maintains its hydrophobicity even after 100 cycles of sandpaper abrasion and knife-scoring tests. The developed SHC exhibited a WCA of  $169.7^\circ$  and displayed resistance to neutral, alkaline, and acidic media. In addition, the SHC revealed binary micro and nanostructures



**Fig. 12.** TEM images of SH fibrous silica nanoparticles and CA of the alkyl chains introduced fibrous silica nanoparticles-based coating [107].

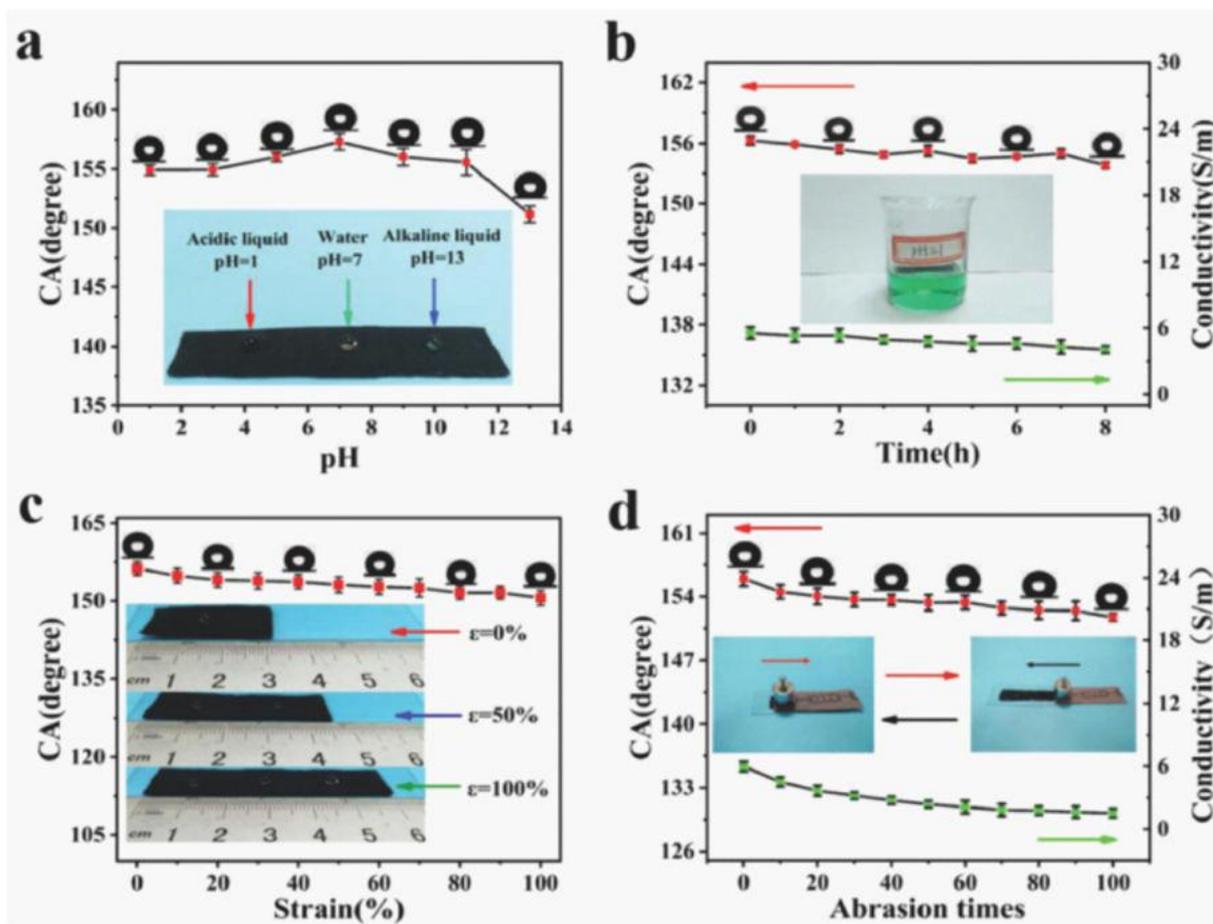


Fig. 13. (a) The WCAs with various pH for the F-CNT/SiO<sub>2</sub> coating, (b) the WCA and conductivity of the coating immersed in an acidic solution with pH = 1 for multiple times, (c) the WCAs of the specimen with various strain (%) values, (d) the WCA and conductivity of the coating versus sandpaper abrasion times with a weight of 20 g [110].

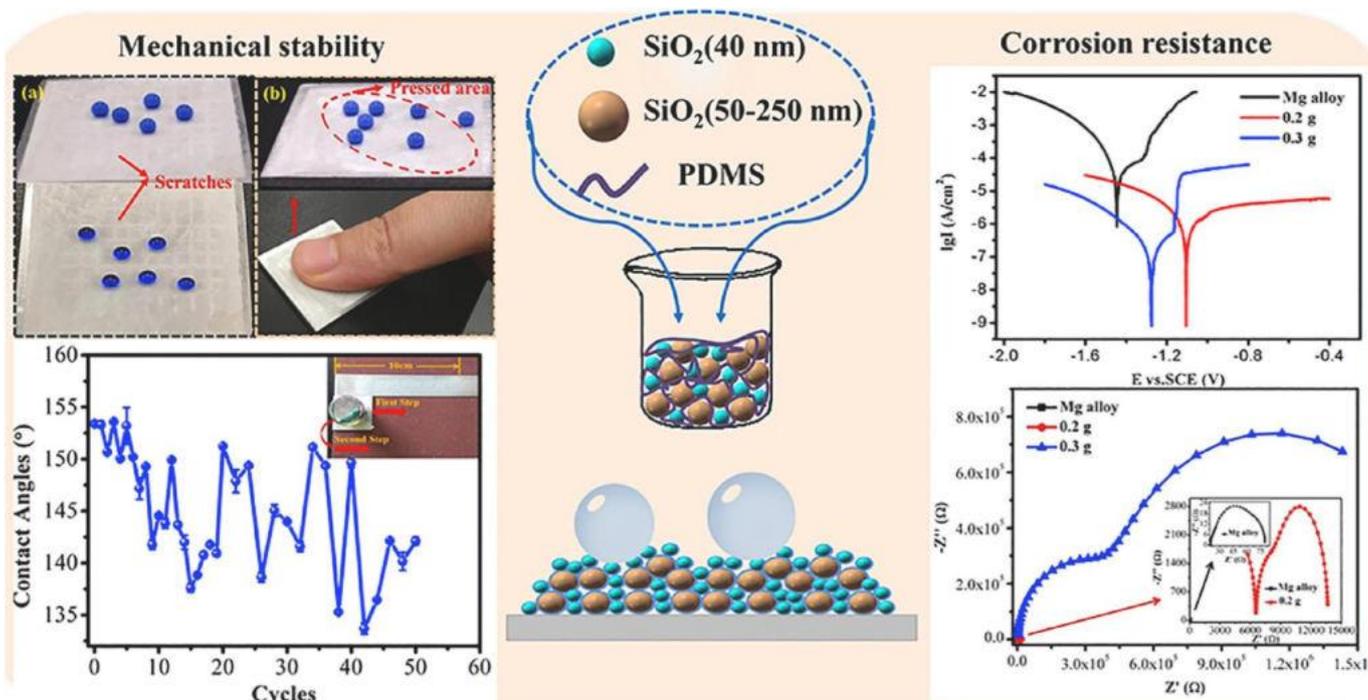


Fig. 14. Mechanical stability, wear performance and corrosion resistance of PDMS/SiO<sub>2</sub> nanocomposite SHC [108].

on its surface. The developed SHC needs further improvement to maintain the superhydrophobicity even after multiple sand abrasion and knife-scoring tests.

Xie et al. [108] reported the fabrication of poly-di-methyl-siloxane/silicon dioxide (PDMS/SiO<sub>2</sub>) films with micro-nano structures via a basic painting process on a magnesium alloy substrate. The SiO<sub>2</sub> nanoparticles of two different size ranges, such as 40 nm and 50–250 nm, were used to develop SHCs with abrasion and corrosion resistance properties (Fig. 14). The size of SiO<sub>2</sub> nanoparticles significantly affects the hydrophobic character of the developed films. Additionally, PDMS/SiO<sub>2</sub> films prepared under optimized process parameters exhibited mechanical stability and superhydrophobicity. The SHCs had maintained high WCAs (138°–150° and 133°–153°) even after 50 sandpaper abrasion cycles. The developed SHC showed excellent mechanical strength and good resistance to finger touching and knife damaging tests. Additionally, electrochemical investigation exhibited that the SHCs can ominously enhance the corrosion resistance of magnesium alloys. The unique robust SHCs can be espoused as corrosion and wear-resistant coatings for magnesium alloys.

Cuia et al. [109] reported the spraying of various percentages of hydrophobic SiO<sub>2</sub> nanoparticles on the aluminum surface to develop SHCs with convenient water repellency and corrosion resistance. The electrochemical experiment was performed on SHCs with dissimilar water adhesion to expose the effect of water sickness on corrosion-resistant ability. The SHCs were immersed in a 3.5 wt % NaCl mixture. The results displayed that the water adhesion on SHC significantly controls the anti-corrosion property of the coating. The developed SHC revealed a unique way to study the anti-corrosion property concerning water adhesion property.

Huang and Yu et al. [111] reported a fluorinated epoxy-silica (FEP-S), multifunctional coating with outstanding mechanical and chemical stability. The developed coating still maintained high amphiphobicity after 10 min of wear testing, indicating great mechanical stability. The coating's superhydrophobic ability remained even after 50 wear cycles, suggesting that the WCA remained higher than 150° as shown in Fig. 15. When the coating was placed in acidic or basic media, the WCAs were compared to determine its chemical stability. The results demonstrate that the coating didn't cling to the droplets as they rolled over it easily. So, the coating revealed highly water-repellent and corrosion resistance (Fig. 15). Additionally, the developed coating exhibited excellent self-cleaning property as shown in Fig. 16. The development of such multifunctional robust coatings can be adopted for industrial applications after further optimization.

Wu et al. [112] fabricated a flexible and robust superhydrophobic coating, F-SiO<sub>2</sub>/PDMS through a simple spraying technique. The inclusion of PDMS improves the dispersion of silica nanoparticles; moreover, the PDMS layer contributes to the achievement of improved mechanical flexibility. The novel superhydrophobic material demonstrated a high WCA of 156.5° and a low SA of 2°, indicating the

significant potential of the SHC for self-cleaning applications (Fig. 17). The anticorrosive characteristics of SHCs were evaluated at various pH ranging from 1 to 14 (Fig. 18(a)), however, the WCA remained over 150°. A sandpaper abrasion test was performed to determine the durability of the SHC which retained its superior hydrophobicity even after five continuous abrasion cycles (Fig. 18(b)). Additionally, F-SiO<sub>2</sub>/PDMS SHC coating exhibited drag reduction application. The development of such robust coatings will be of great use for researchers and manufacturers.

#### 4. Applications of SH coatings

The SHCs or surfaces have a wide range of applications, most notably in the energy industry, where they provide anti-corrosion, anti-freezing, anti-frosting, anti-icing, anti-adhesion, and self-cleaning properties [113–125]. Fig. 19 shows the most typical use of superhydrophobicity. Photovoltaic cells, airplanes, ships, power grids, glass windows, solar panels, submarines, and other related technologies have the potential to fully use the superhydrophobic characteristics for increased durability, robustness, flexibility, and longevity. Superhydrophobic coating made of silica helps accomplish some of these goals.

Developing self-cleaning superhydrophobic structures with little contaminant adhesion has been a long-term study goal for scientists. APS aggregated silica colloid particles [97] and raspberry-like superhydrophobic silica coating [94] created by researchers might be a solution for optical applications, such as self-cleaning solar panels, glass windows, lenses, and mirrors, where rolling water droplets off a superhydrophobic surface removes dust and contaminants. In recent times, flexible self-cleaning superhydrophobic surfaces have been a popular topic for use in electrical and wearable devices as well as sensors. Flexible self-cleaning coatings can be accomplished using a facile SiO<sub>2</sub>/PDMS [112] SHCs.

Corrosion has touched nearly every aspect of life, from the home to numerous sectors, and its prevention is necessary to extend the life of materials and equipment as much as possible. The application of silica-based superhydrophobic coating assists in the development of anti-corrosive characteristics. Researchers have produced several significant silica-based coatings including long-term stable Al<sub>2</sub>O<sub>3</sub>-KH560-SiO<sub>2</sub> coating [96], multifunctional PDMS-SiO<sub>2</sub>-CuO coating [101] that contribute to the growth of anticorrosive properties.

Icing affects people worldwide, and it has a commensurate economic impact. When ice forms on electrical equipment, such as porcelain insulators, energy harvesting devices such as solar panels and wind turbines, aircraft surfaces, offshore installations, and pipelines, it causes major problems. Anti-icing methods like superhydrophobic coatings employ surface modification techniques to keep ice from accumulating on solid surfaces. As a multifunctional SHC, an anti-icing coating composed of fluorinated epoxy-silica (FEP-S) [111] has demonstrated great potential.

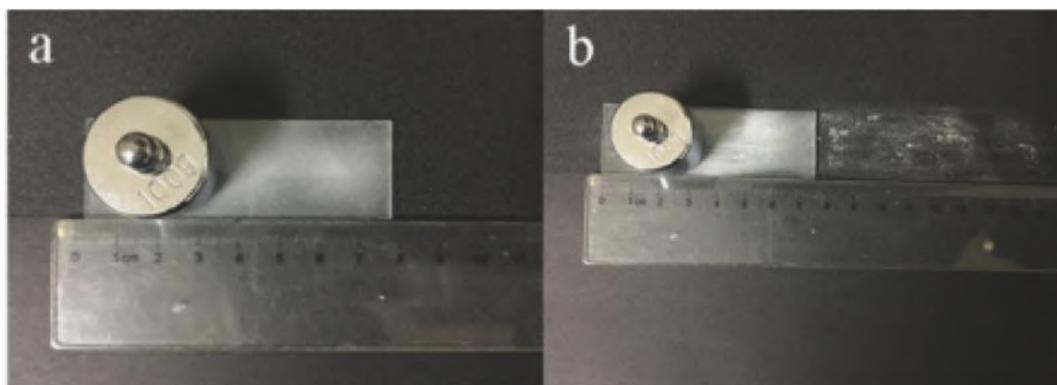


Fig. 15. Fluorinated epoxy-silica (FEP-S) coating before (a) and after (b) sand abrasion test (10 min) [111].

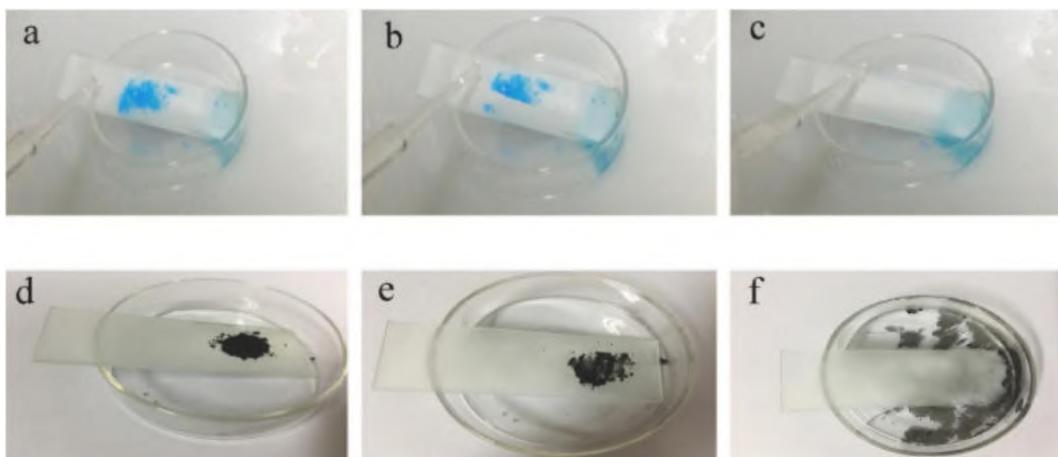


Fig. 16. Self-cleaning performance of FEP-S coating in the presence of (a–c)  $\text{CuSO}_4$  powder and (d–f) carbon black powder [111].

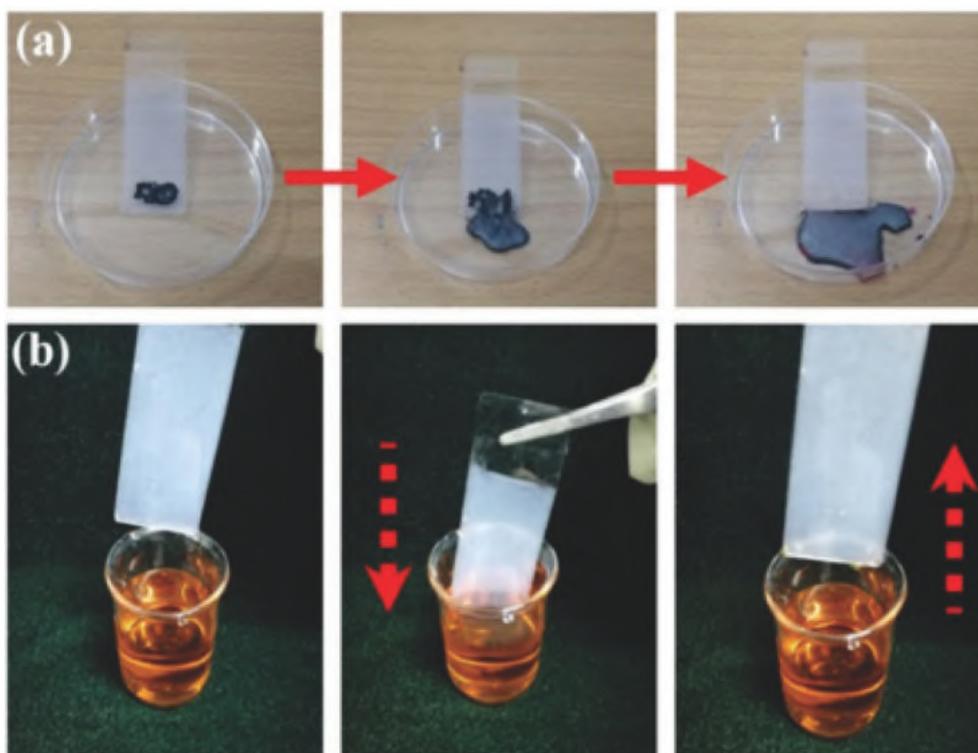


Fig. 17. Self-cleaning properties of  $\text{SiO}_2/\text{PDMS}$  coating (a) water droplets eliminating debris from the coating (b) coated glass before and after colored water soaking [112].

Industrial oil spills and oily wastewater are wreaking havoc on the environment and ecosystem. The application of superhydrophobic coatings such as  $\text{SiO}_2/\text{poly-dopamine}$  [95],  $\text{SiO}_2/\text{octadecyltri-chlorosilane/chlorotrimethylsilane}$  [103], and  $\text{SiO}_2/\text{methyl silicone oil}$  [105], may alleviate these problems while assisting the separation of an oil-in-water emulsion and creating economic value.

## 5. Conclusions

The basics of superhydrophobicity were described in detail. Surface-free energy and surface tension were recognized as the vital factors to play with the wettability of any matter. The SHCs must exhibit WCA from  $150^\circ$  to  $180^\circ$  and SA from  $10^\circ$  to  $0^\circ$ . Many scientists and firms copycat the existing natural superhydrophobic surfaces in various applications. However, the proposed theory-based wetting models require

advancement to meet the requirements of real-world applications of SHCs. The main hurdles to prepare SHCs are mechanical stability and durability of SH surfaces, multi-functionality relevance, lack of novel techniques useful for industrial-scale, expensive superhydrophobic materials, precipitation issue at very low-temperature environments, problems in making permanent air packets into the coating, oil-dripping challenge, etc. The most preferred, cost-effective, and industrially viable routes for the preparation of SHCs are sol-gel, sol-gel followed by spraying, phase inversion, electrodeposition, chemical etching, wet-chemical, and blending of nanomaterials into a polymer matrix by mechanical means. Future works should focus on identifying economical surface modifying agents or production methods of superhydrophobic silica nanoparticles that are highly desired to reduce the development cost of SHCs. Moreover, the silica nanoparticles consisting SHCs are significantly required for anti-corrosion, anti-freezing, anti-frosting,

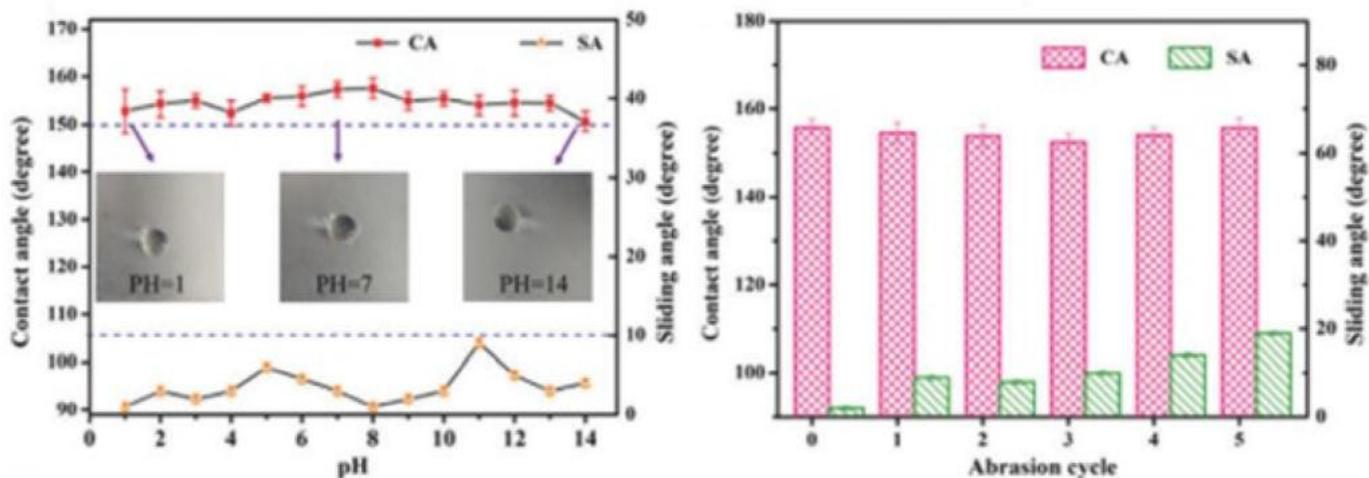


Fig. 18. (a) Plot of WCA and SA of SiO<sub>2</sub>/PDMS coating at varying pH (b) Plot of WCA and SA of SiO<sub>2</sub>/PDMS coating after five abrasion cycles [112].

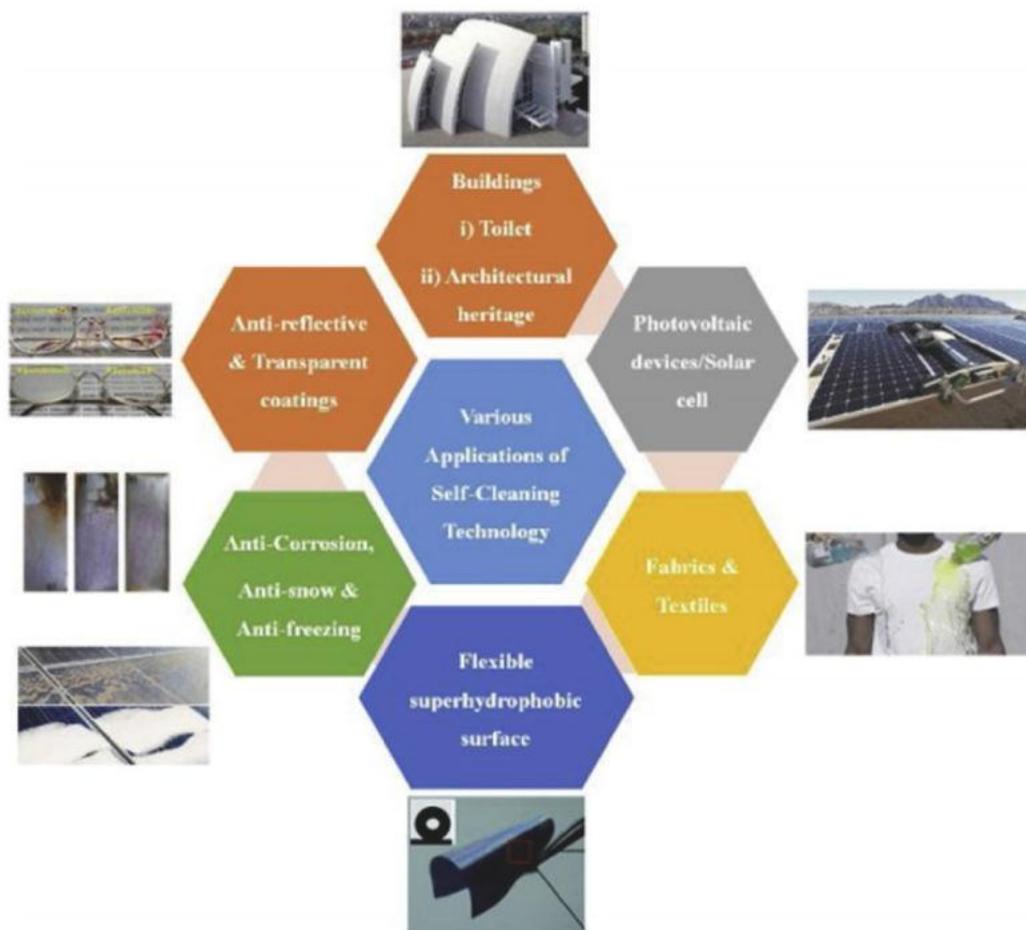


Fig. 19. Potential applications of the SHCs [123].

anti-icing, anti-adhesion, self-cleaning applications. The durability of silica nanoparticles consisting SHCs needs to be improved using better durability valuation techniques. New durability assessment approaches should mimic the actual exposure conditions of the superhydrophobic coatings.

**Declaration of competing interest**

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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## **“Laddishah”: A Conceptual Analysis and Study of Kashmiri Folklore**

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### ABSTRACT

India is land of cultural diversities; every region in India has its own form of folk music. This rich tradition of folk music is very much alive in not just rural India but also in some metro cities. Like other parts of the country, Kashmir has also a rich and pure socio cultural background, which is quite visible in its folk forms and folklores. Kashmir has been a grand arena of folk music, since time immemorial there have been poets, writers, Musicians, Dramatists, dancers etc., who have attained glory in the literacy and art world of Kashmir. From the very beginning Kashmiri people love singing and dancing and have always been a part of their literary culture. Festivals, fairs, marriages, receptions each have a particular folk style to suit the occasion. The characteristic feature of Kashmiri folk songs like “Laddishah” has its direct mass appeal. Laddishah” the folk songs of Kashmir carries the message of nature, mind and soul of the simple and pure Kashmiri people.

Keywords: Laddishah, Idiosyncratic, Mantras, Purity, Kashmiri language

### 1. Introduction

Laddishah is a literary term which has multiple meaning. Ladi means a row or line; shah has been added after wards with the advent of Muslim rulers. “Laddishah” has a very significant historical background. The said genre especially flourished during the region of imperialism and colonialism, when our state was under the control of Non- Residents or outsiders. In those grim days “Laddishah” used to provide some sort of entertainment and pleasure to the native Kashmiri’s even though the pleasure was temporary. Laddishah used to wear some typical things such as, turban on his head, a hanging piece of cotton cloth, white in colour, on his right shoulder a long white robe traditional sort of Kashmiri sleeper made of dry paddy and long moustaches, all these typical things were the identity of a “Laddishah”.

The idiosyncratic feature of Kashmiri folk songs like “Laddishah” lies in its direct mass appeal. These folk songs become a medium of conveying the serenity and purity of Kashmiri people. The rhythms are slow and controlled yet full of enlightenment. Kashmiri folk songs sustain within them a bewitching and aesthetic charm which transforms it into something engrossing and thought-provoking. These folk songs not only manifest the melodic traditions of Kashmir but also carry a sense of inspiration and motivation for the indigenous masses.

### 2. Origin and Meaning

Most of the researchers are of the opinion that “Laddishah” might have been a village “Faqir”(mendicant) who hailed from “Ler” a village in district ‘Pulwama’. Since the village “Ler” fell in a flood prone area it could have been possible that due to the catastrophic consequences of the inundation, some elderly members of the Shah family( professional folk singers) of “Ler” village might have composed a poem explaining the devastation caused. A

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legendary figure Nishat Ansari considers that Ladishah is not at all the contribution of folk literature while as famous scholar Dr. Farooq Fayaz keeps Ladishah within the domain of folk literature.

According to Dr. Farooq Fayaz, "It is slightly similar to ShahrAshoob of Urdu poetic form, which is a folk ballad caustically comic-cum-satire in text and historically acting as a representative to voice people's genuine grievances which has proved to be a source of mental consolation for the enslaved folk". He adds, "the originality/ charm of this folk gets lost when it is written so its originality lies in oral form only."

However, Zareef Ahmad Zareef, disagrees and says, "The word "Laddishah" originated from 'Ladi' which means a row or line and 'Shah' has been added with the passage of time with the coming of Muslim rulers. In spite of being uneducated "Laddishah" were the best history describers." Zareef further adds, "Although, "Laddishah" was an important part of Kashmiri culture with hundreds of years of history. Laddishah were an institution in themselves as they were the real communicators with the mastery of conveying serious messages blended with satire and humor".

Dr. Farooq Fayaz nevertheless argues, "There is no reference of "Laddishah" in Rajtarangini so it is believed that Laddishah came into existence in late eighteenth century or early nineteenth century. And most probably in the late eighteenth century when natural calamities like floods, drought and famines were on rise, which ultimately remained the focus of Laddishah rhythms for a long time".

The historical background of Laddishah is quite noteworthy. Garbed in a pheran, white trousers and a white turban, Laddishah would arrive with his musical instrument known as "Trum-Trum" and nowadays known as "DEHRA". The genre is believed to have flourished during the barbaric eras of colonialism and imperialism when Kashmir was under the occupation of outsiders.

Dr. Farooq Fayaz says that in that era the natives of Kashmir were divided into two segments or classes; the elite who were religious and political, familiar with the religious Scriptures and controlling literature and the common masses who were sufferers. From 1585 to 1947, Kashmir was ruled by non-local rulers who institutionalised a feudal government having no connectivity with their subjects. The authoritative government in order to seek legitimacy carried out illegitimate political mechanisms which along with natural calamities resulted in utter misery of Kashmiri people.

In this perspective that Laddishah would enter the streets of a village or someone's courtyard or in the paddy fields hitting his musical instrument and would sing poems on various themes like buniyl- nam'e (earthquake), sehlab-nam'e (flood), AngrezQanoon (Colonialism) and on special occasions like Eid, religious festivals and marriages. The poems were full of messages about the social, cultural and political vandalism. LaddiShah sang against the barbarity of the Kashmiri rulers to show his resentment, was a classical character of Kashmiri literature and a staunch believer of constructive criticism.

#### **Some of the famous verses composed by Laddi Shah are:**

**1: "AsalamAlaikumLadishahaav  
Kadamthavpatharhaezkanmekunthav"**

Meaning

Ladishah has arrived wishing you the best. Come on sit and listen to me.

**2: "IllahirahamkarmiskeenunKumkumkarkaersehlaban"**

Meaning

Oh God save poor people of Kashmir.

Let there be no floods it caused havoc. God save us and our country.

**3: "Mulki Kashmir KyahWanithaavShersingh drag mokulbanithaav"**

Meaning

When Sher Singh was the governor of Kashmir natural calamities skyrocketed in Kashmir.

Despite carrying a sense of resentment and abhorrence towards the imperialist regimes, Laddi Shah's poems were full of satire which made people laugh. It entertained them but simultaneously was a derision on the existing occupation. The language of Laddi Shah used to be simple and lucid so the listeners could comprehend it easily. The term itself inclined towards a folk artist who opted for comical, critical and tragical verses. Thus, simplicity used to be the hallmark of Laddi Shah's poems. In those grim days, Laddi Shah used to provide some sort of entertainment and pleasure to the natives of Kashmir although the bliss was temporary. As soon as Laddi Shah made his way into a village or town, in a very short span of time almost the whole village folk assembled there to entertain themselves with his lively and comical performance. As a token of love and reward, the singer was given a handful of rice grains.

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### 3. Conclusion

There was a time indeed when majority of the Kashmiri's were illiterate and same was the case of the folk artists. Those artists presented their performances without the support of piece of paper. Memorization is also important in the sense that it provides opportunity for the artists to use good body gestures and facial expressions. The language of "Laddishah" should be simple and lucid which would become easy for viewers and listeners to comprehend. So simplicity of the language is the hall mark of "Laddishah". One can conclude by saying that Laddi Shah represents an interesting and significant part of Kashmiri music tradition and so being the genre of folk poetry should be passed on to the next generations. It must be provided patronage by the government and other private institutions. Dr. Farooq says, "A careful analysis of these songs of "Laddishah" is sure to help in understanding the otherwise hidden aspects of Kashmiri social life as we can find names of places, local names, flora and fauna mentioned in different "Laddishah" folklores which helps in building up local history." He adds, "History doesn't revolve only around literate class now, we have the local history in different folktales."

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## Velu Nachiyar: The Veeramangai who petrified the British

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### Abstract

Indian freedom fighters have struggled for years to attain the freedom we have today. Unfortunately many of these freedom fighters remain unsung to date. One such unlauded freedom fighter was Rani Velu Nachiyar. Born in the era where only men used to rule, she was skilled in handling weapons and martial arts. She was married to the prince of Sivagangai in 1746. In 1772, the British attacked her kingdom, killing her husband and forcing her to flee from her kingdom. But, this did not stop her and she planned to fight against the British to win her kingdom back. Her army commander Kuyili set herself on fire and jumped in British's ammunitions store to destroy every bit of it and became the first suicide bomber in Indian History. In 1780, she fought with the British and took the command in her hand once again.

**Keywords:** Velu Nachiyar, Sivagangai, Freedom Fighter

### 1. Introduction

When the British (East India Company) came to Surat, India in 1608 (seventeenth century), who would have thought that the foreigners whom they were welcoming for trade and burgeoning of Indian economy, were actually yearning for under laying their rule over our country. As the trade started to flourish, the power of British also started to expand. By 1750, the East India Company started intervening in the Indian Political system.

Soon the British government took direct control over the East India Company. Slowly and steadily the British government spread its dominance over the Indian land starting from Gujarat, Maharashtra, Bengal and reaching to the Northern, Southern and Eastern tips of India. The kings who agreed to work under the British rule were safe but the rulers who refused to be ruled by the British were grappled and executed. Many kings and queens fought with the British to save their kingdoms, some of them were killed and some had to hide themselves.

Rulers such as Tipu Sultan, Rani Laxmi Bai, Puli Thevar, Yashwantrao Holkar and many more fought with the British. Even before the first war of Indian Independence in 1857 took place or Tipu Sultan, Rani Laxmi Bai and other freedom fighters gallantly fought against the British rule, some obscure Indian warriors had already initiated the struggle of freedom against the British.

The history books frequently focus on the contribution of the Indian kings in the independence of our country, overlooking the hardships experienced by the queens, even when the queens have played an equal role if not any bigger, overcoming the stereotypes and prejudices, going against their families and people of their kingdoms and winning their reign back<sup>1</sup>.

One such queen was **Velu Nachiyar**, the chivalrous Indian warrior who fought against the British tanks with sword and spear.

## 2. Literature Review

Born in the kingdom of Ramanathapuram, she was the only child to Raja Chellamuthu Vijayaragunatha Sethupathy and Rani Sakandimuthal of the Ramnad kingdom. Since her childhood she was interested in learning new languages and fighting techniques, She was raised like a male heir and was trained in She was also acquainted in assorted languages including Urdu, French and English and was known by many because of her talents.

But many people criticized their parenting and were against the idea of a woman learning the skills that only the men were supposed to learn. The king and the queen disregarding what the people said, continued to teach their daughter the 'manly adroitness'. Her upbringing molded her into a strong and vigorous woman. She always dreamed of being free from the control of the British. She was also against the practice untouchability and did not support discriminating others on the basis of their caste<sup>2</sup>.

### After Marriage

At the age of 16, she was married to Muthuvadugananthur Udaiya Thevar, son of the King of Sivagangai, Sasivarna Periya Udaiya Thevar with whom she had a daughter, Vellachi. Even after getting married, she did not step down from practicing the languages and martial arts she had learnt. After being separated from the kingdom for Ramnad in 1680, the first ruler of Sivagangai was Sasivarna Thevar followed by Muthuvadugananthur Thevar<sup>3</sup>.

They ruled over their kingdom for over two decades from 1750 to 1770. They lived in their own contented world until 1772, when King Muthuvadugananthur Udaiyathevar along with his second wife, his children and many of his ministers was killed in the 'Kalaiyar Kovil War' against the British army led by Colonel Joseph Smith, and the son of Nawab of Arcot who wanted to expand his kingdom to the Southern India<sup>4</sup>.

### The Kalaiyar Kovil War

Nawab's army could not manage to compete with the ferocious Thevar army but with the help of the British army and modern British ammunitions, they managed to get through to Thevar's defence forces. They assassinated all those who came in front of them and did not even reprove the children and killed them ruthlessly. Her bodyguard Udaiyaal fought with the British to save the queen.

She was taken as a prisoner, was asked to tell the queen's location again and again and was tortured mercilessly, when she did not tell anything even after days of interrogation<sup>5</sup>, the Nawab beheaded her. Rani Velu Nachiyar built up an all-women army to honor her valor and perseverance and named

it 'Udaiyaal' and trained these women in different types of warfare. After taking the control over the kingdom of Sivagangai, the Nawab changed the name to Hussain Nagar<sup>6</sup>.

### The Escape from Sivagangai

After the death of her husband, she had to flee from her kingdom with her daughter. She hurriedly went to a nearby temple at Kollangudi where two of the late king's loyal chieftains the Marudhu Pandiyar brothers found them and helped her in finding a safe place for them. Marudhu brothers were commanders under the leadership of Muthuvadugananthur Thevar. They were the king's most faithful commanders.

She found a retreat at Verupakshi in Dindigul under the sanctuary of Palayakaarar Kopala Nayaker. She stayed there for eight years. She was overwhelmed with different types of emotions like shock, despair and woe but she did not let this stop her or become a barrier between her and her objective of reclaiming her kingdom from the British.

### Years in Dindigul

In Dindigul, she met Haider Ali, the then ruler of Mysore. He was very influenced by her hold on various languages especially Urdu, her courage and her perseverance. She accumulated support from Palayakaarar Kopala Nayaker and Haider Ali who pledged to be with her in her fight against the British. The king also built a temple in his place as a symbol of their friendship. In addition to this, he also provided the queen with a monthly financial support of 400 Pounds and 5000 infantry and cavalry troops each.

His support in finances, cavalry troops and weapons helped the queen in assembling a powerful army to fight against the British. The Marudhu Pandiyar brothers raised an army<sup>4</sup> but she believed that the army made by them was not enough to defeat the British and built a robust army. She did not believe in the caste system and her army comprised of Kshatriyas, Vaishyas and Shudra. She included everyone in the infantry, men and women. She kept changing her base to baffle the British.

### The Planning For Her Vengeance

Determined than ever before, the queen vigorously fought with the British in 1780. While the planning the attack, she realized that the walls of the fort were so high that it would be very difficult for the soldiers to climb up on them and could easily be pushed by the Indian sepoys and British army guarding the Fort. This left her with two choices, firstly, forcing the army to come outside the fort, which was nearly impossible, secondly, destroying their ammunitions to weaken them. As a result, she planned a suicide attack in the ammunition store of the British. Kuyili, her army commander and a staunch acolyte, stepped forward and carried out this attack. Many people also believe that Kuyili was the queen's adopted daughter.

The Ambush on the British Coincidentally, the occasion of Vijaydashami was only a few days away. Traditionally the women from all the nearby villages would come to pray in the temple situated in the fort. She entered the fort along with some of her female soldiers disguised as rural women, soaked herself in ghee, set herself on fire, jumped in the British's ammunition store and demolished every bit of it, becoming the first suicide bomber in the Indian history.

The explosion hit the others by a surprise and before they could realize anything, the women of her army slashed the Indian and the British soldiers. Rani Nachiyar waiting outside for the signal entered the fort annihilating every soldier she could see. Helpless by the brawly attacks of joined forces of Rani Velu Nachiyar, Marudhu Pandiyar brothers, Palayakaarar Kopala Nayaker and Haider Ali, the British and the Nawab of Arcot could not do nothing but run away and capitulate to Velu Nachiyar and she regained her power in the kingdom of Sivagangai.

#### Return to the Kingdom Of Sivagangai

Rani Velu Nachiyar along with her daughter and the Marudhu brothers returned back to her kingdom. The first change she made was changing the name of her kingdom back to Sivagangai. She started to govern Sivagangai. She recognized the work of the Marudhu Pandiyar brothers by appointing the older Marudhu brother, Periya Marudhu as Commander in Chief and the younger Marudhu brother, Chinna Marudhu as her Chief Minister. Thereafter, she succeeded her husband from 1780.

After re-establishing her rule over Sivagangai, she expressed her gratefulness to Sultan Haider Ali by constructing a Mosque and Church at Saragani. Even after regaining her power, she maintained good relations with Haider Ali and considered his son, Tipu Sultan as her brother<sup>7</sup>. Even after witnessing her immense valor and brawn, some people did want to accept her still. Despite all these stumbling blocks, she was able to rule over her kingdom. She ruled the kingdom Sivagangai for ten years from 1780 - 1790 and then she was succeeded by her daughter Vellachi who ruled the kingdom from 1790 – 1793.

During her 10 years of dominion over the kingdom of Sivagangai, the land was never attacked by the British or Mughals. Frightened by her vengeance on the Nawab and the British, no ruler could ever plan an attack on the kingdom for many years. She passed away in 1796 at the age of 66 because of heart problems and had even been treated in France.

She became the first woman of Indian origin to fight against the British and one of the few Indian rulers to recapture her kingdom from the British. She is also known by the name ‘Veeramangai’ which means a brave woman<sup>8</sup>. Although she is not known by many people but she has played a very eminent role in the freedom of India from the British control. She also became the first female warrior to raise the victory flag of Indian war for independence.

### 3. Conclusion

The renowned author, Prof. S. Sanjeevi mentioned in his book ‘Maruthiruvar’ that Rani Velu Nachiyar was a ‘Joan of Arc’<sup>9</sup>. She rose from all the stereotypes, prejudices, hardships and travail. She is an inspiration not just for women but also all the people out there. At the time when even seeking for equal rights respect for women was nothing less than a sin, Rani Velu Nachiyar shattered the gender roles. This may also be marked as one of the first fights in opposition to the discrimination against women.

Although she is not known by a large part of the country, but she is treasured, glorified and venerated by the people of the Southern India especially Tamil Nadu. The famous Indian - American hip-hop artist, Prof. A.L.I. dedicated the song ‘Our Queen’ of her album Tamilmatic to Rani Nachiyar. The

philosopher Lt. Sriram Sharma researched about her life and directed a ballet performed in Naradha Gana Sabha, Chennai followed by another grand ballet performed by the OVM Dance Academy in Chennai narrating the life of the Brave queen.

On December 31, 2008, a stamp was released in her remembrance. On 14 July, 2014, the former Chief Minister of Tamil Nadu, late J. Jayalalitha inaugurated a six-foot tall bronze statue of the queen as a tribute to her. It was also announced that January 3<sup>rd</sup> will be celebrated as her birth anniversary.

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## Insights into Second Language Teaching and Learning – An Analysis to Enhance Learner Competency

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### Abstract

The globalized business arena has brought about the need for employees who are excellently skilled in their English language skills. To compete with business worldwide, corporate organizations are always on the look for employees with adequate language skills. This has thrust the need for adopting effective language teaching methods in educational establishments. When language acquisition pedagogies are implemented efficiently in classrooms, the tertiary learners are facilitated to become proficient in their language skills. Imparting effective skills amongst these learners has become the paramount need for educational institutions. These institutions have to focus on both technical and language skills in order to make the learners employable in esteemed organizations. For language acquisition to materialize meritoriously, both teachers and the learners play a prominent role. The teachers and the learners equally contribute to the language learning process. This paper focuses on analyzing the effectual language teaching and learning concepts that enhance learners' language proficiency and competency.

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## **Introduction**

The globalized economy has boosted the need for producing graduates with effective language proficiency. Business organizations expect their employees to be competent in the English language skills (listening, speaking, reading and writing), in order to contribute to the company effectively. “Activities like emails, online chat, business presentations require ‘above average’ language skills in order to have unambiguous and clear-cut transfer of information to all participants”, (Clement A and T Murugavel, 2018 p 1). Studies have shown that the language skills of corporate employees are not adequate to meet the requirements of the business establishments. Poor language skills not only affect the employee’s professional growth but also his/her companies’ communication processes and business advancements.

Poor language skills of corporate employees have accelerated the importance of effective language teaching and learning processes. Palacios Martínez, Ignacio M(1996) while mentioning Rubin and Wenden refers to the main features in the second language learning. He points out that tactics are important for language learning, the learners are the real means in the choice of procedures, language learning is adopted and problem-solving techniques are to be used and that learning strategies are flexible.

In order to impart language learning, implementing theories in learning contexts is important. Of the many learning theories, Stephen D Krashen’s Monitor Model (1985) is of utmost importance to enhance second language learners’ learning competency. This theory puts forth five hypothesis: The acquisition-learning hypothesis (acquisition happens naturally), The natural order hypothesis (learners acquire grammatical structures in a foreseeable order), The monitor model hypothesis (learners make use of their already learnt knowledge), The input hypothesis (learner acquisition happens when inputs are given in the target language), and The affective filter hypothesis (low filter occurs when there is high motivation and confidence amongst learners, while learners with low motivation and confidence receive less input).

## **Language Learning and Teaching Approaches**

To enhance learner competency, certain methods of language learning and teaching can be adopted. Adopted from (Saraswathi V, 2012)

1. Languages are learned predominantly through imitation.

Imitation is an important means to learn language. It is one of the most important ways to learn a language. Imitation is a process, which starts from infancy and continues for a lifetime. In the infancy of babies, they learn the language from the environment that they live in. They listen to the voices around them. Unconsciously the language is recorded in their mind and then they start uttering a few words. After which the baby learns to talk. The child learns reading and writing skills from the kindergarten, as it starts going to school. Saraswathi V (2012) points out Behaviorism theory (B F Skinner). The theory contains major tenets of behaviorism. Saraswathi V (2012, p 18) points out that “language learning is behavior. It is not a mental phenomenon. Language acquisition by human beings is equated with the learning process of animals”. Imitation helps the learners to build new skills. Through the imitation method, higher skills are also gained. At the graduate level, language can be learnt when socializing with academic circle. Conversing in an academic setup makes it comfortable to break the starting trouble, which most learners have. The students who come are greatly influenced by their vernacular and they have the fear to speak in English. Imitating the speaking, tone and style of academicians around, enables the learners to learn the speaking skill. Saraswathi V (2012, p 18) further states that “language acquisition depends on a chain of stimulus-response activities, in which imitation, repetition, memorization, rewards and reinforcement play a significant role”.

Parents usually correct children when they make grammatical mistakes. Children’s speaking skill is developed from their homes. As children hear the sounds of the language, unconsciously the vocabulary, style, tone and the grammatical components are registered in the mind. Whenever children commit grammatical errors, parents correct the faults. Parents play a vital role in developing children’s language skills. They help the children (kindergarten) to not only speak clearly but also motivate the children to read and write.

Persons with extraordinary IQs are good language learners. Good language learners are not only organized and creative but also possess excellent IQ. “In a nutshell, classroom based learning of a second language requires sensitivity to rules, processing speed and considerable powers of memorization in the area of verbal skills. It makes demands that can only be met by those with higher than average levels of ‘academic’ power, in other words of the intelligence that IQ tests aim to measure” says (Bonar B Martin, 2005 p 14).

Motivation is the most significant prerequisite for success in second language acquisition. Motivation is an essential factor to stimulate human beings to act positively. For learning to

take place effectively, motivation plays a vital role. In the learning context, motivation plays a forceful role enhance the learners' language skills. AlizadehMitra (2016 p 11), points out to Pourhosein Gilakjani, Leong, and Saburi, "the success of any action is dependent on the extent to which persons try to get their goal, along with their desire to do so". Motivation is the blend of effortin addition to desire to attain the objective of acquiring the language. In the second language milieu motivation depends to the extent to which the learner works, due to his or her inward desire and the satisfaction to do the task. Huitt (2001) says, learners (who are not inherently driven) can be motivated when they give more attention to the importance of learning the language. LucasRI (2010) says that "learners are intrinsically motivated to learn speaking and reading skills and are also intrinsically motivated through knowledge and achievement". Adding to this, (Alizadeh, Mitra, 2016 p 14) points out that learners' motivation can go up and down depending on the context of language learning. Motivation has a key role in the development of language skills. Teachers can play a significant role in motivating learners to the learning of a second/foreign language". Thus it is important that learners are motivated in order to enhance their language learning skills.

The timelier the children are acquainted to second language in school, the better the prospects of attainment in engrossing it. The beginning years of school education is an important phase when the cognitive skill of learners are developed. During this phase, the learners' level of observation and keenness is extraordinary and this enables them to absorb the language more quickly. Research has shown that bilingual learners are good at problem-solving, cognitive retention, attentiveness and educative growth. "Following a 'topic centred' and 'game-based' approach proved to be a very useful way to teach 'intentional' communication in a semi-natural context, and an attractive option for teaching English to the specific group of young learners. It has been indicated that language learning performed in a 'playful' atmosphere resulted into a) stimulating student's motivation, b) making students feel confident and c) creating their positive attitudes to foreign language learning" say Grivaa Eleni, Klio Semogloua and Athina Geladaria (2010, p 3703). The study points out that the young learners were exposed to various learning contexts. This helped the young learners to conceive and cultivate verbal proficiency. Role-plays were conducted during the study. It made the learning process flexible and enhanced in the cognitive absorption. Including games in the learning process brought in a relaxed environment, reduced stress, fear, and facilitated the learning progression to be successful. Grivaa Eleni, Klio Semogloua and Athina Geladaria (2010, p 3700) opine (Pinter)'s view as "Ages 'between' 5 to 8 can be considered as a sensitive and critical period for the

acquisition of basic skills in a second language as well as for the development of perceptual-motor skills. Very young learners are keen and enthusiastic, active and interested in exploration, and they are usually less anxious and less inhibited than older language learners”.

Learners commit grammatical mistakes predominantly due to their mother tongue interferences. Falla-Wood, Julia (2017) says “According to behaviourists learning theory of language, language learning is a habit formation, and the errors are due to habits already formed in L1. These behaviours interfere in the process forming habits already formed in the L2 (p 2). Touchie Hanna Y (1986) notes that research in applied linguistics consider errors as an indication of an inventive process in language learning. Further she says that interlingual errors (errors caused due to mother tongue) and developmental errors occur due to the difficulty of the second language. Interlingual and developmental factors include simplification, overgeneralisation, hypercorrection, faulty teaching, fossilization, avoidance, inadequate learning and false concepts (Touchie Hanna Y 1986).

The teachers need to focus on grammatical rules one by one. They must introduce the concept and then give exercises to the students. The need to teach grammar has become mandatory. Today, the writing skill has been the most neglected one. Making learners to understand the importance of effective writing is one of the paramount tasks of the English teachers. Effective writing is essential in all formal contexts like workplace, business and the academic arena. Formal writing with grammatical errors cause employees to lose jobs and businesses to close. “It is exact that putting grammar in the foreground in second language teaching, because language knowledge of grammar and vocabulary is the base of English language. Grammatical competence is one of communicative competence. Communicative competence involves knowing how to use the grammar and vocabulary of the language to achieve communicative goals, and knowing how to do this in a socially appropriate way” says Zhang Jianyun (2009, p 184). Zhang Jianyun (2009) points out that grammar, which is essential for effective writing, cannot be learnt naturally, but has to be imparted. Further, grammar is not a set of rules but a cluster of meaningful forms. Grammar is the foundation for the English language and mastering the nuances of the language is also important for tertiary learners. Thus it has become vital that effective grammar teaching methods are adopted in classrooms. The English teacher plays an important role in imparting grammar knowledge to the young and tertiary learners. Over the years, grammar teaching methods like grammar translation method, transformational generative grammar method etc., have been adopted. “Instead of teaching grammar, usage, and

as a prescriptive way to reach a uniformity of correctness, we should approach it descriptively, exploring and celebrating the many discourses that students bring to class” says Shafer Gregory, 2012 p 69. Teaching grammar has to be done systematically; therefore imparting the grammatical the knowledge needs to be one by one. The teacher can focus on one topic at a time. This will enable even the slow learners to get a hold of the basic concepts in grammar.

“Teachers should teach simple grammatical structures before complex ones”, says Saraswati V 2012 p17. The psychological and cognitive aspects of the learners need to be considered while teaching grammar. The grammatical forms have to be conceptualised with the daily communicative usage. Teaching grammar through dialogue method is an effective way to reach out to learners. “The use of dialogues in grammar teaching is useful because the use of dialogues generally matches learners’ expectations of how language is used in the real world: people use language primarily to talk to each other” (Thornbury, 1999 p76). Contextual teaching of grammar will enable the learners to relate the concepts to real life situations and enhance their knowledge. “Teaching grammar through context will help learners perceive the structures of the language effectively. If learners are given grammatical structures in context, they will be able to master the language better” says Mart Çağrı Tugrul, 2013 p 128. Teaching grammar in a simple method motivates the learners to learn the language without difficulty. The fun way method is one of the methods that lowers fear and stress in learners and enables them to learn the grammatical components better. The dreary grammatical rules can be made more interesting when fun activities are included in the teaching methodology. “Language games are an invaluable tool as they offer the elements of fun and meaningfulness in language learning. They are also a means of motivating students to learn, as well as sustaining their interest and focus in the learning itself. When learning grammar is formatted into a game, it removes the monotony that seemingly relates to it” say Metom Lilly, Amelia Alfred Tom and Saira Joe, 2013 p 402. Teaching grammar through games has proved to be a valuable method to ease the learners’ psych and enables them to grasp the concepts without difficulty. To avoid difficulties when conducting games, the following tips may be useful:

- The classroom activity should be organised. The teacher should focus on the learners’ age, level of language proficiency and interest in the learning activity.
- If the class gets boisterous, the teacher can change the activity in order to bring decorum.
- The teacher should choose activities or games that appeal to all kinds of learning patterns and modify the activities as per the need of the learners.

- For certain activities or games, the teacher can set up an established method of conducting the activity.
- The teacher has to inform the rules of the activities with clarity and understanding. The learners should have clarity on the activities given to them.

(adopted from Cam Lien and Thi Minh Thu Tran, 2017 p 68)

The teachers need to check the errors committed by the learners immediately in order to avoid the development of faulty practices. The learners need to be taught not only the right way of writing but also unlearn the wrong writing practises which they would have imbibed over the years. This is not an easy task. It involves patience and meticulous teaching on the part of the teacher. Since error correction is an indispensable part of classroom learning, utmost importance and keenness has to be to it by the teachers. Error correction should not be postponed but it has to be made as early as possible. The duty of the teacher is not only correcting the errors but doing it immediately after the activity is over. Pointing out errors instantly, helps the learner to correct his or her mistakes at once. When corrections are made at the beginning stage, complex errors at the later stage of writing or speaking can be avoided. When the teacher gives immediate feedback, it can motivate the learner to avoid mistakes and learn from the errors. Almuhimedi, Rana Abdulrahman and Yousif A. Alshumaimeri (2015, p 127) point out Long, “reactivefeedback that reacts a problem is effective in facilitating second language acquisition: it distinguishes a grammatical from an ungrammatical one, adjusts the input to match the learners’ proficiency level, and it draws attention to inter-language gaps, and motivates learners to modify the output”.

Academic resources are useful tools in presenting and conducting effective classroom teaching. Today, resources are not just in the form of papers, but also as websites, word documents, blogs, etc. The modern learners are updated in the technological advancement. Subsequently, it is even more necessary that teachers are updated in recommending technological resources to the learners. Teachers need to use knowledgeable resources to enable better learning and also the learners should be shown to the language patterns which they have been taught already. It is the utmost responsibility of the teachers to educate the learners on a concept and then build on it using examples and exercises. For example, in a class when the topic - concord is taught, the teacher should give more examples and exercises pertaining only to that topic. This brings in clarity and helps the learners to understand a particular topic thoroughly. Using resources in classroom is an important aid to the teachers. If ample resources or materials are not used, the students will lose concentration and the purpose of the class will be lost. It creates interest and

motivates the learners to learn new concepts. Resources help in achieving the educative goals and enhances the learning acquisition process. (Busljeta, R 2013) brings in the following shared aims to use resources in classrooms:

1. To motivate students
2. To develop students' creativity
3. To recollect the past information
4. To Inspire the process of understanding, interpreting, organising and blending the educational subject, logical thinking, and reasoning, communication and interaction, and
5. To Contribute to the progression of diverse skills amongst students.

When learners are permitted to intermingle freely in classroom, they study from their peers' errors. Classrooms are not just a one way communicative context (lecture), but a place where academic interactions happen amongst the faculty and learners and also between learners. Classrooms are not just places of theoretical interpretations but also interactive sessions of learning. When students interact with each other and participate in activities, the fear factor in learning is removed and effective learning is promoted. Though teachers spend hours and hours in lecturing, effective learning will not happen unless learners participate in the learning process. One such means to imbibe knowledge is through interaction. "Generating new knowledge and revealing gaps in knowledge through peer instruction, then, effectively supports students' ability to solve novel problems. Peer instruction can be an effective tool to generate new knowledge through discussion between peers and improve student understanding and metacognition" say Tullis-Jonathan G and Robert L. Goldstone (2020 p 10). Sometimes, in large-sized classrooms, teaching and learning becomes demanding. Such challenges can be overcome when the learners are allowed to do group activities. The teacher can divide the groups as four or five in a group. The groups can comprise of intelligent, average, and below-average learners. When learners of different cognitive levels are put together in a group, knowledge sharing would happen successfully. Also, these group-activity sessions enhance the problem-solving skills and critical thinking skills of the learners. Moreover learners' satisfaction in learning new concepts is also achieved. Knowledge enhancement happens amongst both slow learners and quick learners. "To achieve a critical instructional process, interaction is important. The involvement of all class members in the instructional interaction

between teacher-student, teacher-teacher, and student-student has a positive impact on the classroom environment”, say (Rasmitadila, Zulela and Endry Boeriswati, 2017 p 904).

“Learners learn what they are taught” says Saraswati V, 2012 p 17. The teaching process exhibited in the classrooms are of utmost importance. Only in a classroom setup, the learners are given the opportunity to gain knowledge and further their academic competence. Only when the fundamental concepts in language skills are taught and practised in the classroom, the learners will be able to implement it in a workplace context. The classrooms are places of active learning and knowledge gaining platforms. So, it is the ardent duty of the teachers and facilitators to impart the language skills that are essential for the learners.

### **Conclusion**

The modern technological world has become demanding and competitive. Only employees with high language proficiency are considered appropriate for organizational growth and benefit. In order to possess proficient language skills, the process has to onset from the tertiary level itself. The college English or the English taught at the tertiary level is of great importance, since it is from the colleges that learners move to the workforce. “In college English teaching, based on second language acquisition theories, teachers should establish a student-centered class teaching pattern to deliver intercultural communication knowledge, cultivate students’ intercultural communication abilities, create language acquisition environment, fully consider students’ emotional factors, and improve the teaching quality and learning effect of college English” says (Li, Changyu 2009 p 60). This paper focuses on the language learning methods and ideas to enhance tertiary learners’ language acquisition. The various methods that enable learners to acquire English language skills have been discussed in this paper.

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TECHNICAL ARTICLE

# Triethoxyoctylsilane-Modified SiO<sub>2</sub> Nanoparticle-Based Superhydrophobic Coating for Corrosion Resistance of Mild Steel

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In this work, SiO<sub>2</sub> nanoparticles-based corrosion-resistant superhydrophobic coating for mild steel has been developed. A wire electrical discharge machine (EDM) was used to cut micro-patterned mild steel followed by chemical etching via Piranha solution. The etched metal was coated with triethoxyoctylsilane-modified SiO<sub>2</sub> nanoparticles via the solution method to generate the hierarchical micro-nano roughness with low surface energy. The developed coating exhibited micro-nano hierarchical roughness due to SiO<sub>2</sub> nanoparticles and their clusters, verified by atomic force microscope (AFM) and field-emission scanning electron microscope (FESEM) analysis. The maximum water contact angle (CA) of  $153 \pm 2^\circ$  with a sliding angle (SA) of  $5 \pm 2^\circ$  was obtained for the coated mild steel. The electrochemical impedance spectroscopy (EIS) plots confirmed the noteworthy corrosion resistance performance of coated metal over the uncoated one. Thus, the modified SiO<sub>2</sub> nanoparticles-based superhydrophobic coating could be a good option for inhibiting the corrosion of mild steel.

**Keywords** corrosion resistance, mild steel, SiO<sub>2</sub> nanoparticles, superhydrophobic coating, triethoxyoctylsilane

## 1. Introduction

Mild steel is one of the extensively utilized types of steel due to its low-cost and exhibits such properties, which are suitable for a wide range of applications like transportation, construction and oil and gas pipelines (Ref 1). Conversely, worldwide every year, billions of dollars are spent on repairing or replacing corroded mild steel. It is well acknowledged that mild steel suffers from corrosion when exposed to moisture and air (Ref 2). Moisture protection of mild steel is more challenging forcing the researchers to manufacture water-resistant mild steel using the fundamental concepts of hydrophobicity (Ref 3). Lotus leaves, bird feathers and water strider legs are natural water-resistant objects (Ref 4, 5). Such objects exhibit superhydrophobicity. The superhydrophobic surfaces of any material have a static water contact angle  $> 150^\circ$ , which results in the bouncing of water droplets on their surface or displaying non-wetting behavior. Several researchers mimic these types of natural superhydrophobic features on

artificial surfaces to utilize their benefits for various applications, such as anti-corrosion, anti-oxidation, water drag reduction, anti-soiling and anti-icing (Ref 5-8). Superhydrophobic surfaces have unique features such as low surface energy and micro-nano scale structures (Ref 9). Numerous methods were tried out in the past to generate micro-nano level roughness on the metals using well-known techniques such as electrodeposition, sandblasting, plasma etching, chemical etching, lithography and nanoparticle deposition (Ref 3). However, the most economical and feasible routes are chemical etching and micro-nanoparticle deposition (Ref 10-12). For the generation of superhydrophobicity on metallic surfaces, low surface energy of the surface is required which can be obtained easily on a chemically etched surface by the deposition of surface-functionalized nanoparticles. Over the past few years, various nanoparticles, such as carbon nanotubes, ZnO (Ref 12), TiO<sub>2</sub> (Ref 13), and SiO<sub>2</sub> (Ref 9, 14), were explored to generate nano-scale roughness to achieve superhydrophobicity. However, SiO<sub>2</sub> nanoparticles are most commonly used for superhydrophobic surfaces because of their low cost, ease of fabrication, ease of functionalization and low density compared to other nanoparticles (Ref 15). Such properties make these nanoparticles an ideal choice for manufacturing superhydrophobic surfaces. However, the use of surface-functionalized SiO<sub>2</sub> nanoparticles on chemically etched metallic surfaces is not been fully explored yet (Ref 9).

In the present study, a unique approach was employed to protect the mild steel from corrosion. A wire electrical discharge machine (EDM) was used to generate a micro-pattern on mild steel followed by chemical etching via Piranha solution. The wire EDM and chemical etching produced micron-level roughness on the surface of the mild steel. Then the etched metal was coated with triethoxyoctylsilane-modified SiO<sub>2</sub> nanoparticles to generate the hierarchical micro-nano roughness with low surface energy. The superhydrophobicity

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and anti-corrosion performance of the samples produced promising results, which can be very useful for the metal industry.

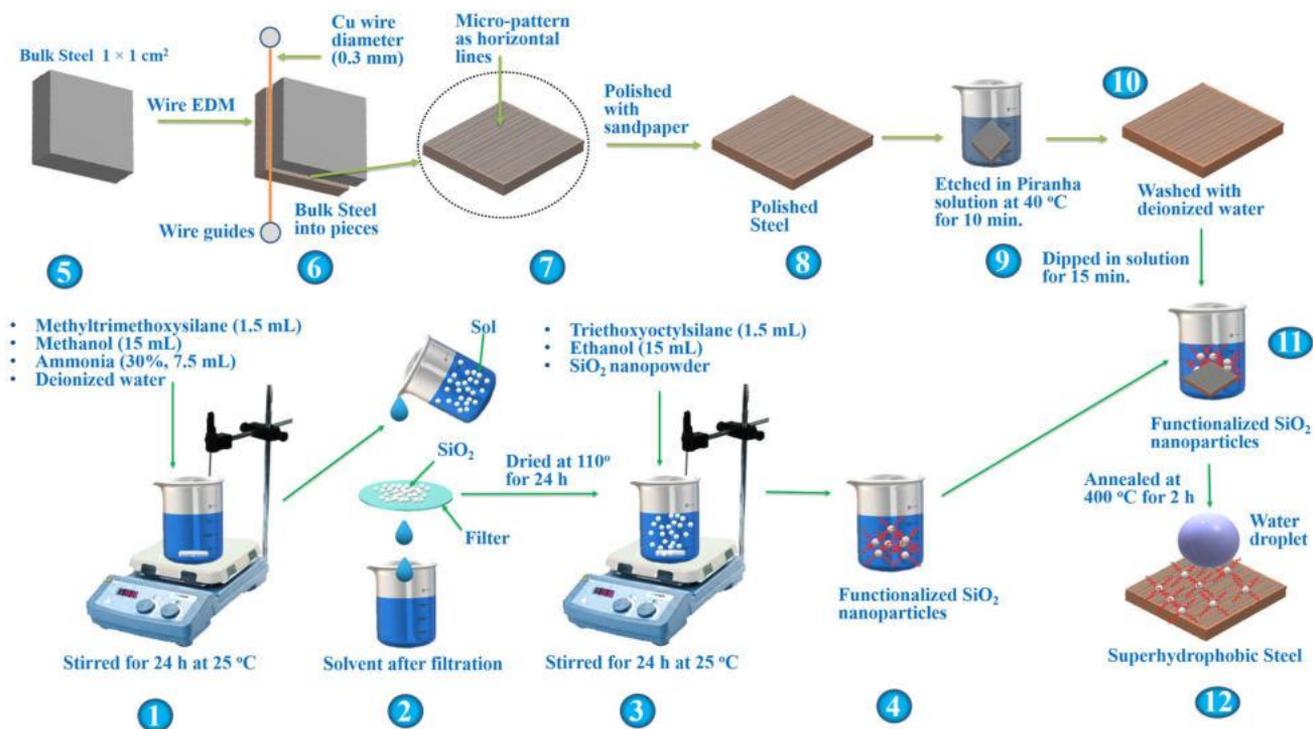
## 2. Experimental

### 2.1 Fabrication of Superhydrophobic Coating on Mild Steel

The fabrication of functionalized SiO<sub>2</sub> nanoparticles-based superhydrophobic coating on mild steel is schematically illustrated in Fig. 1. Methyltrimethoxysilane (1.5 mL), Methanol (15 mL), Ammonia (30%, 7.5 mL) and deionized water were continuously stirred for 24 h at 25 °C to obtain the silica sol. The silica sol was then filtered and dried at 110 °C for 24 h and collected as silica nanopowder. The surface of SiO<sub>2</sub> nanoparticles was functionalized by blending triethoxyoctylsilane (1.5 mL) and ethanol (15 mL) with the nanoparticles followed by magnetic stirring for 24 h at 25 °C. On the other hand, the mild steel of 1 × 1 cm<sup>2</sup> size was cut from the bulk sample using wire EDM (Ezeewin). The wire EDM created a micro-pattern in form of parallel lines over the metal substrate, which was further polished with 400-1200 Grit sandpapers. The polished substrate was ultrasonically cleaned in acetone for 30 min. The polished substrate was etched in a Piranha solution (Ref 16) (concentrated H<sub>2</sub>SO<sub>4</sub>, 98% and H<sub>2</sub>O<sub>2</sub>, 30%. Ratio 7:3) at 40 °C for 10 min. The etched substrate was washed with deionized water several times and dried at room temperature. The etched metal substrate was dipped in the solution of functionalized nanoparticles for 15 min. Later on, the coated substrate was annealed at 400 °C for 2 h to obtain the superhydrophobic mild steel.

### 2.2 Characterization

The morphology of triethoxyoctylsilane functionalized SiO<sub>2</sub> nanoparticles and deposited coatings were characterized using a high-resolution scanning electron microscope (FESEM, Quanta 200F, FEI, USA). The surface modification or functionalization of the nanoparticles by triethoxyoctylsilane was characterized by a Fourier transform infrared (FTIR) spectroscopy (Perkin Elmer FTIR/FIR Frontier, Spectrometer, USA). Both the functionalized and non-functionalized SiO<sub>2</sub> powder samples were separately mixed with high purity potassium bromide (purity 99.9%, Sigma-Aldrich) using a pestle motor and converted into transparent films using a stainless steel die and a hydraulic press. The infrared spectra of the transparent thin films was recorded at ambient conditions. Bruker D8 Advance Diffractometer (Germany) carried out the structural characterization of the samples with a Cu-K $\alpha$  radiation source. The optical micrographs of the samples were recorded using Nikon Eclipse MA200 optical microscope. The wettability of the samples was characterized using a drop shape analyzer (DSA 100, Krüss GmbH, Germany). An atomic force microscope (AFM, NT-MDT, Ntegra) was used to investigate the roughness and surface morphology of the samples. An electrochemical workstation (CHI 660E, CH Instruments, USA) was used to obtain polarization curves with a low scan rate of 0.2 mVs<sup>-1</sup>. The samples were immersed in corrosive salt solution (3.5% NaCl) to obtain polarization curves. The corrosion resistance of the samples was characterized using electrochemical impedance spectroscopy (EIS) from 200 kHz to 50 MHz frequency and via excitation of sinusoidal wave amplitude of  $\pm 5$  mV.



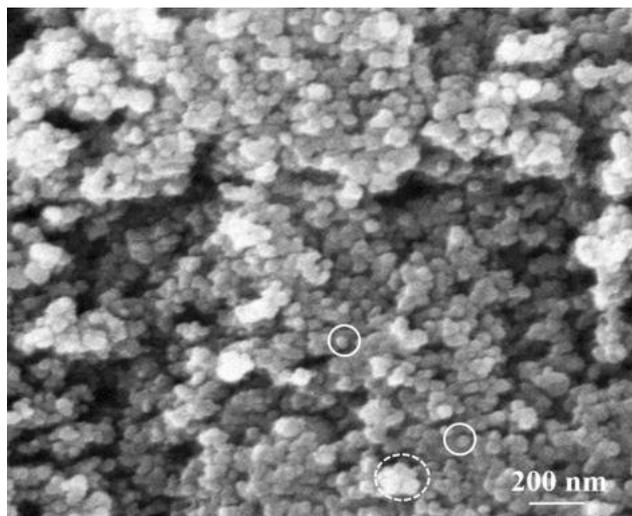
**Fig. 1** Schematic illustration of the systematic fabrication of functionalized SiO<sub>2</sub> nanoparticles-based superhydrophobic coating on micro-patterned and chemically etched mild steel

### 3. Results and Discussion

The FESEM image of triethoxyoctylsilane functionalized silica nanoparticles is shown in Fig. 2. The FESEM images revealed a very smooth spherical shape of the SiO<sub>2</sub> nanoparticles with an average size of ~ 30 nm. However, very limited large size clustered particles can be seen but most of the individual round shape particles are revealed by the FESEM image. This indicates the successful functionalization of the nanoparticle surface because the functionalization agent significantly reduced the clustering of nanoparticles (Ref 12). The particles in solid circles indicate the individual particles, and the particles in the dotted circle indicate the clustered particles (Fig. 2).

FTIR spectra of SiO<sub>2</sub> nanoparticles and triethoxyoctylsilane-modified SiO<sub>2</sub> nanoparticles are shown in Fig. 3. Both the unmodified and modified SiO<sub>2</sub> nanoparticles reveal sharp absorption peaks at 1103 and 802 cm<sup>-1</sup>, which are designated as anti-symmetric and symmetric vibrational peaks of the Si-O-Si bond, respectively (Ref 17-19). A very broad peak centered at 3421 cm<sup>-1</sup>, which is common in both the spectra and a small peak at 966 cm<sup>-1</sup> in the case of unmodified nanoparticles are corresponding to the stretching vibration of Si-OH groups indicating the presence of hydroxyl groups on the surface of nanoparticles (Ref 19). In the case of modified nanoparticle spectra, the change in the position of absorption peak from 966 to 882 cm<sup>-1</sup> and the generation of new peaks at 2978, 2921 and 1381 cm<sup>-1</sup> are corresponding to C-H, CH<sub>3</sub> and C-O functional groups, confirming the surface modification of SiO<sub>2</sub> nanoparticles by long chain triethoxyoctylsilane (Ref 9, 19-22).

X-ray diffraction (XRD) pattern of uncoated and coated mild steel samples is shown in Fig. 4. The XRD analysis was performed to investigate the effect of the presence of SiO<sub>2</sub> nanoparticles-based coating on the crystallinity of the mild steel. The 2θ values were matched to the standard International Centre for Diffraction Data (ICDD) data card (04-014-0360). The XRD pattern of both the uncoated and coated mild steel samples revealed one sharp peak at 2θ = 45.26° corresponding to a plane (110) and one low-intensity peak at 2θ = 65.30° corresponding to a plane (200), which indicates polycrystalline



**Fig. 2** FESEM image of triethoxyoctylsilane functionalized silica nanoparticles

nature and body-centered-cubic (bcc) structure of mild steel (Ref 23, 24). However, the SiO<sub>2</sub> nanoparticles-based coating does not reveal any new peaks except a low-intensity peak at 2θ = 27.30°, which may be due to some impurity of the sample. Nevertheless, the relative intensity of the coated samples was reduced due to the coating on the mild steel substrate. The generation of no new peaks may be due to the amorphous nature of the SiO<sub>2</sub> nanoparticles. Thus, the coating does not change the basic structural characteristics of the steel substrate.

Optical microscopic images of polished mild steel and etched steel substrate at different magnifications such as 20X and 100X with their corresponding water contact angles (CAs) are shown in Fig. 5. The polished sample revealed parallel microscopic lines on the surface due to the use of wire EDM. The surface seems smooth and exhibits a water CA of 92° as depicted in the inset of Fig. 5(a). The water CA > 90° indicates the hydrophobic nature of the metallic substrate. However, the Piranha solution etching of the metallic substrate generates roughness on the surface, which makes the microscopic parallel lines diffused. However, the etching of the metallic surface results in a significant increase in the surface roughness from 90 to 110 nm which remarkably increased the water CA from 92° to 123° as shown in the inset of Fig. 5(c), which is in close agreement with the results reported by others (Ref 11). Thus, the etched metallic substrate exhibits a more hydrophobic character compared to the polished metallic substrate.

Optical microscopic images of the coated mild steel at different magnifications such as 20X and 100X with corresponding water CA are shown in Fig. 6. Due to the coating, the surface of mild steel seems very smooth with uniform surface roughness. The coated substrate exhibits a water CA of 153° as depicted in the inset of Fig. 6(a). Thus, the superhydrophobic character of the coated mild steel has been generated because of the presence of surface-functionalized SiO<sub>2</sub> nanoparticles. The surface functionalization of the nanoparticles reduced the surface energy of the particles and the nano-size of the particles offered nanoscale roughness. Thus, the combination of these two transformed the hydrophobic mild steel into the superhydrophobic one (Ref 12, 14).

AFM analysis was performed to characterize the topography and surface roughness of the polished, etched and coated mild steel samples. The 2-dimensional (2D) and 3-dimensional (3D) images of the polished and etched mild steel are shown in Fig. 7. The polished mild steel is revealing micro-patterned morphology (Fig. 7a, b). The parallel vertical lines with some cavities are exposed by the 2D image and uniform surface roughness is revealed by the 3D image. However, the etched mild steel is revealing a completely different morphology, which is obvious as the chemical etched away the metallic surface. The 2D and 3D images of etched mild steel reveal the non-uniform roughness and significant variation in the surface roughness compared to polished steel (Fig. 7c, d).

The 2D and 3D AFM images of coated mild steel at different magnifications are shown in Fig. 8. The 2D (Fig. 8a, c) and corresponding 3D (Fig. 8b, d) images revealed the presence of significant but uniform surface roughness on the coated mild steel. Additionally, the higher magnification AFM image (Fig. 8c) revealed the presence of individual nanoparticles and their agglomerates on the coated surface of mild steel, which is producing a combination of micro-nano hierarchical surface roughness responsible for the superhydrophobic behav-

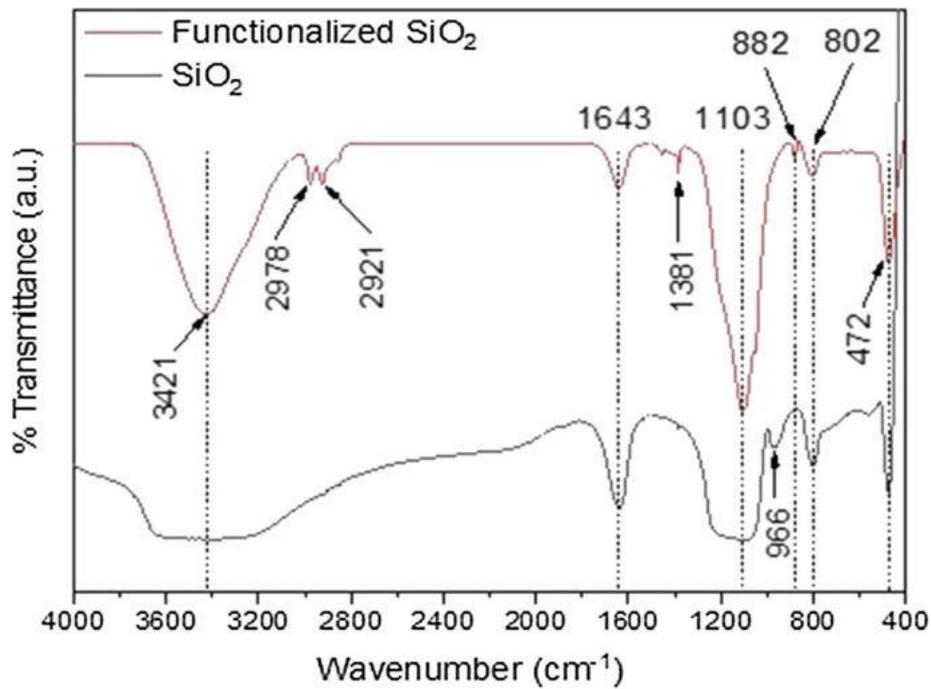


Fig. 3 FTIR spectra of SiO<sub>2</sub> nanoparticles and triethoxyoctylsilane-modified SiO<sub>2</sub> nanoparticles

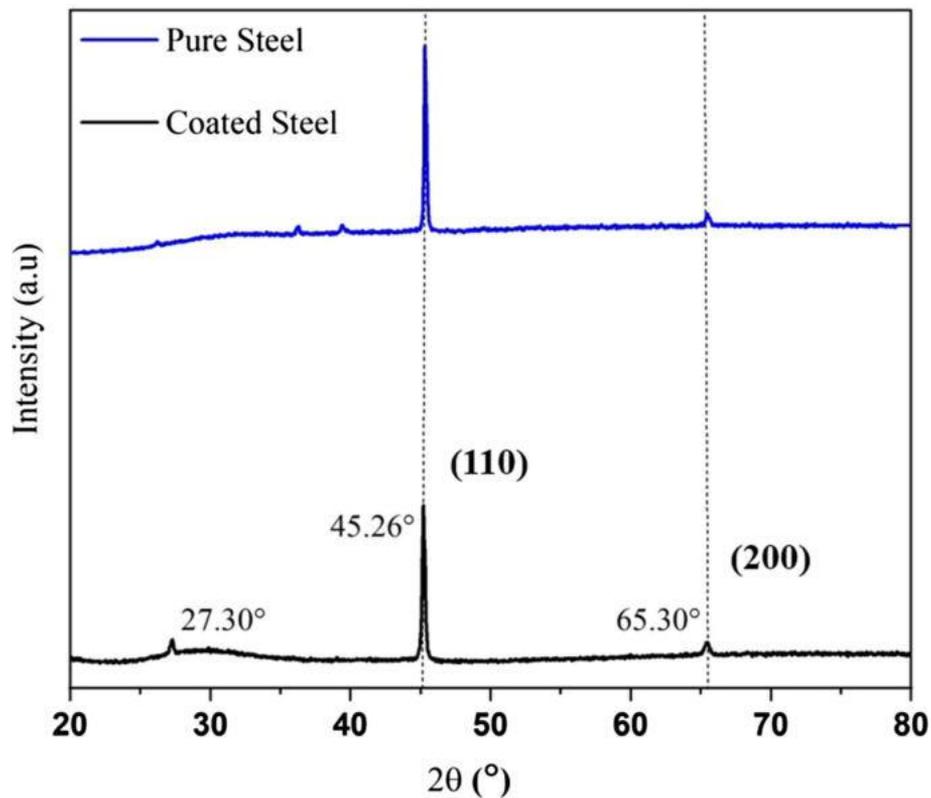
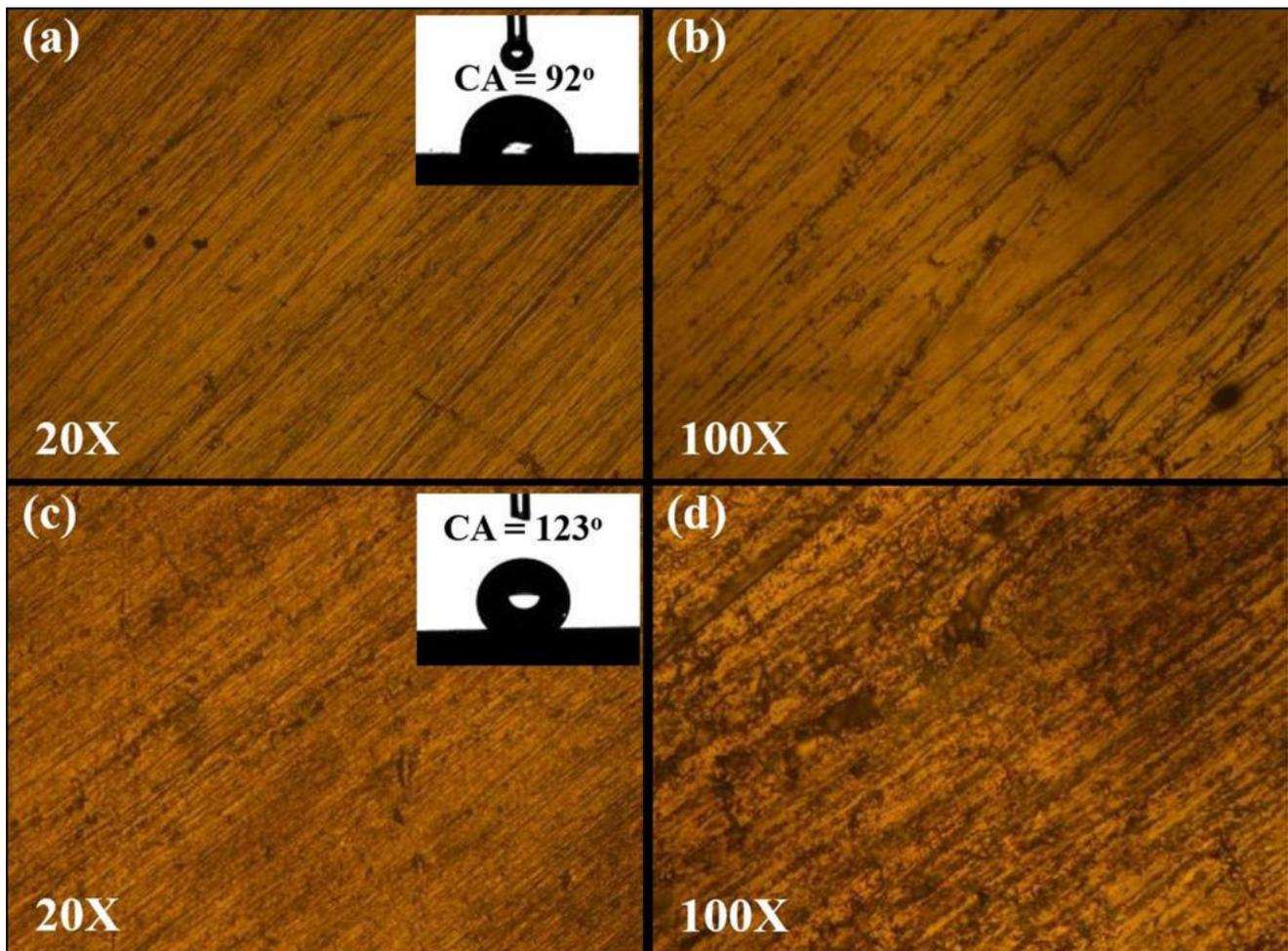


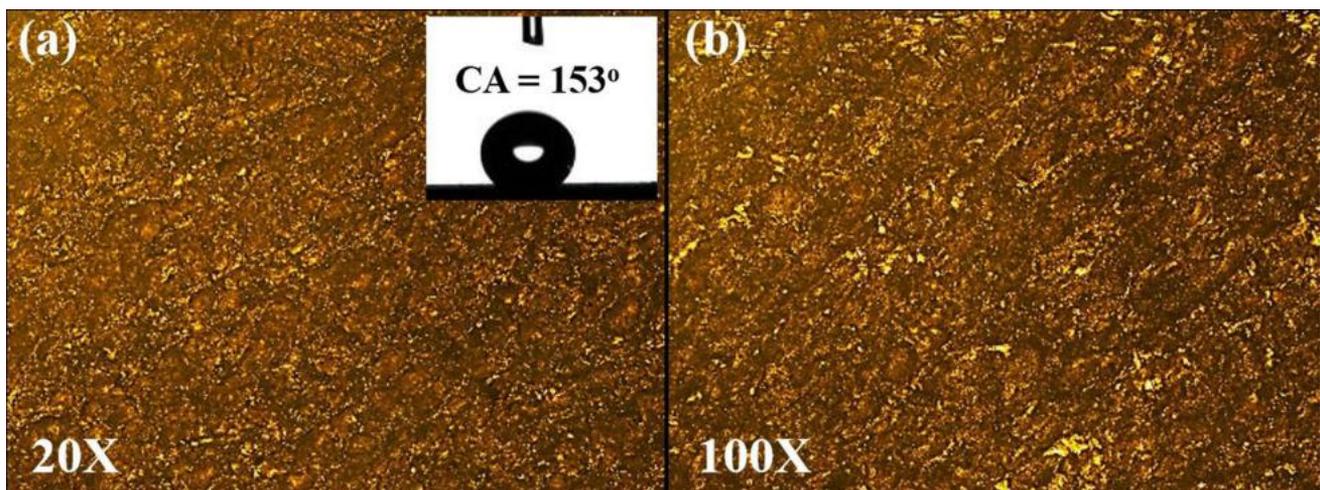
Fig. 4 X-ray diffraction (XRD) pattern of uncoated (pure steel) and coated mild steel samples

ior of the coating. The relation between an average surface roughness ( $R_{avg}$ ) and contact angle (CA) with sliding angle (SA) of the polished, etched and coated mild steel is shown in Table 1. It is evident from Table 1 that etched mild steel has higher  $R_{avg}$  (110 nm) compared to polished steel  $R_{avg}$  (60 nm)

which is obvious because the chemical eats away some portion of the metal (Ref 11). Similarly, the coated mild steel exhibits higher  $R_{avg}$  (193 nm) compared to the etched mild steel. A similar trend is followed by the water CA, because as per the literature if the  $R_{avg}$  of a surface increases then the water CA



**Fig. 5** Optical micrographs of (a, b) polished mild steel and (c, d) etched mild steel substrates at 20X and 100X with their corresponding contact angles (inset of a and c)

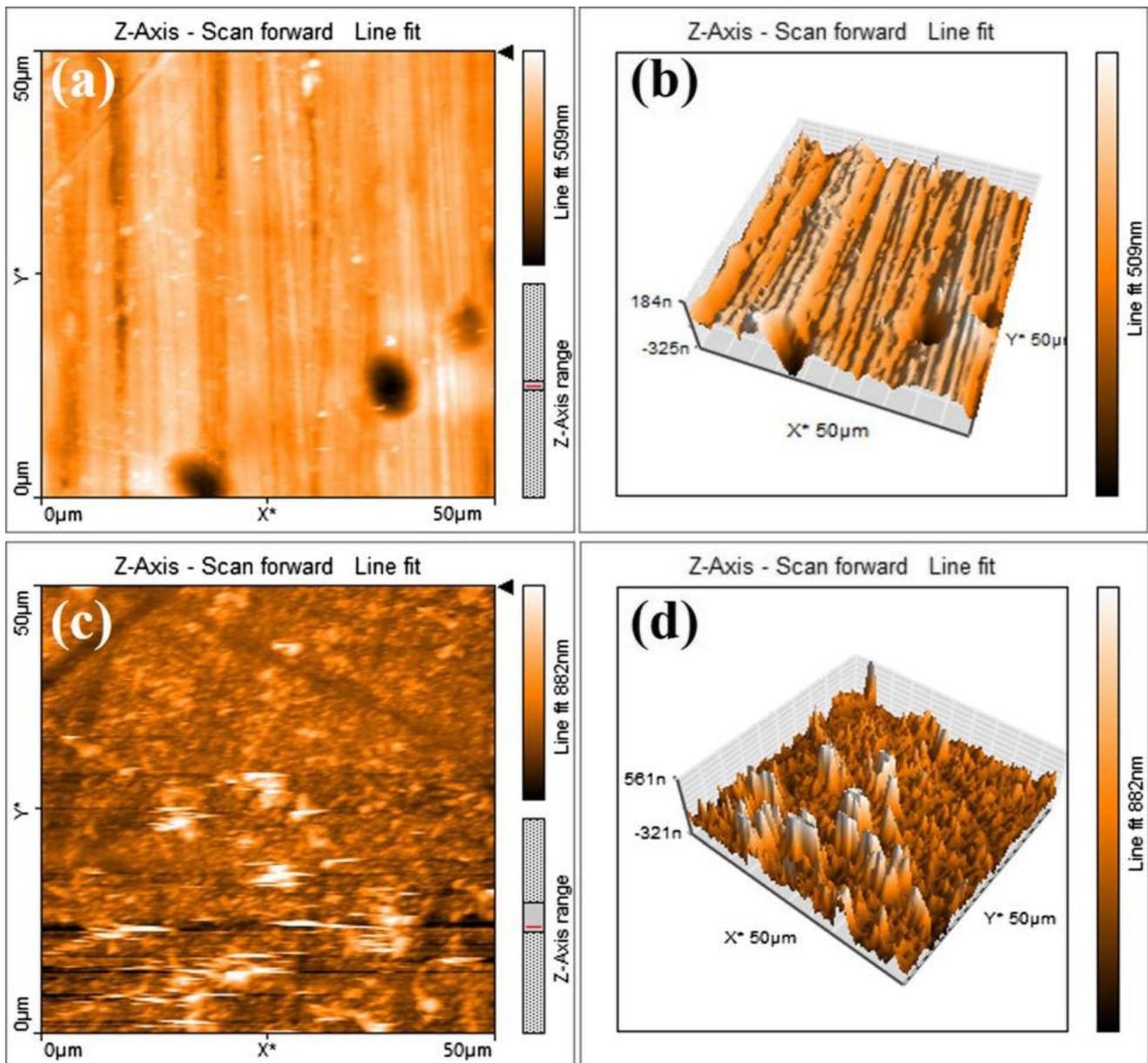


**Fig. 6** Optical micrographs of (a, b) coated mild steel at 20X and 100X with their corresponding contact angle (inset of a)

also increases (Ref 12, 14). However, with the increase in surface roughness, the SA goes on decreasing which is in close agreement with the results published by others (Ref 16). Thus, in the current study, the surface-functionalized  $\text{SiO}_2$  nanopar-

ticles are found responsible for the increased roughness of the mild steel in different situations.

FESEM analysis was performed to characterize the morphology of the coated mild steel. The FESEM images of coated



**Fig. 7** The 2D and 3D AFM images of (a, b) polished and (c, d) etched mild steel

mild steel at different magnifications are shown in Fig. 9. The lower magnification image is showing a quite rough surface of the coated mild steel. The high roughness is in close agreement with the AFM results. However, the high magnification FESEM image is showing individual nanoparticles (solid white circle) and their large size spherical agglomerates (dotted white circle) on the coated surface of mild steel. The presence of nanoparticles and their micron or sub-micron size clusters jointly produce a micro-nano hierarchical surface roughness, which is in close agreement with the AFM results. Thus, this hierarchical roughness leads to the superhydrophobic surface formation on the metallic substrate. That can be very effective in controlling the corrosion of mild steel.

The corrosion resistance of the uncoated and coated mild steel samples was characterized by immersing the samples in a corrosive salt solution (3.5% NaCl) for 30 days. Optical images of uncoated and coated mild steel after dipping in a corrosive

salt solution for a 1-month under ambient conditions are shown in Fig. 10. The physical appearance is revealing that the uncoated substrate corroded significantly, while the coated substrate remains almost non-corroded. However, the coating is damaged a little bit and reveals partially inflated spots on the surface. The water droplet sitting on coated mild steel after a 1-month corrosion test is shown in Fig. 11. The CA of the coated mild steel substrate was reduced to  $\sim 135 \pm 3^\circ$  from  $153 \pm 2^\circ$  after the 1-month corrosion test, which is obvious as the coating was found little bit damaged due to corrosive salt. Thus, it indicates the reliability of the coating and its efficiency as corrosion resistance material for mild steel.

The corrosion resistance performance of uncoated and coated mild steel samples was estimated using Nyquist plots and potentiodynamic polarization curves of EIS (Fig. 12). Figure 12(a) shows that the impedance of coated mild steel is significantly higher than that of uncoated mild steel, signifying

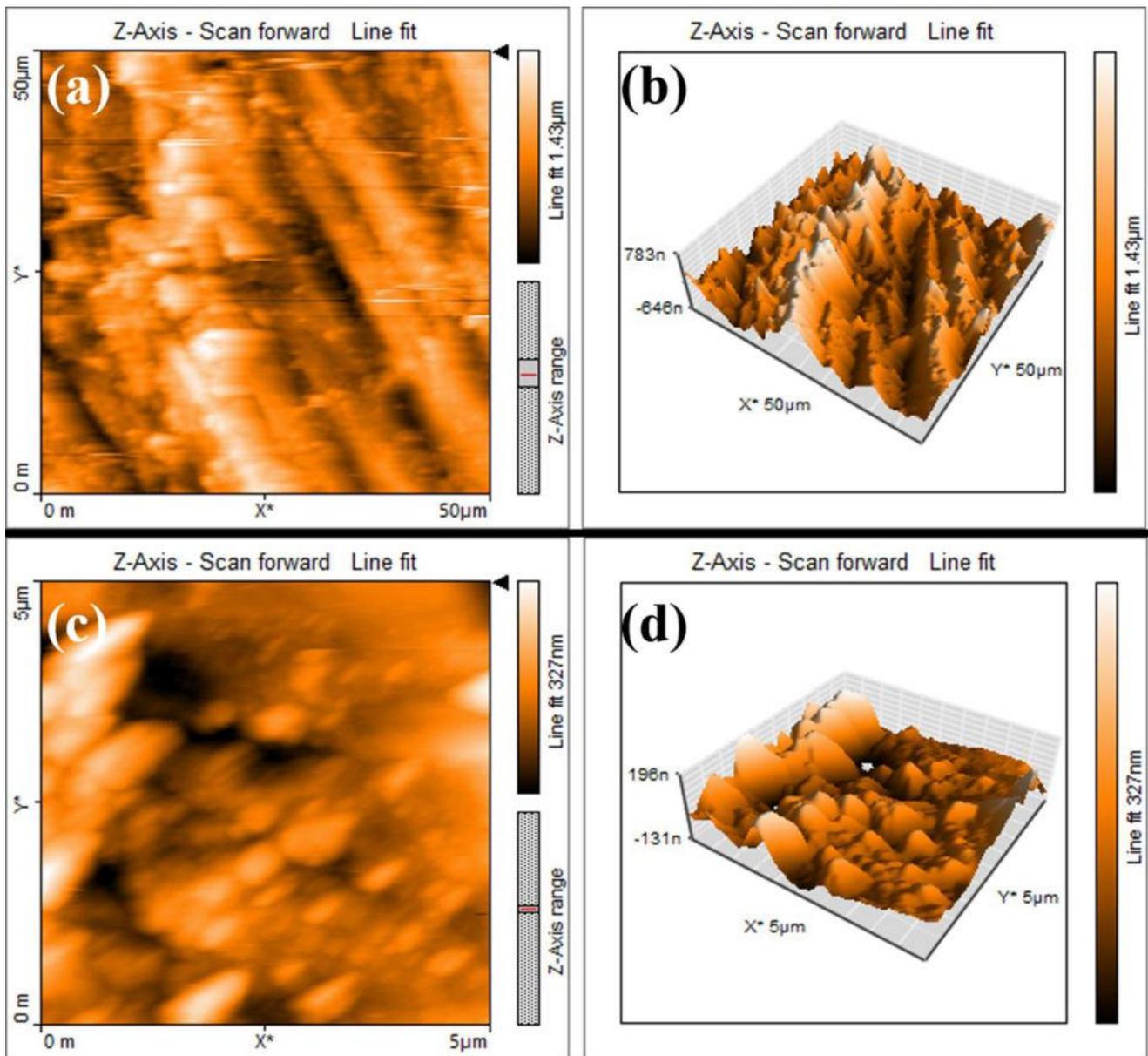


Fig. 8 The 2D (a, c) and 3D (b, d) AFM images of coated mild steel at lower and higher magnifications

Table 1 The relation between  $R_{avg}$  and CA with sliding angle (SA) of the polished, etched and coated mild steel

Metallic substrate	Avg. roughness, nm	CA, °	SA, °
Polished Steel	60	$92 \pm 2$	$50 \pm 5$
Etched Steel	110	$123 \pm 3$	$28 \pm 3$
Coated Steel	193	$153 \pm 2$	$5 \pm 2$

that the corrosion confrontation of coated mild steel is very high compared to the uncoated mild steel (Ref 16, 25). The polarization curves of coated sample (Fig. 12b) demonstrating the low current density ( $I_{corr}$ ) and high  $E_{corr}$  compared to the uncoated one specified the higher corrosion resistance due to the superhydrophobic coating (Ref 16, 25). The corrosion properties of uncoated and coated mild steel are illustrated in

Table 2. The EIS Nyquist plots exhibit typical semi-circle for mild steel and semi-circle type arc with tail for coated mild steel, therefore EIS data was fitted using two equivalent electric circuit models (Fig. 12c and d), which are typically used for bare and coated mild steel (Ref 25, 26). The fitted EIS data of uncoated and coated mild steel is shown in Table 3. Where  $R_s$  is solution resistance,  $R_{pro}$  is the resistance of corrosion products,  $CPE_1$  is the coating constant phase element which corresponds double-layer capacitance at the interface of metal and coating.  $CPE_{dl}$  corresponds to double layer capacitance occurred at the interface of metal and solution (corroded area) and  $R_{ct}$  is charge transfer resistance.  $R_s$  depends on the geometry of the area through which current is flowing as well as on the resistivity of electrolyte.  $R_s$  is technically not the main component as it is not representing the property of a coating during coating performance analysis (Ref 25). The use of modified nanoparticles-based coating on mild steel-enhanced  $R_{ct}$  value almost 8 times

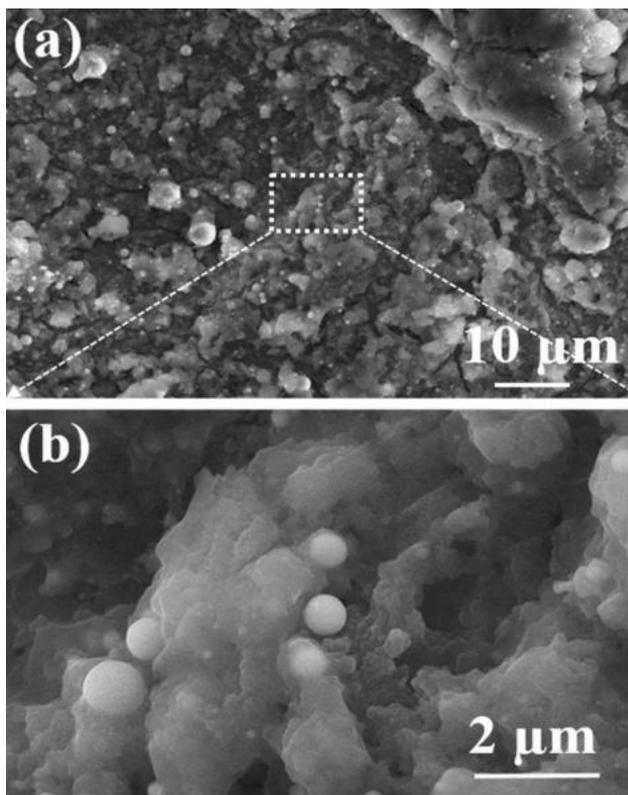
higher than the mild steel whereas diminished double layer capacitance  $CPE_{dl}$ . The low value of  $CPE_{dl}$  signified decreased coating porosity as well as better corrosion resistance performance for coated steel substrate, which is in close agreement with the results reported by others (Ref 25, 26).

Usually, low  $I_{corr}$  means a low corrosion rate. Silica is a well-known coupling element for the corrosion resistance of metals for ages. This may be due to the formation of a layer of Si-O metal bonds over the sample surface, which dominates the

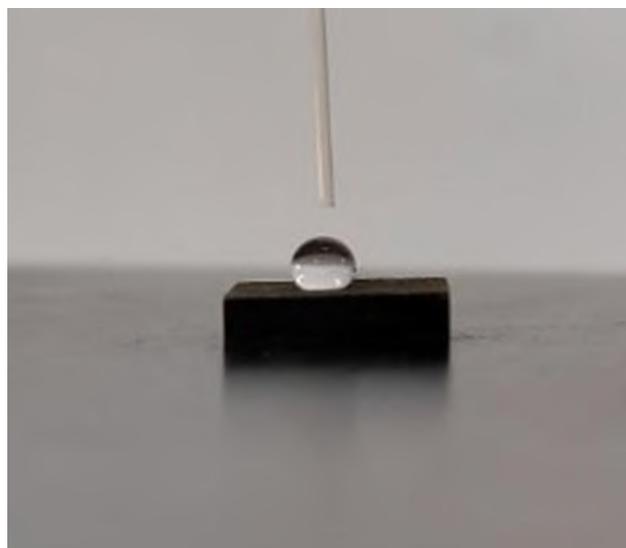
corrosion reaction and decrease its speed, even if the substrate does not possess superhydrophobic properties (Ref 27). The cathodic and anodic current goes down and corrosion potential ( $E_{corr}$ ) goes toward a positive value due to superhydrophobic coating (Ref 28, 29). Thus, the superhydrophobic coating has an inordinate potential to resist the corrosion of mild steel or other metals.

#### 4. Conclusions

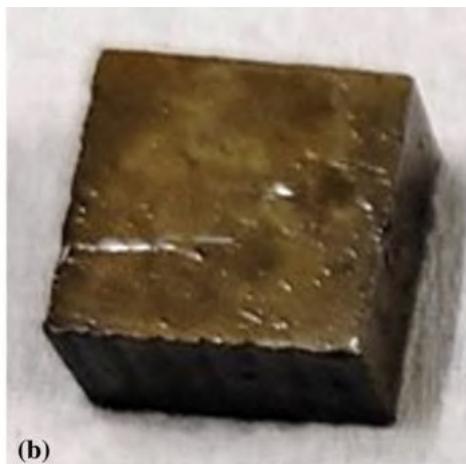
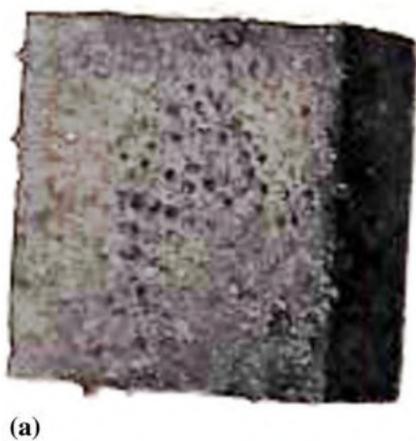
Triethoxyoctylsilane-modified  $SiO_2$  nanoparticles-based superhydrophobic coating was successfully prepared via solution method to prevent the corrosion of mild steel. The developed coating exhibited micro-nano hierarchical roughness due to the presence of individual nanoparticles and their micron size clusters as verified by AFM and FESEM analysis. The hierarchical roughness of the coating resulted in the superhy-



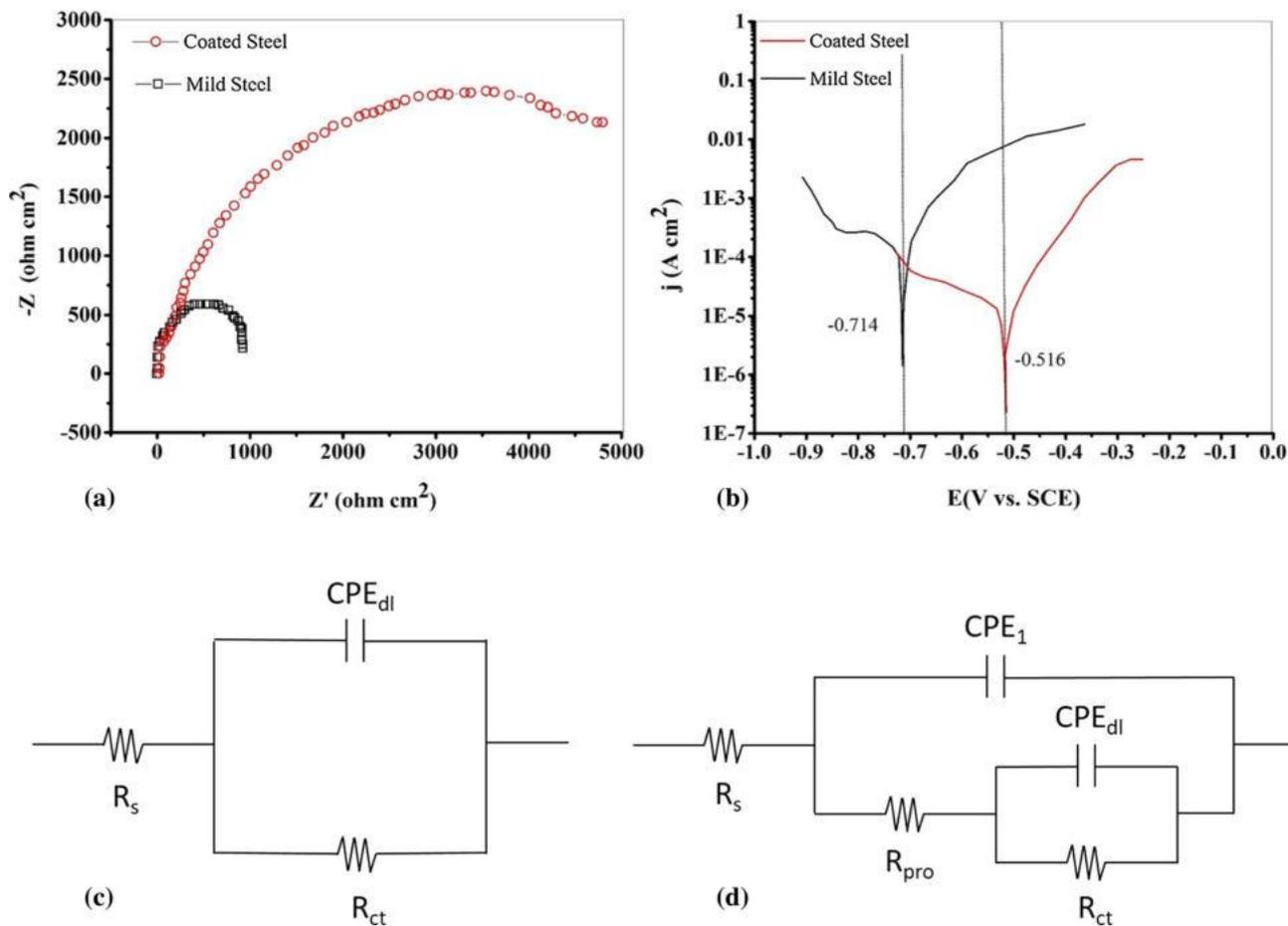
**Fig. 9** FESEM images of coated mild steel at lower and higher magnifications



**Fig. 11** The water droplet sitting on coated mild steel after a 1-month corrosion test



**Fig. 10** Optical images of (a) uncoated and (b) coated mild steel after dipping in a corrosive salt solution for a month at ambient conditions



**Fig. 12** (a) Nyquist plots, (b) potentiodynamic polarization curves and (c) equivalent circuits based on EIS data fitting of uncoated and coated mild steel. SCE-saturated calomel electrode

**Table 2** The corrosion properties of uncoated and coated mild steel

Metallic substrate	$E_{\text{corr}}$ , V versus SCE	$I_{\text{corr}}$ , $\times 10^{-6}$ A/cm <sup>2</sup>
Uncoated mild steel	- 0.516	0.201
Coated mild steel	- 0.714	0.041

**Table 3** Fitted EIS data of uncoated and coated mild steel

Metallic substrate	$R_s$ , $\Omega$ cm <sup>2</sup>	CPE <sub>dl</sub>		CPE <sub>1</sub>		$R_{\text{pro}}$ , $\Omega$ cm <sup>2</sup>
		$C$ , $\mu\text{F}/\text{cm}^2$	$n$	$C$ , $\mu\text{F}/\text{cm}^2$	$n$	
Uncoated mild steel	2.32	6.99	1	121	...	...
Coated mild steel	3.58	2.12	1	962	1000	1 6.288

drophobicity of the mild steel. The maximum water CA of  $153 \pm 2^\circ$  with a SA of  $5 \pm 2^\circ$  was obtained for the coated mild steel compared to the uncoated mild steel (CA of  $92 \pm 2^\circ$  with

SA of  $50 \pm 5^\circ$ ). The EIS plots confirmed the significant corrosion resistance performance of coated metal over the uncoated one. Thus, the developed superhydrophobic coating can play a vital role in controlling the corrosion of metals. However, there is a great need to study the mechanical and thermal stability of such coatings for industrial applications.

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# Organic Preparations and Procedures International

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## Microwave-Assisted Iodotrimethylsilane-Promoted Synthesis of Novel Pyrazolyl Chalcones

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## Microwave-Assisted Iodotrimethylsilane-Promoted Synthesis of Novel Pyrazolyl Chalcones

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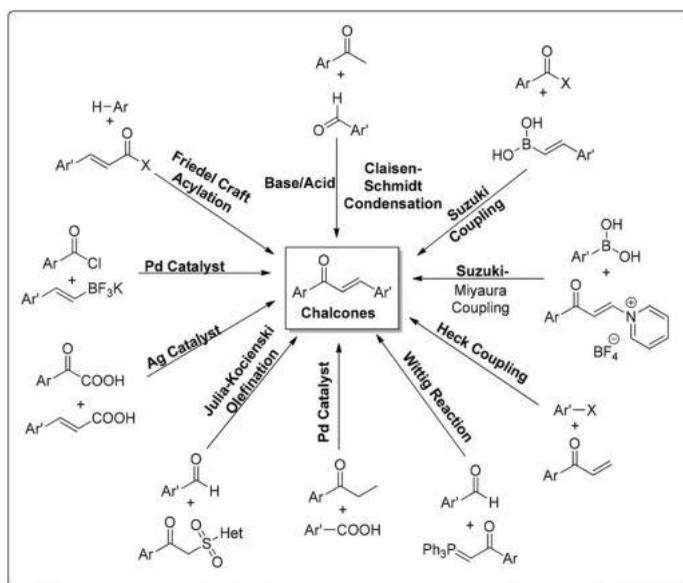
The presence of heterocyclic units as central structural features in both natural products and synthetic molecules has been long recognized in preparative organic chemistry.<sup>1</sup> Among heterocycles, some pyrazoles have been successfully commercialized as medicines or pesticides,<sup>2–5</sup> and, as a class, pyrazoles exhibit a wide range of pharmacological properties. The latter represent remarkably divergent areas, including antimalarial, anti-glaucoma, antihypercholesterolemia, antihyperglycemic, antihypertensive, analgesic, anti-Parkinson, antipsychotic, antimicrobial, anti-inflammatory, anticonvulsant, anticancer, and estrogen receptor (ER) ligand activities.<sup>4–10</sup> Consequently, pyrazole chemistry is a mature field and occupies a prime place in organic synthesis.<sup>11</sup>

Chalcones are key synthons used to design heterocyclic compounds in drug development. It is believed that the broad range of biological activities of chalcones is due, at least in part, to the presence of the ethylene unit in conjugation with the carbonyl functionality, as removal of this functionality makes them inactive. Such biological properties as anticancer,<sup>12–14</sup> anti-oxidant,<sup>15–18</sup> anti-inflammatory,<sup>19–21</sup> antimicrobial,<sup>22</sup> antitubercular,<sup>23</sup> antileishmanial,<sup>24</sup> antimalarial,<sup>25</sup> anthelmintic,<sup>16</sup> and osteogenic<sup>26</sup> activities of chalcones are well known in the literature. The synthesis of chalcones remains a crucial area of research for synthetic organic and medicinal chemists. Several synthetic protocols are reported in the literature for the synthesis of chalcones (Figure 1). The most common involves acid or base mediated Claisen-Schmidt condensation under homogeneous conditions.<sup>27,28</sup> The search for new synthetic protocols with such advantages as shortened reaction times, high yields, and eco-friendliness remains challenging.<sup>29</sup> The advent of microwave-assisted synthesis of heterocyclic compounds has the potential to assist in this search because it offers many of the needed advantages.<sup>30–34</sup>

In our ongoing investigations into the synthesis of pyrazoles<sup>35–47</sup> we have considered Me<sub>3</sub>SiI in its role as a promising promoter and water scavenger. We now report an

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**Figure 1.** Some synthetic methods used for chalcone synthesis.

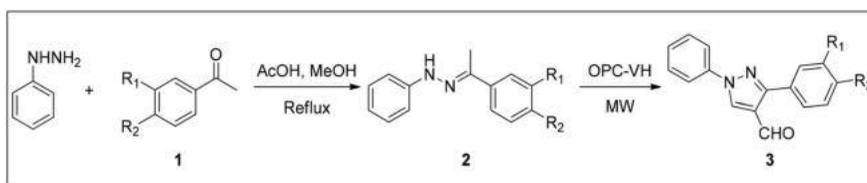
optimized microwave-assisted  $\text{Me}_3\text{SiI}$ -promoted synthetic procedure for pyrazolyl chalcones.

This closely relates to our prior work on the Vilsmeier-Haack reagent OPC-VH (prepared from phthaloyl dichloride (OPC) and DMF), enabling in a convenient way the reaction of acetophenone hydrazones to give 4-formylpyrazoles **3** (Scheme 1).<sup>35,41,48,49</sup>

Having in hand the 4-formylpyrazoles **3** prepared by this method, we sought to use them to prepare the title pyrazolyl chalcones. First, as a model, 1,3-diphenyl-1*H*-pyrazole-4-carbaldehyde **3a** (1.0 equiv.) was subjected to Claisen-Schmidt condensation with propiophenone (1.2 equiv.) to prepare pyrazolyl chalcone **5a** under the conditions noted in Table 1. Under a variety of conventional conditions (Entries 1-6) compound **5a** was formed only in yields of 30-45%. The use of dimethylformamide (DMF), higher temperatures and  $\text{Me}_3\text{SiI}$  offered encouraging improvements in the yield (Entries 7-12). Finally, the reaction of **3a** and propiophenone with 3 equivalents of  $\text{Me}_3\text{SiI}$  in DMF for 10 min at 100 °C using microwave irradiation gave 88% of the pyrazolyl chalcone **5a** (Entry 13). The great reduction in reaction time made possible by microwave irradiation is noteworthy.

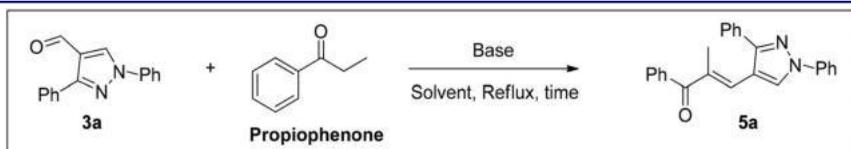
Having established the optimized reaction conditions, we extended the scope and generality of the procedure with different substituents at the aryl moieties as shown in Table 2. Each of the pyrazolyl chalcones **5a-l** could easily be prepared within 15 minutes (yields 76-93%, mean 85%). It was found that the reactions proceeded smoothly when either electron donating or withdrawing groups were present at the aryl rings. All of the novel compounds were rigorously characterized (see Experimental section).

In summary, this study presents a microwave-assisted iodotrimethylsilane-promoted synthesis of novel pyrazolyl chalcones. Hallmarks of this method include operational simplicity, easy work up procedures, very good yields and short reaction times. Now that pyrazolyl chalcones are readily available with the structural complexity



**Scheme 1.** Synthesis of 4-formylpyrazoles **3** using microwave assisted OPC-VH reaction.

**Table 1.** Optimization of reaction conditions.



Entry	Method <sup>b</sup>	Base (equiv.)	Solvent	Time (h)	Temperature (°C)	<b>5a</b> yield (%) <sup>a</sup>
1	A	–	MeOH	24	Reflux	NR
2	A	NaOMe (1.0)	MeOH	7	Reflux	30
3	A	NaOEt (1.0)	EtOH	7	Reflux	33
4	A	NaOH (1.0)	MeOH	6	Reflux	37
5	A	KOH (1.0)	MeOH	6	Reflux	45
6	A	Piperidine (2.0)	EtOH	24	Reflux	32
7	A	Me <sub>3</sub> SiI (2.0)	DMF	18	60°C	61
8	A	Me <sub>3</sub> SiI (2.0)	DMF	14	80°C	63
9	A	Me <sub>3</sub> SiI (2.0)	DMF	10	100°C	68
10	A	Me <sub>3</sub> SiI (2.0)	DMF	10	120°C	67
11	A	Me <sub>3</sub> SiI (3.0)	DMF	10	100°C	71
12	A	Me <sub>3</sub> SiI (4.0)	DMF	10	100°C	69
13	B	Me <sub>3</sub> SiI (3.0)	DMF	10 min	100°C	88

Reaction Condition: Compound **3a** (1 eq.), propiophenone (1.2 eq.), Base, Solvent, time, temperature.

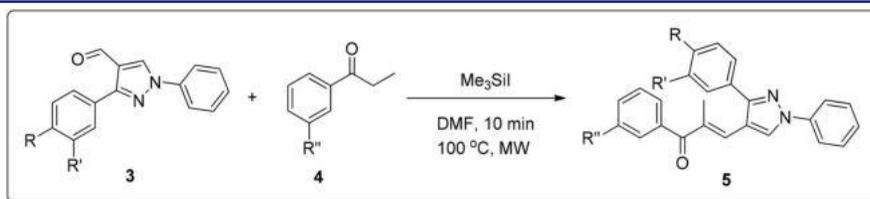
<sup>a</sup>Isolated yields.

<sup>b</sup>Conventional heating (Method A) and Microwave irradiation (Method B).

demonstrated here, we hope that our methods will promote further investigation of their useful properties.

## Experimental section

Chemicals were obtained from commercial sources and used without further purification. Melting points were determined in open glass capillaries on a Fisher-Johns melting point apparatus and are uncorrected. <sup>1</sup>H NMR (400 MHz) spectra were recorded at room temperature in CDCl<sub>3</sub> as solvent and tetramethylsilane (TMS) as an internal standard. Coupling constants (*J*) are reported in Hz; those for common alkyl groups were in the expected range and are not separately marked. <sup>13</sup>C NMR (100 MHz) spectra were recorded in CDCl<sub>3</sub> solutions with TMS as internal standard. The mass spectra were recorded on a JOEL JMS 600 mass spectrometer at an ionizing potential of 70eV (EI) in the electron impact ionization mode using the direct inlet system. All the reactions were monitored by thin-layer chromatography (TLC) on pre-coated silica gel 60 F254 (mesh); spots were visualised under UV light at 254 nm. Elemental analyses were obtained using a Carlo Erba EA1108 microanalyzer. Infrared (IR) spectra were obtained

**Table 2.** Microwave assisted synthesis of Pyrazole based Chalcones (**5**)<sup>a</sup>.

Entry <sup>c</sup>	Product	R	R'	R''	%Yield <sup>b</sup>
1	<b>5a</b>	H	H	H	88
2	<b>5b</b>	Cl	H	H	79
3	<b>5c</b>	CH <sub>3</sub>	H	H	78
4	<b>5d</b>	F	Br	H	87
5	<b>5e</b>	OCH <sub>3</sub>	H	H	90
6	<b>5f</b>	Br	H	H	87
7	<b>5g</b>	H	H	Cl	76
8	<b>5h</b>	Cl	H	Cl	78
9	<b>5i</b>	CH <sub>3</sub>	H	Cl	89
10	<b>5j</b>	F	Br	Cl	86
11	<b>5k</b>	OCH <sub>3</sub>	H	Cl	87
12	<b>5l</b>	Br	H	Cl	93

<sup>a</sup>Reaction conditions: 1*H*-Pyrazole-4-carbaldehyde **3** (1.0 equiv.), propiophenone **4** (1.2 equiv.) and Me<sub>3</sub>SiI (3.0 equiv.), DMF (3 mL), 100 °C, 10 min, MW.

<sup>b</sup>Yields of isolated products **5** with respect to **3**.

<sup>c</sup>All the products were duly characterized by <sup>1</sup>H NMR, <sup>13</sup>C NMR, Mass, IR and elemental analysis.

on the Shimadzu FTIR spectrophotometer using KBr and only functional group frequencies are given in cm<sup>-1</sup>.

### 1,3-Disubstituted-4-formylpyrazoles<sup>35</sup>

Vilsmeier-Haack reagent (OPC-VH reagent)<sup>35</sup> (0.73 g, 5.76 mmol) at 0 °C was added to a solution of the appropriate hydrazone **2** (1.92 mmol) in dimethylformamide (10 mL) in a microwave vial. The vial was closed with a Teflon septum and aluminium crimp by using a suitable crimping tool. The vial was then irradiated in the microwave and the temperature was steadily raised from room temperature to 60 °C in the interval of 10 minutes. The reaction mixture was cooled down and the crude product was poured into ice water. The crude product was neutralized with saturated NaHCO<sub>3</sub> solution and extraction of the target compound was done with ethyl acetate (2 × 50 mL). The ethyl acetate layer was washed with brine solution (2 × 15 mL), then dried over anhyd. Na<sub>2</sub>SO<sub>4</sub>, filtered and the solvent was evaporated under reduced pressure to afford crude compound **3** which was recrystallized with refluxing CHCl<sub>3</sub>-EtOH. The physical data of all 4-formylpyrazoles are provided in Table 3.

### 3-(3-Aryl-1-phenyl-1*H*-pyrazol-4-yl)-2-methyl-1-phenylprop-2-en-1-ones (**5**)

#### Method A (Conventional conditions)

Propiophenone (0.064 g, 0.48 mmol) and 1,3-diphenyl-1*H*-pyrazole-4-carbaldehyde (0.10 g, 0.40 mmol) were placed in a 20 mL tube and dissolved in DMF (5.0 mL).

**Table 3.** Physical data of 4-formylpyrazoles (**3a-f**).

Entry	Compound	R	Mol. Formula	Mol. Wt	%Yield	m.p. <sup>35</sup>
1	<b>3a</b>	H	C <sub>16</sub> H <sub>12</sub> N <sub>2</sub> O	248.28	85	142-145
2	<b>3b</b>	4-Cl	C <sub>16</sub> H <sub>11</sub> ClN <sub>2</sub> O	282.72	88	109-111
3	<b>3c</b>	4-CH <sub>3</sub>	C <sub>17</sub> H <sub>14</sub> N <sub>2</sub> O	262.31	87	99-101
4	<b>3d</b>	3-Br,4-F	C <sub>16</sub> H <sub>10</sub> BrFN <sub>2</sub> O	345.17	91	128-130
5	<b>3e</b>	4-OCH <sub>3</sub>	C <sub>17</sub> H <sub>14</sub> N <sub>2</sub> O <sub>2</sub>	278.31	79	134-136
6	<b>3f</b>	4-Br	C <sub>16</sub> H <sub>11</sub> BrN <sub>2</sub> O	327.18	78	155-157

Iodotrimethylsilane (TMSI) (0.24 g, 1.20 mmol) was added dropwise to the solution. The tube was sealed tightly and heated at 100 °C for 10 h. The reaction progress was monitored by TLC (20% ethyl acetate in pet ether). On completion, the sealed tube was cooled and the reaction mixture was poured onto crushed ice. The organic compound was extracted into ethyl acetate (2 x 50 mL). The organic layer was washed with brine solution (2 x 20 mL). The organic layer was dried over anhydrous Na<sub>2</sub>SO<sub>4</sub>, filtered and the filtrate was concentrated under reduced pressure to afford crude 3-(1,3-diphenyl-1H-pyrazol-4-yl)-2-methyl-1-phenylprop-2-en-1-one **5a**. The crude compound was purified by column chromatography using silica gel (100-200 mesh, 10% ethyl acetate in pet-ether) and afforded **5a** as an off-white solid in 71% yield.

#### **Method B (Microwave irradiation)**

All compounds **5** were synthesized using an Anton Paar Monowave-300 reactor (Gaas, Austria), operating at a frequency of 2.455 GHz with continuous irradiation power of 0 to 850W. The reactions were carried out in a G-4 borosilicate glass vial sealed with a Teflon septum and placed in a microwave cavity. Sufficient power was used to ramp up from room temperature to the desired temperature. Once this temperature was attained, the process vial was held at this temperature for the required time. The reactions were continuously stirred. Temperature was measured by an IR sensor. After the experiments, a cooling jet cooled the reaction vessel to ambient temperature. In a representative case, to a mixture of propiophenone (0.064 g, 0.48 mmol) and 1,3-diphenyl-1H-pyrazole-4-carbaldehyde (0.10 g, 0.40 mmol) in DMF (3.0 ml) in a microwave vial was added TMSI (0.24 g, 1.20 mmol) at room temperature and the mixture was stirred for 1 min. The vial was sealed with the Teflon septum and aluminium crimp, using an appropriate crimping tool. The vial was then subjected to microwave irradiation and the temperature was ramped from room temperature to 100 °C with the holding time of 10 min. The reaction was brought to room temperature, and the reaction mixture was poured into ice-water, and then extracted with ethyl acetate (2 x 20 mL). The organic layer was washed with brine solution (2 x 10 mL). The organic layer was dried over anhydrous Na<sub>2</sub>SO<sub>4</sub>, filtered and the filtrate was concentrated under reduced pressure to afford crude **5a**. The crude compound was purified as before to afford as an off-white solid in 88% yield.

#### **3-(1,3-Diphenyl-1H-pyrazol-4-yl)-2-methyl-1-phenylprop-2-en-1-one (5a)**

Off white solid; 88% yield; m.p. 126-128 °C. TLC solvent system: 20% EtOAc in pet-ether, Rf: 0.7. IR (KBr)  $\nu$  cm<sup>-1</sup>: 1685 (C = O), 1652 (C = N), 1621 (C = C); <sup>1</sup>H NMR

(CDCl<sub>3</sub>, 400 MHz):  $\delta$  8.24 (s, 1H, Pyrazole-H), 7.81 (d,  $J = 7.8$  Hz, 2H, ArH), 7.68 (d,  $J = 7.8$  Hz, 2H, ArH), 7.60 (dd,  $J = 7.5$  & 1.8 Hz, 2H, ArH), 7.33-7.53 (m, 9H, ArH), 7.23 (s, 1H, =CH), 2.30 (s, 3H, =C-CH<sub>3</sub>). <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>):  $\delta$  190.1 (C=O), 151.2 (C=N), 139.3, 139.1, 138.9, 138.3, 133.8, 132.9, 130.1, 129.1, 129.0, 128.9, 128.3, 128.1, 127.1, 125.7, 119.2, 112.6, 10.1 (CH<sub>3</sub>). ESI-MS ( $m/z$ ): 365.19 [M + H]<sup>+</sup>.

*Anal.* Calcd for C<sub>25</sub>H<sub>20</sub>N<sub>2</sub>O: C, 82.39; H, 5.53. Found: C, 82.07; H, 5.51.

### **3-(3-(4-Chlorophenyl)-1-phenyl-1H-pyrazol-4-yl)-2-methyl-1-phenylprop-2-en-1-one (5b)**

Light yellow solid, 79% yield; m.p. 157-159 °C. TLC solvent system: 20% EtOAc in pet-ether, Rf: 0.8. IR (KBr)  $\nu$  cm<sup>-1</sup>: 1687 (C=O), 1648 (C=N), 1619 (C=C); <sup>1</sup>H NMR (CDCl<sub>3</sub>, 400 MHz):  $\delta$  8.23 (s, 1H, Pyrazole-H), 7.79 (d,  $J = 8.4$  Hz, 2H, ArH), 7.68 (d,  $J = 8.4$  Hz, 2H, ArH), 7.49-7.55 (m, 5H, ArH), 7.43 (t,  $J = 7.6$  Hz, 2H, ArH), 7.33-7.38 (m, 3H, ArH), 7.16 (s, 1H, =CH), 2.30 (s, 3H, =C-CH<sub>3</sub>). <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>):  $\delta$  190.2 (C=O), 150.1 (C=N), 139.5, 139.3, 138.9, 138.4, 134.2, 133.9, 130.1, 129.2, 129.1, 129.0, 128.3, 128.1, 127.1, 125.9, 119.4, 112.5, 10.2 (CH<sub>3</sub>). ESI-MS ( $m/z$ ): 401.15 [M + H, <sup>37</sup>Cl]<sup>+</sup>, 399.25 [M + H, <sup>35</sup>Cl]<sup>+</sup>.

*Anal.* Calcd for C<sub>25</sub>H<sub>19</sub>ClN<sub>2</sub>O: C, 75.28; H, 4.80. Found: C, 74.89; H, 4.67.

### **2-Methyl-1-phenyl-3-(1-phenyl-3-(p-tolyl)-1H-pyrazol-4-yl)prop-2-en-1-one (5c)**

Light green solid, 78% yield; m.p. 124-126 °C. TLC solvent system: 20% EtOAc in pet-ether, Rf: 0.8. IR (KBr)  $\nu$  cm<sup>-1</sup>: 1690 (C=O), 1649 (C=N), 1625 (C=C); <sup>1</sup>H NMR (CDCl<sub>3</sub>, 400 MHz):  $\delta$  8.23 (s, 1H, Pyrazole-H), 7.80 (dd,  $J = 8.8$  & 1.2 Hz, 2H, ArH), 7.68 (dd,  $J = 8.4$  & 1.6 Hz, 2H, ArH), 7.48-7.52 (m, 5H, ArH), 7.44 (t,  $J = 7.6$  Hz, 2H, ArH), 7.35 (t,  $J = 7.6$  Hz, 1H, ArH), 7.24 (s, 1H, =CH), 7.18 (d,  $J = 7.6$  Hz, 2H, ArH), 2.37 (s, 3H, ArCH<sub>3</sub>), 2.30 (d,  $J = 1.2$  Hz, 3H, =C-CH<sub>3</sub>). <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>):  $\delta$  190.1 (C=O), 149.3 (C=N), 139.5, 139.3, 138.9, 138.2, 134.1, 131.1, 130.5, 130.1, 129.4, 129.2, 129.1, 128.3, 128.1, 125.9, 119.3, 112.6, 21.1 (Ar-CH<sub>3</sub>), 10.2 (CH<sub>3</sub>). ESI-MS ( $m/z$ ): 379.10 [M + H]<sup>+</sup>.

*Anal.* Calcd for C<sub>26</sub>H<sub>22</sub>N<sub>2</sub>O: C, 82.51; H, 5.86. Found: C, 82.19; H, 5.83.

### **3-(3-(3-Bromo-4-fluorophenyl)-1-phenyl-1H-pyrazol-4-yl)-2-methyl-1-phenylprop-2-en-1-one (5d)**

Light brown solid, 87% yield; m.p. 152-154 °C. TLC solvent system: 20% EtOAc in pet-ether, Rf: 0.8. IR (KBr)  $\nu$  cm<sup>-1</sup>: 1681 (C=O), 1651 (C=N), 1620 (C=C); <sup>1</sup>H NMR (CDCl<sub>3</sub>, 400 MHz):  $\delta$  8.22 (s, 1H, Pyrazole-H), 7.77-7.83 (m, 3H, ArH), 7.68 (d,  $J = 8.0$  Hz, 2H, ArH), 7.44-7.54 (m, 6H, ArH), 7.37 (t,  $J = 7.6$  Hz, 1H, ArH), 7.10-7.15 (m, 2H, ArH, =CH), 2.30 (d,  $J = 1.2$  Hz, 3H, =C-CH<sub>3</sub>). <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>):  $\delta$  189.3 (C=O), 164.1 (Ar-F), 149.9 (C=N), 139.3, 139.1, 138.8, 138.1, 134.1, 133.9, 130.5, 130.2, 129.5, 129.2, 129.1, 128.3, 125.9, 119.3, 117.9, 112.6, 109.5, 10.2 (CH<sub>3</sub>). ESI-MS ( $m/z$ ): 463.17 [M + H, <sup>81</sup>Br]<sup>+</sup>, 461.19 [M + H, <sup>79</sup>Br]<sup>+</sup>.

*Anal.* Calcd for C<sub>25</sub>H<sub>18</sub>BrFN<sub>2</sub>O: C, 65.09; H, 3.93. Found: C, 65.15; H, 3.88.

### **3-(3-(4-Methoxyphenyl)-1-phenyl-1H-pyrazol-4-yl)-2-methyl-1-phenylprop-2-en-1-one (5e)**

Light yellow solid, 90% yield; m.p. 162-164 °C. TLC solvent system: 20% EtOAc in pet-ether, Rf: 0.8. IR (KBr)  $\nu$   $\text{cm}^{-1}$ : 1684 (C=O), 1652 (C=N), 1620 (C=C);  $^1\text{H}$  NMR ( $\text{CDCl}_3$ , 400 MHz):  $\delta$  8.22 (s, 1H, Pyrazole-H), 7.80 (d,  $J=7.5$  Hz, 2H, ArH), 7.68 (dd,  $J=8.4$  & 1.8 Hz, 2H, ArH), 7.34-7.54 (m, 8H, ArH), 7.22 (s, 1H, =CH), 6.91 (d,  $J=8.7$  Hz, 2H, ArH), 3.83 (s, 3H, ArOCH<sub>3</sub>), 2.30 (d,  $J=1.2$  Hz, 3H, =C-CH<sub>3</sub>).  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ ):  $\delta$  190.0 (C=O), 159.9 (C-OCH<sub>3</sub>), 149.8 (C=N), 139.5, 139.3, 139.2, 138.3, 134.2, 130.1, 129.2, 129.1, 128.3, 128.2, 125.9, 125.1, 119.3, 113.9, 112.6, 51.1 (Ar-OCH<sub>3</sub>), 10.1 (CH<sub>3</sub>). ESI-MS (m/z): 395.07 [M + H]<sup>+</sup>.

*Anal.* Calcd for C<sub>26</sub>H<sub>22</sub>N<sub>2</sub>O<sub>2</sub>: C, 79.16; H, 5.62. Found: C, 78.94; H, 5.58.

### **3-(3-(4-Bromophenyl)-1-phenyl-1H-pyrazol-4-yl)-2-methyl-1-phenylprop-2-en-1-one (5f)**

Yellow solid, 87% yield; m.p. 174-176 °C. TLC solvent system: 20% EtOAc in pet-ether, Rf: 0.7. IR (KBr)  $\nu$   $\text{cm}^{-1}$ : 1681 (C=O), 1645 (C=N), 1618 (C=C);  $^1\text{H}$  NMR ( $\text{CDCl}_3$ , 400 MHz):  $\delta$  8.23 (s, 1H, Pyrazole-H), 7.79 (d,  $J=7.8$  Hz, 2H, ArH), 7.68 (d,  $J=8.4$  Hz, 2H, ArH), 7.36-7.54 (m, 10H, ArH), 7.16 (s, 1H, =CH), 2.30 (d,  $J=1.2$  Hz, 3H, =C-CH<sub>3</sub>).  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ ):  $\delta$  190.1 (C=O), 150.3 (C=N), 139.7, 139.4, 139.1, 138.5, 134.3, 131.9, 131.7, 130.1, 129.2, 129.1, 128.3, 128.1, 125.7, 122.9, 119.7, 112.7, 10.2 (CH<sub>3</sub>). ESI-MS (m/z): 445.14 [M + H,  $^{81}\text{Br}$ ]<sup>+</sup>, 443.17 [M + H,  $^{79}\text{Br}$ ]<sup>+</sup>.

*Anal.* Calcd for C<sub>25</sub>H<sub>19</sub>ClN<sub>2</sub>O: C, 67.73; H, 4.32. Found: C, 67.48; H, 4.29.

### **1-(3-Chlorophenyl)-3-(1,3-diphenyl-1H-pyrazol-4-yl)-2-methylprop-2-en-1-one (5g)**

Yellow solid; 76% yield; m.p. 128-130 °C. TLC solvent system: 20% EtOAc in pet-ether, Rf: 0.7. IR (KBr)  $\nu$   $\text{cm}^{-1}$ : 1685 (C=O), 1651 (C=N), 1621 (C=C);  $^1\text{H}$  NMR ( $\text{CDCl}_3$ , 400 MHz):  $\delta$  8.24 (s, 1H, Pyrazole-H), 7.78-7.84 (m, 4H, ArH), 7.66 (t,  $J=1.6$  Hz, 1H, ArH), 7.47-7.55 (m, 9H, ArH), 7.15 (s, 1H, =CH), 2.30 (s, 3H, =C-CH<sub>3</sub>).  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ ):  $\delta$  189.9 (C=O), 149.8 (C=N), 139.3, 139.1, 139.0, 138.4, 134.5, 134.3, 132.9, 130.5, 130.1, 129.6, 129.1, 128.9, 128.3, 127.1, 125.9, 125.5, 119.4, 112.9, 10.2 (CH<sub>3</sub>). ESI-MS (m/z): 401.08 [M + H,  $^{37}\text{Cl}$ ]<sup>+</sup>, 399.10 [M + H,  $^{35}\text{Cl}$ ]<sup>+</sup>.

*Anal.* Calcd for C<sub>25</sub>H<sub>19</sub>ClN<sub>2</sub>O: C, 75.28; H, 4.80. Found: C, 74.89; H, 4.76.

### **1-(3-Chlorophenyl)-3-(3-(4-chlorophenyl)-1-phenyl-1H-pyrazol-4-yl)-2-methylprop-2-en-1-one (5h)**

Light Green Solid, 78% yield; m.p. 112-114 °C. TLC solvent system: 20% EtOAc in pet-ether, Rf: 0.8. IR (KBr)  $\nu$   $\text{cm}^{-1}$ : 1690 (C=O), 1653 (C=N), 1625 (C=C);  $^1\text{H}$  NMR ( $\text{CDCl}_3$ , 400 MHz):  $\delta$  8.26 (s, 1H, Pyrazole-H), 7.81 (d,  $J=8.4$  Hz, 2H, ArH), 7.67 (t,  $J=1.6$  Hz, 1H, ArH), 7.59 (d,  $J=8.0$  Hz, 2H, ArH), 7.33-7.55 (m, 8H, ArH), 7.23 (s, 1H, =CH), 2.31 (s, 3H, =C-CH<sub>3</sub>).  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ ):  $\delta$  190.1 (C=O), 150.2 (C=N), 139.5, 139.3, 138.9, 138.4, 134.2, 133.9, 133.6, 130.9, 129.9, 129.7, 129.3, 128.7,

128.6, 128.2, 125.9, 125.7, 119.6, 112.8, 10.2 (CH<sub>3</sub>). ESI-MS (m/z): 437.12 [M + H, <sup>37</sup>Cl]<sup>+</sup>, 434.99 [M + H, <sup>37</sup>Cl<sup>35</sup>Cl]<sup>+</sup>, 433.16 [M + H, <sup>35</sup>Cl]<sup>+</sup>.

*Anal.* Calcd for C<sub>25</sub>H<sub>18</sub>Cl<sub>2</sub>N<sub>2</sub>O: C, 69.29; H, 4.19. Found: C, 68.96; H, 4.15.

### **1-(3-Chlorophenyl)-2-methyl-3-(1-phenyl-3-(p-tolyl)-1H-pyrazol-4-yl)prop-2-en-1-one (5i)**

Yellow Solid, 89% yield; m.p. 118-120 °C. TLC solvent system: 20% EtOAc in pet-ether, Rf: 0.8. IR (KBr)  $\nu$  cm<sup>-1</sup>: 1691 (C=O), 1654 (C=N), 1623 (C=C); <sup>1</sup>H NMR (CDCl<sub>3</sub>, 400 MHz):  $\delta$  8.24 (s, 1H, Pyrazole-H), 7.80 (dd, *J* = 8.8 & 1.2 Hz, 2H, ArH), 7.67 (t, *J* = 1.6 Hz, 1H, ArH), 7.46-7.56 (m, 6H, ArH), 7.34-7.38 (m, 2H, ArH), 7.23-7.25 (m, 3H, ArH), 2.38 (s, 3H, ArCH<sub>3</sub>), 2.30 (s, 3H, =C-CH<sub>3</sub>). <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>):  $\delta$  190.2 (C=O), 150.1 (C=N), 139.5, 139.3, 138.9, 138.2, 134.3, 134.1, 131.1, 130.5, 130.1, 129.8, 129.4, 129.2, 129.1, 128.3, 126.3, 125.9, 119.5, 112.7, 21.1 (Ar-CH<sub>3</sub>), 10.2 (CH<sub>3</sub>). ESI-MS (m/z): 415.14 [M + H, <sup>37</sup>Cl]<sup>+</sup>, 413.24 [M + H, <sup>35</sup>Cl]<sup>+</sup>.

*Anal.* Calcd for C<sub>26</sub>H<sub>21</sub>ClN<sub>2</sub>O: C, 75.63; H, 5.13. Found: C, 75.54; H, 5.07.

### **3-(3-(3-Bromo-4-fluorophenyl)-1-phenyl-1H-pyrazol-4-yl)-1-(3-chlorophenyl)-2-methylprop-2-en-1-one (5j)**

Yellow solid, 86% yield; m.p. 132-134 °C. TLC solvent system: 20% EtOAc in pet-ether, Rf: 0.8. IR (KBr)  $\nu$  cm<sup>-1</sup>: 1684 (C=O), 1651 (C=N), 1621 (C=C); <sup>1</sup>H NMR (CDCl<sub>3</sub>, 300 MHz):  $\delta$  8.24 (s, 1H, Pyrazole-H), 7.83 (dd, *J* = 6.6 & 2.4 Hz, 1H, ArH), 7.79 (d, *J* = 7.8 Hz, 2H, ArH), 7.63 (t, *J* = 1.5 Hz, 1H, ArH), 7.36-7.55 (m, 7H, ArH), 7.18 (t, *J* = 8.4 Hz, 1H, ArH), 7.12 (s, 1H, =CH), 2.30 (s, 3H, =C-CH<sub>3</sub>). <sup>13</sup>C NMR (75 MHz, CDCl<sub>3</sub>):  $\delta$  189.9 (C=O), 165.2 (Ar-F), 150.1 (C=N), 139.3, 139.1, 138.8, 138.4, 134.3, 134.2, 134.1, 130.5, 130.3, 129.9, 129.5, 129.2, 128.9, 125.9, 125.5, 119.3, 117.9, 112.6, 109.5, 10.2 (CH<sub>3</sub>). ESI-MS (m/z): 499.39 [M + H, <sup>81</sup>Br<sup>37</sup>Cl]<sup>+</sup>, 496.96 [M + H, <sup>79</sup>Br<sup>37</sup>Cl, <sup>81</sup>Br<sup>35</sup>Cl]<sup>+</sup>, 494.90 [M + H, <sup>79</sup>Br<sup>35</sup>Cl]<sup>+</sup>.

*Anal.* Calcd for C<sub>25</sub>H<sub>17</sub>BrClFN<sub>2</sub>O: C, 60.57; H, 3.46. Found: C, 60.39; H, 3.44.

### **1-(3-Chlorophenyl)-3-(3-(4-methoxyphenyl)-1-phenyl-1H-pyrazol-4-yl)-2-methylprop-2-en-1-one (5k)**

Light yellow solid, 87% yield; m.p. 159-160 °C. TLC solvent system: 20% EtOAc in pet-ether, Rf: 0.8. IR (KBr)  $\nu$  cm<sup>-1</sup>: 1681 (C=O), 1647 (C=N), 1618 (C=C); <sup>1</sup>H NMR (CDCl<sub>3</sub>, 400 MHz):  $\delta$  8.24 (s, 1H, Pyrazole-H), 7.79 (d, *J* = 8.8 Hz, 2H, ArH), 7.66 (t, *J* = 1.6 Hz, 1H, ArH), 7.45-7.55 (m, 6H, ArH), 7.33-7.38 (m, 2H, ArH), 7.21 (s, 1H, =CH), 6.97 (d, *J* = 8.8 Hz, 2H, ArH), 3.84 (s, 3H, ArOCH<sub>3</sub>), 2.30 (d, *J* = 1.2 Hz, 3H, =C-CH<sub>3</sub>). <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>):  $\delta$  190.1 (C=O), 159.8 (C-OCH<sub>3</sub>), 149.6 (C=N), 139.5, 139.3, 139.2, 138.3, 134.2, 134.0, 130.1, 129.8, 128.8, 127.9, 125.9, 125.5, 124.9, 119.3, 113.9, 112.6, 51.1 (Ar-OCH<sub>3</sub>), 10.1 (CH<sub>3</sub>). ESI-MS (m/z): 431.11 [M + H, <sup>37</sup>Cl]<sup>+</sup>, 429.06 [M + H, <sup>35</sup>Cl]<sup>+</sup>.

*Anal.* Calcd for C<sub>26</sub>H<sub>21</sub>ClN<sub>2</sub>O<sub>2</sub>: C, 72.81; H, 4.94. Found: C, 72.71; H, 4.91.

### 3-(3-(4-Bromophenyl)-1-phenyl-1H-pyrazol-4-yl)-1-(3-chlorophenyl)-2-methylprop-2-en-1-one (5I)

Light brown solid, 93% yield; m.p. 147-149 °C. TLC solvent system: 20% EtOAc in pet-ether, Rf: 0.7. IR (KBr)  $\nu$  cm<sup>-1</sup>: 1683 (C=O), 1651 (C=N), 1620 (C=C); <sup>1</sup>H NMR (CDCl<sub>3</sub>, 400 MHz):  $\delta$  8.24 (s, 1H, Pyrazole-H), 7.79 (d, *J* = 8.8 Hz, 2H, ArH), 7.66 (t, *J* = 1.6 Hz, 1H, ArH), 7.46-7.57 (m, 8H, ArH), 7.36-7.40 (m, 2H, ArH), 7.15 (s, 1H, =CH), 2.30 (d, *J* = 1.2 Hz, 3H, =C-CH<sub>3</sub>). <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>):  $\delta$  190.2 (C=O), 150.1 (C=N), 139.1, 138.8, 138.7, 138.1, 134.3, 134.1, 131.9, 131.7, 130.1, 129.8, 129.4, 128.9, 127.6, 125.7, 125.1, 122.9, 119.7, 112.7, 10.2 (CH<sub>3</sub>). ESI-MS (*m/z*): 480.76 [M + H, <sup>81</sup>Br<sup>37</sup>Cl]<sup>+</sup>, 478.94 [M + H, <sup>79</sup>Br<sup>37</sup>Cl, <sup>81</sup>Br<sup>35</sup>Cl]<sup>+</sup>, 476.96 [M + H, <sup>79</sup>Br<sup>35</sup>Cl]<sup>+</sup>.

*Anal.* Calcd for C<sub>25</sub>H<sub>18</sub>BrClN<sub>2</sub>O: C, 62.85; H, 3.80. Found: C, 62.49; H, 3.77.

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## Microwave-Assisted OPC-VH Mediated Synthesis of 2-Amino-1,3,4-thiadiazoles

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## Microwave-Assisted OPC-VH Mediated Synthesis of 2-Amino-1,3,4-thiadiazoles

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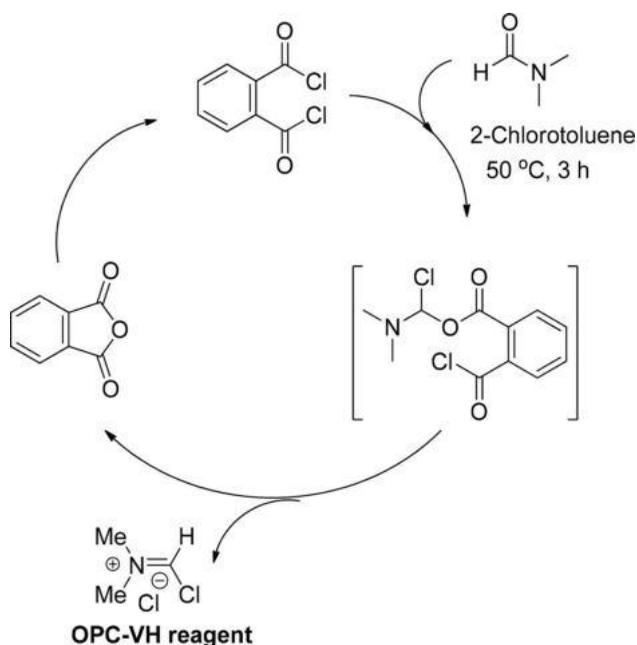
Bioactive thiadiazoles represent an indispensable class of nitrogen and sulfur containing heterocycles, in part due to their extensive applications in medicinal chemistry.<sup>1</sup> It is generally assumed that the biological activities of thiadiazoles are due to the presence of the =N-C-S- moiety and the aromaticity of the ring, responsible for the *in vivo* stability and low toxicity for higher vertebrates.<sup>2,3</sup>

Indeed, the thiadiazole ring represents a remarkably divergent scaffold responsible for numerous biological properties including antimicrobial,<sup>4</sup> antituberculosis,<sup>5</sup> antiviral,<sup>6</sup> analgesic,<sup>7</sup> antidepressant,<sup>8</sup> antihypertensive,<sup>9</sup> local anesthetic and kinesin inhibitory activities.<sup>10,11</sup> Consequently, 1,3,4-thiadiazole chemistry is a mature field and occupies an important niche in heterocyclic chemistry. The unit serves as a vital synthon for the preparation of more elaborate bioactive molecules.

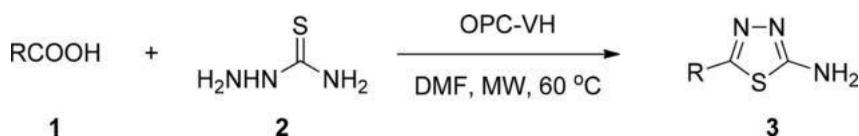
Several synthetic approaches are well known in the literature for the synthesis of 1,3,4-thiadiazoles. Some one-pot synthetic methods involve the reaction between carboxylic acids and thiosemicarbazides using (i) ionic liquids;<sup>12</sup> (ii) excess POCl<sub>3</sub>;<sup>13</sup> (iii) polyphosphoric acid;<sup>14</sup> (iv) a mixture of P<sub>2</sub>O<sub>5</sub> and MeSO<sub>3</sub>H;<sup>15</sup> and (v) polyphosphate ester (PPE).<sup>16</sup> However, high production costs, reagent toxicity, and by-product formation are disadvantages of some of the known methods.<sup>16</sup> Given the movement of the field towards greener, more efficient and lower cost methods,<sup>17</sup> microwave-assisted construction of heterocycles has truly come into its own.<sup>18–20</sup>

Recently, the Vilsmeier–Haack reagent (Scheme 1, OPC-VH) prepared by Kimura and his team<sup>21,22</sup> using *o*-phthaloyl dichloride and dimethylformamide was employed by us for the synthesis of 4-functional pyrazoles.<sup>23–26</sup> Taking into account our interest in the construction of heterocycles<sup>27–32</sup> and in light of the versatility of OPC-VH reagent, we sought a method to produce 2-amino-1,3,4-thiadiazoles, which may then be used to introduce substituents on the 5-position of the heterocycle. We now report an optimized microwave-assisted OPC-VH mediated synthetic approach for the needed 2-amino-1,3,4-thiadiazole derivatives.

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**Scheme 1.** Preparation of OPC-VH reagent.



**Scheme 2.** Construction of 2-amino-1,3,4-thiadiazoles **3** using OPC-VH reagent.

The OPC-VH reagent was first prepared from phthaloyl dichloride (OPC) and dimethylformamide (DMF) using Kimura's procedures.<sup>21,22</sup> The reagent was obtained in pure form, obviating the use of toxic  $\text{POCl}_3$ . The phthalic anhydride formed as a by-product may in its own turn be reused in the preparation of phthaloyl dichloride (Scheme 1).

Recently, the conversion has been reported in the literature of numerous hydrazones to 4-formyl pyrazoles and 4-formyl pyrazoles to 4-cyanopyrazoles using OPC-VH reagent.<sup>23,24,26</sup> These results encouraged us to study the synthesis shown in Scheme 2.

We further hoped that the microwave method would increase the rate of reaction as well as improve the overall yield of the products.<sup>31</sup> As a model experiment, the one-pot reaction of benzoic acid and thiosemicarbazide using OPC-VH (2.5 equiv.) at 60 °C in acetonitrile for 3 hours afforded the desired thiadiazole **3a** (**3**, R = Ph) in 54% yield (Table 1, entry 1). The reaction was also attempted with *o*-phthaloyl dichloride (2.5 equiv.) at 60 °C in acetonitrile for 6 hours but no desired product **3a** was observed (entry 2). Microwave irradiation, operating at a frequency of 2.455 GHz with continuous irradiation power of 0 to 850 W, was next studied, varying the solvent, temperature, and the amount of OPC-VH reagent.

**Table 1.** Optimization of OPC-VH mediated synthesis of 2-amino-1,3,4-thiadiazole.

Entry	OPC-VH (equiv.)	Solvent	Temp (°C)	Reaction time	Yield (%) <sup>a</sup>
1	2.5	Acetonitrile	60	3 hours	54 <sup>b</sup>
2	0.0	Acetonitrile	60	6 hours	NR <sup>c</sup>
3	1.5	Acetonitrile	60	10 minutes	45
4	2.0	Acetonitrile	60	10 minutes	51
5	2.5	Acetonitrile	60	5 minutes	60
6	2.5	Toluene	60	10 minutes	56
7	3.0	Toluene	60	10 minutes	53
8	2.5	DMF	60	4 hours	65 <sup>b</sup>
9	2.5	DMF	60	5 minutes	85
10	2.5	DMF	60	10 minutes	77
11	2.5	DMF	80	5 minutes	73
12	3.0	DMF	80	5 minutes	71
13	0.0	DMF	60	20 minutes	NR

Reaction conditions: benzoic acid (1 equiv.), thiosemicarbazide (1.1 equiv.), solvent (5 mL), OPC-VH,  $\mu$ W power, temperature as specified.

<sup>a</sup>Yields of isolated products.

<sup>b</sup>The reaction was performed at 60 °C without any  $\mu$ W activation.

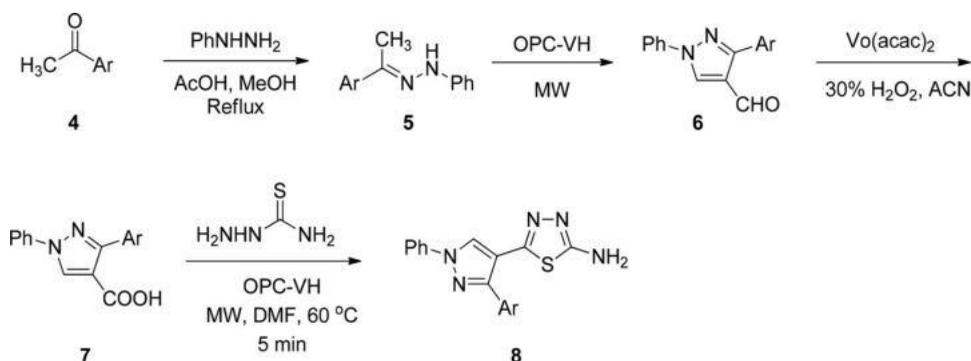
<sup>c</sup>Benzoic acid (1 equiv.), thiosemicarbazide (1.1 equiv.), o-phthaloyl dichloride (2.5 equiv.), acetonitrile, 60 °C, 6 hours.

**Table 2.** Scope of the microwave-assisted OPC-VH synthesis of 2-amino-1,3,4-thiadiazoles **3a-j**.

Entry	Product	R	Yield (%)	m.p (Lit.) <sup>33</sup>	CAS No.
1	<b>3a</b>	C <sub>6</sub> H <sub>5</sub>	85	223-224 (227-230)	2002-03-1
2	<b>3b</b>	4-ClC <sub>6</sub> H <sub>4</sub>	81	228-230 (229-231)	28004-62-8
3	<b>3c</b>	4-BrC <sub>6</sub> H <sub>4</sub>	79	232-234 (228-232)	13178-12-6
4	<b>3d</b>	4-FC <sub>6</sub> H <sub>4</sub>	86	240-242 (238-241)	942-70-1
5	<b>3e</b>	(CH <sub>3</sub> ) <sub>3</sub> C-	75	185-187 (181-185)	39222-73-6
6	<b>3f</b>	4-Py	72	238-240 (242-246)	2002-04-2
7	<b>3g</b>	4-CH <sub>3</sub> Bz	87	205-207 (207-212)	39181-45-8
8	<b>3h</b>	4-ClBz	83	196-198 (195-197)	39181-43-6
9	<b>3i</b>	4-BrBz	80	208-210 (206-210)	329921-62-2
10	<b>3j</b>	4-FBz	84	201-203 (202-207)	39181-55-0

The formation of the desired product **3a** in 60% yield within 5 minutes at the same temperature demonstrated the efficiency of microwave irradiation in this setting (entry 5, Table 1). In the absence of OPC-VH reagent, no product was observed. The reaction carried out in dry DMF at 60 °C for 5 minutes in microwave irradiation was best as it gave 85% yield (entry 9). We thus extended the reaction conditions of entry 9 of Table 1 to further exploration of preparing compounds **3** having different substituents at the 5-position. The results are summarized in Table 2. Under the optimized conditions, the yields of isolated 1,3,4-thiadiazole derivatives **3a-j** were uniformly good (72 – 87%) and did not depend much on the given substituents.

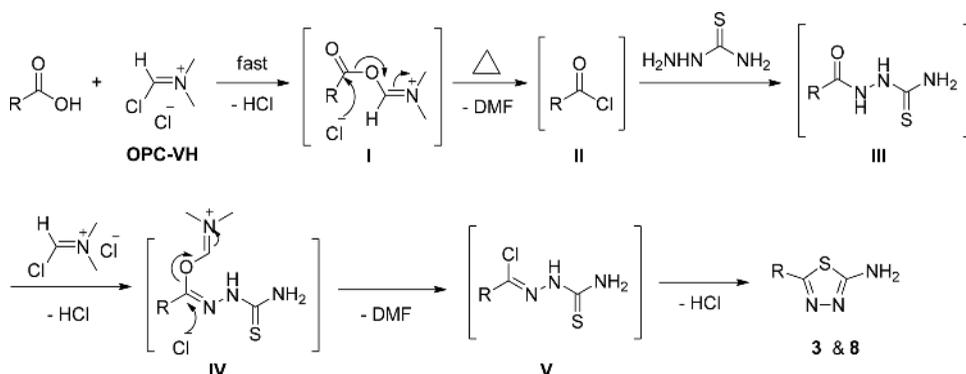
The investigation was further extended to prepare a series of pyrazolylthiadiazoles **8a-e**. The pyrazole-4-carboxylic acids **7** needed were prepared from pyrazole-4-carbaldehydes **6** using vanadium catalyst in the presence of 30% H<sub>2</sub>O<sub>2</sub> in acetonitrile as shown in Scheme 3.<sup>34</sup> The treatment of aryl methyl ketones **4** with phenylhydrazine in refluxing methanol using acidic conditions afforded the corresponding hydrazones **5**. The microwave-assisted cyclization of hydrazones **5** using OPC-VH reagent in DMF at 60 °C within 10 minutes afforded the corresponding pyrazole-4-carbaldehydes **6**.<sup>35</sup> The pyrazole-4-carboxylic acids **7** were further subjected to the optimal reaction conditions



**Scheme 3.** Microwave synthesis of pyrazolythiadiazoles **8a-e** using Vilsmeier–Haack reagent (OPC-VH).

**Table 3.** Yield of a series of pyrazolythiadiazoles **8a-e**.

Entry	Product	Ar	Yield %	Formula
1	<b>8a</b>	C <sub>6</sub> H <sub>5</sub>	75	C <sub>17</sub> H <sub>13</sub> N <sub>5</sub> S
2	<b>8b</b>	4-FC <sub>6</sub> H <sub>4</sub>	85	C <sub>17</sub> H <sub>12</sub> FN <sub>5</sub> S
3	<b>8c</b>	4-ClC <sub>6</sub> H <sub>4</sub>	79	C <sub>17</sub> H <sub>12</sub> ClN <sub>5</sub> S
4	<b>8d</b>	4-BrC <sub>6</sub> H <sub>4</sub>	76	C <sub>17</sub> H <sub>12</sub> BrN <sub>5</sub> S
5	<b>8e</b>	4-EtC <sub>6</sub> H <sub>4</sub>	82	C <sub>19</sub> H <sub>17</sub> N <sub>5</sub> S



**Scheme 4.** Plausible mechanism of the OPC-VH mediated synthesis of 2-amino-1,3,4-thiadiazoles **3** and **8**.

used for **3a** to obtain novel pyrazole-1,3,4-thiadiazoles **8** in good yield (75–85%) and the results are summarized in [Table 3](#). Compounds **8** were rigorously characterized.

The IR spectrum of 5-(1,3-diphenyl-1*H*-pyrazol-4-yl)-1,3,4-thiadiazole-2-amine **8a** showed bands at 3321 and 3265 cm<sup>-1</sup> (NH stretching), 1632 (C=C), 1598 (C=N thiadiazole) and 698 (C-S-C). In the <sup>1</sup>H NMR spectra, compound **8a** showed a singlet at  $\delta$  6.89 due to the –NH<sub>2</sub> protons. In the <sup>13</sup>C NMR spectra, the C=N carbons appeared at  $\delta$  173.1 and 160.2, deshielded due to the adjacent sulfur atom. The mass spectral analysis of **8a** showed the molecular ion peak at  $m/z$  320.19 (M + H)<sup>+</sup>.

In considering a plausible mechanism ([Scheme 4](#)), we believe that the intermediate **I** might be quickly formed in the reaction of the carboxylic acid with the OPC-VH reagent. After that, the chloride anion attacks the intermediate **I** to afford the acid chloride **II**. On reacting with thiosemicarbazide the acid chloride yields thiosemicarbazone **III**. The subsequent reaction of thiosemicarbazone **III** with OPC-VH reagent forms intermediate **IV**, on

which chloride ion attacks to produce the intermediate **V**. Upon cyclization compound **3** or **8** is obtained.

In summary, an efficient microwave assisted OPC-VH mediated synthesis of 2-amino-5-substituted-1,3,4-thiadiazoles from corresponding carboxylic acids has been reported. The operational simplicity, avoidance of toxic materials, easy work up and feedback into the process of a generated by-product are the advantages of this approach. Given the practicality of this method, it is our hope that pyrazolythiadiazole-2-amines can be further investigated for the development of pyrazole-based drugs.

## Experimental section

Melting points were determined in open glass capillaries on a Fisher-Johns melting point apparatus and are uncorrected.  $^1\text{H}$  NMR (400MHz) spectra were recorded at room temperature in  $\text{CDCl}_3$  as solvent and tetramethylsilane (TMS) as an internal standard. Coupling constants ( $J$ ) are reported in Hz; those for common alkyl groups were in the expected range and are not separately marked.  $^{13}\text{C}$  NMR (100 MHz) spectra were recorded in  $\text{CDCl}_3$  solutions with TMS as internal standard. The mass spectra were recorded on a JOEL JMS 600 mass spectrometer at an ionizing potential of 70eV (EI) in the electron impact ionization mode using the direct inlet system. All the reactions were monitored by thin-layer chromatography (TLC) on pre-coated silica gel 60 F254 (mesh); spots were visualized under UV light at 254 nm. Elemental analyses were obtained using a Carlo Erba EA1108 microanalyzer. Microwave irradiation was done using an Anton Paar Monowave-300 Reactor (Gaas, Austria), operating at a frequency of 2.455 GHz with continuous irradiation power of 0 to 850W.

### **Synthesis of 2-amino-5-substituted-1,3,4-thiadiazoles (3 and 8)**

These compounds were synthesized using an Anton Paar Monowave-300 Reactor (Gaas, Austria), operating at a frequency of 2.455 GHz with continuous irradiation power of 0 to 850W. The reactions were carried out in a G-4 borosilicate glass vial sealed with a Teflon septum and placed in a microwave cavity. Sufficient power was used to ramp up from room temperature to the desired temperature. Once this temperature was attained, the process vial was held at this temperature for the required time. The reactions were continuously stirred. Temperature was measured by an IR sensor. After the experiments, a cooling jet cooled the reaction vessel to ambient temperature.

For the representative preparation of compound **3a**, to a mixture of benzoic acid (0.10 g, 0.82 mmol) and thiosemicarbazide (0.082 g, 0.90 mmol) in DMF (5.0 ml) in a microwave vial was added OPC-VH (2.05 mmol) at room temperature and the mixture was stirred for 1 min. The vial was sealed with the Teflon septum and aluminium crimp, using an appropriate crimping tool. The vial was then subjected to microwave irradiation, and the temperature was ramped from room temperature to 60 °C with the holding time of 5 min. The reaction was then brought to room temperature, and the crude product was poured into ice water (approximately 15 mL), then extracted with ethyl acetate (2 x 15 mL). The organic layer was washed with brine solution (2 x 15 mL). The organic layer was dried over anhydrous  $\text{Na}_2\text{SO}_4$ , filtered and the filtrate was

concentrated under reduced pressure to afford crude 5-phenyl-1,3,4-thiadiazol-2-amine **3a**. The crude compound was purified by column chromatography using silica gel (100-200 mesh, eluting solvent 10% ethyl acetate in pet-ether) and concentrated under reduced pressure to afford 5-phenyl-1,3,4-thiadiazol-2-amine **3a** as an off white solid in 85% yield. Compounds **3** are known materials, identified on the basis of comparing their melting points with those available in the literature, as specified in Table 2.

For the preparation of representative compound **8a**, the known compound 1,3-diphenyl-1*H*-pyrazole-4-carboxylic acid **7a**<sup>34</sup> (0.200 g, 0.76 mmol) was mixed with thiosemicarbazide (0.076 g, 0.84 mmol) in DMF (5.0 ml) in a microwave vial, to which was added OPC-VH (2.05 mmol) at room temperature, and the mixture was stirred for 1 min. The vial was sealed with the Teflon septum and aluminium crimp, using an appropriate crimping tool. The vial was then subjected to microwave irradiation, and the temperature was ramped from room temperature to 60 °C with the holding time of 5 min. The reaction was then brought to room temperature, and the crude product was poured into ice (approximately 25 g), then extracted with ethyl acetate (2 x 20 mL). The organic layer was washed with brine solution (2 x 15 mL). The organic layer was dried over anhydrous Na<sub>2</sub>SO<sub>4</sub>, filtered and the filtrate was concentrated under reduced pressure to afford crude compound **8a**. The crude compound was purified by column chromatography using silica gel (100-200 mesh, eluting solvent 12% ethyl acetate in pet-ether) and concentrated under reduced pressure to afford 5-(1,3-diphenyl-1*H*-pyrazol-4-yl)-1,3,4-thiadiazol-2-amine **8a** as an off white solid in 75% yield.

The other derivatives **8b-e** were prepared by following the above procedure. Compounds **8** are novel and were fully characterized as shown below.

#### **5-(1,3-Diphenyl-1*H*-pyrazol-4-yl)-1,3,4-thiadiazol-2-amine (8a)**

Off white solid; 75% yield; mp 225-227 °C; TLC solvent system: 20% EtOAc in pet-ether, Rf: 0.5; IR (KBr)  $\nu$  cm<sup>-1</sup>: 3321, 3265 (NH Str.), 1632 (C=C), 1598 (C=N thiadiazole), 698 (C-S-C); <sup>1</sup>H NMR (CDCl<sub>3</sub>, 400 MHz):  $\delta$  8.89 (s, 1H, Pyrazole-*H*), 7.23-7.80 (m, 10H, Ar*H*), 6.89 (s, 2H, NH<sub>2</sub>). <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>):  $\delta$  173.1, 160.2, 144.5, 142.6, 138.9, 131.2, 129.1, 128.9, 128.2, 127.1, 125.8, 118.1, 102.9. ESI-MS (m/z): 320.19 [M + H]<sup>+</sup>.

*Anal.* Calcd for C<sub>17</sub>H<sub>13</sub>N<sub>5</sub>S: C, 63.93; H, 4.10. Found: C, 63.89; H, 4.07.

#### **5-(3-(4-Fluorophenyl)-1-phenyl-1*H*-pyrazol-4-yl)-1,3,4-thiadiazol-2-amine (8b)**

Off white solid, 85% yield; mp 218-220 °C; TLC solvent system: 20% EtOAc in pet-ether, Rf: 0.4; IR (KBr)  $\nu$  cm<sup>-1</sup>: 3318, 3271 (NH Str.), 1630 (C=C), 1597 (C=N thiadiazole), 697 (C-S-C); <sup>1</sup>H NMR (CDCl<sub>3</sub>, 400 MHz):  $\delta$  8.90 (s, 1H, Pyrazole-*H*), 7.21-8.01 (m, 9H, Ar*H*), 6.85 (s, 2H, NH<sub>2</sub>). <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>):  $\delta$  173.4, 162.3, 160.4, 145.5, 143.1, 131.3, 130.2, 129.1, 128.3, 125.9, 118.9, 115.2, 102.9. ESI-MS (m/z): 338.36 [M + H]<sup>+</sup>.

*Anal.* Calcd for C<sub>17</sub>H<sub>12</sub>FN<sub>5</sub>S: C, 60.52; H, 3.59. Found: C, 60.69; H, 3.56.

#### **5-(3-(4-Chlorophenyl)-1-phenyl-1*H*-pyrazol-4-yl)-1,3,4-thiadiazol-2-amine (8c)**

White solid, 79% yield; mp 258-260 °C; TLC solvent system: 20% EtOAc in pet-ether, Rf: 0.45; IR (KBr)  $\nu$  cm<sup>-1</sup>: 3321, 3287 (NH Str.), 1631 (C=C), 1597 (C=N

thiadiazole), 698 (C-S-C);  $^1\text{H}$  NMR ( $\text{CDCl}_3$ , 400 MHz):  $\delta$  8.92 (s, 1H, Pyrazole-*H*), 7.31-7.75 (m, 9H, Ar*H*), 6.81 (s, 2H,  $\text{NH}_2$ ).  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ ):  $\delta$  172.8, 161.2, 145.4, 143.3, 133.8, 131.1, 130.8, 129.1, 129.0, 128.3, 125.8, 118.7, 102.9. ESI-MS ( $m/z$ ): 356.11 [ $\text{M} + \text{H}$ ,  $^{37}\text{Cl}$ ] $^+$ , 354.09 [ $\text{M} + \text{H}$ ,  $^{35}\text{Cl}$ ] $^+$ .

*Anal.* Calcd for  $\text{C}_{17}\text{H}_{12}\text{ClN}_5\text{S}$ : C, 57.71; H, 3.42. Found: C, 57.65; H, 3.39.

### 5-(3-(4-Bromophenyl)-1-phenyl-1H-pyrazol-4-yl)-1,3,4-thiadiazol-2-amine (8d)

White solid, 76% yield; mp 269-271  $^\circ\text{C}$ ; TLC solvent system: 20% EtOAc in pet-ether, Rf: 0.52; IR (KBr)  $\nu$   $\text{cm}^{-1}$ : 3334, 3286 (NH Str.), 1629 (C=C), 1596 (C=N thiadiazole), 697 (C-S-C);  $^1\text{H}$  NMR ( $\text{CDCl}_3$ , 400 MHz):  $\delta$  8.86 (s, 1H, Pyrazole-*H*), 7.36-7.78 (m, 9H, Ar*H*), 6.85 (s, 2H,  $\text{NH}_2$ ).  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ ):  $\delta$  172.3, 161.3, 145.5, 143.3, 131.8, 131.7, 130.9, 129.1, 128.3, 125.9, 122.7, 118.9, 102.8. ESI-MS ( $m/z$ ): 400.17 [ $\text{M} + \text{H}$ ,  $^{81}\text{Br}$ ] $^+$ , 398.19 [ $\text{M} + \text{H}$ ,  $^{79}\text{Br}$ ] $^+$ .

*Anal.* Calcd for  $\text{C}_{17}\text{H}_{12}\text{BrN}_5\text{S}$ : C, 51.27; H, 3.04. Found: C, 51.19; H, 3.01.

### 5-(3-(4-Ethylphenyl)-1-phenyl-1H-pyrazol-4-yl)-1,3,4-thiadiazol-2-amine (8e)

Off white solid; 82% yield; mp 212-214  $^\circ\text{C}$ ; TLC solvent system: 20% EtOAc in pet-ether, Rf: 0.55; IR (KBr)  $\nu$   $\text{cm}^{-1}$ : 3309, 3251 (NH Str.), 1625 (C=C), 1593 (C=N thiadiazole), 697 (C-S-C);  $^1\text{H}$  NMR ( $\text{CDCl}_3$ , 400 MHz):  $\delta$  8.91 (s, 1H, Pyrazole-*H*), 7.16-7.51 (m, 9H, Ar*H*), 6.77 (s, 2H,  $\text{NH}_2$ ), 2.56 (q, 2H,  $\text{CH}_2$ ), 1.28 (t, 3H,  $\text{CH}_3$ ).  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ ):  $\delta$  172.9, 160.7, 144.5, 143.8, 142.6, 131.3, 129.9, 128.9, 128.5, 126.1, 125.3, 118.1, 102.9, 30.3, 15.3. ESI-MS ( $m/z$ ): 348.49 [ $\text{M} + \text{H}$ ] $^+$ .

*Anal.* Calcd for  $\text{C}_{19}\text{H}_{17}\text{N}_5\text{S}$ : C, 65.68; H, 4.93. Found: C, 65.61; H, 4.89.

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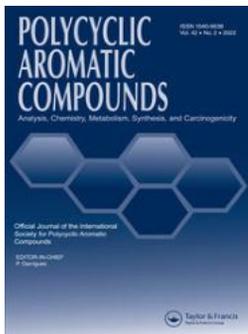
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## 1,3,4-Trisubstituted Pyrazoles: Synthesis, Antimicrobial Evaluation, and Time Resolved Studies

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# 1,3,4-Trisubstituted Pyrazoles: Synthesis, Antimicrobial Evaluation, and Time Resolved Studies

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## ABSTRACT

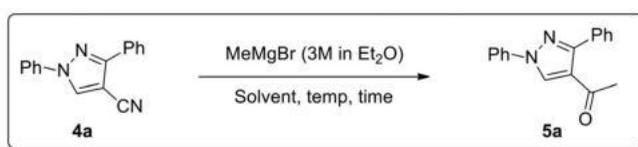
In this article, an efficient and practicable synthesis of 1,3,4-trisubstituted pyrazoles with an acyl functionality attached on the 4-position of the pyrazole scaffolds is reported. The precursor 4-cyanopyrazoles used for the fabrication of target compounds were synthesized from 4-formylpyrazoles *via* oxime formation followed by reaction with Vilsmeier–Haack reagent. The reaction of 4-cyanopyrazoles with various Grignard reagents afforded the corresponding 1,3,4-trisubstituted pyrazoles in 71–88% yield. The operational simplicity, economical starting materials, and high efficiency compared to reported methods are the advantages of this approach. All the pyrazole derivatives have been screened for antimicrobial activity and some of the derivatives exhibit significant activity against bacterial and fungal isolates. Further, time resolved photoluminescence studies for **5d**, **5h**, & **5o** were carried out using pulsed nitrogen laser as the source with a pulse width of few nanoseconds and wavelength of 337 nm. The spectrum was observed in microsecond time domain in all the cases, however, fluorescent lifetime is found to be higher in **5d** & **5h**.

## ARTICLE HISTORY

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1,3,4-Trisubstituted pyrazoles; 4-formylpyrazoles; 4-cyanopyrazoles; antimicrobial; Vilsmeier–Haack reagent



## Introduction

The introduction of new functional moieties at the various positions of the pyrazoles has been a great deal of interest for the researchers owing to the potential synthetic and biological significance of functional pyrazoles.<sup>1–7</sup> The literature survey revealed that out of 1,3,4-trisubstituted pyrazoles, the 4-acetylpyrazoles are proved precious synthons to fabricate a large number of organic compounds and heterocycles, for instance, thiazolylpyrazoles, pyrazolines, pyrazolylpyridines,

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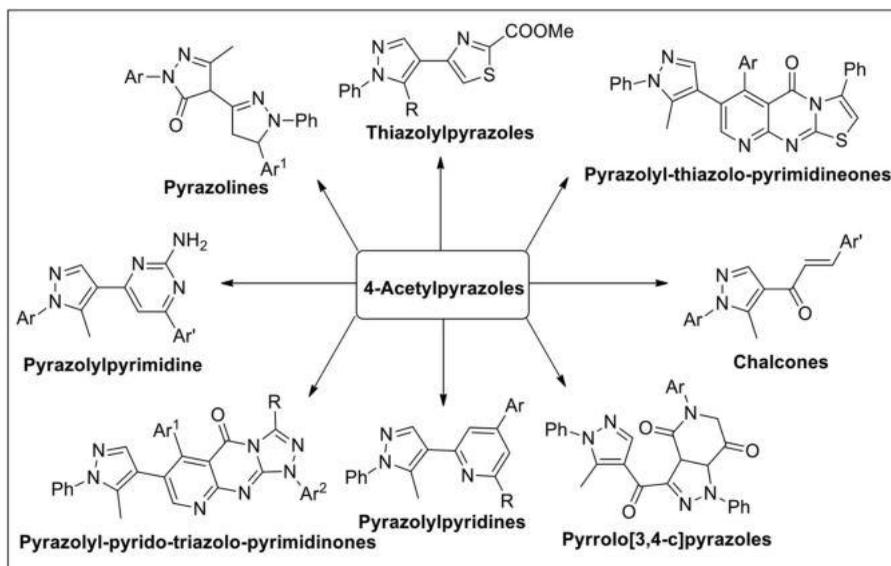


Figure 1. 4-Acetylpyrazoles as well-known valuable synthons.

chalcones, pyrrolo[3,4-c]pyrazoles, pyrazolylpyrimidine, pyrazolylthiazolopyrimidineones, pyrazolyl-pyrido-triazolo-pyrimidinones (Figure 1).<sup>8</sup>

In the recent past, the significant progress has been achieved in the construction of 1,3,4-trisubstituted pyrazoles. The reaction of electron-deficient *N*-arylhydrazones with nitroolefins resulted into regioselective synthesis of 1,3,5-trisubstituted pyrazoles.<sup>9</sup> The substituted 4-acylpyrazoles were prepared from *N*-propynylsulfonyl hydrazide and diaryl iodide salts.<sup>10</sup> Recently, an alternative approach involving the free radical reaction independently for the development of this type of pyrazoles has been reported.<sup>11–13</sup> Duan's group<sup>14</sup> designed a synthetic approach to synthesize 1,3,4-tri- and 1,3,4,5-tetra-substituted pyrazoles *via* methanesulfonic acid (MSA)-catalyzed reaction and excellent regioselectivity has been gained on the reaction of hydrazones with enamines (Scheme 1).

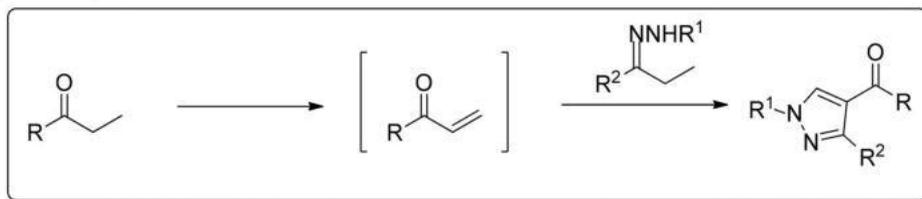
However, the developing of a new and versatile approach for the construction of 1,3,4-trisubstituted pyrazoles from economical and readily available starting materials remains a very challenging and thrust area of research for an organic chemist. Owing the potential applications and in continuation of our program,<sup>15–22</sup> the synthesis and antimicrobial evaluation of 1,3,4-trisubstituted pyrazole derivatives have been reported here along with Time Resolved Studies of selected derivatives.

## Results and discussion

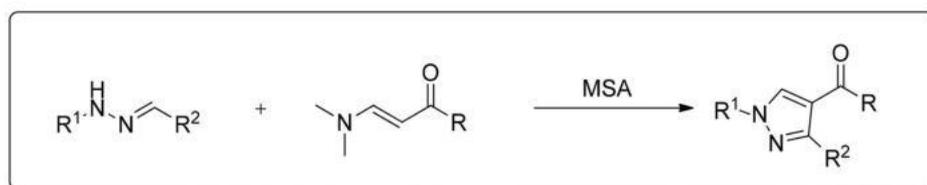
Recently, our group has been reported the conversion of 4-formylpyrazoles to 4-cyanopyrazoles using hydroxylamine hydrochloride followed by treatment with Vilsmeier–Haack reagent.<sup>16,23</sup> The 4-formylpyrazoles<sup>24–26</sup> required for the present investigation were constructed by the condensation of aryl methyl ketones with phenyl hydrazine using acidic condition followed by cyclization of hydrazones using OPC-VH reagent (prepared from phthaloyl dichloride with DMF) as outlined in Scheme 2.

Having 4-cyanopyrazoles **4** in hand, the study of transformation of carbonitrile **4a** into 4-acetylpyrazole **5a** was purposed as a model reaction. A series of experiments were carried out for optimization of the reaction conditions (Table 1).

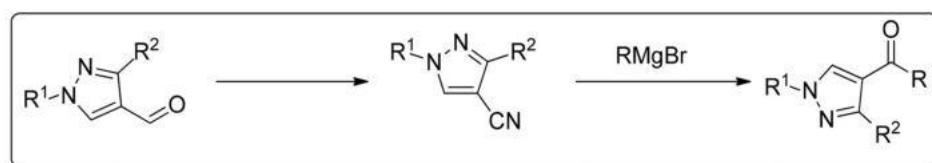
## a) Tian's protocol



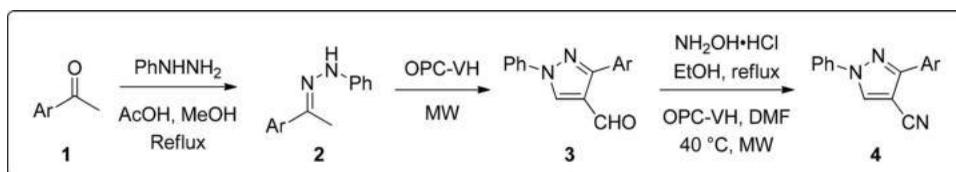
## b) Duan's protocol



## c) This protocol



Scheme 1. Previous protocols and this protocol.

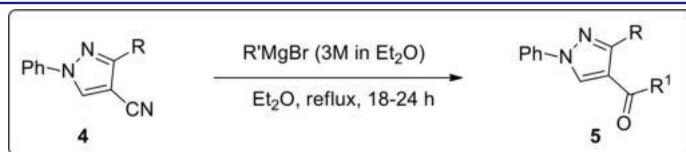


Scheme 2. Synthetic protocol of 4-cyanopyrazoles 4 from 4-formylpyrazoles 3.

Initial exposure of pyrazole-4-carbonitrile **4a** to MeMgBr (3 M in Et<sub>2</sub>O), in THF for 24 h at room temperature in an inert atmosphere afforded the desired 4-acetylpyrazole **5a** (entries 1 & 2, Table 1) in traces. On increasing the amount from 2 to 5 equivalents of methyl magnesium bromide and temperature up to reflux afforded the desired 4-acetylpyrazole **5a** in 41% yield (entries 3 & 4, Table 1). When the reaction was executed with methyl magnesium bromide in Et<sub>2</sub>O at room temperature for 24 h, substantial improvement in the yield (entries 5 & 6, Table 1) was observed. The 5.0 equivalents of MeMgBr (3 M in Et<sub>2</sub>O) in refluxing diethyl ether for 24 h afforded the acetyl product in 79% yield (entry 7, Table 1). Further increasing the reaction time from 30 h to 48 h, a significant decrease of the product yields was observed (entries 8 & 9, Table 1). Thus after screening the various parameters, the best optimized condition (entry 7, Table 1) was identified for carbonitrile transformation into acetyl functionality.

The structure of **5a** has been established through a vigorous analysis of its IR, <sup>1</sup>H NMR <sup>13</sup>C NMR, and ESI-MS. The purity of **5a** was further determined by its elemental analysis. The IR spectrum of **5a** showed a strong band at 1664 cm<sup>-1</sup> due to C=O stretching which recommended the existence of ketone functionality in compound **5a**. <sup>1</sup>H NMR spectrum (CDCl<sub>3</sub>, 400 MHz) revealed the existence of a one-proton singlet at δ 8.45 which was ascribed to the pyrazole-*H*.

Table 1. Optimization of reaction conditions.



Entry	MeMgBr (3M in Et <sub>2</sub> O) (equiv.)	Solvent (dry)	Temp (°C)	Reaction time (h)	Yield <sup>a</sup> (%)
1	1.0	THF	rt	24	Traces
2	2.0	THF	rt	24	Traces
3	2.0	THF	reflux	24	27
4	5.0	THF	reflux	24	41
5	2.0	Et <sub>2</sub> O	rt	24	40
6	5.0	Et <sub>2</sub> O	rt	24	59
7	5.0	Et <sub>2</sub> O	reflux	24	79
8	5.0	Et <sub>2</sub> O	reflux	30	65
9	5.0	Et <sub>2</sub> O	reflux	48	57

<sup>a</sup>Isolated yield.

The aromatic protons of both phenyl rings appeared as a complex multiplets in the region  $\delta$  7.73–7.78 (4H) and 7.42–7.51 (5H) and one proton triplet appeared at  $\delta$  7.36 ( $J=8.4$  Hz). The remaining three protons of the acetyl- $CH_3$  appeared as a sharp singlet at  $\delta$  2.38. <sup>13</sup>C NMR spectrum showed the prominent peak at  $\delta$  192.3 further confirms the formation of the target compound **5a**. The structure of **5a** was further supported by its ESI-MS spectrum which exhibited its molecular ion peak as the base peak of the spectrum at  $m/z$  263.21 [ $M + H$ ]<sup>+</sup>.

Having accomplished the optimal conditions for the Grignard reaction, we set out to evaluate the scope and generality of this novel pyrazole synthesis by varying the substituents on 3-position of the pyrazole precursors. Thus, the Grignard reaction was equally facile with electron-withdrawing and electron-donating substituents on the aromatic ring substituted at the 3-position of pyrazole moiety and yielding 4-acetylpyrazoles in good to excellent yields (Table 2, entries 1–7). Also by employing appropriate 3-aryl/(het)aryl-substituted pyrazole-4-carbonitrile precursors (**5h–l**), the approach could also be extended for the synthesis of 1,3,4-trisubstituted pyrazoles bearing phenyl ketone at 4-position of the pyrazole ring (Table 2, entries 8–12). It is noted that 1,3,4-trisubstituted pyrazoles containing both aryl and (het)aryl rings on the 3-position of the pyrazole moiety could be prepared efficiently in good yield by following this procedure.

Further extension of the reaction to a range of commercially available Grignard reagents revealed that a wide variety of substitution is tolerated as shown in Table 2. Thus, 4-acyl-1,3-diphenylpyrazoles (**5m–u**) containing both electron donating and electron withdrawing substituents or bearing heteroaryl moiety could be prepared efficiently with good to excellent yields.

A plausible mechanism for the synthesis of 4-acylpyrazole derivatives has been given in Scheme 3. The structure of Grignard reagent indicates that electron density is larger on alkyl/aryl group as compared to the magnesium bromide part. The formation of imine salt occurs through nucleophilic attack of alkyl/aryl group of Grignard reagent on  $C\equiv N$  bond. This imine salt is hydrolyzed further by water afford the corresponding ketone.

## Antimicrobial activities

The Minimum inhibitory concentrations (MICs) of the target compounds **5a–u** were evaluated against *Bacillus cereus*, *Staphylococcus aureus*, *Escherichia coli*, and *Yersinia enterocolitica* bacterial strains, and against *Aspergillus flavus*, *Aspergillus niger*, *Candida albicans* fungal strains by broth macrodilution method<sup>23</sup> using standard drugs ampicillin and miconazole and the results have

**Table 2.** Scope of Grignard reaction on pyrazole-4-carbonitriles **4<sup>a</sup>**.


Entry	R	R <sup>1</sup>	Product	Yield <sup>b</sup>	M.p. (°C)
1	C <sub>6</sub> H <sub>5</sub>	CH <sub>3</sub>	<b>5a</b>	79	97–99 (100–103) <sup>14</sup>
2	4-ClC <sub>6</sub> H <sub>4</sub>	CH <sub>3</sub>	<b>5b</b>	82	101–103
3	4-MeC <sub>6</sub> H <sub>4</sub>	CH <sub>3</sub>	<b>5c</b>	75	93–95
4	3-Br-4-FC <sub>6</sub> H <sub>3</sub>	CH <sub>3</sub>	<b>5d</b>	85	112–114
5	4-OCH <sub>3</sub> C <sub>6</sub> H <sub>4</sub>	CH <sub>3</sub>	<b>5e</b>	74	96–98
6	4-BrC <sub>6</sub> H <sub>4</sub>	CH <sub>3</sub>	<b>5f</b>	84	107–109
7	2-ClC <sub>6</sub> H <sub>4</sub>	CH <sub>3</sub>	<b>5g</b>	82	98–100
8	C <sub>6</sub> H <sub>5</sub>	C <sub>6</sub> H <sub>5</sub>	<b>5h</b>	88	140–142 (143–145) <sup>14</sup>
9	4-CH <sub>3</sub> C <sub>6</sub> H <sub>4</sub>	C <sub>6</sub> H <sub>5</sub>	<b>5i</b>	81	147–149 (145–147) <sup>14</sup>
10	4-OCH <sub>3</sub> C <sub>6</sub> H <sub>4</sub>	C <sub>6</sub> H <sub>5</sub>	<b>5j</b>	71	135–137 (131–133) <sup>14</sup>
11	2-Furyl	C <sub>6</sub> H <sub>5</sub>	<b>5k</b>	85	118–121 (119–121) <sup>14</sup>
12	2-Thienyl	C <sub>6</sub> H <sub>5</sub>	<b>5l</b>	84	102–104 (98–100) <sup>14</sup>
13	C <sub>6</sub> H <sub>5</sub>	4-FC <sub>6</sub> H <sub>4</sub>	<b>5m</b>	75	128–130 (131–133) <sup>14</sup>
14	C <sub>6</sub> H <sub>5</sub>	4-CH <sub>3</sub> C <sub>6</sub> H <sub>4</sub>	<b>5n</b>	73	121–123 (117–119) <sup>14</sup>
15	C <sub>6</sub> H <sub>5</sub>	4-NO <sub>2</sub> C <sub>6</sub> H <sub>4</sub>	<b>5o</b>	88	175–177 (178–181) <sup>14</sup>
16	C <sub>6</sub> H <sub>5</sub>	4-OCH <sub>3</sub> C <sub>6</sub> H <sub>4</sub>	<b>5p</b>	78	115–117 (112–114) <sup>14</sup>
17	C <sub>6</sub> H <sub>5</sub>	2,4-F <sub>2</sub> C <sub>6</sub> H <sub>3</sub>	<b>5q</b>	77	105–107 (102–104) <sup>14</sup>
18	C <sub>6</sub> H <sub>5</sub>	3,4-(OCH <sub>3</sub> ) <sub>2</sub> C <sub>6</sub> H <sub>3</sub>	<b>5r</b>	74	222–224 (224–226) <sup>14</sup>
19	C <sub>6</sub> H <sub>5</sub>	$\alpha$ -Naphthyl	<b>5s</b>	83	115–117 (119–121) <sup>14</sup>
20	C <sub>6</sub> H <sub>5</sub>	Ethyl	<b>5t</b>	78	95–97 (98–100) <sup>14</sup>
21	C <sub>6</sub> H <sub>5</sub>	Thienyl	<b>5u</b>	87	188–190 (187–189) <sup>14</sup>

<sup>a</sup>Reaction Conditions: carbonitrile (1 equiv), RMgBr (5.0 equiv), Et<sub>2</sub>O (20 mL), reflux, 18–24 h.

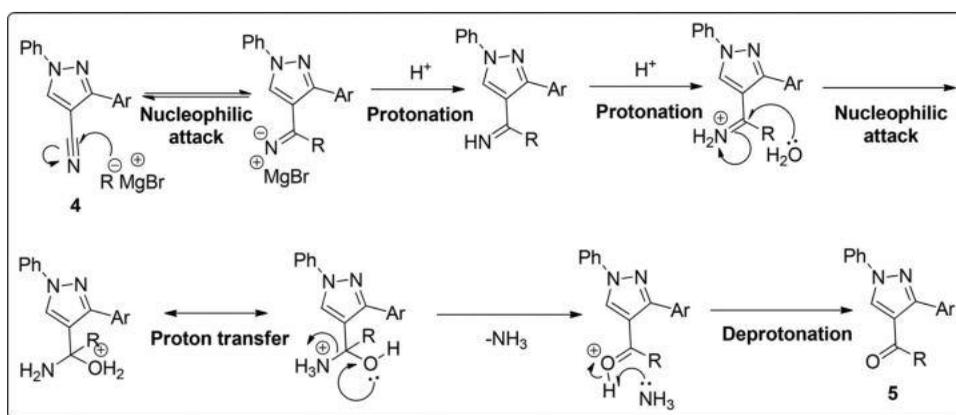
<sup>b</sup>Yields of isolated products.

been shared in Table 3. As shown in Table 3, the compound **5d** showed superior activity and the compounds **5c**, **5e**, **5j–n**, and **5q** exhibited equipotent activity to the reference standard ampicillin against the Gram (-ve) bacterial strain *E. coli* evidenced by minimum inhibitory concentration of 78.1  $\mu\text{g/mL}$ . While compounds **5c–e**, **5k**, **5l**, **5n**, and **5q** exhibited MIC of 39.06  $\mu\text{g/mL}$  against the Gram (-ve) bacterial strain *Y. enterocolitica*. The MIC value of these compounds was found equipotent to the reference standard ampicillin. The compounds **5a**, **5c–g**, **5j–n**, **5p**, and **5q** were having MIC of 78.01  $\mu\text{g/mL}$  against the Gram (+ve) bacterial strains *S. aureus*. The compounds **5d**, **5l**, and **5q** were found excellent compounds to be active against all Gram (-ve) and Gram (+ve) bacterial strains *E. coli*, *Y. enterocolitica*, *B. cereus*, and *S. aureus*. Regarding the antifungal evaluation, the compound **5d** exhibited equipotent antifungal activity against *A. niger* and *C. albicans* with MIC 39.06 & 78.1  $\mu\text{g/mL}$ , respectively as compared to reference standard miconazole. All other compounds displayed lower activity against all bacterial and fungal isolates.

To get the more efficacious antimicrobial lead molecules, there is still a need to investigate further alteration in 1,3,4-trisubstituted pyrazole structure. Moreover, there is a strong need for cytotoxicity evaluation on test microorganisms and mammalian cell lines to establish correlation between antimicrobial potential and therapeutic safety of these 1,3,4-trisubstituted pyrazoles which is under investigation. Follow-up studies with most promising and non-cytotoxic derivatives are important to elucidate their possible molecular mechanism of action.

### Time resolved studies

Expectedly, most pyrazoles are blue to green light emitting fluorophores that can be investigated by laser induced time resolved photoluminescence spectroscopy<sup>27–29</sup> for the future development of tailor-made emitters in OLED applications and fluorescence labeling of biomolecules. In these studies, time resolved photoluminescence studies were done using pulsed nitrogen laser as the source with a pulse width of few nanoseconds and wavelength of 337 nm. The time resolved



Scheme 3. Possible reaction mechanism for the preparation of 4-acylpyrazoles 5 from Pyrazole-4-carbonitriles 4.

Table 3. Minimum inhibitory concentrations (MICs) of test compounds 5a–u against fungal and bacterial isolates.

Test compds	MIC ( $\mu\text{g/mL}$ )						
	Gram-negative bacteria		Gram-positive bacteria		Fungi		
	<i>E. coli</i>	<i>Y. enterocolitica</i>	<i>B. cereus</i>	<i>S. aureus</i>	<i>A. flavus</i>	<i>A. niger</i>	<i>C. albicans</i>
5a	156.25	78.1	156.25	78.1	78.1	78.1	156.25
5b	156.25	78.1	78.1	156.25	156.25	156.25	156.25
5c	78.1	39.06	39.06	78.1	78.1	78.1	78.1
5d	39.06	39.06	39.06	78.1	78.1	39.06	78.1
5e	78.1	39.06	78.1	78.1	78.1	78.1	78.1
5f	156.25	78.1	78.1	78.1	156.25	156.25	78.1
5g	156.25	78.1	78.1	78.1	78.1	78.1	156.25
5h	156.25	78.1	78.1	156.25	156.25	156.25	156.25
5i	156.25	156.25	78.1	156.25	156.25	156.25	78.1
5j	78.1	78.1	78.1	78.1	78.1	78.1	156.25
5k	78.1	39.06	39.06	78.1	78.1	78.1	156.25
5l	78.1	39.06	39.06	78.1	78.1	78.1	78.1
5m	78.1	78.1	78.1	78.1	78.1	78.1	78.1
5n	78.1	39.06	78.1	78.1	78.1	78.1	78.1
5o	156.25	78.1	78.1	156.25	156.25	156.25	156.25
5p	156.25	78.1	78.1	78.1	78.1	78.1	156.25
5q	78.1	39.06	39.06	78.1	78.1	78.1	78.1
5r	156.25	156.25	78.1	156.25	156.25	156.25	78.1
5s	156.25	78.1	78.1	156.25	156.25	156.25	156.25
5t	156.25	156.25	78.1	156.25	156.25	156.25	78.1
5u	156.25	78.1	78.1	156.25	156.25	156.25	156.25
Ampicillin <sup>a</sup>	78.1	39.06	39.06	78.1	–	–	–
Miconazole <sup>b</sup>	–	–	–	–	39.06	39.06	78.1

<sup>a</sup>Standard antibacterial agent.

<sup>b</sup>Standard antifungal agent.

studies were done at a fixed emission wavelength of 440 nm which is a central emission in blue spectra (420–460 nm). The emission wavelength was selected by a high resolution spectrometer. The optical signal was converted into the electrical signal using photo multiplier tube (PMT). The samples with the highest yield were selected one each from the group of known and unknown samples for time resolved studies. The time resolved photoluminescence spectra for compounds 5d, 5h, & 5o has been shown in Figure 2. The spectra was observed in microsecond time domain in all the cases however fluorescent lifetime is found to higher in the compounds 5d & 5h with a  $-\text{COCH}_3$  and  $-\text{COC}_6\text{H}_5$  group at 4-position of the pyrazole ring. Lower fluorescent lifetime in case of compound 5o is attributed to the quenching of luminescence due to strong electron withdrawing group [ $-\text{CO}(4\text{-NO}_2\text{Ph})$ ] attached to the 4-position of the pyrazole ring.

**Table 4.** Physical data of 4-formylpyrazoles (3a–i).

Entry	Product	R	Mol. formula	Mol. wt	Yield %	m.p. (°C) <sup>24</sup>
1	<b>4a</b>	Ph	C <sub>16</sub> H <sub>12</sub> N <sub>2</sub> O	248.28	85	142–145
2	<b>4b</b>	4-ClPh	C <sub>16</sub> H <sub>11</sub> ClN <sub>2</sub> O	282.72	88	109–111
3	<b>4c</b>	4-CH <sub>3</sub> Ph	C <sub>17</sub> H <sub>14</sub> N <sub>2</sub> O	262.31	87	99–101
4	<b>4d</b>	3-Br-4-FPh	C <sub>16</sub> H <sub>10</sub> BrFN <sub>2</sub> O	345.17	91	128–130
5	<b>4e</b>	4-OCH <sub>3</sub> Ph	C <sub>17</sub> H <sub>14</sub> N <sub>2</sub> O <sub>2</sub>	278.31	79	134–136
6	<b>4f</b>	4-BrPh	C <sub>16</sub> H <sub>11</sub> BrN <sub>2</sub> O	327.18	78	155–157
7	<b>4g</b>	2-ClPh	C <sub>16</sub> H <sub>11</sub> ClN <sub>2</sub> O	282.72	87	147–149
8	<b>4h</b>		C <sub>14</sub> H <sub>10</sub> N <sub>2</sub> OS	254.31	81	94–96
9	<b>4i</b>		C <sub>14</sub> H <sub>10</sub> N <sub>2</sub> O <sub>2</sub>	238.24	79	123–125

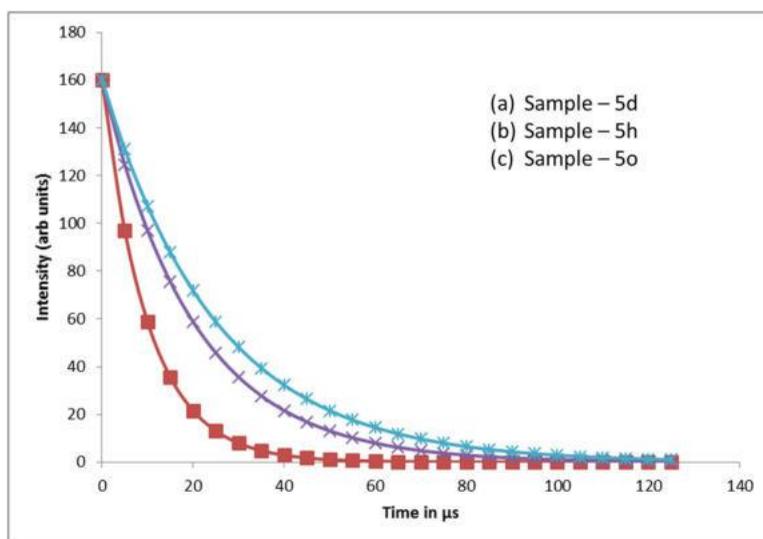
**Table 5.** Physical data of 4-cyanopyrazoles (4a–i).

Entry	Product	R	Mol. formula	Mol. wt	Yield %	m.p. (°C) <sup>23</sup>
1	<b>4a</b>	Ph	C <sub>16</sub> H <sub>11</sub> N <sub>3</sub>	245.28	86	121–123
2	<b>4b</b>	4-ClPh	C <sub>16</sub> H <sub>10</sub> ClN <sub>3</sub>	279.72	82	130–132
3	<b>4c</b>	4-CH <sub>3</sub> Ph	C <sub>17</sub> H <sub>13</sub> N <sub>3</sub>	259.31	77	109–111
4	<b>4d</b>	3-Br-4-FPh	C <sub>16</sub> H <sub>9</sub> BrFN <sub>3</sub>	342.17	83	168–171
5	<b>4e</b>	4-OCH <sub>3</sub> Ph	C <sub>17</sub> H <sub>13</sub> N <sub>3</sub> O	275.30	73	119–121
6	<b>4f</b>	4-BrPh	C <sub>16</sub> H <sub>10</sub> BrN <sub>3</sub>	324.17	82	132–135
7	<b>4g</b>	2-ClPh	C <sub>16</sub> H <sub>10</sub> ClN <sub>3</sub>	279.72	80	111–113
8	<b>4h</b>		C <sub>14</sub> H <sub>9</sub> N <sub>3</sub> S	251.31	78	180–82
9	<b>4i</b>		C <sub>14</sub> H <sub>9</sub> N <sub>3</sub> O	235.24	75	150–152

In summary a practical and efficient synthesis of 1,3,4-trisubstituted pyrazoles with an acyl unit attached on the 4-position of the pyrazole scaffolds has been demonstrated. A range of various pyrazole-4-carbonitriles and Grignard reagents were used while affording in good to excellent yields. The operational simplicity, economical starting materials, and high efficiency compared to the existing methods are the advantages of this synthetic method and may be expected to use widely in the heterocyclic transformations. All the pyrazole derivatives have been screened for antimicrobial activity and the compounds **5d**, **5l**, and **5q** were found excellent compounds to be active against all Gram (-ve) and Gram (+ve) bacterial strains *E. coli*, *Y. enterocolitica*, *B. cereus*, and *S. aureus*. The compound **5d** exhibited equipotent antifungal activity against *A. niger* and *C. albicans* with MIC 39.06 & 78.1 µg/mL, respectively, as compared to reference standard miconazole. Further, time resolved photoluminescence studies for **5d**, **5h**, & **5o** were carried out using pulsed nitrogen laser as the source with a pulse width of few nanoseconds and wavelength of 337 nm. The spectrum was observed in microsecond time domain in all the cases, however, fluorescent lifetime is found to higher in **5d** & **5h**.

### Materials and methods

Melting points were determined in open glass capillaries on a Fisher–Johns melting point apparatus and are uncorrected. <sup>1</sup>H NMR (400 MHz) spectra were recorded at room temperature in CDCl<sub>3</sub> as solvent and tetramethylsilane (TMS) as an internal standard. Coupling constants (*J*) are reported in Hz; those for common alkyl groups were in the expected range and are not separately marked. <sup>13</sup>C NMR (100 MHz) spectra were recorded in CDCl<sub>3</sub> solutions with TMS as internal standard. The mass spectra were recorded on a JOEL JMS 600 mass spectrometer at an ionizing



**Figure 2.** The time resolved photoluminescence spectra for compounds 5d, 5h, & 5o.

potential of 70 eV (EI) electron impact ionization mode using the direct inlet system. All the reactions were monitored by thin-layer chromatography (TLC) on pre-coated silica gel 60 F254 (mesh); spots were visualized under UV light at 254 nm. Elemental analyses were obtained using a Carlo ErbaEA1108 microanalyser. Known compounds were identified by matching their melting points with those in the appropriate references cited in the tables.

### General procedure of 4-formylpyrazoles (3)

All compounds **3** were synthesized using Anton Paar Monowave-300 reactor (Gaas, Austria), operating at a frequency of 2.455 GHz with continuous irradiation power of 0 to 850 W.<sup>24</sup> The reactions were carried out in a G-4 borosilicate glass vial sealed with Teflon septum and placed in a microwave cavity. Initially, microwave of required power was used, and temperature was being ramped from room temperature to the desired temperature. Once this temperature was attained, the process vial was held at this temperature for a required time. The reactions were continuously stirred. Temperature was measured by an IR sensor. After the experiments, a cooling-jet cooled the reaction vessel to ambient temperature.

A mixture of hydrazones **2** (1.92 mmol) in DMF (10 mL) in a microwave vial was added OPC-VH reagent (0.73 g, 5.76 mmol) at 0 °C and stirred for 1 min. The vial was sealed with the Teflon septum and aluminum crimp, using an appropriate crimping tool. The vial was then subjected to microwave irradiation and the temperature was being ramped from room temperature to 90 °C with the holding time of 10 min. The reaction was brought to room temperature, and then crude product was poured into ice-bath, neutralized with a saturated NaHCO<sub>3</sub> solution, and then, extracted with ethyl acetate (2 × 50 mL). The organic layer was washed with brine solution (2 × 15 mL). The organic layer was dried over anhydrous Na<sub>2</sub>SO<sub>4</sub>, filtered, and the filtrate was concentrated under reduced pressure to afford crude compounds **3** which were recrystallized with CHCl<sub>3</sub>-EtOH. The physical data of 4-formylpyrazoles (3a-i) has been provided in Table 4.

### General procedure of pyrazole-4-carbonitriles (4)

All compounds **4** were synthesized using Anton Paar Monowave-300 reactor (Gaas, Austria), operating at a frequency of 2.455 GHz with continuous irradiation power of 0 to 850 W.<sup>23</sup> The

reactions were carried out in a G-4 borosilicate glass vial sealed with Teflon septum and placed in a microwave cavity. Initially, microwave of required power was used, and temperature was being ramped from room temperature to the desired temperature. Once this temperature was attained, the process vial was held at this temperature for a required time. The reactions were continuously stirred. Temperature was measured by an IR sensor. After the experiments, a cooling-jet cooled the reaction vessel to ambient temperature.

A mixture of pyrazole-4-carbaldehydes **3** (0.938 mmol) and hydroxylamine hydrochloride (0.091 g, 1.311 mmol) in ethanol (5 mL) was refluxed for 6 h. The reaction mixture was cooled to room temperature. The separated solid was filtered and dried. A mixture of separated solid in DMF (2 mL) in a microwave vial was added OPC-VH reagent (0.18 g, 1.408 mmol) at 0 °C and stirred for 1 min. The reaction mixture was placed in the Anton Paar Monowave-300 reactor and was irradiated at 40 °C for 2 min. The reaction mixture was cooled to 0 °C and poured into ice-cooled water. The solid separated on cooling was filtered, washed with water, and dried under vacuum. The crude compound was crystallized from ethanol to get pure compound **4**. The physical data of 4-cyanopyrazoles (**4a-i**) has been provided in Table 5.

### General procedure of 1,3,4-trisubstituted pyrazoles (**5**)

To a cooled solution of 1,3-diphenyl-1H-pyrazole-4-carbonitrile **4a** (10.0 g, 40.82 mmol) in dry Et<sub>2</sub>O (100 mL) was added methyl magnesium bromide (3 M in Et<sub>2</sub>O, 204.08 mmol) carefully under N<sub>2</sub> atmosphere and refluxed for 24 h. The reaction progress was monitored by thin layer chromatography. After completion of reaction, the reaction mixture was cooled and treated with 0.5 M sulfuric acid and stirred for 5 min. After evaporation of most of the diethyl ether under vacuum on rotaevaporator, the mixture was basified with aqueous ammonia solution and extracted with chloroform. The organic layer was separated using separating funnel and washed two times with water. The organic layer was dried over anhydrous sodium sulfate and evaporated under vacuum to get crude compound which was purified by column chromatography (13% EtOAc in pet-ether) to obtain pure 1-(1,3-diphenyl-1H-pyrazol-4-yl)ethanone **5a** (8.44 g, 79%).

Similarly, all other analogous were synthesized by following the same procedure.

#### 1-(1,3-Diphenyl-1H-pyrazol-4-yl)ethanone **5a**

Light yellow solid; 79% yield; m.p. 97–99 °C [100–103 °C].<sup>14</sup> IR ( $\nu$  cm<sup>-1</sup>, KBr): 1664 (C=O str). <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>):  $\delta$  8.45 (s, 1H, Pyrazole-H), 7.73–7.78 (m, 4H, ArH), 7.42–7.51 (m, 5H, ArH), 7.36 (t,  $J$  = 8.4 Hz, 1H, ArH), 2.38 (s, 3H, -COCH<sub>3</sub>). <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>):  $\delta$  192.3 (C=O), 152.5 (C=N), 139.2, 134.8, 132.8, 130.0, 129.5, 128.9, 128.2, 127.8, 122.2, 119.4, 29.7 (CH<sub>3</sub>). ESI-MS ( $m/z$ ): 263.21 [M + H]<sup>+</sup>, 247.11, 219.12, 144.08, 116.09. Anal. Calcd for C<sub>17</sub>H<sub>14</sub>N<sub>2</sub>O: C, 77.84; H, 5.38%. Found: C, 77.79; H, 5.35%.

#### 1-(3-(4-Chlorophenyl)-1-phenyl-1H-pyrazol-4-yl)ethanone **5b**

Yellow solid; 82% yield; m.p. 101–103 °C. IR ( $\nu$  cm<sup>-1</sup>, KBr): 1665 (C=O str). <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>):  $\delta$  8.43 (s, 1H, Pyrazole-H), 7.76 (d,  $J$  = 8.4 Hz, 4H, ArH), 7.50 (t,  $J$  = 8.0 Hz, 2H, ArH), 7.36–7.42 (m, 3H, ArH), 2.41 (s, 3H, -COCH<sub>3</sub>). <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>):  $\delta$  193.5 (C=O), 152.1 (C=N), 139.2, 134.9 (C-Cl), 131.7, 130.1, 129.1, 129.0, 128.3, 126.8, 120.2, 114.1, 29.7 (CH<sub>3</sub>). ESI-MS ( $m/z$ ): 298.98 [M + H, <sup>37</sup>Cl]<sup>+</sup>, 297.03 [M + H, <sup>35</sup>Cl]<sup>+</sup>, 281.05, 253.09, 144.08, 116.09. Anal. Calcd for C<sub>17</sub>H<sub>13</sub>ClN<sub>2</sub>O: C, 68.81; H, 4.42%. Found: C, 68.85; H, 4.37%.

**1-(1-Phenyl-3-(p-tolyl)-1H-pyrazol-4-yl)ethanone 5c**

Brown solid; 75% yield; m.p. 93–95 °C. IR ( $\nu$   $\text{cm}^{-1}$ , KBr): 1665 (C=O str).  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ):  $\delta$  8.44 (s, 1H, Pyrazole-H), 7.77 (d,  $J=8.0$  Hz, 2H, ArH), 7.63 (d,  $J=7.6$  Hz, 2H, ArH), 7.49 (t,  $J=8.0$  Hz, 2H, ArH), 7.36 (t,  $J=7.2$  Hz, 2H, ArH), 7.25–7.27 (m, 2H, ArH), 2.40 (s, 6H,  $-\text{COCH}_3$  &  $-\text{CH}_3$ ).  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ ):  $\delta$  193.5 (C=O), 151.9 (C=N), 139.2, 131.9 (C- $\text{CH}_3$ ), 130.7, 130.1, 129.2, 129.0, 128.3, 126.5, 120.1, 114.1, 29.7 ( $\text{CH}_3$ ), 21.8 ( $\text{CH}_3$ ). ESI-MS ( $m/z$ ): 277.28  $[\text{M} + \text{H}]^+$ , 261.11, 233.17, 144.08, 116.09. *Anal.* Calcd for  $\text{C}_{18}\text{H}_{16}\text{N}_2\text{O}$ : C, 78.24; H, 5.84%. Found: C, 78.20; H, 5.81%.

**1-(3-(3-Bromo-4-fluorophenyl)-1-phenyl-1H-pyrazol-4-yl)ethanone 5d**

Yellow solid; 85% yield; m.p. 112–114 °C. IR ( $\nu$   $\text{cm}^{-1}$ , KBr): 1684 (C=O str).  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ):  $\delta$  8.43 (s, 1H, Pyrazole-H), 8.08 (dd,  $J=6.8, 2.0$  Hz, 1H, ArH), 7.80 (ddd,  $J=8.8, 4.8$  &  $2.4$  Hz, 1H, ArH), 7.75 (d,  $J=8.0$  Hz, 2H, ArH), 7.51 (t,  $J=8.4$  Hz, 2H, ArH), 7.39 (t,  $J=7.6$  Hz, 1H, ArH), 7.17 (t,  $J=8.8$  Hz, 1H, ArH), 2.50 (s, 3H,  $-\text{COCH}_3$ ).  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ ):  $\delta$  194.1 (C=O), 170.1 (C-F), 151.3 (C=N), 139.5, 134.5, 131.4, 130.1, 129.9, 129.1, 126.8, 120.2, 119.3, 114.1, 111.2 (C-Br), 29.7 ( $\text{CH}_3$ ). ESI-MS ( $m/z$ ): 361.17  $[\text{M} + \text{H}, ^{81}\text{Br}]^+$ , 359.15  $[\text{M} + \text{H}, ^{79}\text{Br}]^+$ , 344.13, 316.29, 144.08, 116.09. *Anal.* Calcd for  $\text{C}_{17}\text{H}_{12}\text{BrFN}_2\text{O}$ : C, 56.84; H, 3.37%. Found: C, 55.81; H, 3.41%.

**1-(3-(4-Methoxyphenyl)-1-phenyl-1H-pyrazol-4-yl)ethanone 5e**

Brown solid; 74% yield; m.p. 96–98 °C. IR ( $\nu$   $\text{cm}^{-1}$ , KBr): 1670 (C=O str).  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ):  $\delta$  8.43 (s, 1H, Pyrazole-H), 7.77 (d,  $J=8.4$  Hz, 2H, ArH), 7.72 (d,  $J=8.8$  Hz, 2H, ArH), 7.49 (t,  $J=8.0$  Hz, 2H, ArH), 7.36 (t,  $J=7.2$  Hz, 1H, ArH), 6.98 (d,  $J=8.0$  Hz, 2H, ArH), 3.86 (s, 3H,  $-\text{OCH}_3$ ), 2.41 (s, 3H,  $-\text{COCH}_3$ ).  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ ):  $\delta$  194.3 (C=O), 161.5 (C- $\text{OCH}_3$ ), 151.5 (C=N), 139.4, 131.8, 130.0, 129.5, 128.9, 126.8, 125.1, 122.2, 116.4, 59.9 ( $\text{OCH}_3$ ), 29.7 ( $\text{CH}_3$ ). ESI-MS ( $m/z$ ): 293.13  $[\text{M} + \text{H}]^+$ , 277.33, 249.29, 144.08, 116.09. *Anal.* Calcd for  $\text{C}_{18}\text{H}_{16}\text{N}_2\text{O}_2$ : C, 73.95; H, 5.52%. Found: C, 73.91; H, 5.55%.

**1-(3-(4-Bromophenyl)-1-phenyl-1H-pyrazol-4-yl)ethanone 5f**

Yellow solid; 84% yield; m.p. 107–109 °C. IR ( $\nu$   $\text{cm}^{-1}$ , KBr): 1674 (C=O str).  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ):  $\delta$  8.42 (s, 1H, Pyrazole-H), 7.75 (d,  $J=8.4$  Hz, 2H, ArH), 7.70 (d,  $J=8.8$  Hz, 2H, ArH), 7.56 (d,  $J=8.4$  Hz, 2H, ArH), 7.50 (t,  $J=8.4$  Hz, 2H, ArH), 7.37 (t,  $J=7.6$  Hz, 1H, ArH), 2.41 (s, 3H,  $-\text{COCH}_3$ ).  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ ):  $\delta$  194.1 (C=O), 151.9 (C=N), 139.5, 131.9, 131.7, 130.1, 129.5, 128.3, 126.8, 122.8 (C-Br), 120.2, 114.1, 29.7 ( $\text{CH}_3$ ). ESI-MS ( $m/z$ ): 343.04  $[\text{M} + \text{H}, ^{81}\text{Br}]^+$ , 341.03  $[\text{M} + \text{H}, ^{79}\text{Br}]^+$ , 326.12, 298.15, 144.08, 116.09. *Anal.* Calcd for  $\text{C}_{17}\text{H}_{13}\text{BrN}_2\text{O}$ : C, 59.84; H, 3.84%. Found: C, 59.80; H, 3.88%.

**1-(3-(2-Chlorophenyl)-1-phenyl-1H-pyrazol-4-yl)ethanone 5g**

Light yellow solid; 82% yield; m.p. 98–100 °C. IR ( $\nu$   $\text{cm}^{-1}$ , KBr): 1666 (C=O str).  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ):  $\delta$  8.49 (s, 1H, Pyrazole-H), 7.76 (d,  $J=8.4$  Hz, 2H, ArH), 7.47–7.51 (m, 4H, ArH), 7.35–7.41 (m, 3H, ArH), 2.30 (s, 3H,  $-\text{COCH}_3$ ).  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ ):  $\delta$  193.8 (C=O), 150.1 (C=N), 139.2, 131.9, 131.5 (C-Cl), 130.9, 130.5, 130.1, 129.8, 129.1, 128.3, 126.8, 120.2, 114.1, 29.7 ( $\text{CH}_3$ ). ESI-MS ( $m/z$ ): 299.23  $[\text{M} + \text{H}, ^{37}\text{Cl}]^+$ , 297.25  $[\text{M} + \text{H}, ^{35}\text{Cl}]^+$ , 281.07, 253.19, 144.15, 116.19. *Anal.* Calcd for  $\text{C}_{17}\text{H}_{13}\text{ClN}_2\text{O}$ : C, 68.81; H, 4.42%. Found: C, 68.85; H, 4.37%.

## Biological assay

### Test microorganisms

Bacterial cultures (*Bacillus cereus* MTCC1272, *Staphylococcus aureus* MTCC737, *Escherichia coli* MTCC118, *Yersinia enterocolitica* MTCC861) and fungus *Aspergillus flavus* MTCC2798, *Aspergillus niger* MTCC872, *Candida albicans* MTCC227 were obtained from Microbial Type Culture Collection, IMTECH, Chandigarh (India). Cultures were regularly maintained in the laboratory using standard media and incubation conditions.

### Antimicrobial activity

The title compounds **5a–u** were evaluated for their antimicrobial activities by broth macrodilution method as described previously by Sood et al.<sup>23</sup> Briefly, to prepare the stock solution, 10 mg of the test compounds were dissolved in DMSO (4 mL) and similarly, the standard drugs ampicillin and miconazole were dissolved in appropriate quantity of sterile distilled water (2.5 mg/mL). The bacterial and fungal inocula were made in saline solution (0.85% NaCl) and cell counts were adjusted to  $5 \times 10^7$  cfu/mL by using 0.5 McFarland standard. MICs of test compounds and test drugs were determined in sterile test tubes containing 2.0 mL of nutrient broth or Mueller–Hinton broth (for *bacteria*) and Sabouraud dextrose broth (for *fungus*). Two mL stock solution of test compounds and standard antimicrobial agents were added to first tube of their respective series and diluted serially to obtain different concentrations. The resultant diluted concentrations of test compounds and standard antimicrobial agents were 2500, 1250, 625, 312.5, 156.25, 78.1, 39.06, 19.53, 9.76  $\mu$ g/mL. Broth tubes were inoculated with 10  $\mu$ L of microbial suspension so that final counts were  $5 \times 10^5$  cfu/mL. Tubes containing medium or medium plus DMSO, and tubes without microbial inoculum served as growth and sterility controls, respectively. Broth tubes were incubated at 35–37 °C for 24 h and examined for the presence or absence of growth. The minimum concentration of test compounds and standard antimicrobials that resulted in complete growth inhibition was recorded as MIC.

### Disclosure statement

No potential conflict of interest was reported by the authors.

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**INTRODUCING DOGRI FOLK SONGS:  
A PEEP INTO THE REPOSITORY OF LIFE**

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The term folklore is comprised of two terms, that is folk and lore. Folk refers to the regional people and lore means stories. So, folklore refers to the stories of people of a particular region or area. It also defines popular beliefs, faiths and ways of life. In its current meaning folklore includes myths, legends, folktales, jokes, proverbs, riddles, chants, charms, blessings, curses, oaths, insults, retorts, taunts, tongue-twisters, greeting and leave-taking formulas. It also includes folk costume, folk dance, folk drama, folk arts, folk belief, folk medicine, folk instrumental music, folk song, folk similes etc.

Though the study of folklore gained importance in the nineteenth century but the interest in it can be dated back to the ancient times when the works of Herodotus, Livy and Pliny made references to popular beliefs and practices in ancient Greece and Rome. Indian literature played a vital role in the upholding and propagation of folklore. Sama Veda, to name one, can be considered as one of the oldest forms of folk music that has survived through the ages. India is a culturally enriched country with each region having its peculiar folklore.

Folklore in Jammu, likewise, has its own uniqueness and distinctiveness. The *Duggarland* today is known for its rich culture, heritage and traditions. According to Shivanath, "Dogri folk literature is universal in two ways: Firstly, its subjects are universal and the strands in which these subjects are woven are common, and secondly, it appears in the same forms all

over Duggar” (9). In Jammu also, there are differences in case of language, lifestyle, customs, physical features, behaviour. Still, it is interesting to find a fundamental unity among all the divergent cultures prevailing in each region or political unit. Dr. Seema Sharma in her Doctoral thesis writes “...It is interesting to study an emotional synthesis in the diverse elements and this issues forth in music, dances, rituals and ceremonies at places of worship, *dargahasand* shrines of faquirs and saints” (25).

The folklore elements in the Jammu region encompass folk songs, folk dances, ballads, folk tales, folk epics, idioms and phrases, enchantment and witchcraft and folk theatre. The folk songs of Jammu are the preferred form of oral literature in the region. Every aspect of the socio-cultural and religious life of the people of the Jammu region is found manifested in their folk songs. These songs are divided as religious songs, ceremonial songs, seasonal songs, festival songs, lullabies, play songs, and workers’ songs. Commenting on the nature of Dogri folk songs Narain and Baru were of the opinion Dogri folk songs are living repositories of human emotions and they help us understand the Dogra minds and their lifestyles in a clear manner” (26). One finds a wide variety of Dogri folk songs in Jammu. Beginning with the religious folk songs which are further divided into; *Bhishanpatte*, *Bhainta*, *Aarti*, *Gujari*.

*Bhishanpatte* or *Vaishnav Pad* are like bhajans, which are sung in praise of Lord Krishna or His incarnation in the form of their miraculous acts and descriptions of their lives. *Bhishanpatte* and *Bhainta* have the same structure and they are parallel in rhyme and subject matter as both are associated with admiration of God. An example of *Bhishanpata* is:

No one is able to understand you, Lord Krishna, (He is known for playing mesmerizing flute)

I have searched for you in the fairs, asked the gypsies too...

(Translation, *Duggar kaSanskritikItihas*, 537-538)

The above-mentioned song glorifies God whose mysterious deeds and secrets are beyond human perception.

There are very enthralling *Dogri* folk songs, directly linked with sowing and reaping and other rural jobs. The songs stimulate the workers with a particular beat or a refrain. *Gharlohdi* is one of the types of songs, sung while people are doing arduous work so that they stay energetic and motivated. An example of this type from *Dogri Lok Geet* volume seventeen is as under:

Say, young man – go ahead!

Live long- go ahead!...

Apply the force- go ahead!... (163)

On festivals like ‘*Lohri*’ and ‘*Rut Rade*’, songs and couplets are sung to express the curiosity, joy and pleasure of people celebrating them together.

To quote from *Dogri Lok Geet* volume fifteen:

Lohri has come, brother Lohri has come,

Everywhere peanuts and jaggery candies have come!

(Translation 33)

There are satirical verses called '*Tapkolian*' to mock others. These may be called non-sense verses because the words are twisted in a way that they sound meaningless. There are folk songs connected with the cycle of seasons which makes them more joyous. *Dholru* are songs sung on the occasion of the change of season. An example of *Dholru* from *Dogri Lok Geet* volume fifteen is as under:

First the name of Lord Ram will be taken,  
Who has created this world... (Translation 60)

There are satirical verses called '*Tapkolian*' to mock others. These may be called non-sense verses because the words are twisted in a way that they sound meaningless. There are folk songs connected with the cycle of seasons which makes them more joyous. *Dholru* are songs sung on the occasion of the change of season. An example of *Dholru* from *Dogri Lok Geet* volume fifteen is as under:

First the name of Lord Ram will be taken,  
Who has created this world...  
It is the religion that is always hailed! (60)

There are ceremonial songs like *Suhag* (on the marriage of a girl), *Ghodi* (on the marriage of a boy), *Doli* (when the bride is about to leave).

An example of *Suhag* from *Dogri Lok Geet* volume eleven is as under:

We are like sparrows my father, we will fly!  
Our flight is very long, which place shall we to go? (Translation 6)

On the birth of a *child* (male), *mundan* (head shaving ceremony of the child), *sutra* (tying the auspicious thread to make the child part of a particular clan), going on a pilgrimage and occupying a newly built house; songs are sung to congratulate and these are called '*Vadhais*' (*Bihaiyan*). An example of a *Vadhai* or *Bihaiyif* from *Duggar da Sanskritik Itihasis* as under:

My sister-in-law has given birth to a diamond, a son is born,  
What gifts will you offer to your sister-in-law (*nanad*), my dear sister-in-law! (Translation, 529)

*Sithanis* are also known as *Bolian* which are sung in an innocuous manner against the bridegroom and his relatives by the family members of the bride. The following example from *Dogri Lok Geet* volume ten brings out the essence of such ceremonial songs:

Mangoes have ripened and buds have grown on the stems,  
My Brother-in-law has gone to sell his mother! (Translation 223)

Like *Sithanis*, there are also folk songs known as *Chhand*, sung by the bridegroom on being forced by the bride's friends to tease the bride and her relatives.

*Luhani* and *Palla* are folk songs sung on death. *Luhani* is also called *Luhan*. Women of a particular class called '*marasan*' sing these songs while women of the house beat their chests.

For Example: Cut the sandalwood tree,



**RECONSTRUCTING SELF IMAGES IN GLORIA NAYLOR  
AND MANJU KAPUR**

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**Abstract:**

The female self is seen on the verge of Shift as gets revealed in the studies made during post-independence times. In this regard, the women writers are gaining much recognition due to their emphasis to study the self of the women protagonists. Undoubtedly, the conflicts are perennial but the strategy to combat with 'Self' and 'Society' differs from individual to individual. In this regard, the women novelists namely Gloria Naylor and ManjuKapur have been taken to study the exploration of selves in their respective novels namely *The Women of Brewster Place* and *Bailey's Café, A Married Woman & Difficult Daughters*. The blend of two authors with different cultural contexts would help in forming a better viewpoint about the changing images of 'Self' to get a rightful approach to rectify the wrong perception prevalent in the societies with respect to women.

Through their female characters namely Astha, Peeplika, Mattie, Esther, Eve, Sadie, Virmati, Eda and Kasturi, the twin authors have tried to do mind mapping of various female protagonists who have been confronted with dilemmas throughout their existence in this male dominated world. They try to idealize their dreams within the social framework. We come to know about two different cultural contexts during post-colonial period, where the treatment of women is taken altogether different. They assume different

responsibilities for 'Self-Fulfillment'. They are constantly on the verge of losing their morality. With growing times, the rigidity of being charged with sex-taboo goes at the back side of the mind of the female protagonists. They try to listen to their inner voices, thereby breaking the conventionality and do not follow patriarchy. They act thoughtfully and do confront with the quintessential question of survival. Thus, the images of Women are seen in a flux and truly indicate towards the feministic vision of both Indian and Afro-American female writers. The coping strategy of the protagonists differ to in order to make a fine balance to their lives and hence forth the 'Self-Image' also gets reconstructed.

Key Words: Perennial, Mapping, Dilemmas, Patriarchy, Existence, Feministic & Self-Image.

**Introduction:-**The early twentieth century writers glorified the beauty of the black colour and showed that they were proud of their black identity. The modern black novelists focus on the complexity of the individual attainment of his self as it is submerged in the false selves stacked on it by the destructive images and typecasts of the society. The Afro-American fiction basically deals with the mistreatment of the black particularly sexual exploitation of the black women and loyalty to the country which never gave them a chance to enjoy the basic principles of liberty, equality, and justice enshrined in its constitution. The antagonism of the white American culture induces the blacks to search for dignity and identity. The American Negro came into sight from this exceptional situation in America-a person self-esteemed, self-confident with a complete identity and as good as an individual as any white.

A black American is a Negro and an American as well. The origins of Afro-American culture do not propose appearance of any diverse social culture and institutions but a network of social relationship of a group and the actions of the members generally correspond to one another. An Afro-American is thus an exaggerated American. Their identity is denied not only by the white men but also by the black men. The Negro in America has happened to develop an identity for himself which exists without a regular past. Their domestic designs are varied, but still show women's edged alternatives in a patriarchal society. Black women in America are triply burdened and this burden curbs them from a fuller and significant participation in American society.

The theory of Feminine Aesthetics gives a new dimension to the understanding of female psyche. "For the Indian woman the home had been the entire world for many centuries." Woman is torn between cultural conditioning as a woman and feministic aspirations for autonomy and selfhood.

"Why do we travel not in straight lines but in circles?" Do we come to the same point again and again?"

The educated Indian woman is living in the suffocating atmosphere of deep psychic repression, economic exploitation and the tyranny of obsolete conventions and rituals. Yet she carries the indelible imprint of Indian

sensibility and culture in her blood and consciousness. Daring attempts by woman to break the laws lead to nothing but fear and guilt. She sometimes becomes powerless to conquer her own consciousness. In this battle of Self-predicament, she emerges herself in a new image that is Self- contradictory.

**Self Image in ManjuKapur:-**The impact of education becomes prominent in the three generations women in the novel 'Difficult Daughters' by ManjuKapur where Ida seems to formulate altogether a different image as a daughter whose ideological variation brings for her lack of acceptability and distort the traditional image of a daughter who is only obedient to fulfil the age-old practices who gets married in a well to do family to uphold the family honour. The new education and the life of Kasturi generate a new urge and emotion in Virmatito get herself free from the bondage of patriarchy that denies or deserts her freedom and choice. Her marriage is final with Inderjit but is postponed because of the death of her father. She does not think of the marriage and child bearing just after the high school qualification. She falls in love with the romantic oxford-returned professor Harish Chandra who lives next door and is already married. Thus, Virmati's self-affirmation leads a turning point in her life and in a way she draws a new image of herself before her family and creates contradiction in her daughter's mind Ida. Ida does not like to be a replica of her mother and imbibes the values at her own pace.

In ManjuKapur's 'A Married woman' the protagonist is seen torn between duty and responsibility, faith and fact, history and contemporaneity, public ethos and personal ethics, Asthathinks, " tired women cannot make good wives" (154), She fights for her self-assertions. Unlike many unmarried girls she had her infatuations of adolescent love for Bunty, a boy of another colony and for Rohan who left for overseas for a better career. But her real story of love and marriage started with Hemant, the son of a successful government official in Delhi. Soon after marriage Astha gets disillusioned about human nature in general and politics of the country in particular. Sharing her feeling, " we should struggle with her, agonize together with her about her choices and weep with her once she has made them."

Astha's family affairs are also not so good and nothing is right with her. As a married woman she becomes an enduring wife and sacrificing mother. Her temperamental incompatibility with her corporate thinking husband compels her to play the role of mother and father for her children. This denies her self-fulfilment and leads to the collapse of the institution of marriage. Discontentment leads her to defiance and restlessness. Her anxiety, discomfort, loneliness and isolation don't encourage her to give voice to her unhappiness over her troubled relationship, rather it prompts her to develop the feelings of guilt, negativity and lack of self-esteem in facing the challenges in her life. Astha understandsthat a married woman's place in the family is taken to be that of an unpaid servant or a slave and the thought of divorce brings social and economic death in her Indian status. She realizes for herself that , "A willing body at night, a willing pair of hands and feet in the day and

an obedient mouth.”(231) If Astha becomes the victim of male passion, Pipeelika becomes the victim of communal riot and for the mistakes in history. While the lesbian attempts drag Pipeelika to the world of forgetfulness, Astha takes a sweet revenge on her husband. In this act of vengeance, unnatural sex, little excitement, little impatience and much imagination, she has a big jerk in her mind and this cripples her married life. Astha is Kapur’s New Woman, “conscious, introspective, educated, wants to carve a life for herself, to some extent she even conveys a personal vision of womanhood by violating current social codes.”She canonizes and commemorates her insulted feminine sensibility raising the male tantrum to socially transform a society.

Thus, ManjuKapur embedded in feminism has well made her point of view clear that a woman’s basic solidarity needs to be tackled in relation to the socio-cultural situation.“ A woman should be aware, self-controlled, strong-willed, self-reliant and rational, having faith in the inner strength of womanhood. A meaningful change can be brought only from within by being free in the deeper psychic sense.”

**Self-Image in Gloria Naylor:-**InAfro-American context, during post-colonial times, the women writes are telling the real stories, stories of their own lives and struggles. This has made them even stronger and since they are progressing on the way to a more activist feminist stand. An ardent appeal for this is made by Virginia Wolf through her essay *A Room of One’s Own* (1929). Zora Neal Hurston wrote *Their Eyes were Watching God* in 1937. It was an ethnically supported journeying of black female selfhood and proved world-shattering. As a result, it paved the path for many upcoming writers.Fiction in the late 1970’s and 1980’s broke the ascendancy of poetry and drama. During this new period women were the primary writers Toni Morrison, Gayle Jones, Alice Walker, Toni Cade Bambara, Paul Marshall and Gloria Naylor. Glorification of the African women by the African writers in colonial and post-colonial Africa gave rise to woman as an icon but it frequently channels to stereotyping her role and contradicting her position outside her home.

The black woman at the intersection of the sharp blades of the swords of race, sex and class is relegated to the inferior position of denominators that influence group membership. And therefore, she remains neglected and unnoticeable in the ‘dominant, mute, passive and suppressive’ American society. Naylor’s fourth novel *Bailey’s café* is composed of several mini-plots. Each chapter details the life struggle of a different character. From these collective stories the reader confronts once again the depths of human struggle and survival despite the odds. *Bailey’s Cafe* serves as a sanctuary for those who have been forsaken or who have been denied the solace of human compassion. It is a way station where customers are left to their own devices without interference from others. They can interact if they wish, or they can sit quietly to contemplate their condition. Because the customers have been exploited either emotionally or physically, *Bailey’s* offers them a place where

they can try to function unmolested until they can figure out their next alternative. Throughout the stories what echoes is female subjectivity to male desires.

Gloria Naylor's novel 'The Women of Brewster Place' interweaves the story about seven women in a squalid urban neighbourhood, just when she began her graduate work at Yale. This novel introduced the privileged Americans to the struggles and sufferings of those who will never see the American Dream because for them survival itself is victory. There are different stories about different women in the novel. Each story is linked to the next in some way or the other. These women whether Mattie Michael, Etta, Mae Johnson, Kishwana Browne, Lucielia, Kora Lee or Theresa or Lorraine all go through difficult circumstances in their lives, they face several problems and with the support of each other finally survive in life. These women are the residents of Brewster Place, which according to the author is 'the bastard child of several clandestine meetings...' Like its residents the place is now neglected and aloof from the main city by a wall.

Mattie Michael when declares her pregnancy before her father is beaten badly and does not expect her father to understand the real cause of her pregnancy. His attitude is a complete contrast to that of his wife, the mother of Mattie, when Mattie says,

Oh! Mama, I 'm so ashamed.' her mother replies, 'Ain't nothing to be ashamed of havin' a baby is the most natural thing there is .... What's going on in your belly now ain't nothing to hang your head about-you remember that.'

This incidence clearly indicates how differently men and women look at the same issue of child bearing. After the showdown with her father Mattie decides to leave her hometown. She goes to Ashville in North Carolina and works day and night to bring up her son, Basil, all alone, supported by her inner strength. Her only dream and reality now is to give the best of life to her son. Another resident of Brewster Place is Kishwana Browne, who rebels against her middle class parents to realize and assert her black hood. She dwells at Brewster Place to accomplish this purpose and to help the other Blacks living there. Kishwana's mother understands the feelings of her daughter but does not support her because she has no doubt regarding her identity. According to her,

.... She is alive because of the blood of proud people who never scraped or begged or apologized for what they were. They lived asking only one thing of this world.... to be allowed to be. And I (the mother) learned through the blood of this people that black isn't beautiful and it isn't ugly....black is! It is not kinky hair and it is not straight hair....it just is!

There are immeasurable slum streets like Brewster, streets will prolong to be criticised and to die but there will be other streets to whose decay the women of Brewster will adhere. Though misapprehensions about factual motherhood are moreover apparent, there is habitually a glorification of motherhood and of

women who are in distress but will struggle and survive exclusively for their children. Thus, black women turn over all the fallacies associated with them. The female protagonists of Gloria Naylor like any other black women are doubly oppressed. This subjugation they have to face both in their home and outside their homes. Therefore, in these cases the struggle is not for acquirement of mere quality but for acceptance as human beings. Through her stories Naylor also presents that the Afro-American would not have been able to survive as a race without the female values of commonality, sharing and nurturing. The Afro-American women had to bond with each other in order to survive and prove their selves.

Conclusion:-Man is a social animal. He is constantly seen in a flux. He is considered as the harbinger of cultural legacy. Manju Kapur's heroines are assertive who dare to break the threshold and achieve self-accomplishments despite facing a lot of contradictions. They are able to establish their unique identities and fit themselves into different roles as daughters, mothers and wives. Their journey of creating a new self -image is not an easy one but they made it possible through their struggle with self and society. On the contrary, the women in Afro-American culture have to face triple jeopardy and they are able to cherish their identities not within the family convention. They are taken for commodities by their male counterparts and in an alien culture. They are constantly seen struggling through their experiences and are able to heal their tormented selves through sisterhood and compassion which gives a meaning for their survival and are able to create motherly image that itself becomes iconic.

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# Of Men and Morals: *Saangs* of Lakhmi Chand (Haryana) as narratives of local history, identity and culture

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## ABSTRACT

Folk theatre has been neglected and undocumented for centuries even though it is a very vital part of the culture & identity of the people. Folklore is a western concept and can't be applied in toto to the folk performances in India; *Saang* theatre being one example of it. Lakhmi Chand has been considered the greatest exponents of *Saang* theatre. He uses stories from local history, mythology and folklore and uses them as vehicles to reinforce local culture and beliefs. The *Saangs* thus become important documents of the cultural identity of people.

**Keywords:** Saang theatre, undocumented, history mythology, culture identity

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## Introduction

In his book **Rethinking Folk Drama**, Steve Tillis declares that "Traditions of folk Drama exist throughout the world, ranging from simple forms that involve few people, rudimentary texts, and crude performance practices, to complex forms involving entire towns, highly elaborated texts, and performance practices that have developed over hundreds of years. Yet folk Drama lacks, to this day, a full-length study from the perspectives of either folkloristics or Drama studies." What he says holds true for India as well.

India is known all over the world for its cultural diversity and heritage. It has the oldest and richest tradition of theatre. And yet, for long, studies of culture or tradition have been dealing with the established or classical forms of literature, dance, Drama and music. Folk culture has been systematically neglected and undocumented for many centuries even though Folk theatre has played a vivid and lively role in Indian culture. India's repertoire of folk theatre is large and varied. Every corner of India is home to a different kind of performance tradition. While everyone would agree with Steve Tillis about the existence and need for studying folk Drama, there is little consensus about the basic terms or approaches or ideas. The history of the word folk itself is long and difficult. The word folk originated from the German word 'Volk' and was used to refer to common people whose culture was handed down orally. However, it entered the academic language when British antiquarian William J. Thoms (1803-1885) used it in 1846 published by the London Journal *Athenaeum* in 1846. The online dictionary defines folk as "The common people of a society or region considered as the representatives of a traditional way of life and especially as the originators or carriers of the customs, beliefs, and arts that make up a distinctive culture" and their culture may be referred to as folk culture. However, that is to simplify a very complex debate because folklorists as well as anthropologists have been divided over what constitutes folk culture.

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Norbert F. Riedal 'Folklore and the Study of Material Aspects of Folk culture' (Oct-Dec 1966) rightly points out, "so far no consensus seems to have been reached, and the various and often conflicting interpretations of "folklore" that have been brought forth by folklorists as well as anthropologists have caused much consternation, frustration and even alienation between the two disciplines" (1).

### **Difficulties in imposing western theoretical frameworks on Indian theatrical traditions**

Folklore is an inseparable part of culture but the relationship between folklore and dominant culture is not very simple because folklore or folk traditions not only reflect the culture of their folk and are also used as tools to emphasize and reinforce existing power equations but also question dominant social ideologies. The issue gets further complicated when we discuss issues of *Indian* folk tradition in relation to folkloristic as an academic enterprise, which started in the west.

As Lisa Gabart points out in her article Folk Drama

It easily imposes frameworks of interpretations that are not necessarily grounded in local understandings. When used in non-western contexts, for example, the term imposes western understandings of Drama on traditions that may be more profitably understood as something else, such as worship, sacred retellings, or a visitation by deity, thus drawing disparate performance traditions into the same interpretive sphere. (1)

Indian theorists and researchers too voice the same difficulties.

According to K N Panikkar

"We often come across Western scholars who approach Indian artistic traditions in a meticulously analytical way and create theories on our theatre concepts after their own fashion. I have all respect for their analytical approach which helps them make their own deductions. But the question which baffles anyone in theatre is whether these deductions can be taken as guidelines for the practice of Indian theatre. A theory is generalised from our experience of doing a thing. Even when an artist practices an art after thoroughly learning its grammar, he cannot neglect the creative impulse which springs up from within, necessarily paving the way for further enlargement of theory."

In Western countries they consider folk forms as rudimentary, as fossils of some bygone age. Many theorists see folk as primarily low-class activity, belonging to illiterate people. It is hardly seen as literature.

As Lisa Gabert posits in her article Folk Drama,

"In the nineteenth century, scholars were interested in the origins of cultural forms they considered to be "folk Drama," which largely was conceptualized as ancient but degenerated plays that continued to exist in the modern era primarily among the European peasant classes. The plays themselves were presumed to be "survivals,"—that is, leftovers from an earlier era in which fuller, more complete versions had flourished, and where the functions they fulfilled were supposedly more holistically incorporated into society"

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But in India the scenario is different. The folk forms are not dead and gone. True that they have suffered setbacks with the coming in of satellite TV and internet but they are not history as yet. According to J C Mathur

"In these circumstances, the question arises how did the contemporary traditional and folk forms arise? In the West the folk form is considered only a community activity of an amateurish kind. This is not so in India because our traditional and folk Drama has very important and strict traditions in some cases and is far more sophisticated than the Western folk Drama. While editing jointly with my friend Dashrath Ojha some medieval plays on North India and Nepal (C 1300 A D - C 1625 AD) I (J C Mathur) came to realise that those plays along with similar contemporary traditional forms in other parts of India, actually belong to the corpus of a Dramatic genre which has received scant attention from historians of Drama, including Keith who has rejected them as merely "irregular plays." The same attitude is disclosed in a recent work called "Sanskrit Drama- Its Origin and Decline" by Shekar (published in the Netherlands) "

In India, there is a great variety and richness to be found in the different forms of folk theatres that have developed in different parts of the country. The Folk artists combine legends and myth with song and dance to create a vibrant theatre in every region of India. Folk theatre is known by various names in the different states of India. In Kashmir, it is known as *BhandPather*, in Panjab as *Nakkaal*, in Rajasthan as *khyaal*, in U.P. as *Nautanki or Raas* and in Haryana as *Swaang or Saang* to name a few. These performance practices are different from each other not just in name but also in terms of the tools they employ. They have evolved over the centuries and have a unique identity because they perform different sociological functions in the community to which they belong. Rooting a cultural practice is very important because any form of theatre is rooted in its context. By context we don't really mean the time and place of the performance but the social and political scenario it reflects or encourages. The story that the performance is telling may be taken from popular culture or epics like Ramayana or Mahabharata but its meaning and implications differ because of the socio- political circumstances of the people who stage it and the people who are watching it. In fact, there is a spontaneity about folk performances that is missing in classical theatre. The folk performer considers it his right to make changes to the performance sometimes mid performance also depending upon the demands and responses of his audience, something you would not find anywhere else, as elsewhere lines are vigorously memorised and performances are meticulously rehearsed. Also, the folk performances function within a paradigm and framework which may seem odd to an outsider but which make perfect sense to the local audience. They are trying to reinforce some age-old values and traditions, may not bear scrutiny using popular literary and cultural theories but reach directly to the heart and minds of their audience.

#### **Evolution of Saang and its uniqueness**

Swang or *Saang* developed in the north Indian state of Haryana. Haryana as a state may be of a recent creation (Haryana was constituted on **November 1, 1966**, as a result of the partition of the former state of Punjab into two separate states—Punjabi-speaking Punjab and Hindi-speaking Haryana.) but the history of the people of Haryana goes back to time immemorial. In fact, the whole reason that the Govt of India found it necessary to create a separate state is reason enough to agree that the distinctiveness of the Haryanvi people was too much to ignore and could not be brushed aside under the carpet of a common state with the Punjabis. Haryana has existed as a separate unit with its own distinct identity and distinct folk culture. It has unique folk practices and

performances which take place at villages, at temples, at road crossings, at fields and granaries, marriage ceremonies, festivals etc; and are an inseparable part of the lives of the people. It includes *Saangs* also which are performed on a particular kind of stage or platforms with usual themes of legendary story, historical event or love story at its centre and can keep the public or audience enraptured for the whole night. *Saang* is a balanced combination of acting, dialogues, music, dance, songs, plot, worship and spirituality.

Though the history of folk performance traditions in north India has much in common, the *Saang* from of Haryana (erstwhile Punjab) is unique and different from other performance traditions practiced in the area. *Saang* may be called folk theatre but its status as theatre remains disputed. First of all, as stage it uses a platform of about three and a half meters which is open on all four sides. As Balwant Gargi points out in Folk Theatre of India, “life in India is in the streets. Shops, stalls, rituals, bathrooms, all are exposed to the sun and to the glare of people, so is the folk theatre.” (6) There are no curtains or green room attached to the stage and *Saang* hardly uses any props during performance. It is the main narrator or the *sutradhar* who describes to the audience what the stage stands for e.g. a palace, forest, or riverside depending on the scene. Though the characters are well delineated, there are no dialogues; the exchanges between the characters are sung and these songs are called *Ragini*. The performers are all male and sometimes they wear costumes but that is a rarity and in fact a recent practice. Thus, for *Saang*, all the three important constituents of theatre—acting, dialogues and stage are markedly different from practices of the theatre. *Saangs* is also quite distinct from other performing arts in the region. While on the one hand we have narrative traditions like *Alha* which sing epic poetry and the Nath jogis who narrate folk stories to an audience, on the other hand we have the Naqqals and Behrups. While Behrup performers disguise and move from village to, the Naqqal performers usually perform little skits based on imitation. Therefore, if *Alha* is about musical rendering of poetry, Behrup is purely about costume and acting. As per this categorization, *Saang* would fall somewhere in between because it incorporates elements of both. Like the *Alha*, the *Saangis* sing their *Raginis* and like Behrup, the staged performance tells a story using costumes and acting.

Usually the man playing the lead female character is dressed up as a woman, but the onus of creating the scene and retaining the interest of the audience is primarily on the poet who composes the *Raginis* and who is also the lead actor who sings them. The one after whom the *Saang* troupe is known is more often than not the composer and the lead singer/actor. The *Raginis* are accompanied by *Sarangi* and *Nakkara*. The performances demand great skill and stamina from the artists who perform for as long as six hours and usually there are no loud speakers to amplify their sound. An hour or so before the performance, the musicians begin to create the atmosphere and the artistes sing some religious or other songs connected with the performance till such time when the ‘Guru’ appears and the artistes touch his feet to seek his blessings. The *Saang* begins with the recitation of a *bhet* as pointed out by Ved Prakash Vatuk and Sylvia Vatuk in their article the ‘Ethnography of *Saang*’,

Om(a) nam(a) sab(a) tai bada	the name of aum is the
greatest	
Ustai bada na koy(a)	no one is greater than he
Jo uska sumiran(a) karai	one who remembers Om
Sudha at(a)ma hoy(a)	his soul is purified
Ari bhavani bas(a) kar(a)	oh bhavani, come and live in me,
Ghat(a) ke par(a)de khol(a)	open the gates of my heart,
Ras(a)na par(a) basa karo	stay on my tongue, oh mother

Mai suddha sabad(a) mukh(a) and speak the correct words  
 Bol(a) through my mouth.  
 Manai sumar(a) liye jag(a) dis(a) I remember the lord  
 Sat(a) guru mile is my guru  
 Kahu charan(a) vakai sis(a) I bow to his feet. (23)

With a brief introduction about the play, the performance starts.

Of *Saang*'s exponents, Pt. Lakhmi Chand (1901-1945) is the most celebrated. Shashi Bhushan Singal as quoted by Puran Chand Sharma in his book *Lakhmi Chand Granthavali* describes his contribution to the form of *Saang* as, "Pandit Lakhmi Chand freed the themes of the '*Saang*' from religious and puranic subjects to which they had become confined and included in them a blend of love themes and of youth. Thus the '*Saang*' was made more ornate (17). Lakhmi Chand has been called a 'luminous bard', 'Kalidas', and 'Shakespeare of India' by his numerous fans and followers. It is difficult to even imagine the kind of cult following he inspired in the people of his state. People walked for days or travelled in their bullock carts to see him perform and listen to him. It was no less than a pilgrimage for most people, with the only difference that while on pilgrimages women and whole family travelled, only men had the prerogative to attend performances like *Saang*.

When modern academia thinks of 'popular literature' all that they are thinking about is literature that has been written down and recorded. Although in India we have had a long and illustrious oral tradition as the Vedas and puranas and the other religious and semi religious texts too were handed down the generations for thousands of years before they were finally written down, oral literature is not taken seriously. In fact, the whole thing is quite contradictory as the people who wrote belonged to and wrote about the people occupying the upper rungs of social ladder and it was not popular in the truest sense of the word as it did not represent or was appreciated by the populace. However, that doesn't mean that the common people didn't have a literature. They also created exceptionally rich tradition of oral literature. The folk forms like *Saang* gave the common people a medium and means of expressing their sentiments.

### **Lakhmi Chand: the *Saangi* extraordinaire**

*Saangis* like Lakhmi Chand created a huge body of literature but that has been systematically ignored and sidelined simply because he was not writing it down.

Just like Shakespeare, Lakhmi Chand picked up stories from popular mythology folklore, legends, scriptures and created his *Saangs* around them. His stories are generally either fragments of bigger stories from the epics like Ramayana or Mahabharata or local stories and qissas as were called. Most of the people knew the story from popular literature. So, there was no dramatic suspense of the 'what happened next' kind to keep the audience interested. Then how did the poet composer sustain the interest of the audience. When the people already knew what was going to happen in the story what made them hang on to every word that was uttered. And that is where Lakhmi Chand's genius as a poet composer and Dramatist comes into play. One of the reasons for his huge popularity was that as a master dramatist he wove his stories in such a manner that even though the audience knew the meta narrative of the tale served as the basis of the composition, the rendition of the tale was always new. The genius lay in how everything was said. As a master dramatist Lakhmi Chand knew how to first create and then sustain dramatic conflict even when the story was a familiar one. For example, in Shakespeare's plays too the stories were well known to people. The audience knew that Macbeth would kill Duncan but even then, everybody was enthralled when the play opened with the three witches dancing on the barren heath and singing "thrice to thine, thrice to mine and thrice again to make up nine."

Before we look at specific example it is pertinent to note the general structure of the *Saang* compositions. The *Saang* generally opened with a tranquil time...like ‘once there lived a king and queen...’. When everything was peaceful. It is from this tranquil situation that conflict is introduced. The conflict can be man-made like designs of a scheming villain, or supernatural like the falling of misfortune due to some god or goddess or some supernatural character. Since in the *Saang* the dialogues were sung as *Raginis*, the characters are introduced in pairs. In every scene the pairs sing their part as protagonist or antagonist. Even supporting characters get classified as good or bad depending upon which side they are supporting. The growing misfortunes of the protagonist lead to rising conflict and finally comes the climax. It is during the climax that the cause of conflict is revealed and the conflict is resolved with the help of other characters leading to a happy ending. However that is not to say that every *Saang* had a happy ending. *Saangs* were chosen according to the occasion and the demands of the audience. If it was happy occasion like a wedding love stories were performed. However, if it was a religious festival religious, didactic stories were performed. However, both were not mutually exclusive. Even love stories were many a time taken from religious stories and carried didactic elements. And sometimes even love stories were staged at religious festivals because of the social and moral message they carried. It was the poet composer’s prerogative as to how he appropriated the story for his purpose. To look at some examples, Pandit Lakhmi Chand used to begin his compositions with *varta*. An excerpt from one of his *Saang*, “Heer Ranjha”:

“Sajjano! Punjab prant mein ek sheher tha Takhat Hazara. Us sheher mein ek moola jaat rehta tha, jiske bete ka naam tha- Ranjha. Udhar Jhang sheher mein Chuchak ke ghar ek ladki hui, jiska naam tha-Heer. Thode se din mein dono jawan ho gye. Ek raat sapne mein Heer ko Ranjha dikhayi diya. Usne Ranjha ko apne ghar bulwa liya. Ranjha Heer ke ghar bhainso ka pali ban k rehne laga. . . . Ab har roz Heer Ranjhe ka khana lekar khrak mein jaya karti thi. Ek din Heer kharak mein jakar ranjhe se kya kehti hai”(313).

Gentlemen! once there was a city by the name Takht Hazara, in the state of Punjab. In that city a rich Jaat lived. He had a son named Ranjha. In another city nearby named Jhang, a man named Chuchak, had a daughter named Heer. After some time both them grew up. One night Heer dreamed of Ranjha. She called Ranjha to her house. Ranjha went and started living in her house as a caretaker of the cattle... Now every day Heer used to carry food for Ranjha. One day while giving food for Ranjha Heer says to him...

In this manner the *Saang* began and the characters were introduced. *Saangs* were long narratives and continues for many days. In such a scenario how did the *Saangi* maintain the audience’s interest. Since the story is already known to the audience, the composer’s used a lot of rhetoric devices. This method made the audience a part of the story. The situation faced by the character was the situation faced by the audience also and the questions posed before the characters were also posed before the audience.

The poet also used language to evoke the emotions of the audience. Everyone knows that Raja Harish Chandra is the story of the dire tests King Harish Chandra had to face. The story of his pain is well known as misfortune after misfortune befell him and he lost everything. However, when Queen Madanawat hears that her son Rohtaas has been bitten by a snake and died, she is unable to control her tears and breaks down. In that situation the Gardner comes and tells her that it is no use crying over the dead.

Jeete ji ka mail, marre pe Kiska daawa ho se  
 Bakhat beet jya, gayi baatan ka ke pachtawa ho se.  
 Bade bade ut niput digargaye, tu sai kon bichari  
 Is din nai ek saar bana diye, raja aur bhikhari  
 Jaise koi kumhar banawe maat matakne jhari  
 Ghar ghar putle alag tek de chitan kare kumhari  
 Koi pakjya koi phutjya maati ka panjawa ho sai ((2))

One has relations with people only till they are alive and no one has any claim over the dead. Similarly, when a time is past it is no use feeling regret for anything. Lot of Rich and big people have gone the way of death, why are you feeling so sad. In fact, death has equated the King to the beggar. Just like a potter makes different kinds of pots and his wife decorates them similarly people are created by God and given different destinies. Some flourish and some meet misfortune depending upon their destiny. So it is no use crying over what is already past.

When this scene is depicted not an eye used to remain dry in the audience and everyone could feel how it must have felt to lose one's child.

Similarly, the composer used flowery language to depict the beauty of the heroine, the masculinity of the hero, the scheming depravity of the villain and so on. As a result, the audience always looked forward to the performance not in terms of what would happen next but in terms of how it would proceed.

Before Lakhmi Chand *Saangs* were looked down upon by the self-proclaimed custodians of society who declared such entertainment to be obscene and vulgar. All through history folk entertainments had to battle against discrimination as they were looked down upon by the so called literati and respectable high society people. Lakhmi Chand also brought *Saangs* to repute. Not to say that he didn't face any resistance. He did. But slowly he could lift the *Saang* form from the depths of neglect to the height of such popularity that no social occasion was considered complete without his performances. Though he was illiterate himself he didn't let that come in the way of his education. In fact, he kept Tika Ram with himself as his guru, for the purpose of instructing him and teaching him the scriptures. He was able to pour his experience and knowledge in his poetry that he is looked upon not just as a poet composer but as a wise man in the state of Harayana. Other than the *Saangs* he composed lots of Bhajans, and his bhajans have been compiled and recorded in many volumes as 'Lakhmi Chand ka Braham Gyan' or 'Lakhmi Chand's Divine Knowledge'. One of his most famous *Saangs* Nal Damyanti has left an indelible imprint on the psyches of the local people. Nal- Damyanti is a originally a story from Mahabharata.

It is a popular story in literature and there are hundreds or rather thousands of versions of this story. From Himachal Pradesh to Rajasthan to Gujarat to Tamil Nadu, the story can be found in different formats. In fact, the story of Nal Damyanti is a popular story in Persian literature also. As David Shulman points out in his article Damyanti and Nala: the many lives of a story

In The *Mahabharata* episode known as the *Nalopakhyana* is an elegant, fast-paced narrative.... Moreover, the story it tells is one of the most

popular in India, existing in all Indian languages, often in many versions in each language. Hundreds, perhaps thousands of Nala stories exist. Wherever one goes in the sub-continent, Nala was there first. (1)

The story is equally popular in folk literature, with every region having its own version. When we are talking about different versions of the story. Sometimes it is told as a love story, sometimes as court drama, sometimes as a tale displaying fortitude in the face of adversity at other times it is a cautionary tale about going against the wishes of gods, sometimes it is about predestination. In the original story it was narrated by the rishis visiting Yudhishtir when he was living in the jungle. One day he was feeling particularly sorry for himself, wailing at his misfortune. He complained to the rishis about his misfortune and said that no one was probably more unfortunate than him. It was in response to Yudhishtira's wailing and complaining that the Rishis tell him the story of Raja Nala. They tell him that there was one more who suffered more than you and urge him to thank God that even in jungle he is surrounded by his brothers and his wife, while Raja Nala had to battle adversity and misfortune all alone, after losing all his wealth and kingdom. Thus, originally the story of Raja Nala is narrated to Yudhishtira to make him stronger, to have fortitude and to make him count his blessings. The story is narrated to give him hope for a better future and courage to face the difficult time that was coming ahead. However, every Nala story doesn't have the same motive.

In this context it becomes important to analyse how Lakhmi Chand tells his Story. The *Saang* begins by a *Ragini* where Lakhmi Chand talks about the loss of goodness and honesty in the people and how it has led to various misfortunes befalling the people of Haryana.

*Jab te gaarat mahabhart mein attharah akshohini dal hoya*

*yagya hawan tap daan chhoot gayenyun bharat pe jaal pade*

*indra bhi varsha kam karte jal bin soone taal pade*

*bawan janak huye brahma gyani ved dharam ke khyal pade*

It is after the end of the first *Ragini* that the sutra Dhār tells the context of the story. How the story was first narrated by rishi to Yudhishtira in Mahabharat. But the motives of Lakhmi chand's story is far different from the motive of the rishi as we get to know as the *Saang* progresses. Lakhmi chand's story is a love story. In the initial *Raginis* there is prevalence of the romantic element. The poet gives evocative descriptions of the beauty of both raja Nala and Damayanti as both were famous in all three realms for their beauty. Another thing that the poet stresses is Nala's honesty and piousness. In the Lakhmi chand Granthawali, Pt Poorna Chand Sharma has ended Lakhmi Chand's *Saang* at the point when Nala abandons Damyanti and grief stricken Damayanti is roaming in the jungle searching for her husband. She tries to follow his footsteps and does so till the end of the day. Then the night falls and she is forced to abandon her quest. The next morning when the sun comes up, she realises that she is lost. The heroines pain and bafflement have been very poignantly expressed by the poet but after this the *Saang* ends abruptly .

Pooran Chand Sharma has given a note from Lakhmi Chand's son Pt Tuleram that Lakhmi Chand never performed the *Saang* after this. However, the researcher herself has heard some more *Ragini*'s while growing up ascribed to pt. Lakhmi Chand and dealing with latter part of the story. One very popular one is

Uti ganga pahad chadi aur utla chalya paani

Daasi banke rehna lag-gi khud damaynti raani

(The river Ganga is climbing up the mountain and the water is flowing in reverse direction as the queen Damayanti herself has started living like a maid.)

The *Ragini* starts by comparing the descent of queen Damayanti to the station of a common maid to the reversal of natural order. It is as unnatural as a river climbing up the mountain or water flowing from down to up. The *Ragini* further describes the problems that the queen faces, living a life of want and subservience. The queen Damayanti who was a princess before she was a queen and who has never seen hardship in her life and yet her love for her husband is such that she is ready to face any amount of adversity in order to continue her search for her husband. This *Ragini* deals with the part when Damayanti has been abandoned by Nala and reaches the kingdom of Cedi and starts living with the queen as a maid(dasi)

Ja kite toh le raja Nal ne, main kyun garib sataya gaya

Nal te bhi suthra pati mile, tera Swayam Var pher rachaya gaya

(Go and look for Raja Nala! Why are you tormenting me, a poor man? And now that your Swayam Var has been organised again, you would probably find a man better looking than king Nala also.)

This *Ragini* belongs to the time in story when Nala has been living as an ugly deformed servant of the king of Ajodhya, Rituparna. He is tricked into coming to Vidarbha by Damayanti who sends an invitation to the king for her *Swayam Vara*, letting it be known that she is planning to marry a second time, now that there is no hope of her husband Nala to be found. However, she sends the invite at such a short notice that she is sure that only Nala himself would be able to make it in time with the Ajodhya king as the distance is far and time very less. Nala with his expertise of horsemanship would be the only likely candidate. When Rituparna manages to reach Vidarbha on time Damayanti's suspicion is confirmed but the sight of Nala as *Bahuka* makes it difficult to believe. She tries to talk to him to find out the truth but Nala chides her and tells her to leave him, a poor man alone. In the *Ragini* on one hand he urges her to go and look for Nala her husband instead of bothering him. On the other hand, he taunts her about her second *Swayam Var* and hopes that she finds and a husband better looking than Nala himself.

But even if one ignores these other *Raginis*, which the scholars doubt to have been composed by other composers but named after Lakhmi Chand, one thing becomes clear that Lakhmi Chand has appropriated these stories for the purpose of his own representations. In fact, there is significant evidence that every performance used to be unique and a change in emphasis probably changed the message of the story.

Thus, one can see that *Saang* has been the theatre of the people of Haryana. Before television and print media invaded every aspect of our lives, the simple people of villages learned and communicated through the *Saangs*. As WhatsApp has become a university to millions of people of India, *Saang* was a university to the people of villages as it was not just a medium of entertainment but also a source of education to the common people who could neither read nor write. It was a showcase for the local as well as universal problems of life. In fact, the *Saang* were performed by people who shared similar social and

cultural backgrounds and so the connect with the audiences was immediate and complete. Lakhmi Chand was one of the biggest exponents of *Saang* and his popularity lay in the fact that he depicted the men as well as the morals of the society in manner that everyone could feel entertained as well connected with the life of the kings and queens that were depicted on the *Saang* stage.

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**TELLING TALES- PERSPECTIVES ON STAGING  
CULTURE, SOCIETY AND MORALITY  
IN THE SAANGS OF LAKHMI CHAND**

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**Abstract**

The present paper is a critical analysis of three *Saangs*-Raja Harish Chandra, Pooranmal, Jaani Chor: composed, sung and performed by Pandit Lakhmi Chand (1901-1945), poet, composer and *Saang* performer of Haryana. The paper analyses the major themes and content of these *Saangs* to answer questions on representation of culture, society and morality. Is the bard reinforcing the morality of the tales taken from local history, mythology, and folk legends or is he appropriating the tales to convey some other message?

**Introduction**

Art is not a mirror held up to reality but a hammer with which to shape it. This statement commonly attributed to the master dramatist Bertolt Brecht is proof of the fact that any dramatic performance is as much a product of the society which created it, as it helps in creating a new society. Lakhmi Chand has been called (Sharma, KC, 1990) 'aluminous bard', 'Kalidas', and 'Shakespeare of India' by his numerous fans and followers. It is difficult to even imagine the kind of cult following he inspired in the people of his state. People walked for days or travelled in their bullock carts to see him perform and listen to him. It was no less than a pilgrimage for most people, with the only difference that

while on pilgrimages women and whole family travelled, only men had the prerogative to attend performances like *Saang*.

The historical and mythological tales, *Qissas*, and narratives represented on the *Saang* stage were not only modes of entertainment and mediums of expression for the rural audiences but also vehicles of projecting and upholding models of behaviour for the young. These seemingly innocuous representations built the framework of values that were imbibed by the new generations not only in their own behaviour but also used as moral yardsticks to judge the behaviour of the others around them. The patterns of their lives, their expectations, their ideals, their understanding of society and reality, their models of conduct, their desires and their dreams were shaped by the behaviours held up in these stories, myths and legends.

When modern academia thinks of 'popular literature' all that they are thinking about is literature that has been written down and recorded. Although in India we have had a long and illustrious oral tradition as the Vedas, Puranas and the other religious and semi religious texts too were orally handed down the generations for thousands of years before they were finally written down, oral literature is not taken seriously. In fact, the whole thing is quite contradictory as the people who wrote 'popular literature' belonged to and wrote about the people occupying the upper rungs of social ladder and it was not popular in the truest sense of the word as it did not represent or was appreciated by the populace. However, that doesn't mean that the common people didn't have a literature. They also created exceptionally rich tradition of oral literature. The folk forms like *Saang* gave the common people a medium and means of expressing their sentiments. Folk Performers like Lakhmi Chand created a huge body of literature that has been systematically ignored and side-lined simply because he was not writing it down.

### **Themes**

The tales of *Saangs* are a source of tales which make up the popular culture of the people of north India. The plays encompass a broad range of themes drawing upon various sources like the Hindu scriptures, stories from Persian literature regional legends or historical events. Confined to only male arenas they are lewd and vulgar at one level while as propagators of values they are deeply conservative and very utopian at another level too. They raise issues that are quite central to Indian thought and way of living- like the nature of truth and untruth, value of chastity, conflict between love and family, nature of kingship and finally the struggle between good and evil.

Through an analysis of the tales performed in the *Saangs* of Lakhmi Chand we can get deep insight into the popular culture of the present Haryana and erstwhile Punjab and the way of living upheld during those times. There are various plays dealing with the men and morals of those times. One set of plays that one notices deal with the what (Hanson Kathryn, 1992, pg-118) calls "the basis of political authority and its relation with moral conduct and spiritual perfection". These stories are taken from the Hindu puranas like *Satyavaadi Harishchandra*, local legend like Puran Bhagat, Etc. The purpose of these

stories is to promote a fear and unpredictability of fate or divine agencies, moral edification, propagation of certain value system, adventure stories edifying heroism of certain heroic characters or sometimes just pure entertainment. Depending upon the type of tale the source of conflict also varies. One set of stories that one sees are the stories of kings or figures of authority who lose their kingship and wealth and have to face deprivation and degradation. Ramayana being the most popular example where Ram the good son, pupil, citizen, husband is deprived of his rightful kingship and has to go into exile due to the scheming step mother. Such stories are popular not just in north India but all across the country. One may find some variation or the other of this in every part of India. In South India one has the legend of King Mahabali, where the King falls prey to the plotting by gods against him and loses not just his kingdom but his life too. In these stories the boundaries between the kings and common people are destroyed and as the kings are forced to live the life of the common people on the street, these plays raise some of the most fundamental questions – like what is the difference between a common person and a king, wherein lies the real source of political authority, what a king should be like, what should be the dharma of a king? Did the main characters deserve their sufferings? Are the gods really so capricious? And if the Gods are so capricious as to punish the rich and powerful and morally steadfast in such a manner than what is the position of the common people? Do they really have no reason to lament their fate? Do they really stand a chance of happiness?

### ***Raja Harish Chandra***

It becomes clearer when we look at the tales of Raja Harish Chandra? He is an ideal king if there can be one- he is idealistic, knowledgeable, just to his people, devoted to his kingly duties and utterly a worshipper of Truth. Here the capitalized truth stands for not just an abhorrence of lies but also a belief in fundamental transcendent spiritual reality and righteousness. He is really generous and a man of his word. Naturally the king of Gods Indra feels threatened by such kings and feels that Harishchandra is probably plotting something to overtake the kingdom of Indra.

In ancient Indian history, King Harishchandra represents the pinnacle of honesty and virtue. He is well-known for his honesty and dedication. However, it is his virtues that lead to his downfall. It is due to his devotion to truth and his large-hearted generosity that he is tricked into giving more than he has. He is instigated by Vishwamitra, who is disguised as a brahmin, to donate his kingdom and all his wealth to. He surrenders everything he possesses, to Sage Vishwamitra in order to give *Dakshina* (gift) for his *Rajasuya Yajna*. Despite donating all his wealth, he is unable to fulfil his promise to the Sage and has to sell himself and his wife Madanawat and his son Rohtaas in the market at Banaras to fulfil his vow. The whole scene of the auction of the king and his queen is quite shocking. In fact, in Lakhmi Chand's *Saang* while the queen is put up for sale in the market, a prostitute is also looking to buy woman for her trade. Madanawat is shocked beyond belief as she had never seen such a

woman with her retinue before, while the audience is also shocked to wonder what would happen if the fair and righteous queen is bought by a woman of the trade. Luckily, the queen along with her son is sold in the household of a brahmin while the king Harishchandra who calls himself Hariya, now that he is a slave is bought by a *Chandal*, belonging to the caste of untouchables.

So here Harishchandra suffers triply- first because now he has to do hard labour like a common man which he never did before in life. Secondly, he has to serve under an untouchable and thirdly, because he is unable to protect or help his wife, whom he had vowed to protect all his life as part of his marriage vows, or child. One moment he was the wealthiest and most virtuous king, the protector of all his people and the next he is reduced to the most helpless being on the earth. However, his degradation is still not complete. The *Chandal* who bought him puts him to the task of fetching water from the river Ganga. Hariya hardly gets to eat the kind of food he was used to and the hard labour that he has to do slowly takes its toll on his body. He is reduced to a sack of bones very quickly. So much so that one day he is unable to lift the filled pot on his shoulders. As chance would have it, he comes across Madanawat who has also come to the river Ganga to fetch some water flowers for the brahmin's worship. He is very happy to his former queen and asks her for help as described by Lakhmi Chand in the following Ragini as penned down by Sharma, Pooran Chand (2006. Pg 528)

“Daya Kari dono pai Har ne, Darshan pawan ki,  
Kad ka dekhoon baat ghat pai, Manas ke awan ki,  
Kaabu mein mera gaat nahin sai, chain pade din raat nahin sai,  
Ghada thuwade koi baat nahin sai, bilkul sarmawan ki,  
Chinta ghoont jigar nai kha sai, nueai din raat fikar main ja sai  
Tere pati mein shardana sai, matka thawan ki  
Itna ehsaan mere pai dhar de, dawai mere zakhm mein bhar de  
Himmat karke kirpa karde, ek haath lawan ki  
Guru bin kon gyan ka dewa, aake paar laga di khewa  
Guru Mansingh ki karke sewa, lai kaar seekh gawan ki

God has been very kind to both of us for this chance meeting. I have been waiting a long time on the river front waiting for someone. I have no strength left on my body. I have not been getting any relief in day or night. Please don't feel shy or hesitant, just help me lift this pot.

Worries have been eating at my heart. My days and night are full of fear. Your husband now has no strength to lift this pot of water. Oblige me. Your hand would be like a balm to my bruised body. Be kind and lend me a hand with this heavy task. Guru/ teacher is the one who gives your knowledge and wisdom and helps you steer your boat in the right direction, as my teacher Man Singh taught me the art of singing. (Translation mine)

However, despite the moving plea, Madanawat tries to avoid Hariya. Once again, the audience is shocked. Hariya expects and pleads to Madanawat to help him lift the pot of water but she completely refuses. She argues that since she is now a servant at a Brahmin's house, she has to stay away from even the

shadow of Harishchandra, since he is working in the household of an untouchable. Here the relation of husband and wife seems to take a beating because the characters are now trying to be true to their new caste identities. So, the main characters and thus the *Saang* don't really question the existing social order of caste and class when they move across this social spectrum but blindly accept. In fact, they seem to believe that their Dharma and trueness lies in now following their new caste identity. Here one can see a similarity with the beliefs of the Elizabethan world. Just like the Elizabethans, the characters seem to believe that everything has its place in the universe and it is duty of humans to live as per their place. If due to some misfortune you are pushed up and down the rungs of social ladder than you must accept your fate and try to live according to what is expected of you as per your new place in the social order. It was this world order that justified the divine right of kings to rule. The similar kind of belief in the divine order can be seen here. The characters accept the identity that is forced on them and seem to believe that to follow what is expected of them in that identity is their true Dharma. King Harishchandra was a true and generous king but now he has to prove himself true as the slave of the untouchable *Chandal* also. When he was king, Madanawat was his wife and the queen. But as per their new caste identity Madanawat must stay away from him and can't really touch him or she will be polluted. Thus, when the king falls down the social ladder questions are not asked about the injustices perpetrated in the name of caste. nobody seems to ask as to why human beings should have such different places in society. All that one seems to be asking is what did the king do to deserve such a fate. Thus, the *Saang* reinforces the same morals and the same social codes to its audiences. The plays thus are not really raising questions about meritocracy or why the kings are the kings. As Hansen, Kathryn (1992, pg-120) says in her seminal book *Grounds for play*:

“The display of Harishchandra's forbearance had become a set piece, comparable to the labours of Sisyphus or the torments of Job. The king's suffering induces pathos because of its lack of provocation; it comes upon him randomly, as every good person's hour of trial seems to come. If even the most mighty and lauded individual in the land can suddenly find himself shorn of all privilege, degraded and outcast, how tenuous the happiness of any human being must be. The story reverberates with familiar slogans on the inscrutability of destiny. It recommends a course of action that rewards acceptance of subjugation and diligent perseverance—if not in this birth, then surely in the next.”

The figure of the queen and the prince are used as centres of the plays' emotional appeal. If in the first instance the queen refuses to help the king with his pot for fear of coming in contact with an untouchable, the next reversal sees the queen asking the king for pity as her son has died bitten by a snake and she has no money to pay the tax at the cemetery to perform her son's last rites. The king Harishchandra has been put on duty by the *Chandal* at the *Shamshan Ghat*(cemetery) to collect tax from all those who come to

perform the last rites of their loved ones. Now here the king instead of mourning the death of his beloved son and heir must exact the tax from the bereaved and penniless queen of his in order to prove himself true to the work that he has been assigned. The audience is left gasping and in tears as the queen offers to give half her saree the only possession that she has and the king must take that as a tribute even if it means that the queen hardly has enough cloth to cover her body. However, that is not the end of Harishchandra's trials. He must face further descent into the quagmire created by gods for him. What is most heartrending here is that all of it seems totally unjustified and unprovoked. In the next major scene in the play Harishchandra is called upon to execute his own wife. For when he takes her saree to the *Chandal* and tells him how he has extracted this tribute from a hapless woman, even the *Chandal* is moved to tears that what kind of unfortunate woman had to sacrifice the clothes on her body in order to pay tribute to cremate her only son. He tells Harishchandra to return her saree and tells him that he may be a *Chandal* but even he is not so heartless. However, the Gods still haven't had enough. And while the grieving, heartbroken, and bitterly weeping queen falls asleep in a corner of the crematorium, her face is smeared in blood and she is accused of being a witch and of having eaten a young man. As the *Chandal's* slave Harishchandra is called upon to be the executioner for his wife too. As Kathryn Hanson points out in her book (1992, pg-121-122)

“Through the reversals written into the story line, the narrative dismantles pat metaphysical explanations, exposing the contradictions at the heart of the moral system. It is not enough that the king pursue truth with utmost vigour. The drama deconstructs the very concept of truth, distilling its ultimate cruelty and blindness to human desire. Let us take the most memorable scene in the drama, when Harishchandra is called upon to execute his own wife. The act of beheading Taravati (Madanawat in Lakhmi Chand's version) has the radical potential to undermine the truth of the king. It dramatizes the possibility that his descent to untouchability has destroyed his former capacity for virtue: he is beyond the pale socially and morally, not only unable to do good but compelled to do evil. The wife's murder is necessary as the logical extension of the reversal in the king's fortunes, denying the accumulation of goodness as much as wealth. However, the king is prevented from reaching this outer limit of truth—now equated with the murder of a virtuous woman by her husband, a most despicable untruth—by the *Deus ex machina*. Harishchandra's acceptance of the patently immoral act of wife-slaughter as a moral imperative consummates his surrender to the gods; they are satisfied and demand no further sacrifice. For both the king and the audience that identifies with him, the prospect of that horrific deed is sufficient to effect a transformation of awareness. Truth itself is unknowable, difficult to discern, and irrevocably intermixed with untruth.”

### ***Pooranmal***

In the long list of *Saangs* that deal with ascetic kings known for their virtues and kings losing their wealth and power another notable one is the *Saang* of

Pooranmal. In the introduction the *Sutra Dhar* explains the setting of the *Saang* to be Punjab province and the city of Sialkot. King Saleman had two queens the older one was Icchraade and younger one was called Nunade. Queen Icchraade gave birth to Prince Pooran as a result of a boon from Guru Gorakh Nath. As instructed by Guru Gorakh, the king brings up Pooran as an ascetic, away from the life and luxuries of the palace. Pooran is kept strictly isolated and he studies rigorously for twelve years. After twelve years he is brought back to the court. After meeting his father, Pooran is asked to meet his younger step mother first, as a sign of respect. However, the young Stepmother is attracted and drawn by the beauty of Pooran and tries to seduce him. Pooran being the ascetic prince that he is refuses to be seduced by Nunade and reminds her that she is his step mother.

Here one notices that the king marrying twice is quite acceptable. However, the king is old while the stepmother is quite young. While trying to convince Pooran, Nunade says how is she unhappy being saddled with an old man. However, the guilt of the unhappy relationship and the moral transgression is shifted to the step mother's desire rather than the old king who is unable to keep her happy. In the encounter between Pooran and Nunade, the young man is the ascetic or the Bali, who is in control of his senses like a yogi, while the woman is the seductress who tries everything in her power to control him. The audience here roots for the young yogi.

The situation is described very tellingly by Hanson "The situation is thus set for an explosive confrontation between Phulan and Puran. Phulan's chief vice, according to the morality prescribed for women, is that she does not suppress her own desires. She takes the initiative, drawing in the young Puran who is close to her in age and a fitter partner than the decrepit king. Her playful attraction is soon converted under his resistance into humiliation and anger. As she fights back at his affront to her pride, she employs the strategy of Potiphar's wife—accusing him of seducing her when she made the advances. Phulan's intentions, given the information available in the story, may not really be so terrible, but she comes across as a wicked mother, crazed by lust, vicious, out of control. Despite this negative characterization, it is important to note that her sexuality becomes dangerous within the context of the polygynous family, her proximity in age to Puran, and her distance from and unhappiness with the king."

However, no matter what Nunade does she is unable to seduce Pooran. He is the idol of chastity. In the Hindu scriptures Chastity is held up to be an ideal to aspire for. Not only the scripture but these ideals were being fiercely upheld and advocated by the biggest public figures of the pre-independence times. Alter, Joseph (2010, pg -1) argues that there was a celebration of celibacy as a model code of conduct and popular leaders like mahatma Gandhi and swami Vivekananda not only popularized but also upheld it as a model to be followed.

"It is well known that Mahatma Gandhi felt that sexuality and desire were intimately connected to social life and politics, and that self-control

translated directly into power of various kinds, both public and private. Gandhi's enigmatic genius and his popular appeal among India's masses may be attributed, at least in part, to the degree he was able to embody a powerful ideal of sexual self-control that linked his socio-political projects to pervasive Hindu notions of renunciation. Affecting the persona of a world-renouncer, Gandhi was able to mix political, religious, and moral power, thus translating personal self-control into radical social criticism and nationalist goals. Gandhi's mass appeal was partly effected on a visceral level at which many Hindu men were able to fully appreciate the logic of celibacy as a means to psychological security, self-improvement, and national reform.”

In such a scenario it is highly likely that these notions percolated down to folk arenas and found expression in folk performances also. In fact, the folk stories performed on the *Saang* stages acted as connecting points for the Morals, and culture advocated in the Scriptures and the one being advocated by the leaders of the independence. The tales were thus establishing a continuum of culture and society and making people realise that they were a civilisation that was thousands of years old and if they could find and go back to their roots, they could be strong and independent again. Chastity is one of the greatest preoccupations in the stories put up by *Saangs*. What is interesting to note here is that chastity is not just for the woman but for the man also. There is lot of pressure on the men too to remain celibate and not give in to the schemes and mechanisations of women who want to seduce them. In another book written by JS Alter (1992) he has pointed out how in the social context of India celibacy and holding of the semen was connected to power. The wrestlers were taught to practise celibacy in order to be powerful.

The Wrestler's Body tells the story of a way of life organized in terms of physical self-development. While Indian wrestlers are competitive athletes, they are also moral reformers whose conception of self and society is fundamentally somatic. Using the insights of anthropology, Joseph Alter writes ethnography of the wrestler's physique that elucidates the somatic structure of the wrestler's identity and ideology.

In the *Saang* Pooran Bhagat the hero is a young man who refutes the advances made by his step mother, because that would be threatening of the incest taboo but also because he is an ascetic who holds up celibacy as a great virtue. His semen is a source of his power. His practice of *Brahmacharya* give him the resilience to bear all the unjust punishment that his father forces on him under the influence of his step mother. The concept of *Brahmacharya* as it relates to gender and politics and the male concern for celibacy is couched in terms of truth. Pooran Singh is considered to be truthful because he is celibate. The celibate body is considered to be supremely fit. Sex is regarded both distracting and defiling. Kings and sages who take vows of chastity become a threat to Gods. Like in another popular *Saang* Hoor Maneka, which is story from the puranas, Sage Vishwamitra is deep in meditation. So much so that the king of Gods Indra starts feeling threatened thinking that Vishwa Mitra has designs for his throne. He sends the celestial Nymph Maneka to earth to

disturb Vishwa Mitra's meditation. The implication is that if Maneka is able to entice Vishwamitra to sleep with her not only would his sadhana be discontinued, he would also not be able to do it again because he it would be debasing in nature and he would lose all his power. The difference between both the stories is that while Maneka is able to disturb Vishwa Mitra, and sway him from his path, Nunade is not able to do so in the *Saang Pooranmal*. A lot of contemporary literature was published in small booklets on the practice of *Brahmacharya* by small regional presses in small towns of India. These booklets are prescriptive in nature and give details about not only a regimen of diet exercise and rest but also prescribe how to control desire and stay healthy. These *Saangs* and these booklets were very popular also as Haryana being an agrarian economy the young men were encouraged to be physically fit and wrestling was the most popular sport.

### ***Jaani Chor***

Another theme that is very popular in the folk stories of the region is the story of the clever man who outwits his opponents to help the helpless. A young man may be a bright spark or a dullard depending on the version of the story that we are looking at. If he is a bright spark, he generally outwits his opponents using his mind while if he is a dullard, he overcomes his opponents using sheer luck or some supernatural help. In other cases, he gets help from some supernatural elements that gives him power, plus his own mind. Such stories have been a part of the literature of north India since the time of *Panchatantra*. In *Panchatantra* there are various such stories but the foremost that comes to mind is the story of the clever fox that outwits the ferocious lion using her presence of mind or poor Brahmin that saves his bullocks from a mean thief and a vicious monster using his wits. Down the ages one sees the same theme repeated in the stories of Akbar and Birbal, in Tenali Rama or if looks at the Persian literature than in the stories of Khwaza/Mulla Nasruddin.

On the *Saang* stage one sees one such story in the *Saang* of Jaani Chor. Jaani Chor and Nar Sultan were both sworn brothers. They also had a sworn sister Marwan, who was married in Narwargarh. Both Jaani and Nar Sultan were going to her sister's home to attend a wedding. On the way they were resting near the river Abu when they saw a message written on slate float down the river. The message read, "I am a Hindu warrior woman (*Kshatrani*). Adlikhan Pathaan has captured me. If there is true Hindu, who might save me otherwise Adli khan would make me his (wife) Begum. It was signed Mehakde. After seeing this message both, Jaani and Sultan get into a row. Sultan wants that they should pay their respects at the sister's wedding as she would be expecting her brothers and afterwards, they can go and save Mehakde while Jaani feels that they should save Mehakde first as her situation is more dire. Finally, they decide to part ways. While Nar Sultan goes to the sister's house to attend the wedding and fulfil a brother's duties, Jaani moves towards the kingdom of Adli khan.

On his way he meets four sages who are fighting over four relics of their Guru/ teacher. Jaani asks them what they are? They tell him that all the four

things are very precious and powerful. The first one is a pestle that can destroy your enemies. The second one is a mortar which can be used to break anything, the third one is the wisdom blanket using which you can disguise yourself as anyone and fourth is magic sandals, which can take you anywhere you want. Jaani offers to intervene and settle their quarrel. He fires four shots in four directions and tells the sages that whoever would bring the arrow fired by him first will get all the things. As the sages run behind the arrows in four different directions. Jaani bags all the four wonderful things. He first uses the magic sandals and asks to be taken to the kingdom of Adlikhan and reaches there within moments.

As one can see the audience is with the main protagonist right from the beginning. They totally identify with the cocky young man and derive great pleasure from his exploits as he outwits the so-called wise men to increase his power. Also there seems to be a pointer towards the general habit of Muslim rulers to abduct beautiful young women. The people of the area were very familiar with such practices and resented them very much. However, the poet has tried to balance the religious sentiment by making Jaani's sworn brother Nar Sultan, who evidently is a Muslim. Performers during this time tried to remain secular and to pass the message of religious tolerance instead of instigating enmity between the two religions- both covertly as well as overtly. Also, during this time Hindus and Muslims were ruled and oppressed by the British so both communities were united in their oppression and hatred for the British instead of hating each other.

Once there Jaani pastes a note on the palace of Adli Khan challenging him that he would release Mehakde from his imprisonment. Adlikhan is obviously furious when he reads the message and asks his courtiers as to who is ready to take up the challenge and capture Jaani. The challenge is picked by Dhammal *Sunar* (goldsmith). He declares that he will arrest Jaani and present him before Adli Khan. Jaani on the other hand sleeps peacefully in one of the gardens of the city after having spent the night on his exploits outside Adli's palace. However, he is woken up by the wife of the gardener who uses her whip on him when she sees a strange man sleeping in her gardens. Jaani wakes up and very quickly comes to his senses. When the gardener's wife questions him further, he says that he has come here to meet his aunt, his mother's sister. Meanwhile he takes up the disguise of the Gardner's wife's nephew using his supernatural powers. The Gardner's wife is convinced and treats him kindly. He extracts information from her about Dhammal goldsmith and departs for his house. The Goldsmith's wife was alone at home when Jaani disguised as an astrologer knocks at her door. However, the Goldsmith is not the only one who has to face defeat and ignominy at the hands of Jaani. Jaani also outsmarts a *Daroga* or police inspector and finally Adli Khan himself and manages to release the dame Mehakde. The various turns in the plot are guaranteed to bring the underclass hero with flying colours. That he is doing it help a damsel in distress is further to his credit. *Saangs* such as these made Lakhmi Chand very popular among the youth because for once the young men

could see themselves winning over the usual hurdles that obstructed their happiness in real life. Hanson (1992, p.138) calls heroes like these “upstart warrior whose fame and prowess bring him a modicum of respect” (underlining mine)

### **Conclusion**

Lakhmi Chand has used tales and *Qissas* from local history, myths and folk legends to base his folk performances. His stories may have been familiar to the audience but Lakhmi Chand’s treatment of them differs. He uses the tales to present his own point of view or the point of the people at large, during those times. The broad facts of the stories that he has appropriated remain the same but Lakhmi Chand chooses not to take the full tale for his performance. His primary task was to deliver full entertainment to the young men that came in hoards to watch his performances but while entertaining he was also delivering a moral code which became the touchstone to model their own behaviour and to use as a yardstick to judge the behaviour of others. Lakhmi Chand’s characters have been taken from the ancient culture but they represent the struggles and the moral questions that plagued the minds of his contemporaries and seem to be valid even today. In fact, his choice of stories gives his voice a timelessness and universality that made him very popular and a voice that the people of Haryana swear by till today. When we talk about Indian culture as an entity that has been in existence for thousands of years, it is Folk performers like Lakhmi Chand that have given it a continuum and we need to study their oral literature and performances to study the society of those times. The tales that they staged were not just tales of entertainment but also show us of the culture, society and morality of those times.

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## **TEACHER RETENTION IN SECONDARY SCHOOL IN INDIA**

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**Abstract:** The professional instructors and their fundamental functions can't be disregarded in establishing a nation's human capital. Basic education, especially in developing countries, focuses on these key functions. However, the functions of training managers with programmed instructions can appear to be very nearly substituted in the field of training equipment. Teachers are certainly still the major supervisors of information in rising economies such as India. In any nation, economic development is primarily driven by a competent, knowledge-based trained workforce. The research aims to ascertain the variables that contribute to teacher attrition as a result of frequent staff turnover in school and widespread dissatisfaction amongst educators in India and across the globe. The research examines the variables that contribute to teacher attrition and retention in schools, particularly in India, by consulting a variety of periodicals, journals, internet sources, library, and newspapers. The research indicates that instructors must be adequately evaluated in order to maintain their expertise in particular management issues that affect teacher education. Additionally, the research recommends the utilisation of staff training programmes and the development of curricula for educational administrators. This is critical and essential for academics to be well prepared to offer sufficient pay, welfare benefits, and a positive work environment, as is possible in other professions.

**Keywords:** Attrition , Education , Retention, , School, Secondary Education, Teacher.

## **I. INTRODUCTION**

Generally, the teacher is regarded as the primary element in determining a student's success while under the jurisdiction of a school. Additionally, it is well-known that, especially during the first 5 years, teachers have a turnover range of approximately 50%. The research has placed a greater focus on recruiting and retention as a result of Ingersoll's work, which emphasises

The "revolving door" of education and the demands of No Child Left Behind for highly educated instructors in each school. Growing interest in attracting and keeping teachers has resulted in the publication of a sizable proportion of literary works during the past fifteen years. In this research, a variety of factors affecting teacher and movement preferences were evident, including school and student characteristics and a variety of work situations. While research helps explain teachers' general labour market trends and why schools are difficult to run, it makes little sense to explain instructors' specific compromise decisions. There is a shortage of highly quality research that results in the value that a teacher places on many non-monetary aspects and that also establishes them.

Organizations in several industries appear to be struggling to recruit and retain the right talent either because of economic declines. Results from prior study results showed that a loss of expert staff can lead to organizations' bad performance and damage the results of such companies. Depending on the circumstances, employee sales are seen in different ways. Employee turnover refers to the rate at which workers in school and with instructors leave after a certain period of time. If one or two instructors quit the course for a variety of reasons, the effect will be minimal and will not jeopardise the school's coherence. Western nations, namely the United States and the United Kingdom, have adopted policies to avert massive employee losses. Every teacher who leaves the professional education area considerably reduces his budget and determines whether or not pupils reach a high level of studies. The National Academy of Education's White Paper on Teacher Quality included standard evaluations at the middle school level for students from poor socioeconomic backgrounds who were taught for three consecutive years by highly effective elementary school teachers. Research also shows, however, that for 3 years, all pupils are 'academically disadvantaged' as a result of poor education regardless of their circumstances. A school's success needs competent instructors who are willing and dedicated to educating a diverse group of kids and who can make a positive impact in each student's life.

Many schools have no teacher who is new, is teaching out of their certification area, failed a certification exam on their first attempt, or who graduated from the least competitive undergraduate colleges (10th percentile or below). On the other hand, many other schools (90th percentile or above) have a substantial portion of teachers who are brand new teachers (18%), who are only teaching courses for which they are not certified (24%), or who failed a

certification exam on their first attempt (about one third). In some schools less than half of the teachers are permanently certified in all of the courses they teach while in other schools this figure is nearly 90%. Clearly, the qualifications of teachers are not evenly distributed across schools (Lankford, H., Loeb, S., & Wyckoff, J. (2002))

The first step in assisting teachers is to refrain from blaming them. The majority of schools want to assist their teachers but are unable to do so owing to inadequate resources. Several schools have sought private financing through alumni and parents throughout the years; nevertheless, the majority of institutions are compelled to rely on public funding. However, schools may assist by improving management. This also applies to the curriculum. Schools may provide instructors with more freedom in planning and delivering courses, while also minimising administrative work. This may help teachers manage their workloads more effectively and promote a healthier work-life balance. Another approach is to offer ongoing educators, keeping them informed about new teaching technologies and methods that may help them manage their workloads more effectively. Much has been written regarding teacher technology resources. However, it is critical that schools take the time to determine which resources would best meet their budgetary requirements. For instance, a school with a limited budget may benefit more from a virtual learning aid that can be accessible through a number of devices than from a product targeted for learning. Additionally, teaching tools that are flexible to a range of pedagogical approaches are more valuable than those that must be continually updated or extended to accommodate changing student populations.

There are some missing configurations of early career decisions coupled with quality of teaching practice among the five we have identified here in terms of what readers might expect to find in a study like this. For example, there's no configuration that captures the experiences of strong teachers who leave the profession—perhaps to take up administrative positions or enter graduate school or because they are so dissatisfied with their teaching situations that they exit (Gleeson, a. M. (2012)).

Research on teaching turnover comparing disparities in teachers' wages and disparities between school and school in the resources to enable teaching are also documented. The key interest moderator factors included:

- Medium size class.
- Teacher-student ratio.
- Accompanying school expenses per instructor.
- School costs for resources for instruction.
- Assistant teacher or assistant teacher.
- Expenditure on education.
- Expenditure per pupil.
- Wage of teacher.

Special education teachers with less experience are less likely to leave than their more experienced colleagues. However, many people, including many

teachers emerging from alternative routes, begin teaching when they are older, so age, while highly correlated with teaching experience, should be controlled for when examining experience (Connelly, V., & Graham, S. (2009)).

### **Teacher Retention Management**

According to Elfers et al. (2006), teacher retention management should prioritise techniques that enhance employee retention as well as staff unity, productivity, and dedication. Easley describes five retention management ideas that have the ability to increase employee satisfaction, loyalty, and performance (2006). According to him, employees must feel appreciated and trusted. Employers must also understand their role in their employees' growth and development. (Bamisaye, 1998; Baike,2002; Long et al., 2012a) this may lead to workers remaining with the company because it shows that the company cares about the safety of its people Many workers want to stay at their jobs for an extended period of time, and they are better educated and responsible at every stage of their careers. Abakpa and Agbo-Egwuassert that a real company would encourage its employees to maintain a continuous emphasis on performance and outcomes. Employers offer workers with extra skills in particular areas of expertise and capability. With this in mind, workers acquire more knowledge and responsibility as their job progresses (Azuka,2003; Anderson and Olson, 2005). Along with uniqueness and innovation, the authors believe that this mentality exists among organisational workers.

### **Factors that contribute to teacher retention**

Policymakers and educators must take specific steps to stop the flow of teacher attrition and their desire to leave their positions. This notion is applicable not only to destitute nations or areas, but also to affluent countries and locations.

### **Teacher Remuneration:**

Numerous studies from across the globe have consistently identified teacher compensation as a critical factor in teacher retention. The significance of the salary was determined using publicly accessible data from government sources, since it has an effect on instructors' intentions to continue teaching. Goldhaber et al. strengthen the case for higher compensation based on both teacher quality and retention rates (2007). The remuneration has a substantial effect for instructors and could even be used to select whether or not to stay, according to DeAngelis and Presley (2007).Glableck and Bax (2004) developed a sample of respondents in the United States who agreed to continue working in their schools provided compensation increases.

### **Leaders' Personalities:**

Loeb et al. investigate the effect of school styles on teachers' retention intentions (2005). However, the idea of management lacks a generally accepted definition, since what it expects can be rude at times. Long et al. (2012a) identified the leadership characteristics that enable individuals to carry out their responsibilities more effectively and efficiently. According to Knappetal. (2006), school heads are successful in their professions because

they possess a variety of professional skills and are essential in evaluating their schools' affairs. According to school administrators are critical in pursuing forward-thinking initiatives, establishing shared missions, and deciding on curriculum & teacher retention facilities.

This research examined the attrition rates of professors recognised by Indian universities and the causes for instructors' departures in order to ascertain why teachers are concerned about the stated rates. The leavers were asked qualitative and quantitative questions about their choice of not staying in class in order to check the correctness of their answer. Stayers were also questioned about why they chose to stay in the classroom. This provided information on the teacher's retention and compared it to leavers' comments. Finally, demographic variables have been investigated as potential determinants of a person's attrition.

### **Conclusions**

The research's findings are based on a self-reported study sent by the Indian University Teacher Education Program to all certified instructors, with a total of 2,388 questionnaires and 1,031 responses, representing a response rate of about 43%. The poll revealed factors that influence teachers' decisions to quit or stay in the classroom. Data was gathered from a variety of sources, both qualitative and quantitative. Additionally, numerous demographic questions were addressed to ascertain potential determinants of teacher attrition. Each responder was interrogated. The findings demonstrate the critical role of compensation and leadership in keeping teachers. Earnings are the most significant predictor of teacher attrition, as shown by the statistics. Additionally, education leadership is a factor in teacher attrition. The results indicate that a greater proportion of respondents stayed in the teaching profession, while they also cited practical reasons, the majority of which were emotional. Additionally, the research demonstrates that certain demographic variables may be used to forecast attrition. This section presents and discusses the study's findings.

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# Folk Literature and Social Space: Interdependences and Correlations

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**Abstract**— “Art is not a mirror held up to reality, but a hammer with which to shape it.” this dictum attributed to famous playwright Bertolt Brecht as quoted by Bleeker et al., (2019) sums up the interdependence and correlation between art and literature and society. The world has never been a singular entity. There have always been groups that lived a powerful, privileged existence and it is their experience that has passed down the generations as literature, as the core narrative of human existence at a given time. For long ‘Literature’ did not include ‘Folk’ or their culture as was relegated to the peripheries of academic discourse as belonging to the savage, subaltern people. However, it is now increasingly being recognised as an archive of vernacular knowledge systems and a great contributor to the social and cultural development of the people. Both social space and folk literature affect and mould each other. What happens in social space gets reflected in folk literature and what folk literature depicts becomes part of social space. Saang as a form of folk performance tradition has been the source of or a defining influence on the various forms of Folk performance traditions of North India. It has been called “a north Indian Folk Opera” by Vatuk, V. P., & Vatuk, S. (1967) because the dialogues between characters are sung. Taking it as a representative form of North Indian folk performative tradition, my paper attempts to analyse issues of representation of culture, society and morality on the Saang stage. The paper, would focus on some selected Saangs of Lakhmi Chand (1905-1945), as compiled by Sharma, P. Chand. (2006) in *Lakhmi Chand Granthavali*. He is known as the greatest exponent of the Saang form and often referred to as the Shakespeare of North India. His Saangs invariably represent the values and experiences that formed the core of the society of his times. He has taken tales from history, myth and local legends as the basis for his performances. The present paper analyses the content of some Saangs composed and performed by Lakhmi Chand to analyse the knotty question of representation of culture and morality and how one can see reflected in the tales performed by the Saangi, the major social concerns of the times.

**Keywords**— Culture, Folk literature, Performance, Social space, Saangs

## INTRODUCTION

“Art is not a mirror held up to reality, but a hammer with which to shape it.” this dictum attributed to famous playwright Bertolt Brecht as quoted by Bleeker et al., (2019) sums up the interdependence and correlation

between art and literature and society. The world has never been a singular entity. There have always been groups that lived a powerful, privileged existence and it is their experience that has passed down the generations as literature, as the core narrative of human existence at a given time. For long ‘Literature’ did not include ‘Folk’ or

their culture as was relegated to the peripheries of academic discourse as belonging to the savage, subaltern people. However, it is now increasingly being recognized as an archive of vernacular knowledge systems and a great contributor to the social and cultural development of the people. Both social space and folk literature affect and mould each other. What happens in social space gets reflected in folk literature and what folk literature depicts becomes part of social space.

### **Marginalisation of Folk literature**

The online dictionary defines folk as “The common people of a society or region considered as the representatives of a traditional way of life and especially as the originators or carriers of the customs, beliefs, and arts that make up a distinctive culture” and their culture may be referred to as folk culture. However, that is to simplify a very complex debate because folklorists as well as anthropologists have been divided over what constitutes folk culture. Norbert F. Riedal ‘Folklore and the Study of Material Aspects of Folk culture’ (Oct-Dec 1966) rightly points out, “so far no consensus seems to have been reached, and the various and often conflicting interpretations of “folklore” that have been brought forth by folklorists as well as anthropologists have caused much consternation, frustration and even alienation between the two disciplines” (1). Folklore is an inseparable part of culture but the relationship between folklore and dominant culture is not very simple because folklore or folk traditions not only reflect the culture of their folk and are also used as tools to emphasize and reinforce existing power equations but also question dominant social ideologies. The issue gets further complicated when we discuss issues of Indian folk tradition in relation to folkloristic as an academic enterprise, which started in the west.

As Lisa Gabart points out in her article Folk Drama

It easily imposes frameworks of interpretations that are not necessarily grounded in local understandings. When used in non-western contexts, for example, the term imposes western understandings of Drama on traditions that may be more profitably understood as something else, such as worship, sacred retellings, or a visitation by deity, thus drawing disparate performance traditions into the same interpretive sphere. (1)

Indian theorists and researchers too voice the same difficulties.

According to K N Panikkar

"We often come across Western scholars who approach Indian artistic traditions in a meticulously analytical way and create theories on our theatre concepts after their own fashion. I have all respect for their

analytical approach which helps them make their own deductions. But the question which baffles anyone in theatre is whether these deductions can be taken as guidelines for the practice of Indian theatre. A theory is generalised from our experience of doing a thing. Even when an artist practices an art after thoroughly learning its grammar, he cannot neglect the creative impulse which springs up from within, necessarily paving the way for further enlargement of theory."

In Western countries they consider folk forms as rudimentary, as fossils of some bygone age. Many theorists see folk as primarily low-class activity, belonging to illiterate people. It is hardly seen as literature.

As Lisa Gabert posits in her article Folk Drama,

"In the nineteenth century, scholars were interested in the origins of cultural forms they considered to be “folk Drama,” which largely was conceptualized as ancient but degenerated plays that continued to exist in the modern era primarily among the European peasant classes. The plays themselves were presumed to be “survivals,”—that is, leftovers from an earlier era in which fuller, more complete versions had flourished, and where the functions they fulfilled were supposedly more holistically incorporated into society”

But in India the scenario is different. The folk forms are not dead and gone. True that they have suffered setbacks with the coming in of satellite TV and internet but they are not history as yet. According to J C Mathur

"In these circumstances, the question arises how did the contemporary traditional and folk forms arise? In the West the folk form is considered only a community activity of an amateurish kind. This is not so in India because our traditional and folk Drama has very important and strict traditions in some cases and is far more sophisticated than the Western folk Drama. While editing jointly with my friend Dashrath Ojha some medieval plays on North India and Nepal (C 1 300 A D - C 1 625 AD) I (J C Mathur) came to realise that those plays along with similar contemporary traditional forms in other parts of India, actually belong to the corpus of a Dramatic genre which has received scant attention from historians of Drama, including Keith who has rejected them as merely "irregular plays." The same attitude is disclosed in a recent work called “Sanskrit Drama- Its Origin and Decline” by Shekar (published in the Netherlands) "

### **Saang -as a unique Performance Tradition of North India**

Swang or *Saang* developed in the north Indian state of Haryana. Haryana as a state may be of a recent creation (Haryana was constituted on **November 1, 1966**, as a

result of the partition of the former state of Punjab into two separate states—Punjabi-speaking Punjab and Hindi-speaking Haryana.) but the history of the people of Haryana goes back to time immemorial. In fact, the whole reason that the Govt of India found it necessary to create a separate state is reason enough to agree that the distinctiveness of the Haryanvi people was too much to ignore and could not be brushed aside under the carpet of a common state with the Punjabis. Haryana has existed as a separate unit with its own distinct identity and distinct folk culture. It has unique folk practices and performances which take place at villages, at temples, at road crossings, at fields and granaries, marriage ceremonies, festivals etc; and are an inseparable part of the lives of the people. It includes *Saangs* also which are performed on a particular kind of stage or platforms with usual themes of legendary story, historical event or love story at its centre and can keep the public or audience enraptured for the whole night. *Saang* is a balanced combination of acting, dialogues, music, dance, songs, plot, worship and spirituality.

Though the history of folk performance traditions in north India has much in common, the *Saang* from of Haryana (erstwhile Punjab) is unique and different from other performance traditions practiced in the area. *Saang* may be called folk theatre but its status as theatre remains disputed. First of all, as stage it uses a platform of about three and a half meters which is open on all four sides. As Balwant Gargi points out in *Folk Theatre of India*, “life in India is in the streets. Shops, stalls, rituals, bathrooms, all are exposed to the sun and to the glare of people, so is the folk theatre.” (6) There are no curtains or green room attached to the stage and *Saang* hardly uses any props during performance. It is the main narrator or the *sutradhar* who describes to the audience what the stage stands for e.g., a palace, forest, or riverside depending on the scene. Though the characters are well delineated, there are no dialogues; the exchanges between the characters are sung and these songs are called *Ragini*. The performers are all male and sometimes they wear costumes but that is a rarity and in fact a recent practice. Thus, for *Saang*, all the three important constituents of theatre—acting, dialogues and stage are markedly different from practices of the theatre. *Saangs* is also quite distinct from other performing arts in the region. While on the one hand we have narrative traditions like *Alha* which sing epic poetry and the *Nath jogis* who narrate folk stories to an audience, on the other hand we have the *Naqqals* and *Behrups*. While *Behrup* performers disguise and move from village to, the *Naqqal* performers usually perform little skits based on imitation. Therefore, if *Alha* is about musical rendering of poetry, *Behrup* is purely about costume and acting. As per this categorization, *Saang* would fall somewhere in between

because it incorporates elements of both. Like the *Alha*, the *Saangis* sing their *Raginis* and like *Behrup*, the staged performance tells a story using costumes and acting.

Usually, the man playing the lead female character is dressed up as a woman, but the onus of creating the scene and retaining the interest of the audience is primarily on the poet who composes the *Raginis* and who is also the lead actor who sings them. The one after whom the *Saang* troupe is known is more often than not the composer and the lead singer/actor. The *Raginis* are accompanied by *Sarangi* and *Nakkara*. The performances demand great skill and stamina from the artists who perform for as long as six hours and usually there are no loud speakers to amplify their sound. An hour or so before the performance, the musicians begin to create the atmosphere and the artistes sing some religious or other songs connected with the performance till such time when the ‘Guru’ appears and the artistes touch his feet to seek his blessings. The *Saang* begins with the recitation of a *bhet* as pointed out by Ved Prakash Vatuk and Sylvia Vatuk in their article the ‘Ethnography of *Saang*’,

Om(a) Nam(a) sab(a) tai Bada the name of aum is the greatest

Ustai bada na koy(a) no one is greater than he

Jo uska sumiran(a) karai one who remembers Om

Sudha at(a)ma hoy(a) his soul is purified

Ari bhavani bas(a) kar(a) oh bhavani, come and live in me,

Ghat(a) ke par(a)de khol(a) open the gates of my heart,

Ras(a)na par(a) basa karo stay on my tongue, oh mother

Mai suddha sabad(a) mukh(a) and speak the correct words

Bol(a) through my mouth.

Manai sumar(a) liye jag(a) dis(a) I remember the lord

Sat(a) guru mile is my guru

Kahu charan(a) vakai sis(a) I bow to his feet. (23)

With a brief introduction about the play, the performance starts.

### **Lakhmi Chand’s performances as Folk literature and Chronicles of Social Space**

Of *Saang*’s exponents, Pt. Lakhmi Chand (1901-1945) is the most celebrated. Shashi Bhushan Singal as quoted by Puran Chand Sharma in his book *Lakhmi Chand Granthavali* describes his contribution to the form of *Saang* as, “Pandit Lakhmi Chand freed the themes of the ‘*Saang*’ from religious and puranic subjects to which they had become confined and included in them a blend of love

themes and of youth. Thus the 'Saang' was made more ornate (17). Lakhmi Chand has been called a 'luminous bard', 'Kalidas', and 'Shakespeare of India' by his numerous fans and followers. It is difficult to even imagine the kind of cult following he inspired in the people of his state. People walked for days or travelled in their bullock carts to see him perform and listen to him. It was no less than a pilgrimage for most people, with the only difference that while on pilgrimages women and whole family travelled, only men had the prerogative to attend performances like *Saang*.

Before Lakhmi Chand *Saangs* were looked down upon by the self-proclaimed custodians of society who declared such entertainment to be obscene and vulgar. All through history folk entertainments had to battle against discrimination as they were looked down upon by the so called literati and respectable high society people. Lakhmi Chand also brought *Saangs* to repute. Not to say that he didn't face any resistance. He did. But slowly he could lift the *Saang* form from the depths of neglect to the height of such popularity that no social occasion was considered complete without his performances. Though he was illiterate himself he didn't let that come in the way of his education. In fact, he kept Tika Ram with himself as his guru, for the purpose of instructing him and teaching him the scriptures. He was able to pour his experience and knowledge in his poetry that he is looked upon not just as a poet composer but as a wise man in the state of Harayana. Other than the *Saangs* he composed lots of Bhajans, and his bhajans have been compiled and recorded in many volumes as 'Lakhmi Chand ka Brahmgyan' or 'Lakhmi Chand's Divine Knowledge'.

One of his most famous *Saangs* Nala Damyanti has left an indelible imprint on the psyches of the local people. Nala-Damayanti is originally a story from Mahabharata.

It is a popular story in literature and there are hundreds or rather thousands of versions of this story. From Himachal Pradesh to Rajasthan to Gujarat to Tamil Nadu, the story can be found in different formats. In fact, the story of Nala Damayanti is a popular story in Persian literature also. As David Shulman points out in his article Damayanti and Nala: The Many lives of a Story

In The *Mahabharata* episode known as the *Nalaopakhyana* is an elegant, fast-paced narrative.... Moreover, the story it tells is one of the most popular in India, existing in all Indian languages, often in many versions in each language. Hundreds, perhaps thousands of Nala stories exist. Wherever one goes in the sub-continent, Nala was there first. (1)

The story is equally popular in folk literature, with every region having its own version. When we are talking about

different versions of the story. Sometimes it is told as a love story, sometimes as court drama, sometimes as a tale displaying fortitude in the face of adversity at other times it is a cautionary tale about going against the wishes of gods, sometimes it is about predestination. In the original story it was narrated by the rishis visiting Yudhishtir when he was living in the jungle. One day he was feeling particularly sorry for himself, wailing at his misfortune. He complained to the rishis about his misfortune and said that no one was probably more unfortunate than him. It was in response to Yudhishtira's wailing and complaining that the Rishis tell him the story of Raja Nala. They tell him that there was one more who suffered more than you and urge him to thank God that even in jungle he is surrounded by his brothers and his wife, while Raja Nala had to battle adversity and misfortune all alone, after losing all his wealth and kingdom. Thus, originally the story of Raja Nala is narrated to Yudhishtira to make him stronger, to have fortitude and to make him count his blessings. The story is narrated to give him hope for a better future and courage to face the difficult time that was coming ahead. However, every Nala story doesn't have the same motive.

In this context it becomes important to analyse how Lakhmi Chand tells his Story. The *Saang* begins by a *Ragini* where Lakhmi Chand talks about the loss of goodness and honesty in the people and how it has led to various misfortunes befalling the people of Haryana.

*Jab te gaarat mahabhart mein attharah akshohini  
dal hoya*

*yagya hawan tap daan chhoot gayenyun bharat  
pe jaal pade*

*indra bhi varsha kam karte jal bin soone taal  
pade*

*bawan janak huye brahma gyani ved dharam ke  
khyal pade*

It is after the end of the first *Ragini* that the sutra Dhār tells the context of the story. How the story was first narrated by rishi to Yudhishtira in Mahabharat. But the motives of Lakhmi chand's story is far different from the motive of the rishi as we get to know as the *Saang* progresses. Lakhmi chand's story is a love story. In the initial *Raginis* there is prevalence of the romantic element. The poet gives evocative descriptions of the beauty of both raja Nala and Damayanti as both were famous in all three realms for their beauty. Another thing that the poet stresses is Nala's honesty and piousness. In the Lakhmi chand Granthawali, Pt Poorna Chand Sharma has ended Lakhmi Chand's *Saang* at the point when Nala abandons Damayanti and grief-stricken Damayanti is roaming in the jungle searching for her husband. She tries to follow his footsteps and does so till the end of the day. Then the night

falls and she is forced to abandon her quest. The next morning when the sun comes up, she realises that she is lost. The heroine's pain and bafflement have been very poignantly expressed by the poet but after this the *Saang* ends abruptly.

Pooran Chand Sharma has given a note from Lakhmi Chand's son Pt Tuleram that Lakhmi Chand never performed the *Saang* after this. However, the researcher herself has heard some more *Ragini*'s while growing up ascribed to Pt. Lakhmi Chand and dealing with latter part of the story. One very popular one is

Ulta ganga pahad chadi aur ulta chalya paani  
Daasi banke rehna lag-gi khud damaynti raani

(The river Ganga is climbing up the mountain and the water is flowing in reverse direction as the queen Damayanti herself has started living like a maid.)

The *Ragini* starts by comparing the descent of queen Damayanti to the station of a common maid to the reversal of natural order. It is as unnatural as a river climbing up the mountain or water flowing from down to up. The *Ragini* further describes the problems that the queen faces, living a life of want and subservience. The queen Damayanti who was a princess before she was a queen and who has never seen hardship in her life and yet her love for her husband is such that she is ready to face any amount of adversity in order to continue her search for her husband. This *Ragini* deals with the part when Damayanti has been abandoned by Nala and reaches the kingdom of Cedi and starts living with the queen as a maid (daasi)

Ja kite toh le raja Nala ne, main kyun garib sataya gaya  
Nala te bhi suthra pati mile, tera swayamvar pher rachaya gaya

(Go and look for Raja Nala! Why are you tormenting me, a poor man? And now that your *swayamvar* has been organised again, you would probably find a man better looking than king Nala also.)

This *Ragini* belongs to the time in story when Nala has been living as an ugly deformed servant of the king of Ajodhya, Rituparna. He is tricked into coming to Vidarbha by Damayanti who sends an invitation to the king for her *Swayamvara*, letting it be known that she is planning to marry a second time, now that there is no hope of her husband Nala to be found. However, she sends the invite at such a short notice that she is sure that only Nala himself would be able to make it in time with the Ajodhya king as the distance is far and time very less. Nala with his expertise of horsemanship would be the only likely candidate. When Rituparna manages to reach Vidarbha on time Damayanti's suspicion is confirmed but the sight of

Nala as *Bahuka* makes it difficult to believe. She tries to talk to him to find out the truth but Nala chides her and tells her to leave him, a poor man alone. In the *Ragini* on one hand he urges her to go and look for Nala her husband instead of bothering him. On the other hand, he taunts her about her second *Swayamvar* and hopes that she finds and a husband better looking than Nala himself.

But even if one ignores these other *Raginis*, which the scholars doubt to have been composed by other composers but named after Lakhmi Chand, one thing becomes clear that Lakhmi Chand has appropriated these stories for the purpose of his own representations. In fact, there is significant evidence that every performance used to be unique and a change in emphasis probably changed the message of the story.

## CONCLUSION

Thus, one can see that *Saang* has been the theatre of the people of Haryana. Before television and print media invaded every aspect of our lives, the simple people of villages learned and communicated through the *Saangs*. As WhatsApp has become a university to millions of people of India, *Saang* was a university to the people of villages as it was not just a medium of entertainment but also a source of education to the common people who could neither read nor write. It was a showcase for the local as well as universal problems of life. In fact, the *Saang* were performed by people who shared similar social and cultural backgrounds and so the connect with the audiences was immediate and complete. Lakhmi Chand was one of the biggest exponents of *Saang* and his popularity lay in the fact that he not only depicted the men as well as the morals of the society but also challenged some age-old norms and reinforced the message of good life through his performances.

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**Eco-feminism in Jhaverchand Meghani's 'Charan Kanya'**

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**Abstract**

Literature and poetry are an important part of the Charan identity, literature written primarily during times of peace or shortly after returning from battle, and particularly to record the exploits of fellow warriors. Charani literature is a literary genre in its own right. This caste is primarily responsible for the Dingal language and literature. Jhaverchand Meghani was a prolific Gujarati novelist, critic, and journalist who lived from 1897 to 1947. This paper focuses on his pioneering work in Gujarati folk literature, especially his popular poem "Charan kanya," about a charan girl's valour in saving her calf. Meghani spent many years travelling across Saurashtra, gathering and recording oral culture repositories through folk tales, songs, ballads, and other traditional types. People from different professions, castes, genders, and social classes served as his sources. This paper attempts to analyse the poem "Charan Kanya" through an eco-feminist perspective.

**Key words:** Eco-sophy, Eco-feminism, eco-criticism, Charan girl, valour

Ecological interconnectedness research offers a window into dual and nondual structures for the bio-culturally rooted human identity. This field is part of a broader academic move towards a transdisciplinary, holistic philosophy of science. Before the Covid pandemic, central topics of national debates were related to inequality, war, climate change, environmental destruction, and extinction. We are nearer to the latter topic of near extinction, going by the current mortality rate. There's no doubt that mankind has invited this pandemic upon itself, majorly, due to pan-global industrial capitalism that is being rapidly modernised, interconnected—and fragile.

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Continuity and disparity are the epitomes of two indirectly divergent deep ecology perspectives. Despite the fact that they both talk of human–nature union through ecological selfhood, they take different paths to the same source, with mixed results. According to Naess and Rothenberg (1989), eco-sophical self-realisation is closely related to identification with the atman, described as 'self' in the Bhagawad Gita.

The other point is summed up by John Seed's well-known exclamation (cited in Merchant 2005: 111):

I am rainforest... You destroy me so carelessly, tearing down so many of my trees for a few planks... You cause my thick layer of precious topsoil to wash away, destroying the coral reefs that fringe me... Your screaming machines tear through my trunks, rip my flesh, reducing me to sawdust and furniture.

This verse, through the personification of a rainforest, describes human existence as coinciding with the Earth, driving home the brutal act of denudation by using the first person about something that is usually spoken in the third person. Trees, planks, topsoil, reefs, machines, flesh, sawdust, and furniture are all descriptors that refer to material part of nature. The transformation of a living tree into non-living furniture is described in a very macabre language. In the Bhagavad Gita, Arjuna synchronises with universal dharma by allowing Krishna to direct his chariot of body, mind, and senses, and by enacting his own dharma as warrior. In theory, these two systems of deep ecology and Hindu philosophy seem to be identical.

When Seed says that the rainforest is being destroyed, it does not mean that nature or Gaia as a whole is being destroyed; however, it could be interpreted as a metaphor for that outcome. The debate invokes ideologies such as the death of nature alongside the sacred feminine, and God's Greening (Merchant 1989; Shelldrake 1994; Roszak et al. 1995). As indicated by Seed, the emergence of the "screaming machine" defines a weakening larger Self through the loss or dissolution of many other smaller selves.

According to a post-colonial ecofeminist interpretation of our history, the entire material world in general was meant for the consumption of the white man, the industrial capitalist system who exploited, raped and denuded the weaker countries they dominated. The vibrant ecosystems of the oppressed nations became the "raw materials" for the "machine" that drove modernity, the global west feminised and demonised the global east. This can be compared to the tyranny of the male, the industrialised West of subjugation of the feminine East, replete with her rich cultural heritage and biodiversity.

In 1974, Françoise d' Eaubonne, a feminist from France, coined the word "ecofeminism." Subjugation and inequality of women, people of colour, and the poor, she claims, was inseparably related to environmental degradation, as, both resulted from patriarchal domination. Ecofeminist ideals are incorporated into today's climate change movement by those who consciously campaign for sustainable change for environment and society.

The fundamental tenets of ecofeminism are that oppression of the oppressed communities and oppression of nature are caused by the same thing. Our culture of exploitation culture to be replaced with a caring culture. All forms of oppression are mistaken they're all interconnected. For unbiased reform, it's crucial to understand these links. It becomes imperative to admire the intrinsic value of everything in nature and develop deep respect for the natural, cultivate biocentrism, rather an anthropocentric approach to the natural world. Thus, the aim of ecofeminism is to empower the downtrodden and to restore the health of the planet.

Ecofeminists promote ancient rituals based on the Mother Goddess, the moon, animals, and the female reproductive system in order to honour the bond between women and nature. An evolving patriarchal culture of male gods to whom female deities were subservient dethroned this prehistoric

period, which was focused on goddess worship. The Scientific Revolution of the 17th century further degraded nature by replacing the nurturing earth with the "metaphor of a computer to be regulated and repaired from the outside...The earth is to be ruled by male created and controlled technology, research, and industry" (Merchant 1992, p. 191).

It is during this time that a poem like 'Charan Kanya' warms the inner cockles of the heart when the poet, Jhaverchand Meghani, glorifies the valour of a young girl of the Charan community and also sings about the pristine beauty of the forests of Gir and its presiding residents, its majestic lions. The poet waxes eloquent about the protective, nurturing nature of women towards their cows, calves, towards the weaker sections and how the motherly instinct of a young girl of the 'charan' community comes to the fore and stands its stead in front of danger to the self before a ferocious lion. Without the use of machines, guns, fire or any other weapons the feminine oppressed protects those under her protection and drives away the savage male oppressor. She successfully subjugates him without the use of any violence.

Zaverchand Meghani was born in the Surendranagar district of Gujarat, in the Chotila town. His father, Kalidas, was a police officer who was frequently transferred, so Zaverchand spent the majority of his childhood in Rajkot. Lalchand and Prabhaskar were his two younger siblings. At the age of 24, he married Damyanti, and after her death, he married Chitradevi, at the age of 36. He had nine children. His college friends nicknamed him *Raja Janak* because of his plain and simple lifestyle. His everyday wardrobe consisted of a white long coat, a dhoti that reached far below the knees, and a turban tied around his head. His matriculation was completed in 1912, and his B.A. was completed in 1917. He went to work for Jivanlal Ltd, an aluminium company in Kolkatta, for nearly three years, during which time he travelled to England. He returned to Bagasra in 1921 after leaving this job. In 1922 he married Damyantiben, in Jetpur. From his youth, Zaverchand Meghani was immersed in Gujarati literature. His stay in Kolkatta introduced him to Bengali literature.

Meghani, who referred to himself as "a boy of the Saurashtra mountains," spent nine to ten years collecting and recording oral culture storehouses through folk tales, songs, ballads, and other types of traditional memory. He recorded them in bits and pieces as he came across them in a wide range of linguistic regional inflections, including Sorathi, Kutchi, and dozens of other dialects, all of which were interwoven with his own knowledge of chaste or shisht scholarly Gujarati. He worked as a journalist, publisher, and writer at the same time, writing for the newly founded journal 'Saurashtra' on some days and travelling and collecting folktales on others. His notes were then freely edited, expanded, and rewritten into the final form of the book 'Saurashtra ni Rasdhar'. Details of the setting, the time of the incident, and dialogue were also inserted into the story to give it the feel of an oral narrative in writing (Doshi 220).

His 'Kurbani ni Kathao,' was the first book to be published in book form followed by 'Saurashtra Ni Rasdhar'. In addition, he began translating Bengali works. He was given the title of 'Raashtreya Shaayar' by Mahatma Gandhi at the spur of the moment (National Poet). He also won several literary awards, including the Ranjitram Suvarna Chandrak and the Mahida Parritoshik. More than 100 books were written by him. However, he died of a major heart attack at his Botad home on March 9, 1947, at the age of 50.

Meghani's works are dominated by the term "Shaurya rasa" (valour). His poems are energising, inspiring, and full of courage. Charan Kanya is a masterpiece that prominently features Shaurya Rasa. It tells the story of Heerbai, a 14-year-old girl from Gujarat's Charan tribe. Raw grit is still

a distinguishing characteristic of many Gujarati tribes, including the Charan. They used to live in the Girnar foothills, which were home to ferocious Lions. The Charan community has great poets, they not only respect women but go a step further, and deify their women. Charan history is replete with how the Rajputs, fierce warriors, who could not be daunted by a naked double-edged sword, were weary of a Charan's sharp tongue which could make or break a man. The community worships cows, they protect their cattle, consider them to be family members. Fearless and proudly independent, the Charan's are praised for their bravery.

Meghani was present watching the struggle between the male and female, between the man and the beast, between the oppressor and the oppressed. He was so taken aback that he is said to be speechless. He uses words to paint an image of what he saw. Meghani's words convey emotion, anger, grit, and bravery.

*Lion roars!*

*The King of the Jungle roars! (lines 1-2)*

The structure of the poem is such that it paints a vivid picture of the ferocious fight between the girl and the lion and the unexpected result of the girl driving the beast away. Written in free verse, the poem is replete with repetition and imagery, the poet's ample use of anaphora makes the poem a feast for the mind and soul. This is the reason that the poem is enjoyed and narrated or sung in many a 'Dayra' or social gathering, to this day.

The Lion's ferocity is discussed in the first half of the poem, including his spine-chilling roar, fire flaming eyes, and the fear he instils in the hearts of people and animals alike. He himself was death personified. The "angan" or the courtyard of the house where Heerbai lived is invaded by such a terrifying lion who grabbed one of the tethered calves. Cows and calves have hold a special place in the hearts and minds of Hindus of all communities and creed since the beginning of time. The level of affection and respect is comparable to, if not greater than, that which dog owners have for their pets. Cows are more likely than other species to reciprocate human feelings, not only by providing milk and ghee, but also by providing bulls to tend the farms.

*Roars in the babul tree*

*Roars in the hills*

*Roars in the fields of cannabis*

.....

*Roars in the river cliffs*

*Roar in the gems of the hills.....(lines 10-16)(rough, self translation)*

The lion is free to roam about in the hills and valleys, jungles and babul thickets of the Gir in Gujarat. Even the leaves start trembling at the lion's roar.

*Start trembling!*

...

*Birds tremble at midnight*

*Leaves tremble on trees...(lines 17-18) )(rough, self translation)*

### Eco-feminism in Jhaverchand Meghani's 'Charan Kanya'

While having lions as neighbours isn't exactly a fantasy, it does have a lion-like quality to it. On Heerbai, they certainly did. As a result, when the lion dares to reach her property and scoops up her calf, the young Heerbai, enraged and unfazed, chases the lion with only a stick.

It's no surprise that when Heerbai saw her calf being carried away, she lost her temper. She ran towards the Lion, swinging a stick in her hand, without flinching or hesitation— how dare he strike her calf, how dare he approach her beloved cat. She's not going to let the calf die until she's confident in her own skin. She roars, burns, and leaps in front of the Lion like Durga. The Lion loses his vigour due to her terrifying spirit and courageous determination. He reverses his course and walks forward, leaving the calf behind.

*...Lioness, your brave ran away!*

*Coward, left the battlefield... (lines 24-25) (rough, self translation)*

The poet beautifully, melodiously tells the story of how the weak can overpower the brave and ferocious and chase him away with a mite of a stick and a mighty courage. The resolve of the feminine nature to protect her young calf from becoming the meal of a hungry male beast embodies the tenets of ecofeminism.

The society in general, is a social structure dominated by men, their women are marginalised. The selected poem demonstrates the poet's love for the inherent worth of everything in nature as well as appreciation for the natural environment, demonstrating a biocentrism rather than anthropocentric approach to the natural world. There has always been a plethora of descriptions of nature and her residents. Yet, as a poet, Meghani transforms the mundane into the divine. The corpus of his literary work is made up of ordinary incidents in his personal wanderings in search of folk tales and poetry. He has a remarkable ability to transform the personal into the radical using a subjective tone.

When one examines the numerous protest movements, it is shown that ecofeminists' claim that women have a special relationship with nature is false. Women's interactions with nature and responses to environmental degradation needs to be examined and contextualised within the material reality of gender, caste, and race-based labour, property, and power divisions. Women are both victims and agents of environmental degradation. The loss of indigenous information structures and subsistence strategies, which poor, rural women depend on, reflects the negative class-gender impact of these processes. But, the poem under study refutes all of the above-mentioned claims of ecofeminists. Women do have a special relationship with nature, in fact this poem stands up for the fact that a woman is capable of fighting the fiercest of beasts, she can fight the male dominance, can overturn the patriarchal society upside down on its toes and fight for what is hers, if she decides to do so.

The poem is a supreme ode to women's influence. A poem that needs to be read in order to be felt and lived. It is indeed a poem whose each line screams the doctrines of ecofeminism.

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## Article

# Relevance of Factorization Method to Differential and Integral Equations Associated with Hybrid Class of Polynomials

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**Abstract:** This article has a motive to derive a new class of differential equations and associated integral equations for some hybrid families of Laguerre–Gould–Hopper-based Sheffer polynomials. We derive recurrence relations, differential equation, integro-differential equation, and integral equation for the Laguerre–Gould–Hopper-based Sheffer polynomials by using the factorization method.

**Keywords:** Laguerre–Gould–Hopper-based Sheffer polynomials; factorization method; generating function; differential equation; integral equation

**MSC:** 44A45; 33C45; 05A15; 33E20

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## 1. Introduction and Preliminaries

The class of Sheffer polynomial sequences is one of the significant classes of the polynomial sequences [1–3]. The Sheffer polynomial sequences emerge in many fields of applied mathematics, mathematical physics, engineering sciences, estimation theory, and various branches of applied sciences. The class of Sheffer sequences is a group of non-abelian type with reference to the umbral calculus.

During recent years, the generalized and multi-variable varieties of the special functions have remained as notable key functions in the development of mathematical physics. The special functions of two variables are the solutions of differential equations which are encountered in many different fields.

By Roman [4], the Sheffer sequence is elaborated by the generating relation

$$\frac{e^{af^{-1}(t)}}{g(f^{-1}(t))} = \sum_{n=0}^{\infty} S_n(a) \frac{t^n}{n!}, \quad (1)$$

$\forall a$  in  $\mathbb{C}$ , where  $f^{-1}(t)$  is the compositional inverse of  $f(t)$  and  $f(t)$  are uniquely determined by two power series.

Let  $f(t)$  be a delta,  $g(t)$  be an invertible series given by

$$f(t) = \sum_{n=0}^{\infty} f_n \frac{t^n}{n!}, f_1 \neq 0, f_0 = 0, \quad (2)$$

and

$$g(t) = \sum_{n=0}^{\infty} g_n \frac{t^n}{n!}, g_0 \neq 0. \quad (3)$$

Then,  $\exists$  a sequence  $s_n(x)$  of polynomials satisfy the orthogonality condition

$$\langle g(t)f(t)^k | s_n(x) \rangle = n! \delta_{n,k}, \forall n, k \geq 0.$$

For ( $g(t) = 1$ ), it is the associated Sheffer sequence and with condition ( $f(t) = t$ ), it becomes the Appell sequence [5].

Some important sequences of polynomials, such as Hermite, Laguerre, Bessel, etc., are the special cases of the Sheffer polynomial sequence. These polynomials are very useful in mathematical physics, and various fields of engineering.

In 2012, Khan et al. [6] presented the 3-variables Laguerre–Gould–Hopper polynomials by the following generating relation

$$J_0(-at^p)e^{(bt+ct^s)} = \sum_{n=0}^{\infty} {}_LH_n^{(p,s)}(a, b, c) \frac{t^n}{n!}, \quad (4)$$

where  $J_0(x)$  is a Bessel–Tricomi function of 0th order.  $J_n(x)$  is  $n$ th order Bessel–Tricomi function, which can be defined by the generating function

$$\exp\left(t - \frac{x}{t}\right) = \sum_{n=0}^{\infty} J_n(x)t^n, \quad (5)$$

for  $t \neq 0$  and  $\forall$  finite  $x$ .

In 2016, Raza et al. [7] presented a new class of Laguerre–Gould–Hopper–Sheffer polynomials (3VLGHSP)  ${}_LH_n^{(p,s)}S_n(a, b, c)$  by using the generating function. The development and properties of hybrid special polynomials [8–10] have been most substantial theme in applied mathematics in last decades. The generating function of Laguerre–Gould–Hopper–Sheffer polynomials (3VLGHSP)  ${}_LH_n^{(p,s)}S_n(a, b, c)$  [7] can be given as follows

$$\frac{1}{g(f^{-1}(t))} \exp\left(b(f^{-1}(t)) + D_a^{-1}(f^{-1}(t))^p + c(f^{-1}(t))^s\right) = \sum_{n=0}^{\infty} {}_LH_n^{(p,s)}S_n(a, b, c) \frac{t^n}{n!}, \quad (6)$$

$J_0(ax)$  is Bessel–Tricomi function of order zero [11].

Since

$$J_n(xt) = \sum_{r=0}^{\infty} \frac{(-1)^r (xt)^n}{r^2!},$$

where  $D_a^{-1}$  denotes the inverse derivative operator  $D_a = \frac{\partial}{\partial a}$  and is defined by

$$D_a^{-1}\{f(a)\} = \int_0^a f(\xi)d\xi.$$

The series representation of Laguerre–Gould–Hopper-based Sheffer polynomials of 3-variables (3VLGHSP)  ${}_LH_n^{(p,s)}S_n(a, b, c)$  is as follows

$${}_LH_n^{(p,s)}S_n(a, b, c) = \sum_{k=0}^n \binom{n}{k} {}_LH_{n-k}^{(p,s)}(a, b, c) S_k. \quad (7)$$

The factorization method [12,13] is used to derive the differential and integro-differential equations for Appell polynomial. Recently, the differential equations are investigated for hybrid forms of Appell polynomials (see, example [14–18]). In 2020, Wani et al. [19] used an idea to derive the differential equations, recurrence relations and integral equations for Laguerre–Gould–Hopper-based Appell and related polynomials by factorization method. We mention here a few preliminaries associated with the factorization technique.

Let  $\{p_n(x)\}_{k=0}^\infty$  be a sequence of polynomials as the degree of  $(p_n(x)) = n (p_n \in \mathbb{N}_0 := 0, 1, 2, 3, \dots)$ . The operators satisfying the following relations

$$\Phi_n^- p_n(x) = p_{n-1}(x), \tag{8}$$

$$\Phi_n^+ p_n(x) = p_{n+1}(x), \tag{9}$$

are known as the derivative operator and multiplicative operators, respectively. Dattoli et al. [20–24] used the monomiality principle and operational rules to derive new classes of hybrid polynomials and their properties.

The differential equation of hybrid polynomials

$$(\Phi_{n+1}^- \Phi_n^+) p_n(x) = p_n(x), \tag{10}$$

can be derived using the  $\Phi_n^-$  and  $\Phi_n^+$  operators. For finding the derivative  $\Phi_n^-$  and multiplicative  $\Phi_n^+$  operator, we use the factorization technique [25] as the Equation (10) holds.

### 2. Recurrence Relation and Differential Equations for Laguerre–Gould–Hopper-Based Sheffer Polynomial (3VLGHSP) ${}_{LH(p,s)}S_n(a, b, c)$

First, we derive the recurrence relation for the Laguerre–Gould–Hopper-based Sheffer polynomial (3VLGHSP)  ${}_{LH(p,s)}S_n(a, b, c)$ .

**Theorem 1.** *The Laguerre–Gould–Hopper–Sheffer polynomials  ${}_{LH(p,s)}S_n(a, b, c)$  satisfy the recurrence relation*

$$\begin{aligned} {}_{LH(p,s)}S_{n+1}(a, b, c) &= \left( (b + \alpha_0) {}_{LH(p,s)}S_n(a, b, c) \right. \\ &+ \sum_{k=1}^n \binom{n}{k} \alpha_k {}_{LH(p,s)}S_{n-k}(a, b, c) \\ &+ \frac{n!}{(n-p+1)!} p D_a^{-1} {}_{LH(p,s)}S_{n-p+1}(a, b, c) \\ &\left. + \frac{n!}{(n-s+1)!} s c {}_{LH(p,s)}S_{n-s+1}(a, b, c) \right) \frac{1}{f'(t)}, \end{aligned} \tag{11}$$

where the coefficients  $\{a_k\}_{k \in \mathbb{N}_0}$  are given by the expansion

$$\frac{g'(t)}{g(t)} = \sum_{k=0}^\infty \frac{a_k}{k!} t^k. \tag{12}$$

**Proof.** Differentiating the each sides of generating relation (6) of Laguerre–Gould–Hopper-based Sheffer polynomials  ${}_{LH(p,s)}S_n(a, b, c)$  (3VLGHSP) with respect to  $t$ , we have

$$\begin{aligned} &\sum_{n=0}^\infty {}_{LH(p,s)}S_{n+1}(a, b, c) \frac{t^n}{n!} \\ &= \frac{1}{g(f^{-1}(t))} \exp\left(D_b^{-1}(f^{-1}(t))^s + a f^{-1}(t)\right) \\ &\quad \times \left( b + p D_a^{-1}\left(f^{-1}(t)\right)^{p-1} c s (f^{-1}(t))^{s-1} + \frac{g'(f^{-1}(t))}{g(f^{-1}(t))} \right) \frac{1}{f'(f^{-1}(t))}. \end{aligned}$$

Using the Equations (6) and (12) in the above equation, and then applying the cauchy product rule in the left-hand side of the resultant equation, we obtain

$$\begin{aligned} \sum_{n=0}^{\infty} {}_{LH^{(p,s)}}S_{n+1}(a, b, c) \frac{t^n}{n!} &= \sum_{n=0}^{\infty} \left( \sum_{k=0}^n \binom{n}{k} \alpha_k {}_{LH^{(p,s)}}S_{n-k}(a, b, c) \right. \\ &+ b {}_{LH^{(p,s)}}S_n(a, b, c) \\ &+ \frac{n!}{(n-p+1)!} p D_a^{-1} {}_{LH^{(p,s)}}S_{n-p+1}(a, b, c) \\ &\left. + \frac{n}{(n-s+1)!} c S_{{LH^{(p,s)}}} S_n(a, b, c) \right) \frac{t^n}{n!} \frac{1}{f'(f^{-1}(t))}. \end{aligned} \quad (13)$$

Now, comparing the coefficients of equal powers of  $t$  on both sides of the above equation and solving the resultant equation for  $t = f^{-1}(t)$ , then we get the Equation (11).  $\square$

Furthermore, we derive the shift operators for Laguerre–Gould–Hopper-based Sheffer polynomials (3VLGHSP)  ${}_{LH^{(p,s)}}S_n(a, b, c)$ .

**Theorem 2.** *The Shift operators for the Laguerre–Gould–Hopper-based Sheffer polynomials (3VLGHSP)  ${}_{LH^{(p,s)}}S_n(a, b, c)$  are given by*

$${}_a \mathcal{E}_n^- = \frac{1}{n} D_a D_b^{-(p-1)}, \quad (14)$$

$${}_b \mathcal{E}_n^- = \frac{1}{n} D_b, \quad (15)$$

$${}_c \mathcal{E}_n^- = \frac{1}{n} D_c D_b^{-(p-1)}, \quad (16)$$

$$\begin{aligned} {}_a \mathcal{E}_n^+ &= \left( (b + \alpha_0) + \sum_{k=1}^n \frac{\alpha_k}{k!} D_a^k D_b^{-k(p-1)} + p D_a^{p-2} D_b^{-(p-1)^2} \right. \\ &\left. + s c D_a^{s-1} D_b^{(1-r)(p-1)} \right) \frac{1}{f'(t)}, \end{aligned} \quad (17)$$

$${}_b \mathcal{E}_n^+ = \left( (b + \alpha_0) + \sum_{k=1}^n \frac{\alpha_k}{k!} D_b^k + p D_a^{-1} D_b^{p-1} + s c D_a^{(s-1)} \right) \frac{1}{f'(t)}, \quad (18)$$

$$\begin{aligned} {}_c \mathcal{E}_n^+ &= \left( (b + \alpha_0) + \sum_{k=1}^n \frac{\alpha_k}{k!} D_c^k D_b^{k(s-1)} + p D_a^{-1} D_b^{(p-1)(1-s)} D_c^{p-1} \right. \\ &\left. + s c D_c^{(s-1)} D^{-(s-1)^2} \right) \frac{1}{f'(t)}, \end{aligned} \quad (19)$$

where  $D_a = \frac{\partial}{\partial a}$ ,  $D_b = \frac{\partial}{\partial b}$ ,  $D_c = \frac{\partial}{\partial c}$ , and  $D_x^{-1} = \int_0^x f(\zeta) d\zeta$ .

**Proof.** Differentiating the generating function of (3VLGHSP) with respect to  $b$ , and then equating the coefficients of same powers of  $t$  from both sides, then we get

$$\frac{\partial}{\partial b} \left( {}_{LH^{(p,s)}}S_n(a, b, c) \right) = n {}_{LH^{(p,s)}}S_{n-1}(a, b, c), \quad (20)$$

so that

$$\frac{1}{n} \frac{\partial}{\partial b} \left( {}_{LH^{(p,s)}}S_n(a, b, c) \right) = {}_{LH^{(p,s)}}S_{n-1}(a, b, c). \quad (21)$$

Consequently,

$${}_b \mathcal{E}_n^- \{ {}_{LH^{(p,s)}}S_n(a, b, c) \} = \frac{1}{n} D_b \{ {}_{LH^{(p,s)}}S_n(a, b, c) \} = {}_{LH^{(p,s)}}S_{n-1}(a, b, c), \quad (22)$$

which proves (15).

Next, differentiating the generating relation (6) with respect to  $a$ , and then equating the same powers of  $t$  from both sides, we obtain

$$\frac{\partial}{\partial a} \{ {}_L H^{(p,s)} S_n(a, b, c) \} = \frac{n!}{(n-p)!} \{ {}_L H^{(p,s)} S_{n-p}(a, b, c) \}. \tag{23}$$

From the Equation (20), it may be written as

$$\frac{\partial}{\partial a} \{ {}_L H^{(p,s)} S_n(a, b, c) \} = n \frac{\partial^{p-1}}{\partial b^{p-1}} = n \{ {}_L H^{p,s} S_{n-1}(a, b, c) \}, \tag{24}$$

$$\begin{aligned} {}_a \mathcal{E}_n^- \{ {}_L H^{(p,s)} S_n(a, b, c) \} &= \frac{1}{n} D_a D_b^{-(p-1)} \{ {}_L H^{(p,s)} S_n(a, b, c) \} \\ &= {}_L H^{(p,s)} S_{n-1}(a, b, c). \end{aligned} \tag{25}$$

Consequently,

$${}_a \mathcal{E}_n^- = \frac{1}{n!} D_a D_b^{-(p-1)},$$

which proves (14).

Again differentiating the generating relation (6) with respect to  $c$  and comparing the coefficients of equal powers of  $t$ , we obtain

$$\frac{\partial}{\partial c} \{ {}_L H^{(p,s)} S_n(a, b, c) \} = \frac{n!}{(n-s)!} \{ {}_L H^{(p,s)} S_{n-s}(a, b, c) \}, \tag{26}$$

which, in view of Equation (20), may be written as

$$\frac{\partial}{\partial c} \{ {}_L H^{(p,s)} S_n(a, b, c) \} = n \frac{\partial^{s-1}}{\partial b^{s-1}} = n \{ {}_L H^{(p,s)} S_{n-1}(a, b, c) \}. \tag{27}$$

Consequently,

$${}_c \mathcal{E}_n^- [ {}_L H^{(p,s)} S_n(a, b, c) ] = \frac{1}{n} D_c D_b^{-(s-1)} \{ {}_L H^{(p,s)} S_n(a, b, c) \} = {}_L H^{(p,s)} S_{n-1}(a, b, c), \tag{28}$$

which proves assertion (16).

Next, to find the raising operator for  ${}_b \mathcal{E}_n^+$

$${}_L H^{(p,s)} S_{n-k}(a, b, c) = \left( {}_b \mathcal{E}_{n-k+1}^- {}_b \mathcal{E}_{n-k+2}^- \dots {}_b \mathcal{E}_n^- \right) {}_L H^{(p,s)} S_n(a, b, c),$$

which, on using Equation (22), may be written as

$${}_L H^{(p,s)} S_{n-k}(a, b, c) = \frac{(n-k)!}{n!} D_b^k \{ {}_L H^{(p,s)} S_n(a, b, c) \}, \tag{29}$$

by the use of this equation in recurrence relation in view of the fact that

$${}_b \mathcal{E}_n^+ \{ {}_L H^{(p,s)} S_n(a, b, c) \} = {}_L H^{(p,s)} S_{n+1}(a, b, c),$$

$${}_b \mathcal{E}_n^+ = \left( (b + \alpha_0) + \sum_{k=1}^n \frac{\alpha_k}{k!} D_b^k + p D_a^{-1} D_b^{(p-1)} + s c D_b^{s-1} \right) \frac{1}{f'(t)},$$

which proves (18) equation.

Next, to find the raising operator for  ${}_a \mathcal{E}_n^+$

$${}_L H^{(p,s)} S_{n-k}(a, b, c) = \left( {}_a \mathcal{E}_{n-k+1}^- {}_a \mathcal{E}_{n-k+2}^- \dots {}_a \mathcal{E}_n^- \right) {}_L H^{(p,s)} S_n(a, b, c),$$

which, on using Equation (25), can be presented as

$${}_L H^{(p,s)} S_{n-k}(a, b, c) = \frac{(n-k)!}{n!} D_b^{k-(p-1)} D_a \{ {}_L H^{(p,s)} S_n(a, b, c) \}, \tag{30}$$

by using this equation in recurrence relation in view of the fact that

$${}_a \mathcal{E}_n^+ \{ {}_L H^{(p,s)} S_n(a, b, c) \} = {}_L H^{(p,s)} S_{n+1}(a, b, c).$$

We have

$${}_a \mathcal{E}_n^+ = \left( (b + \alpha_0) + \sum_{k=1}^n \frac{\alpha_k}{k!} D_a^k D_b^{-k(p-1)} + p D_a^{p-2} D_b^{-(p-1)^2} + sc D_a^{s-1} D_b^{(1-s)(p-1)} \right) \frac{1}{f'(t)},$$

which proves (17) equation.

Now, finally, the raising operator for  ${}_c \mathcal{E}_n^+$

$${}_L H^{(p,s)} S_{n-k}(a, b, c) = \left( {}_c \mathcal{E}_{n-k+1}^- \dots {}_c \mathcal{E}_{n-k+1}^- \right) {}_L H^{(p,s)} S_{n-k}(a, b, c),$$

which, on using the Equation (28), can be written as

$${}_L H^{p,s} S_{n-k}(a, b, c) = \frac{(n-k)!}{n!} D_c^k D_b^{k(1-s)} \{ {}_L H^{(p,s)} S_n(a, b, c) \}. \tag{31}$$

By using the Equation (31) in recurrence relation in view of the fact that

$${}_c \mathcal{E}_n^+ \{ {}_L H^{p,s} S_n(a, b, c) \} = {}_L H^{(p,s)} S_{n+1}(a, b, c).$$

We find

$${}_c \mathcal{E}_n^+ = \left( (b + \alpha_0) + \sum_{k=1}^n \frac{\alpha_k}{k!} D_c^k D_b^{-k(s-1)} + p D_a^{(-1)} D_b^{-(1-s)(p-1)} D_c^{p-1} + sc D_c^{s-1} D_b^{-(1-s)^2} \right) \frac{1}{f'(t)},$$

which proves assertion (19). □

Now, we derive the differential equation for Laguerre–Gould–Hopper-based Sheffer polynomials (3VLGHSP)  ${}_L H^{(p,s)} S_n(a, b, c)$ .

**Theorem 3.** *The differential equation for Laguerre–Gould–Hopper-based Sheffer polynomials (3VLGHSP)  ${}_L H^{(p,s)} S_n(a, b, c)$  can be given as follows*

$$\left( \{ (b + \alpha_0) D_b + \sum_{k=1}^n \frac{\alpha_k}{k!} D_b^{k+1} + p D_a^{-1} D_b^p + sc D_b^s \} \frac{1}{f'(t)} - n \right) {}_L H^{(p,s)} S_n(a, b, c) = 0. \tag{32}$$

**Proof.** Now, we use the factorization method to derive the differential equation

$${}_b \mathcal{E}_{n+1}^- {}_a \mathcal{E}_n^+ \{ {}_L H^{(p,s)} S_n(a, b, c) \} = {}_L H^{(p,s)} S_n(a, b, c).$$

Putting the values of the shift operators from Equations (15) and (18) in the left-hand side of the above equation

$$\left( \{(b + \alpha_0)D_b + \sum_{k=1}^n \frac{\alpha_k}{k!} D_a^{k+1} + pD_a^{-1}D_b^p + scD_b^s\} \frac{1}{f'(t)} - n \right) {}_{LH(p,s)}S_n(a, b, c) = 0,$$

which proves (32). Using the relation  $D_b^p = D_a a D_a$  [6], we get

$$\left( \{(b + \alpha_0)D_b + \sum_{k=1}^n \frac{\alpha_k}{k!} D_b^{k+1} + paD_a + scD_b^s\} \frac{1}{f'(t)} - n \right) {}_{LH(p,s)}S_n(a, b, c) = 0.$$

□

### 3. Integro-Differential Equation for Laguerre–Gould–Hopper-Based Sheffer Polynomial (3VLGHSP)

**Theorem 4.** The integro-differential equations of Laguerre–Gould–Hopper-based Sheffer polynomials (3VLGHSP)  ${}_{LH}S_n(a, b, c)$  are given as the follows equations

$$(i) \quad \left( \{(b + \alpha_0)D_a + \sum_{k=1}^n \frac{\alpha_k}{k!} D_b^{-k(p-1)} D_a^{k+1} + pD_b^{(p-1)^2} D_a^{(m-1)} + scD_b^{-(s-1)(1-p)} D_a^s\} \frac{1}{f'(t)} - (n+1)D_b^{p-1} \right) {}_{LH(p,s)}S_n(a, b, c) = 0. \quad (33)$$

$$(ii) \quad \left( \{(b + \alpha_0)D_c + \sum_{k=1}^n \frac{\alpha_k}{k!} D_b^{-k(s-1)} D_c^{k+1} + pD_b^{-(1-s)(1-p)} D_a^{-1} D_c^p + scD_b^{-(1-s)^2} D_c^s + sD_b^{-(1-s)^2} D_c^{s-1}\} \frac{1}{f'(t)} - (n+1)D_b^{s-1} \right) {}_{LH(p,s)}S_n(a, b, c) = 0. \quad (34)$$

$$(iii) \quad \left( \{(b + \alpha_0)D_a + \sum_{k=1}^n \frac{\alpha_k}{k!} D_a D_c^k D_b^{-k(s-1)} + pD_b^{-(1-s)(1-p)} D_c^{p-1} + scD_b^{-(1-s)^2} D_c^{s-1} D_a\} \frac{1}{f'(t)} - (n+1)D_b^{p-1} \right) {}_{LH(p,s)}S_n(a, b, c) = 0. \quad (35)$$

$$(iv) \quad \left( \{(b + \alpha_0)D_c + \sum_{k=1}^n \frac{\alpha_k}{k!} D_b^{-k(p-1)} D_a^k D_c + pD_b^{-(1-p)^2} D_c D_x^{p-2} + scD_b^{-(1-s)(1-p)} D_a^{s-1} + sD_b^{-(1-s)(1-p)} D_a^{s-1} D_c\} \frac{1}{f'(t)} - (n+1)D_b^{s-1} \right) {}_{LH(p,s)}S_n(a, b, c) = 0. \quad (36)$$

**Proof.** By using the factorization method

$$\mathcal{E}_{n+1}^- \mathcal{E}_n^+ \{ {}_{LH(p,s)}S_n(a, b, c) \} = {}_{LH(p,s)}S_n(a, b, c). \quad (37)$$

By using the shift operators expressions (14); (16) and (17); (19) in Equation (37), we find the integro-differential Equations (33) and (34), respectively. By the same process, taking the pair of shift operators (14); (16) and (19), (17) in the relation (37) and we find the integro-differential Equations (35) and (36) respectively. □

**Remark 1.** The partial differential equations for the Laguerre–Gould–Hopper-based Sheffer polynomials (3VLGHSP)  ${}_{LH(p,s)}S_n(a, b, c)$  are calculated as the following consequence of Theorem 4.

**Corollary 1.** *By differentiating the Equation (33) integro-differential equation  $n(p - 1)$ -times with respect to  $b$  then we get a partial differential equation of Laguerre–Gould–Hopper-based Sheffer polynomials (3VLGHSP)*

$$(i) \quad \left( \{ (b + \alpha_0) D_a D_b^{n(p-1)} + n(p-1) D_b^{np-n-1} D_a + \sum_{k=1}^n \frac{\alpha_k}{k!} D_b^{n-k(p-1)} D_a^{k+1} + p D_b^{(p-1)(n-p+1)} D_a^{(p-1)} + s c D_b^{(p-1)(n-s+1)} D_a^s \} \frac{1}{f'(t)} - (n+1) D_b^{p-1} \right)_{LH(p,s)} S_n(a, b, c) = 0. \tag{38}$$

*By differentiating Equation (34) integro-differential equation  $n(s - 1)$ -times with respect to  $b$ , then we get a partial differential equation of Laguerre–Gould–Hopper-based Sheffer polynomials (3VLGHSP)*

$$(ii) \quad \left( \{ (b + \alpha_0) D_c D_b^{n(s-1)} + n(s-1) D_b^{ns-n-1} D_c + \sum_{k=1}^n \frac{\alpha_k}{k!} D_b^{(n-k)(s-1)} D_c^{k+1} + p D_a^{-1} D_b^{(s-1)(n-p+1)} D_c^p + s c D_b^{(r-1)(n-s+1)} D_c^s + s D_b^{-(1-s)^2+n(s-1)} D_c^{s-1} \} \frac{1}{f'(t)} - (n+1) D_b^{(s-1)+n(s-1)} \right)_{LH(p,s)} S_n(a, b, c) = 0. \tag{39}$$

*By differentiating Equation (35) integro-differential equation  $n(s - 1)$ -times with respect to  $b$ , then we get a partial differential equation of Laguerre–Gould–Hopper-based Sheffer polynomials (3VLGHSP)*

$$(iii) \quad \left( \{ (b + \alpha_0) D_a D_b^{n(s-1)} + n(s-1) D_b^{ns-n-1} D_a + \sum_{k=1}^n \frac{\alpha_k}{k!} D_a D_b^{(n-k)(s-1)} D_c^k + p D_b^{(s-1)(n-p+1)} D_c^{p-1} + s c D_b^{(s-1)(n-s+1)} D_c^{s-1} D_a \} \frac{1}{f'(t)} - (n+1) D_b^{(p-1)+n(s-1)} \right)_{LH(p,s)} S_n(a, b, c) = 0. \tag{40}$$

*By differentiating equation of (36) integro-differential equation  $n(p - 1)$ -times with respect to  $b$ , we get a partial differential equation of Laguerre–Gould–Hopper-based Sheffer polynomials (3VLGHSP)*

$$(iv) \quad \left( \{ (b + \alpha_0) D_c D_b^{n(p-1)} + n(p-1) D_b^{np-n-1} D_c + \sum_{k=1}^n \frac{\alpha_k}{k!} D_b^{(n-k)(p-1)} D_a^k D_c + p D_b^{(p-1)(n-p+1)} D_c D_a^{p-2} + s c D_b^{(p-1)(n-s+1)} D_a^{s-1} + s D_b^{(p-1)(n-s+1)} D_a^{s-1} D_c \} \frac{1}{f'(t)} - (n+1) D_b^{n(s-1)+(p-1)} \right)_{LH(p,s)} S_n(a, b, c) = 0. \tag{41}$$

**Proof.** Differentiating the integro-differential Equation (33) by  $n(p - 1)$ -times with respect to  $b$ , then we get a partial differential equation of Laguerre–Gould–Hopper-based Sheffer polynomials and differentiating the Equation (34) by  $n(s - 1)$ -times, with respect to  $b$ ; then, we get a partial differential equation of Laguerre–Gould–Hopper-based Sheffer polynomials. By the same process, the partial differential Equation (40) can be obtained by taking the derivatives of the integro-differential Equation (35)  $n(s - 1)$ -times with respect to  $b$  and Equation (41) can be obtained by taking the derivatives of the integro-differential Equation (36)  $n(p - 1)$ -times with respect to  $b$ .  $\square$

#### 4. Integral Equation of the Laguerre–Gould–Hopper-Based Sheffer Polynomial (3VLGHSP)

Here, we derive the integral equations for the Laguerre–Gould–Hopper-based Sheffer polynomial. The importance of these integral equations of the Laguerre–Gould–Hopper-based Sheffer polynomials may be observed in different engineering sciences.

**Theorem 5.** *Following homogeneous volterra integral equation for the Laguerre–Gould–Hopper-based Sheffer polynomials (3VLGHSP)  ${}_{LH(p,s)}S_n(a, b, c)$  holds true*

$$\begin{aligned}
 \phi(b, c) = & -\frac{\alpha_1}{sc} \left( \mathbb{P}_{s-2} \frac{b^{s-3}}{(s-3)!} + \mathbb{P}_{s-3} \frac{b^{s-4}}{(s-4)!} + \dots + \mathbb{P}_2(b) + \mathbb{P}_1 \right) \\
 & -\frac{\alpha_0}{sc} \left( \mathbb{P}_{s-2} \frac{b^{s-2}}{(s-2)!} + \mathbb{P}_{s-3} \frac{b^{s-3}}{(s-3)!} \right. \\
 & \quad \left. + \dots + \mathbb{P}_2 \frac{a^2}{2!} + \mathbb{P}b + n\mathbb{R}_{n-1} \right) - \frac{1}{sc} \left( \mathbb{P}_{s-2} \frac{b^{s-1}}{(s-1)!} + \mathbb{P}_{s-3} \frac{b^{s-2}}{(s-2)!} \right. \\
 & \quad \left. + \dots + \mathbb{P}_2 \frac{b^3}{2!} \mathbb{P}_1 b^2 + n\mathbb{R}_n - 1b \right) \\
 & + \frac{nf'(t) - paD_a}{sc} \left( \mathbb{P}_{s-2} \frac{b^{s-1}}{(s-1)!} + \mathbb{P}_{s-3} \frac{b^{s-2}}{(s-2)!} \right. \\
 & \quad \left. + \dots + \mathbb{P}_2 \frac{b^3}{3!} + \mathbb{P}_1 \frac{b^2}{2!} + n\mathbb{R}_{n-1}b + \mathbb{R}_n \right) \\
 & - \frac{1}{sc} \int_0^b \left( \alpha_1 \frac{(b-\xi)^{s-3}}{(s-3)!} + (b + \alpha_0) \frac{(b-\xi)^{s-2}}{(s-2)!} \right. \\
 & \quad \left. + (paD_a - nf'(t)) \frac{(b-\xi)^{s-1}}{(s-1)!} \right) \phi(\xi, c) d\xi,
 \end{aligned} \tag{42}$$

where

$$\begin{aligned}
 {}_{LH(p,s)}S_n(0, b, c) &= S_n(b, c) = {}_{H^s}S_n(b, c) = \mathbb{R}_n, \\
 \mathbb{P}_{s-q} &= \prod_{k=0}^{s-q} (n-k) \mathbb{R}_{n-s+(q-1)}, \quad q = s-1, s-2, \dots, 3, 2.
 \end{aligned}$$

**Proof.** Now, we take the differential equation with  $k = 1$ ,

$$\left( [D_b^s + \{b + \alpha_0 + \alpha_1 D_b^2 + paD_a\} \frac{1}{sc}] \frac{1}{f'(t)} - n \frac{1}{sc} \right) {}_{LH(p,s)}S_n(a, b, c) = 0, \tag{43}$$

from the generating function (6) with  $a = 0$

$$\begin{aligned}
 & \frac{1}{g(f^{-1}(t))} \exp(bf^{-1}(t) + D_a^{-1}(f'(t))^p + c(f'(t))^s) \\
 &= \sum_{n=0}^{\infty} {}_{LH(p,s)}S_n(0, b, c) \frac{t^n}{n!} = \sum_{n=0}^{\infty} {}_{H^s}S_n(b, c) \frac{t^n}{n!}.
 \end{aligned}$$

Since, by  $A(t) = \frac{1}{g(f^{-1}(t))}$  ([26], (p. 923)) and expanding the exponential in the left-hand side and then using the cauchy product rule in the left-hand side in the resultant equation, we have the following presentation of  ${}_{H^s}S_n(b, c)$

$${}_{H^s}S_n(b, c) = n! \sum_{k=0}^n \sum_{l=0}^k \frac{S_{n-kl} \gamma^{k-sl}}{(n-k)! l! (k-sl)!} \tag{44}$$

The initial condition obtained

$${}_L H^{(p,s)} S_n(0, b, c) = S_n(b, c) = {}_H^s S_n(b, c) = \mathbb{R}_n,$$

and letting  ${}_H^s S_n(b, c) = \mathbb{R}_n$

$$\begin{aligned} \frac{d}{db} {}_L H^{(p,s)} S_n(0, b, c) &= D_b \{ {}_H^s S_n(b, c) \} = n \mathbb{R}_{n-1}, \\ \frac{d^2}{d^2 b} {}_L H^{(p,s)} S_n(0, b, c) &= D_b^2 \{ {}_H^s S_n(b, c) \} \\ &= n(n-1) \mathbb{R}_{n-2} = \prod_{k=0}^1 (n-k) \mathbb{R}_{n-2} = \mathbb{P}_1. \\ D_b^{s-2} \{ {}_L H^{(p,s)} S_n(0, b, c) \} &= n(n-1)(n-2)\dots(n-s+3) \mathbb{R}_{n-s+2} \\ &= \mathbb{P}_{s-3} = \prod_{k=0}^{s-3} (n-k) \mathbb{R}_{n-s+2}, \\ D_b^{s-1} \{ {}_L H^{(p,s)} S_n(0, b, c) \} &= n(n-1)(n-2)\dots(n-s+1) \mathbb{R}_{n-s+1} \\ &= \mathbb{P}_{s-2} = \prod_{k=0}^{s-2} (n-k) \mathbb{R}_{n-s+1}. \end{aligned} \quad (45)$$

Consider the equation

$$D_b^s \{ {}_L H^{(p,s)} S_n(a, b, c) \} = \phi(b, c). \quad (46)$$

Now, integrate the Equation (46) with the initial conditions

$$\begin{aligned} D_b^{s-1} \{ {}_L H^{(p,s)} S_n(a, b, c) \} &= \int_0^b \phi(\xi, c) d\xi + \mathbb{P}_{s-2} \\ D_b^{s-2} \{ {}_L H^{(p,s)} S_n(a, b, c) \} &= \int_0^a \phi(\xi, c) d^2 \xi + \mathbb{P}_{s-3} \\ D_b^2 \{ {}_L H^{(p,s)} S_n(a, b, c) \} &= \int_0^b \phi(\xi, c) d^2 \xi^{s-2} + \mathbb{P}_{s-2} \frac{b^{s-3}}{(s-3)!} + \mathbb{P}_{s-3} \frac{b^{s-4}}{(s-4)!} \\ &\quad + \dots + \mathbb{P}_2 b + \mathbb{P}_1 \\ D_b \{ {}_L H^{(p,s)} S_n(a, b, c) \} &= \int_0^b \phi(\xi, c) d^2 \xi^{s-1} + \mathbb{P}_{s-2} \frac{b^{s-2}}{(s-2)!} + \mathbb{P}_{s-3} \frac{b^{s-3}}{(s-3)!} \\ &\quad + \dots + \mathbb{P}_1 b + \dots + n \mathbb{R}_{n-1}, \\ {}_L H^{(p,s)} S_n(a, b, c) &= \int_0^b \phi(\xi, c) d^2 \xi^s + \mathbb{P}_{s-2} \frac{b^{s-1}}{(s-1)!} + \mathbb{P}_{s-3} \frac{b^{s-2}}{(s-2)!} \\ &\quad + \dots + \mathbb{P}_1 \frac{b^2}{2!} + n \mathbb{R}_{n-1} x + \mathbb{R}_n, \end{aligned} \quad (47)$$

where

$$\mathbb{P}_{s-q} = \prod_{k=0}^{s-q} (n-k) \mathbb{R}_{n-s+(q-1)}, \quad q = s-1, s-2, \dots, 3, 2. \quad (48)$$

Using the Equation (4) in Equation (43), we get

$$\begin{aligned} \phi(b, c) = & -\frac{(b + \alpha_0)}{sc} \left( \int_0^b \phi(\xi, c) d\xi^{s-1} + \mathbb{P}_{s-2} \frac{b^{s-2}}{(s-2)!} + \mathbb{P}_{s-3} \frac{b^{s-3}}{(s-3)!} \right. \\ & \left. + \dots + \mathbb{P}_2 \frac{b^2}{2!} + \mathbb{P}_1 \frac{b}{1!} + n\mathbb{R}_{n-1} \right) \\ & - \frac{\alpha_1}{sc} \left( \int_0^b \phi(\xi, c) d\xi^{s-2} + \mathbb{P}_{s-2} \frac{b^{s-3}}{(s-3)!} \right. \\ & \left. + \mathbb{P}_{s-3} \frac{b^{s-4}}{(s-4)!} + \dots + \mathbb{P}_2 b + \mathbb{P}_1 \right) \\ & + \frac{(paD_a - nf'(t))}{sc} \left( \int_0^b \phi(\xi, c) d\xi + \mathbb{P}_{s-2} \frac{b^{s-1}}{(s-1)!} + \mathbb{P}_{s-3} \frac{b^{s-2}}{(s-2)!} \right. \\ & \left. + \dots + \mathbb{P}_1 \frac{b^2}{2!} + n\mathbb{R}_{n-1} b + \mathbb{R}_n \right), \end{aligned}$$

which proves assertion (42).  $\square$

## 5. Conclusions

We derived differential equations, shift operators, and integral equations for the Laguerre–Gould–Hopper-based Sheffer polynomial by the factorization method in the present investigation. The development of these types of techniques may be useful in different scientific areas. The Laguerre–Gould–Hopper-based Sheffer polynomial and for their relatives can be taken in further investigations of mathematical and engineering sciences. Specifically, the integral, differential and integro-differential equations are of particular motivation of this paper for the applications purpose in engineering sciences.

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## CERTAIN INTEGRAL AND DIFFERENTIAL EQUATIONS INVOLVING HYBRID POLYNOMIALS VIA FACTORIZATION METHOD

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ABSTRACT. This article has a motive to derive new classes of differential equations and associated integral equations for some hybrid families of truncated exponential-based Appell polynomials. We derive the recurrence relation, differential equation, integro-differential equation, and integral equation of the truncated exponential based Appell polynomials by using the factorization method. Finally, we also give some illustrative examples.

### 1. INTRODUCTION AND PRELIMINARIES

The class of the Appell polynomial sequence is one of the significant classes of polynomial sequences [1]. In applied mathematics, theoretical physics, approximation theory, and several other mathematical branches. The set of Appell polynomial sequence is closed under the operation of umbral composition of polynomial sequences. The Appell polynomial sequence can be given by the following generating function

$$A(x, t) = A(t)e^{xt} = \sum_{n=0}^{\infty} A_n(x) \frac{t^n}{n!}. \quad (1.1)$$

The power series  $A(t)$  is given by

$$A(t) = A_0 + \frac{t}{1!} + A_1 \frac{t^2}{2!} + A_2 + \dots + \frac{t^n}{n!} + \dots = \sum_{n=0}^{\infty} A_n \frac{t^n}{n!}, \quad (A_0 \neq 0), \quad (1.2)$$

where  $A_i \{i = 1, 2, 3, \dots\}$  are real coefficients. It is easy to see that for any  $A(t)$ , the derivative of  $A(t)$  satisfies

$$A'_n(x) = nA_{n-1}(x). \quad (1.3)$$

Some related numbers are shown in table 1.

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TABLE 1. Certain members belonging to the Appell family.

S.No.	name of the polynomials and related numbers	$A(t)$	series definition	Generating functions
1.	Bernouli polynomials and numbers {10}	$\frac{t}{e^t-1}$	$B_n(x) = \sum_{k=0}^n B_k x^{n-k}$	$e^{yt} \left(\frac{t}{e^t-1}\right) = \sum_{n=0}^{\infty} B_n(x) \frac{t^n}{n!}$ $\frac{t}{e^t-1} = \sum_{n=0}^{\infty} B_n \frac{t^n}{n!}$
2.	Euler polynomials and numbers {10}	$\frac{2}{e^t+1}$	$E_n(x) = \sum_{k=0}^n \frac{E_k}{2^k} (x - \frac{1}{2})^{n-k}$	$\left(\frac{2}{e^t+1}\right)e^{yt} = \sum_{n=0}^{\infty} E_n(x) \frac{t^n}{n!}$ $\frac{2e^t}{e^t+1} = \sum_{n=0}^{\infty} E_n(x) \frac{t^n}{n!}$
3.	Genocchi polynomials and numbers {16}	$\frac{2t}{e^t+1}$	$G_n(x) = \sum_{k=0}^n G_k x^{n-k}$	$\left(\frac{2t}{e^t+1}\right)e^{yt} = \sum_{n=0}^{\infty} G_n(x) \frac{t^n}{n!}$ $\frac{2t}{e^t+1} = \sum_{n=0}^{\infty} G_n \frac{t^n}{n!}$

Note. It should be noted that in table 1, the Genocchi polynomials  $G_n(x)$  do not fulfill all requirements of Appell polynomials, for instance, the degree of  $G_n(x)$  is  $n - 1$ , though, the degree of Appell polynomials is  $n$ . Therefore, we may put  $G_n(x)$  in the class of polynomials sequences which are not considered Appell polynomials in the strong sense [2].

A family of truncated polynomials of noteworthy interest is provided by the series [7, p.597(14)]. These polynomials play an important role in the evaluation of the integral involving product of special functions and also appear in a wide variety of physical problems such as optics and quantum mechanics. The special polynomials of two variables are important from the view point of applications. The extension of two variables truncated exponential polynomials is given by series [7, p. 599(31)].

Truncated exponential polynomial  $e_n(x)$  defined by the series

$$e_n(x) = \sum_{k=0}^n \frac{x^k}{k!}. \tag{1.4}$$

Truncated exponential polynomials define by the generating function

$$\frac{e^{xt}}{(1-t)} = \sum_{n=0}^{\infty} e_n(x)t^n. \tag{1.5}$$

Generating function of Appell polynomials

$$A(t)e^{xt} = \sum_{n=0}^{\infty} A_n(x) \frac{t^n}{n!}. \tag{1.6}$$

We consider the 2-variable higher order truncated polynomials (2TEP) are defined by the series [8, p. 174(29)]

$$e_n^r(x, y) = n! \sum_{k=0}^{\frac{n}{r}} \frac{y^k x^{n-rk}}{(n-rk)!}, \tag{1.7}$$

and the generating function of (2VTP)

$$\frac{e^{xt}}{(1-yt^r)} = \sum_{n=0}^{\infty} e_n^r(x, y) \frac{t^n}{n!}. \tag{1.8}$$

**1.1. Truncated exponential based Appell polynomials.** 2-Variable truncated exponential based Appell polynomials (2VTEAP)  $e_n^r A_n(x, y)$  can be defined by the generating function [10]

$$A(t)exp(xt)C_0(-yt^r) = \sum_{n=0}^{\infty} e_n^r A_n(x, y) \frac{t^n}{n!}, \tag{1.9}$$

$$A(t)exp(xt)exp(D_y^{-1}t^r) = \sum_{n=0}^{\infty} e_n^r A_n(x, y) \frac{t^n}{n!}, \tag{1.10}$$

where  $C_0(ax)$  is Tricomi function of order zero [3].

Since  $C_n(xt) = \sum_{r=0}^{\infty} \frac{(-1)^r (xt)^n}{r! 2^r}$ , and where  $D_x^{-1}$  denotes the inverse derivate operator  $D_x = \frac{\partial}{\partial x}$  and is defined by  $D_x^{-1}\{f(x)\} = \int_0^x f(\xi)d\xi$ .

Truncated exponential based Appell polynomials (2VTEAP) can defined in series form as follows

$$e_n^r A_n(x, y) = n! \sum_{k=0}^{\frac{n}{r}} \frac{A_{n-rk} y^k}{(n - rk)!}.$$

In 2002, He and Ricci exploited the idea to derive the differential equations for the Appell polynomials by the factorization method in [14](see also, [16]). Recently, differential equations for mixed type Appell polynomials are derived by many authors [9, 18, 20]. The applications of recurrence relations, differential equations, and other results of these hybrid special polynomials [4, 11, 12, 13] can be observed in different branches of science as well as the solutions of the new emerging problems. This motivates to establish the differential equations for the truncated exponential Appell polynomials by using the factorization method. We retrace some preliminaries related to the factorization method

Let  $\{p_n(x)\}_{k=0}^{\infty}$  be a sequence of polynomials such that  $deg(p_n(x)) = n (p_n \in \mathbb{N}_0 := 0, 1, 2, 3, \dots)$ . These operators satisfying the properties

$$\Phi_n^- p_n(x) = p_{n-1}(x), \tag{1.11}$$

$$\Phi_n^+ p_n(x) = p_{n+1}(x), \tag{1.12}$$

are known as the derivative and multiplicative operators, respectively. Dattoli et. al used the monomiality principle [5, 19] and operational rules in [6] The polynomials sequences  $\{p(x)\}_{n=0}^{\infty}$  satisfying the above equations is then called quasi-monomial.

A property, like as the differential equation.

$$(\Phi_{n+1}^- \Phi_n^+) p_n(x) = p_n(x), \tag{1.13}$$

can be derived using the  $\Phi_n^-$  and  $\Phi_n^+$  operators. For finding the derivative operator  $\Phi_n^-$  and a multiplicative operator  $\Phi_n^+$  as the equation (1.13) holds. Above method used for driving the differential equations via equation(1.13) is known as the factorization method [15].

The article is consolidated as follows. The recurrence relation and the shift operator for the truncated exponential-Appell polynomials are established in section 2. Further, the differential equation, integro-differential equation, and partial differential equation for the family are derived. In section 3, corresponding results for the truncated-Bernoulli polynomials, truncated-Euler polynomials, and truncated-Genocchi polynomials are obtained as an example. The integral equation for the truncated-Appell polynomials and the certain members belonging to this family are derived in the last section.

## 2. RECURRENCE RELATIONS AND DIFFERENTIAL EQUATION

First, we recall the recurrence relation for the truncated exponential based Appell polynomials (2VTEAP)  $e_n^r A_n(x, y)$ .

**Theorem 1.** *The truncated exponential based Appell polynomials (2VTEAP)  $e_n^r A_n(x, y)$  satisfy the recurrence relation:*

$$e_n^r A_{n+1}(x, y) = (x + \alpha_0) e^r A_n(x, y) + \sum_{k=1}^n \binom{n}{k} \alpha_k e^r A_{n-k}(x, y) + \frac{n!}{(n-r+1)!} r D_y^{-1} e^r A_{n-r+1}(x, y), \quad (2.1)$$

where the coefficient  $\{\alpha_k\}_{k \in \mathbb{N}_0}$  are given by the expansion.

$$\frac{A'(t)}{A(t)} = \sum_{k=0}^{\infty} \frac{\alpha_k}{k!} t^k. \quad (2.2)$$

*Proof.* Differentiating both sides of generating function(1.10) of truncated exponential based Appell polynomials (2VTEAP) with respect to t, we have

$$\left( x + r D_y^{-1} t^{r-1} + \frac{A'(t)}{A(t)} \right) A(t) e^{xt + D_y^{-1} t^r} = \sum_{n=0}^{\infty} e_n^r A_{n+1}(x, y) \frac{t^n}{n!}. \quad (2.3)$$

Using the equation (2.2) and (1.10) in the above equation and then applying the cauchy product rule in left side of the resultant equation, it follows that

$$\sum_{n=0}^{\infty} e_n^r A_{n+1}(x, y) \frac{t^n}{n!} = \sum_{n=0}^{\infty} \left( \sum_{k=0}^n \binom{n}{k} \alpha_k e_n^r A_{n-k}(x, y) + x e_n^r A_n(x, y) + \frac{n!}{(n-r+1)!} r D_y^{-1} e_n^r A_{n-r+1}(x, y) \right) \frac{t^n}{n!}. \quad (2.4)$$

Now equating the coefficients of same power of  $t$  on the both sides of the above equation and the simplifying the resultant equation, then we get equation (2.1).  $\square$

Next, we find shift operators for truncated exponential-Appell polynomials.

**Theorem 2.** *The Shift operator for the truncated exponential based Appell polynomials (2VTEAP)  $e_n^r A_n(x, y)$  are given by;*

$${}_x \mathcal{L}_n^- = \frac{1}{n} D_x, \tag{2.5}$$

$${}_y \mathcal{L}_n^- = \frac{1}{n} D_y D_x^{-(r-1)}, \tag{2.6}$$

$${}_x \mathcal{L}_n^+ = (x + \alpha_0) + \sum_{k=1}^n \frac{\alpha_k}{k!} D_x^k + r D_y^{-1} D_x^{r-1}, \tag{2.7}$$

$${}_y \mathcal{L}_n^+ = (x + \alpha_0) + \sum_{k=1}^n \frac{\alpha_k}{k!} D_y^k D_x^{-k(r-1)} + r D_y^{r-2} D_x^{-(r-1)^2}, \tag{2.8}$$

where  $D_x = \frac{\partial}{\partial x}$ ,  $D_y = \frac{\partial}{\partial y}$ , and  $D_x^{-1} = \int_0^x f(\xi) d\xi$ .

*Proof.* Differentiating the generating function of truncated exponential based Appell polynomials (2VTEAP) with respect to  $x$  and the equating the coefficient of same power of  $t$  from both sides of equation, then we get

$$\frac{\partial}{\partial x} (e_n^r A_n(x, y)) = n e_n^r A_{n-1}(x, y), \tag{2.9}$$

so that

$$\frac{1}{n} \frac{\partial}{\partial x} (e_n^r A_n(x, y)) = e_n^r A_{n-1}(x, y).$$

Consequently, it follows that.

$${}_x \mathcal{L}_n^- [e_n^r A_n(x, y)] = \frac{1}{n} D_x \{e_n^r A_n(x, y)\} = e_n^r A_{n-1}(x, y), \tag{2.10}$$

Which proves (2.5)

Next, differentiating the generating function (1.10) with respect to  $y$  and then equating the same power of  $t$  from the both sides, then we get

$$\frac{\partial}{\partial y} \{e_n^r A_n(x, y)\} = \frac{n!}{(n-r)!} \{e_n^r A_{n-r}(x, y)\}, \tag{2.11}$$

from the equation (2.9), can be written as

$$\frac{\partial}{\partial y} \{e_n^r A_n(x, y)\} = n \frac{\partial^{r-1}}{\partial x^{r-1}} = n e_n^r A_{n-1}(x, y). \tag{2.12}$$

Thus,

$${}_y \mathcal{L}_n^- = \frac{1}{n!} D_y D_x^{-(r-1)}, \tag{2.13}$$

which proves (2.6).

Next, to find the raising operator

$$e_n^r A_{n-k}(x, y) = \left( {}_x \mathcal{L}_{n-k+1}^- {}_x \mathcal{L}_{n-k+2}^- \dots {}_x \mathcal{L}_n^- \right) e_n^r A_n(x, y),$$



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*Research article*

## A new family of differential and integral equations of hybrid polynomials via factorization method

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**Abstract:** In this study, we investigate differential and integral equations of some hybrid families of truncated exponential-based Sheffer polynomials. We also derive some integro-differential equation and new recurrence relations for the truncated exponential based Sheffer polynomials by using the factorization method. We also discuss some special cases as illustrative examples.

**Keywords:** truncated exponential based Sheffer polynomials; factorization methods; differential equations; integral equations; integro-differential equation

**Mathematics Subject Classification:** 05A15, 33C45, 33E20, 44A45

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### 1. Introduction and preliminaries

The family of Sheffer polynomial sequences was introduced by I. M. Sheffer. The Sheffer sequence is the one of the main classes of the polynomial sequence [20]. The Sheffer sequence arise in many fields of applied mathematics and other branches of mathematics. With reference to application of umbral composition of polynomial sequence, the set of Sheffer sequences is closed.

In physical problems, the class of 2-variable hybrid polynomials gives importance of its formation as solution of different important differential equations again and again encountered in [14, 15].

The pervasive investigation of Appell and Sheffer sequences along with the structure of modern umbral calculus collected by the Roman [19]. Roman [19] elaborated the following generating function

of Sheffer sequence.

$$\frac{e^{xf^{-1}(t)}}{g(f^{-1}(t))} = \sum_{n=0}^{\infty} S_n(x) \frac{t^n}{n!}, \quad (1.1)$$

for all  $x$  in  $\mathbb{C}$ , wherever  $f^{-1}(t)$  is the inverse function of  $f(t)$  and  $f(t)$  is differently fixed by 2-power series.

Let  $f(t)$  and  $g(t)$  be a delta and an invertible series respectively, are given by

$$f(t) = \sum_{n=0}^{\infty} f_n \frac{t^n}{n!}, f_1 \neq 0, f_0 = 0, \quad (1.2)$$

$$g(t) = \sum_{n=0}^{\infty} g_n \frac{t^n}{n!}, g_0 \neq 0. \quad (1.3)$$

If  $g(t) = 1$ , then the Sheffer sequence is the associated Sheffer sequence and for the Appell sequence  $g(t) = t$  [2]. These polynomials are appeared in number theory, physics, and various other branches of mathematics. The class of the Sheffer sequence has some valuable sequences as Hermite, Bessel, Laguerre polynomials etc. According to the physical applications, the Sheffer sequences are very useful.

By the series [6, p.597 (14)], a noteworthy interest of a group of truncated polynomials is presented. These polynomials [3, 18] come out in a vast variety of physical problems as optics, quantum mechanics problems and furthermore play a job in the assessment of the integral including result of special functions. 2-variables special polynomials are significant according to the applications.

This is the series of truncated exponential polynomials  $e_n(x)$ . [1]

$$e_n(x) = \sum_{k=0}^n \frac{x^k}{k!}. \quad (1.4)$$

This is the first  $(n + 1)$  terms of Maclaurin series for  $e^x$ . In many problems of quantum mechanics and optics, these polynomials appears. In the beginning Dattoli [6] gave the systematic research of these polynomials.

Generally, these polynomials have the properties which may be acquired by definition (1.4). Truncated exponential polynomials can be addressed by the generating function [6, p. 596 (4)],

$$\frac{e^{xt}}{(1-t)} = \sum_{n=0}^{\infty} e_n(x) t^n. \quad (1.5)$$

Now, we see the 2-variable higher order truncated polynomials are specified by the series [7, p. 174 (29)]

$$e_n^{(r)}(x, y) = \sum_{k=0}^{\lfloor \frac{n}{r} \rfloor} \frac{y^k x^{(n-rk)}}{(n-rk)!}, \quad (1.6)$$

the generating function of 2-variable truncated exponential polynomial (2VTP) [7, p.174 (30)]

$$\frac{e^{xt}}{(1-yt^r)} = \sum_{n=0}^{\infty} e_n^{(r)}(x, y) \frac{t^n}{n!}. \quad (1.7)$$

There are the integral representation of truncated exponential

$$e_n^{(r)}(x) = \frac{1}{n!} \int_0^{+\infty} e^{-\xi} (x + \xi)^n d\xi,$$

where

$$n! = \int_0^{\infty} e^{-\xi} \xi^n d\xi.$$

## 2. Truncated exponential based Sheffer polynomials

In 2014, Khan et al. introduced the two variables truncated-exponential-Sheffer polynomials (2VTESP) and derived with the frame of reference of the operational method

$$\frac{\exp(xf^{-1}(t))}{g(f^{-1}(t))(1-y(f^{-1}(t))^r)} = \sum_{n=0}^{\infty} e^{(r)}s_n(x, y) \frac{t^n}{n!}.$$

The generating function of Truncated exponential-Sheffer polynomial (2VTESP)  $e^{(r)}s_n(x, y)$

$$\frac{1}{g(f^{-1}(t))} e^{(xf^{-1}(t))} C_0(-y(f^{-1}(t))^r) = \sum_{n=0}^{\infty} e^{(r)}s_n(x, y) \frac{t^n}{n!}, \quad (2.1)$$

$$\frac{1}{g(f^{-1}(t))} e^{(xf^{-1}(t))} e^{(D_y^{-1}(f^{-1}(t))^r)} = \sum_{n=0}^{\infty} e^{(r)}s_n(x, y) \frac{t^n}{n!}, \quad (2.2)$$

where  $C_0(ax)$  is Tricomi function of order zero [1].

Since  $C_n(x) = \sum_{r=0}^{\infty} \frac{(-1^r)(x)^r}{r!(n+r)!}$ , and where  $D_y^{-1}$  is defined as the inverse derivative operator  $D_y = \frac{\partial}{\partial y}$ , and is specified by  $D_y^{-1}\{f(y)\} = \int_0^y f(\theta)d\theta$ .

The two variables truncated exponential-Sheffer polynomials (2VTESP)  $e^{(r)}s_n(x, y)$  are as stipulated by series

$$e^{(r)}s_n(x, y) = n! \sum_{k=0}^{\lfloor \frac{n}{r} \rfloor} \frac{S_{n-rk} y^k}{(n-rk)!}. \quad (2.3)$$

In 2002, He and Ricci exploited the idea to derive the differential equations by the factorization method for the Appell polynomials in [16] (see also, [17]). Recently, differential equations for confluent type Sheffer polynomials are investigated by many authors [9, 10, 14, 15, 21, 23]. This motivates to investigate the differential equations for the truncated exponential-Sheffer polynomials by apply the factorization technique. We retrace a few initially allied to the factorization technique.

The technique of factorization method is very useful to derive the differential and integro-differential equations of hybrid class of polynomials.

Now, let us suppose that  $\{P_n(x)\}_{k=0}^{\infty}$  be a sequence of polynomials like as the  $\deg(P_n(x)) = n, (n \in \mathbb{N}_0 := 0, 1, 2, 3, \dots)$ . The differential operators  $\mathbf{Q}_n^-$  and  $\mathbf{Q}_n^+$  holding the properties

$$\mathbf{Q}_n^- P_n(x) = P_{n-1}(x), \quad (2.4)$$

$$\mathbf{Q}_n^+ P_n(x) = P_{n+1}(x). \quad (2.5)$$

$\mathbf{Q}_n^-$  known as the derivative operator and  $\mathbf{Q}_n^+$  the multiplicative operator. The principle of monomiality [4, 22] and also related operational rules are applied in [5] to expand new families of cospectral which leads to non-trivial generalized polynomials.

The differential equation for the class of hybrid polynomials

$$(\mathbf{Q}_{n+1}^- \mathbf{Q}_n^+) P_n(x) = P_n(x), \quad (2.6)$$

will be derived by the application of the operators  $\mathbf{Q}_n^-$  and  $\mathbf{Q}_n^+$ . By applying this method for obtaining the differential equation through the Eq (2.6) is called factorization method [8]. The factorization method has the main purpose to present derivative operator  $\mathbf{Q}_n^-$  and multiplicative operator  $\mathbf{Q}_n^+$  as the Eq (2.6) holds.

### 3. Recurrence relation and differential equation

Now, we obtain some recurrence relations for the truncated exponential based Sheffer polynomials (2VTESP)  ${}_{e^r} S_n(x, y)$ .

**Theorem 3.1.** *The following recurrence relation for the truncated exponential-Sheffer polynomials (2VTESP)  ${}_{e^r} S_n(x, y)$  holds true*

$$\begin{aligned} {}_{e^r} S_{n+1}(x, y) = & \left( (x + \alpha_0) {}_{e^r} S_n(x, y) + \sum_{k=1}^n \binom{n}{k} \alpha_k {}_{e^r} S_{n-k}(x, y) \right. \\ & \left. + \frac{n!}{(n-r+1)!} r D_y^{-1} {}_{e^r} S_{n-r+1}(x, y) \right) \frac{1}{f'(t)}, \end{aligned} \quad (3.1)$$

coefficients  $\{\alpha_k\}_{k \in \mathbb{N}_0}$  can be express by

$$\frac{g'(t)}{g(t)} = \sum_{k=0}^{\infty} \frac{\alpha_k}{k!} t^k. \quad (3.2)$$

*Proof.* Differentiate the Eq (2.2) with respect to  $t$ , we have

$$\begin{aligned} \sum_{n=0}^{\infty} {}_{e^r} S_{n+1}(x, y) \frac{t^n}{n!} = & \frac{1}{g(f^{-1}(t))} \exp(D_y^{-1}(f^{-1}(t))^r + x f^{-1}(t)) \\ & \times \left( r D_y^{-1}(f^{-1}(t))^{r-1} + x + \frac{g'(f^{-1}(t))}{g(f^{-1}(t))} \right) \frac{1}{f'(f^{-1}(t))}. \end{aligned} \quad (3.3)$$

Using the Eqs (3.2) and (2.2) in the Eq (3.3), and then in the left hand side we use the Cauchy product rulers follows

$$\sum_{n=0}^{\infty} e^{(r)} S_{n+1}(x, y) \frac{t^n}{n!} = \sum_{n=0}^{\infty} \left( \sum_{k=0}^n \binom{n}{k} \alpha_k e^{r} S_{n-k}(x, y) + x e^{(r)} S_n(x, y) + \frac{n!}{(n-r+1)!} r D_y^{-1} e^{(r)} S_{n-r+1}(x, y) \right) \frac{t^n}{n!} \frac{1}{f'(f^{-1}(t))}.$$

On comparing the coefficients of equal power of  $t$ , on the both sides of the above equation and after that solving the equation with  $t = f^{-1}(t)$ , then we get Eq (3.1).  $\square$

Now, we derive shift operators for truncated exponential-Sheffer polynomial (2VTESP).

**Theorem 3.2.** *The shift operators for the truncated exponential-Sheffer polynomials (2VTESP)  $e^{(r)} S_n(x, y)$  are as follows*

$${}_x \mathfrak{F}_n^- = \frac{1}{n} D_x, \quad (3.4)$$

$${}_y \mathfrak{F}_n^- = \frac{1}{n} D_y D_x^{-(r-1)}, \quad (3.5)$$

$${}_x \mathfrak{F}_n^+ = \left( (x + \alpha_0) + \sum_{k=1}^n \frac{\alpha_k}{k!} D_x^k + r D_y^{-1} D_x^{r-1} \right) \frac{1}{f'(t)}, \quad (3.6)$$

$${}_y \mathfrak{F}_n^+ = \left( (x + \alpha_0) + \sum_{k=1}^n \frac{\alpha_k}{k!} D_y^k D_x^{-k(r-1)} + r D_y^{r-2} D_x^{-(r-1)^2} \right) \frac{1}{f'(t)}, \quad (3.7)$$

$$\text{where } D_x = \frac{\partial}{\partial x}, D_y = \frac{\partial}{\partial y} \text{ and } D_x^{-1} = \int_0^x f(\xi) d\xi.$$

*Proof.* First, the generating function of truncated exponential-Sheffer polynomials (2VTESP) will be differentiated and then comparing the coefficients of equal powers of  $t$ , we get

$$\frac{\partial}{\partial x} (e^{(r)} S_n(x, y)) = n e^{(r)} S_{n-1}(x, y). \quad (3.8)$$

So that

$$\frac{1}{n} \frac{\partial}{\partial x} (e^{(r)} S_n(x, y)) = e^{(r)} S_{n-1}(x, y).$$

Consequently,

$${}_x \mathfrak{F}_n^- [e^{(r)} S_n(x, y)] = \frac{1}{n} D_x \{e^{(r)} S_n(x, y)\} = e^{(r)} S_{n-1}(x, y), \quad (3.9)$$

which proves (3.4).

Next, differentiate the generating function (2.2) and then comparing the coefficients of equal powers of  $t$ , we get

$$\frac{\partial}{\partial y} \{e^{(r)} s_n(x, y)\} = \frac{n!}{(n-r)!} \{e^{(r)} s_{n-r}(x, y)\}. \quad (3.10)$$

From the Eq (3.8), it can be observed that

$$\frac{\partial}{\partial y} \{e^{(r)} s_n(x, y)\} = n \frac{\partial^{r-1}}{\partial x^{r-1}} e^{(r)} s_{n-1}(x, y).$$

Thus

$${}_y \mathfrak{F}_n^- [e^{(r)} s_n(x, y)] = \frac{1}{n!} D_y D_x^{-(r-1)} \{e^{(r)} s_n(x, y)\} = e^{(r)} s_{n-1}(x, y), \quad (3.11)$$

which proves (3.5).

Next, to obtain the raising operator

$$e^{(r)} s_{n-k}(x, y) = ({}_x \mathfrak{F}_{n-k+1}^- {}_x \mathfrak{F}_{n-k+2}^- \cdots {}_x \mathfrak{F}_n^-) e^{(r)} s_n(x, y),$$

which on using Eq (3.9), gives

$$e^{(r)} s_{n-k}(x, y) = \frac{(n-k)!}{n!} D_x^k e^{(r)} s_n(x, y). \quad (3.12)$$

Now, by using the Eq (3.12) in Eq (3.1)

$${}_x \mathfrak{F}_n^+ \{e^{(r)} s_n(x, y)\} = e^{(r)} s_{n+1}(x, y),$$

can be given by

$${}_x \mathfrak{F}_n^+ = \left( (x + \alpha_0) + \sum_{k=1}^n \frac{\alpha_k}{k!} D_x^k + r D_y^{-1} D_x^{(r-1)} \right) \frac{1}{f'(t)},$$

which proves (3.6).

Now, for  ${}_y \mathfrak{F}^+$  obtain the raising operator, considered the relation

$$e^{(r)} s_{n-k}(x, y) = ({}_y \mathfrak{F}_{n-k+1}^- {}_y \mathfrak{F}_{n-k+2}^- \cdots {}_y \mathfrak{F}_{n-k+1}^-) e^{(r)} s_n(x, y),$$

which on using Eq (3.11), gives

$$e^{(r)} s_{n-k}(x, y) = \frac{(n-k)!}{n!} D_y^k D_x^{k(1-r)} \{e^{(r)} s_n(x, y)\}. \quad (3.13)$$

Using above equation in (3.1), we obtain

$${}_y \mathfrak{F}_n^+ \{e^{(r)} s_n(x, y)\} = e^{(r)} s_{n+1}(x, y),$$

$${}_y \mathfrak{F}_n^+ = \left( (x + \alpha_0) + \sum_{k=1}^n \frac{\alpha_k}{k!} D_y^k D_x^{-k(r-2)} + r D_y^{(r-2)} D_x^{-(r-1)^2} \right) \frac{1}{f'(t)},$$

which proves Eq (3.7). □

**Theorem 3.3.** *The differential equation for truncated exponential-Sheffer polynomials (2VTESP)  ${}_{e^{(r)}}s_n(x, y)$  satisfy the following equation*

$$\left( \{(x + \alpha_0)D_x + \sum_{k=1}^n \frac{\alpha_k}{k!} D_x^{k+1} + ryD_x^r\} \frac{1}{f'(t)} - n \right) {}_{e^{(r)}}s_n(x, y) = 0. \quad (3.14)$$

*Proof.* Considering the factorization method for the derivation of differential equation

$${}_x\mathfrak{F}_{n+1}^- {}_y\mathfrak{F}_n^+ \{ {}_{e^{(r)}}s_n(x, y) \} = {}_{e^{(r)}}s_n(x, y),$$

Putting the values of the shift operators from Eqs (3.5) and (3.7), we get

$$\left( \{(x + \alpha_0)D_x + \sum_{k=1}^n \frac{\alpha_k}{k!} D_x^{k+1} + rD_y^{-1} D_x^{(r-1)} D_x\} \frac{1}{f'(t)} - n \right) {}_{e^{(r)}}s_n(x, y) = 0,$$

or

$$\left( \{(x + \alpha_0)D_x + \sum_{k=1}^n \frac{\alpha_k}{k!} D_x^{k+1} + rD_y^{-1} D_x^r\} \frac{1}{f'(t)} - n \right) {}_{e^{(r)}}s_n(x, y) = 0,$$

which proves (3.14). □

#### 4. Integro-differential equation for truncated exponential-Sheffer polynomials

**Theorem 4.1.** *The following integro-differential equation of truncated exponential-Sheffer polynomials holds true*

$$\left( \{(x + \alpha_0)D_x + \sum_{k=1}^n \frac{\alpha_k}{k!} D_y^k D_x D_x^{-k(r-1)} + rD_y^{(r-2)} D_x^{-(r-1)^2+1}\} \frac{1}{f'(t)} - nD_x \right) {}_{e^{(r)}}s_n(x, y) = 0. \quad (4.1)$$

*Proof.* By using the factorization method, and the pair of shift operators  ${}_x\mathfrak{F}_{n+1}^-$  and  ${}_y\mathfrak{F}_n^+$ , we have assertion

$${}_x\mathfrak{F}_{n+1}^- {}_y\mathfrak{F}_n^+ \{ {}_{e^{(r)}}s_n(x, y) \} = {}_{e^{(r)}}s_n(x, y).$$

Putting the value of shift operator in above equation, we get (4.1). □

**Corollary 4.1.** *By differentiating the equation of integro-differential equation  $n$ -times with respect to  $y$ , then we find a partial differential equation of truncated exponential-Sheffer polynomials*

$$\left( \{(x + \alpha_0)D_x D_y^n + \sum_{k=1}^n \frac{\alpha_k}{k!} D_y^{n+k} D_x^{-k(r-1)+1} + rD_y^{(r-2)+n} D_x^{(r-1)^2+1}\} \frac{1}{f'(t)} - nD_x D_y^n \right) {}_{e^{(r)}}s_n(x, y) = 0. \quad (4.2)$$

## 5. Integral equation for truncated exponential based Sheffer polynomials

Integral equations appear in engineering and logical applications. The applications of integral equations can be observed in different directions of scientific fields like quantum physics, water waves diffraction problems etc. [11, 13].

**Theorem 5.1.** *The following homogeneous Volterra integral equation of the truncated exponential-Sheffer polynomials holds true*

$$\begin{aligned} \phi(x) = & -\frac{\alpha_1}{ry} \left( \mathbb{P}_{r-2} \frac{x^{r-3}}{(r-3)!} + \mathbb{P}_{r-3} \frac{x^{r-4}}{(r-4)!} + \dots + \mathbb{P}_2(x) + \mathbb{P}_1 \right) \\ & -\frac{\alpha_0}{ry} \left( \mathbb{P}_{r-2} \frac{x^{r-2}}{(r-2)!} + \mathbb{P}_{r-3} \frac{x^{r-3}}{(r-3)!} + \mathbb{P}_2 \frac{x^2}{2!} + \mathbb{P}x + n\mathbb{R}_{n-1} \right) \\ & -\frac{1}{ry} \left( \mathbb{P}_{r-2} \frac{x^{r-1}}{(r-1)!} + \mathbb{P}_{r-3} \frac{x^{r-2}}{(r-2)!} + \dots + \mathbb{P}_2 \frac{x^3}{2!} + \mathbb{P}x^2 + n\mathbb{R}n - 1x \right) \\ & + \frac{nf'(t)}{ry} \left( \mathbb{P}_{r-2} \frac{x^{r-1}}{(r-1)!} + \mathbb{P}_{r-2} \frac{x^{r-2}}{(r-2)!} + \dots + \mathbb{P}_1 \frac{x^2}{2!} + n\mathbb{R}_{n-1}x + \mathbb{R}_n \right) \\ & -\frac{1}{ry} \int_0^x \left( \alpha_1 \frac{(x-\xi)^{r-3}}{(r-3)!} + (x+\alpha_0) \frac{(x-\xi)^{r-2}}{(r-2)!} - n \frac{(x-\xi)^{r-1}}{(r-1)!} \right) \phi(\xi) d\xi. \end{aligned} \quad (5.1)$$

*Proof.* Consider the differential equation of truncated exponential-Sheffer polynomial for  $k = 1$  in the following form

$$\left( [ryD_x^r + (x + \alpha_0)D_x + \alpha_1 D_x^2] \frac{1}{f'(t)} - n \right] \frac{1}{ry} e^{(r)} s_n(x, y) = 0. \quad (5.2)$$

The generating function (2.2) with  $y = 0$  can be presented

$$\frac{1}{g(f^{-1}(t))} e^{(x f^{-1}(t))} = \sum_{n=0}^{\infty} e^{(r)} s_n(x, 0) \frac{t^n}{n!} = \sum_{n=0}^{\infty} s_n(x) \frac{t^n}{n!}.$$

By using  $A(t) = \frac{1}{g(f^{-1}(t))}$  [12, p.923] with Substituting the series expression of exponential in left hand side and then apply Cauchy product rule, we have

$$s_n(x) = \sum_{k=0}^n \binom{n}{k} s_{n-k} x^k.$$

The initial condition can be obtained as

$$e^{(r)} s_n(x, 0) = s_n(x) = \sum_{k=0}^n \binom{n}{k} s_{n-k} x^k.$$

Letting  $s_n(x) = \mathbb{R}_n$ . Then the derivative of  $s_n(x)$  with respect to  $x$

$$\frac{d}{dx} e^{(r)} s_n(x, 0) = n s_{n-1}(x) = n \sum_{k=0}^{n-1} \binom{n-1}{k} s_{n-1-k} x^k = n \mathbb{R}_{n-1},$$

$$\frac{d^2}{dx^2} {}_{e^{(r)}}s_n(x, 0) = n(n-1)s_{n-2}(x) = \prod_{k=0}^1 (n-k)\mathbb{R}_{n-2} = \mathbb{P}_1.$$

Since  $\mathbb{R}_n = {}_{e^{(r)}}A_n(x) = s_n(x)$ , we have

$$D_x^{r-2} \{ {}_{e^{(r)}}s_n(x, 0) \} = n(n-1)(n-2)\dots(n-r+3)\mathbb{R}_{n-r+2} = \mathbb{P}_{r-3} = \prod_{k=0}^{r-3} (n-k)\mathbb{R}_{n-r+2},$$

$$D_x^{r-1} \{ {}_{e^{(r)}}s_n(x, 0) \} = n(n-1)(n-2)\dots(n-r+1)\mathbb{R}_{n-r+1} = \mathbb{P}_{r-2} = \prod_{k=0}^{r-2} (n-k)\mathbb{R}_{n-r+1}.$$

Consider the equation

$$D_x^r \{ {}_{e^{(r)}}s_n(x, y) \} = \phi(x). \quad (5.3)$$

On integrating the Eq (5.3) with initial conditions, we get

$$D_x^{r-1} \{ {}_{e^{(r)}}s_n(x, y) \} = \int_0^x \phi(\xi) d\xi + \mathbb{P}_{r-2},$$

$$D_x^{r-2} \{ {}_{e^{(r)}}s_n(x, y) \} = \int_0^x \phi(\xi) d^2\xi + \mathbb{P}_{r-3}.$$

$$D_x^2 \{ {}_{e^{(r)}}s_n(x, y) \} = \int_0^x \phi(\xi) d\xi^{r-2} + \mathbb{P}_{r-2} \frac{x^{r-3}}{(r-3)!} + \mathbb{P}_{r-3} \frac{x^{r-4}}{(r-4)!} + \dots + \mathbb{P}_2 x + \mathbb{P}_1,$$

$$D_x \{ {}_{e^{(r)}}s_n(x, y) \} = \int_0^x \phi(\xi) d\xi^{r-1} + \mathbb{P}_{r-2} \frac{x^{r-2}}{(r-2)!} + \mathbb{P}_{r-3} \frac{x^{r-3}}{(r-3)!} + \dots + \mathbb{P}_1 x + \dots + n\mathbb{R}_n - 1,$$

$${}_{e^{(r)}}s_n(x, y) = \int_0^x \phi(\xi) d\xi^r + \mathbb{P}r - 2 \frac{x^{r-1}}{(r-1)!} + \mathbb{P}_{r-3} \frac{x^{r-2}}{(r-2)!} + \dots + \mathbb{P}_1 \frac{x^2}{2!} + n\mathbb{R}_{n-1}x + \mathbb{R}_n, \quad (5.4)$$

where

$$\mathbb{P}_{r-s} = \prod_{k=0}^{r-s} (n-k)\mathbb{R}_{n-r+(s-1)}, \quad s = r-1, r-2, \dots, 3, 2.$$

Using the expression (5.4) in Eq (5.2), we obtain

$$\begin{aligned} \phi(x) = & -\frac{(x + \alpha_0)}{ry} \left( \int_0^x \phi(\xi) d\xi^{r-1} + \mathbb{P}_{r-2} \frac{x^{r-2}}{(r-2)!} + \mathbb{P}_{r-3} \frac{x^{r-3}}{(r-3)!} + \mathbb{P}_2 \frac{x^2}{2!} + \mathbb{P}_1 \frac{x}{1!} + n\mathbb{R}_{n-1} \right) \\ & - \frac{\alpha_1}{ry} \left( \int_0^x \phi(\xi) d\xi^{r-2} + \mathbb{P}_{r-2} \frac{x^{r-3}}{(r-3)!} + \mathbb{P}_{r-3} \frac{x^{r-4}}{(r-4)!} + \dots + \mathbb{P}_2 x + \mathbb{P}_1 \right) \\ & + \frac{nf'(t)}{ry} \left( \int_0^x \phi(\xi) d\xi + \mathbb{P}_{r-2} \frac{x^{r-1}}{(r-1)!} + \mathbb{P}_{r-3} \frac{x^{r-2}}{(r-2)!} + \dots + \mathbb{P}_1 \frac{x^2}{2!} + n\mathbb{R}_{n-1}x + \mathbb{R}_n \right), \end{aligned}$$

which proves assertion (5.1).  $\square$

## 6. Conclusions

We derive differential equation, shift operators, and integral equation for the truncated-exponential based Sheffer polynomials by the factorization method in the present investigation. The development of these type techniques may be useful in different scientific areas. The truncated exponential-Sheffer polynomials (2VTESP) and for their relatives can be taken in further investigations of mathematical and engineering sciences.

## Conflict of interest

The authors declare that there are no conflicts of interest.

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## PAPER

# Environment-friendly and biodegradable a-Fe<sub>2</sub>O<sub>3</sub>/C<sub>20</sub>H<sub>38</sub>O<sub>11</sub>nanocomposite growth to lengthen the Solanum lycopersicum storage process

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## Abstract

In this work, the growth of enviro-friendly and biodegradable  $\alpha$ -Fe<sub>2</sub>O<sub>3</sub>/C<sub>20</sub>H<sub>38</sub>O<sub>11</sub> nanocomposite is reported by means of a real time application to prolong the storage life of Tomato (*Solanum Lycopersicum*). A low temperature technique is used to prepare the  $\alpha$ -Fe<sub>2</sub>O<sub>3</sub> nanoparticles to obtain a crystalline nanopowder. XRD confirms the phase formation and crystalline nature of  $\alpha$ -Fe<sub>2</sub>O<sub>3</sub> nanoparticles. The surface morphology and elemental analysis of  $\alpha$ -Fe<sub>2</sub>O<sub>3</sub>/C<sub>20</sub>H<sub>38</sub>O<sub>11</sub> nanocomposite is conducted by SEM and EDX. Nanocomposite exhibits excellent antimicrobial activity against *Klebsiella pneumoniae* and *Staphylococcus aureus* bacteria. Tomato fruit samples are coated with two different concentrations of  $\alpha$ -Fe<sub>2</sub>O<sub>3</sub>/C<sub>20</sub>H<sub>38</sub>O<sub>11</sub> nanocomposite with 5% UC1A, UC2A and 3% UC1B, UC2B; and uncoated samples UC1, UC2 are stored at room temperature (25 ± 2 °C) and refrigerator temperature (4 °C) respectively for ascorbic acid (vitamin C) analysis on days 0, 4, 8, 12 and 16. Our study revealed that a 3% concentration of  $\alpha$ -Fe<sub>2</sub>O<sub>3</sub>/C<sub>20</sub>H<sub>38</sub>O<sub>11</sub> nanocomposite material is quite potent in maintaining quality aspects of the tomato fruit with no decline in vitamin C under refrigerated conditions up to the 16th day. FTIR analysis of all samples was done to determine the functional groups present in tomato samples after storage. Atomic absorption spectrometer (AAS) was used to analyse the content of Fe in tomato samples.

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## Original Article

# Theoretical and experimental study of the phase coexistence and impedance response in multiferroic Gd doped $\text{La}_{0.665}\text{Bi}_{0.33}\text{Ba}_{0.005}\text{Gd}_x\text{Mn}_{1-x}\text{O}_3$ ceramics



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## ABSTRACT

Polycrystalline samples of  $\text{La}_{0.665}\text{Bi}_{0.33}\text{Ba}_{0.005}\text{Gd}_x\text{Mn}_{1-x}\text{O}_3$  (LBBGMO) ( $x = 0.25, 0.45, \text{ and } 0.65$ ) were prepared via using conventional solid–state reaction method. The preliminary structural studies were carried out by X-ray diffraction at room temperature (RT). Rietveld refinement analysis of diffraction data confirmed that for  $x = 0.25$  and  $0.45$ , the structure was orthorhombic but co-existence of orthorhombic and rhombohedral were observed for  $x = 0.65$ . The average crystallite size calculated from the  $W-H$  plot of all the samples and reported 20.4753 nm, 16.6014 nm, 16.0821 nm for  $x = 0.25, 0.45$  and  $0.65$  respectively. The dielectric constant for all samples had a negative value at low frequency and positive for higher frequency range. The presence of one semicircle in Nyquist plot were observed, which shows the grain effect in all ceramic materials. At all observed temperatures, the frequency dependence of impedance plots has been utilized to characterize the electrical conduction of the sample which demonstrated the NTCR character (Negative Temperature Coefficient of Resistance). The ac conductivity variation with frequency dependence was well fitted according to Jonscher's power law and ac conductivity increases with increasing temperature.

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## 1. Introduction

During the past few years, a lot of attention has been likely to searching materials for both negative and positive electronic devices where the Manganese based mixed-valence materials  $\text{La}_{1-x}\text{A}_x\text{MnO}_3$  ( $\text{A} = \text{Ca}, \text{Sr}, \text{Ba}$ ) has been found the interesting magnetic, magneto transport and electrical properties [1–5]. Zener introduced a specific form of charge exchange interactions ( $\text{Mn}^{4+}$ ) and double exchange charge carriers which help to explicate the interaction mechanism between magnetic and transport properties, [6]. Due to the high interaction between the charge, orbital, and lattice degrees of freedom in these perovskites materials, they exist in several phases [7]. As a result, they have a large number of complex phenomena such as Colossal magnetic resistance (CMR), superconductivity, catalytic properties, photo-catalysis, magnetocaloric effect (MCE), and metal-insulator (MI) transition [8–13] and these all phenomena are used for technological applications such as storage devices and spintronics devices [14–16]. Some research work focused on calcium and barium doped lanthanum manganites ( $\text{La}_{0.6}\text{Ca}_{0.2}\text{Ba}_{0.2}\text{MnO}_3$ ) had been done in past few years and they found enhanced magnetic effect of magnetic materials which were used for magnetic cooling or green refrigeration, now it is very dynamic research field because it has more energy-efficient and less environmental impact [17]. Compared to vapor-compression technology, this approach achieves a substantially higher cooling efficiency.

The parent compound of our work is  $\text{La}_{0.665}\text{Bi}_{0.33}\text{Ba}_{0.005}\text{Gd}_x\text{Mn}_{1-x}\text{O}_3$  perovskite-based magnetite material. By substitution of divalent cations ( $\text{A} = \text{Ca}^{2+}, \text{Sr}^{2+}$ ) and trivalent cation ( $\text{Ba}^{2+}$  and  $\text{Bi}^{3+}$ ) at  $\text{La}^{3+}$  cation site in manganites it possesses remarkable magnetic and electrical properties compared to those of undoped manganites [18–20]. Despite the fact,  $\text{BiMnO}_3$  has ferromagnetic ordering and  $\text{BaMnO}_3$  has antiferromagnetic ordering [21]. Even though the ionic radii and oxidation states of the  $\text{La}^{3+}$  and  $\text{Bi}^{3+}$  ions and  $\text{Ba}^{2+}$  ions are quite similar, the cause of this difference in magnetic and transport properties is of interest [22]. All these characteristics make this compound extraordinary compared to other manganites perovskites. Perovskite manganite is a family of materials that show colossal magnetoresistance [21,23,24]. Colossal magnetoresistance (CMR) materials have a significant number of technological applications i.e. cathode materials for solid fuel cells, new classes of memory devices and magnetic sensors etc. [25,26]. CMR materials feature a high negative magnetoresistance and a ferromagnetic–paramagnetic transition, as well as a metal-insulator transition. The CMR behavior is usually explained using the double exchange theory [27,28] and additional effect, e.g. the strong electron–phonon interaction [29,30]. Remarkably, multiple prior studies have identified  $\text{Gd}^{3+}$  doped compound as a promising electrolyte material due to its better ionic conductivity than (Yttria stabilized Zirconia-YSZ) YSZ electrolyte and the superior electrical characteristics of  $\text{Gd}^{3+}$  ions [31–33]. Some papers also reported the change of the structural and

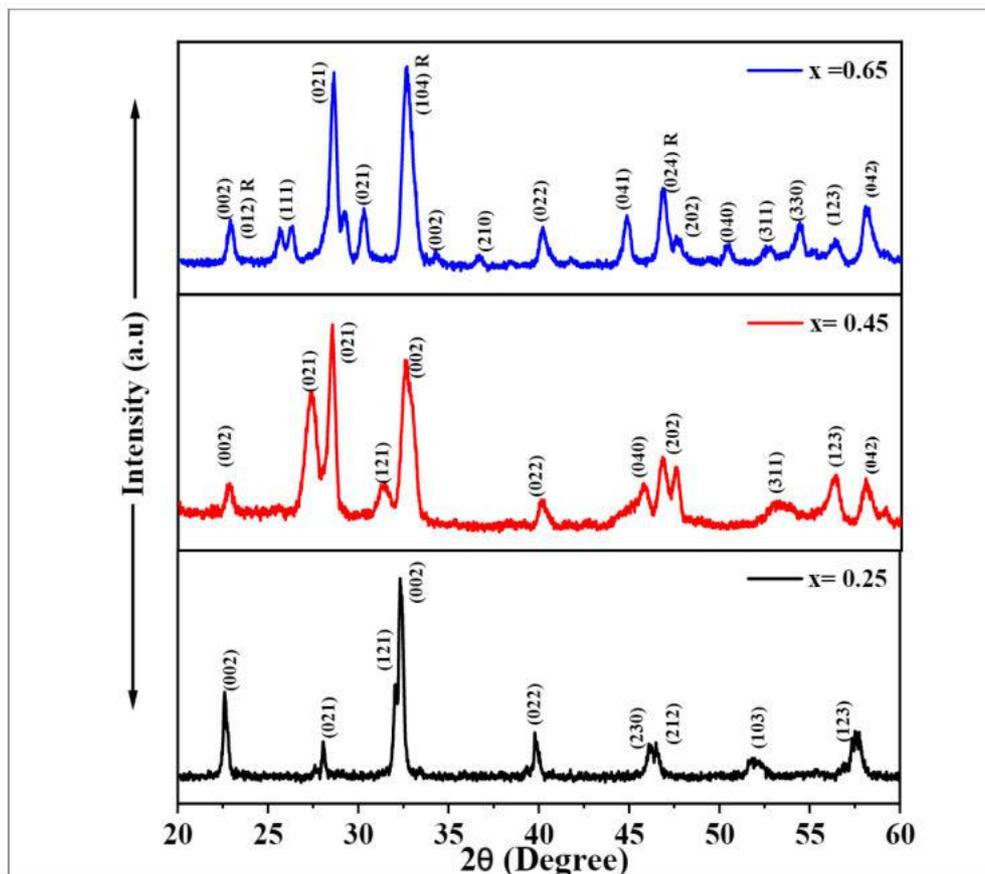


Fig. 1 – XRD pattern for  $\text{La}_{0.665}\text{Bi}_{0.33}\text{Ba}_{0.005}\text{Gd}_x\text{Mn}_{1-x}\text{O}_3$  ( $x = 0.25, 0.45$  and  $0.65$ ) ceramics.

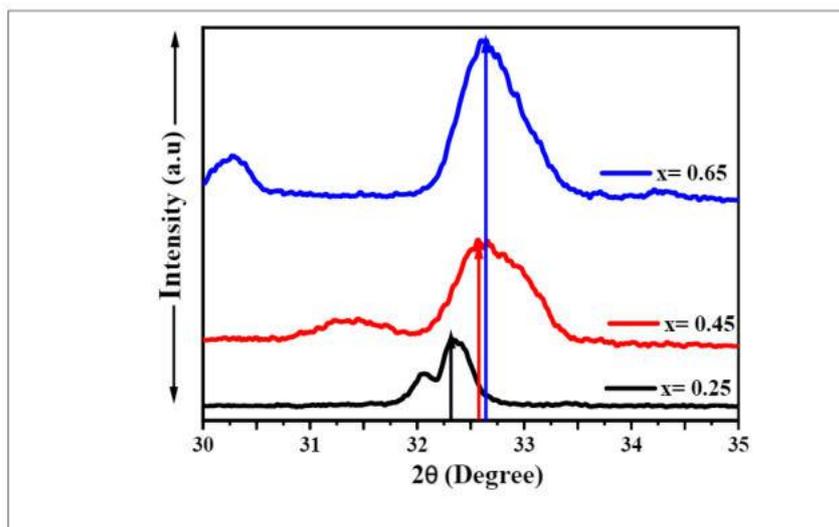


Fig. 2 – XRD Pattern of  $\text{La}_{0.665}\text{Bi}_{0.33}\text{Ba}_{0.005}\text{Gd}_x\text{Mn}_{1-x}\text{O}_3$  ( $x = 0.25, 0.45$  and  $0.65$ ) ceramics.

electrical properties of  $\text{Gd}^{3+}$  ion doped at the Mn site ( $\text{La}_{0.665}\text{Bi}_{0.33}\text{Ba}_{0.005}\text{MnO}_3$ ) with better electrical characterizations [32,34,35]. With the help of Rietveld analysis and impedance spectroscopy we have studied the effect of  $\text{Gd}^{3+}$  ion doping on the structural and electrical properties of  $\text{La}_{0.665}\text{Bi}_{0.33}\text{Ba}_{0.005}\text{Gd}_x\text{Mn}_{1-x}\text{O}_3$  ( $x = 0.25, 0.45$  and  $0.65$ ) ceramics synthesized by the solid-state reaction method.

## 2. Experimental

Polycrystalline samples of  $\text{La}_{0.665}\text{Bi}_{0.33}\text{Ba}_{0.005}\text{Gd}_x\text{Mn}_{1-x}\text{O}_3$  (LBBGMO) ( $x = 0.25, 0.45$ , and  $0.65$ ) were prepared via using conventional solid-state reaction method. The starting materials were with proper stoichiometric proportion i.e.,  $\text{La}_2\text{O}_3$

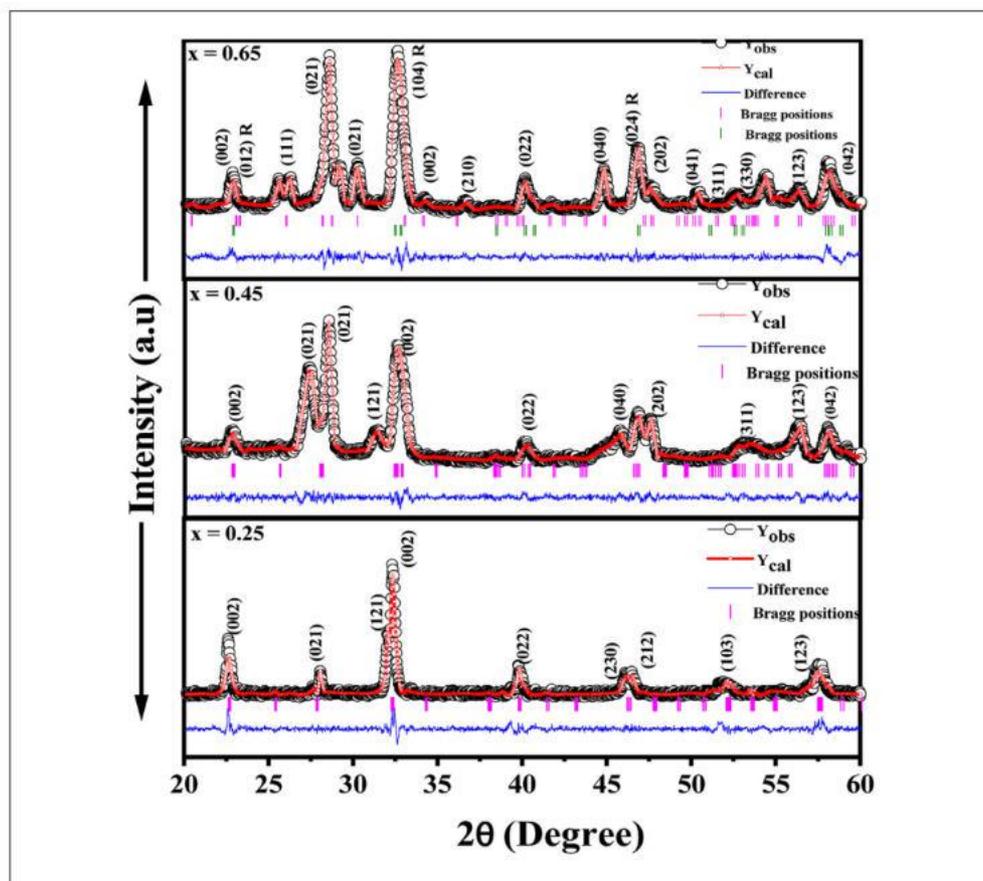


Fig. 3 – Rietveld refinement of XRD pattern of  $\text{La}_{0.665}\text{Bi}_{0.33}\text{Ba}_{0.005}\text{Gd}_x\text{Mn}_{1-x}\text{O}_3$  ( $x = 0.25, 0.45$  and  $0.65$ ) ceramics.

(99.999%), Bi<sub>2</sub>O<sub>3</sub> (99.999%), BaCO<sub>3</sub> (99.999%), Gd<sub>2</sub>O<sub>3</sub> (99.999%), and MnO<sub>2</sub> (99.99%) were taken and mixed in ethanol medium at 6 h and the milled dry powder was calcined at 900 °C for 5 h. After the calcination, the powder was pressed into a disk with 2 wt. % polyvinyl alcohol (PVA as the binder) at 10 MPa pressure using the hydraulic press with 1 mm thickness and 10 mm diameter pellets. After that ceramic pellet were densified by sintering at 1000 °C for 4 h in an alumina crucible in the presence of air. The sintered pellets were polished with different mess size paper for smoothing both surfaces and then again washed in an ultrasonic bath for removing dust/impurities. For removing the mechanical strain (developed during Polishing), the pellets were again for heated at 500 °C for 1 h.

Powder-diffraction experiments was performed on the powder of synthesized ceramics at room temperature by using Panlytical X'pert Pro system equipped with the CuK<sub>α</sub> anode ( $\lambda = 1.5408 \text{ \AA}$ ) from 20°–60° at a scan speed of 2°/min with 0.02 step size. Rietveld analysis of all samples were done by using FullProf Suite software and the phase diagram of the

system was drowned with the help of VESTA software. For the dielectric spectroscopy, we polished pellet surfaces of the sintered samples and make the electrode on both side of the pellet by using silver paste. Impedance Analyzer (IM3570) was used to check the temperature and frequency dependence of impedance for all the samples with heating rate of 0.5 °C min<sup>-1</sup> with three-terminal sample holder at different frequencies (50 Hz–4MHz) and temperature range from RT to 450 °C.

### 3. Result and discussion

#### 3.1. X-ray diffraction analysis

X-ray diffraction pattern of the La<sub>0.665</sub>Bi<sub>0.33</sub>Ba<sub>0.005</sub>Gd<sub>x</sub>Mn<sub>1-x</sub>O<sub>3</sub> (where x = 0.25, 0.45, and 0.65) ceramics were shown in Fig. 1. The XRD data samples were checked using powder XRD at room temperature and it confirms perovskite structure with second phases. Fig. 2 shows that the intensity peak at ~32°

**Table 1 – Refined parameters, for La<sub>0.665</sub>Bi<sub>0.33</sub>Ba<sub>0.005</sub>Gd<sub>x</sub>Mn<sub>1-x</sub>O<sub>3</sub> (x = 0.25, 0.45 and 0.65) ceramics.**

Simulated Parameters		x = 0.25		x = 0.45		x = 0.65	
		Orthorhombic		Orthorhombic		Orthorhombic	Rhombohedral
Lattice Parameters	a (Å)	5.4210		5.4539		5.2533	5.5121
	b (Å)	7.8498		7.7958		7.7026	5.5121
	c (Å)	5.5356		5.5233		5.5567	13.3015
Volume of unit cell	V(Å <sup>3</sup> )	240.8227		234.8371		224.8457	349.9962
Tolerance factor		0.74		0.72		0.71	
Atomic Positions	X	La	0.5070	0.5070	0.5070	0.5070	0.0000
		Bi	0.5070	0.5070	0.5070	0.0000	
		Ba	0.5070	0.5070	0.5070	0.0000	
		Gd	0.0000	0.0000	0.0000	0.0000	
		Mn	0.0000	0.0000	0.0000	0.0000	
		O <sub>1</sub>	-0.0060	-0.0060	-0.0060	0.4510	
	Y	O <sub>2</sub>	0.25900	0.2590	0.2590	.....	
		La	0.2500	0.2500	0.2500	0.0000	
		Bi	0.2500	0.2500	0.2500	0.0000	
		Ba	0.2500	0.2500	0.2500	0.0000	
		Gd	0.0000	0.0000	0.0000	0.0000	
		Mn	0.0000	0.0000	0.0000	0.0000	
	Z	O <sub>1</sub>	0.2500	0.2500	0.2500	0.0000	
		O <sub>2</sub>	0.0300	0.0300	0.0300	.....	
		La	0.0030	0.0030	0.0030	0.2500	
		Bi	0.0030	0.0030	0.0030	0.2500	
		Ba	0.0030	0.0030	0.0030	0.2500	
		Gd	0.0000	0.0000	0.0000	0.0000	
R-factor (%)	Mn	0.0000	0.0000	0.0000	0.0000		
	O <sub>1</sub>	-0.0580	-0.0580	-0.0580	0.2500		
	O <sub>2</sub>	0.2300	0.2300	0.2300	.....		
	R <sub>p</sub>	40.90	14.20	25.20	25.20		
	R <sub>exp</sub>	27.80	13.30	18.40	18.40		
	R <sub>wp</sub>	37.40	14.20	22.60	22.60		
GoF	R <sub>f</sub>	10.80	0.46	4.39	7.16		
	R <sub>Bragg</sub>	8.55	0.85	2.36	6.82		
	χ <sup>2</sup>	1.8100	1.1420	1.5150	1.515		
	Bond Length (Å)	La-O <sub>1</sub>	2.8631	2.6773	2.5107	2.4893	
La-O <sub>2</sub>		2.5909	2.5408	2.5332	.....		
Gd-O <sub>1</sub>		1.9888	1.9754	1.9526	1.9573		
Gd-O <sub>2</sub>		1.9625	1.9437	1.9114	.....		
Bond Angle (degree)	O1-La-O2	113.1140	111.9500	109.9756	84.4160		
	O1-Gd-O2	89.8740	89.8290	89.6290	88.9120		

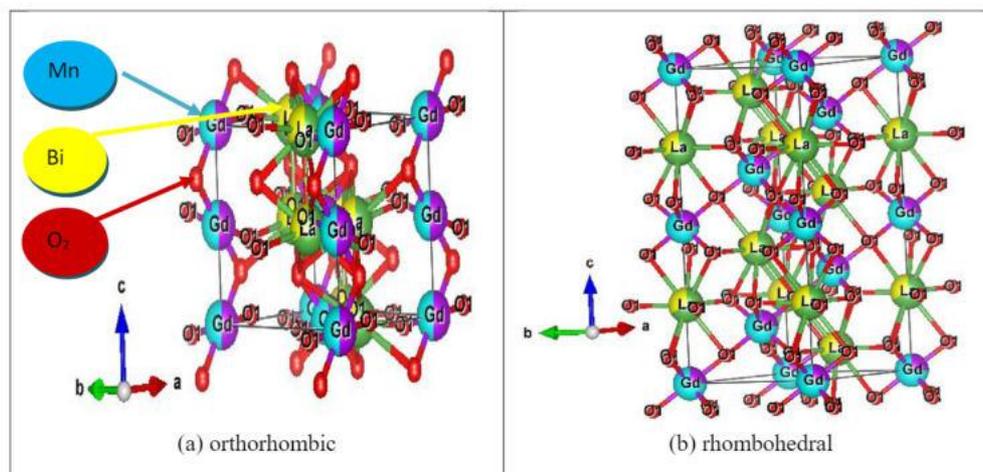


Fig. 4 – Unit cell of  $\text{La}_{0.665}\text{Bi}_{0.33}\text{Ba}_{0.005}\text{Gd}_x\text{Mn}_{1-x}\text{O}_3$  ( $x = 0.25, 0.45$  and  $0.65$ ) using VESTA software by data obtained from Rietveld refinement.

Table 2 – Structural parameters for $\text{La}_{0.665}\text{Bi}_{0.33}\text{Ba}_{0.005}\text{Gd}_x\text{Mn}_{1-x}\text{O}_3$ ( $x = 0.25, 0.45$ and $0.65$ ) ceramics.				
Sample name	Most Intense Peak Position ( $\theta$ )	Most Intense Peak FWHM ( $\theta$ )	Average Crystallite Size (nm)	Lattice Strain ( $\epsilon$ )
$x = 0.25$	32.75	0.38566	138.696	0.11296
$x = 0.45$	32.86	0.40307	149.031	0.08438
$x = 0.65$	32.96	0.45418	162.074	0.06235

shifted towards the higher angle with increase in the concentration of  $\text{Gd}_2\text{O}_3$  content. All the observed diffraction peaks were well indexed with the orthorhombic with Pbnm space group (JCPDS file #85-2218) and rhombohedral structure with

R3-c space group (JCPDS file #85-2219) [36]. For  $x = 0.25$  and  $0.45$ , the structure was orthorhombic but mixed phase structure were observed for  $x = 0.65$  (both orthorhombic and rhombohedral) and a slight splitting of peaks observed at  $\sim 22^\circ$ ,

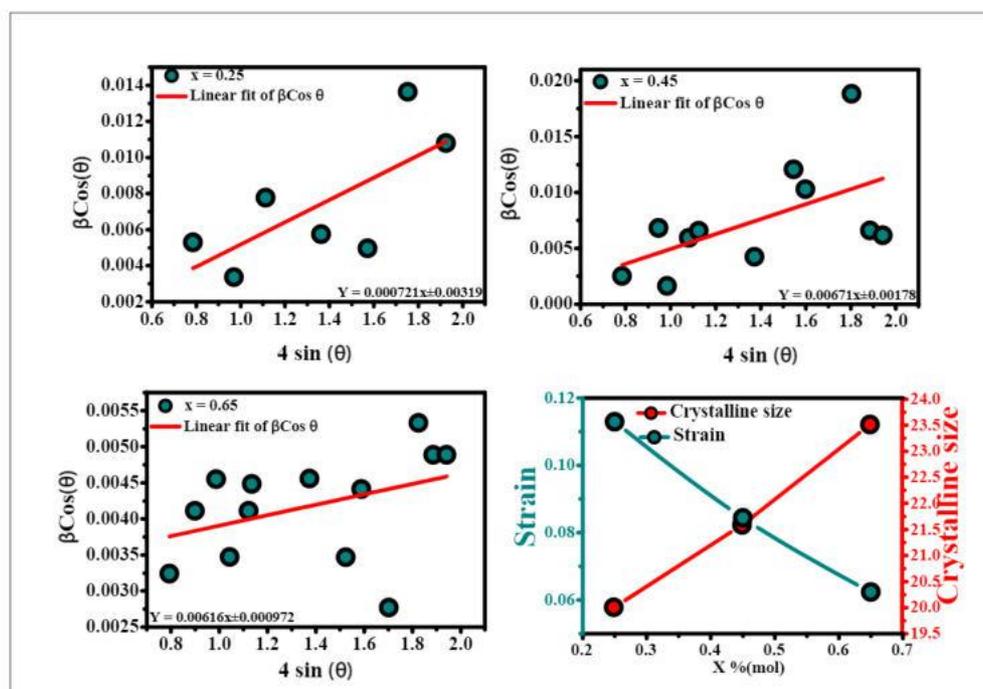


Fig. 5 – (a–c) W–H plots of  $\text{La}_{0.665}\text{Bi}_{0.33}\text{Ba}_{0.005}\text{Gd}_x\text{Mn}_{1-x}\text{O}_3$  ( $x = 0.25, 0.45$  and  $0.65$ ) ceramics and (d) variation of strain and crystallite size with composition.

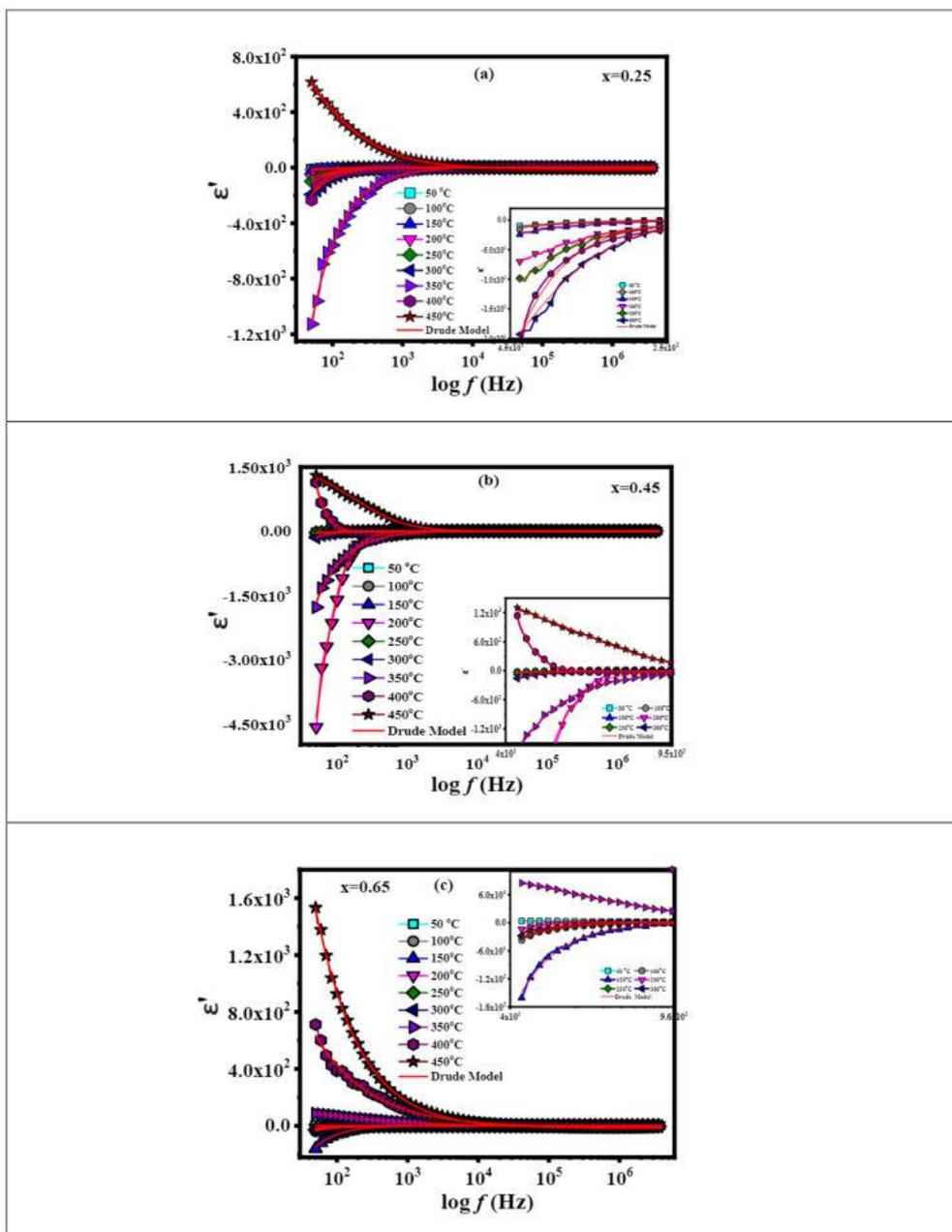
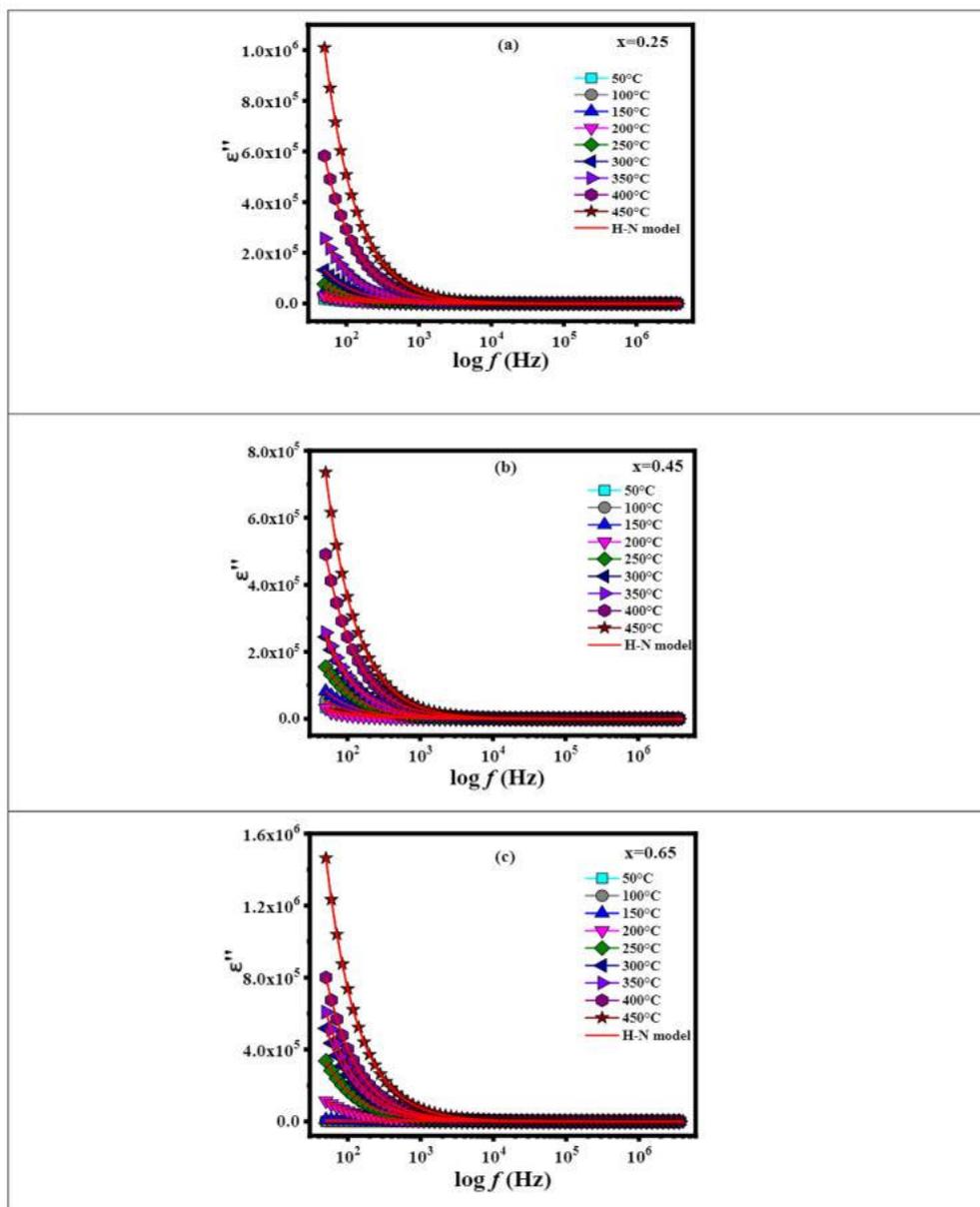


Fig. 6 – (a–c) Real part of dielectric constant vs.  $\log(f)$  for  $\text{La}_{0.665}\text{Bi}_{0.33}\text{Ba}_{0.005}\text{Gd}_x\text{Mn}_{1-x}\text{O}_3$  ( $x = 0.25, 0.45$  and  $0.65$ ) ceramics.

$\sim 33^\circ$ ,  $\sim 41^\circ$ ,  $48^\circ$ ,  $\sim 58^\circ$  [37]. In Fig. 3 by using Rietveld refinement the several structural parameters such as lattice parameters (a, b, c), atomic positions (x, y, z), profile residual factor ( $R_p$ ), expected weighted pattern factor ( $R_{\text{exp}}$ ), weighted profile factor ( $R_{\text{wp}}$ ), full width at half maximum intensity (FWHM) parameters (u, v, w), refinement factor ( $R_f$ ), Bragg factor ( $R_{\text{Bragg}}$ ) were refined several times and observed less than 5 goodness of fit (GoF). All these refined parameters of LBBGMO samples were reported in Table 1. Further VESTA software was used to obtain the crystallographic crystal structure (Fig. 4) of LBBGMO ceramics by employing these parameters. The sample with  $x = 0.25, 0.45$  shows the orthorhombic structure with parameters  $a = 5.421 \text{ \AA}$ ,  $b = 7.8498 \text{ \AA}$ ,  $c = 5.5356 \text{ \AA}$ ,  $v = 240.8227 \text{ \AA}$  and  $a = 5.4539 \text{ \AA}$ ,  $b = 7.7958 \text{ \AA}$ ,  $c = 5.5233 \text{ \AA}$  and  $v = 227.8457 \text{ \AA}$

respectively but with increase the doping concentration of  $\text{Gd}_2\text{O}_3$  as  $x = 0.65$  both orthorhombic and rhombohedral structure co-exist and there lattice parameters were  $a = 5.2533 \text{ \AA}$ ,  $b = 7.7026 \text{ \AA}$ ,  $c = 5.5567 \text{ \AA}$  and  $v = 224.8457 \text{ \AA}$  and  $a = b = 5.5121 \text{ \AA}$ ,  $c = 13.3015 \text{ \AA}$  and  $v = 349.9962 \text{ \AA}$  respectively. The volume of the unit cell decreases when the Gd concentration increases and such type of behavior exist due to the presence of higher radius of  $\text{Gd}^{3+}$  ion ( $0.94 \text{ \AA}$ ) compared to that of  $\text{Mn}^{3+}$  ( $0.53 \text{ \AA}$ ) and changes in the tolerance factor [38]. The tolerance factor of  $\text{La}_{0.665}\text{Bi}_{0.33}\text{Ba}_{0.005}\text{Gd}_{0.75}\text{Mn}_{0.25}\text{O}_3$  were calculated by using ionic radii ( $r_{\text{La}^{3+}} = 1.22 \text{ \AA}$ ,  $r_{\text{Ba}^{2+}} = 1.47 \text{ \AA}$ ,  $r_{\text{Bi}^{3+}} = 1.24 \text{ \AA}$ ,  $r_{\text{Mn}^{4+}} = 0.53 \text{ \AA}$ ,  $r_{\text{Gd}^{3+}} = 0.94 \text{ \AA}$  and  $r_{\text{O}^{2-}} = 1.35 \text{ \AA}$ ) and we found that the tolerance factor for  $x = 0.25, 0.45$  and  $0.65$  decreases as  $0.76, 0.72$ , and  $0.71$  respectively and clearly



**Fig. 7 – (a–c) Imaginary part of dielectric constant vs. log (f) for  $\text{La}_{0.665}\text{Bi}_{0.33}\text{Ba}_{0.005}\text{Gd}_x\text{Mn}_{1-x}\text{O}_3$  ( $x = 0.25, 0.45$  and  $0.65$ ) ceramics.**

confirms that the sample has both orthorhombic and rhombohedra structure. The value of tolerance factor ( $t$ ) of  $\text{La}_{0.665}\text{Bi}_{0.033}\text{Ba}_{0.005}\text{Gd}_x\text{Mn}_{1-x}\text{O}_3$  were indexed in Table 1. The average crystallite size decreases with increasing  $\text{Gd}^{3+}$  concentration which is shown in Table 2. The decreasing size with increasing concentration may be attributed to induced strain caused by difference in ionic radius of  $\text{Gd}^{3+}$  (0.94 Å) and  $\text{Mn}^{3+}$  (0.53 Å). Micro strains and average crystallite size of all the samples were calculated and compared using the Williamson-Hall (W–H) method. In the XRD pattern, it is important to broadening the Bragg peaks to estimate the crystalline size and the lattice strain of the pattern [39,40]. XRD largely depends on the effect of the sample and the equipment and cause to broadening of a particular Bragg peak.

W–H plots for all the compositions ( $x = 0.25, 0.45, 0.65$ ) were shown in Fig. 5(a–c). Preferred Bragg peaks were selected

and plotted for  $\beta_{hkl} \cos \theta$  along Y-axis and  $4 \sin \theta$  along X-axis. As a result, the slope and intercept on the Y-axis of the linearly fitted line were used to determine strain ( $\epsilon$ ) and crystallite size ( $D$ ) [40]. The plots clearly show that the samples have a positive slope, indicating that the samples exhibit positive strain [41].

Further, the average crystallite size ( $D$ ) was calculated by the Debye–Scherrer equation:

$$D = \frac{K\lambda}{\beta \cos \theta} \tag{1}$$

where  $D$  in Eq. (1) represents crystallite size,  $K$  is shape factor usually take value 0.9,  $\lambda$  is wavelength of the source radiation (Cu,  $K\alpha$ ), i.e., 0.15406 nm,  $\beta_{hkl}$  is full width at half maximum (FWHM) of Bragg peaks corresponding  $hkl$  and strain was found by using Eq. (2)

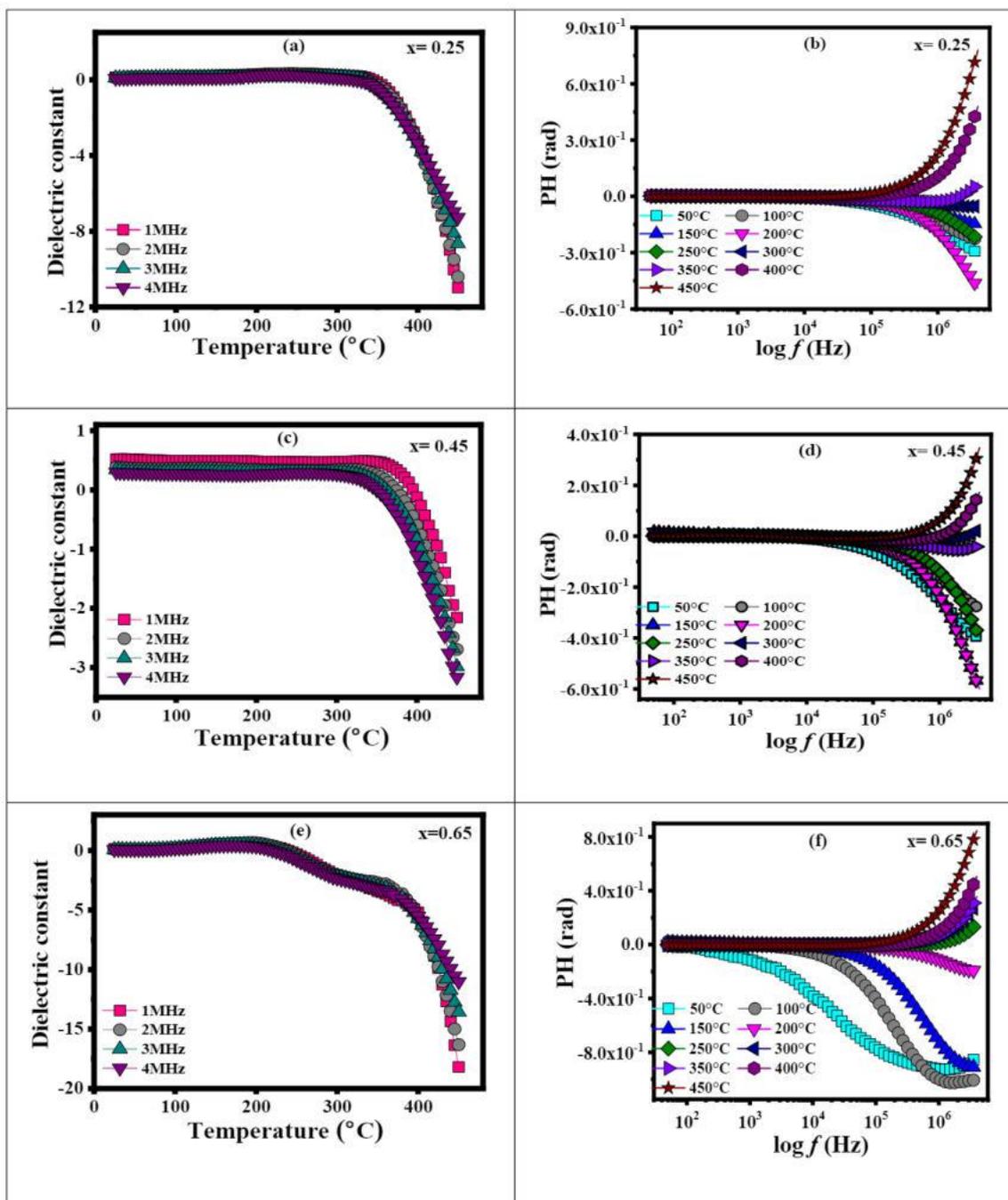


Fig. 8 – (a, c and e) Variation of dielectric constant vs. temperature at observed frequencies and (b, d and f) variation of phase vs.  $\log(f)$  for  $\text{La}_{0.665}\text{Bi}_{0.33}\text{Ba}_{0.005}\text{Gd}_x\text{Mn}_{1-x}\text{O}_3$  ( $x = 0.25, 0.45$  and  $0.65$ ) ceramics.

$$\beta_{hkl} \cos \theta = \left( \frac{K\lambda}{D} \right) + 4\epsilon \sin \theta \quad (2)$$

The lattice strain and crystalline size for  $x = 0.25, 0.45$  and  $0.65$  is  $0.1129$  and  $20.0854$  nm, and  $0.0843$  and  $21.5821$  nm and  $0.6235$  and  $23.5091$  nm respectively.

### 3.2. Dielectrics study

The frequency dependent real part of the dielectric permittivity was shown in Fig. 6(a–c) representing the variation of real part of dielectric constant with frequency at different

temperatures. From fig it was clear that at only  $450^\circ\text{C}$  temperature the +ve dielectric value exist in low frequency range. Below  $400^\circ\text{C}$  the dielectric constant has a –ve dielectric at low frequency. It means that samples had a low negative dielectric constant (NDC) at low frequency and positive for higher frequency ( $10^3$ – $10^6$  Hz) range. At low frequencies, the dielectric constant ( $\epsilon'$ ) decreases as the temperature increases, and as the temperature increases even higher, the dielectric constant becomes a negative value at certain temperatures and frequencies. However, at higher temperatures, the dielectric constant ( $\epsilon'$ ) becomes more negative, and the value of negative

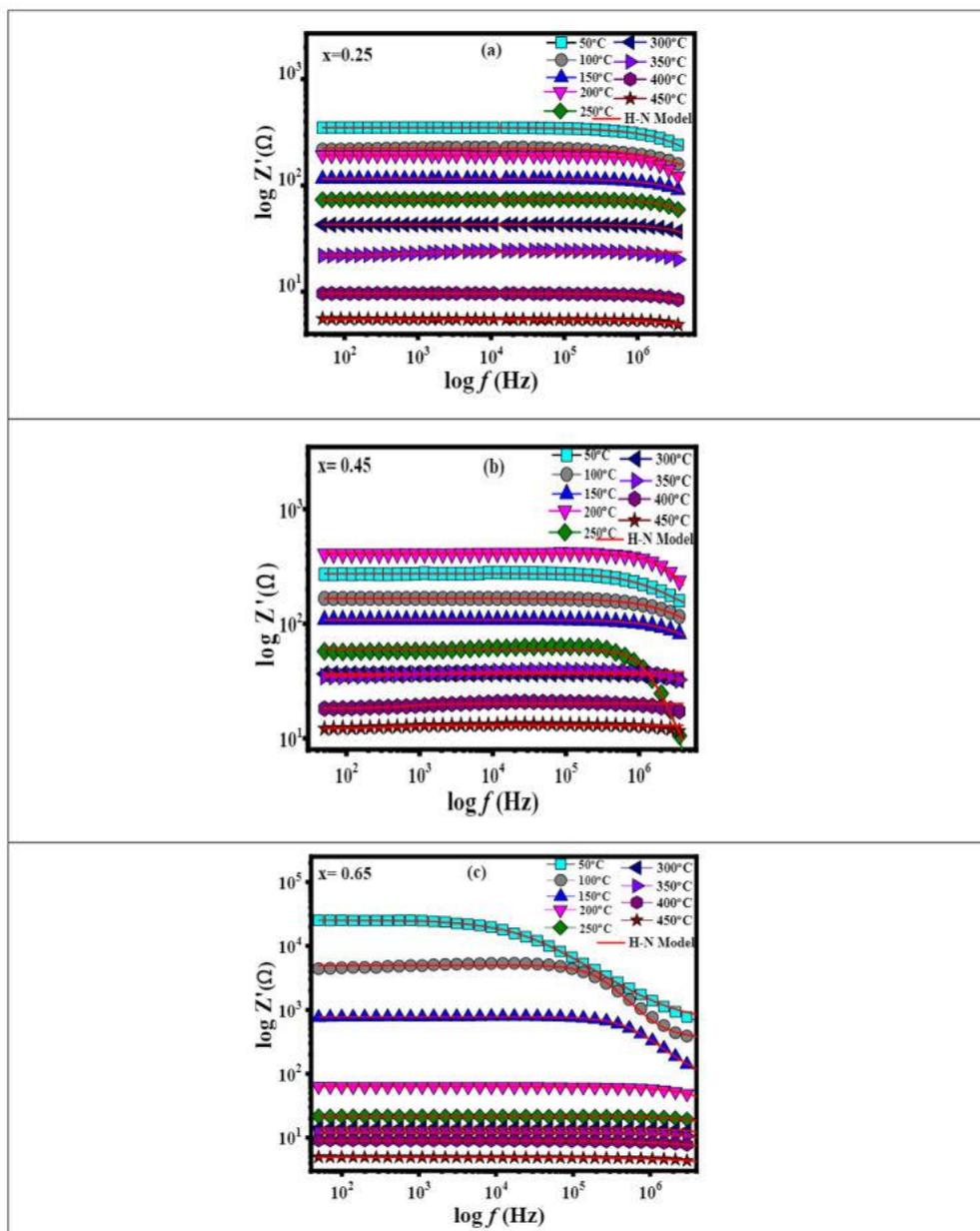
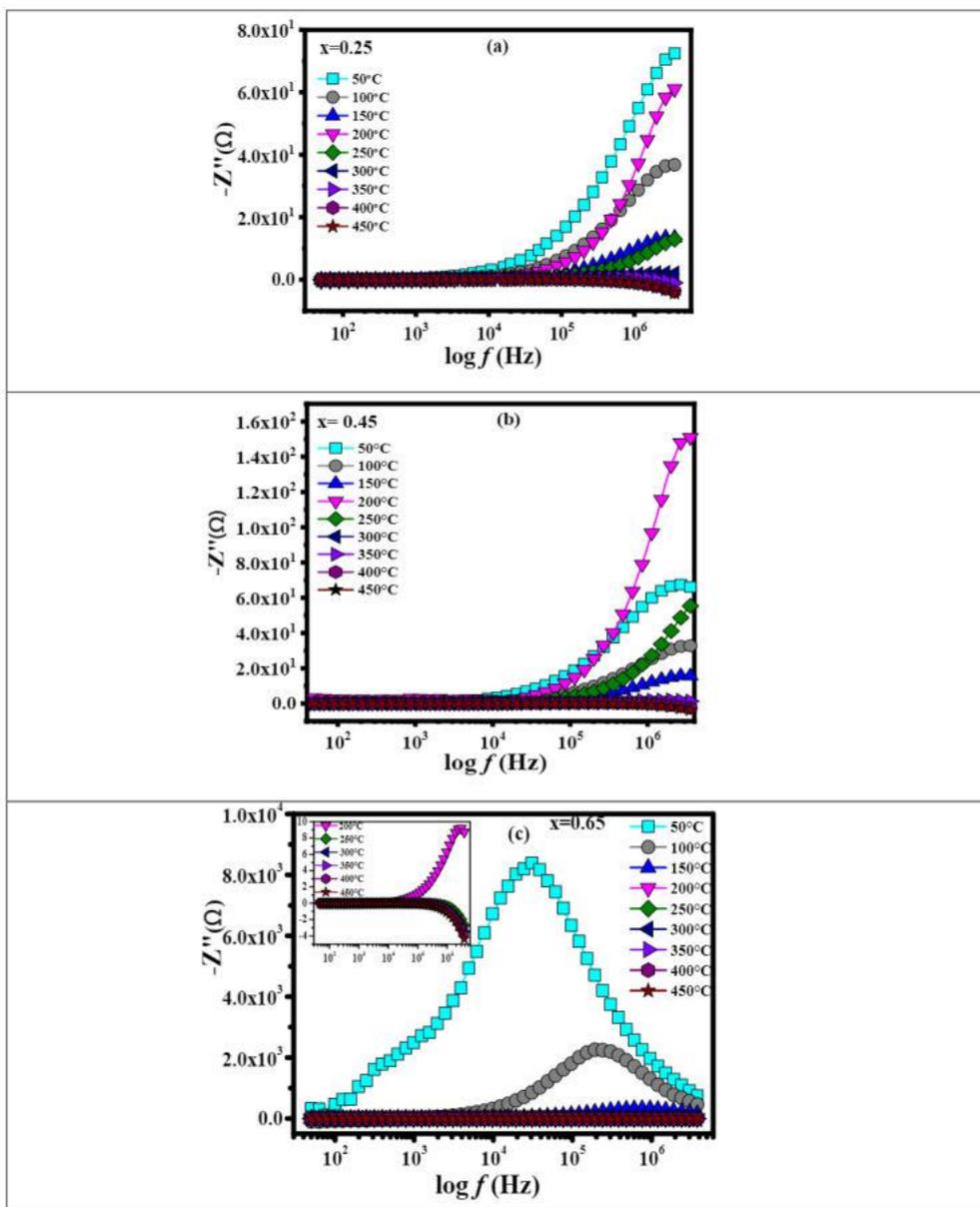


Fig. 9 – (a–c) Real component of impedance vs. log (f) for  $\text{La}_{0.665}\text{Bi}_{0.33}\text{Ba}_{0.005}\text{Gd}_x\text{Mn}_{1-x}\text{O}_3$  ( $x = 0.25, 0.45$  and  $0.65$ ) ceramics.

decreases as the frequency increases and the value of dielectric constant becomes positive after 350 °C. Because of large electric charge gathering, the composition's negative dielectric constant in the low frequency domain could be attributable to the gathering of space charge polarization and interfacial polarization effects [42]. According to Drude's classical hypothesis [43], the Negative Dielectric Constant (NDC) might develop if electrons–electrons unite by overcoming their repulsion (i.e. Coulombic force must be attractive) [44]. Coulomb's law describes the force between a system of charges as their product and inversely proportional to the square of the distance between them, as  $F = Kq_1q_2/\epsilon_r r^2$ , where  $\epsilon_r$  is relative permittivity of the medium. The sign of force indicates the nature; positive for repulsive and negative for attractive, If the force between like charges is to be attractive,

the only possibility to have a negative  $\epsilon_r$  value. The direction of the electric field developed in the sample is in the opposite direction of the applied electric field, resulting in a negative value of dielectric constant [45] i.e. the material's polarization is in the opposite direction as the applied electric field. NDC exemplifies polarization that opposes the applied electric field, like diamagnetic materials expelled magnetic field lines or (due to negative polarization) indicating the negative dielectric susceptibility [22]. The NDC can also be called the dielectric property of sample [46]. At low frequencies, the low-frequency plasmon of free electrons in the samples caused a plasma-like negative permittivity behavior. Negative permittivity was observed for Drude-type negative permittivity when the plasma oscillation frequency of delocalized electrons was larger than the frequency of the external electric field [47,48]



**Fig. 10 – (a–c) Imaginary component of impedance vs.  $\log(f)$  for  $\text{La}_{0.665}\text{Bi}_{0.33}\text{Ba}_{0.005}\text{Gd}_x\text{Mn}_{1-x}\text{O}_3$  ( $x = 0.25, 0.45$  and  $0.65$ ) ceramics.**

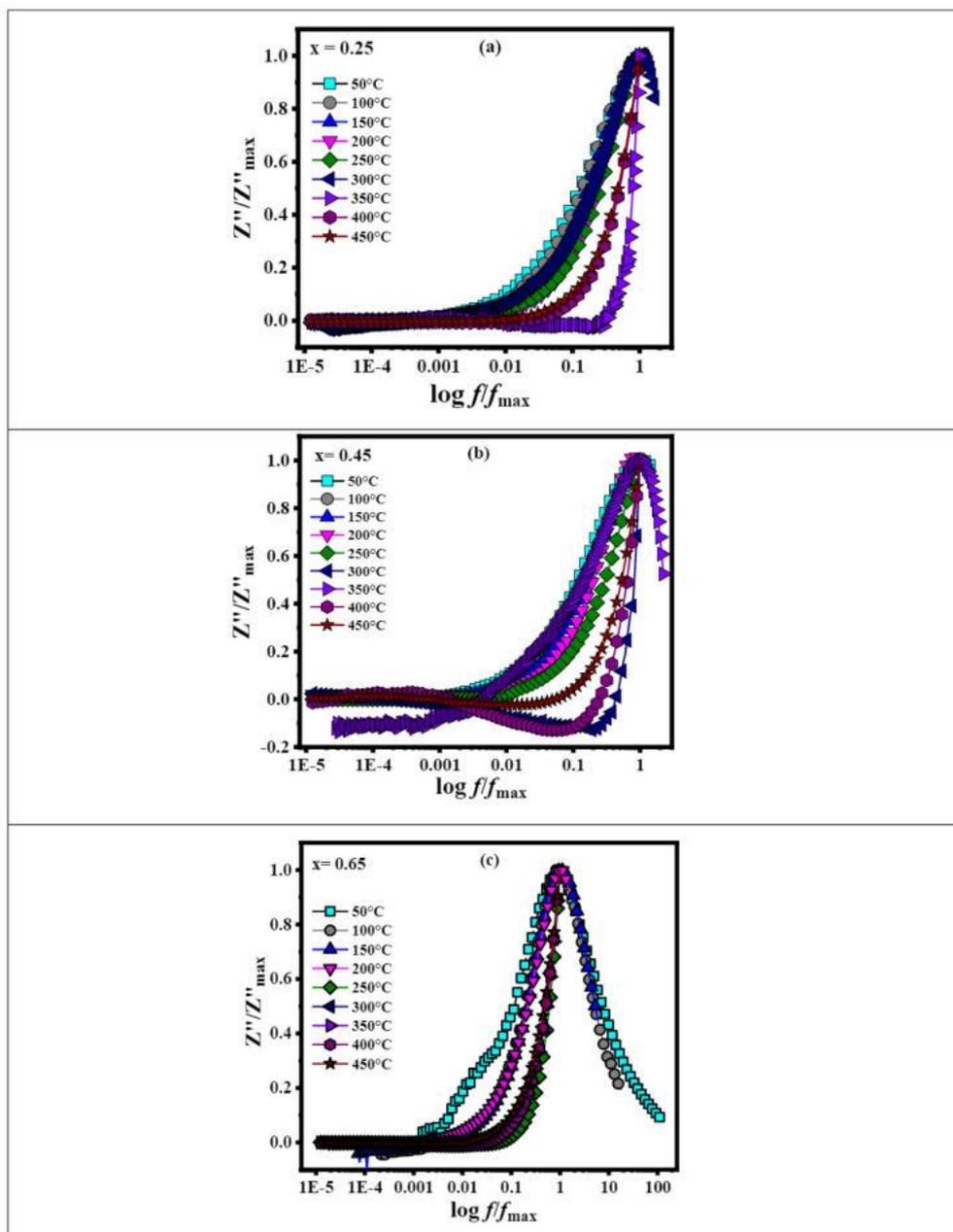
and the NDC decrease with increasing frequency and temperature above 350 °C. The following Drude model certainly explains permittivity's dispersion behavior [49].

$$\epsilon' = \epsilon_{\infty} - \frac{\omega_p^2}{\omega^2 + \Gamma_D^2} \quad (3)$$

$\epsilon_{\infty}$  is permittivity at high frequency limit,  $\omega_p$  is the plasmonic frequency and  $\Gamma_D$  is damping constant. The fitting curve matched with experimental curves of  $\epsilon'$  which indicating that drude model was fit with the samples.

Fig. 7(a–c) showing the variation of imaginary part of dielectric constant ( $\epsilon''$ ) with frequency and at various temperatures. This indicates that imaginary part ( $\epsilon''$ ) increases with increasing temperature and at high frequencies the magnitude was low. Imaginary part was inversely

proportional to frequency. In other words, the larger value of  $\epsilon''$  at lower frequencies and  $\epsilon''$  decreases gradually with increasing frequency and remains constant at higher frequencies and after 1 KHz it stay steady. The estimation of  $\epsilon''$  were larger at lower frequencies is considerably due to the contribution of ionic polarizations, space charge polarizations and interface polarizations. Imaginary part of dielectric constant ( $\epsilon''$ ) remains independent of frequency at higher frequencies; because at higher frequencies electric dipoles are unable to chase the quick change of alternating applied electric field [50]. Because the atomic and electronic polarizations remain unchanged at low frequencies, consequently the complex dielectric dispersion in the lower frequency range was attributed to interfacial polarization only [51].



**Fig. 11 – (a–c) Variation of  $Z''/Z''_{\max}$  vs.  $\log(f/f_{\max})$  for  $\text{La}_{0.665}\text{Bi}_{0.33}\text{Ba}_{0.005}\text{Gd}_x\text{Mn}_{1-x}\text{O}_3$  ( $x = 0.25, 0.45,$  and  $0.65$ ) ceramics at different temperatures.**

The imaginary part of the dielectric constant were well associated to conductivity of the material as,  $\sigma_{ac} = \omega\epsilon_0\epsilon''$  [52]. The experimental data were fitted to the Havriliak-Negami (H–N) model. Using this model, the observed dispersion of imaginary part of the dielectric constant can be demonstrated utilizing Eq. (4)

$$\epsilon'' = \epsilon_{\infty} + \frac{(\epsilon_s - \epsilon_{\infty})}{[1 + (i\omega\tau)^{\alpha\beta}]^{\beta}} \quad (4)$$

where  $\epsilon_{\infty}$  is the permittivity at the high frequency limit, where  $\epsilon_s$  is the static, low frequency permittivity, and  $\tau$  is the relaxation time, where  $0 < \alpha < 1$  and  $0 < \beta < 1$ ,  $\alpha$  and  $\beta$  describe the asymmetry and broadness of the spectra and  $\omega$  is the angular frequency.

Fig 8(a, c, e) shows the variation of dielectric constant ( $\epsilon'$ ) with temperature at different observed frequencies. The dielectric constant as a function of temperature is the tool for observing phase transition in the system. All these figures reveals that the dielectric constant was initially constant up to 300–350 °C temperature but after that it decreases with increasing temperature, and all samples shows a negative dielectric constant after a particular temperature at all the frequencies. The electrical character of tested sample may change from capacitive to inductive one. It can be assumed, by resemblance with a diamagnetic material in the magnetic field that the material with negative dielectric constant has dielectric properties i.e. the electric field inside the sample has the opposite direction to the applied external electric field.

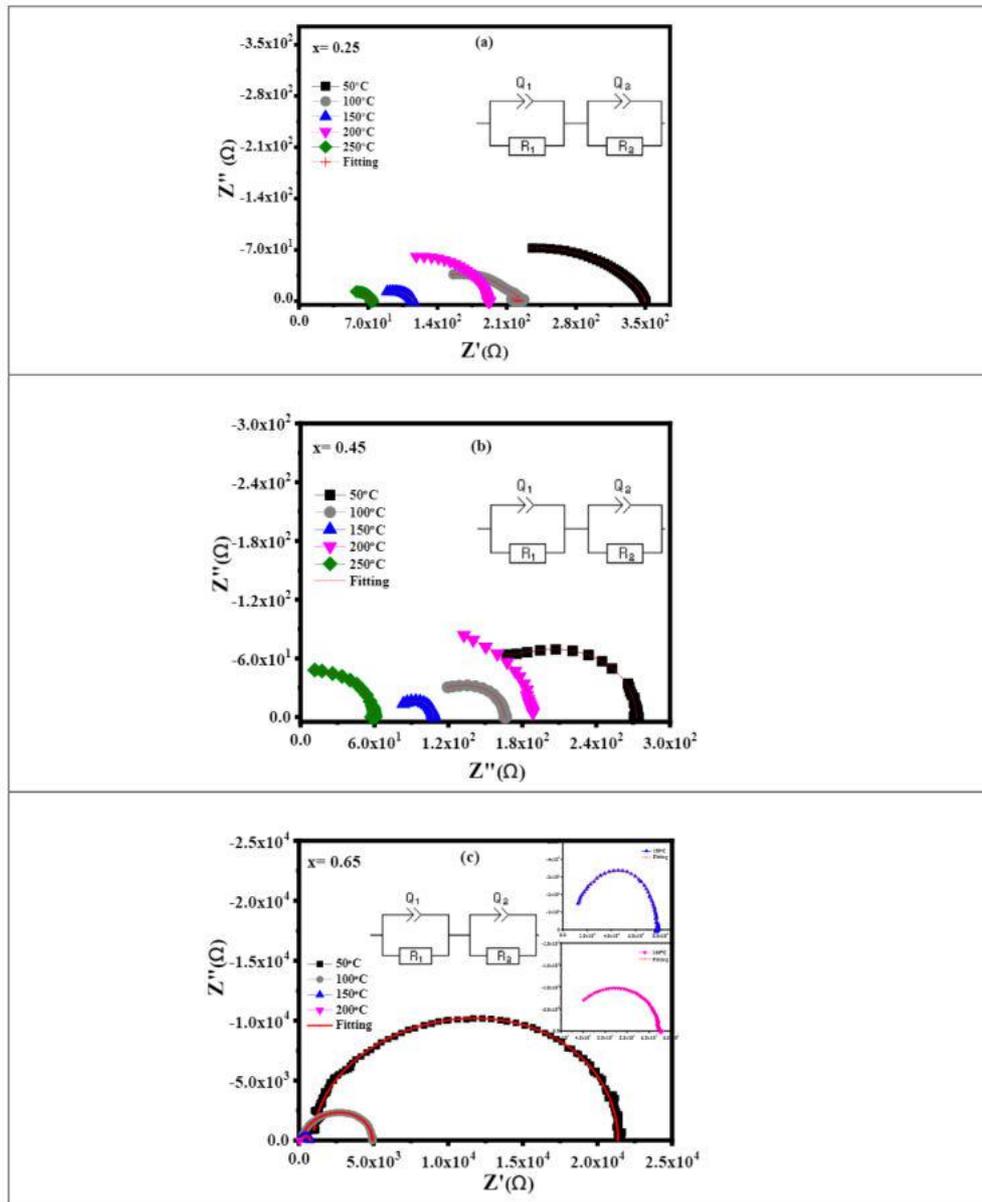


Fig. 12 – (a–c) Cole–cole plot for  $\text{La}_{0.665}\text{Bi}_{0.33}\text{Ba}_{0.005}\text{Gd}_x\text{Mn}_{1-x}\text{O}_3$  ( $x = 0.25, 0.45$  and  $0.65$ ) ceramics at temperature range  $50^\circ\text{C}$ – $250^\circ\text{C}$ .

Fig. 8(b, d, f) shows the variation of phase angle ( $\theta$ ) with frequency at different temperatures. The material was purely resistive, and the voltage and current were synchronous at  $\theta = 0^\circ$ . In capacitive or inductive materials, current and voltage are usually unsynchronized [53]. The voltage will lead current by  $\theta = 90^\circ$  in an inductive circuit; however, voltage lags current by  $90^\circ$  ( $\theta = -90^\circ$ ) in capacitive circuit. In our samples, the magnitude of  $\theta$  value less than  $10^1\text{ Hz}$ – $10^5\text{ Hz}$  region was not larger but phase angle below  $10^5$ – $10^6\text{ Hz}$  region shift from negative to positive value. Phase angle ( $\theta$ ) shifted from negative to positive with increasing temperature, indicate the occurrence of capacitive–inductive transition. From Fig. 8(b, d, f) it was clearly observed that the negative values of phase angle ( $\theta$ ) at temperature range  $50$ – $300^\circ\text{C}$  for  $x = 0.25$ , which indicating capacitive character and above this temperature phase angle had positive value which indicate the inductive

character of materials. Whereas with the increasing compositions capacitive–inductive transition happened at low temperatures. It was observed that Phase angle value of sample switched from negative to positive at  $\sim 350^\circ\text{C}$ ,  $300^\circ\text{C}$  and  $250^\circ\text{C}$  for compositions  $x = 0.25, 0.45$  and  $0.65$  respectively, in other words phase shifting occurs at above mentioned temperatures.

Fig. 9(a–c) shows the variation of real component of impedance ( $Z'$ ) with frequency at different temperatures for  $\text{La}_{0.665}\text{Bi}_{0.033}\text{Ba}_{0.005}\text{Gd}_x\text{Mn}_{1-x}\text{O}_3$  ( $x = 0.25, 0.45$ , and  $0.65$ ) ceramics. The higher impedance values were observed at the lower frequency range. As we investigated impedance in higher frequency range with increasing temperature, the real component of impedance was observed decreases. This phenomenon is associated with increases in charge carrier mobility and a decrease in trapped charge density. The same

**Table 3 – The fitted parameters from Cole–Cole plots for  $\text{La}_{0.665}\text{Bi}_{0.33}\text{Ba}_{0.005}\text{Gd}_x\text{Mn}_{1-x}\text{O}_3$  ( $x = 0.25, 0.45$  and  $0.65$ ) ceramics in the range  $50\text{ }^\circ\text{C}$ – $250\text{ }^\circ\text{C}$ .**

x	Temp ( $^\circ\text{C}$ )	$R_1$ ( $\Omega$ )	$L_1$ (H)	$R_2$ ( $\Omega$ )	$C_2$ (F)
x = 0.25	50 $^\circ\text{C}$	238.8	$0.134\text{e}^{-3}$	107.6	$24.24\text{e}^{-15}$
	100 $^\circ\text{C}$	157.8	$71.51\text{e}^{-6}$	61.48	$52.2\text{e}^{-15}$
	150 $^\circ\text{C}$	83.6	$27.49\text{e}^{-6}$	30.98	$0.1436\text{e}^{-12}$
	200 $^\circ\text{C}$	76.09	$77.67\text{e}^{-6}$	30.91	$49.84\text{e}^{-15}$
	250 $^\circ\text{C}$	42.73	$-0.1347\text{e}^{-6}$	30.82	$1.346\text{e}^{-9}$
x = 0.45	50 $^\circ\text{C}$	155.2	$-1.256\text{e}^{-6}$	117.3	$1.127\text{e}^{-9}$
	100 $^\circ\text{C}$	111.1	$-0.4799\text{e}^{-6}$	54.46	$1.909\text{e}^{-9}$
	150 $^\circ\text{C}$	76.19	$-28.09\text{e}^{-9}$	31.72	$2.545\text{e}^{-9}$
	200 $^\circ\text{C}$	98.51	$-1.827\text{e}^{-6}$	89.6	$0.6725\text{e}^{-9}$
	250 $^\circ\text{C}$	-4.162	$-0.911\text{e}^{-6}$	63.38	$1.23\text{e}^{-9}$
x = 0.65	50 $^\circ\text{C}$	1015	$-30.72\text{e}^{-6}$	20366	$0.1439\text{e}^{-9}$
	100 $^\circ\text{C}$	280.6	$-5.871\text{e}^{-6}$	4646	$0.1196\text{e}^{-9}$
	150 $^\circ\text{C}$	109.4	$-1.363\text{e}^{-6}$	660.3	$0.3399\text{e}^{-9}$
	200 $^\circ\text{C}$	38.56	$0.1431\text{e}^{-6}$	23.66	$2.7\text{e}^{-9}$

phenomena of real part of impedance were observed in other polycrystalline samples also at lower frequencies [54]. A merging of  $Z'$  curves for different temperature was observed at high frequencies, indicating that space charge polarization is existent at high frequency range [55]. With increasing temperature, the magnitude of  $Z'$  decreases and merges at high frequencies, resulting in a constant value. This reduction reveals the semiconductor behavior of the compound [56].

The variation in the imaginary component of impedance with frequency at different temperatures shown in Fig. 10(a–c). The observed asymmetric peak clearly indicates that at increasing higher temperatures peak shifted towards the lower side. This phenomenon shows that the material possesses temperature dependent relaxations. The asymmetric peak is caused by the spread of relaxation time as temperature increases. The relaxation time decreases as the temperature increases; at lower frequencies, relaxation was caused by the presence of immobile charge carriers; at higher frequencies, relaxation was caused by charge carrier hopping or variation in local polar domains [57–59]. As the temperature increases,  $Z''$  shifts towards the higher frequencies side, because the materials exhibit an electrical relaxation phenomenon [60]. The center of the observed peak does not lie at the same frequency; which shows non-Debye type relaxation presence in all ceramic materials [61].

Fig. 11(a–c) shows the normalized plot of  $Z''/Z''_{\text{max}}$  vs.  $\log(f/f_{\text{max}})$  at various temperatures. All the curves at different temperatures were found to overlap with the same master curve. The overlapping of curves shows that the relaxation dynamics almost stay unchanged with the measurement temperature or dynamical processes shows temperature independent behavior. The curves shows the presence of non-Debye type of relaxation phenomenon [62,63].

In general, for the electrode/ceramic/electrode, the values of resistance  $R$  and capacitance  $C$  can be analyzed by an equivalent circuit of one parallel resistance–capacitance (RC) element. The complex impedance spectrum (Nyquist plot) i.e., variation of real and imaginary part of impedance, observed at different temperatures, were shown in Fig. 12(a–c). By impedance spectroscopy we analyzed the presence of the semicircular arcs, whose development pattern changes with

rise in temperature. The effect of temperature on impedance behavior is more important because as temperature increase, the symmetrical nature of the arcs increases and the arcs move towards the origin of the complex simple plot in the center of the arcs. The high frequency semicircle was due to the bulk property of the material and low frequency semicircle was due to the grain boundary effect. The decreasing value of grain boundary resistance with increasing temperature, indicates the Negative Temperature Coefficient Resistance (NTCR) which reveals a normal semiconductor behavior of the materials [64]. Fig. 12(a–c) shows the variation of real and imaginary part of impedance, measured at different temperatures ( $50\text{ }^\circ\text{C}$ – $2500\text{ }^\circ\text{C}$ ). It can clearly show that the semicircular arc is not obtained in higher frequency may be due to the grain melt during sintering and the lower frequency semicircles may corresponds to the grain boundary effect. The effect of temperature on impedance behavior is more important because semicircular nature of the arcs decreases as temperature increases.

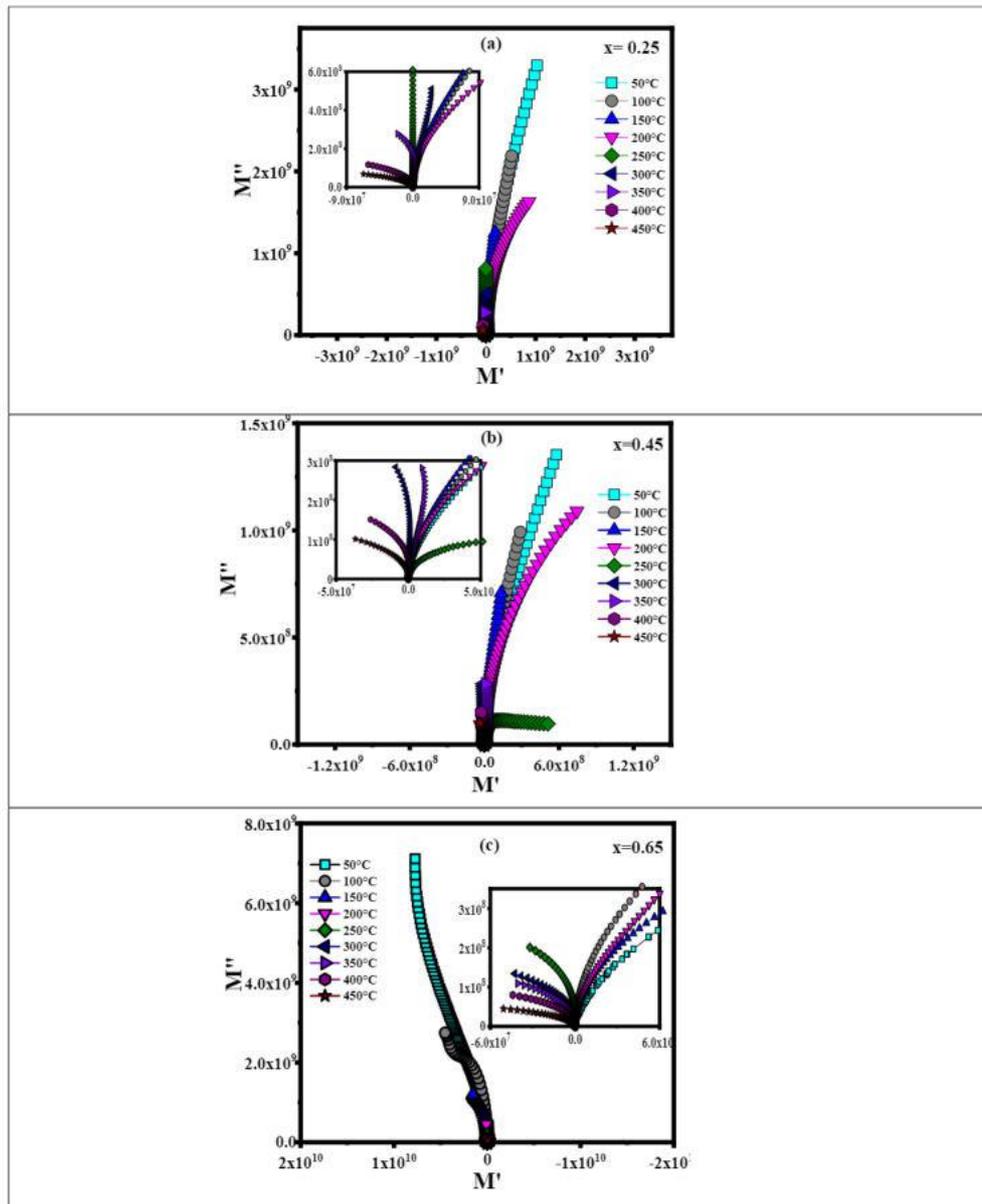
Single semi-circular arc was obtained in low frequency range, whose center lies below the real and the semi-circular arcs decreases with increasing temperature confirms the negative temperature coefficient (NTC) of resistance. The Cole–Cole plots were fitted with an equivalent circuit to confirm the individual contribution of grain and grain boundary. The expression for the complex impedance can be described as,

$$C = L_1 + R_1 + C_2/R_2 \tag{5}$$

The fitting values of inductance, capacitance and resistance for grain and grain boundary ( $L_1, R_1, C_2, R_2$ ) are obtained and listed in Table 3. The grain boundary resistance is more than the grain resistance at all temperatures except at  $250\text{ }^\circ\text{C}$ . The analysis of the curves shows that the semicircle shows some dispersion degree instead of a semicircle centered on the axis. This decentralization reflects the non-Debye-type relaxation.

Complex modulus plot for real and imaginary part of dielectric modulus ( $M'$  versus  $M''$ ), known as Cole–Cole plots, shown in Fig. 13(a–c). The Cole–Cole plot were used to investigate the presence of grain conduction and grain boundaries effect in the ceramic materials. From the graphs we have clearly observed there was phase transition in curves from first quadrant to second quadrant (+ve to -ve phase), these transitions were also observable in the phase vs. frequency graph, which is related to capacitive–inductive transitions [45,65,66].

Fig. 14(a–c) shows the variation of ac conductivity ( $\sigma_{\text{ac}}$ ) with frequency ( $50\text{ Hz}$ – $4\text{ MHz}$ ) for  $\text{La}_{0.665}\text{Bi}_{0.33}\text{Ba}_{0.005}\text{Gd}_x\text{Mn}_{1-x}\text{O}_3$  ( $x = 0.25, 0.45,$  and  $0.65$ ) ceramics at different observed temperatures. Graph shows that the conductivity spectra of each sample exhibits two distinct regions corresponding to (i) frequency independent conduction (plateau region) and (ii) frequency dependent ac conduction (dispersive region) [67]. At lower frequencies, a plateau or frequency-independent behavior of ac conductivity indicates the predominance of dc conductivity to conduction mechanism and the absence of hopping charge carrier polarization. Through a tunnelling process from one site to another site, electrons hopping



**Fig. 13 – (a–c) Complex modulus plot for  $\text{La}_{0.665}\text{Bi}_{0.33}\text{Ba}_{0.005}\text{Gd}_x\text{Mn}_{1-x}\text{O}_3$  ( $x = 0.25, 0.45$  and  $0.65$ ) ceramics at different temperatures.**

occurred between bound states. A drop in ac conductivity was observed after a particular frequency, which was attributed to a mismatch between the hopping frequency and applied frequencies. When the applied frequency exceeds the hopping frequency, hopping becomes out of phase with the applied frequency, and ac conductivity decreases as frequency increases. Deviations from ideal conditions were observed, and the system contained a small number of free charge carriers. The frequency dependence were analyzed by means of “Jonscher’s Universal Power Law” [68] and by using this law we calculated the fitting parameters. The hopping process between the charge carriers, according to Jonscher, is also

responsible for the frequency dependency of ac conduction. From Fig 14(a–c), it can be estimated that at low frequency  $\sigma_{ac}$  changes very slowly, and at high frequency, it increases as the temperature increases up to 350 °C and at the high frequency it decreases with the increase in temperature. The ac conductivity  $\sigma_{ac}$  curve shows an excellent fit (solid line) by the modified Jonscher model, as in Eqs. (6 and 7):

$$\sigma_{ac} = \sigma_{DC} + A1\omega^{S1} + A2\omega^{S2} \quad (6)$$

where  $A1$ ,  $A2$  are constants,  $S1$ ,  $S2$  are the frequency exponents and  $\sigma_{DC}$  is the DC conductivity which is associated with long-range motion of electrical charge carriers.

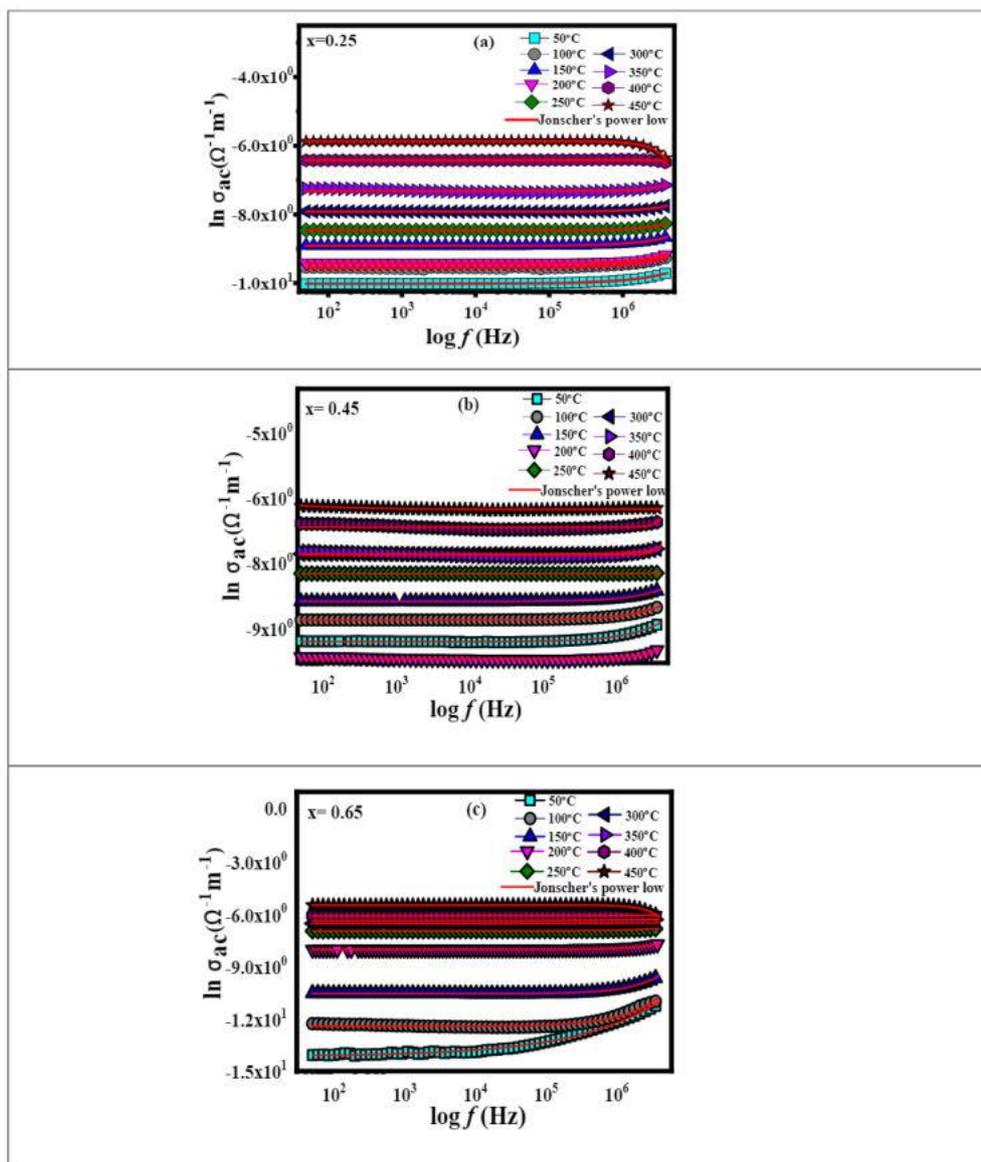


Fig. 14 – (a–c) AC conductivity vs. log (f) for  $\text{La}_{0.665}\text{Bi}_{0.33}\text{Ba}_{0.005}\text{Gd}_x\text{Mn}_{1-x}\text{O}_3$  ( $x = 0.25, 0.45$  and  $0.65$ ) ceramics.

Fig. 15(a–c) shows the variation of AC conductivity with temperature at high frequency range (1 MHz–4 MHz). It was observed that an increase in temperature causes an increase in the value of ac conductivity. The semiconductor behavior of the sample, as described in the impedance section, was supported by this behavior of these curves also. By using the Arrhenius equation given below

$$\sigma = \sigma_0 \exp\left(\frac{-E_a}{k_B T}\right) \quad (7)$$

$\sigma_0$  = pre-exponential factor,  $k_B$  = Boltzmann constant,  $E_a$  = activation energy,  $T$  = temperature, We analyzed the sample's activation energy by using the Arrhenius equation, and was temperature dependent. The calculated activation energy for all the samples was tabulated in Table

4. From the calculated values, it was observed that when frequency increases, the value of activation energy decreases, but ac conductivity increases with increasing temperature. This could be due to ionic solids having a limited number of mobile ions trapped in relatively stable potential wells during their movement through the solid at high temperatures. Donor cations play an important role in the conduction process because of a temperature increase. Hence, they get activated through small energy which is known as activation energy. The activation energy is essentially summarized by the energy given by charge carrier motion and the vacancies/defects generated at higher temperatures. However, as the frequency increases, the hopping probability of charge carriers increases, lowering the activation energy [69].

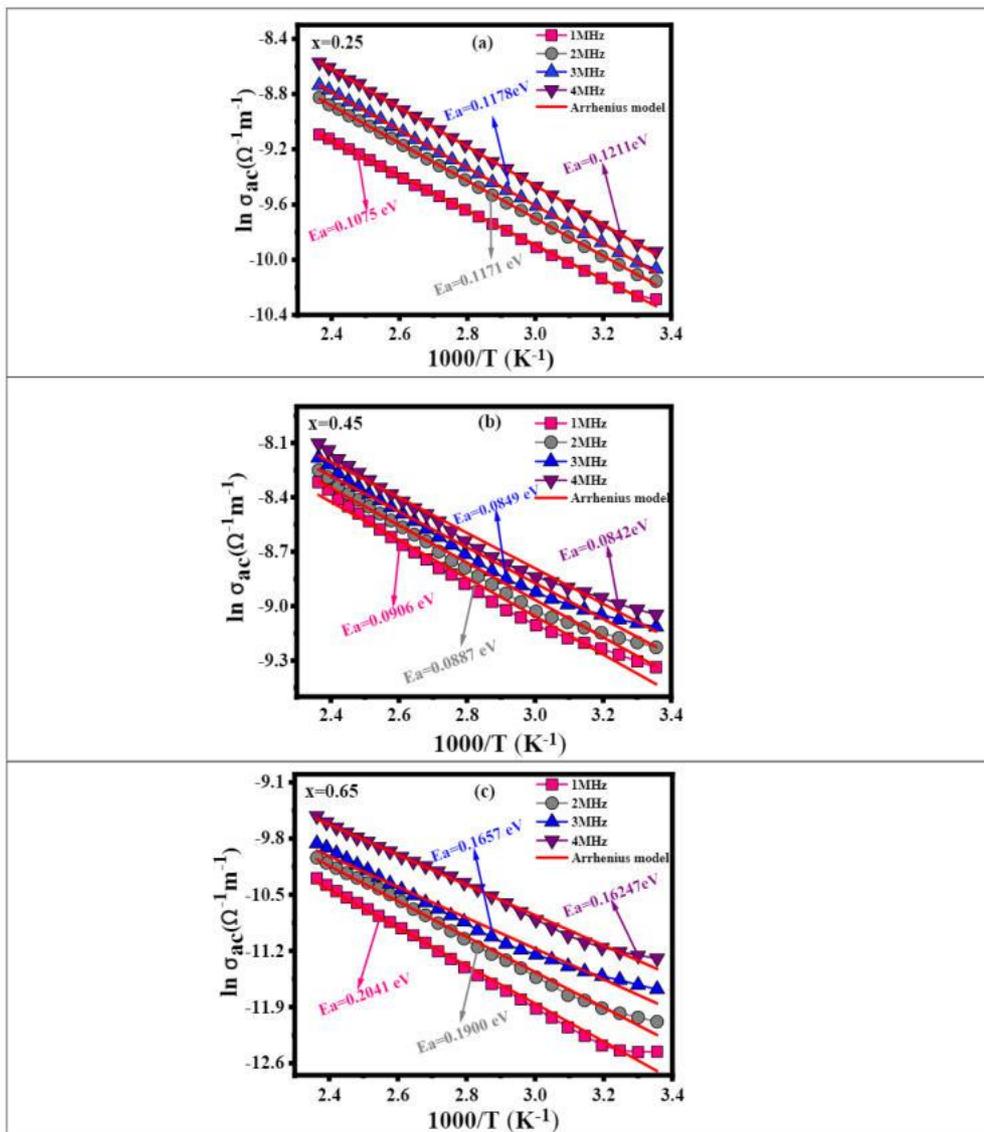


Fig. 15 – (a–c) Variation of AC conductivity with temperature for  $\text{La}_{0.665}\text{Bi}_{0.33}\text{Ba}_{0.005}\text{Gd}_x\text{Mn}_{1-x}\text{O}_3$  ( $x = 0.25, 0.45$  and  $0.65$ ) ceramics.

**Table 4 – Activation energy for  $\text{La}_{0.665}\text{Bi}_{0.33}\text{Ba}_{0.005}\text{Gd}_x\text{Mn}_{1-x}\text{O}_3$  ( $x = 0.25, 0.45, 0.65$ ) ceramics of different frequency for temperature range  $50\text{ }^\circ\text{C}–250\text{ }^\circ\text{C}$ .**

Frequency	$x=0.25$	$x=0.45$	$x=0.65$
1 MHz	$E_a = 0.1240\text{ eV}$	$E_a = 0.1010\text{ eV}$	$E_a = 0.2135\text{ eV}$
2 MHz	$E_a = 0.1247\text{ eV}$	$E_a = 0.0957\text{ eV}$	$E_a = 0.1948\text{ eV}$
3 MHz	$E_a = 0.1216\text{ eV}$	$E_a = 0.0929\text{ eV}$	$E_a = 0.1840\text{ eV}$
4 MHz	$E_a = 0.1210\text{ eV}$	$E_a = 0.0913\text{ eV}$	$E_a = 0.1779\text{ eV}$

#### 4. Conclusions

X-Ray diffraction of LBBGMO ( $x = 0.25, 0.45,$  and  $0.65$ ) were performed at room temperature and which confirmed the perovskite structure with second phases. Rietveld refinement of the XRD patterns was performed with best fit and different parameters were found and confirmed that for  $x = 0.25$  and

$0.45,$  had orthorhombic structure was but co-existence of orthorhombic and rhombohedral were observed for  $x = 0.65$ . It was also observed that for low frequency range the samples possessed Negative Dielectric Constant (NDC) behavior. Nyquist plot of the samples showed non-Debye type and NTCR behavior. The real part of impedance in higher frequency range decreases with increase in temperature indicating semiconducting behavior of the samples. Quantitative analysis of AC conductivity study showed a decrease in conductivity with increase in frequency. It was observed that when frequency increases, the value of activation energy decreases, and ac conductivity increases with increasing temperature. The ionic solids having a limited number of mobile ions trapped in relatively stable potential wells during their movement through the solid at high temperatures. The activation energy is essentially summarized by the energy given by charge carrier motion and the vacancies/defects generated at higher temperatures. On the basis of the structural and

dielectric analysis we can say that the composition of  $X = 0.25$  have a more single phase system and useful for the high frequency dielectric system.

### Declaration of Competing Interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: Dr. Radheshyam Rai reports was provided by Indian National Science Academy, New Delhi.

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# Structural and ferroelectric growth of Ba<sub>0.85</sub>Mg<sub>0.15</sub>TiO<sub>3</sub>–Ga<sub>2</sub>O<sub>3</sub> ceramic through hydrothermal method

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## ABSTRACT

Lead-free perovskite materials Barium Magnesium Titanate (BMT) and composite of BMT/Ga<sub>2</sub>O<sub>3</sub> were prepared using environment friendly low temperature method. XRD peak profile analysis of pure BMT and nanocomposite of BMT/Ga<sub>2</sub>O<sub>3</sub> to determine the crystallite size have been carried out using various calculations methods like Scherrer, Williamson–Hall, and Size–Strain plot. The crystallite size was found to increase with the addition of Ga<sub>2</sub>O<sub>3</sub> in BMT. Moreover, XRD patterns reveal the pure and crystalline phase of the prepared samples. Raman study of BMT and BMT/Ga<sub>2</sub>O<sub>3</sub> are showing the tetragonal symmetry. SEM studies revealed that the addition of Ga<sub>2</sub>O<sub>3</sub> accelerates the grain growth of BMT whereas EDX indicated that there is no significant trace of any impurity and confirmed the stoichiometric presence of the expected elements within the sample. SAED patterns demonstrate broad concentric rings, which confirm the presence of crystalline powder. P–E hysteresis loop confirms the ferroelectric behaviour of the samples with increase in remnant polarization and the increase in coercive field.

## 1 Introduction

Perovskites exhibit a crystal structure described by the general formula ABO<sub>3</sub>, where twelve equidistant oxygen atoms surround by A cation, and six oxygen atoms surround the B cation. They can be further classified into two categories: Lead-based and Lead-free materials. Lead-based perovskite materials like PT (Lead Titanate) and PZT (Lead Zirconate Titanate) have gained widespread interest for various

microelectronic devices, such as sensors, capacitors, actuators, and transducers due to their remarkable piezoelectric properties [1–5]. However, considering the toxic nature of lead-based materials, researchers are focussing on developing lead-free perovskite materials [6]. Therefore, the development of lead-free perovskite ceramics is encouraged in recent years. Various lead-free systems have been explored in this context, such as BT, BNT, KNN, and BKT [7, 8]. Among these lead-free piezoelectric materials,

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BaTiO<sub>3</sub> (Barium Titanate) based materials have been widely studied because of their ferroelectric properties, high dielectric constant, low dielectric loss, pyroelectric and piezoelectric behaviour [9–11].

Furthermore, the functional properties can also be tailored using suitable substitutions at different atomic sites. In addition, developing a suitable synthesis process and selection of dopants are crucial parameters to develop the desirable structure for structural analysis [12]. For BaTiO<sub>3</sub>, particularly, Sr, Ca, La, Mn and Zr doping can help improve their structural, ferroelectric, dielectric properties, and piezoelectric properties [13–15]. However, it is difficult to control their composition together with a difficult phase design. Moreover, traditional methods used for their preparation are not energy-efficient and requires long hours of calcination process. There are several routes which can be used to synthesize perovskite material, like solid-state reaction [16, 17], molten salt reaction [18], co-precipitation [19], sol–gel [20], spray and freeze drying [21, 22]. In the case of the solid-state reaction method and molten salt reaction, controlling the morphologies and size of the desired materials without ligand or organic molecule protection on the surface of particles is a huge challenge [23–25]. On the other hand, the sol–gel method involves high operational temperature, less control of the crystallisation, and morphology of the products lack uniformity, controllability, and dispersibility, which decline their functional properties dramatically [26–28]. The co-precipitation method yields low-quality ceramic powders and, therefore, cannot be easily scaled up to industrial demand. In addition, the slight amount of polar solvents results in the formation of bulk crystals instead of nanosize perovskites.

To overcome these problems, using the hydrothermal process is considered a viable and energy efficient method for preparing highly pure and homogeneous powder. The hydrothermal method is a powerful technique for the preparation of homogenous and very fine nanopowders with high purity. The main advantage of the hydrothermal method is to reduce the temperature level (100–200 °C) of reaction compared to the other conventional synthesis process [29]. The hydrothermal method is an environmentally benign process that operates at relatively low temperatures and is good at suppressing the compositional change. Recently, Ma et al. prepared a composite of BMT–Ga<sub>2</sub>O<sub>3</sub> ceramics

using the conventional solid-state reaction method. However, the calcination process was carried out at a very high temperature, i.e. 1250 °C. The synthesis process for the preparation of nanoparticles involving high calcination temperature usually suffers from several limitations such as poor homogeneity, high porosity, and non-uniform particle size, which affects the functional properties of the synthesized material [30]. Arshad et al. synthesized strontium-doped BT (Ba<sub>1-x</sub>Sr<sub>x</sub>TiO<sub>3</sub>) ceramics using the conventional solid-state method. The XRD and Raman studies reveal that Sr<sup>2+</sup> ions change lattice constant, unit cell volume, and tetragonality ratio of pure BaTiO<sub>3</sub>. Impedance spectroscopy revealed that BST ceramic shows relaxation behaviour and oxygen vacancies (OVs), and those (OVs) are responsible for conduction in prepared BST samples [13]. Slimani et al. prepared BaTiO<sub>3</sub>/ZnO based ceramic by solid-state technique. The substitution of ZnO in BT change the crystal symmetry from tetragonal to cubic. The grain size increases with the addition of ZnO and reduces the bandgap energy. The increasing concentration of ZnO improves the dielectric, electric, and optical properties of BT ceramics. Dong et al. prepared BaTiO<sub>3</sub>/YNbO<sub>4</sub> based ceramics using traditional solid-state method. XRD and Raman analysis reveals that the substitution of YNbO<sub>4</sub> in BT change the phase transition from tetragonal to pseudo-cubic. The grain size and unit cell volume increased with the addition of YNbO<sub>4</sub>. The increasing concentration of YNbO<sub>4</sub> moved curie temperature towards lower temperature side and exhibit para-electric phase. These results showed that the BaTiO<sub>3</sub>/YNbO<sub>4</sub> ceramics systems could be a capable alternate material for a high energy storage density capacitor [31].

The present investigation was carried out to study the effect of the addition of Ga<sub>2</sub>O<sub>3</sub> on structural and morphological properties of lead-free Ba<sub>0.85</sub>Mg<sub>0.15</sub>TiO<sub>3</sub> (or BMT) by hydrothermal method at low temperature. To the best of our knowledge, no work has been conducted on the composite of BMT/Ga<sub>2</sub>O<sub>3</sub> using the hydrothermal method. This paper is a continuation of our previous research work [32]. The characterisation results confirm the pure phase and crystalline nature of the prepared pristine BMT and composite BMT/Ga<sub>2</sub>O<sub>3</sub>.

## 2 Materials & Methods

Barium Magnesium Titanate Oxide (or  $\text{Ba}_{0.85}\text{Mg}_{0.15}\text{TiO}_3$ ), BMT was prepared by mixing powder oxides using the following raw materials; Barium Hydroxide Octahydrate,  $\text{Ba}(\text{OH})_2 \cdot 8\text{H}_2\text{O}$  (Sigma Aldrich, 99% purity) and Magnesium Acetate,  $(\text{CH}_3\text{COO})_2\text{Mg} \cdot 4\text{H}_2\text{O}$  (Sigma Aldrich, 99% purity), Titanium (IV) Isopropoxide ( $\text{C}_{12}\text{H}_{28}\text{O}_4\text{Ti}$ ) (Sigma Aldrich, 99% purity) were selected as initial materials with the molar ratios of Ba:Mg:Ti ions (0.5:0.3:1). The BMT nanoparticles synthesis was as follows:  $\text{Ba}(\text{OH})_2 \cdot 8\text{H}_2\text{O}$ ,  $(\text{CH}_3\text{COO})_2\text{Mg} \cdot 4\text{H}_2\text{O}$ , and  $(\text{C}_{12}\text{H}_{28}\text{O}_4\text{Ti})$  were dissolved in 30 mL deionized water under constant stirring. After mixing the starting materials, few drops of KOH were added to the above solution, which helps to maintain its  $\text{pH} > 7$ . Teflon cup was fitted inside the autoclave and placed in the muffle furnace for reaction at 120 °C for 48 h. After the completion of reaction, it was allowed to naturally cool down at room temperature and thereafter, was transferred into a borosilicate beaker for ultrasonic cleaning for 30 min. The synthesized nanoparticles were washed in the presence of deionized water and centrifuged for 10 min at a speed of 400 rpm and dried in hot air oven for 5 h at 50 °C.  $(1-x)\text{BMT}-x\text{Ga}_2\text{O}_3$  ( $x = 0.05$ ) were prepared by mixing  $\text{Ga}_2\text{O}_3$  to hydrothermally synthesized BMT nanoparticles and calcined at 650 °C for 2 h. The structural properties were studied by XRD using PW3040 Philips X-ray diffractometer with  $\text{CuK}\alpha$  radiation ( $\lambda = 0.15406$  nm). The Rietveld refinement of the XRD data was carried out using FullProf 2019 software. The lattice morphology and elemental analysis were characterized by SEM (Hitachi SU8010 series).

## 3 Results & discussion

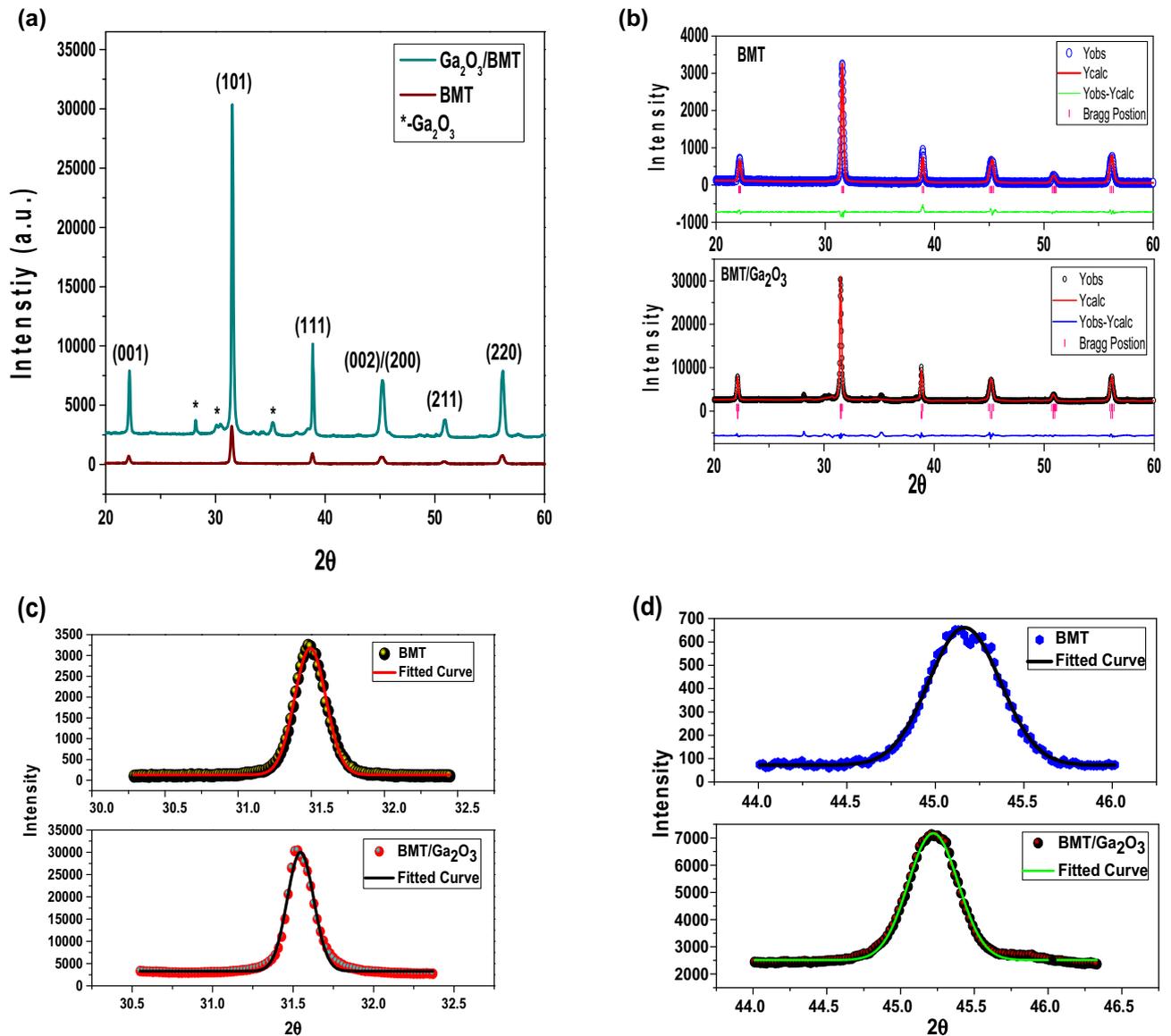
### 3.1 X-ray diffraction (XRD)

Figure 1 shows the XRD patterns of the prepared BMT and BMT/ $\text{Ga}_2\text{O}_3$  nanoparticles via the hydrothermal method at room temperature. The structural properties of the sample like lattice parameters ( $a$ ,  $b$ ,  $c$ ), the crystallite size ( $D$ ), volume of the unit cell ( $V$ ), stress ( $\sigma$ ), lattice strain ( $\epsilon$ ), energy density ( $u$ ), and young's modulus ( $E_{hkl}$ ) were determined by analysing the XRD patterns. It was observed that BMT exhibits a pure perovskite phase

with a tetragonal crystal structure. XRD patterns are in accordance with  $\text{BaTiO}_3$  (JCPDS #75-2121) with no impurity of secondary peaks. Moreover, on the addition of  $\text{Ga}_2\text{O}_3$ , the occurrences of additional peaks are also in good agreement with the JCPDS #76-0573 of  $\text{Ga}_2\text{O}_3$  and do not distort BMT's tetragonal symmetry. However, on the addition of  $\text{Ga}_2\text{O}_3$  in BMT, a slight shift towards higher diffraction angles is easily discernible. It might be due to the addition of  $\text{Ga}_2\text{O}_3$  within BMT, which leads to shrinkage of the host lattice. The lattice parameters for BMT were found to decrease from  $a = 4.0075\text{Å}$ ,  $c = 3.5899\text{Å}$ , and  $V = 57.65\text{Å}^3$  to  $a = 3.954\text{Å}$ ,  $c = 3.326\text{Å}$  and  $V = 51.999\text{Å}^3$  on the addition of  $\text{Ga}_2\text{O}_3$ . To obtain the detailed crystal structure data of the prepared sample, Rietveld refinements for XRD patterns of BMT and  $\text{Ga}_2\text{O}_3/\text{BMT}$  were performed using Fullprof software as shown in Fig. 1b. All Rietveld refinements were performed using a perovskite-type tetragonal structure and a space group (P4mm) using CIF file 1,513,252. A pseudo-Voigt function was chosen to fit the obtained XRD pattern of the samples. The results obtained from Rietveld refinement are tabulated in Table 1. According to Table 1, fitting parameters ( $R_p$ ,  $R_{wp}$ ,  $R_e$ ,  $R_f$ ,  $R_B$ , and  $\chi^2$ ) indicate good agreement between progressive and observed values XRD patterns for both samples [33–37]. The full width at half maxima (FWHM) for the most intense peaks of both BMT and BMT/ $\text{Ga}_2\text{O}_3$  are shown in Fig. 1c. It is visible that the FWHM decreases on the addition of gallium oxide within BMT, which indicates an increase in the crystallite size of the samples. The average crystallite size of the prepared nanoparticles was calculated from the reflection of the significant peaks in the XRD patterns using the Debye Scherrer formula as follows [32].

$$d = \frac{k\lambda}{\beta \cos\theta}, \quad (1)$$

where  $d$  is the crystallite size, and  $k$  is the Scherrer constant,  $\lambda$  is the X-ray wavelength (0.154 nm), and  $\theta$  is the Bragg angle of the reflection. The calculated average crystallite size for both samples from Eq. (1) are shown in Table 2. In addition, the peak broadening in the XRD patterns clearly contributes to the crystallite size. As the peak broadening decreases in BMT/ $\text{Ga}_2\text{O}_3$ , therefore, the value of crystallite size increases. Figure 2a shows a linear relationship between  $\cos\theta$  as  $y$ -axis versus  $1/\beta$  as the  $x$ -axis.



**Fig. 1** a XRD patterns, b Rietveld refinement, c Gaussian fit of XRD peak at  $2\theta = 31^\circ\text{--}33^\circ$ , and d  $2\theta = 44^\circ\text{--}46^\circ$  of BMT and BMT/Ga<sub>2</sub>O<sub>3</sub> nanoparticles synthesized *via* hydrothermal method

The lattice strain ( $\varepsilon$ ) within the material can also cause broadening of the XRD diffraction patterns [38] given by

$$\varepsilon = \frac{\beta_{hkl}}{4\sin\theta} \quad (2)$$

The line broadening according to the Williamson-Hall relationship is simply the sum of size-induced and strain-induced broadening given by:

$$\beta = \frac{k\lambda}{D\cos\theta} + 4\varepsilon\tan\theta. \quad (3)$$

By rearranging the Eq. (4), we simply get,

$$\beta\cos\theta = \frac{k\lambda}{D} + 4\varepsilon\sin\theta. \quad (4)$$

Figure 2b shows the plot between  $4\sin\theta$  along the x-axis and  $\beta\cos\theta$  along the y-axis with a straight line. The average crystallite size was extracted from the y-intercept and the values of lattice strain from the slope of the linear fit to the data points, as shown in Table 2.

Furthermore, the parameters like stress ( $\sigma$ ) and strain ( $\varepsilon$ ) are related to each other by Hooke's law by  $\sigma = Y_{hkl} \varepsilon$ , where  $Y_{hkl}$  is the Young's Modulus in the direction perpendicular to the set of the crystal lattice

**Table 1** Fullprof based Rietveld refinement parameters and calculated crystallographic parameters of the XRD pattern of BMT and BMT/Ga<sub>2</sub>O<sub>3</sub>

Calculated crystallographic parameters		BMT	BMT/Ga <sub>2</sub> O <sub>3</sub>
Lattice parameters	a = b (Å)	4.00160	4.0026
	c (Å)	4.02130	4.0289
c/a ratio	c/a	1.0049	1.0065
Volume of unit cell	V (Å <sup>3</sup> )	64.339	64.5441
R—factor (%)	R <sub>p</sub>	7.02	2.47
	R <sub>wp</sub>	9.15	3.42
	R <sub>e</sub>	7.72	1.67
	R <sub>f</sub>	2.06	1.72
	R <sub>B</sub>	3.82	2.02
GOF	χ <sup>2</sup>	1.08	4.44
Space group		P 4 mm	P 4 mm, P m–3 m

**Table 2** Structural parameters of the prepared samples

Samples	Scherrer	Williamson–Hall method									SSP	
		UDM			USDM			UEDDM			D (nm)	ε × 10 <sup>-3</sup>
		D (nm)	D (nm)	ε × 10 <sup>-3</sup>	D (nm)	ε × 10 <sup>-3</sup>	σ (MPa)	D (nm)	ε × 10 <sup>-3</sup>	σ (MPa)		
BMT	33.2	46.04	1.5	45.6	1.6	220	46.04	1.7	224	165.6	47.2	1.6
BMT/Ga <sub>2</sub> O <sub>3</sub>	42.8	51.7	1.2	51.1	1.3	164	50.9	1.4	179	95.6	52.1	1.3

plane (hkl). It is assumed that a minor strain is present inside the sample. Therefore, the Hooke’s law approximation, Eq. (4) can be re-written as:

8.84 × 10<sup>-12</sup> m<sup>2</sup> N<sup>-1</sup>, respectively [40]. The values of the calculated Y<sub>hkl</sub> for pristine BMT and nanocomposite 0.95 BMT–0.05 Ga<sub>2</sub>O<sub>3</sub> are ~ 132GPa and ~

$$\frac{1}{Y_{hkl}} = \frac{s_{11}(h^4 + k^4) + (2s_{12} + s_{66})h^2k^2 + (2s_{13} + s_{44})(h^2 + k^2)(\frac{a}{c})^2 + s_{33}(\frac{a}{c})^4}{(h^2 + k^2 + (\frac{a}{c})^2)^2}, \tag{6}$$

$$\beta_{hkl} \cos\theta = \frac{k\lambda}{D} + \frac{4\sigma \sin\theta}{Y_{hkl}}. \tag{5}$$

A linear relationship between β cosθ as a function of 4sinθ/Y<sub>hkl</sub> is shown in Fig. 2c, wherein the value of σ was estimated from the slope of the fitted line and the importance of D from the y-intercept. Young’s Modulus (Y<sub>hkl</sub>) for a tetragonal crystal symmetry, is related to its elastic compliances, s<sub>ij</sub> by[39]:

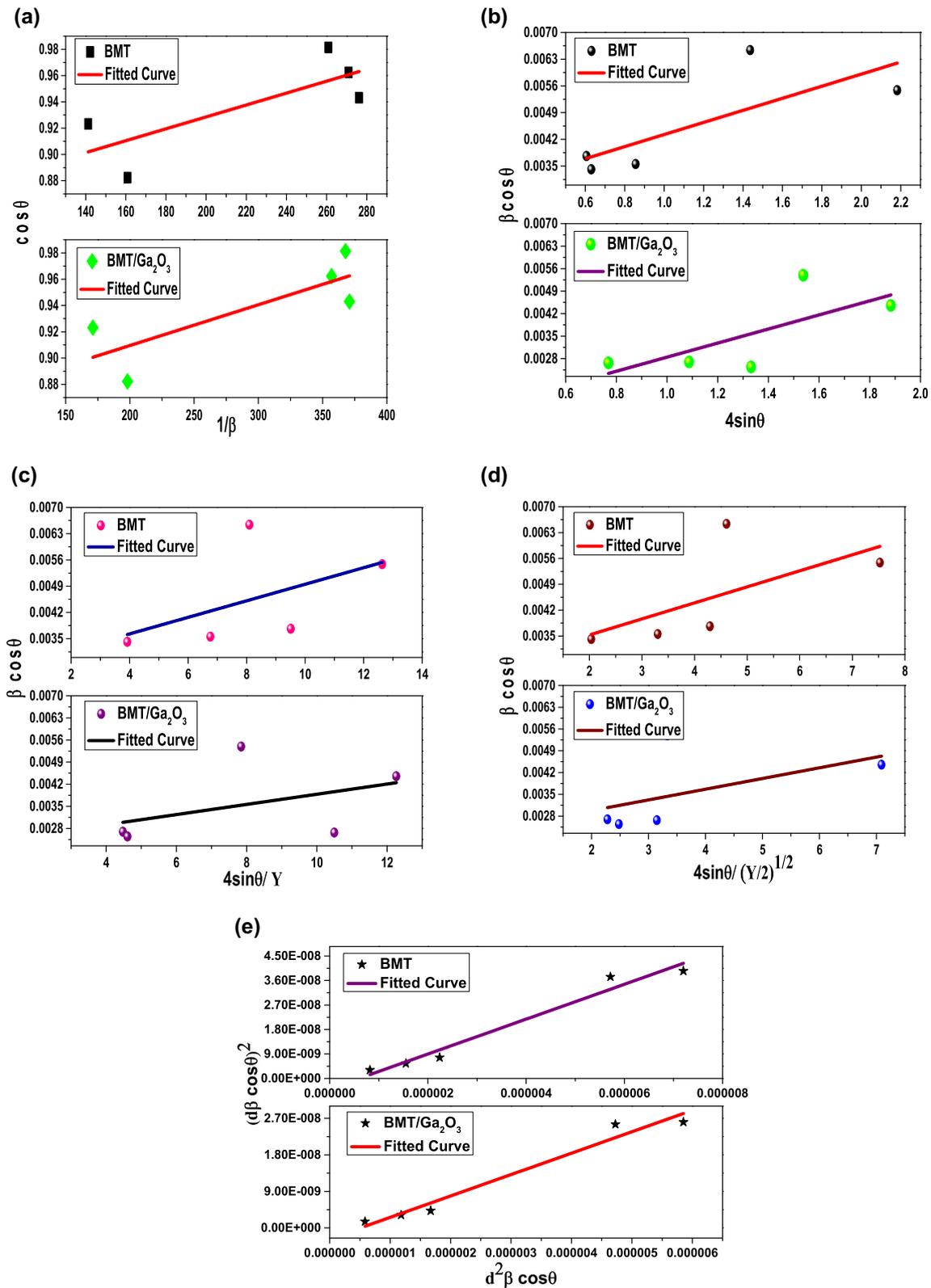
where the values of s<sub>11</sub>, s<sub>12</sub>, s<sub>13</sub>, s<sub>33</sub>, s<sub>44</sub>, and s<sub>66</sub> for BaTiO<sub>3</sub> are 8.05 × 10<sup>-12</sup>, - 2.35 × 10<sup>-12</sup>, - 5.24 × 10<sup>-12</sup>, 15.7 × 10<sup>-12</sup>, 18.4 × 10<sup>-12</sup>, and

125 GPa, respectively.

Furthermore, in order to calculate the energy density (u), Uniform Deformation Energy Density Model (UEDDM) analysis was taken into consideration. The energy density is a function of strain defined as: u = ε<sup>2</sup>Y<sub>hkl</sub>/2 for an elastic system. In this case, the Eq. (4) can be re-written as:

$$\beta \cos\theta = \frac{k\lambda}{D} + 4\sin\theta \sqrt{\frac{2u}{Y_{hkl}}}. \tag{7}$$

Figure 2d shows β cosθ as a function of 4sinθ√2/Y<sub>hkl</sub>. The linear fit of the data points reveals the value



**Fig. 2** a Scherrer plot, b Uniform Deformation Model (UDM) analysis, c Uniform Stress Deformation Model (USD) analysis, d UEDM analysis, and e SSP of BMT and BMT/Ga<sub>2</sub>O<sub>3</sub>

of crystallite size which can be estimated from the y-intercept and the value of energy density can be measured from its slope.

Another way to determine the crystallite size and lattice strain of the crystal system is using Size–Strain plot (SSP); as shown in Eq. (8)

$$(d\beta\cos\theta)^2 = \frac{k}{D}(d^2\beta\cos\theta) + \left(\frac{\epsilon}{2}\right)^2, \quad (8)$$

where  $k$  is a constant and depends on the shape of particles. For spherical particles,  $k = 3/4$ . Figure 2e represents a linear graph plotted between  $(d\beta\cos\theta)^2$  as a function of  $d^2\beta\cos\theta$  for both samples. This method has a benefit that less importance is given to data from reflections at higher angles where the precision is usually lower.

In summary, the structural parameters were calculated various methods like Scherrer, Williamson–Hall method (UDM, USDM, and UDEDM), and SSP. Variations in the calculations of the Scherrer formula comes from the different FWHM values at each peak. The crystallite size of BMT/Ga<sub>2</sub>O<sub>3</sub> increases as the FWHM of the peak decreases since both entities, i.e.,  $D$  and  $\beta$ , are inversely proportional to each other. Furthermore, the result of W–H plots provides information about the crystallite size and strain of the crystal. In the case of the UDM plot, the line broadening is essentially isotropic, and the least-square points had a positive slope and a non-zero intercept. The lattice strain and crystallite size evaluated from W–H plots and SSP were found to be comparable and in agreement with each other. However, in the case of the SSP method, the data points lay much closer to the linear fit and, therefore, becomes more suitable than W–H plots [41, 42].

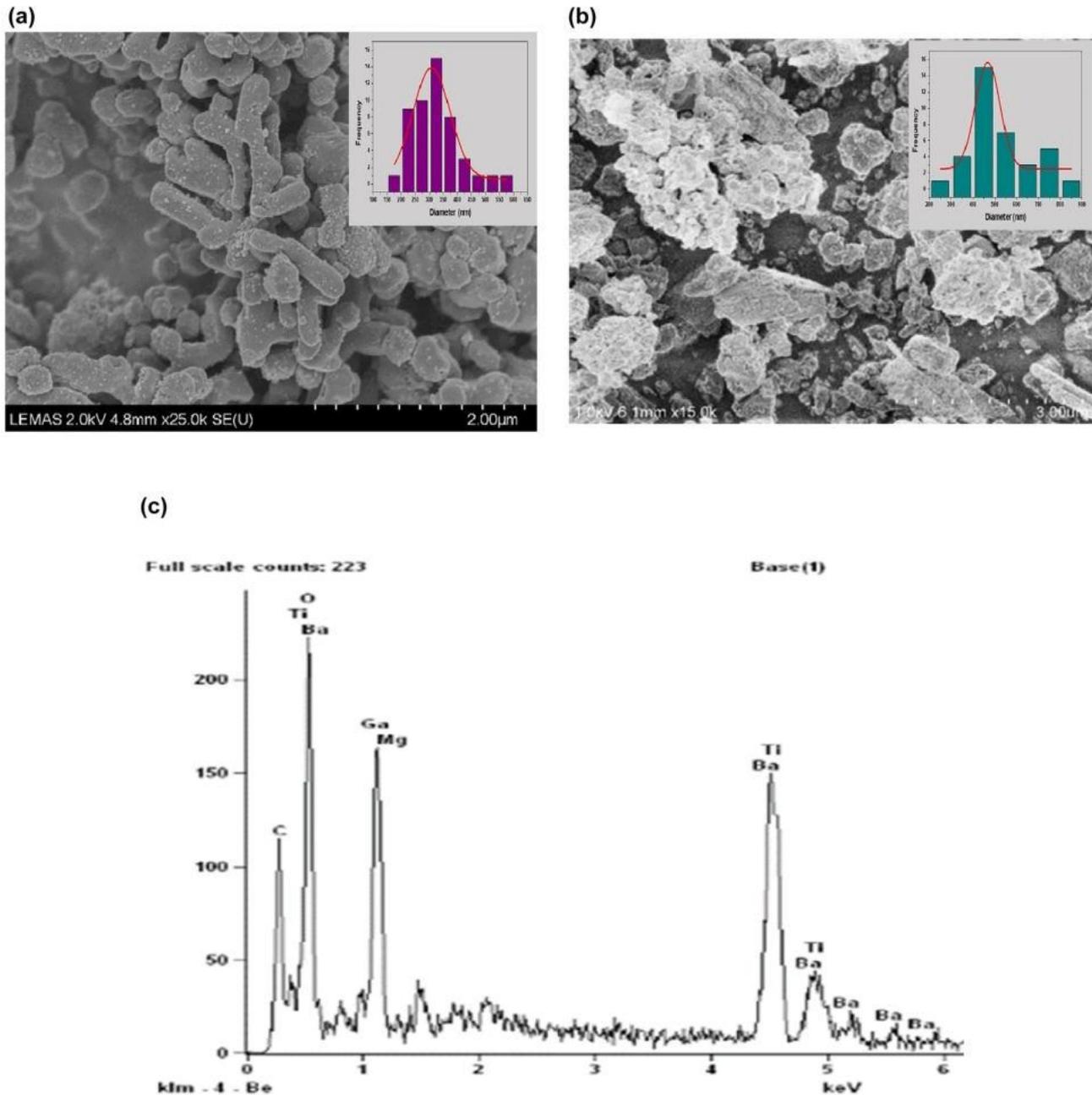
### 3.2 Scanning electron microscopy (SEM) analysis

Figure 3 shows the SEM micrographs of the synthesized BMT and BMT/Ga<sub>2</sub>O<sub>3</sub> at room temperature, which provides further insight into the shape and size of the synthesized powder. Nucleation is the crucial step in the crystallisation process and plays a vital role in particle size distribution. In the hydrothermal method, the presence of solvent media facilitates the formation of better crystal nucleation, higher dispersion, and higher rates of reaction and, most importantly, better shape control of the nanoparticles [43, 44]. The chemical reaction starts in

the presence of pressure and temperature, which trails the non-classical crystal formation. Moreover, the preparation of ceramics in the presence of solvent media helps to control the size and shape of the ceramic [45, 46]. KOH acts both as a mineralised and surfactant in the hydrothermal process. The concentration of OH<sup>−</sup> ions plays a vital role in the crystal nucleation and crystal growth rate. If the concentration is low, then the driven force in the reaction system is not sufficient, resulting in disordered particles aggregation. In contrast, when the concentration is more, the crystal nucleation rate is higher due to the presence of more nucleated small clusters in the solution, yet the crystal growth rate is inhibited and the crystals aggregate randomly [47, 48]. Subsequently, OH<sup>−</sup> ions bind the particles together and facilitate the self-assembly process that is responsible for shape evolution and produces mesocrystals [49, 50]. Figure 3a shows the formation of well crystallised pristine BMT ceramic with dense, compact, soft agglomerated spherical and rod-like shaped morphology. The average particle size was found to be  $\sim 305 \pm 10$  nm as evident from the histogram presented in the inset of Fig. 3a. With the addition of gallium oxide, more mature and spherical shaped particles were formed with increased particle size to  $\sim 460 \pm 10$  nm as shown in the histogram presented in the inset of Fig. 3b. The particle size was estimated using ImageJ software. This might be ascribed to the incorporation of gallium oxide within BMT, which produces lattice distortion and is responsible for forming larger grains. Energy-dispersive X-ray spectrograph (EDX) analysis was used to confirm the presence of all elements within the prepared sample as shown in Fig. 3c. Shows the EDX spectra of the BMT/Ga<sub>2</sub>O<sub>3</sub> NPs synthesized by the one-step hydrothermal method, from which the elements Ba, Mg, Ti, Ga, and O were confirmed. Carbon tape used during the EDX analysis gives rise to a peak corresponding to carbon (C).

### 3.3 Transmission electron microscopy (TEM)

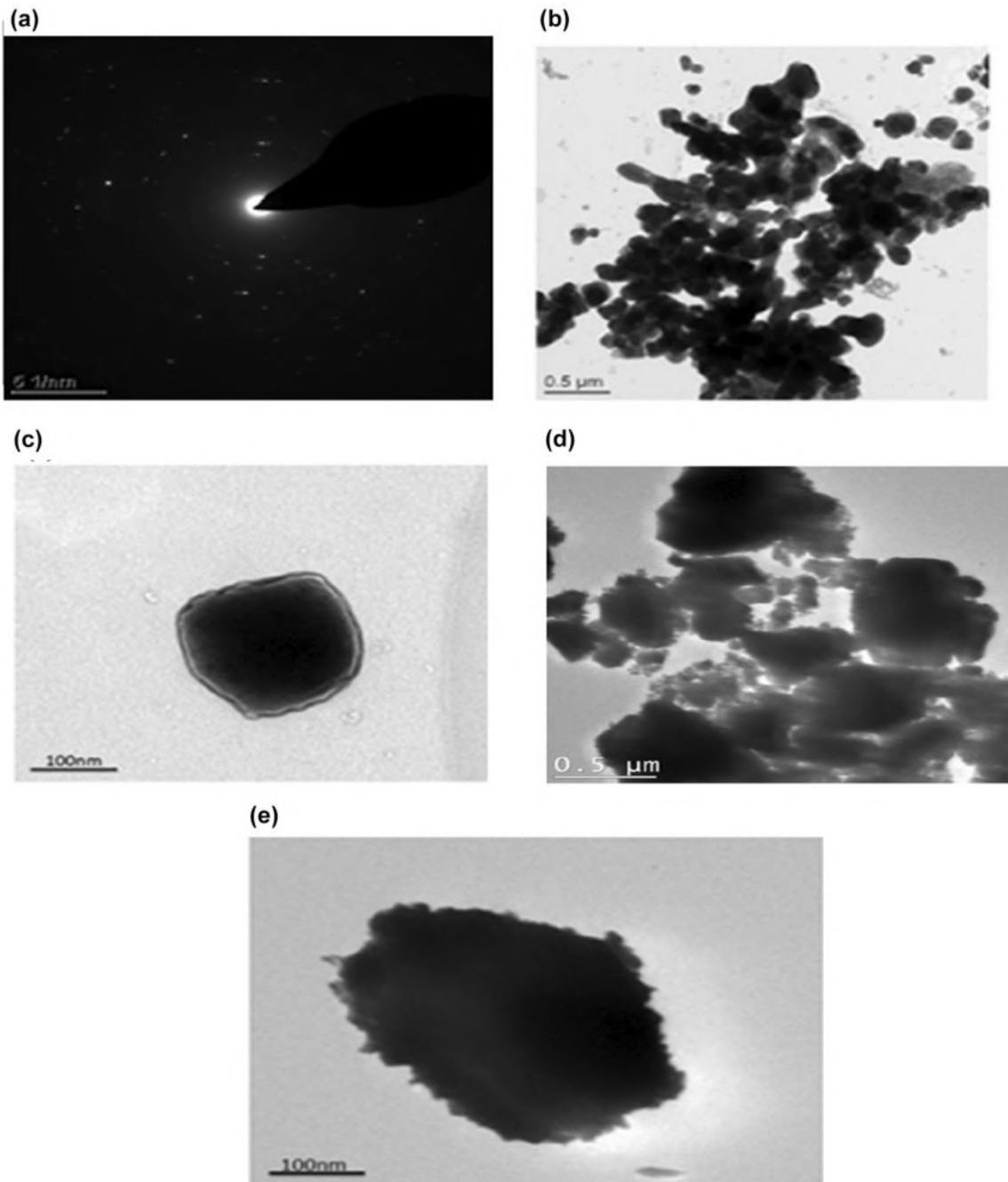
TEM was employed to analyse the crystal evolution of the sample at the atomic scale. The synthesized samples were placed onto the carbon-coated copper grids for TEM analysis. Furthermore, the Selected Area Electron Diffraction (SAED) analysis was performed to recognize crystal structures and observe



**Fig. 3** a SEM micrographs of BMT, b BMT/Ga<sub>2</sub>O<sub>3</sub>, and c EDX spectrograph of BMT/Ga<sub>2</sub>O<sub>3</sub> nanoparticles

crystal defects [51]. SAED patterns of such a spherical assembly demonstrate broad concentric rings, which confirm the presence of crystalline powder, as shown in Fig. 4a. TEM images show the formation of uniform and smooth surfaces of the nanoparticles with particle size distribution in the range of  $\sim 220 \pm 10$  nm as shown in Fig. 4b, c. The nanoparticles grow and nucleate to form spherical nanoparticles along with small particles on the surface of the microspheres due to the dissolution–recrystallization

process, which is often observed in the hydrothermal process [52, 53]. During the preparation of BMT nanoparticles, surfactant (KOH) is added to prevent the aggregation. Therefore, it is essential to adopt a reliable method for the preparation of uniform size nanoparticles [54]. Subsequently, on the addition of gallium oxide, it is evident that the size of nanoparticles increases to  $\sim 350 \pm 10$  nm as shown in Fig. 4d, e.



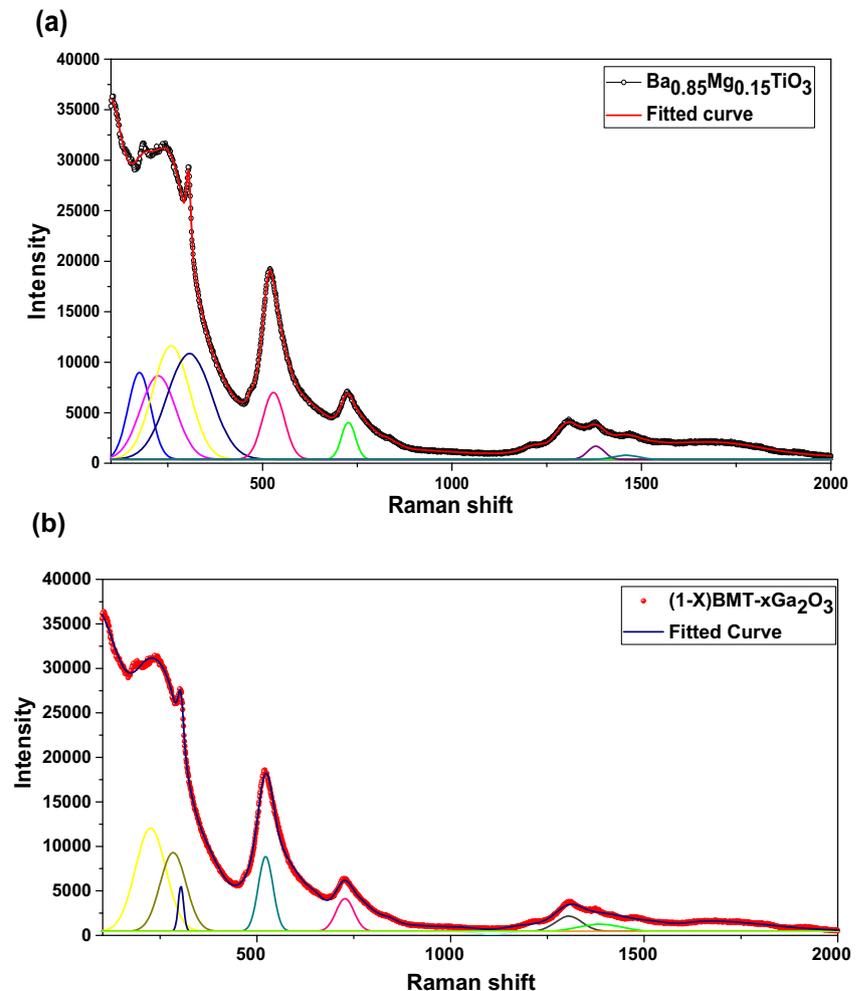
**Fig. 4** **a** SAED pattern, **b** TEM micrograph, and **c** enlarged TEM image of pristine BMT nanoparticles, **d** TEM micrograph, **e** enlarged TEM image of BMT/Ga<sub>2</sub>O<sub>3</sub> nanoparticles

### 3.4 Raman spectroscopy

Raman spectroscopy is an effective technique to investigate the structural changes of the prepared samples. Figure 5 shows the Raman spectrum of BMT and BMT/Ga<sub>2</sub>O<sub>3</sub> at room temperature. The Raman spectrum consists of five Raman active modes at 220 cm<sup>-1</sup>, 260 cm<sup>-1</sup>, 306 cm<sup>-1</sup>, 510 cm<sup>-1</sup> and

720 cm<sup>-1</sup>. The presence of Raman active modes ~ 220 cm<sup>-1</sup> occurs due to the local symmetry breaking (polar distortion/octahedral tilting) [55, 56]. A broad peak 280 cm<sup>-1</sup> represents A1TO mode. A small peak is observed at 720 cm<sup>-1</sup>, which represents the tetragonal phonon mode at A1TO<sub>3</sub>. A well-defined prominent peak can be noticed at 510 cm<sup>-1</sup> (TO

**Fig. 5** Raman spectra of BMT and BMT/Ga<sub>2</sub>O<sub>3</sub>



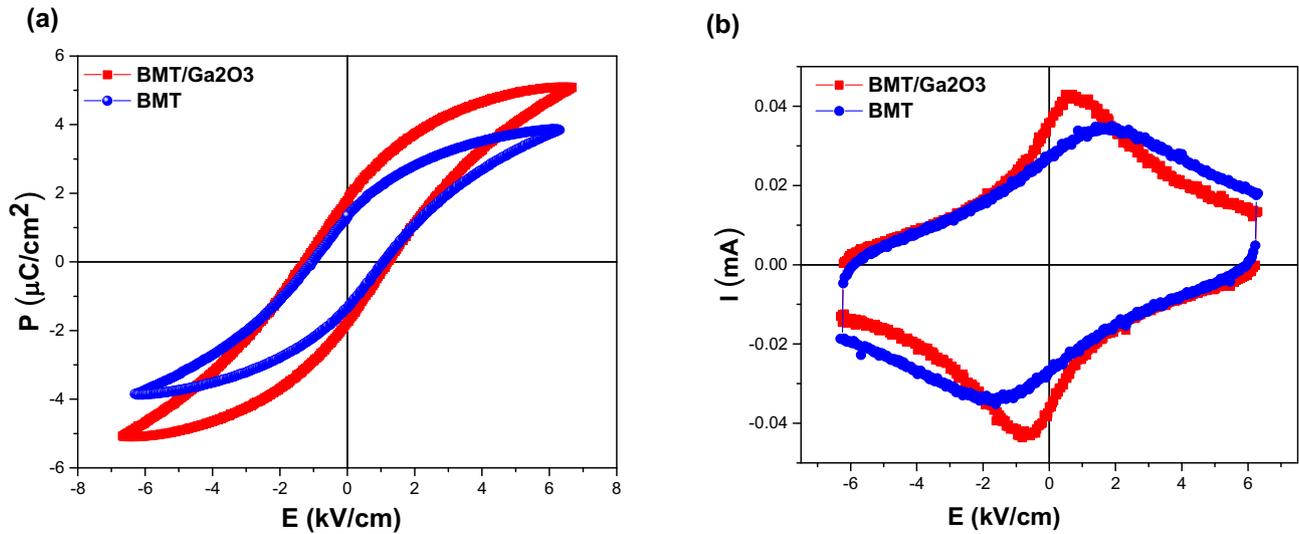
mode), which can be ascribed to the symmetry stretching of the O–Ti–O molecule. The material with perovskite structure exhibits such type of mode [57–59]. The tetragonal phase for BMT is confirmed from the ETO/B characteristics mode at 305 cm<sup>-1</sup>.

In contrast, a slight shift is easily evident from the Raman of the composite BMT/Ga<sub>2</sub>O<sub>3</sub>. This shift can be attributed to asymmetric TIO phonon vibration due to the incorporation of Ga<sub>2</sub>O<sub>3</sub> within BMT. Addition of Ga<sub>2</sub>O<sub>3</sub> increases the disorder in local symmetry shows the broadness in Raman peaks.

### 3.5 Ferroelectric study

Polarization vs Electric field (P–E hysteresis loop) confirms its ferroelectric behaviour of pure BMT and BMT/Ga<sub>2</sub>O<sub>3</sub> ceramics at room temperature are shown in Fig. 6a. Both samples exhibited a well-saturated hysteresis loop with the value of remnant polarization ( $P_r$ ) ~ 2.1 and 1.8  $\mu\text{C cm}^{-2}$ , coercive fields

( $E_c$ ) ~ 1.5 and 1.3 kV cm<sup>-1</sup> and saturation polarization ( $P_s$ ) ~ 4.0125 and 5.023  $\mu\text{C cm}^{-2}$  for BMT and BMT/Ga<sub>2</sub>O<sub>3</sub>, respectively. The low coercivity of the pure BMT sample suggests that it is ferroelectrically soft and a small electric field is relevant to cause switching of domains [60]. The saturated polarization, remnant polarization, and coercive field increase with the addition of Ga<sub>2</sub>O<sub>3</sub>. BMT/Ga<sub>2</sub>O<sub>3</sub> sample shows the maximum polarization at room temperature. In the prepared sample, Ga<sub>2</sub>O<sub>3</sub> content increases the grain size, decreases the energy barriers and increases the number of grain boundaries [61]. The occurrence of remnant polarization at transition temperature and the ferroelectric region shows the thermal stability of the sample. The variation of polarization of current density with respect to the applied electric field shown in Fig. 6b the current density (J) express the peaking behaviour of (+)ve and (-)ve cycle of the applied electric field. The rate



**Fig. 6** **a** Ferroelectric loop and **b** Electric field dependence of polarization current of BMT and BMT/Ga<sub>2</sub>O<sub>3</sub> ceramics at room temperature

of change of current density ( $j$ ) in the direction of applied electric field ( $E$ ) given as

$$j \frac{dP_E}{dt} = \rho V_s \delta [\hat{E} \cdot P_s] T, \tag{9}$$

where  $dP_E$  is the change in polarization along electric field direction,  $\rho$  is the number of nucleation sites per unit volume,  $T$  is the rate of formation of nuclei,  $\delta$  is the angle between  $P_s$  and  $\hat{E}$ , and  $P_s$  is the spontaneous polarization [62]. The leakage current characteristics of BMT and BMT/Ga<sub>2</sub>O<sub>3</sub> ceramics were also examined. BMT sample shows a lower value of current density than BMT/Ga<sub>2</sub>O<sub>3</sub> [63, 64]. In addition, BMT/Ga<sub>2</sub>O<sub>3</sub> ceramic show the presence of two peaks in the opposite direction to applied electric field which indicates the existence of two stable states with an opposite polarity. At the same time, the maximum current density ( $j$ ) is related to the polarization switching [65]. The slight increase in value of current density does not affect the tetragonal phase of BMT/Ga<sub>2</sub>O<sub>3</sub> ceramic.

## 4 Conclusion

BMT and BMT/Ga<sub>2</sub>O<sub>3</sub> nanoparticles were synthesized successfully via the hydrothermal method. XRD results reveal the pure perovskite phase of BMT with tetragonal symmetry, and the symmetry does not change on the incorporation of Ga<sub>2</sub>O<sub>3</sub>. This result is consistent with the Raman spectroscopy. Rietveld refinement plots confirm that the experimental peaks

are in good agreement with the calculated peak positions and intensities. Moreover, the average crystallite size of the prepared sample is increased with the addition of Ga<sub>2</sub>O<sub>3</sub> in BMT. SEM micrograph reveals the formation of large spherical shape grains, whereas the elemental analysis through EDX spectrograph confirmed the stoichiometric presence of the common elements within the sample. TEM analysis demonstrates that the particle size increases from  $220 \pm 10$  nm to  $350 \pm 10$  nm on the addition of Ga<sub>2</sub>O<sub>3</sub> within BMT nanoparticles. The well-defined P–E loop is observed with the increase in residual polarization and also increase in coercivity.

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## Data availability

The raw/processed data required to reproduce these findings cannot be shared at this time as the data also forms part of an ongoing study.

## Declarations

**Conflict of interest** The authors state that they have no conflict of interest.

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# Structural, dielectric and impedance response of BCT reinforcement on BZT matrix

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## ABSTRACT

Lead-Free composites of  $(1-x)\text{BaZr}_{0.2}\text{Ti}_{0.8}\text{O}_3-(x)\text{Ba}_{0.7}\text{Ca}_{0.3}\text{TiO}_3$  (BZT-BCT) were prepared using ferroelectric  $\text{BaZr}_{0.2}\text{Ti}_{0.8}\text{O}_3$  and  $\text{Ba}_{0.7}\text{Ca}_{0.3}\text{TiO}_3$  by solid-state reaction method with different mole fractions of  $x$  ( $x = 0.15, 0.30$  and  $0.45$ ). The preliminary structural studies were carried out by X-ray diffraction at room temperature (RT). It revealed that the samples had both tetragonal and orthorhombic structures at room temperature. Rietveld refinement analysis of diffraction data confirmed the coexistence of the tetragonal and orthorhombic phases in the sintered samples. The average crystallite size calculated from the W–H plot of all the samples varies between  $0.0416$  and  $0.0293 \mu\text{m}$ . The dielectric and impedance relaxation properties of the  $(1-x)\text{BaZr}_{0.20}\text{Ti}_{0.80}\text{O}_3-(x)\text{Ba}_{0.70}\text{Ca}_{0.30}\text{TiO}_3$  ceramics were analysed from RT– $600^\circ\text{C}$  in the frequency range of  $100 \text{ Hz}–1 \text{ MHz}$ . The ac conductivity variation with frequency dependence was well fitted according to Jonscher's power law. While the diffusion factor increases from  $1.21$  to  $1.30$  with increase in  $x$  from  $0.15$  to  $0.45$ , indicating a composition-induced diffuse transition. The presence of two semicircles in Nyquist plot were observed, which shows the grain and grain boundary contribution in all samples. The existence of a non-Debye type of relaxation behaviour of the samples was also confirmed from impedance analysis as the centre of the semicircles lies below the real axis. At various temperatures, the frequency dependence of impedance plots has been utilized to characterize the electrical conduction of the sample which demonstrated the NTCR character (Negative Temperature Coefficient of Resistance).

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## 1 Introduction

Lead-free ferroelectric materials like BT (Barium Titanate), BZT (Barium Zirconate Titanate), and BCT (Barium calcium Titanate) are very important due to their large value of piezoelectric and dielectric constant. The perovskite  $ABO_3$  type compounds are acknowledged due to their various applications in modern piezo- and ferroelectric devices like sensing and actuating systems, photocatalysis, photovoltaic, piezo-catalysis, pyro-catalysis, and energy harvesting, etc. [1–5]. Low Curie temperature and high dielectric constant make the use of BT feasible at low temperatures. Modifications in Curie temperature can be done by doping with other elements or by mixing BT with other perovskite lead-free ceramics. The lead (Pb) based ceramics such as  $Pb(ZrTi)O_3$  (PZT) shows high piezoelectric and dielectric constant with high Curie temperature and low dielectric loss [6, 7]. But the major drawback of materials with lead as one of its components is that they are very toxic to humans and not environment friendly [8]. Various lead free ferroelectrics namely  $BaTiO_3$ ,  $(K_{0.5}Na_{0.5})NbO_3$ ,  $(Bi_{0.5}Na_{0.5})TiO_3$ ,  $(Bi_{0.5}Na_{0.5})TiO_3$ - $BaTiO_3$ , alkali metal niobates  $ANbO_3$  ( $A = Li, Na, K$ ), etc. had been represented as replacement of lead-based materials [9]. Among them,  $BaTiO_3$  is a room temperature ferroelectric material that exhibits transition at  $120^\circ\text{C}$  (cubic-tetragonal), at  $5^\circ\text{C}$  (tetragonal-orthorhombic) and  $-90^\circ\text{C}$  (orthorhombic-rhombohedral) [10–12].  $Ca^{2+}$  and  $Zr^{4+}$  doped  $BaTiO_3$  ceramics had been recognized due to their technological importance for their high piezoelectric properties [13–16].  $Zr^{4+}$  substitution at the  $Ti^{4+}$  site in BT ceramics enhances the dielectric behaviour and  $Ca^{2+}$  substitution at  $Ba^{2+}$  site modified their Curie temperature with orthorhombic to tetragonal phase transition [17]. Various doped BT systems had been studied for its broad dielectric phenomenon near  $T_c$ , and piezoelectric properties [18]. Structural correlations in the enhancement of ferroelectric property of Sr doped  $BaTiO_3$  ceramics had been observed and reported the higher remnant electric polarization ( $P_r \sim 5 \mu\text{Ccm}^{-2}$  at room temperature and the maximum  $P_r \sim 8 \mu\text{Ccm}^{-2}$ ) of Sr doped  $BaTiO_3$  than pure  $BaTiO_3$  [19].

The motivation to work on BZT-BCT ceramics was due to their high dielectric constant, low loss, and high piezoelectric properties suitable for different applications.  $(x)\text{BZT}-(1-x)\text{BCT}$  composite with

$x = 0.5$  had drawn significant attention due to its appreciable dielectric properties along with the co-existence of tetragonal and rhombohedral phases near the morphotropic phase boundary (MPB) [20–22]. A majority of studies has been carried out on the different properties of BCZT-based materials on conventionally synthesised ceramics using the Solid-State reaction method, calcination temperature ( $\leq 1200^\circ\text{C}$  for 4–6 h) and sintering temperature ( $\geq 1450^\circ\text{C}$  for 2–4 h) [23–26]. Such type of fabrication approach appears to produce a coarse-grained microstructure that is mechanically unstable, limiting device miniaturisation. Sn doped BCZT ceramics investigation showed that the recoverable energy storage has been enhanced with Sn doping rate and reported the highest recoverable energy density and efficiency ( $W_{\text{rec}} = 19 \text{ mJ/cm}^3$ ,  $\eta = 81.65\%$ ). Synthesis of  $Ba_{0.85}Ca_{0.15}Zr_{0.1}Ti_{0.9}O_3$  ceramics by solid state method, sintering in air and nitrogen investigated for structure refinement and impedance analysis and reported the higher dielectric constant when sintered in air [27]. Multiferroic composite of  $SrFe_{12}O_{19}$  and  $Ba_{0.85}Ca_{0.15}Zr_{0.1}Ti_{0.9}O_3$  have been investigated and reported NTCR and non-Debye type behaviour of the ceramic materials [28]. Comparative study of dielectric and ferroelectric properties of  $Cu^{2+}$ - and  $Cu^{2+}/Bi^{3+}$ -doped BCZT ceramics have been studied and reported  $d_{33}$  value, which was  $54 \text{ pC/N}$  for pure BCZT, and  $140 \text{ pC/N}$ ,  $64 \text{ pC/N}$  for BCZTC and BCZTCB respectively [29].

In this paper, we present a structural, dielectric and impedance behaviour of a lead-free  $BaZr_{0.2}Ti_{0.8}O_3$ ,  $Ba_{0.7}Ca_{0.3}TiO_3$  and  $(1-x)BaZr_{0.2}Ti_{0.8}O_3-(x)Ba_{0.7}Ca_{0.3}TiO_3$ , (with  $x = 0.15, 0.30$  and  $0.45$ ) (BZT-BCT) system. Calcination and sintering temperature during the synthesis process have been optimized based on the literature review. Before the optimization of calcination and sintering temperature, we have fabricated the samples at different temperature and time. After the analysis of these data, we synthesised all the samples at  $1200^\circ\text{C}$  (calcination temperature) and  $1250^\circ\text{C}$  (sintering temperature) with the pure phase.

## 2 Materials and methods

$(1-x)BaZr_{0.2}Ti_{0.8}O_3-(x)Ba_{0.7}Ca_{0.3}TiO_3$  (BZT-BCT) (where  $x = 0.15, 0.30$  and  $0.45\%$ ) ceramics were prepared by solid-state reaction technique. Pure starting materials were used ( $BaCO_3$  ( $> 99\%$ ),  $ZrO_2$  ( $99\%$ ),  $TiO_2$

(> 99%), and  $\text{CaCO}_3$  (> 99%) with the above said stoichiometric proportion from Sigma Aldrich. The weighed chemicals were ball milled in the presence of zirconia balls for 12 h in acetone medium for the fine grinding of the particle. The mixed powder slurry was dried at 100 °C for 4 h. After drying, the powder mixtures were calcined at 1200 °C for 12 h. The powder was pressed into pellets of approximately 1 mm thickness and 10 mm diameter at a pressure of 10 MPa using a hydraulic press in the presence of a Polyvinyl alcohol binder by 2 wt. %. Sintering was performed at 1250 °C for 2 h in a closed alumina crucible in the presence of air. After sintering, the pellets were polished. Before measurements, the pellets were washed in the ultrasonic bath for removing dust. After all this treatment, the pellets were heating at 500 °C for 1 h to remove the mechanical strain in the pellets. A powder X-ray diffraction (XRD) study was carried out by using Panalytical X'pert Pro equipped with the  $\text{CuK}_\alpha$  anode ( $\lambda = 1.5408 \text{ \AA}$ ). The different phases were identified by using the diffraction peak refinement method.

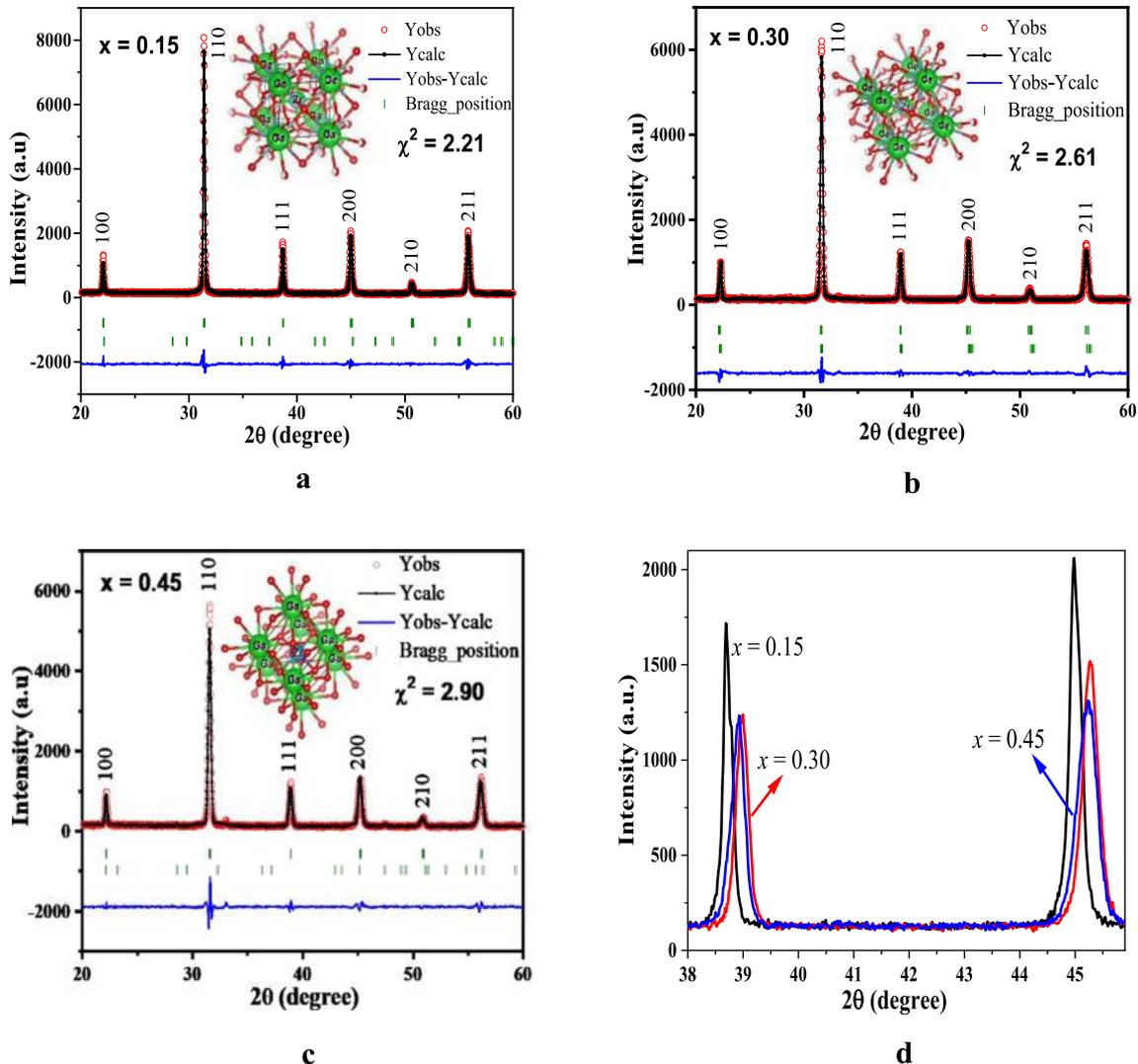
All XRD data were collected from 20° to 80° with a slow scan speed of 2 °/min. Rietveld analysis of all samples was done by using online available FullProf Suite software. Electrical and impedance analysis was taken using KEYSIGHT E4990A Impedance Analyzer (20 Hz -10 MHz) at different temperatures (RT - 500 °C) and different frequencies (100 Hz to 1 MHz). Ferroelectric hysteresis loop (P-E) was recorded on an Automatic PE Loop Tracer, Marine India at a frequency of 20 Hz with an optimal field of 30 kV/cm.

### 3 Results and discussion

#### 3.1 X-ray diffraction analysis

The normalized XRD patterns of all  $(1-x)\text{BaZr}_{0.2}\text{Ti}_{0.8}\text{O}_3-(x)\text{Ba}_{0.7}\text{Ca}_{0.3}\text{TiO}_3$  (where  $x = 0.00, 0.15, 0.30,$  and  $0.45$ ) ceramic powder are shown in Fig. 1a-d. XRD patterns confirmed that all the ceramic samples possessed a pure perovskite phase. The XRD lines presented in the patterns were identified as tetragonal and orthorhombic structures. The XRD data of BZT-BCT ceramics were simulated by Rietveld refinement based on pseudo-Voigt fitting function as shown in Fig. 1a-c. Rietveld refinement of XRD data of all samples was carried out in systemic order and the final refined structural parameters of the  $x = 0.00$

were taken as initial input structural parameters for the rest of the samples. In comparison, with increasing the  $x$  value, the (200) peak starts to shift towards the higher side near 45° Fig. 1d. The XRD analysis suggests the possible coexistence of both tetragonal (T) and orthorhombic (O) phases for all  $x$  values, according to the peak profile and fitting parameters. Rietveld's refined data indicates that fitting parameters were found to be well within the acceptable limits (as shown in Table 1). The low-value goodness of fit (GOF) (< 2.90) for all samples, indicating, the experimental and theoretical data were matched. Figure 1d shows the enlarged views of the main peaks in the  $2\theta$  range of 38–40° and 44–46°, respectively. No impurity phase exists with an increase of the BCT content in samples. The average crystallite size was calculated by Scherrer equation  $D = \frac{0.9\lambda}{\beta \cos\theta}$  where  $D$  = average crystallite size,  $\lambda$  = wavelength of the incident X-rays,  $\beta$  = full width at half maximum (FWHM), and  $\theta$  is the Bragg diffraction angle. The X-ray density ( $\rho$ ) was calculated by the equation,  $\rho = \frac{ZM}{NV}$  (where  $Z$  is the number of molecules per unit cell which is 12 for perovskite materials,  $M$  is the molecular weight,  $N$  is Avogadro number and  $V$  is the volume of the unit cell) [30]. For  $x = 0.30$  and  $0.45$  compositions, there was no clear splitting (the only hump and shifted towards a higher angle) observed. From the inset graph, we found that the peaks at 38° and 44° in  $x = 0.00, 0.15$  showed clear splitting. The peak intensity of these two peaks had also been found to change with increasing  $x$ . There is no splitting found in  $x = 0.30,$  and  $0.45$  samples. As the  $x$  content increased, the main diffraction peaks also merge in one intense peak (111) (200) and gradually shifted towards higher angles. For all the samples, the best fitting was obtained for the tetragonal crystal structure, which belongs to the  $P4mm$  space group. The refined structural parameters (lattice parameters, volume of the unit cell, atomic positions, R-factors (%), GoF, and tolerance factor) of all the samples are shown in Table 1. A lower value of GoF for all the samples confirmed an excellent match between the experimental and calculated results. The variation in unit cell parameters and unit cell volume value with  $x$  content is also shown in Table 1. From Table 1, with an increase in  $x$  content, for all the samples lattice parameters and cell volume decreases. This is also supported by the shifting of peaks towards higher angles with an increase in BZT-BCT samples. The



**Fig. 1** a–c XRD pattern of  $(1-x)\text{BaZr}_{0.2}\text{Ti}_{0.8}\text{O}_3-(x)\text{Ba}_{0.7}\text{Ca}_{0.3}\text{TiO}_3$  (where  $x = 0.15, 0.30$  and  $0.45$ ) ceramics (d) expanded XRD pattern of all samples for 111 and 200 reflection  $(1-x)\text{BaZr}_{0.2}\text{Ti}_{0.8}\text{O}_3-(x)\text{Ba}_{0.7}\text{Ca}_{0.3}\text{TiO}_3$  (where  $x = 0.15, 0.30$  and  $0.45$ ) ceramics

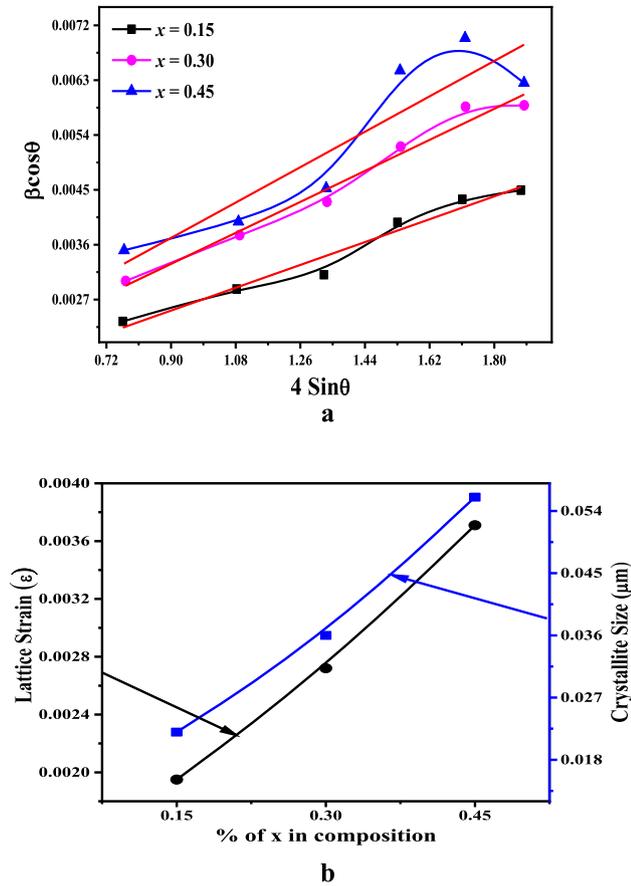
volume of the unit cell decreased with increasing  $x$  content. Bond distance and bond angle of  $\text{O}_1\text{-Zr-O}_2$  and  $\text{O}_1\text{-Ba-O}_2$  were found to decrease with an increase in BCT concentration. Structure and orbital ordering depend on the distortions in the lattice, oxygen content, and oxygen complex network in the perovskite lattice [31, 32]. There is no change in the  $c/a$  ratio with an increase in the  $x$  ratio, indicating the same tetragonal distortions.

It can be described by the Williamson-Hall uniform deformation model (UDM). The UDM plots for the  $(1-x)\text{BaZr}_{0.2}\text{Ti}_{0.8}\text{O}_3-(x)\text{Ba}_{0.7}\text{Ca}_{0.3}\text{TiO}_3$  (where  $x = 0.00, 0.15, 0.30,$  and  $0.45$ ) ceramics are shown in Fig. 2a. The graph was plotted between the  $\beta_{\text{hkl}} \cos\theta$  and  $4\sin\theta$ . The plots clearly showed that all the samples had a

positive slope, indicated that the samples had a positive strain or tensile strain. The increase in lattice parameters, which was also revealed by Rietveld’s analysis, could be attributed to this tensile strain. The lattice strain increases from 0.00195 to 0.00371 as  $x$  varies from 0.15 to 0.45 mol% of concentration. As per the figure, it affirms that, if the crystalline size increases, strain increases [33]. Further to that, the slope and intercept of the plot of Fig. 2a by the method of linear fitting were used to calculate strain ( $\epsilon$ ) and crystallite size ( $D$ ). Variation of these parameters were shown in Fig. 2b with respect to  $x$  mol% of concentration. The widening of Bragg peaks in the XRD pattern is noteworthy in evaluating the crystallite size and in the estimation of the lattice strain

**Table 1** FullPROF based Rietveld refinement parameters and calculated crystallographic parameters of the XRD pattern of  $(1-x)\text{BaZr}_{0.2}\text{Ti}_{0.8}\text{O}_3$ — $(x)\text{Ba}_{0.7}\text{Ca}_{0.3}\text{TiO}_3$  (where  $x = 0.15, 0.30$  and  $0.45$ ) ceramics

Calculated crystallographic parameters		$x = 0.15$	$x = 0.30$	$x = 0.45$
Lattice Parameters Tetragonal	$a = b$ (Å)	4.0304	4.0027	4.0077
	$c$ (Å)	4.0231	4.0206	4.0341
Ratio of Tetragonal		0.9981	1.0044	1.0078
Volume of unit cell Tetragonal	$V$ (Å <sup>3</sup> )	65.35	64.41	64.79
Lattice Parameters Orthorhombic	$a$ (Å)	5.0118	4.0064	4.9390
	$b$ (Å)	4.0158	3.9805	4.0082
	$c$ (Å)	3.0002	2.8334	3.8314
Volume of unit cell Orthorhombic	$V$ (Å <sup>3</sup> )	75.35	45.47	75.84
Ba/Ca	X	0.99290	0.99290	0.99290
	Y	0.99290	0.99290	0.99290
	Z	0.99290	0.99290	0.99290
Zr/Ti	X	0.5	0.5	0.5
	Y	0.5	0.5	0.5
	Z	0.51305	0.51305	0.51305
Atomic positions	O <sub>1</sub>			
	X	0.5	0.5	0.5
	Y	0.5	0.5	0.5
	Z	0.01615	0.01615	0.01615
	O <sub>2</sub>			
	X	0.5	0.5	0.5
	Y	0	0	0
	Z	0.48612	0.48162	0.48612
R-factor() tetragonal	$R_p$	19.0	19.6	22.6
	$R_{wp}$	14.8	17.6	18.4
	$R_e$	9.99	10.9	10.8
	$R_f$	0.615	1.17	0.906
	$R_B$	1.20	1.63	1.05
R-factor() orthorhombic	$R_p$	....	....	....
	$R_{wp}$	....	....	....
	$R_e$	....	....	....
	$R_f$	15.9	2.13	17.9
	$R_B$	13.6	1.13	29.4
GOF		2.21	2.61	2.90
Bond angle (θ)	O <sub>1</sub> – Ba – O <sub>1</sub>	89.970	89.890	89.970
	O <sub>2</sub> – Ba – O <sub>2</sub>	60.909	58.992	88.408
	O <sub>1</sub> – Ca – O <sub>1</sub>	90.749	90.749	90.749
	O <sub>2</sub> – Ca – O <sub>2</sub>	59.993	59.912	89.193
	O <sub>1</sub> – Zr – O <sub>1</sub>	180	180	180
	O <sub>2</sub> – Zr – O <sub>2</sub>	173.83	173.81	173.83
Bond length (Å)	O <sub>1</sub> –Ba	2.8478	2.8326	2.8358
	O <sub>2</sub> –Ba	2.8085	2.8757	2.8753
	O <sub>1</sub> –Ca	2.8082	2.7932	2.8369
	O <sub>2</sub> –Ca	2.8084	2.8356	2.8751
	O <sub>1</sub> –Zr	2.0267	1.9958	2.0179
	O <sub>2</sub> –Zr	2.0161	2.0053	2.0076

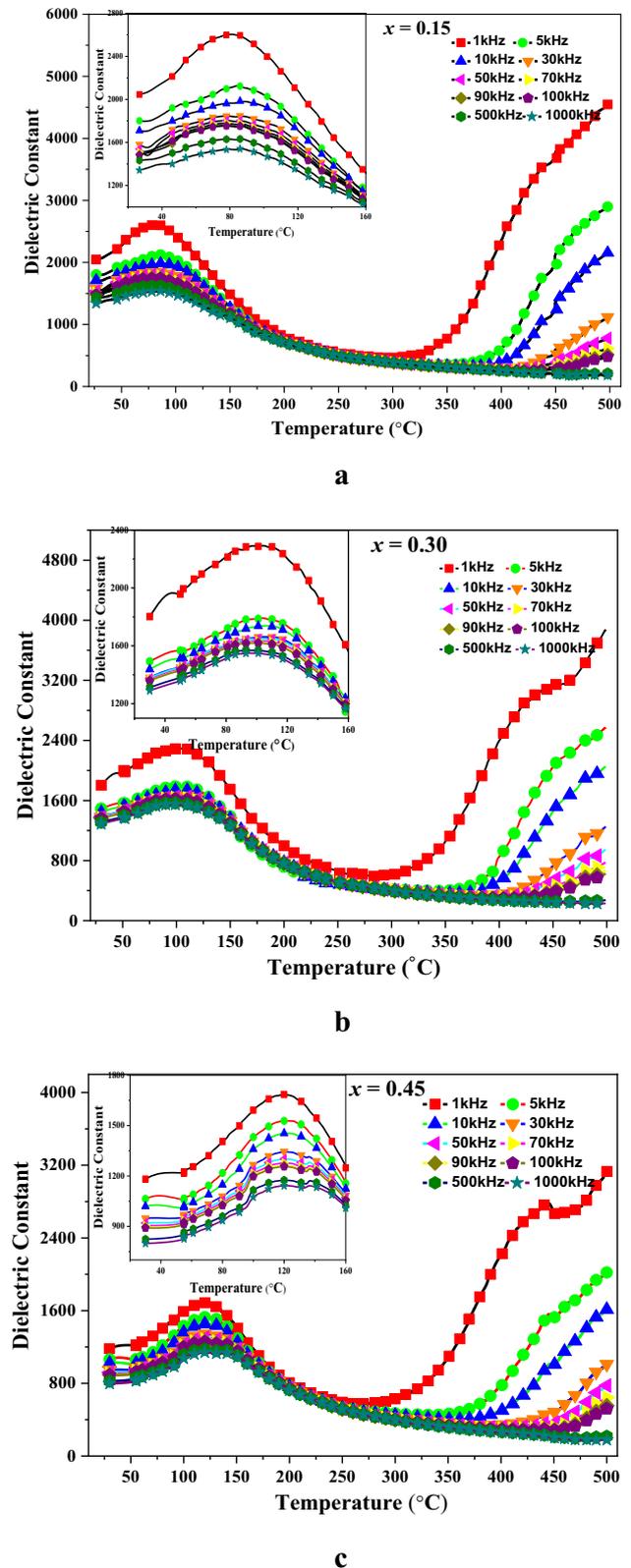


**Fig. 2** a Williamson-Hall plot and b Variation in Lattice Strain and Crystallite Size at the different compositions

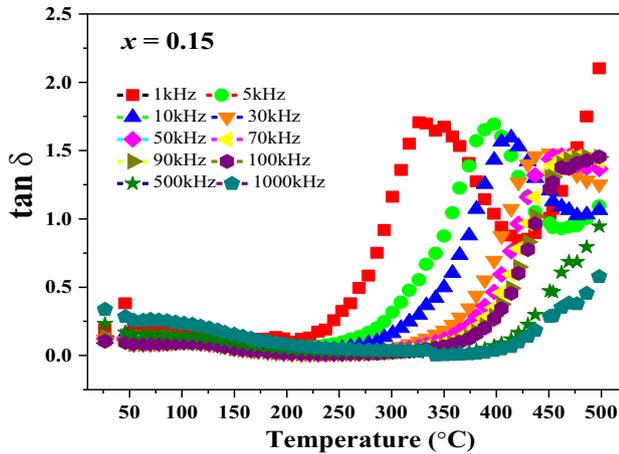
**Table 2** Detail of parameters calculated from W–H Plot (Williamson-Hall Plot) of  $(1-x)\text{BaZr}_{0.2}\text{Ti}_{0.8}\text{O}_3 - (x)\text{Ba}_{0.7}\text{Ca}_{0.3}\text{TiO}_3$  (where  $x = 0.15, 0.30$  and  $0.45$ ) ceramics

x (mol %)	Lattice Strain ( $\epsilon$ )* $10^{-3}$	Crystallite Size (nm)
x = 0.15	1.95	22.95
x = 0.30	2.72	36.42
x = 0.45	3.71	56.07

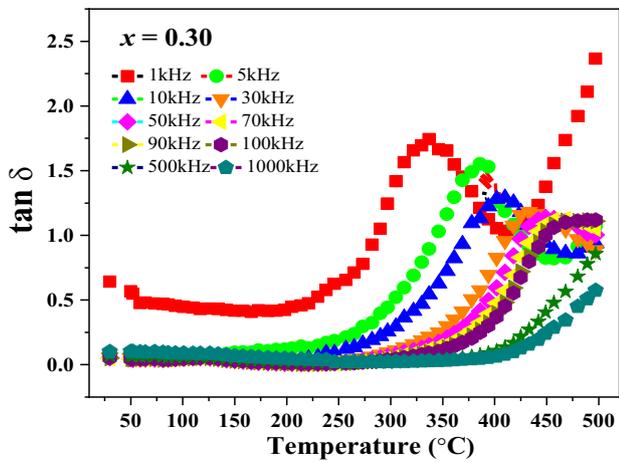
[34]. The Bragg peak broadening generally depends on the sample and the instrument factor of XRD. The broadening of peaks demonstrated that there was a huge strain associated with the grain. According to, W–H plot the crystalline size increases with increasing the lattice strain [35]. In Table 2 parameters calculated from W–H plot had been reported. The existence of uniform tensile stress in the samples was suggested by the apparent shift (higher  $2\theta$ ) in the diffraction peaks with a concentration. From Fig. 1



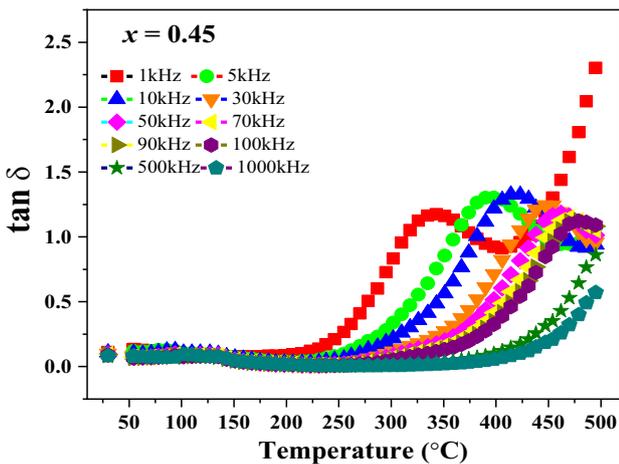
**Fig. 3** a–c Temperature dependence of Dielectric Constant ( $\epsilon$ ) of  $(1-x)\text{BaZr}_{0.2}\text{Ti}_{0.8}\text{O}_3 - (x)\text{Ba}_{0.7}\text{Ca}_{0.3}\text{TiO}_3$  (where  $x = 0.15, 0.30$  and  $0.45$ ) ceramics at different frequency



a

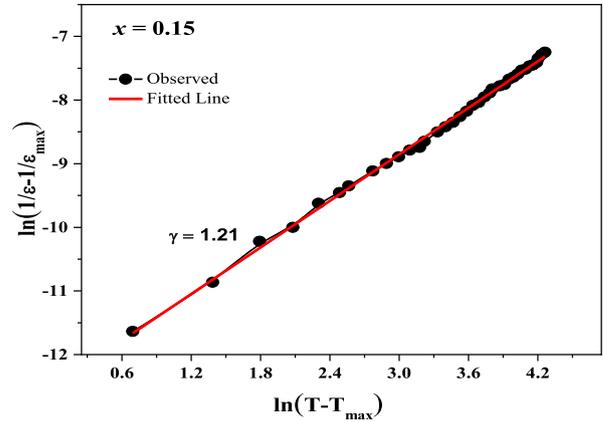


b

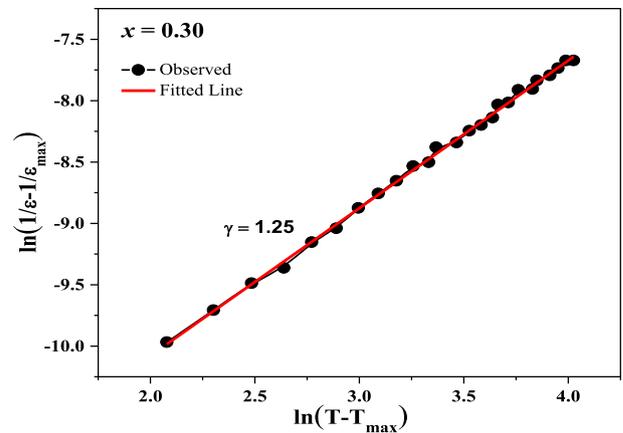


c

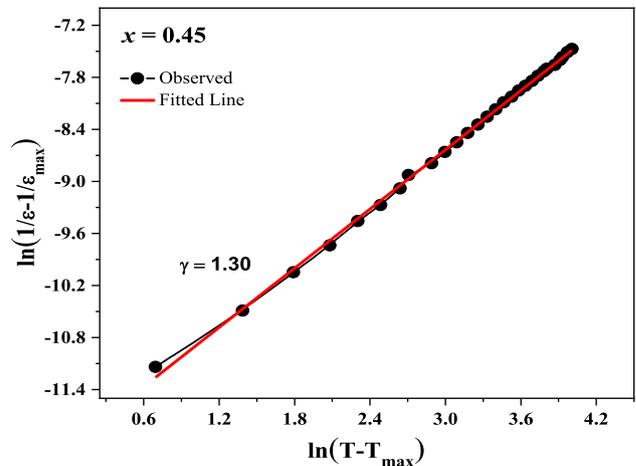
**Fig. 4** Temperature dependence of Dielectric loss ( $\tan \delta$ ) of  $(1-x)\text{BaZr}_{0.2}\text{Ti}_{0.8}\text{O}_3-(x)\text{Ba}_{0.7}\text{Ca}_{0.3}\text{TiO}_3$  (where  $x = 0.15, 0.30$  and  $0.45$ ) ceramics at different frequency



a



b



c

**Fig. 5 a–c** Variation of  $\ln(1/\epsilon - 1/\epsilon_{\max})$  vs  $(T - T_{\max})$  in the paraelectric region  $(1-x)\text{BaZr}_{0.2}\text{Ti}_{0.8}\text{O}_3-(x)\text{Ba}_{0.7}\text{Ca}_{0.3}\text{TiO}_3$  (where  $x = 0.15, 0.30$  and  $0.45$ ) ceramics

we found that the XRD peaks shifted towards the higher side in 2theta, due to which the strain developed in samples with the change in the concentration.

**Dielectric study**

Figure 3a–c indicates the temperature dependence of the dielectric constant ( $\epsilon$ ) of  $(1-x)\text{BaZr}_{0.2}\text{Ti}_{0.8}\text{O}_3-(x)\text{Ba}_{0.75}\text{Ca}_{0.3}\text{TiO}_3$  (where  $x = 0.15, 0.30$  and  $0.45$ ) ceramics at different frequency ranging from 1 to 1000 kHz. It was observed that  $\epsilon$  decreased after the Curie temperature  $T_c$ .  $T_c$  was found to be shifted towards the high-temperature side with frequency. It was also observed that there were slight changes in the dielectric constant with frequency increases. The slope of the figure (broadening of peaks at  $T_c$ ) confirms that the transition was diffused type of phase transition (DPT). Figure 4a–c illustrates how dielectric loss varies with temperature ( $\tan \delta$ ) for  $(1-x)\text{BaZr}_{0.2}\text{Ti}_{0.8}\text{O}_3-(x)\text{Ba}_{0.7}\text{Ca}_{0.3}\text{TiO}_3$  (where  $x = 0.15, 0.30$  and  $0.45$ ) ceramics at different frequencies. The value of  $\tan \delta$  increased with an increase in temperature, and after that, it decreased showing an anomaly. From Fig. 5a–c the equation  $\ln(1/\epsilon - 1/\epsilon_{\text{max}})$  vs  $(T - T_{\text{max}})$  was used to measure the degree of disorder or diffuseness (i.e. diffusivity) in the phase transition of BZT–BCT, where  $\epsilon$  is the dielectric constant at temperature  $T$  and  $\epsilon_{\text{max}}$  is its maximum value at  $T_{\text{max}}$ . The maximum value of diffusivity calculated from the graph was found to be 1.30 for  $x = 0.45$  composition. This demonstrates that in materials with a high degree of disorder, a diffused phase transition occurs. The value of  $\gamma$  was found to increase with increasing  $x$  content. The occurrence of disordering in this system can thus be interpreted as a deviation from the Curie–Weiss type of phase transition behaviour. Detail of parameters calculated from dielectric studies had been reported in Table 3.

**3.2 Impedance study**

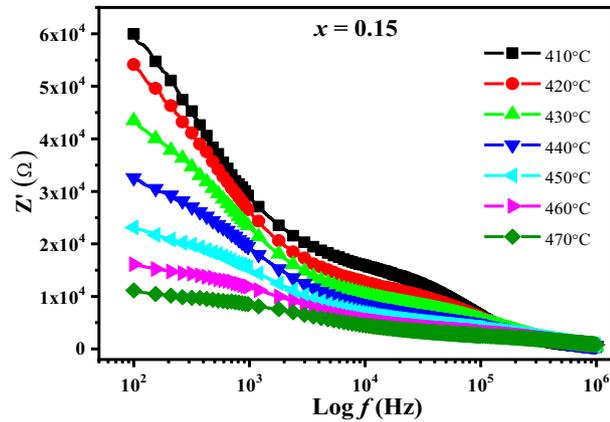
Figure 6a–c shows  $Z'$  (real part of impedance) as a function of frequency. It was found that  $Z'$  decreases as temperature increases which shows the Negative temperature coefficient resistance (NTCR) behavior

of the samples. At a lower frequency,  $Z'$  possessed higher values while it decreased at a higher frequency. Figure 7a–c shows the deviation of  $Z''$  (imaginary part of impedance) as a function of frequency at different temperature ranges. It was observed that the imaginary part of impedance decreases as frequency increases. It is clear from the figure as we moved towards the high frequency, all the curves merged at a point. The peak shifted towards the high-frequency side with increasing temperature. The decreasing magnitude of the imaginary part of impedance ( $Z''$ ) with increasing temperature indicated a reduction in the resistive behavior of the samples. The existence of a temperature-dependent electrical relaxation phenomenon is indicated by the shifting of peaks with increasing temperature [36, 37].

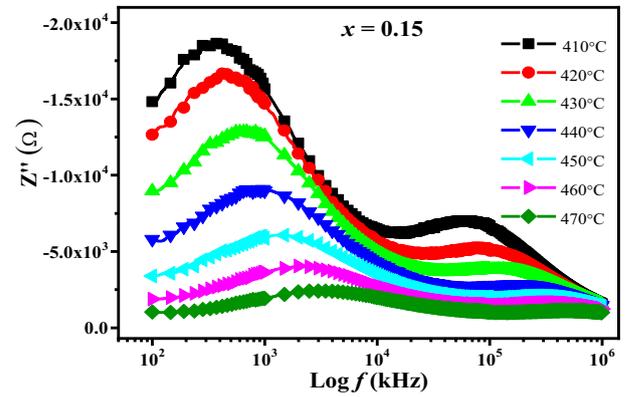
Figure 8a–c shows the frequency dependence of  $M'$  (real component of dielectric modulus) at different temperatures over a broad range of frequencies of  $(1-x)\text{BaZr}_{0.2}\text{Ti}_{0.8}\text{O}_3-(x)\text{Ba}_{0.7}\text{Ca}_{0.3}\text{TiO}_3$  composites with  $x = 0.15, 0.30, 0.45$  materials. From the observed experimental results, we found that the value of  $M'$  is lower at lower frequencies, gradually increases with increasing frequency, and eventually saturates at higher frequencies for all temperature ranges. The short-range mobility of charge carriers is responsible for this type of saturation behaviour. Figure 9(a–c) shows the discrepancy of  $M''$  (imaginary part of the modulus) with the frequency at different observed temperatures of all the samples. At both low and high frequencies, the peaks were found to be asymmetric and broad. The lower frequency peak indicates that ions can move long distances, while the high-frequency peak indicates that ions are confined within their potential well. With increasing temperature, the peak value ( $M''_{\text{max}}$ ) imaginary part of modules shifts towards a higher frequency, as shown in the figure. This demonstrates  $M''$  strong reliance on temperature and frequency when it comes to correlating the motion of mobile charge carriers [38].

**Table 3** Details of the physical parameters of  $(1-x)\text{BaZr}_{0.2}\text{Ti}_{0.8}\text{O}_3-(x)\text{Ba}_{0.7}\text{Ca}_{0.3}\text{TiO}_3$  (where  $x = 0.15, 0.30$  and  $0.45$ ) ceramics at 1 kHz

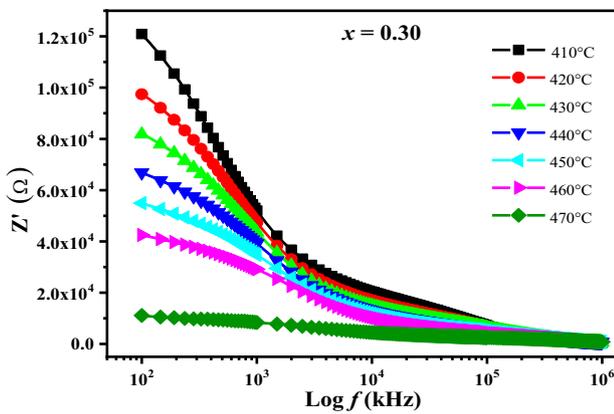
x (mol %)	Curie temperature (°C)	Dielectric constant	Diffusivity ( $\gamma$ )
x = 0.15	81.39	2587.49	1.21
x = 0.30	105.22	2278.94	1.25
x = 0.45	119.62	1679.25	1.30



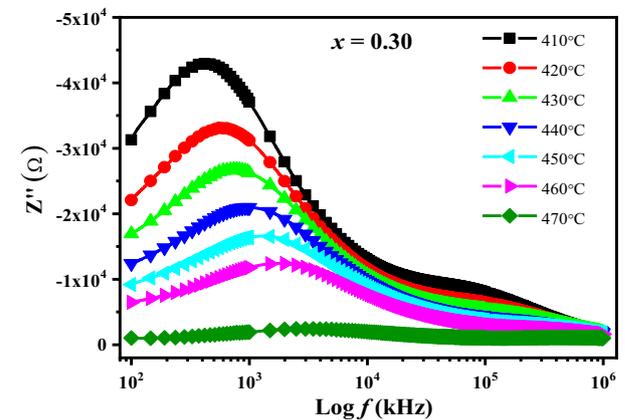
a



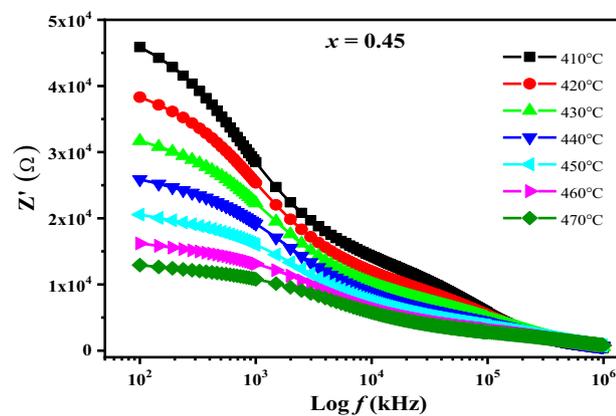
a



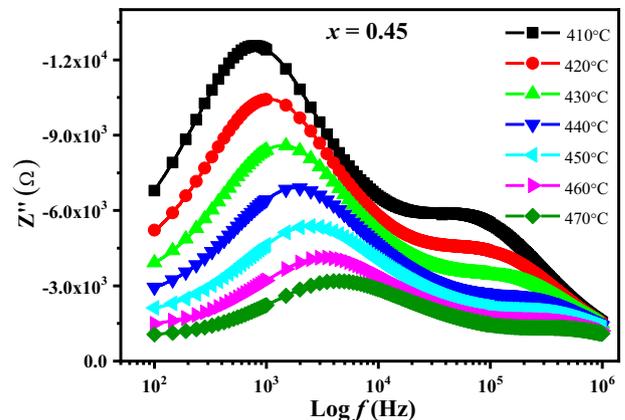
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b



c



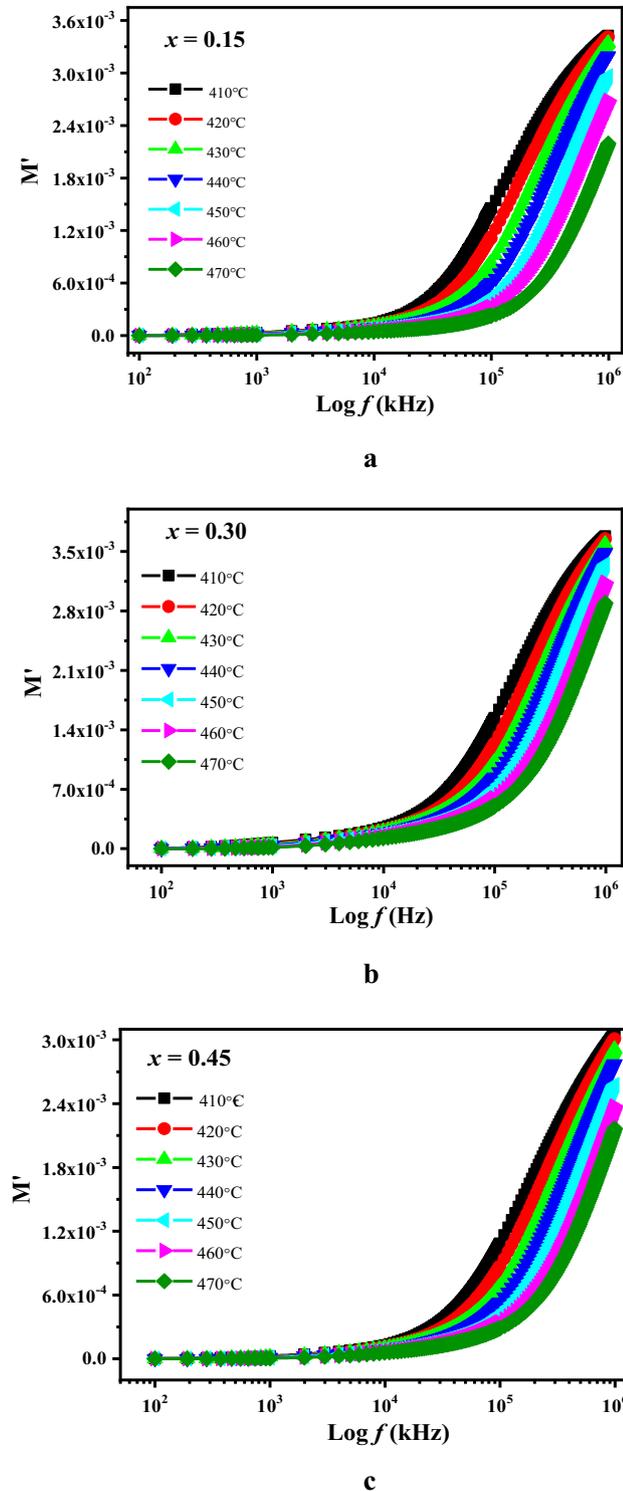
c

**Fig. 6** a–c Frequency dependence of real impedance part of  $(1-x)\text{BaZr}_{0.2}\text{Ti}_{0.8}\text{O}_3-(x)\text{Ba}_{0.7}\text{Ca}_{0.3}\text{TiO}_3$  (where  $x = 0.15, 0.30$  and  $0.45$ ) ceramics at different temperature

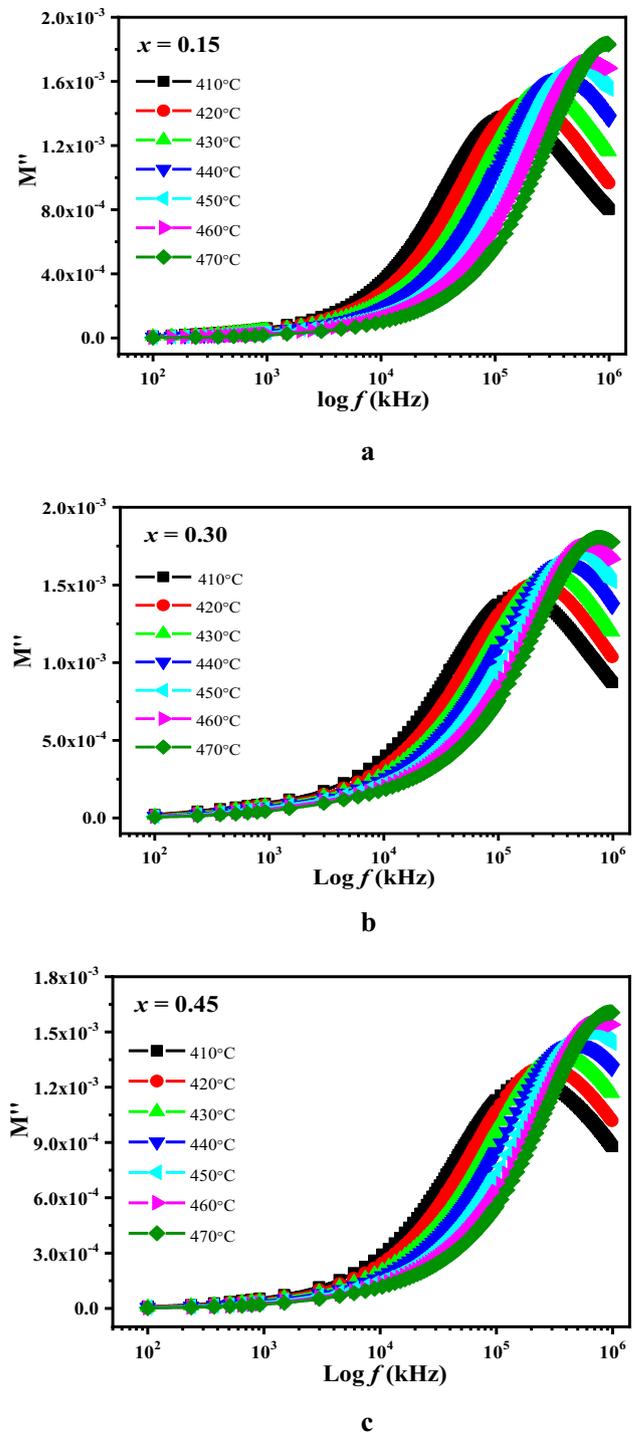
Figure 10(a–c) shows the Nyquist plot of  $(1-x)\text{BaZr}_{0.2}\text{Ti}_{0.8}\text{O}_3-(x)\text{Ba}_{0.7}\text{Ca}_{0.3}\text{TiO}_3$  ceramics with  $x = 0.15, 0.30,$  and  $0.45$ . Semi-circular arcs

**Fig. 7** a–c Frequency dependence of imaginary impedance part of  $(1-x)\text{BaZr}_{0.2}\text{Ti}_{0.8}\text{O}_3-(x)\text{Ba}_{0.7}\text{Ca}_{0.3}\text{TiO}_3$  (where  $x = 0.15, 0.30$  and  $0.45$ ) ceramics

characterize the impedance spectrum [32]. EC-Fit software was used to fit the Nyquist plots for all the compositions with the equivalent circuit. The experimental and fitted data were found to be quite

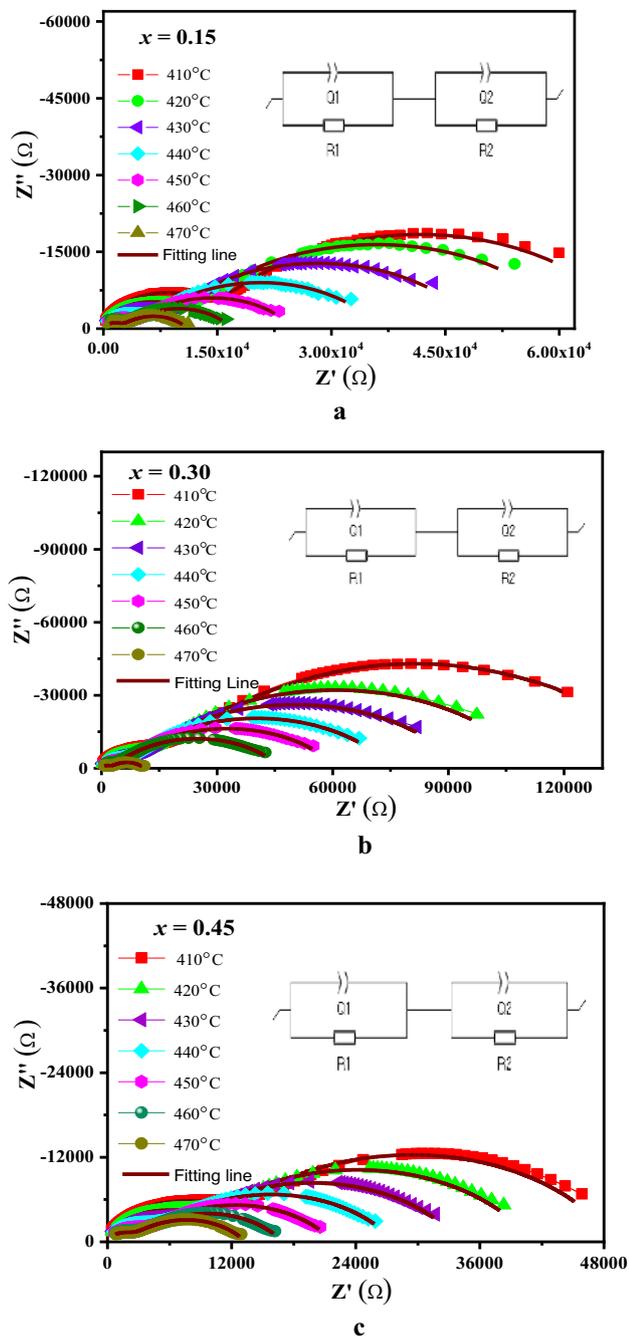


**Fig. 8** a–c Variation of real part of modulus ( $M'$ ) with frequency of  $(1-x)\text{BaZr}_{0.2}\text{Ti}_{0.8}\text{O}_3-(x)\text{Ba}_{0.7}\text{Ca}_{0.3}\text{TiO}_3$  (where  $x = 0.15, 0.30$  and  $0.45$ ) ceramics at different temperature



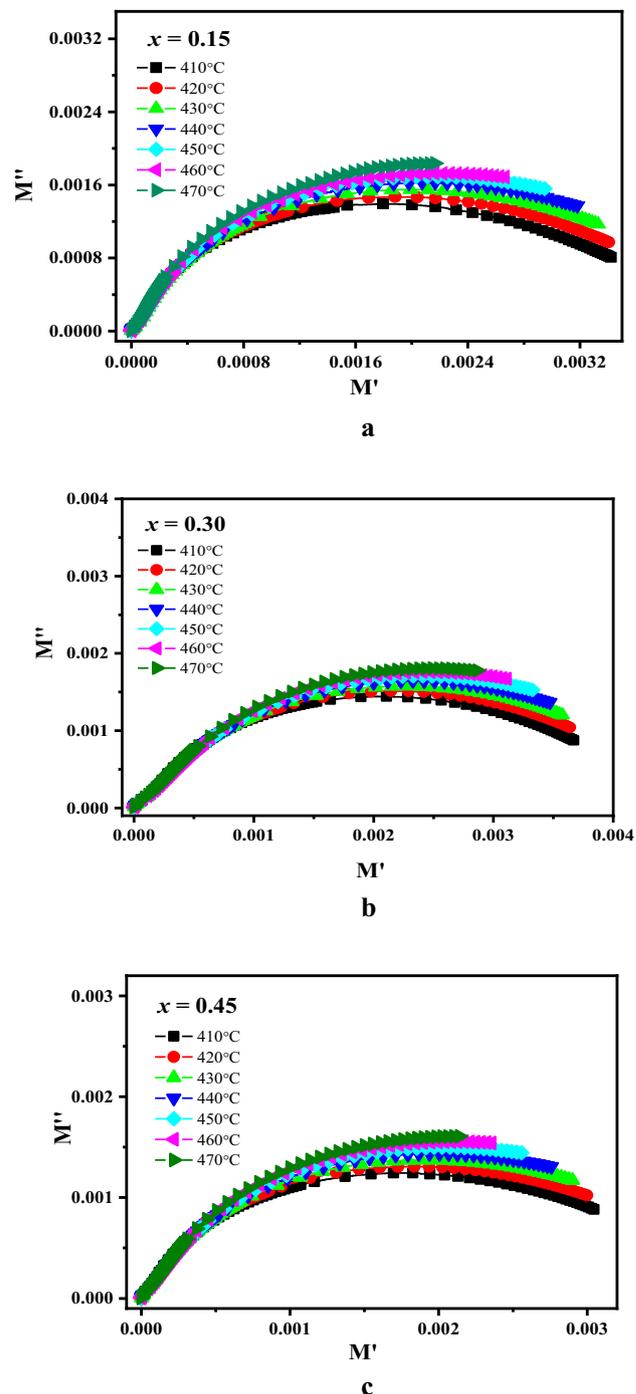
**Fig. 9** a–c Variation of imaginary part of modulus ( $M''$ ) with frequency of  $(1-x)\text{BaZr}_{0.2}\text{Ti}_{0.8}\text{O}_3-(x)\text{Ba}_{0.7}\text{Ca}_{0.3}\text{TiO}_3$  (where  $x = 0.15, 0.30$  and  $0.45$ ) ceramics at different frequency

comparable. In the complex plane plot, two semicircular arcs well separated at higher temperatures were observed. The existence of both grains and grain boundary contributions was represented by these



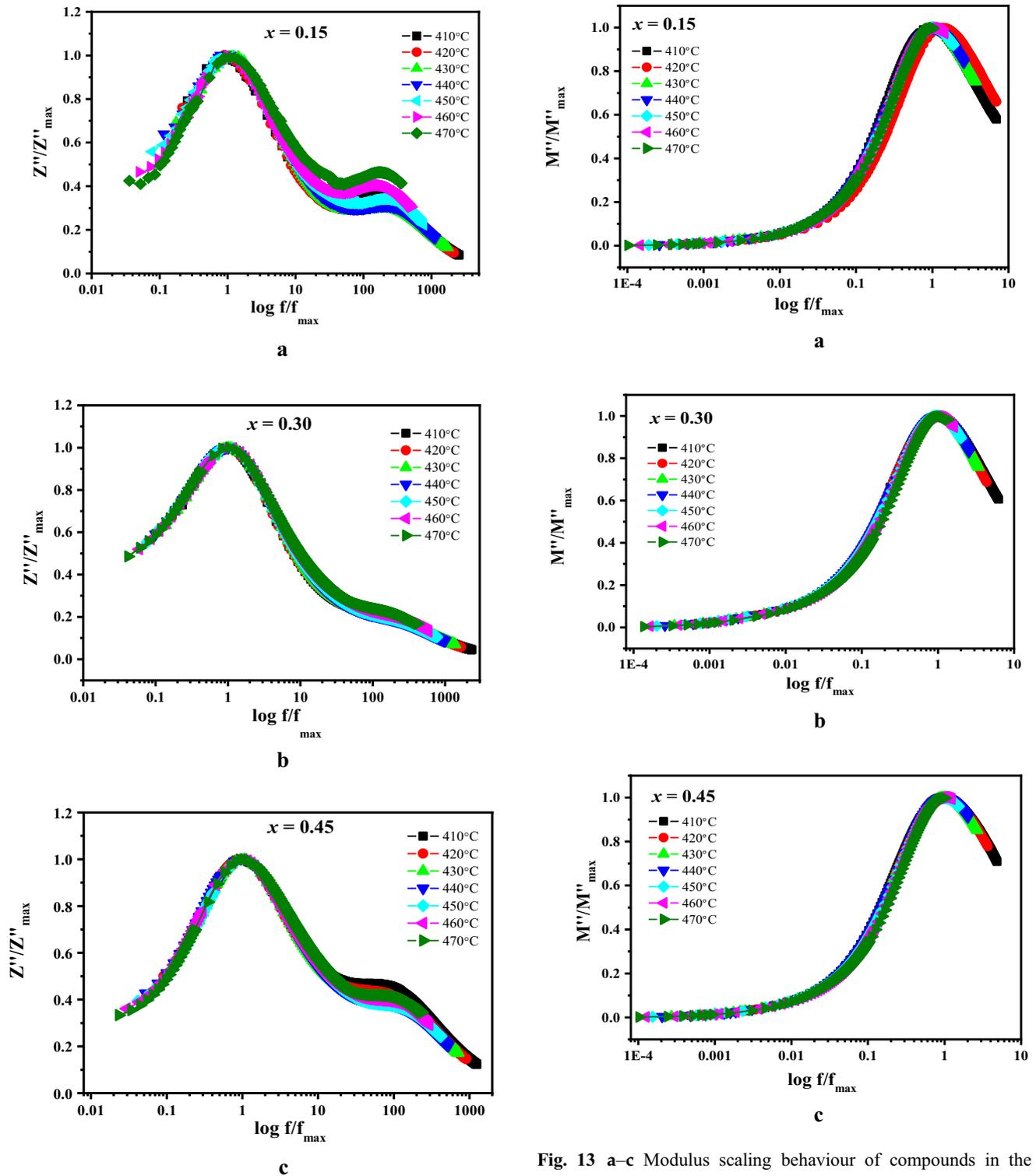
**Fig. 10** a–c Cole–Cole plot and fitting of Cole–Cole plot of  $(1-x)\text{BaZr}_{0.2}\text{Ti}_{0.8}\text{O}_3-(x)\text{Ba}_{0.7}\text{Ca}_{0.3}\text{TiO}_3$  (where  $x = 0.15, 0.30$  and  $0.45$ ) ceramics at different temperature

two semi-circular arcs. The first semi-circular arc, on the higher frequency side, denotes grain contributions arising from a parallel combination of bulk resistance ( $R_b$ ) and bulk capacitance ( $C_b$ ), while the second semi-circular arc, on the lower frequency side, indicates grain boundary contributions arising from a



**Fig. 11** a–c Variation of real and imaginary part of modulus with temperature of  $(1-x)\text{BaZr}_{0.2}\text{Ti}_{0.8}\text{O}_3-(x)\text{Ba}_{0.7}\text{Ca}_{0.3}\text{TiO}_3$  (where  $x = 0.15, 0.30$  and  $0.45$ ) ceramics at different temperature

parallel combination of grain boundary resistance ( $R_{gb}$ ) and capacitance ( $C_{gb}$ ). The decreasing values of bulk resistance and grain boundary, with increasing temperature revealing the semiconducting behavior of the material. Figure 11(a–c) represents the



**Fig. 12** a–c Impedance scaling behaviour of compounds in the master curves of  $(1-x)\text{BaZr}_{0.2}\text{Ti}_{0.8}\text{O}_3-(x)\text{Ba}_{0.7}\text{Ca}_{0.3}\text{TiO}_3$  (where  $x = 0.15, 0.30$  and  $0.45$ ) of the ceramic at different temperature.

**Fig. 13** a–c Modulus scaling behaviour of compounds in the master curves of  $(1-x)\text{BaZr}_{0.2}\text{Ti}_{0.8}\text{O}_3-(x)\text{Ba}_{0.7}\text{Ca}_{0.3}\text{TiO}_3$  (where  $x = 0.15, 0.30$  and  $0.45$ ) of the ceramic materials at different temperature

temperature dependence of the complex modulus spectrum of all samples at different temperatures. The pattern was characterized by the presence of little asymmetric and single semicircular arcs whose center does not lie on the real axis. This type of behavior confirms the non-Debye type of relaxation in all ceramic materials. With an increase in temperature, these semicircular arcs on the real axis appear to shift towards the lower value of  $M'$  [28].

The sample's scaling nature was investigated by plotting the normalized plots of  $Z''/Z''_{\max}$  and  $M''/M''_{\max}$  as a function of the normalized frequency at various temperatures for all ceramic materials and shown in Fig. 12(a–c) and Fig. 13(a–c). At different temperatures, the normalized plot overlaps on a single master curve. The modulus scaling behavior reveals information about the dielectric processes taking place within the material. The FWHM calculated from the normalized spectrum is greater than the  $\log \frac{2+\sqrt{3}}{2-\sqrt{3}}$ , indicating non-Debye behavior, which was confirmed by a complex impedance graph. With increasing temperature, the peak shifts and broadening were observed at higher frequencies. The emergence of temperature-dependent peaks ( $Z''_{\max}$  and  $M''_{\max}$ ) at a specific frequency ( $\omega_{\max} = 2\pi f_{\max}$ ) suggested the presence of a temperature-dependent relaxation process [39]. These relaxation processes could be influenced by defects that were mobile at high temperatures and remained immobile at low temperatures. With increasing temperature, the peaks shifted and broadened at higher frequencies.

## 4 Conclusion

In summary, the complex perovskite oxide  $(1-x)\text{BaZr}_{0.2}\text{Ti}_{0.8}\text{O}_3-(x)\text{Ba}_{0.7}\text{Ca}_{0.3}\text{TiO}_3$  ceramics (with  $x = 0.15, 0.30,$  and  $0.45$ ) were fabricated by a solid-state reaction method.  $(1-x)\text{BaZr}_{0.2}\text{Ti}_{0.8}\text{O}_3-(x)\text{Ba}_{0.7}\text{Ca}_{0.3}\text{TiO}_3$  ceramics (with  $x = 0.15, 0.30,$  and  $0.45$ ) crystallized both in the tetragonal and orthorhombic crystal system. The temperature dependence of the dielectric constant showed the presence of diffused phase transition in the BZT-BCT system. By varying BCT content in samples, the lattice parameters and cell volume get suppressed. Due to grain and grain boundary effects in all samples, the complex impedance and modulus plot found two semicircles over the frequency range of 100 Hz–1 MHz. Complex

impedance analysis also confirmed the existence of a non-Debye type of relaxation. The low dielectric loss is experienced in all the samples. The transition temperature ( $T_c$ ) was also found to shift towards the high-temperature side as the frequency was increased from 1 to 1000 kHz. It was also observed that  $T_c$  shifted towards the high-temperature side with an increase of frequency from 1 to 1000 kHz. It was observed that all the compositions had a value of  $\gamma$  between 1 and 2 which indicated a diffused ferroelectric behavior. Further, these composites show the transitions to be a diffuse phase transition. The complex impedance study suggested the NTCR behavior of the system indicating the semiconducting nature of the material. We have demonstrated that a composite material can prove to be an effective way to further improve the temperature stability range, dielectric, and ferroelectric properties to meet specific requirements for applications. These materials can be used for the piezoelectric and energy harvesting devices. Such type of ceramics is very useful for the electrocaloric/ fluorescence and energy storage devices.

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Focus Subject	History

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# Role of Arsenic in the Development of Neurodegenerative Diseases and Memory Impairment

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## ABSTRACT

Arsenic is a naturally occurring toxic metalloid present worldwide. Arsenic in its inorganic form is the most hazardous and is responsible for causing different diseases like cancer, skin disease, and many neurological disorders in humans which can be demonstrated by several experimental models. Contamination of the drinking water by metal toxins has been a major problem worldwide in which arsenic is one of the major. For the past few decades, there has been increased concern about the health risk due to arsenic and lots of epidemiological studies have been done suggesting an arsenic role in developing neurotoxicity. They also suggest the neurological damage caused by arsenic in children. In this current work, we are trying to explore the different mechanisms involved in arsenic neuropathy and the effects of arsenic-contaminated water on the spatial memory, frontal cortex, and hippocampal ultra-structures, and many other different regions of the brain disrupted by arsenic. Additionally, this review will guide the viewer to determine their future directions for the remission of developing arsenic neuropathy.

**Keywords:** Arsenic · Oxidative stress · Neurotoxicity · Frontal cortex · Hippocampus

## I. INTRODUCTION

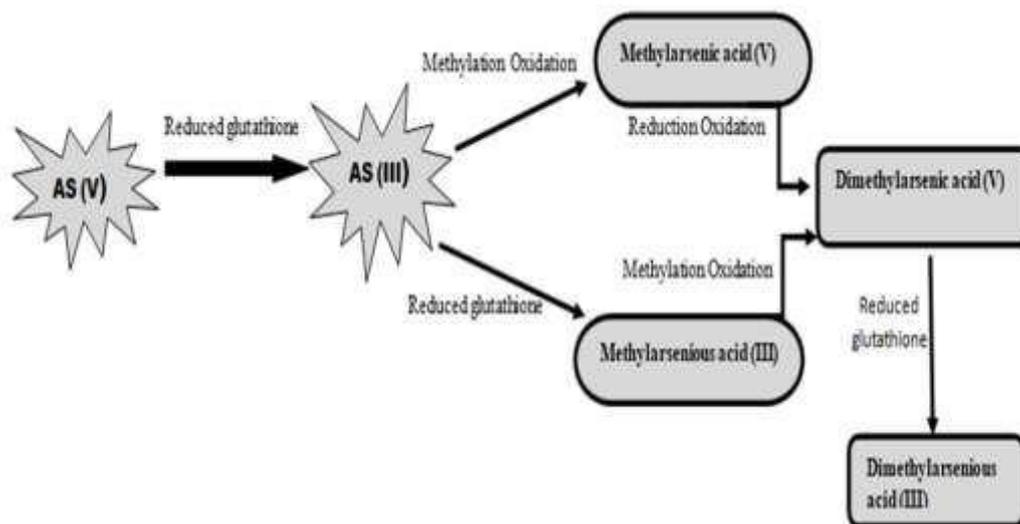
Arsenic, a metalloid occurring worldwide found in the environment from various natural and anthropogenic sources [1] at an average concentration of 1.8 ppm [2]. Arsenic is first of all the toxicants posing a significant known or direct and indirect potential threat to humans [3]. It is a co-carcinogen and in lower concentration also known to increase cognitive impairment [4]. It exists both in plants and animals, naturally, it occurs in its organic form which is less toxic [5]. Most exposure to humans occurs from the consumption of water in the form of inorganic arsenic (iAs) i.e., arsenite (As [III]) and arsenate (As[V]), which is abundantly available in water and

the most toxic form of arsenic [6]. The presence of arsenic in the groundwater is a major health problem globally, due to its various ailing effects [7, 8, 9]. Therefore, the identification of new regions with arsenic contamination in Asia has aroused great concern, as the large population is at risk of exposure [10, 11, 12]. Around 140 million people all over the world are exposed to arsenic-contaminated water [13]. Besides, its anthropogenic uses as an alloy, different semiconductor, transistors, metal adhesives and pigment factories [14, 15], mining, fossil fuels burning, natural weathering, and volcano eruptions also introduce arsenic to the environment [16] and therefore the presence of arsenic in the environment enhances the risk of exposure to humans which arises a need to explore its possible clinical effects and its various other links and other environmental sources.

Consumption of arsenic-containing water above 50g/l during pregnancy enhances the risk of fetal loss [17, 18]. It is also found to enhance immune suppression and incident to various infectious diseases in both mother and child [18, 19]. Peripheral neuropathies are quite common in arsenic-exposed individuals [20]. Neurological deficits in children and adults have been reported as the consequences of environmental and occupational exposure to arsenic [21, 22]. Arsenic exposure (>10 µg/L), the permissible water arsenic concentration considered safe by the WHO which can lead to declines in its different ailing effects.

### 1.1 Arsenic metabolism

The most common valence state of inorganic arsenic (AsV) is its arsenate form whereas arsenite is potentially found in groundwater in the form of sodium arsenite (Na<sub>3</sub>AsO<sub>3</sub>) due to the interaction with aquifer minerals and physiochemical conditions favoring its release.



**Figure 1. Proposed metabolic pathway of conversion of inorganic arsenic to organic arsenic**

The proposed metabolic pathway of Arsenic is shown in Figure 1 [23, 24]. Glutathione conjugation and Oxidative methylation are known to be the primary pathways of Arsenic metabolism [25]. Inorganic Arsenic (V) is reduced to Arsenic (III). Inorganic Arsenic (III) is methylated to methyl arsenic acid (V) and methylarsenious acid (III) which is reduced and methylated to Dimethylarsenic acid respectively. Dimethylarsenic acid formed by oxidation and reduction of As(III) and As(v) forms Dimethylarsenious acid (III).

Higher occurrence of skin lesions, cancer, neurological disorders, impairment of psychological and mental health, cardiovascular disorders, and infertility problems are reported in countries like Colombia, Argentina, Japan, Mexico, Bangladesh, and Taiwan where consumption of groundwater is high [26, 27, 28, 29, 30, 31]. Rising evidence of animal and human studies indicates that arsenic has toxic effects on the central and peripheral nervous systems [32, 33]. Presently, the concern over the increasing neurotoxicity of arsenic has been raised. [34, 35]. Development of physiological abnormalities including decreased growth rate, neural defects, malformation [36, 37, 38], and other behavioral changes as arsenic can directly reach the brain as it can cross the blood-brain barrier and placental barrier freely [39, 40, 41, 42, 43]. Several epidemiological studies have demonstrated that arsenic exposure leads to poor, impaired cognitive, and neuropsychological functioning suggesting its role in brain dysfunctions [44- 47]. Infertility, Neural tube defects, neonatal deaths, spontaneous abortion were reported in pregnant women consuming water

contaminated with high arsenic content [36, 48, 49, 50]. Arsenic levels are also found in the breast milk of Bangladeshi women which can adversely affect the infant's health [51]. This finding suggests arsenic may cause impaired fetal growth and can also affect infant health adversely. The underlying mechanism of arsenic-induced neurotoxicity is not clearly known, though several mechanisms have been proposed from various animal and human studies. Arsenic metabolites cause the inactivation of the enzymes involved in the cellular pathways as well as the formation and repair of DNA is the target of the metabolites formed [52], oxidative stress, thiamine deficiency, and decreased acetylcholinesterase activity are some of the mechanisms involved in the arsenic-induced neurotoxicity.

## II. EXPERIMENTAL AND EPIDEMIOLOGICAL EVIDENCES OF ARSENIC INDUCED NEUROTOXICITY

### 2.1 Experimental evidences

Long-term arsenic exposure to humans has been associated with impaired intellectual function in children and adults. Various In vitro and In vivo studies have been conducted as epidemiological evidence of As-induced impaired cognition.

Several studies have been conducted that in mice providing evidence for the toxic effects of arsenic on the entire brain [53, 54] and its discrete regions [55, 56]. Studies also support the evidence that assures the effect of acute and chronic exposure of arsenic develops deficits in spatial

working memory, short term, and long term memory impairment, and damaging different neurological regions responsible for memory impairment. The study indicates the effects of arsenic-containing drinking water on different regions of brain hippocampal ultra-structures, spatial memory, and N-methyl-d-aspartate receptor expression in SD rats [57]. Some studies also indicate that Postnatal exposure to low-concentration of arsenic induces autism-like behavior and affects the frontal cortex in the brain of rats [58].

A. Anwar-Mohamed et. al. investigated and found that acute arsenite (As(III)) exposure can lead to a decrease in cytosolic phospholipase A2 (cPLA2) with a subsequent decrease in brain catalytic activity of mice. It also alters CYP epoxygenases and CYP -hydroxylases, increases expression of cyclooxygenase-2 (COX-2), 5-lipoxygenase (5-LOX), and 15-LOX mRNA while decreasing prostaglandins F2 (PGF2) and PGJ2. This altered state of the different enzymes affects brain development and neurochemistry [59].

## 2.2 Epidemiological evidences

Many Epidemiological investigations found that low level and chronic exposure to arsenic can be broadly related to serious toxic effects on intellectual functions and early exposure to arsenic can cause full memory deficit by interfering with different brain functions.

In children, adverse neurobehavioral outcomes have been associated with acute and chronic arsenic exposure. A meta-analysis in arsenic-exposed children indicated intelligence deficits; considering 4 cross-sectional studies in China on arsenic exposure and IQ effects, this analysis found that the overall mean IQ score of children who lived in arsenic-exposed areas was more than 6 points lower than the mean score in unexposed children.36 Indeed, a growing number of studies are confirming intellectual deficits associated with arsenic exposure in children as young as 5 years of age [60-68].

A cross-sectional study conducted on older age relates to chronic arsenic exposure in adolescents. The study found that adolescent exposure to the arsenic-contaminated water in early life performed poorly in 3 of 4 neurological subtests when compared with the unexposed control groups, indicating an alteration in neurobehavioral development in later life might be due to the exposure during childhood exposure [69].

A study on the geriatric population exposed with long term low-level arsenic exposure (average 6.33 mg/L), estimated by the geographic information system (GIS)-based models was significantly associated with impaired executive functioning, slower processing speed, diminished visuospatial skills, poorer global cognition, slower processing speed, reduced language and reduced short term memory [70].

A study on 6-8year old school children in Mexico suggested that arsenic toxicity can lead to different neurological alterations including memory, problem-solving ability, and attention span [63]. A longitudinal cohort study was conducted on children in Bangladesh suggested that there was a reduction in verbal IQ and full-scale IQ associated with arsenic exposure [71].

Urinary arsenic has been inversely associated with full and verbal IQ in 6-8yr old children in Mexico [60]. Finally, arsenic in drinking water has been associated with decreased full IQ scores in children 6- to 10 years of age [62]. In a meta-analysis, including 15 studies evaluating the effect of arsenic on neurodevelopment, in which 13 articles showed a significant effect on neurodevelopment in children of age between 5-15years. In separate meta-analysis assessing arsenic exposure in urine (n ¼ 6) and those that studying drinking water (n ¼ 4), observed that combined effect suggests that a 50% increase in arsenic level in urine would cause a reduced IQ level by 0.39 points, whereas 50% increase in water causes a significant reduction in full-scale IQ by 0.65 points [72]. The timing of exposure to arsenic seems to affect the outcome.

In a study that directly quantified water arsenic exposure, above-median early prenatal maternal arsenic exposure in drinking water was found to be associated with a decreased verbal IQ in children, and late gestational maternal arsenic exposure was associated with a decreased performance IQ in children at 5 years of age [51].

## III. MECHANISMS INVOLVEMENT IN NEURODEGENERATION AND MEMORY IMPAIRMENT OF ARSENIC

**3.1Oxidative stress and intracellular pathways activation :**In vivo studies have demonstrated that high iAs concentration (i.e., 4 mg/L), leads to neurological damage-inducing oxidative stress and decreased amount of superoxide dismutase, 8-nitroguanine and peroxiredoxin 2 and expression in the neurological tissue of exposed rodents [73],

glutathione after exposure to 50mg/L [74] and increased expression of superoxide anion, singlet oxygen, hydrogen peroxide, hydroxyl radical, and peroxy radicals in different cells [75, 76, 77]. The main signal transduction pathways altered by ROS are: (i) the tyrosine phosphorylation system; (ii) transcription factor families, including the activating protein-1 (AP-1) and nuclear factor-kB (NF-kb); and (iii) mitogen-activated protein kinases (MAPKs) like ERK1/2 [78].

**3.2 Pro-inflammatory mediators:** Fry et al., found that iAs in concentrations higher than 10mg/L are known to cause overexpression of NF-Kb and IL-1B in the umbilical cord of newborns which causes the overproduction of the inflammatory mediators in urothelial cells [79]. An increase in different inflammatory markers – such as TNF-a, IL-1a, IL-8, and IL6 are also get increased in human and rodents peripheral blood [80, 81, 82].

**3.3 Neurotransmitter synthesis and regulation:** Arsenic has been found to produce decreased levels of different neurotransmitters, such as norepinephrine (NE), epinephrine (EPN), Dopamine (DA), serotonin (5-HT), and acetylcholine in the different regions of rats brain exposed to sodium arsenite(20mg/L p.o) [83], whereas glutamate expression also gets reduced in the brain when rats are being exposed to sodium arsenite(70mg/L) [84]. As arsenic activates multiple pro-inflammatory signaling pathways which in turn activates indoleamine 2,3-dioxygenase or IDO leading to a reduction in serotonin availability increasing KP's (kynurenine pathway) intermediates which negatively modulates the release of different neurotransmitters including Ach, dopamine, GABA, and glutamate [85]. Therefore, KP impairment may impose a negative impact on the brain and can lead to many neurological and neurodegenerative diseases and also cognitive deficits [86].

**3.4 Mitochondrial Dysfunction:** There are several studies that support the damage in the mitochondrial region of the brain region by arsenic at different concentrations in rats that are 2 mg /kg BW for 10 weeks [87], 2.5 mg /Kg BW for 4weeks [88], 20 mg/Kg BW for 28 days [89], 10 mg/ kg BW for 16 weeks [90] and 100 ppm for GD 6 to PND 21, 28 and 3 months [91] and found that there is an increase in ROS, lipid peroxidation in the frontal cortex

and hippocampus region of the brain and reduced content of GSH, MnSOD and CAT, GPx and GST in rats and pups respectively in the mitochondria of the cerebral cortex, cerebellum and hippocampus regions of the brain.

**3.5 Autophagy impairment:** Studies show that autophagy plays an important role in regulating pathophysiology [92], as there are many neurodegenerative diseases associated with impaired autophagy such as Parkinson's, Autism, Alzheimer's, and Huntington's where defective BBB plays a major role [93]. Ram Kumar Manthari et.al. found that the leaky BBB in the cerebral cortex and hippocampus may facilitate the transfer of As and induces autophagy by inhibiting PI3K/Akt/mTOR signaling pathway that causes the rats at PND21 more vulnerable to As-induced neurotoxicity [94]. Qi et al., found that sodium arsenite (0.25mM) inhibited autophagy in human bronchial epithelial cells [95].

**3.6 Ultra-structural changes in Brain and accumulation of proteins:** Ultrastructural changes in neurons and endothelial cells in the hippocampus, found when the rats are being chronically exposed to sodium arsenite. The expressions of NMDAR subunits in the hippocampus were decreased and there was a reduction in NR2A mRNA levels in the hippocampus after arsenic exposure [96]. Many In vitro and In vivo studies showed that the metabolites induce tau protein hyperphosphorylation, which is acytoskel biomarker for different neurological disorders [97,98]. As arsenic is known to cause oxidative stress which can lead to lead to the activation of kinases, including GSK-3and p38, which phosphorylates tau proteins leading to disassembling of microtubules and is responsible for the formation of tau oligomers [99]. Sodium arsenite has also been reported to decrease PPARg expression while increasing TNF-a and NF-kb contributing to the formation of reactive species and Ab oligomers.

**3.7 Impaired expressions of proteins:** Studies have shown that arsenic in its trioxide form at 0.15 mg or 1.5 mg or 15 mg doses when administered from gestational to lactational and continued to the pups till PND42 in

drinking water causes declined mRNA expression of TJ proteins, Occludin protein, PI3K, Akt, mTOR, and p62 [94].

**3.8 Endoplasmic reticulum stress:**Endoplasmic reticulum stress: Accumulation of misfolded proteins triggers unfolded protein response (UPR). An impaired UPR, leading to apoptosis. In brain protein aggregation, improper synaptic function, impair signal transduction contributes to the development of several neurodegenerative diseases. AD, PD, HD, and ALS besides their protein folding and aggregation are also characterized by increased ER stress and UPR activation [100]. The ability of sodium arsenite and metabolites in rat liver cells was also demonstrated [101]. Bolt et al. established that In vitro 1.5mM sodium arsenite activates the ER stress in three-pathways: protein kinase-like endoplasmic reticulum kinase (PERK), inositol requiring enzyme (IRE-1) in human B lymphoblastoid cell line, and activating transcription factor 6 (ATF6) [102]. Chiu et al. found that programmed cell death was induced on exposure to arsenic trioxide through the stimulation of ER stress. It was also found to suppresses the ubiquitin-proteasome system and Akt/mTOR signaling pathways in human sarcoma cells [102, 103].

Studies indicate that arsenic-induced ER stress is associated with both ROS-dependent and ROS-independent pathways, and includes phosphorylation of eIF2 $\alpha$  (the translation initiation factor) and over-expression of chaperones [101,104,105]. Also, involve activation of JNK/Erk pathway has been found to be involved in ER-related cellular apoptosis [104].

Some of the In vitro studies account that iAs also disrupt mitochondrial membrane potential, increasing intracellular calcium level and increased cytochrome C level and impair Akt expression and activation leading to arise different mechanisms for the development of arsenic toxicity activation [106,107,104].

#### IV. CONCLUSION

Several experiments have been conducted in the last few decades which shows arsenic is one of the major toxins contaminating water and it seems that it is the major cause behind many neurodegenerative diseases and cognitive impairment in adults as well as in children. On analysis, the mechanism underlying the

neurotoxicity include neurotransmitter synthesis and their transmission, Protein accumulation and their impaired expressions, increased oxidative stress, production of pro-inflammatory mediators, impaired autophagy. Based on these, we can conclude that arsenic via the above-discussed mechanisms may lead to imposing neurotoxic effects on different regions of the brain that may lead to neurodegeneration and cognitive impairment.

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# A STUDY ON PURCHASE BEHAVIOUR OF WORKING WOMEN IN PURCHASING PERSONAL CARE PRODUCTS AT NATIONAL CAPITAL REGION

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## A STUDY ON PURCHASE BEHAVIOUR OF WORKING WOMEN IN PURCHASING PERSONAL CARE PRODUCTS AT NATIONAL CAPITAL REGION\*

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### **Abstract:**

**Purpose** – To investigate the factors that influence working women's purchase choices regarding personal care items in the National Capital Region.

**Research Design/Methodology** – A survey with 200 participants was conducted, and the data was later analysed using SPSS to discover the variables influencing the purchasing choices of working women.

**Findings** – The study's significant results indicate that the brand of the product influences the purchase behaviour of working women based on age. In contrast, the working women's income does not affect the factors of purchase consideration for the study.

**Managerial Implications:** The research findings help understand the factors influencing the purchase decisions of working women in purchasing personal care products and for companies to develop holistic and workable strategies catering to the needs of the present-day market.

**Limitations:** The research is limited to analysing the variables impacting the purchasing decisions of women consumers in the National Capital Region; however, other research in this relevant field might examine consumers' purchasing decisions in a variety of geographical regions.

**Keywords** – Purchase Behaviour, National Capital Region, Personal Care products, Working Women,

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### **Introduction:**

Consumer behavior consists of all human behavior that go in making purchase decisions and it involves psychological factors, which of men and women are not same. Women take on variety of different roles in purchasing decisions and should be treated this way by marketers and advertisers.

Having a good understanding of how the purchasing function is organized in families by women makes marketers to give best efforts on segmentation of markets on the basis of women consumers. Changing roles of women at work and home have led business leaders to recognize women as the largest and most important market. Women make 83% of all consumer purchases and 80% of health care-related decisions in their household.

In general, personal care products are those that a customer uses for maintaining self-care & hygiene. Among the items are soaps, hair shampoo, talcum powder, cold cream, toothpaste, toothbrushes (aromatherapy), antiperspirant (hair oil), cleanser (skin care), newborn care (care for newborn babies), and beauty care (beauty care). There are specific functions & benefits of these products.

Consumers are willing to spend more money on a well-known and prestigious brand for their specific needs. Social media, lifestyle and advertising have played a vital role in increasing interest among consumers about a product usefulness and benefits. Customers living in urban, semi-urban or rural cities have become much more brand conscious, as higher brand image represents, better quality of product and value for money.

By 2025, it is expected that India's personal care industry would exceed US\$ 20 billion from the current level of US\$ 6.5 billion. This is due to the so-called upward spike in disposable income for the middle classes, as well as growing expectations of customers to live a quality and healthy lifestyle. FMCG companies are exploring and introducing various product categories with great price ranges to cater to big disparities in buying power. According to many researchers the rural population is becoming much more brand conscious and is more willing to try out new brands & experience the premium quality personal care products as multinational companies are penetrating extensively into the rural markets to fuel growth through their franchise expansion. More than 68 per cent of younger people say that utilizing grooming items helps them to feel more confident in their appearance and makes them feel more socially acceptable among their peers.

## II. LITERATURE REVIEW

R. Lavuri and D. Sreeramulu (2019) examined the purchasing behavior of female customers when it comes to personal care items. The research discovered that product attributes such as brand loyalty, brand recognition, and product quality all had a substantial correlation with respondents' purchasing behavior. Additionally, it was revealed that brand ambassadors and Family & Friend recommendations positively correlate with personal care product purchases.

Rajarajan.M., Birundha.G. (2016) is a solid believer that if the investigation's suggestions are properly evaluated, the affected parties will take necessary action. The demands of the responders may appear as expected, and both consumers and producers will feel soothed, placated, and free to act in their natural manner.

Sumesh. R. Anu (2016) analyses a similar examination of consumer identification and purchase behaviour for individual consideration items. Buyer behaviour refers to how individuals, groups, and associations pick, acquire, utilise, and discard items, administrations, ideas, or experiences to meet

their requirements and wants. The research revealed that the market's growth is being driven by a rising trend of various restorative goods, exceptional care products, healthy skincare items, and hair care items, among other things.

Suganya S and Beena Joice M (2016) consider efforts to understand women's purchasing behaviour and identify the elements that influence their purchasing behaviour. By using the comfort inspecting technique, a poll was constructed and sent to female purchasers. The ad hoc sample comprises 150 people who answered the survey questions. There are several components to the assessment. The assessment gives proof and morsels of information examined and reveals that brand loyalty, temperament, attributes, and conviction significantly impact drive females gaining. The findings demonstrate that motivation has a favourable influence on purchase behaviour.

Sanjeev Kumar, Savita Maan, and Vandana Sabharwal (2014) discuss the utilisation of examples, factors, and brand ownership regarding women's beauty care goods. Additionally, it studies the factors that influence women's purchase decisions for cosmetics products. All females cited brand as their top factor while shopping. The purchase of healthy skin products is influenced by many aspects, including quality, anticipation, and fit for one's skin type. According to the study's findings, the cream is the most often used moisturiser across all age categories. Male Toners, who were antagonistic to the process of maturation, were honoured to be desired by developed females.

Dr D.K. Sinha and Siddhartha Shriram Shimp (2012) investigated and evaluated the dispositions, brands, and values that influence female purchase behaviour. The analysis provides evidence and comprehension of the many aspects examined and reveals that confidence, self-introduction, and unity have contributed to women attaining increased prominence. Each person has a unique approach to obtaining the process; nonetheless, they are all influenced by distinct factors.

Sushil Mohan, M.D. (2012) When it comes to female consumers' purchasing behavior, status branding, brand thinking, paying a premium for marked clothing, self-image, and reference groups all have a favorable impact while also enhancing female consumer inclusion in fashion items. Customers' practices are impacted by several criteria, such as culture, social class, reference group affiliation, family, income level and income independence, and age. As a consequence of these influences, customers display a variety of client behaviours. Eighty-eight per cent of motivational buying has been based on a buyer's statistical profile. The indicator factors' quality revealed that teaching was unimportant but had the most significant influence on customer buying. Personality has a crucial impact on consumer purchasing behaviour since each consumer has unique personality qualities that reflect their purchasing behaviour. Agbo Onu, J. C. (2014).

### **Research Objectives:**

- The main objective is to understand the purchase behaviour of the working women while purchasing personal care products at the National Capital Region.
- To identify the key factors influencing the purchase of personal care products from the available literature.
- To test the factors affecting the purchase behaviour of working women while purchasing personal care products based on age and income.

## METHODOLOGY

**Research design:** The research is exploratory; a survey approach was used.

**Sample design:** The convenience sampling methodology was used to choose a representative sample of 200 respondents.

**Questionnaire design and pre-test:** The data were obtained using a structured questionnaire, and a primary analysis was undertaken to ensure that the questionnaire gathered sufficient information.

**Sampling Area:** National Capital Region

**Data Collection:** The researcher collected the requisite data by the researcher by visiting the stores in the months of December-2020, January and February-2021.

**Measurement:** The questionnaire includes five factors, namely preferred place of purchase, the reason for purchase, brand, quality, and innovation are collected. The collected data were analysed using statistical tools like percentage, chi-square and ANOVA test.

**Reliability and Validity:** Cronbach's Alpha test was used to determine the data's reliability and validity. The estimated values, as shown in the Table, are more than 0.6. As a result, the scale's dependability has been established.

**Table-1: Reliability Statistics**

Cronbach's Alpha	Cronbach's Alpha Based on Standardised Items	No of Items
.895	.896	42

### Research Hypothesis:

H<sub>1</sub>: There is no difference in the factors considered for the purchase of personal care products.

H<sub>2</sub>: There is no influence of age of working women on purchasing personal care products.

H<sub>3</sub>: There is no influence of income of working women on purchasing personal care products.

### Analysis and Discussion:

**Table-2: Profile of the Respondents**

	Particulars	Number of Respondents	Percentage
<b>Age Group (in Years)</b>	Less than 20	42	21
	21 – 30	86	43
	31 -40	34	17
	41 – 50	22	11
	Above 50	16	8
	<b>Total</b>	<b>200</b>	<b>100</b>
<b>Occupation</b>	Professional	18	9
	Business/ Self-employed	16	8

	Private Employee	78	39
	Government Employee	32	16
	Others	56	28
	<b>Total</b>	<b>200</b>	<b>100</b>
<b>Income level</b>	Less than ₹ 20000	45	22.5
	₹ 20001 – ₹ 30000	76	38
	₹ 30001 – ₹ 40000	37	18.5
	₹ 40001 – ₹ 50000	20	10
	More than ₹ 50,000	22	11
	<b>Total</b>	<b>200</b>	<b>100</b>
<b>Education</b>	SSC /Intermediate	34	17
	Bachelor's degree	80	40
	Postgraduate	52	26
	Diploma	22	11
	Others	12	6
	<b>Total</b>	<b>200</b>	<b>100</b>

As shown in Table-2, the plurality of respondents (43%) are between the ages of 21-30 years, followed by 21% between the ages of less than 20 years and 17% between the ages of 31-40 years. As can be seen, slightly more than 80% of the whole sample is under 40. According to the respondents' educational backgrounds, most respondents (40 per cent of the model) have a bachelor's degree, followed by respondents having a master's degree (26 per cent of the sample). In contrast, 17% of respondents have completed the SSC/Intermediate level. Income is typically seen as a crucial factor in an individual's buying behaviour. Around 38% of respondents earn between ₹20,000 and ₹40,000 per month, while 22.5 per cent make less than ₹20,000 and 18.5 per cent make between ₹30,000 and ₹40,000. According to the respondents' occupations, 39% work in the private sector, while 28% work in another category. By contrast, 16% of respondents are government workers.

**Table-3: Preferred Place of Purchase**

S. No.	Particulars	Number of Respondents	Percentage
1	Departmental Store	34	17
2	Super Markets	26	13
3	Special Beauty Store	54	27
4	Beauty Salon/ Parlours	21	11
5	Professional (Cosmetologist/Doctor)	32	16
6	Online	33	17
	<b>Total</b>	<b>200</b>	<b>100</b>

It can be observed from Table-3 that out of the total respondents, 27 per cent of respondents prefer to buy the personal care products at the special beauty store, followed by an identical percentage of respondents, i.e., 17 per cent chooses to purchase either through the departmental store or through online. Respondents' preference of Professional run store to buy personal care products represents 16 per cent. Some of the respondents from the total sample representing 13 per cent and 11 per cent prefers to buy the personal care products at supermarkets and Beauty Salon/ Parlours, respectively. It can be inferred that most working women prefer to buy personal care products from special beauty stores.

**Table-4: Reasons for Purchase of Personal Care Products**

S. No.	Particulars	Number of Respondents	Percentage
1	To improve personality	72	36
2	Social influence	34	17
3	Fashion and status symbol	18	9
4	Health care	45	23
5	Psychological Satisfaction	14	7
6	Habitual Action	17	9
	<b>Total</b>	<b>200</b>	<b>100</b>

It can be observed from Table-4 that out of the total respondents, 36 per cent of the respondents said the reason for purchase is to improve their personality, followed by 23 per cent of the respondents who said that the main reason is for health care. Some of the respondents representing 17 per cent said that the social influence as a reason for purchase, an identical percentage of respondents, i.e., nine per cent, have said either the reason as fashion and status symbol or habitual action. The remaining seven per cent of respondents said that psychological satisfaction is the main reason. It can be inferred that most working women preferred personal care products for improving their personality or for healthcare.

**Table-5: Brand Preference for Purchase of personal care products**

S. No.	Reason for purchase of Branded Product	No. of Respondents	Percent -age	Overall Percent -age	Reason for purchase of Non-Branded Product	No. of Respondents	Percent -age	Overall Percent -age
1	Gives social status	41	29	21	Affordable price	16	28	8
2	Non-Availability of Non-	6	4	3	Easy availability	8	14	4

	branded products							
3	High quality	23	16	12	More Varieties	6	10	3
4	Durability	15	11	8	Better performance	5	9	3
5	Brand image	46	32	23	Promotional Offers	9	16	5
6	After sales support	11	8	6	Suggested by Peers	14	24	7
	<b>Total</b>	<b>142</b>	<b>100</b>	<b>71</b>	<b>Total</b>	<b>58</b>	<b>100</b>	<b>29</b>

As shown in Table-5, 71% of respondents prefer to purchase branded items, whereas 29% prefer to purchase non-branded items. Among the respondents who buy branded products, 32 per cent of respondents prefer to buy the branded products because of the brand image, followed by 29 per cent of the respondents who purchase the products as they give them the social status. Some of the respondents representing 16 per cent opined that the branded products produce high-quality products and 11 per cent opined that durability is the reason for the purchase of branded products. A small number of respondents, i.e., eight per cent of respondents, prefer them because of after-sales support. The remaining four per cent said that non-availability of non-branded products makes them purchase branded products.

Among the respondents who purchase non-branded products, 28 per cent said that affordable price is the main reason for purchase, followed by 24 per cent of the respondents' purchases the non-branded products because of the suggestion they got from their peers. Some of the respondents representing 16 per cent buy non-branded products due to promotional offers, and 14 per cent of the respondents purchase them because of the availability. Few of the respondents representing ten per cent opined that more variety of products to choose from in the category make them go for non-branded products. The remaining nine per cent of the respondents said that better performance is a reason for opting non-branded products.

It can be inferred that the primary reasons for purchasing the branded products are the brand image and the social status the respondents perceive with the branded products. In contrast, for non-branded products, the price of the product and the suggestion by the peers are the main reasons.

**Table-6: Perception of Respondents on Quality of Personal Care Products**

S. No.	Particulars	Number of Respondents	Percentage
1	High Price	28	14
2	Brand Name	37	19
3	Presence of Particular Ingredient	75	38
4	Packaging	18	9

5	Attributes of the product	22	11
6	Green Product	20	10
	<b>Total</b>	<b>200</b>	<b>100</b>

It can be seen from Table-6 that out of the total respondents, 38 per cent perceived that the presence of a particular ingredient is the quality, followed by 19 per cent perceived that the brand name of the product signifies the quality of the product. Some of the respondents representing 14 per cent perceived that high price indicates the quality for them, and 11 per cent said that the product's attributes indicate the quality. Few respondents representing ten per cent perceived that if the product is green, it shows quality for them, and the remaining nine per cent perceived that final packaging indicates quality for them. It can be inferred that most working women perceive a particular ingredient's presence as a quality for them.

**Table-7: Response of Respondents on Innovation of Product**

S. No.	Particulars	Number of Respondents	Percentage
1	Easy to use	87	44
2	Attractive Container	9	5
3	Eco Friendly packaging	35	18
4	Product Form	27	14
5	Associated Service benefit	18	9
6	New Ingredient	24	12
	<b>Total</b>	<b>200</b>	<b>100</b>

It can be seen from Table-7 that out of the total respondents, 44 per cent of the respondents felt that easy to use the product is the innovation for them, followed by 18 per cent opined that eco-friendly packaging is an innovation. Some of the respondents representing 14 per cent said that the product form is innovation, and 12 per cent of the respondents felt a new ingredient in the product is an innovation. Few respondents representing nine per cent said that associated service benefit as innovation, and the remaining five per cent of the respondents opined that an attractive container for the product is an innovation.

### **Hypothesis Testing:**

H<sub>1</sub>: There is no difference in the factors considered for the purchase of personal care products.

**Table-8: Chi-Square Test**

Hypothesis	Factors of purchase	Degrees of Freedom	Calculated Chi-Square Value	p-value	Result
H <sub>1a</sub>	Preferred Place of Purchase	5	19.06	0.00187	Rejected
H <sub>1b</sub>	Reasons for Purchase	5	75.22	8.32E-15	Rejected

H <sub>1c</sub>	Brand	11	121.96	7.31E-21	Rejected
H <sub>1d</sub>	Quality	5	69.58	1.25E-13	Rejected
H <sub>1e</sub>	Innovation of the product	5	115.12	3.39E-23	Rejected

It can be observed from Table-8 that the calculated value of chi-square at the critical value of five per cent level of significance is greater than the critical value, so we reject the null hypothesis. It indicates that the factors considered for the study are different.

H<sub>2</sub>: There is no influence of age of working women on purchasing personal care products.

**Table-9: Age and Factors of purchase**

Hypothesis	Factors of purchase	F-Value	p-value	Result
H <sub>2a</sub>	Preferred Place of Purchase	0.295532533	0.599901744	Accepted
H <sub>2b</sub>	Reasons for Purchase	0.196089112	0.668348145	Accepted
H <sub>2c</sub>	Brand	3.903195	0.044958	Rejected
H <sub>2d</sub>	Quality	0.202947245	0.663008759	Accepted
H <sub>2e</sub>	Innovation of the product	0.158255671	0.700038517	Accepted

The significance level of p is considered to be as 0.05. By observing the above Table, the p-value for the factors, preferred place of purchase, reasons for purchase, quality and innovation of the product are greater than the significant level. So, the null hypothesis can be accepted. It can be interpreted that there is no statistical significance between the age and the above-said factors of purchase in the purchase behaviour of working women. In the purchase of branded products, the calculated p-value is less than the significance value, which indicates that the null hypothesis is rejected. It can be inferred that their age influences the purchase of branded products. Overall, age is not an influencer on the purchase behaviour of working women while purchasing personal care products.

H<sub>3</sub>: There is no influence of working women's income on purchasing personal care products.

**Table-10: Income and Factors of Purchase**

Hypothesis	Factors of purchase	F-Value	p-value	Result
H <sub>3a</sub>	Preferred Place of Purchase	0.405643	0.540049	Accepted
H <sub>3b</sub>	Reasons for Purchase	0.239165	0.636507	Accepted
H <sub>3c</sub>	Brand	1.925181	0.198677	Accepted
H <sub>3d</sub>	Quality	0.249446	0.629447	Accepted
H <sub>3e</sub>	Innovation of the product	0.185172	0.677086	Accepted

The test static value for all the factors is greater than the significant value of 0.05. It indicates that we accept the null hypothesis. It can be interpreted that there is no statistical significance between the working women's income and the factors of purchase of personal care products.

### Findings of the study:

1. Most of the working women prefer to buy personal care products from Special Beauty stores.
2. The main reasons for purchasing personal care products by working women are improving their personality and healthcare.
3. The primary reasons for purchasing a branded product are the brand image and the social status associated with that while purchasing non-branded products is the affordable price and the suggestion by peers.
4. Most of the working women felt that the presence of a particular ingredient is the quality for them
5. A good number of working women indicate that the ease of use is the innovation of the product.
6. Based on the study, the brand image influences the working women based on age, whereas the other factors don't influence purchase decisions.
7. Surprisingly, the income of the respondents doesn't have any influence on the purchase behaviour of the working women.

### **Conclusion:**

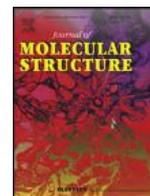
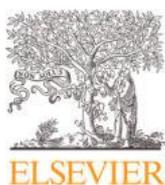
Personal cleanliness is critical for both personal health and societal well-being. The personal-care goods sector exists to improve people's appearance and self-esteem. It develops, produces, and distributes products for personal care, beauty, and hygiene. By 2025, the Personal Care industry is estimated to have 347.0 million consumers. The study's objective is to ascertain the parameters influencing working women's purchases of personal care items in the National Capital Region. This study gives valuable information for retailers and makers of personal care products by revealing that most working women have similar purchasing habits. According to the findings of this survey, the majority of working women choose to purchase personal care items to enhance their personality and health.

Additionally, the survey discovered that working women prefer to purchase personal care goods in speciality retailers. The majority of working women say that product innovation should prioritise simplicity of use. As a consequence of this research, merchants and manufacturers should design efficient marketing strategies stressing natural beauty and simplicity of use to attract new consumers. Additionally, this study indicates that age and wealth have little influence on the purchasing behaviour of working women in the National Capital Region.

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# Facile synthesis of the chemically oxidative grafted copolymer of 2,6-diaminopyridine (DAP) and thiophene (Th) for optoelectronic and antioxidant studies



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## ABSTRACT

The conjugated polymers-based graft copolymer is significantly explored due to their potential applications in sensing devices posing with notable optical and physiological properties. The current preliminary investigation presents for the first time the synthesis of grafted copolymer Poly (DAP-g-Th) from 2,6-diaminopyridine (DAP) and thiophene (Th) via chemical oxidative copolymerization using ferric chloride as an oxidizing agent for enhancing its photoluminescence properties. Modifications via copolymerization were confirmed by optical, morphological, and spectral analysis through FT-IR, UV-Visible, XRD, fluorescence studies. Increased value of oscillator strength, molar extinction coefficient, and lowered bandgap were observed in the case of poly(DAP-g-Th). FT-IR results showing alteration in the properties of polymer lying intermediate between individual monomers confirming copolymerization. Intermediate quantum yield value disclosing transformations in the electronic structure of the poly(DAP-g-Th). Morphological studies also suggested the intermediate property of copolymer. Poly(DAP-g-Th) showed the best antioxidant activity against DPPH free radical assay and its IC<sub>50</sub> value was reported 0.024 ± 0.001 mg/ml.

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## 1. Introduction

Intrinsically conducting organic nano polymeric particles which include polyaniline (PAni) [1,2], polythiophene (PTh) [3], polypyrrole (PPy) [4], poly(o-phenylenediamine) (POPD) [5,6], poly(1-naphthyl amine) (PNA) [7], poly(carbazole) (PCz) [8] have procured notable recognition latterly in the sphere of optoelectronics namely in sensors, solar cells, electrochromic displays, OLEDs, and rechargeable batteries. Tremendous efforts have been employed to design extremely efficient conjugated polymers with improved chemiluminescence and prompt charge generation properties. To accomplish the desired properties significantly different from the homopolymers, copolymerization is solely the frequently employed method for tailoring different types of monomers carrying distinct functionalities. Ample literature has been outlined on the electrochemical and chemical oxidative synthesis of copolymers of polyaniline (PAni) [9], polypyrrole (PPy), polycarbazole (PCz),

polyfluorene (PF), and its derivatives [10]. Amongst them, polythiophene and its copolymers are extensively explored in chemical sensors, solar cells, flexible displays, catalysis, supercapacitors, and field-effect transistors for fabricating efficient electrode materials possessing remarkable photophysical properties including thermal resistance, environment sustainability, processibility, photo-luminescence, a highly stable transient framework of both doped and undoped configuration. Copolymers of thiophene with indole [11,12], fluorene [12], pyrrole [13,14] are listed in literature. In recent times Poly(2,6-diamino pyridine) (PDAP) is widely investigated as a highly efficient sensing device in nitrite sensor reported by wang et al. [13], a potential glucose sensor reported by Qin et al. [14] and in the extraction of various toxic heavy metal ions [15,16]. Functionalization of PDAP with different variety of electron acceptor substituents can be easily carried out due to the presence of electron donor amino groups which in turn helps in tuning the HOMO-LUMO bandgap by regulating electron /hole injecting ability to achieve the required emissive fluorescent range. This work is executed following the evaluation of the literature despite the exceedingly efficient performance of these conjugated

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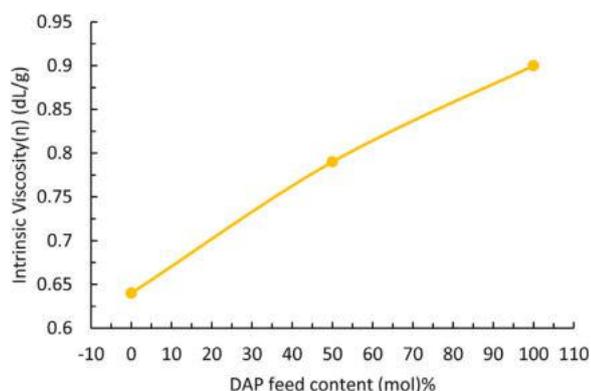
**Table 1**  
The solubility of PDAP, PTh, and Poly (DAP-g-Th) in polar solvents.

Sample	H <sub>2</sub> O	NMP	THF	C <sub>2</sub> H <sub>5</sub> OH	DMF	DMSO	CH <sub>3</sub> OH	CH <sub>3</sub> COCH <sub>3</sub>
PDAP	IS	ES	ES	PS	ES	ES	PS	PS
PTh	IS	ES	ES	IS	ES	ES	IS	PS
Poly (DAP-g-Th)	IS	ES	ES	PS	ES	ES	PS	PS

\*ES = Easily Soluble, \*PS = Partially Soluble, \*IS = Insoluble.

**Table 2**  
CHNS elemental analysis, intrinsic viscosities, and viscosity average molar mass of PDAP, PTh, and Poly(DAP-g-Th).

Homopolymer Copolymer	C%	N%	H%	S%	Empirical Formula	Intrinsic Viscosity ( $\eta$ )	Viscosity Average Molar Mass (Mv)
PDAP	57.63	36.66	5.72	-	C1.84 N1.0 H2.17	0.9	159959
PTh	59.44	-	3.23	37.34	C4.27 H2.78 S1.0	0.64	54252
Poly (DAP-gTh)	58.48	2098	4.53	16.01	C9.74 N2.98 H9.06 S1.0	0.79	104632



**Fig. 1.** Influence of 2,6-Diaminopyridine (DAP) feed content on intrinsic viscosity of the copolymer.

polymers no literature is reported until now on the copolymerization of these monomers and encouraged from the above possibilities, the present study reports the chemical oxidative copolymerization of thiophene and 2,6-diaminopyridine using anhydrous ferric chloride as an oxidizing agent. Spectral, thermal, and morphological properties of the grafted copolymer Poly(DAP-g-Th) were analysed using FTIR, UV-Vis, XRD, fluorescence spectroscopy. The antioxidant property of the copolymer was also investigated using DPPH and hydrogen peroxide assay.

## 2. Experimental

### 2.1. Materials

Thiophene(Molecular formula: C<sub>4</sub>H<sub>4</sub>S, Molar mass:84.14 g/mol) (Sigma Aldrich, USA), 2,6-diaminopyridine(Molecular formula: C<sub>5</sub>H<sub>7</sub>N<sub>3</sub>, Molar mass:109.129g/mol) (Sigma Aldrich, USA), N-methyl-2-pyrillidone (Molecular formula: C<sub>5</sub>H<sub>9</sub>NO, Molar mass: 99.13 g/mol) (Sigma Aldrich, USA), THF (Molecular formula: C<sub>4</sub>H<sub>8</sub>O, Molar mass: 72.11 g/mol)) (Sigma Aldrich, USA), Ferric Chloride (FeCl<sub>3</sub>, molar mass: 162.2 g/mol) (Sigma Aldrich, U.S.A.), Ethanol(C<sub>2</sub>H<sub>5</sub>OH, molar mass: 46.07g/mol) (Sigma Aldrich, U.S.A.),(Potassium Ferricyanide (C<sub>6</sub>N<sub>6</sub>FeK<sub>3</sub>, molar mas:329.24g/mol) (Sigma Aldrich, U.S.A.)Sulfuric acid (H<sub>2</sub>SO<sub>4</sub>, molar mass: 98.079 g/mol) (Sigma Aldrich, U.S.A.), Dimethyl sulfoxide (Molecular formula: (CH<sub>3</sub>)<sub>2</sub>SO, Molar mass: 78.13g/mol) (Sigma Aldrich, USA), N, N-Dimethylformamide (Molecular formula: HCON(CH<sub>3</sub>)<sub>2</sub>, Molar mass: 73.09g/mol) (Sigma Aldrich, USA).

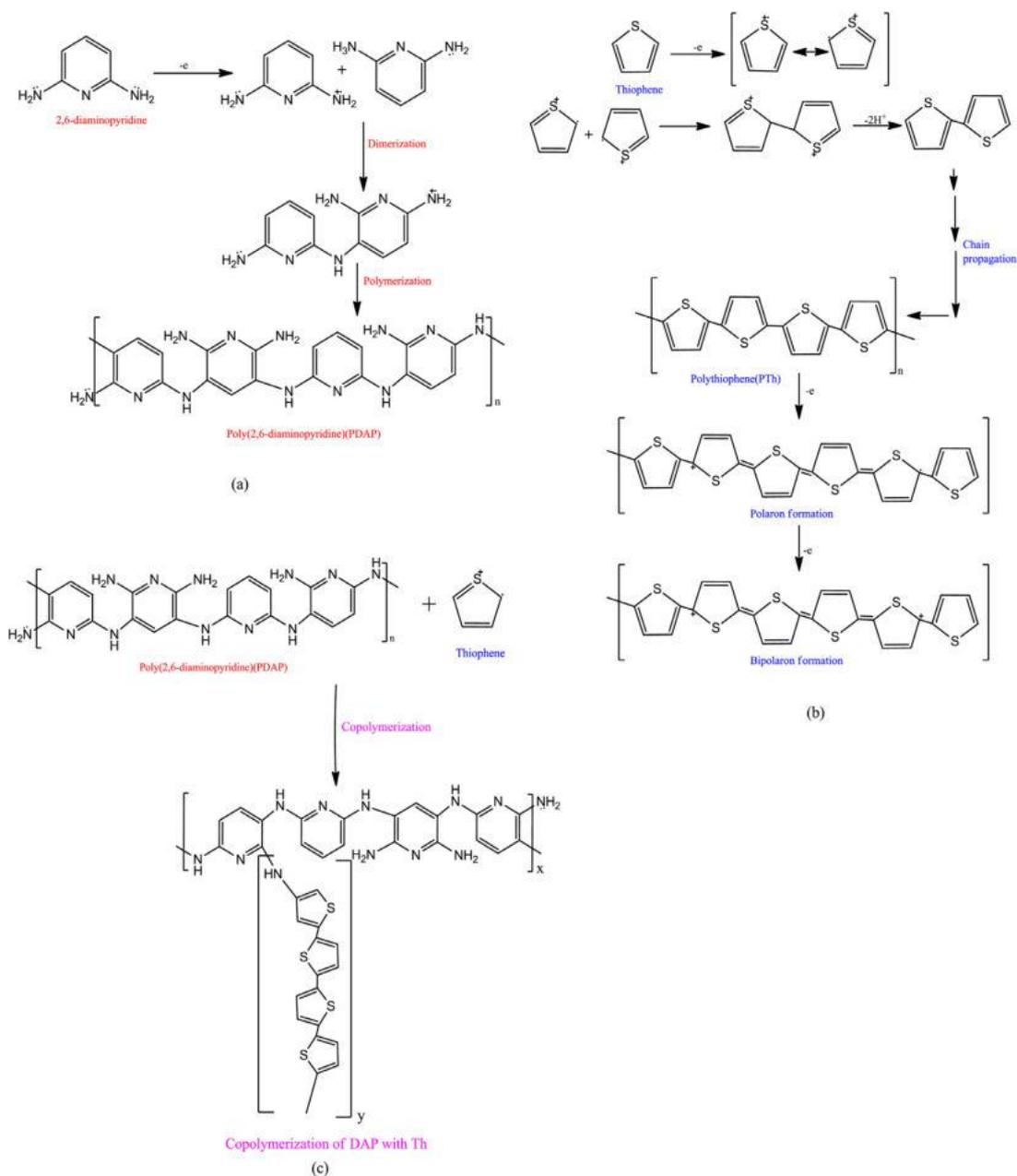
### 2.2. Synthesis of homopolymers Poly(2,6-diaminopyridine) (PDAP), Polythiophene (PTh)

2,6-diaminopyridine monomer (DAP) (2g, 0.0183mol) in 2ml acetic acid and 50ml deionized water was taken in a 250ml Erlenmeyer flask. The solution was stirred for 20 min at room temperature. A Ferric chloride solution (2.972g, 0.0183mol) dissolved in 30ml deionized water was added to the reaction mixture dropwise. The solution mixture was then magnetically stirred for more than 3 hours maintaining a temperature of 5°C. The solution mixture color turned greenish-black. The polymer solution was then kept in a deep freezer for 24 hours at-5°C and then centrifuged with distilled water and ethanol several times to ensure complete removal of excess ferric chloride which is further confirmed by filtrate testing using potassium ferricyanide. The procured Polymer was vacuum dried for 72 hours at 70°C.

Monomer thiophene (Th)5ml (5.315g, 0.0631mol) in 2.5ml ethanol was dispersed in 50ml deionized water was taken in a 250 ml Erlenmeyer flask. To this, a solution of prepared ferric chloride (10.246g, 0.0631mol) in 50ml deionized water was added dropwise with constant stirring. The above solution was stirred for 4 hours on a magnetic stirrer. The color of the solution turned pinkish purple. The solution was deep freeze overnight at-5°C and then washed several times with deionized water and ethanol ensuring removal of excess ferric chloride by testing the filtrate using potassium ferricyanide. The obtained polymer was dried in a vacuum oven at70°C for 3 days.

### 2.3. Synthesis of grafted copolymer Poly(DAP-g-Th)

Monomer 2,6-diaminopyridine (DAP) (2.762g,0.0253) in 2ml acetic acid in 50ml deionized water was taken in a 250ml Erlenmeyer flask to the above solution 2ml thiophene (Th) (2.13g,0.0253mol) was added drop by drop and kept on a magnetic stirrer for 20min. (1:1 monomer ratio). After 20 min prepared solution of ferric chloride (3.97g, 0.0244mol) in 50ml distilled water was added dropwise. The polymer solution mixture was magnetically stirred on an ice bath for more than 4 hours. The solution turned dark green which is then kept for deep freezing overnight at-5°C. The polymer solution was then washed several times to remove excess ferric chloride with deionized water and ethanol using a centrifuge. The filtrate was tested with potassium ferricyanide to certify that excess ferric chloride was removed. The polymer so obtained was vacuum dried at 70°C for 72 hours. The polymer was assigned as Poly(DAP-g-Th).



**Scheme 1.** Proposed scheme for the synthesis of homopolymers (a) PDAP, (b) PTh and copolymer (c) poly (DAP-g-Th).

### 3. Characterization

UV-Vis spectrophotometer model SPECORD 210 plus was employed to investigate the UV-Vis spectra of the synthesized homopolymers and copolymer in solution form, with NMP as a solvent. For precise analytical determination, the integrated absorption coefficient was employed against the absorption coefficient at wavelength maxima ( $\lambda_{max}$ ). The integrated area ( $\int \alpha d\nu$ ) under the transition peak was determined using Origin 2020b by standardizing to Gaussian-Lorentzian shape. The molar extinction coefficient and oscillator strength were determined as reported in the literature [17]. FT-IR spectra of conjugated polymeric nanoparticles were recorded using the FT-IR spectrophotometer model Shimadzu IRA affinity-1 in the form of pellets. The IRA affinity-1 software, through Gaussian-Lorentzian curve fittings, was used to calculate the integrated absorption coefficient ( $\int \alpha d\nu$ ). The fluorescence spectra of the prepared homopolymers and copolymer so-

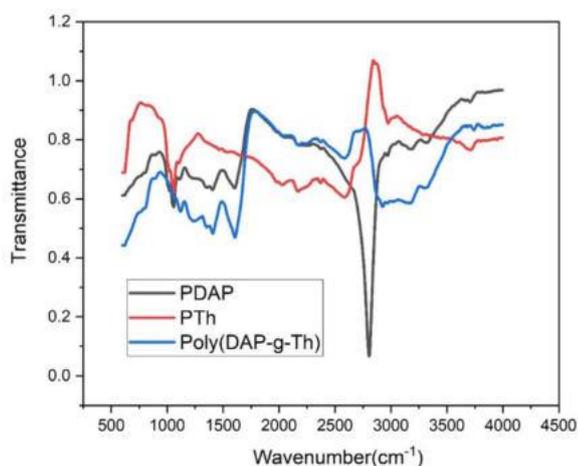
lution in NMP (N-Methyl-2-pyrrolidone) were taken on the spectrofluorometer model Cary eclipse. The Quantum yield ( $\phi$ ) was determined using the equation and reference material as Rhodamine B [15,16].

$$\Phi_{sample} = \Phi_{ref} \left( \frac{I_{sample}}{I_{ref}} \right) \left( \frac{n_{sample}^2}{n_{ref}^2} \right) \left( \frac{A_{ref}}{A_{sample}} \right)$$

X-ray diffraction patterns of the synthesized conjugated polymeric nanoparticles were recorded on Philips PW3710 powder diffractometer (Nickel filtered Cu-K $\alpha$  radiations). The d spacing (D) was evaluated using Bragg's equation and the crystallite size was determined using the Scherrer equation [18] For sharp intense crystalline peak, interchain separation length was calculated by employing the Klug-Alexander equation [17] ( $R = \frac{5\lambda}{8\sin\theta}$ ). The viscosity average molecular weight was determined using Mark-Houwink equation  $[\eta] = KM_v^a$ , where  $M_v$  is viscosity average molecular weight, and K and a are Mark-Houwink constants ( $K = 2.0 \times 10^{-2}$

**Table 3**  
Analysis of FT-IR spectra of PDAP, PTh, and Poly(DAP-g-Th).

Sample	Functional group	Peak Position/Absorption intensity (cm <sup>-1</sup> )	Benzenoid/Quinonoid
PDAP	N-H Stretching	3465/0.07	1.06
	C-C Stretching (Quinonoid)	1537/0.17	
	C-C Stretching (Benzenoid)	1439/0.18	
	Imine Stretching	1646/0.15	
	C-N Stretching (Quinonoid)	1354/0.19	
PTh	C-N Stretching (Benzenoid)	1228/0.17	1.2
	C-S Bending	686/0.06	
	C-C Stretching (Quinonoid)	1540/0.1	
	C-C Stretching (Benzenoid)	1466/0.12	
	C-H Stretching	2976/0.08	
Poly (DAP-g-Th)	C-H Out of the plane bending	1060/0.21	1.04
	N-H Stretching	3469/0.12	
	C-C Stretching (Quinonoid)	1536/0.26	
	C-C Stretching (Benzenoid)	1445/0.27	
	Imine Stretching	1645/0.26	
	C-N Stretching (Quinonoid)	1355/0.29	
	C-N Stretching (Benzenoid)	1234/0.28	
C-H Stretching	2925/0.24		
	C-H Out of the Plane Bending (2,5-substituted)	764/0.26	



**Fig. 2.** FT-IR spectra of PDAP PTh, and Poly(DAP-g-Th).

and  $a = 0.3176$  [8]. Prepared 0.2 wt.% solution of the polymers in NMP (N-Methyl-2-pyrrolidone) was taken for measuring the viscosity using ubbelohde viscometer. For morphological analysis TECNAI, 200 kV TEM (Fei, Electron Optics) was used for High-resolution transmission electron micrographs (HRTEM).

## 4. Antioxidant Studies

### 4.1. DPPH free radical antioxidant activity

2, 2-diphenyl-1-picryl-hydrazyl (DPPH) free radical has been used to estimate the antioxidant activity of (PDAP, PTh, and Poly(DAP-g-Th) by reported methods [19,20]. The increasing amount of test compounds (0.1-0.6 ml) was mixed with 2 ml of DPPH (0.1 mM) and incubates for 1 hour in dark. By using a UV-visible spectrophotometer, absorbance was recorded at 509 nm and it was inferred that absorbance was decreased after the addition of test compounds. Ascorbic acid was treated as a positive standard. The minimum concentration of test compound to scavenge DPPH free radical by 50% (IC<sub>50</sub>, mg/ml), was determined from the linear graph plotted between % antioxidant activity v/s concentrations. All the experiments were done in triplicate and % antioxidant activity was measured by using the following equation:

$$\% \text{Inhibition} = \frac{A_{\text{Control}} - A_{\text{Sample}}}{A_{\text{Control}}} \times 100$$

Where  $A_{\text{control}}$  = absorbance of DPPH free radical in methanol without an antioxidant and  $A_{\text{sample}}$  = absorbance of DPPH free radical in the presence of an antioxidant.

### 4.2. Hydrogen peroxide antioxidant assay

The antioxidant property of (PDAP, PTh, and Poly(DAP-g-Th) were also estimated against hydrogen peroxide [21]. 2 mM of hydrogen peroxide (1.8 ml) in phosphate buffer was added to increasing concentrations of each test compounds (0.1-0.6 mg/mL). After the incubation of 10 minutes at room temperature, a decrease in absorbance was recorded at 240 nm by UV-Vis spectrophotometer. The ability of test samples to scavenge the hydrogen peroxide was measured by using the following equation.

$$\% \text{Inhibition} = \frac{A_B - A_T}{A_B} \times 100$$

Where  $A_B$  was the absorbance of blank (without compounds) and  $A_T$  was the absorbance of tested samples.

## 5. Results and discussion

### 5.1. Solubility and intrinsic viscosity analysis

The ease of solubility of PDAP was found to be mostly in polar aprotic solvents while in polar protic solvents PDAP was partially soluble. Homopolymer PDAP has the highest intrinsic viscosity revealing facile arbitrary orientation of the polymeric units with highly expanded polymeric chain arrangement while for PTh with minimal intrinsic viscosity had a close-packed  $\pi$ - $\pi$  stacked orientation. Polythiophene was easily or partly soluble in most of the polar aprotic solvents but insolubility is seen in the case of most of the ordinary polar protic solvents making it less processible. However, upon copolymerization Table 1, the grafted copolymer becomes partly soluble in most of the commonly employed polar protic solvents like ethanol and methanol due to the presence of polar and neutral amino side chains of PDAP attached to the  $\pi$ -conjugated backbone of polythiophene and thereby confirming modifications in chain orientation and enhancing its processibility that can be utilized as a promising material in optoelectronic devices. Mark-Houwink equation  $[\eta] = KMv^a$  was used to determine the Viscosity average molar mass ( $M_v$ ) and Intrinsic viscosity ( $\eta$ ) where  $K$  ( $2.0 \times 10^{-2}$ ) and  $a$  (0.3176) are Mark-Houwink constants  $M_v$  is viscosity average molar mass and  $\eta$  is intrinsic viscosity.

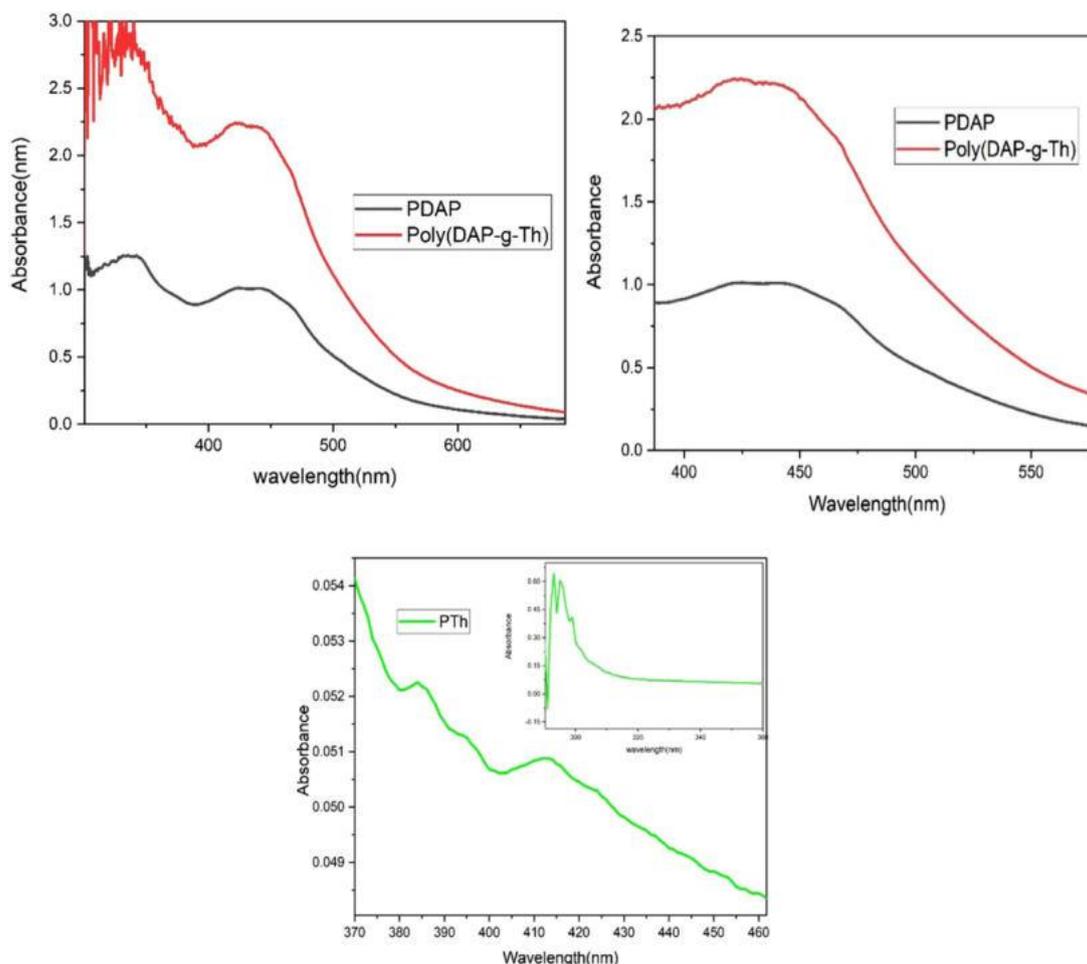


Fig. 3. UV-Visible spectra of PDAP, PTh, and Poly(DAP-g-Th).

Table 4

Calculated Molar extinction coefficient and oscillator strength for PDAP, PTh, Poly(DAP-g-Th).

Sample	$\lambda_{\max}$ (nm)	Absorbance	$\int \text{ad}\nu$ Integrated absorption coefficient ( $\text{cm}^{-2}$ )	Molar Extinction Coefficient	Oscillator strength
PDAP	343	1.25	947.88	15243.9	0.0499
	444	1	1713	12195.12	0.0902
PTh	385	0.05	7.1	1785.71	0.0011
	424	0.05	14.88	1785.71	0.0023
Poly(DAP-g-Th)	345	2.79	1588	34024.39	0.0837
	447	2.17	5145	26463.41	0.2711

By dilute solution viscometric method, taking 0.2 wt % solution of PDAP, PTh, and Poly(DAP-g-Th) in NMP the viscosities were measured using Ubbelohde Viscometer. Intermediate viscosity average molar mass as compared to their pristine homopolymers was observed for Poly(DAP-g-Th) having conjugated polymeric backbone of PDAP with PTh randomly grafted onto the backbone possessing the properties of both the individual monomers. While the inflated molar mass of PDAP indicating the highly extended and compact architecture of the polymeric chain. The polymeric chain of the obtained grafted copolymer can be optimized by varying the monomer feed content. For the synthesized homopolymers and copolymer C,H,N, S %, and the empirical formula were calculated using viscosity average molar mass, Table 2.

A similar trend was observed in the case of intrinsic viscosities for PDAP, PTh, and Poly(DAP-g-Th) depicted in Fig. 1 with increasing molar mass intrinsic viscosity increases with the highest value corresponding to PDAP and lowest for PTh and Poly(DAP-g-Th), the intrinsic viscosity value lies midway validating that with increasing

DAP monomer feed proportions, intrinsic viscosity providing with a closely packed compact array that attributes to the rigidity of the polymeric framework.

The proposed Scheme 1, illustrates the formation of homopolymers and grafted copolymer PDAP, PTh, and Poly(DAP-g-Th).

## 5.2. FT-IR spectral analysis

FT-IR spectrum Fig. 2 of PDAP revealed a band at  $3465\text{cm}^{-1}$  corresponding to NH stretching vibration while the ring puckering vibration peaks of the quinonoid and the benzenoid are observed at  $1537\text{cm}^{-1}$  and  $1439\text{cm}^{-1}$  respectively. The benzenoid to the quinonoid ratio (B/Q) for PDAP was found to be 1.06. The imine stretching peak was observed at  $1646\text{cm}^{-1}$ . PTh showed a characteristic C-S bending peak centered at  $686\text{cm}^{-1}$ . The band observed at  $2976\text{cm}^{-1}$  corresponds to C-H stretching band while the C-H out of the plane bending band appeared at  $1060\text{cm}^{-1}$ .

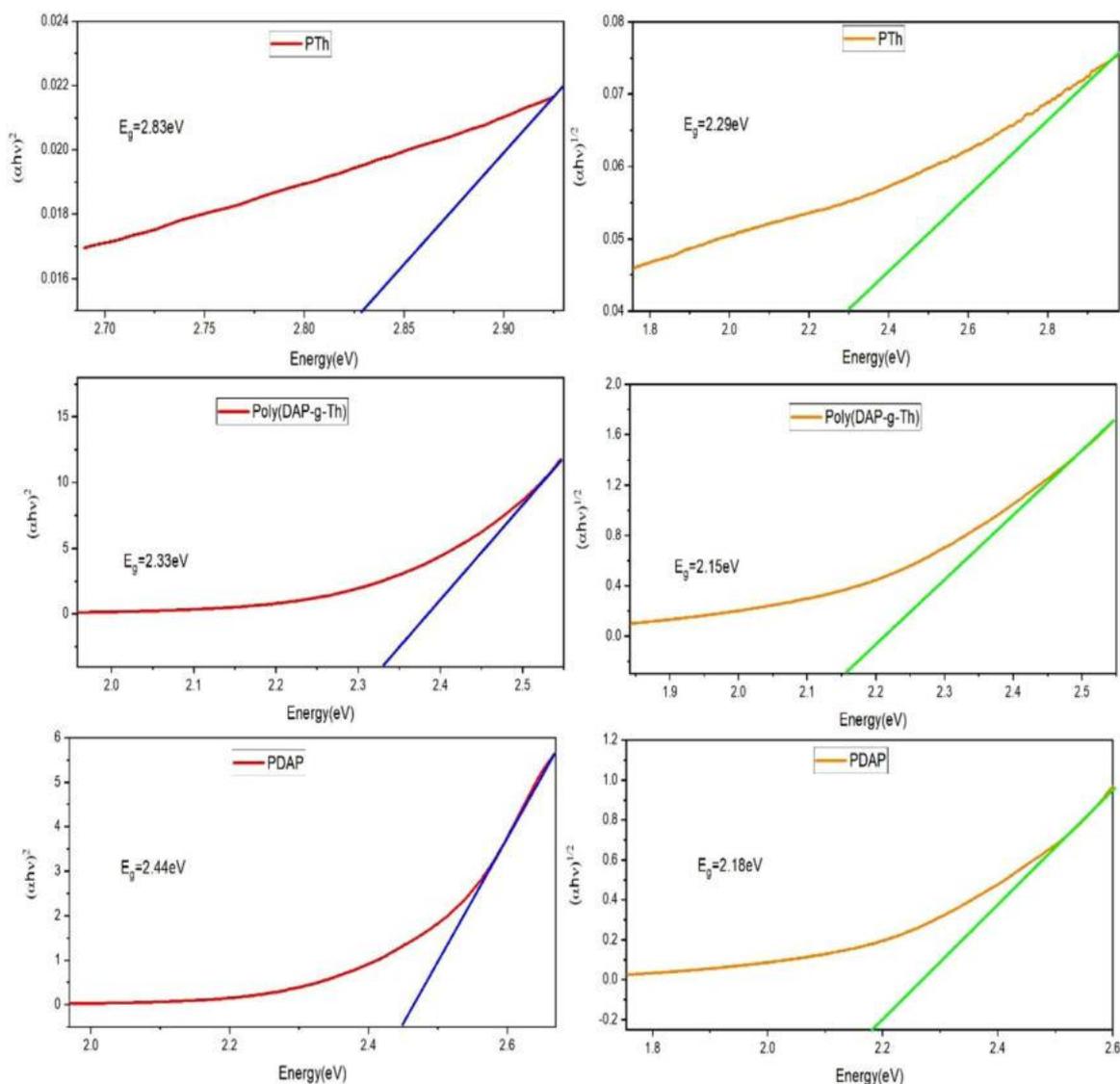


Fig. 4. TAUC plots of Direct and Indirect bandgap for PDAP, PTh, and Poly(DAP-g-Th).

**Table 5**  
Calculated bandgap (direct and indirect) energies using tauc plot.

Sample	$\lambda_{\max}$ (nm)	Absorbance	Direct Band gap (eV)	Indirect Band gap (eV)
PDAP	444	1	2.44	2.18
PTh	414	0.05	2.83	2.29
Poly(DAP-g-Th)	447	1.25	2.33	2.15

The C-C stretching vibration peaks of the quinonoid and the benzenoid for PTh showed a slight shift towards a higher wavenumber with peaks centered at  $1540\text{ cm}^{-1}$  and  $1466\text{ cm}^{-1}$ . The above-noticed peaks confirm the polymerization of homopolymers PDAP and PTh. Grafted copolymer poly (DAP-g-Th) revealed NH stretching peak at  $3469\text{ cm}^{-1}$  while the vibration peaks due to ring puckering of quinonoid and the benzenoid appeared at  $1536\text{ cm}^{-1}$  and  $1445\text{ cm}^{-1}$  and the peak at  $1645\text{ cm}^{-1}$  corresponding to the imine stretching peak are almost commonly centered but with pronounced peak intensity revealing a higher proportion of PDAP indicating modifications with grafting where PDAP is acting as the main polymeric backbone onto which PTh has been grafted. The structural modifications in poly (DAP-g-Th) are further confirmed by the presence of bands centered around  $2925\text{ cm}^{-1}$  and  $764\text{ cm}^{-1}$  corresponding to C-H stretching and C-H out of plane bending (2,5-disubstituted) of PTh units.

The (B/Q) ratio for the grafted copolymer was found to be 1.04 indicating that the copolymer is having an almost equal fraction of quinonoid and the benzenoid moieties revealing its conducting character. The above observations closely resemble the proposed structural framework of the homopolymers and the copolymer. Table 3 summarising the peak positions of various stretching and bending vibrations of the functional groups present in the homopolymers and the grafted copolymer.

### 5.3. UV-Visible spectral analysis

The UV-Vis spectrum of the homopolymers and grafted copolymer in NMP are illustrated in Fig. 3 in which the peak at 444 nm corresponds to an excitonic transition in the visible region which can be correlated with the conjugation of conducting transition state with lone pair of electrons on the amino groups [22]. The

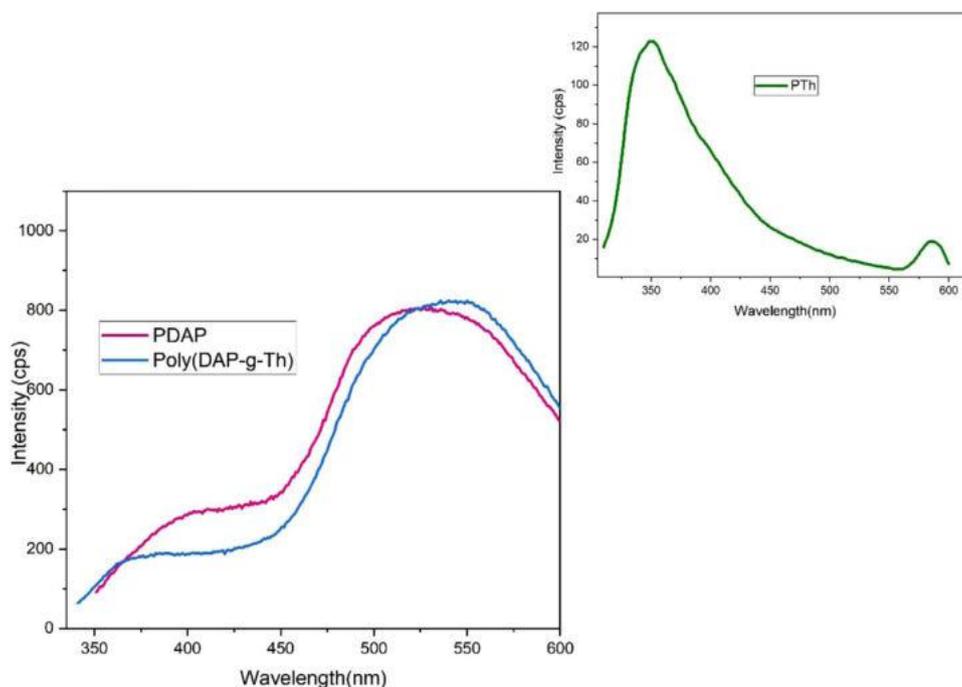


Fig. 5. Fluorescence spectra of PDAP, PTh, and Poly(DAP-g-Th).

**Table 6**  
Quantum Yield ( $\phi$ ) calculations values using fluorescence data.

Sample	$\lambda_{\text{max}}$ (nm)	$A_{\text{sample}}$	Integrated area ( $I_{\text{sample}}$ )	Quantum Yield ( $\phi_{\text{sample}}$ )
PDAP	400	0.9142	7.32E+06	2.73E-03
	529	0.3259	3.96E+06	4.14E-03
PTh	341	0.0645	3.10E+06	1.64E-02
	416	0.0507	7.10E+06	4.77E-02
	586	0.0495	2.28E+06	1.57E-02
Poly(DAP-g-Th)	387	2.0784	1.24E+07	2.03E-03
	540	0.6017	4.45E+07	2.52E-02

spectra of PTh revealed peaks at 293 nm, 385 nm are associated with  $\pi$ - $\pi^*$  transition and polaronic transition at 424 nm. Variation in the intensities is observed upon copolymerization with inflated peak intensity for the copolymer at 447 nm for the polaronic transition than the individual homopolymers PDAP and PTh at 444 nm and 424 nm inferring tailoring of the polymeric structure [23].

Increased peak intensities of  $\pi$ - $\pi^*$  transition and the polaronic transition at 345 nm and 447 nm are attributed to escalated molar extinction coefficient and oscillator strength value depicted in Table 4. As compared to their original pristine homopolymers revealing efficient HOMO-LUMO configuration resulting in better electron transition ability. The improved modifications in the copolymer optical properties displaying the formation of random copolymer which can be effectively tuned to achieve enviable optoelectronic properties.

Using the Tauc equation, the energy bandgap can be evaluated by estimating the intercept for the linear portion of the plot.

$$\alpha h\nu = B[h\nu - E_g]^r$$

The optical energy band gap is determined by extrapolating the Tauc plot [24] to the baseline. For direct bandgap, the plot was made between  $(\alpha h\nu)^2$  versus  $h\nu$ , whereas for indirect bandgap, it was plotted between  $(\alpha h\nu)^{1/2}$  and  $h\nu$  for PDAP, PTh, and Poly(DAP-g-Th) as shown in Fig. 4. The bandgap values of direct as well as indirect cases for grafted copolymer Poly(DAP-g-Th) i.e., 2.33eV and 2.15eV respectively, Table 5 were found to be decreased, confirming copolymerization.

The lowest energy bandgap for the copolymer than the pristine homopolymers substantiates a longer conjugation length to the polymeric backbone while for PTh and PDAP with higher bandgap lowered conjugation length at the backbone inferring for the changes in the structural architecture of the polymeric chain [23] and thereby making the resulting copolymer more promising material and widens its scope for use in several optoelectronic applications.

#### 5.4. Fluorescence studies

The emission spectrum of PDAP, PTh, Poly(DAP-g-Th) was analyzed using NMP solvent in solution form is presented in Fig. 5. The samples were excited at 330 nm and the emissive spectrum was recorded from 350-650 nm.

In the fluorescence spectra of pure PDAP peaks were observed at 400 nm and 529 nm. A broad peak centered at 529 nm corresponds to  $S_1 \rightarrow S_0$  transition [22]. The transition peak with a modest increase in the intensity was noticed with a slight bathochromic shift in the peak value at 540 nm, for the copolymer, and the emissive region was plunged towards the near IR region upon copolymerization attributing to the customization in the electronic transition structure. A sharp PTh peak was observed at 341 nm, which attributes to  $S_2 \rightarrow S_0$  transition. Peak broadness was observed at 416 nm for PTh in the visible region depicting the conducting state for polaron and bipolaron formation in PTh and the peak centered at 586 nm with lowered transition intensity corresponds to  $S_1 \rightarrow S_0$  transition. The lowering in the transition inten-

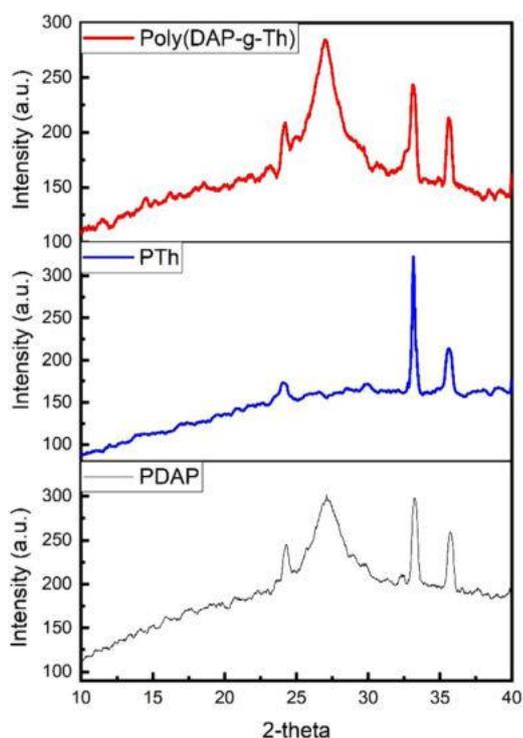


Fig. 6. XRD spectra of PDAP, PTh, and Poly(DAP-g-Th).

sity can be correlated with the lowered integrated area and quantum yield ( $\phi$ ). Modified copolymer at 540 nm showed the highest quantum yield as compared to their pristine forms i.e. PTh and PDAP at 586 nm and 529 nm respectively, which can be correlated with the highest integrated area closely resembles the intensity of fluorescence peak resulting from effective overlapping of HOMO – LUMO orbitals, promoting donor-acceptor interactions through radiationless energy transfer [25] imparting tailorable fluorescence properties which can be attained by varying the monomer feed ratio. The quantum yield ( $\phi_{\text{sample}}$ ) values for pristine PDAP, PTh, and the grafted polymer are given in Table 6.

### 5.5. Morphological studies

X-ray diffraction patterns of the homopolymers (PDAP and PTh) and the grafted copolymer poly(DAP-g-Th) are demonstrated in Fig. 6. The diffractogram of PDAP revealed various small broad peaks and some intense pronounced peaks at  $2\theta = 24.27^\circ, 27.18^\circ, 33.23^\circ$ , and  $35.71^\circ$  indicating semicrystalline behavior. Broad peaks centered at  $2\theta = 24.27^\circ, 27.18^\circ$  corroborates to close-packed structure indicating  $\pi$ - $\pi$  stacking in the molecules while intense peaks attribute to crystallinity. Crystalline peaks in case of PTh were observed at  $2\theta = 33.16^\circ, 35.61^\circ$  with the peak centered at  $2\theta = 33.16^\circ$  being the highly intense sharp peak for which the interchain separation length (R) was found to be  $3.37 \text{ \AA}$  and crystallite size ( $\tau$ ) determined using Scherer equation [18]

$$\tau = \frac{K\lambda}{\beta \cos\theta}$$

is  $26.62 \text{ nm}$  indicating a highly ordered and compact array of the polymeric chain.

The above-mentioned variation in the crystalline behavior can also be attributed to their molar masses obtained from intrinsic viscosity measurements having the highest molar mass value for PDAP and lowest value for PTh indicating its crystalline behavior. Crystallinity being customized in case grafted copolymer poly(DAP-g-Th) showing intermediate interchain separation length(R)

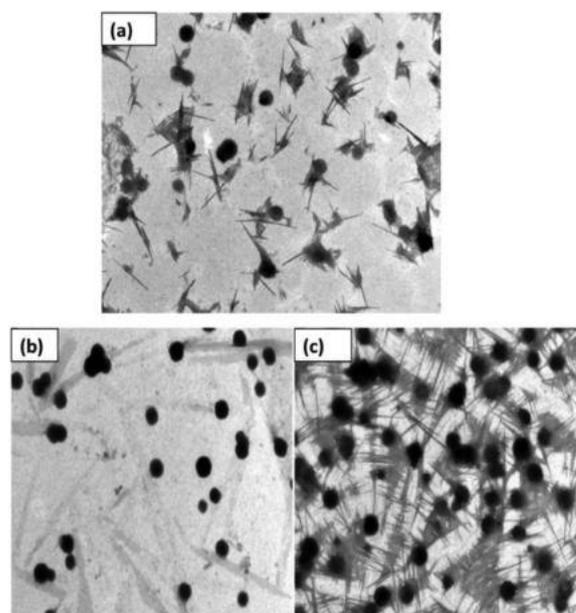


Fig. 7. TEM Micrographs of (a) PDAP, (b) PTh, and (c) Poly(DAP-g-Th).

of  $3.15 \text{ \AA}$  and crystallite size( $\tau$ ) of  $18.31 \text{ nm}$  for an intense crystalline sharp peak at  $2\theta = 35.64^\circ$  as compared to their pristine form homopolymers. The broadening of the peaks at  $2\theta = 27.18^\circ$  and  $27.01^\circ$  can be correlated with lattice strain determined using the equation [26].

$$\beta = 4\varepsilon \tan\theta$$

where  $\beta$  is FWHM and  $\varepsilon$  is the induced lattice strain showing decrement in lattice strain value from PDAP to poly(DAP-g-Th) depicting semicrystalline behavior with calculated XRD spectral data demonstrated in Table 7.

### 5.6. TEM Analysis

The HRTEM micrograph of PDAP Fig. 7 (a) revealed needle clusters and some distorted spherical particles. The morphology of polythiophene Fig. 7(b) showed small spherical particles some of which are combined to form smaller aggregates. Mixed morphology for poly(DAP-g-Th) was depicted in Fig. 7 (c) with dense needle clusters in almost a triangular fashion and evenly distributed spherical particles onto the needle clusters. The procured size of the particles of PDAP, PTh, and Poly(DAP-g-Th) was  $200 \text{ nm}$ . The morphologies of the homopolymers and copolymer well attribute to the XRD studies illustrating semicrystalline behavior for the copolymer which is appropriated from the copolymer fostering the morphology of both the homopolymers PTh and PDAP .

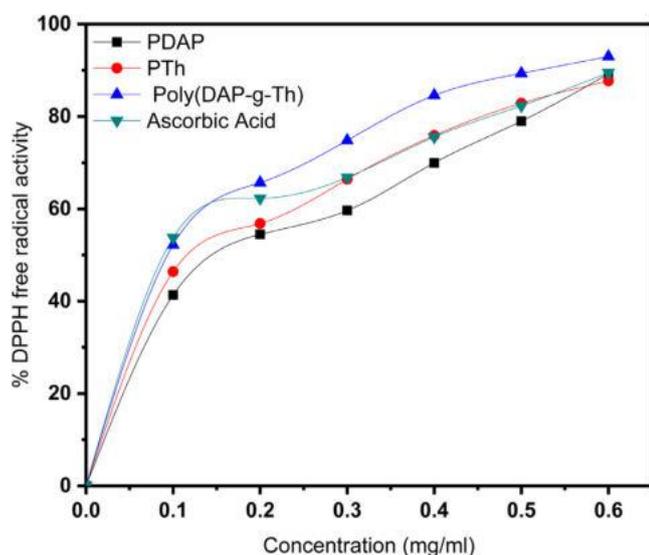
### 5.7. Antioxidant studies

#### 5.7.1. DPPH Free radical antioxidant assay

Antioxidant activity of (PDAP, PTh, and Poly(DAP-g-Th) were evaluated using DPPH free radical assay [27,28]. After the incubation period of 1 hr, a change in color from violet to yellow was noted which confirms the presence of antioxidant moiety in our compound.  $IC_{50}$  values were calculated for (PDAP, PTh, and Poly(DAP-g-Th) by plotting the graph (Fig. 8) which was found to be  $0.18 \pm 0.002$ ,  $0.12 \pm 0.001$ , and  $0.024 \pm 0.001 \text{ mg/ml}$  respectively. Results showed that test compounds exhibited significant activity as compared to standard ascorbic acid ( $0.109 \pm 0.011 \text{ mg/ml}$ ) and Poly(DAP-g-Th) showed the best antioxidant activity [29]

**Table 7**  
XRD spectral data of PDAP, PTh, and Poly(DAP-g-Th).

Sample	2 $\theta$ (deg)	Interchainlength (R) 10 <sup>-10</sup> m	Lattice Strain	FWHM	d = $n\lambda/2\sin\theta$ (m)	Crystallite size( $\tau$ ) (nm)
PDAP	24.27	4.58	0.0146	0.7194	3.6647	11.80
	27.18	4.10	0.0484	2.684	3.2786	3.18
	33.23	3.37	0.0063	0.432	2.6942	20.05
	35.71	3.14	0.0059	0.435	2.5126	19.91
PTh	24.13	4.61	0.0166	0.813	3.6857	10.44
	29.95	3.73	0.0221	1.354	2.9814	6.35
	33.16	3.37	0.0048	0.3253	2.6997	26.62
	35.61	3.15	0.0106	0.7837	2.5194	11.12
Poly(DAP-g-Th)	24.22	4.59	0.0152	0.7465	3.6722	11.37
	27.01	4.12	0.0408	2.2465	3.2989	3.80
	33.14	3.38	0.0074	0.5062	2.7013	17.11
	35.64	3.15	0.0065	0.4763	2.5173	18.31



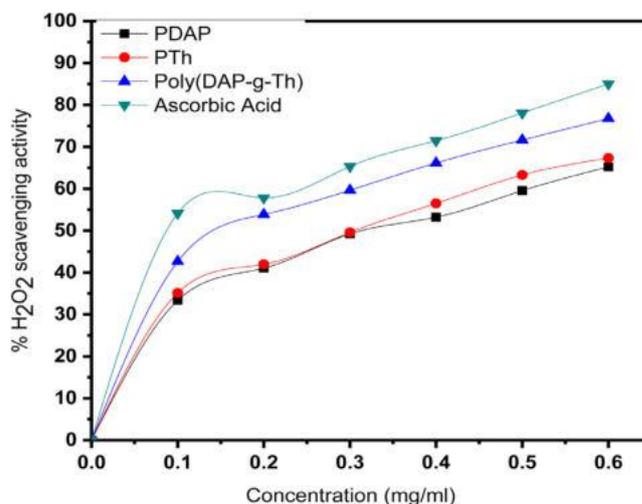
**Fig. 8.** DPPH Free radical scavenging assay of the PDAP, PTh, and Poly(DAP-g-Th).

### 5.7.2. Hydrogen peroxide antioxidant assay

Hydrogen peroxide is a very reactive oxygen-containing species used for the evaluation of the antioxidant properties of the (PDAP, PTh, and Poly(DAP-g-Th)) [30,31]. A fixed amount of hydrogen peroxide (2 ml) in phosphate buffer was added to increasing concentrations of the test compounds (0.1-0.6 ml). The test samples were incubated for 30 minutes and absorbance was recorded using a UV-Vis spectrophotometer at 240 nm. Results showed that absorbance was decreased after the addition of hydrogen peroxide [30]. IC<sub>50</sub> values of the (PDAP, PTh, Poly(DAP-g-Th) and ascorbic acid) were calculated as  $0.37 \pm 0.02$  mg/mL,  $0.32 \pm 0.009$  mg/mL,  $0.17 \pm 0.005$  mg/ml, and  $0.057 \pm 0.005$  mg/mL, respectively Fig. 9 Results exhibited that Poly(DAP-g-Th) showed better activity as compared to other compounds because of the presence of amine groups in DAP which are acting as effective stabilizers when introduced in low concentrations [29] and results were in accordance with DPPH activity.

## 6. Conclusion

Grafted copolymer Poly(DAP-g-Th) was successfully synthesized via chemical oxidative copolymerization and its spectral, morphological, and optical properties were investigated for confirming the customization in the structure on copolymerization. UV-Vis spectral studies reveal structural modifications with the highest oscillator strength and lowered energy bandgap for the resulting copolymer. Viscosity measurements revealed intermediate intrinsic viscosity and molar mass for the copolymer, while elemental,



**Fig. 9.** Hydrogen peroxide scavenging assay of the PDAP, PTh, and Poly(DAP-g-Th).

and FTIR analysis confirmed copolymerization. XRD diffractogram showed crystalline morphology for PTh and semi-crystalline behavior for PDAP and the grafted copolymer. Fluorescence studies revealed monomer feed ratio dependency with intermediate quantum yield value for the copolymer as compared with their homopolymers. Poly(Dap-g-Th) showed better antioxidant scavenging assay against DPPH and hydrogen peroxide radical assay. The above results suggest that synthesized poly(DAP-g-Th) copolymer can be employed in various high-end optoelectronic devices with a tunable bandgap.

### Data availability statement

The raw/processed data required to reproduce these findings cannot be shared at this time due to legal or ethical reasons.

### Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

### CRediT authorship contribution statement

**Deepali Khokhar:** Writing – original draft. **Sapana Jadoun:** Writing – review & editing, Supervision. **Rizwan Arif:** Resources, Software. **Shagufta Jabin:** Visualization. **Dhirendra Singh Rathore:** Writing – review & editing.

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# Analysis of hydrodynamic compliant journal bearings

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## ABSTRACT

The hydrodynamic compliant journal bearings are operating with hydrodynamic lubrication which is generally used to carry radial loads at higher working speed where the standard bearings cannot exist with operation. The both system (journal and bearing) are hold up by a thin lubricating film (fume) due to the distribution of pressure (hydrodynamic). The performance framework prediction of journal bearing, the Reynolds equation (compressible) can be solved by Finite Analysis (FA) method, new Modified Parabolic Approximation and Infinitely Long Approximation. The Modified Parabolic Approximation method converts Reynolds's equation (classical) into a differential equation which is known as ordinary differential equation. Numerical solutions and a suitable equation are produced for Reynolds's equation (compressible) using modified parabolic approximation method. The dynamic characteristics study of a gas bearing with this method can be extended which could further help to understand and design of newer generation of journal bearings.

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## 1. Introduction

The hydrodynamic compliant journal bearing has greater significance according to present scenario due to their special purpose of functioning and its various practical/industrial applications. It is also called as foil bearings. When we will compare to compliant journal bearings with conventional rigid journal bearings, then it has various usefulness in form of lesser power loss, higher load carrying capacity, better endurance and stability. These are self-acting bearings which can be work with atmospheric air or any working gas lubricating fluid. For significant weight reduction and lower maintenance, a complex lubrication system is eliminated. The ambient air is most commonly used as lubricant which availability is plentiful. Whereas the conventional oil-based lubricants fail to work but ambient air (as lubricants) can be operated at increasing temperature because, with increase in temperature its viscosity start exponentially decreasing. The journal bearing is a mechanical machinery element by which the friction force is reduces and also the relative motion is restricted between rotating elements for the required motion. For example, a bearing designed for free rotation around a fixed axis or for free aligned motion of the rotating parts. This motion can be prevented by controlling the normal vector

forces that can bear by rotating parts. It may also be possible that some bearings simplify the motion of journal bearing, it may be happen by minimizing friction [1–5].

## 2. Working principle

Animation of ball bearing is given which is without a cage. In ball bearing the internal ring is rotating part while external ring is stationary part.

There are six general principles of (Figs. 1-3) operation of ball bearing:

- (i) The most basic principle of ball bearing is to minimize the friction and make rotation smoother.
- (ii) In ball bearing we use balls to maintain the gap between races of bearing.
- (iii) In Jewel bearing, working load on journal bearing is hold up by rolling axle which is set slightly to the off-center [6–8].
- (iv) In fluid journal bearing, working load is hold up by liquid or gas.

### 2.1. Motions

The general motion for bearings permitted by:

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**Nomenclature**

<b>D</b>	mean diameter of bearing (mm)	$w_a, w_b$	squeeze components
<b>N</b>	rotational speed of bearing (rpm)	$x, y, z$	cartesian coordinates
<b>S</b>	bump pitch (m)	$\rho$	air density (in $\text{kg/m}^3$ )
<b>H</b>	film thickness of fluid (m)	<b>C</b>	radial clearance (m)
$h_{\min}$	minimum fluid film thickness (m)	<b>D</b>	diameter of shaft (m)
<b>e</b>	eccentricity of shaft (m)	<b>E</b>	modulus of elasticity
$e_f$	eccentricity of compliant bearing shaft (m)	<b>R</b>	radius of shaft (m)
$e_r$	eccentricity of rigid bearing shaft (m)	$u_a, u_b$	sliding velocity
<b>l</b>	half bump length (m)	<b>W</b>	Carrying capacity of load (N)
<b>L</b>	length of bearing (m)	$W_r$	Carrying capacity of load of bearing (rigid) (N)
<b>T</b>	Time (hrs.)	$W_f$	Carrying capacity of load of compliant/ foil bearing(N)
$t_f$	top foil thickness (m)	$\epsilon_f$	eccentricity ratio for compliant/ foil bearing
$t_b$	bump foil thickness (m)	$\epsilon_r$	eccentricity ratio for bearing (rigid)
<b>P</b>	hydrodynamic pressure (Pa)		
$P_a$	ambient pressure (Pa)		

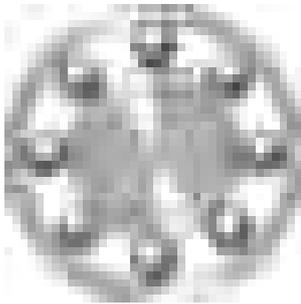


Fig. 1. Diagram of ball bearing.



Fig. 3. Diagram of peak and Bump Foils.

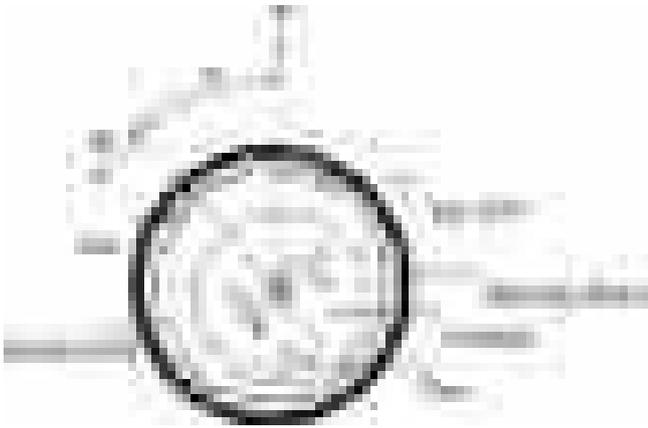


Fig. 2. Diagram of Compliant/Foil Journal Bearing.

- (i) Free circular rotation around a fixed axis (Example: **shaft rotation**).
- (ii) Free linear motion of the moving part (Example: **Drawer**).
- (iii) Spherical rotation (Example: **Socket and ball joint**).

**2.2. Friction**

In bearings the reducing friction plays an important role for efficiency, to reduce wear and tear it should be used at higher speeds & to avoid premature failure and overheating of the journal bearing. Fundamentally, the friction can be decreases by a bearing by merit of its material or by shape or surfaces separated by an elec-

tromagnetic field or by containing & introducing a fluid between the surfaces [9–15].

- (i) **Shape:** The spheres or rollers shape usually gains advantage, or by making flexure bearings.
- (ii) **Materials:** Material using in exploits the behavior / nature of bearing used. (Example: plastics are using which has low surface friction).
- (iii) **Fluid:** Fluid exploits the layer of low viscos fluid, such as a pressurized medium (fumes) that is work as lubricants to prevent the 2 solid parts from contacting each other or by reduced to minimum normal force between both mating parts [16–20].

**2.3. Applied load/ forces**

To a rolling bearing (radial), an external load is applied which is distributed amongst all the rolling elements. The internal load distribution on bearing in various applications can be adapted by the deformation elastically of rings of bearing. The adaption of this application can be enhancing the life of bearing. The size and directions of forces can vary for the bearings that they providing support. The applied loads on bearing can be mainly radial thrust, axial thrust or bending moments which is normal to the principal axis.

### 2.4. Speed

Each and every category of bearings have various limits of its working speed. Generally, speed is identified as maximum speed on relative surface, commonly identified as m/s. The performance of rotational bearings generally narrates in productive terms of (D) & (N) where 'D' is the Bearing diameter (mm) and 'N' is the Rotational speed of bearing (rpm).

Commonly there is a substantial range of speed which is overlap amongst various types of bearing. Generally, at lower speeds only plain bearings and at higher speed rolling journal bearings works properly, which is follow-up by the fluid bearings and ultimately magnetic bearings which are modified by centripetal force by which the strength of bearing material can be overcome.

### 3. Reynolds Equation's derivation for journal bearings

The assumptions are listed below for deriving the Reynolds Equation.

- (i) The lubrication fluid which is used to be assumed as Newtonian fluid where shear stress is directly proportional to the shearing velocity.
- (ii) The acting Inertia and forces on elements are supposed to be negligible as compared to viscous terms.
- (iii) Across the film, the variation of pressure is to be assumed as to much small.
- (iv) The flow of fluid as laminar flow.
- (v) The effect of curvature on fluids are negligible.

A three dimensional slider bearing configuration is indicated in Fig. 4 which has a clearance between film of  $g(x) = g(x,y)$ . The upper most and lower most, both plates are assumed to undergoes as sliding movement (velocity)  $u_a$  and  $u_b$ . A squeezing motion which is normal to the x-y plane may exist in the z- direction. The squeezing elements are indicated by  $w_a$  and  $w_b$ .

Momentum equation along the direction of X is given below as;

$$\frac{\partial p}{\partial x} = \frac{\partial}{\partial z} \left( \mu \frac{\partial u}{\partial z} \right) \quad (1)$$

Momentum equation along the direction of Y is given below as;

$$\frac{\partial p}{\partial y} = \frac{\partial}{\partial z} \left( \mu \frac{\partial v}{\partial z} \right) \quad (2)$$

Momentum equation along the direction of Z is given below as;

$$\frac{\partial p}{\partial y} = 0 \quad (3)$$

The pressure variation over the whole film is to be considered as to much small.

Integrating equation (1) and (2) and twice too with the boundary conditions given below;



Fig. 4. Diagram of Slider Bearing.

$$u = u_a, v = 0, w = w_a, atz = 0$$

$$u = u_b, v = 0, w = w_b, atz = h$$

$$u = \frac{1}{2\mu} \frac{\partial p}{\partial x} (z^2 - zh) + \left(1 - \frac{z}{h}\right) u_a + \frac{z}{h} u_b \quad (4)$$

$$\frac{1}{2\mu} \frac{\partial p}{\partial x} (z^2 - zh) \rightarrow \text{Poiseuille flow term}$$

$$\left(1 - \frac{z}{h}\right) u_a + \frac{z}{h} u_b \rightarrow \text{Couette flow term}$$

The velocity profile represented by Equation (4) which is composed of the term Poiseuille by pressure gradient along the direction of X and term Couette flow by surface motion.

$$v = \frac{1}{2\mu} \frac{\partial p}{\partial y} (z^2 - zh) \quad (5)$$

The velocity in flow direction is represented by Equation (5) which shows the leaking out fluid velocity profile on both sides of slider journal bearing. By integrating equations (4) and (5) across the gap respectively, the rate of volumetric flow along direction of sliding and leakage rate of flow can be calculated.

The generalized equation for conservation of mass is;

$$\frac{\partial \rho}{\partial t} + \frac{\partial(\rho u)}{\partial x} + \frac{\partial(\rho v)}{\partial y} + \frac{\partial(\rho w)}{\partial z} = 0 \quad (6)$$

By integrating the equation (6) over the whole film thickness;

$$\int_0^h \frac{\partial \rho}{\partial t} dz + \int_0^h \frac{\partial(\rho u)}{\partial x} dz + \int_0^h \frac{\partial(\rho v)}{\partial y} dz + \int_0^h \frac{\partial(\rho w)}{\partial z} dz = 0 \quad (7)$$

The resulting equation is;

$$h \frac{\partial \rho}{\partial t} + \frac{\partial}{\partial x} \left( -\frac{\rho h^3}{12\mu} \frac{\partial \rho}{\partial t} \right) + \frac{1}{2} \frac{\partial}{\partial x} [\rho(u_a - u_b)h] - u_b \rho \frac{\partial h}{\partial x} + \frac{\partial}{\partial y} \left( -\frac{\rho h^3}{12\mu} \frac{\partial \rho}{\partial y} \right) + \rho(w_a - w_b) = 0 \quad (8)$$

Rearranging above equation;

$$\frac{\partial}{\partial x} \left( \frac{\rho h^3}{12\mu} \frac{\partial \rho}{\partial t} \right) + \frac{\partial}{\partial y} \left( \frac{\rho h^3}{12\mu} \frac{\partial \rho}{\partial y} \right) = \frac{1}{2} \frac{\partial}{\partial x} [\rho(u_a - u_b)h] - u_b \rho \frac{\partial h}{\partial x} + \rho(w_a - w_b) + h \frac{\partial \rho}{\partial t} \quad (9)$$

Neglect the stretchable terms, the density terms and the general expansive terms of equation (9) which reduces in final generalized Reynolds's equation that is broadly using for greatly industrial applications.



Fig. 5. Diagram of a Journal Bearing.

$$\frac{\partial}{\partial x} \left( \frac{\rho h^3}{12\mu} \frac{\partial \rho}{\partial x} \right) + \frac{\partial}{\partial y} \left( \frac{\rho h^3}{12\mu} \frac{\partial \rho}{\partial y} \right) = \frac{1}{2} [\rho(u_a - u_b)] \frac{\partial h}{\partial x} + \rho(w_a - w_b) + h \frac{\partial \rho}{\partial t} \quad (10)$$

Fig. 5, a journal bearing configuration is shown below in which fixed element is bearing sleeve and rotating element is journal. There are no any conditions where the thickness of film may vary with time by the conditions given below;

$$u_a = 0, w_a = 0 \text{ and } u_b = u \text{ and } w_b = w \neq 0$$

Now finalized Reynolds equation is reduced in;

$$\frac{\partial}{\partial x} \left( \frac{\rho h^3}{12\mu} \frac{\partial \rho}{\partial x} \right) + \frac{\partial}{\partial y} \left( \frac{\rho h^3}{12\mu} \frac{\partial \rho}{\partial y} \right) = \frac{1}{2} U \frac{\partial(\rho h)}{\partial x} + \frac{\partial(\rho h)}{\partial t} \quad (11)$$

#### 4. Results

The properties of compliant journal bearing are listed in Table 1 and 25,000 rpm is its operating speed. In compliant journal bearing the ambient air is used as lubricants and its properties are listed in Table 2. It is assumed to be compare the rigid journal bearing of same dimensions, same properties of lubricants using and the same working speeds [21]. The compliant journal bearing (foil bearing) pressure distribution profile which spreads over a greater area when it will be compared by counterpart of their rigid bearing which results a heavier load supporting' capacity.

From Fig. 7 we are representing the comparison of profile of film thickness between a rigid bearing with a on larger area by distortion of this foils. The concept of least thickness of film that may converged with an equivalent to 10 μm (10 μm) where angle of attitude (h<sub>min r</sub>, h<sub>min r</sub>) for compliant journal bearing [φ<sub>r</sub> = 36] and for the rigid bearing [φ<sub>r</sub> = 42.3] with a total load bearing capacity which is equal to 120 N. This report is compared with experiments performed by Strom (1987).

Figs. 6 and 7 shows the profile of pressure and film thickness in which we compare a journal bearing (rigid) with 1st generation compliant journal bearing runs at 40000 rpm. It changed into a least thickness of film i.e. 9 μm, pitch(attitude) angle φ<sub>r</sub> = 30° and for rigid bearing φ<sub>r</sub> = 35° which has carrying load capacity is 210. This report is compared with experiments performed by Strom (1987).

From N. Kawabata 1987, The Numerical Analysis of Reynolds Equation, it has some unique features with regards the compliant journal bearing operation which eccentricity ratio is greater than one. The rigid journal bearing has eccentricity which is similar to exculpated (clearance). The approach angle, in the case of compliant journal bearings is comparing by its counterpart of rigid bearing, it may improve the overall firmness of operation (Peng and Khonsari, 2004). To understand the bearing performance at higher speed, the numerical code has developed for further testing. It can be simulated for the maximum speed (in rpm) near about 4,00,000.

**Table 1**  
Experimental data of Compliant/Foil Bearing (Peng, 2003).

Bump/encounter foil Poisson's Ratio (ν)	0.30
Pitch for bump (s)	4.57 × 10 <sup>-3</sup> m
Thickness top foil (t <sub>r</sub> )	0.101 × 10 <sup>-3</sup> m
Nominal radial clearance (C)	50 × 10 <sup>-6</sup> m
Radius of shaft (R)	19.05 × 10 <sup>-3</sup> m
Length of bump (2 l)	3.55 × 10 <sup>-3</sup> m
Young's modulus (E) for bump foil	200 × 10 <sup>9</sup> Pa
Length of bearing (L)	38.09 × 10 <sup>-3</sup> m
Thickness of bump foil (t <sub>b</sub> )	0.101 × 10 <sup>-3</sup> m

**Table 2**  
Properties of lubricants used (ambient air) (Peng, 2003).

Density (ρ)	1.161 kg/m <sup>3</sup>
Viscosity (μ)	184.6 × 10 <sup>-7</sup> N-s/m <sup>2</sup>

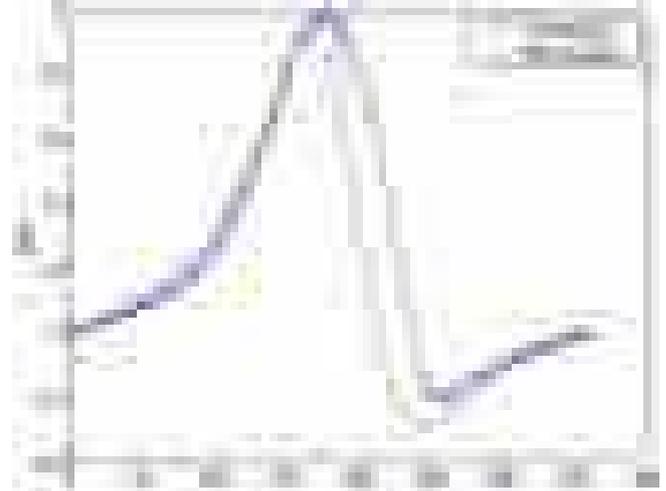


Fig. 6. Comparison of Rigid and Foil/Compliant Bearing at 25,000 rpm.

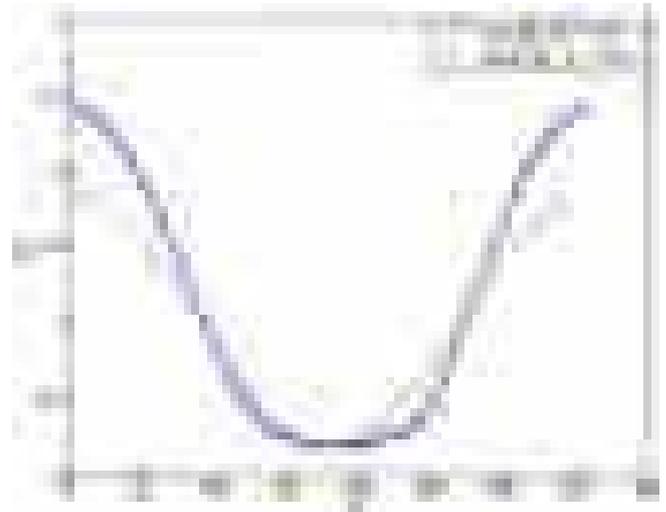


Fig. 7. Comparison of profile of film thickness of attitude angle for Rigid and foil Bearing at 25,000 rpm.

When we will compare the profile of film thickness of attitude angle for Rigid and foil Bearing given in Fig. 7 which shows the genuine worth throughout a range of eccentricity ratio.

#### 5. Conclusions

The current requirements of aerospace in which the energetic & efficient turbines, rotating machineries, and other machineries which are pushing-up the existing knowledge in development and design of bearings that can be operated at extreme speed and high temperature. According to requirement, the hydrodynamic compliant/foil journal bearings plays an important role in design and development. Then this concept of compliant journal

bearing is most important first to understand their fundamentals and then its operational characteristics and also its limitations to guide for industrial designers and manufacturers [22–25].

In this report I am presenting a model with the help of mathematics for compliant/foil journal bearings which is based on Reynolds Classical equation. Initially this non-linear equation is computed mathematically by ILA (infinitely-long approximation) method to predict & understand the performance parameter of compliant journal bearings.

An assumption regarding the pressure is based on Reynolds classical equation (partial-differential) which is manipulated into an equation i.e. ordinary differential. These all bunch of equations are too much simpler than others to compute numerical problems by the MPA (modified-parabolic approximation) method which is explained in this report to predict the performance parameters of compliant and rigid journal bearings. The agreement of this obtained results is with the finite analysis (FA).

A bunch of data for journal bearing (rigid) is explained which is based on important factors of non-dimensional parameters. These non-dimensional parameters are the eccentricity ratio, ratio of length to diameter for the bearing and bearing numbers. With the help of these data the non-dimensional force/load is obtained for different-different bearing no. and also obtained the criteria for eccentricity ratios to the proportionate exponential which is necessary to the Modified Parabolic Approximation analysis.

#### CRedit authorship contribution statement

**Saurabh Singh:** Conceptualization, Methodology. **Mohd Zaheen Khan:** Software, Investigation, Visualization, Writing - review & editing, Formal analysis.

#### Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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## COPYRIGHTS AND ARTIFICIAL INTELLIGENCE

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### **Introduction**

The first time this word came up in a conference in the year 1956 and Mr. John Mccarthy who studied computer science was the man who had given the world this term 'Artificial Intelligence'. He described it as the notion of a program, working, formulating and acting on any given information or input in the same way as a rational human being would respond on such thing. WIPO (World Intellectual Property Organization) identified and gave the existence of three types of Artificial Intelligence categories i.e., expert systems, perception systems and natural language systems<sup>1</sup>

Expert systems are basically used to do creative work related to art and other. They diagnose and solve problems in some particular field of science or that requires a particular knowledge such as diagnosing medical conditions, treatment of a disease, geological conditions etc. Perception systems are those systems that perceive the world by the use of sight and hearing and is needed by topologists, word context experts etc. A natural language program uses a dictionary database and used to know the meaning of words of different languages.

### **Copyright Concept**

In India, Copyright can be understood as a right which is given to a person who is creator or author of literary, musical, dramatic and artistic work. Copyright is basically a bundle of rights which includes that work can be adapted, translated, reproduced, communicated etc. the test for a work to be given copyright protection is that the work should be original. Copyright act protects the expression of an idea and just an idea. Hence for a work to be given copyright protection in India, it must be original and must be expressed in some form.

### **Can Copyright Law recognize Artificial Intelligence generated works?**

Only the original creation by authors i.e., composers, artists, writers etc. is covered and granted protection under the Copyright act of most of the countries. However when it comes to the work done by using machines or computers as in the case of Artificial Intelligence, the question is who the Author is? The computer or the human? This has to be understood with regard to the statutory provisions and case laws in various countries.

### **Position under United Kingdom Legislation**

In the united kingdom, section 9 of the copyright, designs and Patents Act 1988, the author of a work is the person who creates it.

Section 11 of the CDPA says that copyright belongs to the author unless it is made by an employee who is in the course of employment and in that case the author is the employer.

For computer-generated works, Section 9(3) CDPA states that :

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<sup>1</sup> www.wipo.org

In case of literary, dramatic, musical or artistic work which is computer generated, the author shall be taken to be the person by whom the arrangements necessary for the creation of the work are undertaken.

Authorship is given to the programmer of these programs in countries lie India, UK, Ireland, New Zealand , Hong Kong.

The UK Copyright, Designs and Patent Act (CDPA) added a clause in the statute, section 178 that allowed authorship of computer generated works where work is made by computer and there is absence of any human author to vest in the ‘ person by whom the arrangements necessary for the creation of work are undertaken ’.<sup>2</sup>

In the case of Express Newspapers Plc v. Liverpool Daily Post & Echo Plc<sup>3</sup>, the issue was there was a grid copied which was used in the newspaper lottery. Computer software was used to generate the grids. The High Court of England and Wales said that computer was nothing more than a tool which was used by the author to make the work just like the work to an artist’s pen or typewriter. The reason was that the computer does not create the work by using human input but act as s conduit to manifest the expression of the human author.

In Nova Productions Ltd v Mazooma Games Ltd<sup>4</sup>, the question before High Court was whether the bitmap files which were used to generate the elements of a computer video game which were made by a computer programmer were the authorship of the programmer or not. The court said that the composite frames produced by the PC program were the initiation of the software engineer as ‘... he conceived the presence of the different components of the diversion and the standards and rationale by which each edge and frame is created and he composed the important PC program’. He along these lines ‘... is the individual by whom the game plans essential for the production of the works were embraced and in this way is considered to be the author’, following the present provisions of the CDPA. The problem here was that just making of the arrangement necessary for the creation of the works could lead to a virtual monopoly in the Artificial Intelligence – created works and thus there should be a difference in the computer related works and the work which is made by using the assistance of computers.

### **Position under European Union Legislation**

Artificial Intelligence authorship is also doubtful. In the case of Infopaq International A/s v Danske Dagbaldes Forening , the CJEU ( Court of Justice of the EU) held that the Copyright can be given to work that reflect the authors own intellectual creation to mean works where ‘... its author communicates his imaginative capacity in a unique way by settling on free and inventive choices ... and accordingly stamps his "own touch" [on the works]’. Clearly AI would come up short in the above test, as it would not be classed as an author, and the works it makes would not be viewed as original creative works and given copyright protection.

To expand the protection of copyrights, the Copyright Directive was established in the European Union in the year 2001. The primary focus was on Information Society. It did not want to replace the national laws. It was based upon the Berne Convention of the year 1886. Article 2 of the Copyright Directive has the notion of an author for which all member states must provide exclusive rights to authorize or prohibit direct or indirect, temporary or permanent,

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<sup>2</sup>Copyright, Designs and Patents Act 1978

<sup>3</sup> 1985 3 ALL ER 680

<sup>4</sup> [2007] EWCA Civ 219, [2007] Bus LR 1032

reproduction by any way of any work partly or wholly. The directive by itself does not exclude any non human authors but the judgments do so. In the landmark decision of Infopaq (Infopaq International A/S v Danske Dagblades Forening), the CJEU decided that authors own intellectual creation must be seen in the original work of the work. Thus the European standard of originality was established in this case.<sup>5</sup>

### **Position in India**

Copyright Law has not given neither any rules regarding Artificial Intelligence nor given any provision regarding the ownership of the work created by computer or machines. There are certain rights which are provided to other tangible things as Artificial Intelligence do not have somatic existence and not regarded as entities in conventional sense.

The main point in granting legal personhood lies in the fact that whether such entity has any right to own property and capacity to sue or be sued. Courts in India have not decided any matters related to work created by Artificial Intelligence. Indian law has although granted legal personhood status to entities other than human such as companies and corporate houses.

### **Who should be the author?**

There is no clear cut answer to this as the law is more authors centric and not really protects individual works in isolation. But if more focus is driven towards individual works in isolation, it would lead to flexibility in terms of level of protection and also mitigate against mass production of works for the enforcement of rights. A report on robotics by EU suggested that electronic personhood could be created or maybe a specific set of rights for AI to own the right in the particular work that is created by it. One opinion is that the work created by Artificial Intelligence should be treated as works for hire. This would give the rights to the person who had made the AI to create any work.

### **Challenges for Intellectual Property wrt Artificial Intelligence**

1. Third Party Rights: The breach of third party intellectual property rights is an issue for companies who will undoubtedly be seeking to protect their business. A copyright can only be infringed by persons and hence artificial intelligence will not be covered here. The way forward is that the developers should develop their soft ware's so as to respect the rights of third parties.
2. Content Creation: the use of Artificial Intelligence will reduce or completely finish the need for human input. As copyright only covers human authors, hence it is not possible for an artificial intelligence system to be classed as an author. Original work is made by a human and the work made by artificial intelligence cannot be compared to that which is made by a human as artificial intelligence system cannot exercise the same diligence, labor and judgment. The only possible source of originality in artificial intelligence systems is the way in which the skills or intellectual creation is expanded within the training process of the system as it allows artificial intelligence to create specific type of work only.
3. Patent ownership: another challenge is that who will be the owner of the patent of the idea generated. Can the ownership be given to Artificial Intelligence? It would be wise to solve this issue by way of agreement as opposed to leaving it on courts to decide.

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<sup>5</sup> www.Wipo.org

<sup>6</sup> www.lawctopus.com

To tackle the issues tended to over an extensive Legislation is required. This Legislation must determine the issue of non-human creators to dodge the diminishing of investment into AI, which would obstruct progress. Rethinking authorship, as some worldwide researchers have recommended (Abbot, 2016; David, 2011), like the purview in the UK may comprise a sensible arrangement.

Be that as it may, challenges lie ahead which requests additionally inquire about. For example, the equivocalness of authorship prompts the accompanying inquiries: Who can be credited the copyright of an AI-creation when numerous gatherings are included? Answers to this inquiry incorporate the developer who composed the AI, the end-client who set the parameters, and the makers of the preparation information, who might be on account of The Next Rembrandt, the effectively dead Rembrandt himself.

The extent of this article can't build up a broad examination of this unpredictable point. The effect appraisal must be considered unmistakably comprehensively and from a financial viewpoint as well as from a social and natural perspective. Besides, the separation of AI as an apparatus which bolsters a human creator in its creation and AI which self-sufficiently and recursively makes work is obscured. The characterization of AI may recommend an intriguing further research question with broad results.

The impact of AI is yet to take off. With fast approaching advances in registering power in sight (Anthony, 2016) it won't take hundreds of years yet decades until the point that we won't have the capacity to recognize human-made and machine-made manifestations. To be prepared for this quick paced condition exact legislation is important.



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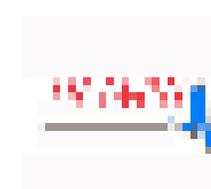
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## COPYRIGHTS AND ARTIFICIAL INTELLIGENCE

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### **Introduction**

The first time this word came up in a conference in the year 1956 and Mr. John McCarthy who studied computer science was the man who had given the world this term 'Artificial Intelligence'. He described it as the notion of a program, working, formulating and acting on any given information or input in the same way as a rational human being would respond on such thing. WIPO (World Intellectual Property Organization) identified and gave the existence of three types of Artificial Intelligence categories i.e., expert systems, perception systems and natural language systems<sup>1</sup>

Expert systems are basically used to do creative work related to art and other. They diagnose and solve problems in some particular field of science or that requires a particular knowledge such as diagnosing medical conditions, treatment of a disease, geological conditions etc. Perception systems are those systems that perceive the world by the use of sight and hearing and is needed by topologists, word context experts etc. A natural language program uses a dictionary database and used to know the meaning of words of different languages.

### **Copyright Concept**

In India, Copyright can be understood as a right which is given to a person who is creator or author of literary, musical, dramatic and artistic work. Copyright is basically a bundle of rights which includes that work can be adapted, translated, reproduced, communicated etc. the test for a work to be given copyright protection is that the work should be original. Copyright act protects the expression of an idea and just an idea. Hence for a work to be given copyright protection in India, it must be original and must be expressed in some form.

### **Can Copyright Law recognize Artificial Intelligence generated works?**

Only the original creation by authors i.e., composers, artists, writers etc. is covered and granted protection under the Copyright act of most of the countries. However when it comes to the work done by using machines or computers as in the case of Artificial Intelligence, the question is who the Author is? The computer or the human? This has to be understood with regard to the statutory provisions and case laws in various countries.

### **Position under United Kingdom Legislation**

In the united kingdom, section 9 of the copyright, designs and Patents Act 1988, the author of a work is the person who creates it.

Section 11 of the CDPA says that copyright belongs to the author unless it is made by an employee who is in the course of employment and in that case the author is the employer.

For computer-generated works, Section 9(3) CDPA states that :

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<sup>1</sup> www.wipo.org

In case of literary, dramatic, musical or artistic work which is computer generated, the author shall be taken to be the person by whom the arrangements necessary for the creation of the work are undertaken.

Authorship is given to the programmer of these programs in countries lie India, UK, Ireland, New Zealand , Hong Kong.

The UK Copyright, Designs and Patent Act (CDPA) added a clause in the statute, section 178 that allowed authorship of computer generated works where work is made by computer and there is absence of any human author to vest in the ‘ person by whom the arrangements necessary for the creation of work are undertaken’.<sup>2</sup>

In the case of Express Newspapers Plc v. Liverpool Daily Post & Echo Plc<sup>3</sup>, the issue was there was a grid copied which was used in the newspaper lottery. Computer software was used to generate the grids. The High Court of England and Wales said that computer was nothing more than a tool which was used by the author to make the work just like the work to an artist’s pen or typewriter. The reason was that the computer does not create the work by using human input but act as s conduit to manifest the expression of the human author.

In Nova Productions Ltd v Mazooma Games Ltd<sup>4</sup>, the question before High Court was whether the bitmap files which were used to generate the elements of a computer video game which were made by a computer programmer were the authorship of the programmer or not. The court said that the composite frames produced by the PC program were the initiation of the software engineer as ‘... he conceived the presence of the different components of the diversion and the standards and rationale by which each edge and frame is created and he composed the important PC program’. He along these lines ‘... is the individual by whom the game plans essential for the production of the works were embraced and in this way is considered to be the author’, following the present provisions of the CDPA. The problem here was that just making of the arrangement necessary for the creation of the works could lead to a virtual monopoly in the Artificial Intelligence – created works and thus there should be a difference in the computer related works and the work which is made by using the assistance of computers.

### **Position under European Union Legislation**

Artificial Intelligence authorship is also doubtful. In the case of Infopaq International A/s v Danske Dagbaldes Forening , the CJEU ( Court of Justice of the EU) held that the Copyright can be given to work that reflect the authors own intellectual creation to mean works where ‘... its author communicates his imaginative capacity in a unique way by settling on free and inventive choices ... and accordingly stamps his "own touch" [on the works]’. Clearly AI would come up short in the above test, as it would not be classed as an author, and the works it makes would not be viewed as original creative works and given copyright protection.

To expand the protection of copyrights, the Copyright Directive was established in the European Union in the year 2001. The primary focus was on Information Society. It did not want to replace the national laws. It was based upon the Berne Convention of the year 1886. Article 2 of the Copyright Directive has the notion of an author for which all member states must provide exclusive rights to authorize or prohibit direct or indirect, temporary or permanent,

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<sup>2</sup>Copyright, Designs and Patents Act 1978

<sup>3</sup> 1985 3 ALL ER 680

<sup>4</sup> [2007] EWCA Civ 219, [2007] Bus LR 1032

reproduction by any way of any work partly or wholly. The directive by itself does not exclude any non human authors but the judgments do so. In the landmark decision of Infopaq (Infopaq International A/S v Danske Dagblades Forening), the CJEU decided that authors own intellectual creation must be seen in the original work of the work. Thus the European standard of originality was established in this case.<sup>5</sup>

### **Position in India**

Copyright Law has not given neither any rules regarding Artificial Intelligence nor given any provision regarding the ownership of the work created by computer or machines. There are certain rights which are provided to other tangible things as Artificial Intelligence do not have somatic existence and not regarded as entities in conventional sense.

The main point in granting legal personhood lies in the fact that whether such entity has any right to own property and capacity to sue or be sued. Courts in India have not decided any matters related to work created by Artificial Intelligence. Indian law has although granted legal personhood status to entities other than human such as companies and corporate houses.

### **Who should be the author?**

There is no clear cut answer to this as the law is more authors centric and not really protects individual works in isolation. But if more focus is driven towards individual works in isolation, it would lead to flexibility in terms of level of protection and also mitigate against mass production of works for the enforcement of rights. A report on robotics by EU suggested that electronic personhood could be created or maybe a specific set of rights for AI to own the right in the particular work that is created by it. One opinion is that the work created by Artificial Intelligence should be treated as works for hire. This would give the rights to the person who had made the AI to create any work.

### **Challenges for Intellectual Property wrt Artificial Intelligence**

1. Third Party Rights: The breach of third party intellectual property rights is an issue for companies who will undoubtedly be seeking to protect their business. A copyright can only be infringed by persons and hence artificial intelligence will not be covered here. The way forward is that the developers should develop their soft ware's so as to respect the rights of third parties.
2. Content Creation: the use of Artificial Intelligence will reduce or completely finish the need for human input. As copyright only covers human authors, hence it is not possible for an artificial intelligence system to be classed as an author. Original work is made by a human and the work made by artificial intelligence cannot be compared to that which is made by a human as artificial intelligence system cannot exercise the same diligence, labor and judgment. The only possible source of originality in artificial intelligence systems is the way in which the skills or intellectual creation is expanded within the training process of the system as it allows artificial intelligence to create specific type of work only.
3. Patent ownership: another challenge is that who will be the owner of the patent of the idea generated. Can the ownership be given to Artificial Intelligence? It would be wise to solve this issue by way of agreement as opposed to leaving it on courts to decide.

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<sup>5</sup> www.Wipo.org

<sup>6</sup> www.lawctopus.com

To tackle the issues tended to over an extensive Legislation is required. This Legislation must determine the issue of non-human creators to dodge the diminishing of investment into AI, which would obstruct progress. Rethinking authorship, as some worldwide researchers have recommended (Abbot, 2016; David, 2011), like the purview in the UK may comprise a sensible arrangement.

Be that as it may, challenges lie ahead which requests additionally inquire about. For example, the equivocalness of authorship prompts the accompanying inquiries: Who can be credited the copyright of an AI-creation when numerous gatherings are included? Answers to this inquiry incorporate the developer who composed the AI, the end-client who set the parameters, and the makers of the preparation information, who might be on account of The Next Rembrandt, the effectively dead Rembrandt himself.

The extent of this article can't build up a broad examination of this unpredictable point. The effect appraisal must be considered unmistakably comprehensively and from a financial viewpoint as well as from a social and natural perspective. Besides, the separation of AI as an apparatus which bolsters a human creator in its creation and AI which self-sufficiently and recursively makes work is obscured. The characterization of AI may recommend an intriguing further research question with broad results.

The impact of AI is yet to take off. With fast approaching advances in registering power in sight (Anthony, 2016) it won't take hundreds of years yet decades until the point that we won't have the capacity to recognize human-made and machine-made manifestations. To be prepared for this quick paced condition exact legislation is important.



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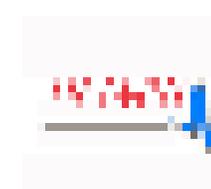
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# DEFECTIVE INTERPRETATIVE METHODOLOGY - A CRITICAL ANALYSIS OF THE CASE SATISH RAGDE V. STATE OF MAHARASHTRA

- Divya, Assistant Professor, Lingaya's Vidyapeeth, Haryana.

## I. INTRODUCTION

Sexual abuse and sexual exploitation of children is the major concern of global level. Each state wants to protect its countries children from these heinous crimes. Therefore, on 11th December 1992, the UN convention on rights of the child (CRC) was ratified by India. The states who are members of this convention were asked to give protection to the children of their countries from heinous crimes like Sexual abuse, Sexual Harassment, and child pornography. It was the obligation of each member state in this convention to take all appropriate measures to protect children from Unlawful sexual practices. Therefore, “the POCSO Act, 2012” was the result of the CRC<sup>1</sup>.

The main aim of the protection of children from sexual offenses Act (POCSO), 2012 is to provide protection to children from sexual offenses and to provide the establishment of Special courts for the trial of those offenses. Additionally, the goal of the act is to provide minors with an additional layer of protection in issues of sexual offenses. It was also meant to fill some loopholes in the existing criminal laws regulating sexual offenses under the Indian Penal Code, 1860 but this very safeguard was ignored in the recent cases where the justice Pushpa V. Ganediwala delivered a judgment that set a dangerous precedent for defining sexual assault in courts. Bombay High Court of India held that section 7 of the Act requires skin-to-skin contact and the act which is committed by the accused does not fall under the Ambit of section 7 of the act.

“The Section 7 of the POCSO Act, 2012,” says that if any person with having sexual intention touches the vagina, anus, breast, penis of a minor or does any other act with sexual intent is said to have committed the offense of sexual assault and section 354 of IPC talks about outraging the modesty of a woman.

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<sup>1</sup> VIKASPEDIA, <https://vikaspedia.in/education/policies-and-schemes/protection-of-children-from-sexual-offences-act>, (last visited March 18, 2021).

The main difference between “section 354 of IPC, 1860” and section “7 of POCSO Act, 2012” is that the latter attracts the lesser punishment of one year only while “section 7 of POCSO” Act attracts the greater Punishment up to three years.

In a span of one week, only Justice Sushma V Ganediwala delivered three controversial judgments. The first one was given on 14th January, In *Jagar Singh v. State of Himachal Pradesh*<sup>2</sup> she acquitted the convict of the offense under “section 376(2) of IPC” and section 5 punishable under “section 6 of POCSO Act, 2012” on the basis that there was nothing to support the case of prosecution for rape. The second one was given on January 15 2021 in *Linbus Vs. State of Maharashtra*.<sup>3</sup> In this case, the Nagpur bench of Bombay High court acquitted the convict on the basis that holding the hands of the minor over pants while the zip of the pants of the accused remains open at the same time does not amount to Sexual assault and the third one was given on January 19, 2021, in the case of *Satish Ragde Vs. State of Maharashtra*<sup>4</sup> in which the Honorable Court held that pressing the breast of a minor over her top does not amount to Sexual Assault.<sup>5</sup>

This article will be mainly focusing on the case *Satish Ragde v. the State of Maharashtra*. According to the police complaint the incident took place in December 2016 when a 12-year-old girl went out of the house to buy some guavas but didn't return for a period sufficiently long to alarm her mother, who continued to wander about to search. Her mother was informed by the neighbor that she saw a person who took the girl into his house then the mother went to the house of the accused person and start looking for her daughter in the house when she went to the first floor she saw that one room was bolted from the outside. After opening that door she discovered that her daughter had been locked in that room her daughter was crying continuously and told her mother that under the pretext of giving her guava the accused baited her into his house and started pressing her breast and attempted to remove her salwar then immediately thereafter a first information report was lodged.

### **WHAT WAS THE ISSUE IN THE CASE?**

<sup>2</sup> *Jagar Singh v. State of Himachal Pradesh*, Cr. M.P. (M) No. 1112 of 2014 (criminal appeal filed in High Court of Himachal Pradesh).

<sup>3</sup> *Linbus v. State*, Criminal Appeal no. 445 OF 2020 (Criminal appeal filed in High Court of Bombay).

<sup>4</sup> *Satish Ragde v. State of Maharashtra*, Criminal Appeal no. 161 OF 2020 (criminal appeal filed in High Court of Bombay).

<sup>5</sup> Legal Service India, <http://www.legalserviceindia.com/legal/article-4835-two-judgements-disrobing-pocso-act.html> (last visited February 15, 2021).

Whether groping a child's breast over her clothes without skin-to-skin or direct touch comes under the meaning of physical contact which is defined in “section 7 of the POCSO Act, 2012.” It was found by the session court that the accused was guilty under “section 354(Assault or criminal force to woman with intent to outrage her modesty), Section 363(Punishment for Kidnapping), Section 342(Punishment for wrongful Confinement) of Indian Penal Code, 1860” and “Section 8(Punishment for Sexual Assault) of POCSO Act, 2012.” The 39-year-old Bandu Ragde (Accused) was convicted under “section 8 of POCSO Act” and got the punishment of 3 years in prison by the session court.

“Section 7 of the POCSO Act” talks about Sexual Assault and section 8 prescribes the punishment of Sexual Assault.

The decision of the session court was reversed by the Bombay high court. Instead of Convicting the accused under the “POCSO act, 2012” the court convicted him under the “Indian Penal Code, 1860” for a lesser offense. It was said by justice Pushpa V. Ganediwala that the charge was not genuine enough to attract the greater punishment prescribed under the law. The Bombay High Court upheld the conviction under the section that conveyed a lesser sentence of one year under the IPC. This ruling by the high court of Bombay drew criticism for its limited and restricted interpretation of the offense and highlights the idea of minimum sentencing in legislation including “POCSO Act, 2012.”

The reason given by the High Court was that the POCSO act constitutes a higher punishment and to convict a person under the POCSO act then it would require a higher standard of proof and allegation that were more genuine. According to “Section 7 of POCSO Act” whoever with sexual intent touches the vagina, penis, anus, or breast of the child or make the child touch the vagina, penis, anus, or breast of such person or any other person, or does any other act with sexual intent which involves physical contact without penetration is said to commit sexual assault. Therefore there are two essential ingredients in section 7-i) Physical contact. ii) Intention.<sup>6</sup> The court said that since the Convict grabbed the girl over her garments this indirect contact would not amount to established sexual assault. The same thing also happened in *State v. Bijender* case in which a man was convicted under the sections of IPC instead of being convicted under the POCSO act. In this case, a 7-year-old girl had informed that the Convict

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<sup>6</sup> BAR AND BENCH, <https://www.barandbench.com/columns/the-bombay-high-court-judgment-on-sexual-assault-a-serious-matter>, (last visited March 18, 2021).

brought her into the restroom forcibly, slapped her, and tore her pants. The court held that tearing of garments did not establish the actual contact regardless of sexual intention was there.<sup>7</sup> The controversial decision which was taken on 19 January 2021 by the justice Sushma V. Ganediwala of the Bombay High court was stayed by the Supreme court by the bench led by the chief justice of India Sharad A. Bobde after Attorney general K.K Venugopal mentioned the case after noticing that the decision of the High court would be set as a bad precedent and diminish the intention of the POCSO act, 2012.

“This Decision of the Bombay High court” related to “POCSO Act, 2012” risks making the law superfluous. The main aim behind the enactment of the POCSO act is to give protection to children against sexual assault and harassment. The proportionality rule is a significant guideline in criminal law. While considering the seriousness of the offense the Bombay High court has not given a lot of thought that the minor girl is required to more prominent protection. The punishment which is severe given under this Act is not because of the seriousness of the act or offense but because it has been committed against the child who is vulnerable. The act considers the vulnerability of minor victims and gives special protection to them. One specific concern is that the understanding of the court seems to nullify the point of “the POCSO act, 2012.”

It seems that while giving this judgment the Honorable court has forgotten the objective of the “POCSO Act” and applied the ambit of IPC instead. The precedents set down by the Bombay High court would lessen the punishment of the crime for the accused or culprits. Consequently, the given understanding by the court conflicts with the idea of the enactment.

Instead of convicting the accused person under “section 7 of POCSO Act” the court convicted him under “section 354 of IPC” which attracts the lesser punishment of one year while the latter has the greater punishment. The reasons given by the Honorable court for doing so were that firstly, the prosecution has not argued that the accused has inserted his hands into the top of the victim before molesting the victim sexually. Secondly, it is unclear that whether the accused inserted his hands inside the top of the victim so therefore there is no proof of direct skin to skin touch and thirdly to attract the case under the ambit of “section 7 of POCSO Act” it is required higher edge of claims and evidence and in this case they are absent. So because of all these reasons, the court convicted the accused under “section 354 of IPC” instead of convicting him under “section 7 of POCSO Act.”

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<sup>7</sup> THE DAILY GUARDIAN, <https://theguardian.com/satish-ragde-vs-state-of-maharashtra-misconceived-interpretation-of-section-7-of-the-pocso-act-contrary-to-the-legislative-intent/> (last visited March 22, 2021).

## II. DEFECTIVE INTERPRETIVE METHODOLOGY

According to the honorable court 'skin to skin' touch is a precondition to establishing an offense of rape or "Sexual Harassment under section 7 of POCSO Act." This interpretation of the court is problematic for certain reasons.

Firstly, the POCSO Act is silent on the requirement of 'skin to skin' touch. Section 7 just says that if a person does an act with sexual intent and involves physical contact even without penetration is said to commit a sexual assault. Here, the Honorable court has misinterpreted the term 'physical contact' as 'skin to skin' touch. Moreover, section 7 starts with the expression "whoever with sexual intent touches...". Here also the term 'touch' does not imply 'skin to skin' touch. Thus, in this case, accused pressed the breast of the victim therefore the offense of

sexual assault was complete irrespective of whether the sexual harassment was happened over or under the clothes. Although the distinction created by the Bombay High court is unprecedented in India. It is interesting to note that the common law country England does not make any difference between the term 'Physical Contact' and Skin to skin' contact. Section 79(8) of the Sexual Offences Act of the United Kingdom describes three-fold definition of the term 'Touching'. Firstly, "with any part of the body", Secondly, "with anything else" and thirdly and most importantly "through anything else".<sup>8</sup>

In the case of *R v H*,<sup>9</sup> the court held that where a person is wearing the clothing we consider that touching over the clothes constitutes touching.<sup>10</sup>

Secondly, According to section 29 of the POCSO Act, the burden of proof lies on the accused. Considering the special nature of the legislation, the rule of "innocent till proven guilty" shifts, and the burden of proof is placed on the accused. According to section 29 of the POCSO Act, if a person is prosecuted under sections 3, 5, 7 and 9 of the Act, it is important for the court to assume that the accused has committed an attempt to commit the offense until the opposite is proved.

In *Justin Renjith v. Union of India*<sup>11</sup>, the High court of Kerala while maintaining the constitutionality of section 29 of the POCSO Act, held that if the molestation committed by the accused against the victim being a child is established then the burden of proof lies on the defendant to rebut those claims. Therefore, in this case, it was established that the accused had molested the victim and the victim was a child, the reasoning of the court that, to convict an

<sup>8</sup> INTERESTING LAWS, <https://interestinglaws.com/case-analysis-of-satish-ragde-vs-state-of-maharashtra/> (last visited March 18, 2021).

<sup>9</sup> *R v. H*, (2005) 1 WLR, (UK).

<sup>10</sup> LAW TEACHER, <https://www.lawteacher.net/cases/r-v-h-2005.php> (last visited April 5, 2021).

<sup>11</sup> *Renjith J.V v. State Of Kerala*, WP(C).No.4753 OF 2020(T) (Writ petition filed in High court of Kerala).

accused of an offense under section 7 of the POCSO Act requires a higher edge of claims and evidence is incorrect as according to section 29 the burden of proof always lies on the accused. Lastly, the judgment of the Bombay High court sets the bad precedent by making ‘skin-to-skin touch a necessary requirement to constitute an offense under section 7 of the POCSO Act. It will effectively allow the molesters to grab a child over his/her clothes. The act of touching the child under his/her clothes will work as an excuse for the molesters to get away from the criminal liability. This bad interpretation of the Bombay High court, in this case, has led to the miscarriage of justice as the Honorable court has forgotten the true intention and objective of the POCSO Act, 2012 i.e to save or protect a child from sexual offenses by imposing stricter punishment to the accused.

### **III. ROLE OF NATIONAL COMMISSION OF WOMEN**

On 27th January the Honorable court had stayed the decision of High court given by Justice Sushma V Ganediwala after when Attorney general noticed that the judgment was “unprecedented” and will likely set a bad precedent.

On January 25th the National Commission for Protection of Child Rights had entreated the Maharashtra Government to file an urgent appeal against the decision of the High court because of the bad interpretation of what constitutes Sexual assault of a minor. The body for children’s right said that the judgment of the High court needed to be reviewed because it has the bad interpretation of the law and it is disrespectful to the minor.<sup>12</sup> Several activists and child rights bodies had shown criticism of this judgment. They are naming it totally unsuitable, obnoxious, outrageous, and unacceptable.

NCW filed an appeal against the decision of the Bombay High court in this case which was given by the Sushma V Ganediwala. NCW has said that this interpretation of the law by the Honorable Court is unreasonable and bad in law. The plea said that by a plain reading of section 7 it is cleared that Sexual assault in terms of section 7 is predominantly a touch by the offender. The plea further said that if an accused touches a victim or the body part of the victim with sexual intent then the offense of sexual assault is complete. No further classification of the term ‘Physical contact’ is to be done in this regard. The petition added that actual contact cannot be given a bad understanding of touch or contact without clothes.

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<sup>12</sup> LIVE LAW, <https://www.livelaw.in/top-stories/pocso-skin-to-skin-judgment-supreme-court-national-commission-for-women-bombay-high-court-skin-to-skin-judgment-168911>, (last visited March 18, 2021).

#### **IV. CONCLUSION**

In this case, the honorable court acknowledged that punishment should always be proportionate to the seriousness of an offense but it had forgotten the main objective and intention of the legislation that juveniles need much more protection because of their vulnerability, and because of this motive only the POCSO Act, 2012 was enacted to provide adequate protection and safety to the children i.e the most vulnerable section of the society. To fulfill this motive said the legislation provides a more serious punishment than the IPC. POCSO Act talks about both genders whereas the Indian Penal Code is women-centric. The reasons which were given by the Honorable court, in this case, go against the intent of the POCSO Act, 2012. It was made to protect and safeguard the child from the heinous crime of sexual abuse and harassment. The POCSO Act was amended in 2019 to provide and ensure the healthy, physical, mental, emotional, intellectual, social development of the child but because of bad interpretation of the law, the court made the law obsolete and set a bad precedent for the future cases. This was not the only case in which the intention of the POCSO Act was ignored but within a span of one week only Justice Sushma V Ganediwala delivered three judgment and in all the three judgments the intention of the POCSO Act was ignored, the accused in these three cases were convicted under the IPC instead of being convicted under POCSO Act which inflicts the severe punishment. If the legislature wanted to restrict the scope of “section 7 of the POCSO Act” then it would have mentioned the requirement of ‘skin-to-skin touch explicitly. Therefore, the court by itself does not apply the defective interpretative methodology to restrict the punitive scope of section 7 of the POCSO Act, 2012. By seeing these problematic observations of the Bombay High court the National Commission for women has thus, decided to challenge the judgment in the apex court i.e Supreme Court. However, the Honorable Supreme Court after the submission of the Attorney General stayed the judgment of the High court for now as it will be likely to set a bad precedent. The appeal filed in the Supreme Court will provide an opportunity to the court to give a better interpretation of the legislature by keeping the intention of the POCSO Act in mind for the safety and wellbeing of juveniles.

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#### Editorial

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The Journal of Personality and Social Psychology is pleased to announce the publication of the Special Section on "The Psychology of the 1990s." This section is a collection of articles that reflect the current state of the field and the challenges it faces. The articles in this section are: "The Psychology of the 1990s: A Review of the Field" by David A. Gosling and "The Psychology of the 1990s: A Review of the Field" by David A. Gosling. The first article provides a comprehensive overview of the field, highlighting the major trends and issues that have shaped the discipline over the past decade. The second article offers a more detailed look at the challenges facing the field, including the need for more rigorous research methods and the importance of addressing social and cultural issues in psychological research. Together, these articles provide a valuable resource for researchers and students alike, offering insights into the current state of the field and the challenges it faces.

The second article, "The Psychology of the 1990s: A Review of the Field" by David A. Gosling, provides a more detailed look at the challenges facing the field. Gosling discusses the need for more rigorous research methods, including the use of experimental designs and the importance of replication. He also emphasizes the importance of addressing social and cultural issues in psychological research, arguing that these issues are central to understanding human behavior. Gosling's article is a call to action for researchers to embrace these challenges and to work towards a more rigorous and socially relevant psychology.

The first article, "The Psychology of the 1990s: A Review of the Field" by David A. Gosling, provides a comprehensive overview of the field. Gosling discusses the major trends and issues that have shaped the discipline over the past decade, including the rise of cognitive psychology, the importance of social and cultural issues, and the need for more rigorous research methods. He also highlights the challenges facing the field, including the need for more rigorous research methods and the importance of addressing social and cultural issues in psychological research.

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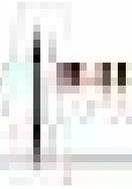
2007). In addition, a number of the authors of the book have been involved in the development of the book's content, and the book is a result of their ongoing collaboration.

The book is a comprehensive and up-to-date text that is designed to be used in a variety of ways. It can be used as a primary text for a course in organizational behavior, or it can be used as a supplementary text for a course in management. The book is also suitable for use as a reference work for students and professionals alike. The book is written in a clear and concise style, and it includes a wealth of examples and case studies to illustrate the concepts discussed. The book is also rich in research, and it includes a number of empirical studies that support the authors' arguments. The book is a valuable resource for anyone interested in the field of organizational behavior.

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## The Need for Gym Exercises and the Imminent Benefits

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### Abstract

Exercising of any type and in any form comes under the regular physical activity, which helps in keeping you fit, in order and far more energetic than you may otherwise think. Exercise is important in maintaining health, and creating difference in the field of activities that one may like to get involved into. The long and short term benefits of undergoing exercises are enormous, and this enormity is just far more exciting than can be thought about.

The research and review paper showcases significant benefits of exercising on your body systems and the temperament levels. In fact it is not only the body systems that show improved performance, but thinking also gets improved too.

The research paper finds out the ways of reducing the stress, anxiety and strain from the muscles and the brain through the means of exercising. The positive impact of all of this can be seen in the form improvement in the self-esteem, upgrading of the self-confidence and moreover there is sharpening of the memory.

Exercising on regular basis is also instrumental in development of the muscle as well as the bone strength. There is also less chance of reducing the heart disease, occurrence of fluctuations in the blood sugar levels, and extremely reduced chances of occurrence of cardiovascular diseases.

Aerobic exercises are above all other forms of exercising regimen, and this also includes the cardio exercises. Most of the aerobic exercises like the ones which include brisk walking are effective enough in reducing osteoporosis. In short, it means that people who exercise are always healthy, irrespective of their age or gender. The research paper has its focus on taking into the view the idea that roles behind concept of exercising, and the key changes that are undertaken when people start exercising within the artificial subsystem or in their natural surroundings.

**Keywords:** *Exercising, Aerobic Exercises, Exercising Benefits, Gym Exercises*

## Introduction

Physical activity is basically the name given to the movement of body and change in posture resulting from the skeletal muscles. This movement requires spending of energy. It is significant to point here that “Physical Activity” does not mean you are exercising. However, physical activity involves exercising, which is indeed one of the inherent parts. Exercise follows a very structured approach, and has the purpose behind it. As the popular saying goes – “Body with Sound Health Has a Sound Thinking” and it is quite right.

If your mind is not balanced you cannot reap the benefits of exercise in true sense, and all your efforts would not produce any worthwhile results whatsoever. People, who are weak, appear to be dull or problems in walking are not fit for the exercising.

People having a strict and regular exercising regimen would always be ahead of others in every sense. Regular exercising activity makes the individual happy too. But, it is very important to understand that exercise does not necessarily mean that you have to make visits to the gym or any formalized exercising club. Exercise is valuable in averting and even paying for critical health issues like coronary heart disease, osteoporosis, obesity, depression and for that matter any form of diabetes.

Cardiac restoration exercises are highly special and innovative means of physical activity, which advances cardiovascular system for inhibition and convalescence of cardiac disorders and diseases. A properly designed exercise program will improve the overall health, build patience, and dawdling many of the effects of aging.

Regardless of your age or the type of your body build up, exercising always helps an individual to remain in shape and be perfect.



Maintaining the routine exercising module also helps in keeping the cholesterol levels at bay and well managed. When we exercise on regular basis we are reducing the excess of our body weight and also dropping the blood pressure.

Exercise offers a pleasurable way of spending their amazing time. Leading an inactive life without the presence of exercise will bring the life to a complete standstill. By including a regular exercising schedule in your daily life, you are taking the step ahead towards building a good and balanced life.

Preserving physical fitness and keeping the exercising regimen held together would give rise to physiological benefits.

## II –Literature Review

Proper exercising helps in maintaining the body balances and biochemical reactions inside the body. Light weight exercises are useful for keeping everything in far more organized way than otherwise. Here is the review of literature that showcases development of research and the outcome of exercises over the period of years.

Long term exercise module will bring phenomenal changes in depression and anxiety (Morgan and Goldston 1987). Exercising in a more detailed way would reduce the anxiety and there is a physiological enhancement

lasting for almost 4 hours (Hannum and Kasch, 1981; Raglin and Morgan 1987). Anxiety reduced by means of exercises followed by brief interventions brings relaxation (Bharke and Morgan in 1979).

Physical activity is crucial for advancement of regular and normal human functionalities and this is also essential in adding to the longevity. Gordon Larsen et al (2007). Entertaining activities aid in the development of social skills and keeps the balance of motor functions and all of it further enhances the development of real creativity (Gleave & Cole-Hamilton, 2012). Introducing a strong physical regimen early in childhood through the maintenance of muscular fitness as well as cardio respiratory system leads to good results. On the other hand inactive children grow and become inactive (Janssen & Leblanc, 2010).

There are several instances where the physical activity either in the home or elsewhere will help in keeping the chronic diseases at bay or protect the body on all times. (Warburton, Nichol & Bredin, 2006). Maintaining regular activities in adults helps in the development of stamina and vigor and ensures betterment of life in the adults for more than decade in the adult population of the UK (DH, 1996). Following a sedentary and sitting lifestyle has deep effect on the mental wellbeing of the population and may result in the stress, anxiety and other kinds of social and physical problems (Netz, Wu, Becker, & Tenenbaum, 2005). Irregular or absence of physical activities from the life of individuals may result into obesity and many other types of severe malfunctioning and diseases. Such diseases may often be considered as irreversible in nature. (King et al, 2001); (Hu et al, 2004).

Many people who visit the gyms for physical activities and exercising with the intention to improve the quality of life may are often mistaken by irrelevant idea (WHO, 2004). Only a mere 30 minutes of moderate physical activity undertaken by the individuals in the premises of gyms do not cause any substantial control over the weight gain in adults (DH, 2004, Blair, Lamonte & Nichaman, 2004). Due to more stress laid on the children and growing adults in the schools and colleges, less and less number of students is spending their time in the physical activities, Hardman and Stensil (2003).

People who are consistent with the physical activities are capable of maintaining their functional fitness as they continue to grow old and become grappled by the infirmities (O'Brien-Cousins & Gillis, 2004; Leino-Arjas,

Solovieva, Riihima`ki, Kirjonen&Telama, 2004. Regular exercising in gyms or elsewhere in the natural surroundings is known to cause reduction in physical effects related to the human aging process,(McMurdo,2000). People falling in the lower social strata have lower accessibility to physical activities and it is for this reason they show lower rate of inactivity (Hillsdon, Foster, Naidoo& Crombie2004). In the similar fashion, Rowe, Beasley and Adams (2004) found out that people who symbolized the lower socio-economic set of patterns were leading a slow and sluggish lifestyle in comparison to the higher status groups.

Health activities and exercising in the leisure time has a direct proportion to the income generated by men and womenHealth for England Survey (1998). It is also suggested that physical activities undertaken during the time of leisure is useful in reducing all kinds of risks associated with the early death. Further, for maintaining the health, it is essential to maintain regular kind of physical activities (Harvard Alumni Study, 1978, 1986, 2000. Health Professionals'Follow-up Study, 1996. Aerobics Longitudinal Study, 1998,Nurses HealthStudy, 1997, Whitehall Study, 2000).

### **III. Objectives**

The principle objectives of this research paper are drawn here:

- 1) to search for the gyms where weight management is practiced, adding to health benefits;
- 2) to explore the benefits of new age gyms on health understanding of the youth;
- 3) to exploit the ease of doing exercises in hi tech gyms;
- 4) to assess the approachability of gym goers to the gyms.

### **Physical Activity and Different Perspectives**

A good maintenance of physical activity on daily routine basis would be influential and useful in the development of body and maintaining the posture for long times to come. Such an activity will reduce the occurrence of several types of chronic diseases including the occurrence of type II diabetes, cancer and the cardiovascular diseases on the whole. Individuals who do not indulge in any kind of physical activity will result in the reduction of their cognitive thinking as much as it results in extensive lethargy.

Physical activity and gym exercising is important for the grown-ups and the older population, however the extent and frequency to which these exercises are to be done vary from one point of time to another. The effect of physical activity on cognition helps in building up of higher values and noteworthy increases in cardiorespiratory fitness although this fitness may not be considered at par with the older population. The strength and physical fitness of individuals who come under the younger population is quite high over the other group of people who do not exercise or are poor in exercising.

The neurocognitive functions related to physical exercising can be ascertained on much higher terrain as compared to people who are not exercising at all. The cerebral cortex shows an increased activity among the exercise takers, while those who are on the passive mode of exercising or gym activity show a remarkable downsizing. As the result, the memory functions as well as the power to memorize shows a lower rate among the people who do not exercise or show a kind of inconsistency.

The biological mechanisms through which means the perception about a particular activity is heightened by means of physical exercise training is far more enormous than one could actually think about. In point of view of the Spirduso, is known to ameliorate the health conditions in the individuals and such amelioration are going to happen on an elaborate scale.

A few of the early and most convincing results about physical exercising comes from the real fact that exercising, here in case of animals, it is the active running, there is going to be induced synaptogenesis, which means that new neurons are built up consistently and these are integrated within the network, ultimately resulting into active functions and overall development.

The reality of life is that while young people are moving gradually towards a hi tech life style, they also need to be sure that moving to such a direction would eventually put their physical fitness on a complete halt. Young have to show the quality of their lives, and this is when gym exercises as well as other forms of exercising activities would bring the change and young people show their prolonged fitness.

### Research Methodology

It is noteworthy to recognise the sentiments of the individuals who go out openly for the advanced gyms look for style and advancements as much as they look for cool workouts. The research methodology realized for studying as well as analysis of the need of gym and exercising in the hi-technology environments is based on internet research and comparison. All such research and comparison will be undertaken by forming an interpretation of secondary resources. Apart from the secondary resources, a few primary resources were also consulted to form a conclusive statement and drive home the points of understanding.

However, it is also to be noted that there were no conceptual or other type of references were made with respect to the research conducted on the basis of primary data. Furthermore, the extent of studies and research methodologies that were incorporated in the preparation of this research paper is focused on the patterns and the gym equipment used thereof.

During the process of writing research paper, all the necessary secondary data has been analysed, corroborated following various literatures, online magazines, and several other journals, besides consulting the gym owners to find out exact and latest data.

Since the incidence of COVID 19 there has been only a limited obtainability of the material and other form of evidence available about the need of young population to visit the gyms. In fact, the critical COVID 19 situation has also restricted flow of realistic data about on type of products that the prospective gym goes like to go around with.

## Comparing and Analysis of the Gyms in Delhi

Name	Gym Features	About the Gym	Parking	Guests/Visitors
<b>Fitness First, Connaught Place</b>	Weight management, Goal Specific Workouts, TRX Suspension, Strength & Endurance, Body building, Dance, Aerobics, Zumba, Spinning and Indoor Cycling, Yoga, Cross Functional, good cardio equipment and a perfect techno gym.	Fitness First is an international gym operating in at least 16 different countries. The fascinating part of gym is that it operates with 7 international standard clubs.	Not much of parking, although the gym is quite close to metro station.	Males/Females Toddlers/Grownups
<b>Chisel, Punjabi Bagh</b>	Bodybuilding, Workout and Weight Training with Personal trainers, General trainers and helpers. However, the gym has Dumbbells up to 50 kilogram. 2: No decline bench. 3: Weight plates	Chisel is the state of the art and the new age wellness brand with branding from Virat Kohli.	Spacious parking facility, but not in the vicinity of metro station.	Males/Females Toddlers/Grownups
<b>Olympia , Greater Kailash 2</b>	Spinning, Group Classes, Power Yoga, Combine Training, TRX Training, Cardio Equipment, Strength Training Equipment, Stretching Area, Music and Video Entertainment, Zumba Classes Yoga, Zumba Aerobics, Pilates Core And Abs Cardio Gym Kick Boxing, Mixed Martial Arts The trainers are friendly and highly qualified, and the facilities are great. The variety of gym equipment is limited.	It is superb and innovative gymnasium and fitness centre, spread over 15000 sq.ft. and 3 stories. It is one of the biggest gyms with enough of spacing facility.	Good parking facility, although it is not spacious. The gym is not in the vicinity of metro line.	Males/Females Toddlers/Grownups
<b>Gold Gym, East of Kailash</b>	Spinning, Personal Training, Free Trial for 7 Days, A Week Certified Trainers Group Classes, Indoor Steam and Sauna Power, Yoga, Cardio Equipment, Strength Training Equipment, Stretching Area Music And Video Entertainment, Zumba Classes, Yoga, Zumba, Dance Aerobics, MMA and Kickboxing, Cardio Air Conditioned, Gym Kick Boxing Mixed Martial Arts	The Gym began its functioning in the Venice California in 1965, and soon became the hotbed for the development of training techniques, equipment and nutritional concepts leading to the foundation for modern fitness revolution. In 1975, Gold's Gym received international attention when it was featured in the major motion picture, 'Pumping Iron,' becoming the 'Mecca of Bodybuilding'. The Gym has more than 700 facilities across the globe with exclusive heritage, and involvement as being the specialist in fitness and lifestyle.	Gold Gym has a superb parking facility, and it is next to Kailash Colony Metro Station	Males/Females Toddlers/Grownups

## Analysis and Discussion

The gyms in Delhi have an international character, and these are also equipped with the best and innovative methodologies and equipment, which is essential for the overall development of body and physique. The younger lot, and this includes both males and females are regular goers to these hi-tech gyms and attracted to the methodologies and innovation out there. There is no point of contention here that the modern gyms of Delhi hold a special place in the young population for many obvious reasons. Much of it also relates to the lifestyle requirements as much as the gyms have to do with work outs and maintaining the overall well-being of the individuals. The gyms that were researched and the data collated in respect of that shows that gyms do not provide direct connectivity to the members. These are the regular gym goers, which reach the gym site on their private vehicles. Almost every gym has got new age exercising equipment, and the best guides, which provide customized training to its members. The ultimate need of exercising in these high tech gyms is therefore settled and fulfilled.

The benefits of exercising in these gyms are also complemented by the idea that the atmosphere and the inner climates are spacious with plenty of room space that allows comfortable walking. These gyms are also supplied by the state of the art gym and yoga equipment. Almost every hi tech and corporate gym is offering facilities like the TRX Training, Strength Training along with Gym Kick Boxing as well as mixed martial arts. There is a mix and match of the activities carried out in these gyms, which means that the individual gym goers are enjoying the music and video entertainment, Ab and Cardio Exercises.

In this respect, the need of exercising and carrying the regular work outs has always been the right way and means to overcome monotonous lifestyle, stress and social obligations within the typical Indian family. Since the gyms are flexible with regard to their working hours, this is indeed one of the key beneficial factors to think about. Regardless of the areas where these gyms are located in Delhi, almost each one of these gyms have the same exercising facilities, entertainment and much of everything alike.

The best thing about exercising in such gyms is that individuals feel relaxed and contented. The options to exercise are unlimited, and all such options are available at one place. And above all, gyms have maintained an international character, which is the right way of treating the body.

The innovative and hi-tech gyms in Delhi are valuable addition to the quality of life, and at the same time, such gyms bring an overall change in the personality and thought of the individuals, leading to better life management.

### Suggestions

The new millennium has given a new way of life for the younger lot, who have out of sheer curiosity taken towards the development of their physicality, and engage in lifestyle activities that brings a completely changed personality and a broader outlook. However, these new age and innovative exercise modeling centers also need to be looked from a different perspective, especially as discussed in the context of changing times and health challenges, like the COVID 19 situations.

While the size and style of the hi- tech gyms cannot be undermined, there is always the need to take the current COVID 19 situation into consideration. India has already become the second in line as far as the active COVID 19 cases are looked. Through the online research and the literature studied, these gyms do not have an efficient and regular testing of the COVID 19. It means that the individuals who are regular visitors are not checked in a legitimate way on about their COVID condition. The only method used is temperature monitoring, and if the individual who enters the gym space does not have high temperature, it is understood that that the individual is healthy and fine and allowed to go for the work outs.

Therefore, it is suggested that only such individuals or members are allowed into the gym who have the certificate from government body or local dispensary that shows that the individual is free from Corona Virus. In this manner, a diseased free and congenial environment for the work outs could be maintained, and a consistent healthy atmosphere is created thereof.

Another factor to look into is that although the hi technology and new age gyms are offering spinning, group Classes, power yoga, Combine Training, TRX Training, and provided with Cardio Equipment, Strength Training Equipment, Stretching Area, Music and Video Entertainment, Zumba Classes Yoga, there is always a unique need for every member, and this should be judged by gym authorities on various parameters. One of the suggestions

therefore is that these gyms should not only work on the general parameters but specific parameters should be looked inside on all occasions.

And finally the trainers working out here are friendly and have the necessary qualifications; they also need to regularly upgrade their qualifications from time to time keeping in line with the international standards. More importantly, such trainers should have an international reputation and name in the field of gym and workouts.

### **Conclusion**

In the league of concluding the research paper, it could be inferred that body building not necessarily means staying healthy or likewise keeping yourself fit and structured. Rather there are the times when you begin to feel that too much of exercising activity leads to complete physical depreciation as well as reducing your mental health. It could be concluded herewith that individuals maintaining a strong exercising regimen may also get affected in terms of their body and health. But by overall means, exercising in gyms or at homes help in developing the personality of the individuals.

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The research probed into the assumptions as to why people like to visit the health centers and gymnasiums for the development of the body and muscle mass. The research paper makes substantial efforts to present a fair idea of various forms of exercises in our routine lives. I recognize the data and other pieces of knowledge offered to me in preparing the research paper were useful and effective in many ways. It helped me to know the significance of exercising as well as the body building measures.

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**TRAINING AND DEVELOPMENT AND ITS IMPACT EMPLOYEE AND ORGANIZATIONAL PERFORMANCE: A REVIEW**

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There is no question that multinational organisations are aiming to attain excellence and outpower others in the same field. To achieve this, organisations must successfully acquire and use their human resources. Organizations must be more conscious of their human resources in a practical way. Training has a positive influence on employee work results. Training is a driving force that strengthen the workers' competence in their work and improve their capacity to achieve positive performance. Training is often seen as a valuable way for grappling with technical innovation-fostered changes; business competitiveness, corporate structure and, most significantly, employee success play a vital part. This paper analyses the relation amid the effect of training on employee efficiency and performance.

**Keywords:** Training, Development, Employee, Performance, Human Resource

**Introduction**

Organizations are experiencing intensified competitiveness due to globalisation, technical developments, political and economic conditions (Evans, Pucik & Barsoux 2002) so that they can train their workers to brace themselves to respond and develop their efficiency to the above rise. The recent proof of awareness development in the business environment over the last decade can not be overlooked. It is significant this development was brought on not only by technical changes or variations of output variables, but also growing attempts to enhance organisation's human capital.

Human resources in this era of globalisation have been a strategic weapon for sustainable competitive advantages. The distinction between a successful business versus a good organisation is human resources. The human resource is the foundation of any company, it is also the organisation's primary capital. The distinction between financial resources and a successful business is human capital. Training and development was an essential task for the administration of HRM and efficient utilisation of human resources. An investment in an organisation's human resources, both immediate and long-term profits, is successful training and development.

Training is a crucial factor in enhancing efficiency and can strengthen human and organisational abilities. Training is critical to open up the future prospects for growth and advancement and gain a competitive advantage. Training systems allow staff to understand more about modern technologies and acquire robust competencies and expertise such that recently designed technological equipment can perform the tasks and fundamentals. Training encourages capability upgrades and contributes to enhanced engagement, wellbeing and sense of membership, which directly strengthens the competitiveness of company.

Therefore, the obligation for enhancing employee efficiency of any company is definitely one of the key measures that most organisations ought to do. Training and development is definitely one of the main steps. As is clear, workers are a vital resource, the commitment of employees in order to sustain productive efficiency must be optimised. This also allows managers to have sufficient personnel who are physically and socially qualified and willing to establish their professional careers in divisions or managerial roles (Afshan, Sobia, Kamran & Nasir 2012, 646)

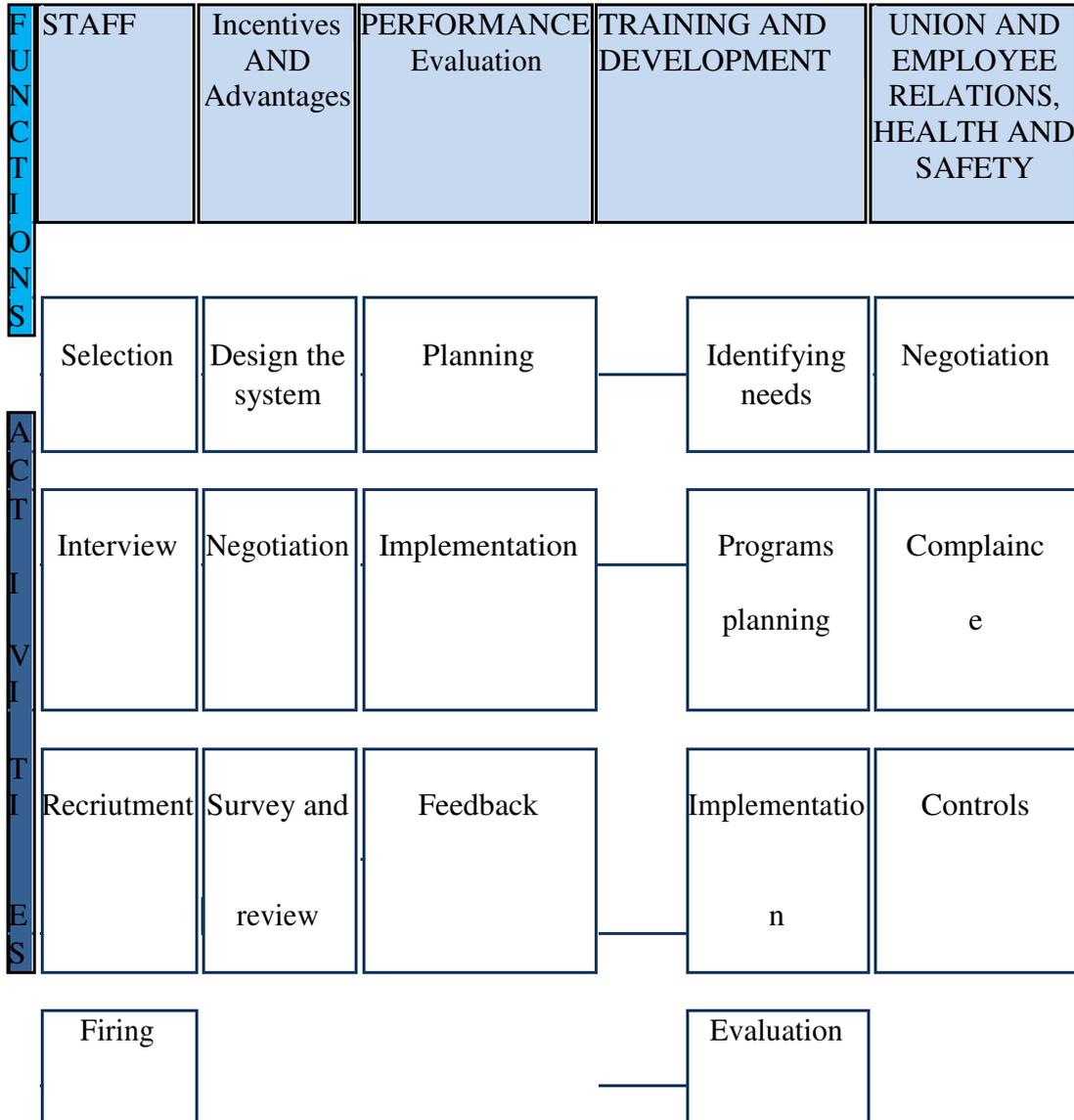
Training has the main function in enhancing workers' abilities to carry out existing and potential activities. Training allows you to alter things such as technologies and competitiveness. Training is, beyond a doubt, essential for an organisation in many things. Training is historically described as the mechanism by which persons adjust their abilities, expertise, attitudes and/or actions.

**Objective**

This study is intended to know the impact of training on employee performance on their jobs.

**Human Resource Management**

The management of human resources includes maintaining the human resources required by a company and ensuring that human resources are gained and retained in order to support the vision, policy and priorities of the organisation. In other terms, the emphasis of HRM is on the securing, management and use of an productive workforce, which companies demand for their short and long-term business survival. HRM main roles Briscoe (1995) are staff, training and development, performance evaluation, incentives and advantages and essentially the health and safety and employee relations.



**Training and Development**

Several variables included in these studies include: quality / quantity of jobs, preparation / organisation, effort / engagement, collaboration / co-operation and contact about the gaps in the employee output prior to and after training (Paat and Rumokoy, 2015). The findings of their analysis demonstrated the substantial gap in employee efficiency before and after training in quality / quantity

of jobs, plan / organisation, initiative / commitment, coordination and communication. One of the valuable systems for enhancing employee efficiency is the training programme. Management could also increase the quality of the training and expand the diversity of the training programme content and module (Paat & Rumokoy, 2015).

Falola 's (2014 ) explored the efficacy of training and development in Nigerian banking in terms of employee success and company competitive advantage. Descriptive study approaches were used by two hundred and twenty three accurate questionnaire, conducted using basic random sampling techniques by selected banks in the State of Lagos in the South-West of Nigeria. The collected data was evaluated in order to represent the raw data substantially using descriptive statistics. The findings revealed that there is a clear correlation between education and growth, success and competitive gain for employees. The results reveal that the tested dependent variable and independent construction have a close relationship.

Adeniji et al (2012) In the surveys of librarians in such Institutions, researchers showed that the quality or lack of a training programme depended strongly on the form of education offered by workers and the training they gained.

The effect of training on employee efficiency was evaluated in Bin Atan et al , ( 2015). The study was performed in a small and medium-sized (SME) Malaysian business. The research looked at the preparation element which had an effect on the success of company employees. The functional field of the organisation chosen for the research has also been analysed and involves preparation and staff success in the successful human resources management practises. A questionnaire was used to engage openly in the study by 85 workers of the respective development units of the company. Study results found that an essential association existed between productive training and the job performance of workers.

By an applied study model integrating the main factors which have been demonstrated in current literature with training transitions and also by evaluating the connexion between the transition of training and organisational results, the medium to long-term consequences of training programmes for companies were examined by Diamantidis and Chatzoglou (2014). The research involved the nature of preparation, self-sustainability and working conditions of trainees. Applying the Structural Equation Simulation method to data from 126 workers who have worked in a variety of Greek organisations, the test is accurate. The findings show the greatest influence on post-training work success and self-efficacy and after-training actions of trainees while the training curriculum is planned.

Al-Awawdeh (2011) carried out an analysis aiming primarily at statistically examining the connection between training policy and employee efficiency. The aim of this research was to evaluate the possible impact of staff performance found in the theoretical part of the study. Single regression method; SPSS were used to assess individual modules; training framework; training system, training and obstructions. Out of 651 staff members from the Al-Bayt University, a sample of 120 were selected. The findings revealed statistically significant impacts on output of all independent variables; the influence on morality was statistically significant. The transaction results of the two independent output variables were also positive. The research exposed the need for scientific approaches that will assess employees' training needs and that training systems are structured to concentrate on the practise and function to overcome challenges in the workplace. The Study guidelines included designing educational programmes in the face of global trends to give trainees training opportunities to deal with shifts in the environment which includes retraining from time to time.

### **Benefits of training**

Training strives primarily to develop awareness, expertise and behaviours in relation to job assignments and to enhance them. It is one of the most powerful motivators that can help both people and organisations on a temporary and long-term basis. With preparation, there are so many advantages. The following was summarised by Cole (2002):

1) Strong morals – trusted and inspired workers earned training;

- 2) Reduced manufacturing costs – training reduces the risks of efficient, more cost-effective usage of products and facilities in order to minimise and prevent waste;
- e3) Lesser turnover – preparation offers a feeling of protection at the office, minimising labour sales and avoiding absenteeism.
- 4) Change Management – preparation promotes change management by the staff awareness and interest in the change phase and also offers the knowledge and skills required for adjusting to different situations;
- 5) To include visibility, improved transparency and expanded compensation and advancement opportunities;
- 6) Support to maximise employee quality and availability.

### **Training and development methods**

Nadler (1984) stated that all practises relating to human resource growth are intended to enhance the individual's work efficiency, trainee new talents for new employment and new roles in the future and generally increase individuals and organisations in order to accomplish the present and future goals of the organisation. There are two ways in which organisations may opt to prepare and improve their staff's skills. This is on-the-job preparation given to corporate workers when doing their daily jobs at the same workplaces and off-work training allows employees to get away from their normal work atmosphere. Examples of work-related formation involve career rotations and transitions, coaching and/or mentoring, but are not constrained. Off-the-job preparation scenarios, on the other hand, include workshops, role playing, among several others, as detailed below.

Armstrong (1995) suggests that training on the job can be a teaching or coaching on the desk or at the table by more qualified persons or instructors. Various companies, for example, are encouraged to use various teaching strategies, (1) according to the policy, the objectives and the appropriate resources of the institution, (2) based on the requirements defined at the time and (3) according to the target population to be trained which may include, inter alia, particular staff, associations, teams, divisions or the whole organisation.

### **Effect of training on performance**

There are a lot of factors that influence organisation's success and development in the modern world. In view of present study, training for workers plays an important role in maximising efficiency and competitiveness in the growth of organisations. This ensures the companies are well positioned to compete and remain at the top. This also suggests that there is a substantial gap between the companies that train their workers and others that do not. Existing research indicates that there are clear impacts on job success in training and growth. In specific, several researchers have analysed employee efficiency (Purcell, Kinnie & Hutchinson 2003; Harrison 2000), while others have generalised to a general viewpoint on corporate performance (Swart et al. 2005). Both of these are associated in the way that the success of workers relies on organisational performance when employee performance affects overall organisational performance. Wright & Geroy (2001) states that the capabilities of workers change with successful training systems. In this sense. Therefore, it not only boosts employee's average efficiency in order to fulfil their existing roles successfully, it also raises workers' expertise and abilities, and thereby leads to greater corporate efficiencies.

Interesting results have been made on this partnership in the field of previous studies on training and employee performance. Training has shown a positive effect on success by improving awareness, talents, skills, abilities, maturity and actions for the employee and the business (Appiah, 2010; Harrison, 2000). (Appiano, 2014). Furthermore, other research by Swart et al. (2005) for example, analyse training to overcome ability deficiencies and competence gaps in order to enhance employee performance. The bridging of the performance gap is a relevant training technique for the acquisition of special abilities and skills of the workers and enhancement of their performance, according to Schwart et al., (2005). He expanded the idea further and claimed that creation allows organisations to understand that their employees do not perform well and therefore thus their expertise, abilities and

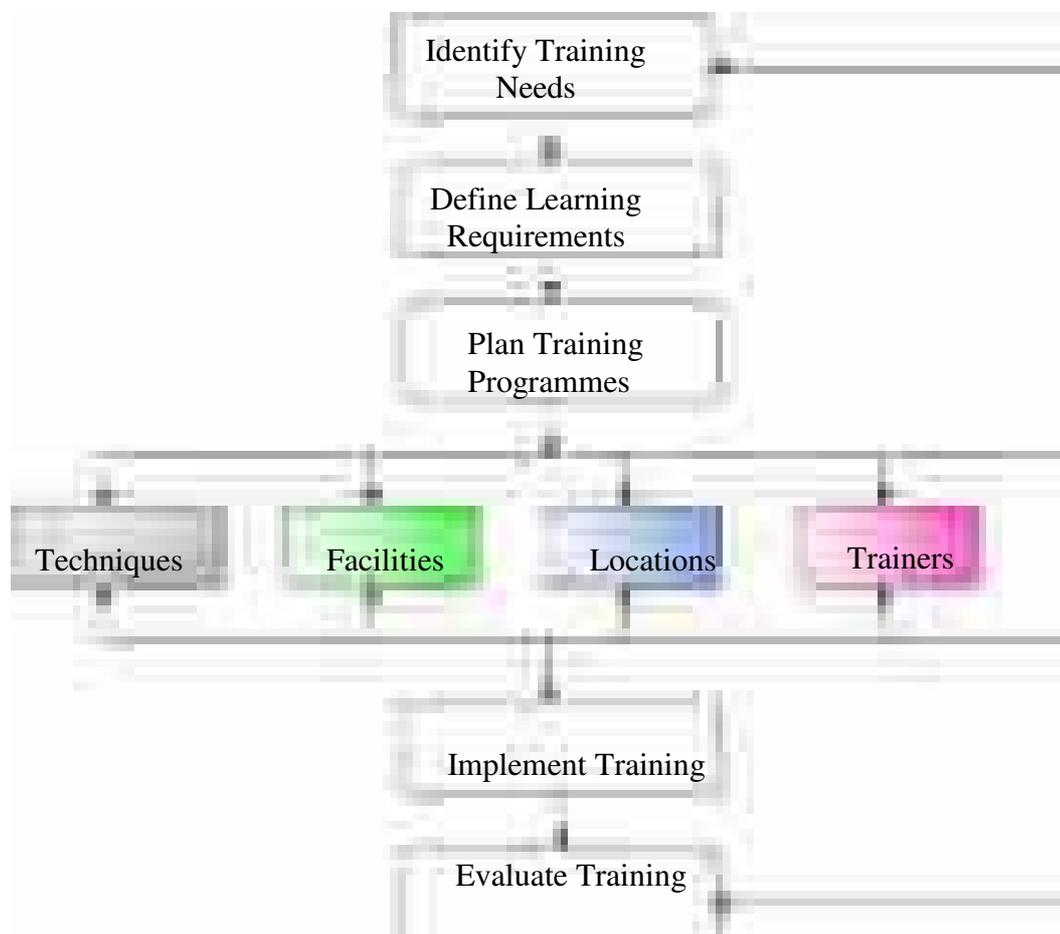
behaviours ought to be tailored to the firm's needs. It is often the case when workers have any information regarding multiple jobs. However this is not enough and workers need to respond regularly to new work performance criteria. In other terms, companies require quality preparation and staff engagement policies, and thus should not have to wait for qualifications and failures to arise.

The capabilities of workers change through successful training programmes, according to Wright & Geroy (2001). It not only boosts employees' cumulative efficiency to successfully fulfil the current work, but also enhances employees' expertise, abilities and mindset, thereby leading to higher organisation. Via training, employee skills are built and empowered to execute the role successfully and accomplish firm targets competitively. In addition, concerns of frustration, absentness and attrition may be significantly minimised where workers are so well trained that their success and expertise can be guided toward their innate strengths (Pigors & Myers 1989).

When training is scheduled, much of the gains from training will quickly be accomplished. So the company, trainers and trainees are trained well in advance for training. The proposed training is intentional action in order to obtain the requisite education to enhance jobs efficiency, according to Kenney & Reid (1986). The following phases are scheduled for training under Kenney and Reid:

- Identifying and defining needs for training
- Defines the training needed to recognise the expertise and abilities and the behaviours that need to be improved. Defining the training goals
- Planning training programmes, utilising the best blend of training methods and sites, to satisfy needs and goals. Choose who delivers the instruction
- Assess training.
- Amendment and expansion of training as needed.

Planned Training Process (Source: Armstrong Michael (1995).



### Conclusion

Training and development and its effect on results were outlined in the current study. In addition, the study indicates that organisational performance is substantially influenced by training provided to employees. A company's success depends on its dedication to workers, which in turn depends on its training and growth strategy for human resources. The analysis of the relationship between employees' training and success is relevant because the current market patterns need greater productivity, accuracy and efficiency in a lower period and expense and can only be accomplished by planning, improving and introducing excellent training programmes for employees. In order to acquire information about their employment, further educational programmes in the company allows workers to receive promotions between their colleagues. Given that training affects employee commitment and efficiency, it is essential that training is improved and implemented in order to meet organisational objectives.

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# Women Entrepreneurs in India - Emerging Issues And Challenges

**Dr. Richa Khugshal**

**ABSTRACT** - Women need to struggle a lot to have equal rights and place like men have in Indian society. Regardless of all the social barriers, women have struggled with man effectively and improved their educational status, living conditions, made necessitate changes in their life style, managed to survive in the competitive environment with their hard work, attentiveness, determination, and perseverance. The present research endeavors to recognize the factors that motivate women to become an entrepreneur, assess the several problems and challenges faced by women entrepreneurs and highlight the various government schemes to promote women entrepreneurs. This study is descriptive in nature and secondary data is accumulated from published articles, books, thesis, websites, newspapers, journals, etc. on women entrepreneurs. This research showed that increased family support, education and qualification, success of friends and relatives, better future of their children, family occupation, need of extra income, government procedures and policies, liberty to take own decision, new challenges and opportunities for self accomplishment are some factors that motivate women to become an entrepreneur; women face various problems and challenges like family dispute, scarcity of finance, marketing problems, deficiency of entrepreneurial training, scarcity of raw materials, low risk taking ability, hard competition, inadequate managerial ability, absence of entrepreneurial aptitude, high cost of production, patriarchal society, legal formalities, travelling to become an entrepreneur; and government has various schemes like Swalamban (NORAD), Rashtriya Mahila Kosh, Support to Training and Employment Programme for women (STEP), Women Component Plan (WCP), Technology Development and Utilization Programme for Women (TDUPW), Women Enterprise Development Scheme(WEDS), Self Employed Women's Association (SEWA), The Stand up India scheme etc. to promote women entrepreneur in India.

**KEYWORDS:** Entrepreneurship, Women, Business, Government Schemes.

## I. INTRODUCTION

According to Indian government "women enterprise is an enterprise which is managed, controlled and owned by women, that means women are having minimum 51 per cent of the capital/ share and at least 51 per cent women are working in an enterprise". Educated women are not willing to limit their lives within the boundaries their house. They also want equal respect from their spouses. Though, Indian society has been a male dominated, so Indian women need to go a long way to attain equal rights and equal position in the society. In Indian culture, women are assumed as weaker than men and they are asked to execute the decisions taken by the men in their family. But now Indian society has been changed in terms of enhanced educational status of women, better living standards and life style. Women struggled and competed with men and successfully stood up with men and performed well. Women are self-confident, persuasive, enthusiastic, willing to take risk, and capable enough to manage to survive and excel in their work. Women with their ability to learn quickly, solving problem, willingness to take risk, to motivate people, and to know how to win are the strengths of the women

entrepreneurs in Indian. Women stand high in the society and are applauded for their accomplishments in their respective fields.

## II. WOMEN ENTREPRENEUR

Women entrepreneurs are those women who think about business enterprise, take initiative, organize and combine the all necessary factors of production, and by undertaking the risks run a business enterprise.

**Kamal Singh** has defined woman entrepreneur as "a creative, innovative and confident woman competent of attaining self-financial freedom independently or in partnership, creates employment opportunities for others people also by starting, establishing and running the business enterprise by keeping pace with her personal and social life."

**Indian Government (GOI2006)** has defined women entrepreneur as "an enterprise hold, owned and controlled by a women with a minimum monetary interest of 51 per cent of the capital and also providing employment opportunities to at least 51 per cent to the women."



## STATUS OF WOMEN ENTREPRENEURS IN INDIA

India is a country where there is a rich cultural heritage. But now social scenario in India is changing. Time has gone when women were not permitted to venture out of their homes, now women have enhanced their education standards and also participate in social, financial and political activities with equal zeal and enthusiasm like men. Traditionally, Indian women like Brahmi, Gargi, Laxmi Bai, Damyanti & Razia Sultana were strong and considerable decision makers. But, today the role and status of women has been drastically changed all over the world. In all over the world women are breaking their traditional and stereotypic roles.

Progressively with time, women entrepreneurs are being measured as essential for the economic development of the nation. Women help in generating employment opportunities and economic growth. Entrepreneurship facilitates women to become economically independent and also to develop and improve their social status in the society.

World Bank report showed that women entrepreneurs usually tend to recruit women. Perhaps because women entrepreneurs have started these enterprises. A considerable quantity of women entrepreneurs are micro-domestic based enterprises increasing their family income in India.

Ministry of Statistics and Programme in sixth economic census released that women comprise about 14% of the total entrepreneur base that means about 8.05 million out of the total 58.5 million entrepreneurs in India.

## NEED TO STUDY WOMEN ENTREPRENEURSHIP

In today's period of social change and advancement, it is significant to study about women entrepreneurship and also about how to promote and boosted women entrepreneurship. In many countries it has been observed that where there is gender impartiality and women play important roles in an organization, there is social development, greater wealth, and development of moral organizations. Women entrepreneurs are generally the owners of micro, small and medium enterprises that mean women play important role in the development of MSME. Thus, role of women as an entrepreneur and in modern organization is of great academic interest.

## III. LITERATURE REVIEW

**Terjesen, S., Elam, A. and Brush, C.G. (2011) De Bruin, Brush, Welter, 2006; Bullough, Moore, and Kalafatoglu, 2017<sup>[1]</sup>** in their study showed that women entrepreneurs play a vital role in generating new opportunities and also contribute towards the social and economic growth of their societies.

**Ramasetu (2015)<sup>[2]</sup>** in his study, focused on the issues and difficulties faced by urban working women in India and

found that women go through with physical and psychological pressure, poor work-life balance, inequitable management in the work place, stressed life and work place discrimination.

**Chanchan (2013)<sup>[3]</sup>** in his study, recognized and examined the pull and push factors related to the growth of women entrepreneurs and showed that irrespective of the education level and the income, the economic restrictions are the key reasons for women starting up entrepreneurship.

**Tuschano (2013)<sup>[4]</sup>** in his research, showed that women mainly belonging to lower or middle income group were found in the micro businesses in the unorganized sector. Women entrepreneurs faced immeasurable problems as these businesses run under condition of intense scarcity of all resources and also outside the range of social security. The amount of low investment limit their businesses to remain small sized. Thus, it enforced them to utilize traditional tools and economical raw material. Professionalism, lack of skills and low production level in business also affect their income but there was a immense chance of development in some businesses.

**Umamaheswari (2011)<sup>[5]</sup>** considered the development and the factors affecting the development of women enterprises in her research and showed that the factors such as nature of the organization, age of the enterprise, location of the organization, supply of labor, and professional management have control on the growth of women enterprises. Also other variable such as technically qualified entrepreneurs, past experience and the special skills of the entrepreneurs also have influence on the growth women enterprises.

**Mehta and Mehta (2011)<sup>[6]</sup>** in their research found that the major challenges and problems faced by women are work background and educational in rural area in business. The research indicated that various State Small Industries Development Corporations, NGOs and the nationalized banks are conducting several development programmes for women entrepreneurs.

**Thangaraju (2011)<sup>[7]</sup>** in his study considered the factors of entrepreneurial motivation, growth and problems faced by women entrepreneurs. The study found that the key problem was inavailability of money but reimbursement of it. The reimbursement is hard due to low paying ability, which is influenced by poor education and skills, and some issues related to marketing, viz., poor mobility, partial towards women and social group they belong and bad infrastructural facilities. Therefore, women need to be educated, skilled and trained to become successful entrepreneurs.

**Kulkarni (2010)<sup>[8]</sup>** in his study showed that the difficulties that women entrepreneurs faced micro issues related was financial problem caused by lack of money and modern technology. The second limitation that women entrepreneurs faced macro issues related was competition.



Women entrepreneurs need to be emotionally stronger to survive in the male dominated society. The third limitation that women entrepreneurs faced macro issues related to external environment was the geographic problems concerned with channels of distribution, distance, communication mode, etc.

**Ghosh and Cheruvalath (2007)<sup>[9]</sup>** in their study they discussed about various challenges faced by women entrepreneurs such as low education and socio-cultural constraints. The research also given some proposal to improve women entrepreneurship such as inculcating an entrepreneurial attitude, accurate training, understanding their entrepreneurial inspiration, attribution augmenting, and removal of discriminating social duties essential to them.

**Setty (2004)<sup>[10]</sup>** in his research focused on challenges and potential of women to become entrepreneurs. Women have been the economic associate of men in numerous fields when they become entrepreneurship, but men seem to rule the entrepreneurial world. Woman are equally endowed with the managerial abilities and psychological qualities that required in successful entrepreneurship. At times, the opportunities and environment are the same for both women and men. But the entrepreneurial activities in traditional societies have been restricted to men.

#### OBJECTIVES OF THE STUDY

1. To recognize the factors that inspires women to become an entrepreneur.
2. To study the several problems and challenges faced by women entrepreneurs.
3. To know about the various government schemes to promote women entrepreneurs.

#### IV. RESEARCH METHODOLOGY

Research methodology used in present study is as follows:-

**Research design:** Descriptive research was used in the present study.

**Research area:** Research area in present study was India.

**Data collection:** This study was based on secondary data. Secondary data was collected from published books, articles, thesis, websites, newspapers, magazines, public records, journals, and annual reports on women entrepreneurs. For the present study data about the women entrepreneurs in India was collected.

#### V. ANALYSIS

##### Objective 1

**1. To recognize the factors that inspires women to become an entrepreneur.**

In India, women entry into business is traced out as an expansion of their day to day primarily kitchen activities such as 3P's, Pappad and Pickle. But with the enhanced education and span of time women started shifting from 3P's to modern 3E's i.e., Energy, Engineering and Electronics. Skill, knowledge, compliance and adaptability in business are the key factors for women to emerge into business. Women entrepreneurs take such challenging role to congregate their personal needs and to become economically independent. Inbuilt quality of entrepreneurial and a strong aspiration to do something in their life make women capable to contribute values to both family as well as social life. Media makes women to know about their own personality, rights and the work conditions. Numerous women start a business because of some hurtful incidents such as divorce, the health of a family member, unfairness due to pregnancy, or economic reasons. But today a new flair pool of women entrepreneurs is forming, because many women leaving the corporate world and planning their own future. Women are booming as interior decorators, designers, publishers, exporters, garment manufacturers and still trying to search new opportunities for economic contribution.

There are various factors which inspire women to become entrepreneurs such as innovative thinking, new challenges and opportunities for self accomplishment, employment generation, freedom to take own decision, desire to become independent, favorable government policies and procedures, family occupation, requirement of additional income, better future of children, success stories of friends and relatives, role model to others, supportive family, education and qualification, self identity and social status.

##### Objectives 2

**To study the several problems and challenges faced by women entrepreneurs.**

In India, women faced several problems to get ahead in business in their life. Women entrepreneurs face various problems to develop their own enterprise. Women faced problems at various stages starting from their initial commencement of business and also in running their business. The major problems faced by women entrepreneurs in India are as follows:

**Shortage of Finance:** Women entrepreneurs endure from insufficient economic resources and working capital. Women have a very less assets and bank balance and family members show least interest in investing money in the business run by women because of lack of confidence in the ability of the women to run business successfully. It also very complicated to take loan and support from banks and manage the working capital for the women.

**Marketing problems:** Women entrepreneurs always face difficulties in marketing their products because they depend upon the middlemen for advertising their products who ask



for the high profit. The middlemen usually take advantage of the women entrepreneurs. It's very difficult for women entrepreneurs to capture the market and to make their products popular because of tough competition from male entrepreneurs.

**Shortage of raw materials:** Women entrepreneurs also find it difficult to acquire the essential raw materials and other inputs required for production because of high prices of raw materials.

**Stiff competition:** Male entrepreneurs and organized industries pose strict competition for women entrepreneurs.

**Limited managerial ability:** Women entrepreneurs may not be specialist in all functions of the business venture and they shall not be able to dedicate enough time for all kinds of activities of enterprise.

**High cost of production:** The development of women entrepreneurs is also restricted by the high cost of production. To reduce the cost of production it is required to increase competence and expand productive capacity. Reduction of cost of production is required to make their survival possible for longer tenure. Women entrepreneurs also face the problems of human resources, legal formalities, infrastructure, lack of family support, overload of work, etc.

**Absence of Entrepreneurial Aptitude:** The another problems of women is the lack of entrepreneurial aptitude such as innovation, risk bearing etc.

**Low risk taking ability:** Women entrepreneurs usually plan for a protected life so they have a problem of low risk taking ability as comparison to male entrepreneurs.

**Family Conflicts:** In India, women are also supposed to take care of the children and other family members. Married women entrepreneurs have to balance their household activities and business activities. Women spend long hours in business and thus they find it hard to fulfill the requirements of their family members and also sometimes become unable to do the domestic work, to have time for children's education, personal hobbies, and this lead to family conflicts.

**Patriarchal Society:** In India, women do not get equal treatment because of male-dominated society and men ego also places barriers in women progress.

**Lack of entrepreneurial training:** Many women usually do not have proper technical and professional training to start a new business enterprise.

**Legal Formalities:** Women entrepreneurs find it very hard to comply with several legal formalities to obtain license etc.

**Travelling:** Women entrepreneurs cannot travel from one location to another freely in comparison to men.

### Objective 3

**To know about the various government schemes to promote women entrepreneurs.**

Development of women has been a policy objective of the government since independence. Following are the government schemes to promote women entrepreneur.

#### **Trade Related Entrepreneurship Assistance and Development Scheme for women (TREAD)**

This scheme is for women involved in non-farm activities. The main components of this scheme are as follows:

- Grant by government to 30% of the total project expenditure to the NGOs for encouraging trade associated activities among women. The remaining 70% of the project expenditure is financed by the primary agency as loan for operating activities as laid down by the project.
- Government grants up to Rs 1 lakh per programme to the many training institutions and NGOs for organizing training programmes for the women who willing to start up their own business.
- The government also grants need based grants up to Rs 5 lakhs to national entrepreneurship development institutions and any other institution for conducting research, field surveys, and evaluation studies and hence making a blueprint for training modules.

#### **Credit Guarantee Fund Scheme**

Government grant loan up to 25 lakhs without third party guarantees to small scale industries. It is run by Credit Guarantee Fund Trust for Small Industries (CGTSI). This scheme covers up to 80% of the credit to enterprises run by women which embrace maximum guarantee limit of Rs 20 lakhs.

#### **Support for Entrepreneurial and Managerial Development**

Micro, Small and Medium Enterprises conducts entrepreneurship development programmes and charge fees for enrolling in such programmes. To promote more entrepreneurs from women, SC/ST, physically challenged groups, it is emphasized that such programmes will not ask for any fees instead these programmes will give stipend of Rs 500 per capita per month. 50,000 entrepreneurs will get trained in diverse industries like Fashion, IT, Agro, Catering, Pharmaceutical, Food Processing, etc. 20% of the programmes will be organized only for women.

#### **Exhibitions for women under promotional package for Micro and Small Enterprises approved by CCEA under marketing support**

To promote women entrepreneurs to take participation in International Exhibitions some provisions are implemented which are as follows-



- Free space in exhibitions is provided to women.
- Reimbursement of air fare of economy class for one women representative.
- Reimbursement of shipping cost up to 15000.

**Swalamban(NORAD)** This scheme is to offer training for skill development to women to facilitate them to get employment or self-employment. The focus of this scheme is the needy and poor women from backward and weaker section of the society. The Haryana State Women Development Corporation (WDC) is the nodal organization for execution of this scheme through voluntary organisation of the state.

**Rashtriya Mahila Kosh** A cluster is a assembly of venture producing similar products/services. In a cluster there can be 20 or more venture. This Cluster Development Program aims to improve technology, competitiveness, manufacturing practices, market the products competently, create employment, etc. The clusters encompasses women enterprises and they are assigned up to 90% support to organize diagnostic study, workshops and seminars, forming association, capacity building through training programmes, market development, etc.

#### **Support to Training and Employment Programme for women(STEP)**

Ministry of women and Child Development manages STEP scheme of training of women to develop their skill, to enhance employability and helps them to become entrepreneurs /self-employed. This scheme is for 16 years and above age group women.

#### **Swa Shakti project and Swamsiddha scheme**

This scheme grants financial aid to capacitate rural poor women through microfinance from international agencies.

#### **The Ministry of Small Scale Industries**

The ministry develops productivity, competitiveness, and capacity building of small women ventures in India.

#### **Women Component Plan (WCP)**

This plan gives prioritizing economic resources for schemes/programmes for women, mainly those which give power to women.

#### **Technology Development and Utilization Programme for Women (TDUPW)**

This programme encourages awareness regarding the new technology, acceptance of new technology by women, training programmes for women regarding technology issues, encourages technological upgradation of tiny, small and medium enterprises run by women entrepreneurs, also conducts demonstration programmes on design, technical procedures and growth of products for the benefit of women.

**Schemes of Consortium of Women Entrepreneurs of India (CWEI)** CWEI supports in attaining E-commerce (Electronic Commerce) through its global information transformation system and web portal. E-commerce is the online buying and selling of services and products.

#### **The Federation of Indian Women Entrepreneurs (FIWE)**

This federation is to conduct training programme in domestic marketing, export marketing and management, quality control, management of enterprises, procedures and systems, laws and regulations for running a small and medium scale enterprises in order to sustain their growth.

#### **Scheme of Assistance to Women Co-operatives (SAWP)**

This scheme commence several functional, structural, and institutional measures to empower women, development of their access to inputs and technology, capacity building, and other farming resources.

#### **Women Enterprise Development Scheme(WEDS)**

This scheme provides economic assistance to women for any feasible economic creating activities in liberal terms and conditions.

#### **Self Employed Women's Association (SEWA)**

SEWA is a trade union registered in 1972 and supports poor and self-employed women workers. SEWA supports women in establishing their own economic organization and capacity building. SEWA connects women workers to development programs, so that they can attain full employment and self-reliance.

#### **The Stand up India scheme**

This scheme helps the SC/ST and women entrepreneurs economically so that women have a equal chance to set up their own enterprises. This scheme helps by giving loans from Rs 10 lakh to Rs 1 crore to the weaker section of the population. The Start-Up India scheme was launched in January 2016 by Prime Minister Narendra Modi to assist new entrepreneurs to start up their own enterprise.

**The Ministry of Small Scale Industries** The Ministry enhances competitiveness, productivity and capacity building of small women ventures and their collectives in India.

## **VI. FINDINGS**

1. Increased education and qualification, support of family members, success stories of friends and relatives, better future of children, need for additional income, family occupation, government policies and procedures, freedom to take own decision and be independent, new challenges and opportunities for self fulfillment are some factors that inspire women to become an entrepreneur.



2. Women face several problems and challenges like scarcity of finance, marketing problems, scarcity of raw materials, hard competition, inadequate managerial ability, high production cost, lack of entrepreneurial aptitude, inability to risk, family disputes, inadequate entrepreneurial training, legal formalities, travelling to become an entrepreneur.
3. Government has various schemes like Trade Related Entrepreneurship Assistance and Development Scheme for women (TREAD), Credit Guarantee Fund Scheme, Support For Entrepreneurial and Managerial Development, Swalamban (NORAD), Technology Development and Utilization Programme for Women (TDUPW), Rashtriya Mahila Kosh, Support to Training and Employment Programme for women (STEP), Ministry of Small Scale Industries, Women Component Plan (WCP), Women Enterprise Development Scheme(WEDS), Self Employed Women's Association (SEWA), The Stand up India scheme to promote women entrepreneur in India.

## VII. CONCLUSION

Women have increased their education and qualification and they are motivated to become an entrepreneur. Today women have equal passion and enthusiasm like men. Enhanced education and qualification, supportive family, success stories of friends and relatives, better future of children, requirement of additional income, family occupation, government policies and procedures, freedom to take decisions, desire to become independent, new challenges and opportunities for self accomplishment are some factors that inspire women to become an entrepreneur. But to become an entrepreneur women face several problems and challenges like scarcity of finance, marketing problems, scarcity of raw materials, hard competition, inadequate managerial ability, high production cost, lack of entrepreneurial aptitude, inability to risk, family disputes, inadequate entrepreneurial training, legal formalities, travelling. Progressively with time, women entrepreneurs are being considered as crucial for the economic development of the country. Women contribute towards the employment creation and economic growth. In India, government has come up with several schemes to promote and support the women entrepreneur like Women's Association (SEWA), The Stand up India, Trade Related Entrepreneurship Assistance and Development Scheme for women (TREAD), Credit Guarantee Fund Scheme, Support For Entrepreneurial and Managerial Development, Swalamban (NORAD), Technology Development and Utilization Programme for Women (TDUPW), Rashtriya Mahila Kosh, Support to Training and Employment Programme for women (STEP), Ministry of Small Scale Industries, Women Component Plan (WCP), Women Enterprise Development Scheme(WEDS), Self Employed. These schemes facilitates women to become

financially independent and also to improve their social status in the society.

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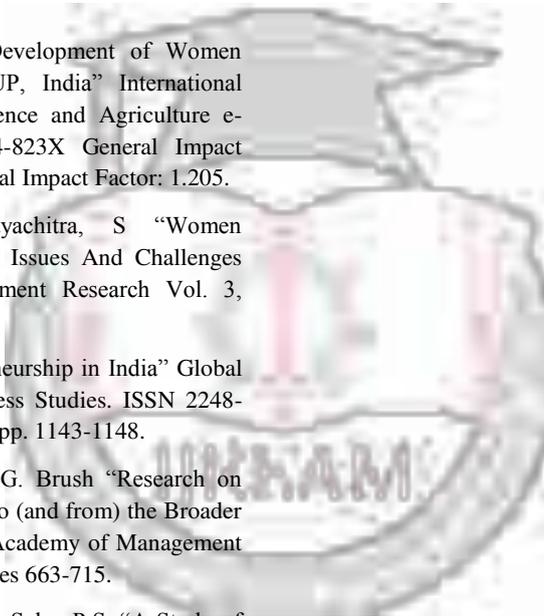
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**A study of student's perception regarding E-learning during Lockdown.****Submitted By:****Dr Rachna Kalsan****Assistant Professor****Lingayas Vidyapeeth****Faridabad****8295472725****drrachnakalsan@gmail.com****Abstract:**

Corona virus pandemic era interrupt many things in the world. Where the GDP fall down, the education sector also faces several problems. Due to the lockdown all the colleges, universities, schools, institutes are interrupted. Due to these students faces many problems. This lockdown creates a major cause in student's learning. Due to this several health issues occurred among students. To limit/ minimize the loss of studies, Ministry of Human Resource Development & Regulators, Directorate of Higher Education in States motivated to educational institutions to shift to online modes of education. Due to this online teaching mode starts for higher education to reduce the loss of student's study. Online mode is a new challenge for both the students and teachers. This paper helps in knowing the current situation of online learning of students. For this study primary data was collected from 150 college students. The data was collected from Haryana rural areas with questionnaire method (in Google form) and mailed to students. This paper focus on the student's hurdles faced during lockdown basically in rural areas.

**Keywords:****Lockdown, MIHRD, Corona virus.****Introduction:**

The covid-19 pandemic era comes with several challenges for the whole world. The covid-19 spoils the whole world economy. All sectors were seriously harmed. In all sectors the education sector is also one of the major sectors faced various challenges. Education sector is also plays a very important role in Country's economy. In India both state and central government authorities faces various challenges and do preventive

measures to solve this problem. This pandemic situation disturbed the education sector, which effects the students future.

COVID-19 is an infectious disease caused by a newly discovered corona virus. Formerly, this disease was referred to as '2019 novel corona virus' or '2019 ncov'. COVID-19 was first identified in Wuhan, China in December 2019. This lockdown situation develops various health issues in students and teachers life.

E-learning tools are playing a crucial role during this pandemic, it aims to help instructors, schools, and universities facilitate student learning during periods of universities and schools' closure. Besides, most of these systems are free which can help ensure continuous learning during this Corona virus pandemic. The success of any information system depends on the usage of the system by users.

E-Learning is just like a web based training means to install a software through which both teachers and students communicate with each other. Everything change with the changing technology. Now the new tools of teaching and learning changes with the technology.

The deadly and infectious disease Corona Virus also known as Covid-19 has deeply affected the global economy. This tragedy has also shaken up the education sector, and this fear is likely to resonate across the education sector globally. The Covid-19 pandemic outbreak forced many schools and colleges to remain closed temporarily. Several areas are affected worldwide and there is a fear of losing this whole ongoing semester or even more in the coming future. Various schools, colleges, and universities have discontinued in-person teaching. As per the assessment of the researchers, it is uncertain to get back to normal teaching anytime soon. As social distancing is preeminent at this stage, this will have negative effects on learning opportunities. Educational units are struggling to find options to deal with this challenging situation. These circumstances make us realize that scenario planning is an urgent need for academic institutions. This is a situation that demands humanity and unity. There is an urgent need to protect and save our students, faculty, academic staff, communities, societies, and the nation as a whole.

E-learning tools are playing a crucial role during this pandemic, it aims to help instructors, schools, and universities facilitate student learning during periods of universities and schools' closure. Besides, most of these systems are free which can help ensure continuous learning during this Corona virus pandemic.

### **Literature Review:**

1. Dr Amita (2020) in his study analyse that faculty made appreciable efforts to compensate the loss of syllabus. According to them various online learning tools were used to deal with students. With the help of online teaching 60 to 80 percent syllabus were completed. The data is collected from 882 students of various higher education institutions through the questionnaire method.
2. Radha and her research coordinators conduct a research in 2020. According to them E-learning mode become the future trend of leaning. The study conducted on 175 students across the world using stratified sampling method. The findings are based on primary data of different students. According to them most of the students were interested in online learning but within their comfort. This mode become more effective and popular during the lockdown situation.
3. Accorging to Suraksha and their co-researchers findings in 2020 analyse that most of the respondents were suffered from disturbance during lockdown. The disturbance are in the form of internet connectivity problem, electricity problem, data packs facilities etc. Due to these hurdles online teaching mode makes difficult to understand the concepts. The data is collected from 13 different nursing colleges of Nepal. The primary data was collected with distributed the questionnaire to all the respondents through mail. This is a descriptive cross-sectional online survey on students. Both teachers and students faced the problem of internet connectivity, and others. If we have to reduce or minimize theses hurdles than it makes the online teaching and learning process more effective and efficient method.
4. According to the study motivation is most important element while using online classes. When the students are not motivated then they don't prefer to use this mode. According to their survey teachers use various strategies to motivate the students.
5. Raheem in his study concluded that learning and teaching from home with the help of online tools is a very efficient step to teach the students. It is beneficial for both the teachers as well as students. In today's life technology become the most

important part of our life. For E-Learning various applications like Zoom, Google meet, Google classroom, Youtube etc were used to help the teachers. So finally during the pandemic era E-Learning through various applications become the most effective tool. It is interesting to share something new.

6. M Samir, said that many educational institutions faced various obstacles during online classes. But the latest technology can help in overcome these problems with the help of different E- Learning platform like Zoom, Google Meet, Youtube, Google Classroom etc. Now these technologies were used in the universities to deliver lectures. This study is done in Egypt. Due to him E- Learning is a easy and effective way to motivate students for learning.
7. Mohammadi, in his study has showed the role of e-learning and its application in language learning process and compared it with traditional form of language learning. It also has provided advantages and disadvantages of e-learning in language learning. The researcher when referred to the above related studies was able to bring out this maiden thought into his research done on the role of e-learning in COVID19 crisis and to show the important of it in different fields. The present paper is going to show the role of e-learning in COVID -19 crisis.
8. Amidst this deadly virus spread such online platforms are needed where (a) video conferencing with at least 40 to 50 students is possible, (b) discussions with students can be done to keep classes organic, (c) internet connections are good, (d) lectures are accessible in mobile phones also and not just laptops, (e) possibility of watching already recorded lectures, and (f) instant feedback from students can be achieved and assignments can be taken in the study.
9. Kapasia in his study analyse the impact of lockdown on students both (graduate & undergraduate). This survey is basically conducted in West Bengal through questionnaire method. The survey conducted on 232 students. According to them 70% learners were involved in the online learning process. But during online classes students faced many obstacles like depression, poor internet connectivity, anxiety, unfavorable study environment at home etc. She suggests targeted interventions to create a positive space for study among students from the vulnerable section of society. Strategies are urgently needed to build a resilient education system in the state that will ensure to develop the skill for employability and the productivity of the young minds.
10. Pravat in his study highlights on major impacts of Covid-19 on HEIs in India. Some measures taken by HEIs and educational authorities of India to provide seamless educational services during the crisis are discussed. Due to Covid-19 pandemic, many new modes of learning, new perspectives, new trends are emerged and the same may continue as we go ahead to a new tomorrow. So,

some of the post Covid-19 trends which may allow imagining new ways of teaching learning of higher education in India are outlined. Some fruitful suggestions are also pointed to carry out educational activities during the pandemic situation

**Objectives:**

1. To know the status of e- learning during lockdown.
2. To study students behavior regarding e-learning.
3. To gather suggestions to make online teaching more effective.

**Research Methodology:****Population:**

All the college students of faridabad are the population of this study.

**Sample:**

This study is conducted on the Faridabad students. The study was done on college going students of different colleges of Faridabad. It mainly focuses on the private sector colleges students.

**Sample Size:**

In the study the sample of 150 students was taken to reach at the conclusion.

**Data Collection:**

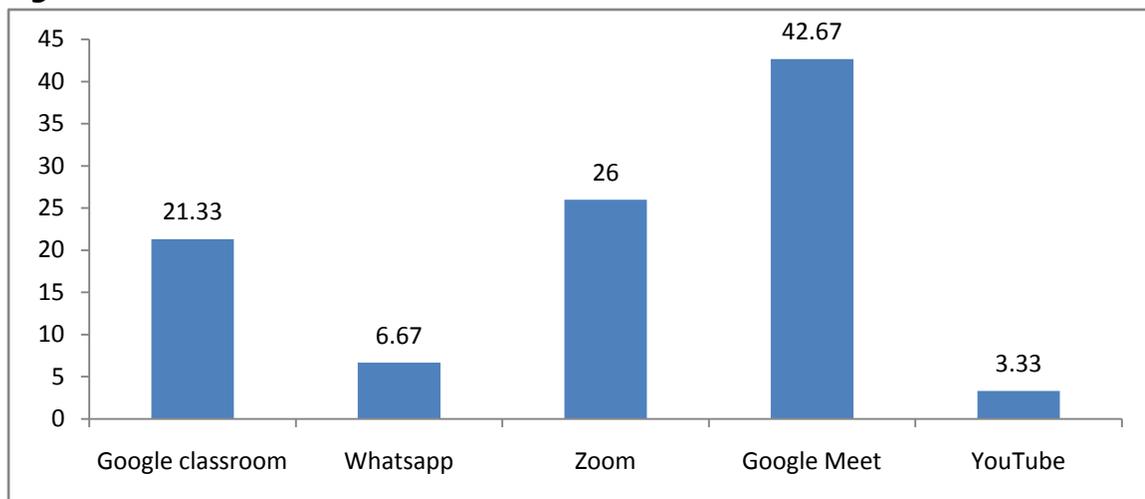
Primary as well as secondary both the sources of data were used in collecting the data. The primary data was collected through questionnaire method. The questionnaire was mailed to the respondents and collects the necessary information from them.

**Findings:**

1. Students preference on different types of application tools used for e-learning:

Table 1:

Classification	Respondents	Percentage
Google classroom	32	21.33
Whatsapp	10	6.67
Zoom	39	26
Google Meet	64	42.67
YouTube	5	3.33
Total	150	100

**Figure 1:**

2. Types of Device used for e-learning:

Table 2:

Classification	Respondents	Percentage
Laptop	42	28
Mobile	84	56
Desktop	24	16
Total	150	100

Figure 2:

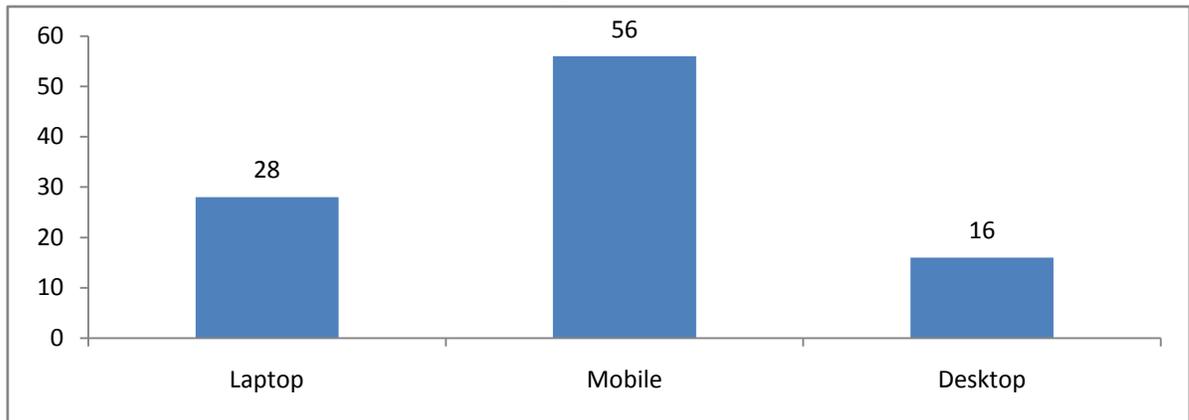
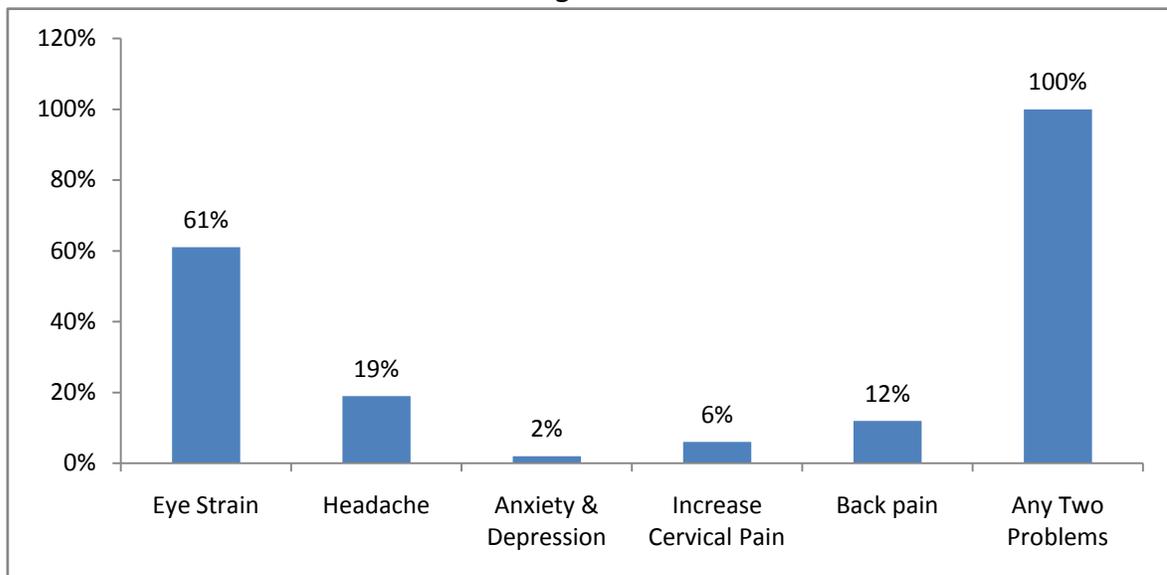


Table: 3

Students faced various health problems:

S.no	Health Problems	No. of Students	%
1	Eye Strain	92	61%
2	Headache	28	19%
3	Anxiety & Depression	3	2%
4	Increase Cervical Pain	9	6%
5	Back pain	18	12%
	Total	150	

Figure: 3

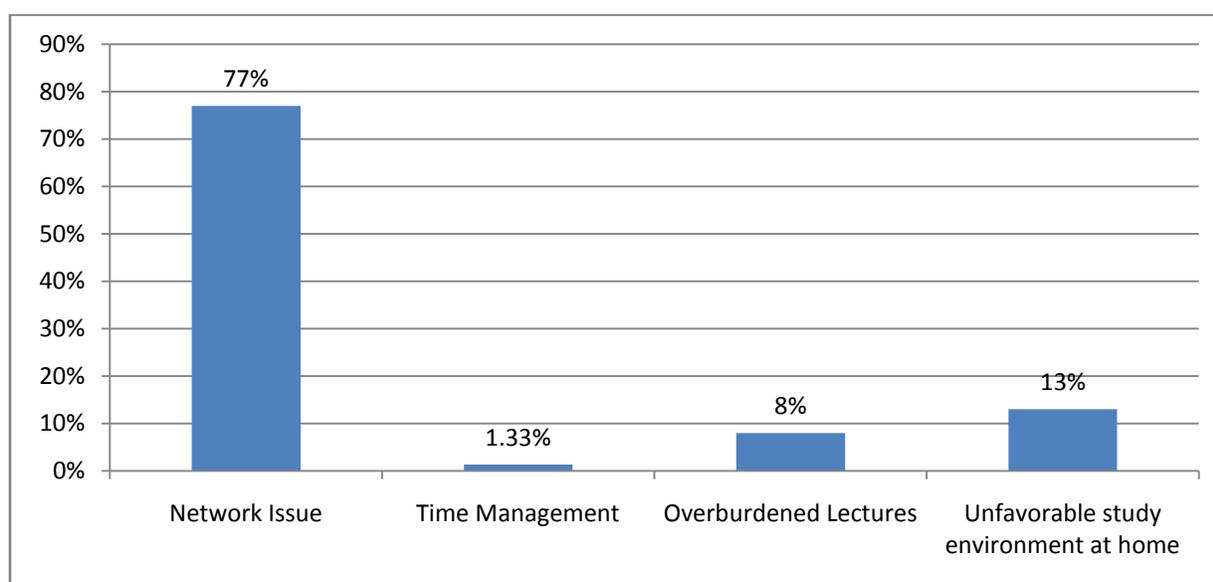


4. Different Problems faced by students during online classes:

Table: 4

S.no	Classification	No. of Students	%
1	Network Issue	116	77%
2	Time Management	2	1.33%
3	Overburdened Lectures	12	8%
4	Unfavorable study environment at home	20	13%
	Total	150	

Figure: 4



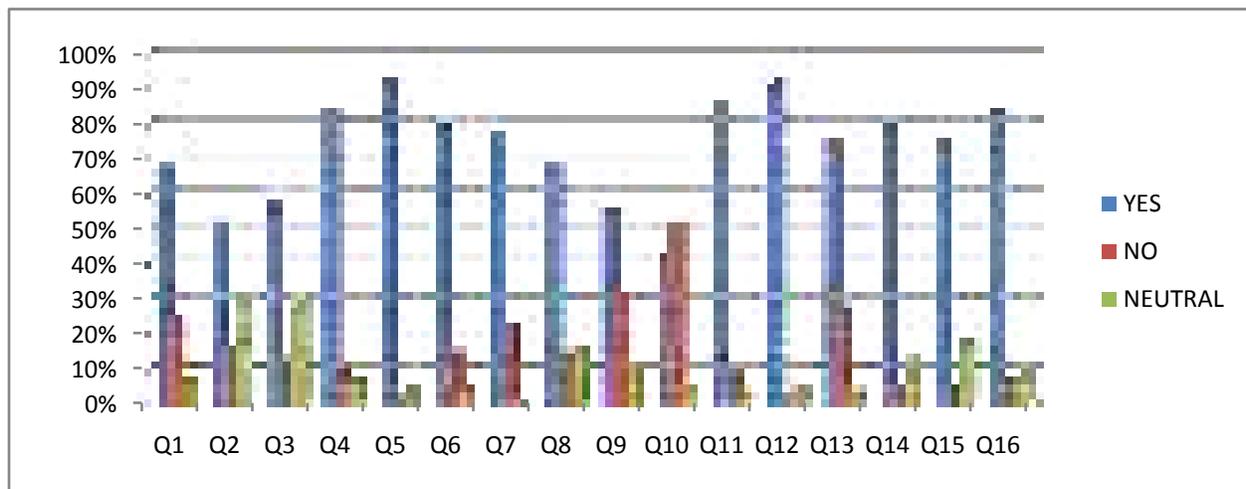
## 5. Attitude of students towards E-Learning:

Table: 5

Sno	Statement	Yes	No	Neutral
1	I enjoy taking online classes from home.	68%	25%	7%
2	Online classes are better than the offline classes.	52%	16%	32%
3	It can easily clarify the doubts and quarries.	58%	13%	29%
4	Online classes are suitable for Theoretical subjects.	84%	9%	7%
5	It can create health issues.	92%	2%	6%
6	Are you interested in e-learning?	80%	15%	5%
7	Does e-learning improve your study skill?	78%	23%	1%
8	Are you satisfied with Google Form mock test?	69%	15%	16%
9	Does e-learning make your quarantine time a useful one?	56%	32%	12%

10	Do you believe that improving knowledge through e-learning is better than traditional learning?	42%	52%	6%
11	Do you think Face to face learning is important for practical teaching?	87%	9%	4%
12	Did you face any issues during e-learning?	92%	2%	6%
13	Are you positive towards e-learning?	76%	28%	4%
14	Does e-learning make your knowledge wider?	81%	6%	13%
15	Do you think web-based teaching is important for a student?	76%	6%	18%
16	Can e-learning bring a social change in India?	84%	7%	9%

Figure: 5



**Conclusion:**

This pandemic era is very difficult for all human being. Due to this various sectors face obstacles and try to overcome the barriers. For students also this time is very difficult where they study from home using various applications and device to learn something new. This time period taught something new to students. They learn time management, give time to their parents, help in each and every activity. These all things are not done when they went to colleges. This covid-19 has positive and negative effects both. It can make students more efficient. More than 70% of students believe that online classes are effective to learn but there are several obstacles arise during E-Learning. If these

obstacles will remove then it makes learning more effective. But it can create health problems among students. Those who have cervical problem before lockdown, it may increase and also back pain increases due to over sitting for online classes. Eye problem also rises due to over usage of phones, laptops, Desktops and sit in front of camaras for a long time. Ministry of Education can control on make rules and guidelines for online classes for school students. According to their guidelines the time limit of each lecture is fixed of 30-40 minutes and 9 -12 pm is fixed to take classes. But for college students no guidelines were made. They take 6-7 lectures per day. Internet connectivity problem, electricity problem are the various obstacles during online classes. For remove these obstacles if we work on these things, then we make online classes more effective and attractive for the students.

The measures to be taken to remove the obstacles during E-Learning are:

1. Fix the time limit of online classes with limited Hours.
2. Fix the limit of no. of lectures per day with 3-4 lectures per day.
3. If the companies minimize the data rate, so that each and every student easily afford the network connection.
4. Make presentation more attractive for students.

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### Questions to be asked from respondents:

1. Students preference on types of application tools used for E-Learning:
  - A. Google Classroom
  - B. Zoom
  - C. Google Meet
  - D. Youtube
2. Which type of device will be prefer by students during online classes:
  - A. Laptop
  - B. Mobile
  - C. Desktop
3. Are you suffering with any health problems due to online classes:
  - A. Eye strain
  - B. Headache
  - C. Anxiety & Depression
  - D. Increase Cervical Pain

- E. Back Pain
4. Which type of problem faced by students during online classes:
- A. Network Issues
  - B. Time Management
  - C. Overburdened Lectures
  - D. Unfavorable study environment at home

Sno	Statement	Yes	No	Neutral
1	I enjoy taking online classes from home.	Yes	No	Neutral
2	Online classes are better than the offline classes.	Yes	No	Neutral
3	It can easily clarify the doubts and quarries.	Yes	No	Neutral
4	Online classes are suitable for Theoretical subjects.	Yes	No	Neutral
5	It can create health issues.	Yes	No	Neutral
6	Are you interested in e-learning?	Yes	No	Neutral
7	Does e-learning improve your study skill?	Yes	No	Neutral
8	Are you satisfied with Google Form mock test?	Yes	No	Neutral
9	Does e-learning make your quarantine time a useful one?	Yes	No	Neutral
10	Do you believe that improving knowledge through e-learning is better than traditional learning?	Yes	No	Neutral
11	Do you think Face to face learning is important for practical teaching?	Yes	No	Neutral
12	Did you face any issues during e-learning?	Yes	No	Neutral
13	Are you positive towards e-learning?	Yes	No	Neutral
14	Does e-learning make your knowledge wider?	Yes	No	Neutral
15	Do you think web-based teaching is important for a student?	Yes	No	Neutral
16	Can e-learning bring a social change in India?	Yes	No	Neutral

## IMPACT OF ANNOUNCEMENT OF MERGERS AND ACQUISITION ON SHAREHOLDER'S WEALTH: A STUDY OF PNB AND IT'S ASSOCIATES.

Submitted by:

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### Abstract

The aim of the study is to identify the impact of announcement of merger of Punjab National Bank with Oriental Bank of Commerce and United Bank by Minister of Finance of India Smt. Nirmala Sitharaman on wealth of its shareholders. Secondary data is collected from the website of BSE. In this study share price of the Punjab National bank is collected for one year before and one year after the merger to identify the impact of merger announcement on the share price of the bank. By analyzing the trend in the share price of Punjab National Bank for one-year pre-merger and one-year post-merger, this study finds that the share price of banks was increasing with slow rate before the announcement of merger but after the announcement this study finds that for first 3 months share price of the bank was increased after that there was a drastic decline in the share price of the Punjab National Bank. The share price of the bank was decreased in long term which also result as the decreased in the wealth of share holders of banks therefore this study concludes that the announcement of merger of Punjab National Bank is not in the favor of the shareholders of the bank.

**Keywords** Mergers, Announcement, Shareholders, Wealth.

### INTRODUCTION

We can define Banks as a financial institution whose main purpose is to deal in accepting and lending money by which it makes profit. Bank lend money on extra rate of interest rate as compare to the rate of interest it pays to its customer who deposit their money in the banks, this difference is known as interest spread and banks earn through this interest spread. Banks also issue their shares like all other publicly listed companies, by which people invest in Banks and own some ownership in the banks. Being traded as a public company is also in favor of all of both public and private sectors banks, as it generates crucial funds for banks to survive and thrive in the market and compete with other banks in the market, it also helps banks in further expansions development, however this is only one example of several various strategies taken by banks to expand in the market, one other example by which banks expand in the market is the strategy of merging together but in public sector banks the objective of merging of banks is not only expansion but to give a new life to the weaker banks in the market. Merger of banks is in practice in India for over 100 years, starting from the merger of Bank of Bengal, Banks of Madras and Bank of Bombay in 1921 to form the Imperial Bank of India which is now known as the State Bank of India at that time the reason of the merger was world war because of which there was shortage of sufficient fund to run three major banks in the country therefore in order to survive these banks were merged together. In 1969 14 banks were nationalized and in 1980 government nationalize 6 more banks in pre liberalization era. In 1993 New Bank of India was merged with Punjab National Bank as earlier was not in very good financial situation to survive. With time there were different committees were setup in country to improve the situation of banks in India such as Narsimham Committee in 1998. Recently SBI and its associates were merged together in 2017 also this time the objective of the merger was by give and take same to create a single strong machinery in

banking sector of national level rather than having several average banks. Strong banking system is a sign of strong economy.

In August 2019 Finance Minister of India Ms. Nirmala Sitharaman gave a statement that we need to have a strong banking machinery in our country, none of our banks came in the list of 50 largest banks in the World and she announced 4 new mergers of the PSBs, after the merger India will have total number 12 PSBs.

Mergers that were announced are:

1. Punjab National Bank + United Banks + Oriental Bank of commerce,
2. Canara Bank + Syndicate Bank +
3. Union Bank + Corporation Bank + Andhra Bank
4. Indian Bank. + Allahabad Bank.

When two or more banks merged together it brings a lot of change in the organization from the size of the organization to the technology of the banks, from the number of customers to the value of the share-holders of the banks. Changes may be different in different cases, as it also depends on the pre-merger situation of the Banks, for strong banks merging with weak banks may impact negatively whereas for weak banks merging with strong banks will impact positively. However, the end goal of merging of banks is to improve the condition of banking sector in the economy. Merger of banks result in the increase of the economy of scale which reduces the overall cost of operation of banks and increases revenue for the banks. Banks also takes benefits of each other resources such as infrastructure. technology etc which also result as the increased productivity of the banks. In case of shareholders of the banks there are several studies have been conducted which gave different results, the shareholders of the target banks get more benefits as they were having the share of weak banks, whereas the shareholder of the strong banks has least benefit. This study is focused on the objective of identifying the impact of announcement of merger of Punjab National Bank on the wealth of its shareholders.

## **Review of Literature**

- Dutta and Dawn (2012) considered the impact of mergers on profit, deposits, total assets, number of employees and revenue. They focused on the merger of firms four years prior and after the merger. They concluded that the year after the merger of banks were more successful and have a significant increase in deposits, profit, number of employees and total assets In the firms that acquired other firms in Indian banking sector.
- Sikarwar, Ekta (2012) did a study on the impact of announcement of mergers on the wealth of shareholders. They studied the merger of State Bank of Indore and State Bank of Saurashtra with State Bank of India by the method of event study and their study gave mixed results with respect to the changes in wealth of shareholders of these banks. State Bank of Saurashtra gave abnormal return significantly in comparison of merger of State Bank of India with State Bank of Indore. They said that the movement in the market is not caused only because of the announcement of merger but also because of the various information already available in the market.
- Saluja (2012), in used CAMEL-MODEL for 2 years before and after the acquisition to study the impact of acquisition of Centurion bank of Punjab by HDFC bank and found that the financial performance of HDFC bank after the acquisition was affected significantly and also shows improvement in market condition of HDFC banks. it's as a productive strategy in order to improve the financial performance

by HDFC bank. This study shows that even in private sector banks when two strong banks get merged together, they can compete with public sector banks in terms of size and strength.

- S, Devarajappa (2012) concluded that for further expansion and growth of banks merging of weaker banks with stronger banks is a useful strategy, he said that merger of banks is good for the survival of the weaker banks in the competitive environment of the market, he focused his study on the changes in financial aspect of banks like of Net profit margin, return on capital invested, gross profit of the banks, debt equity ratio, return on equity of banks and operating profit of the banks before and after the merger and his study shows the significant improvement in them after the merger.
- Soongswang, Amporn, (2011) in their study take account on the share prices of both the bidder bank as well as of target banks in the period of 12 months before and after the merger announcement of the banks. In their study they use three different tests: cross sectional test, residual test and t-test. In order to estimate abnormal return of bidder and target firms they used market adjustment models. They also used the method of BHAR and CAR to measure the return of bidder banks and target banks. They also found that the announcement of merger has more positive impact on the prices of target bank as compare to bidder banks which sometimes also gave negative return as well.
- Sophia, John.M and EbunoboweiAppah (2011) undertook the effect on efficiency by Mergers and Acquisition. They took the sample of 10 different banks for the study and did the comparison for three years before and after the announcement of mergers on the return on the equity. They used descriptive statistics to analysed the data. They used t-test to analyse the data and found that there was absence of any difference in the mean of equity return in post and pre-merger and suggested that market forces of Nigerian Banking are driving Merger and Acquisition in the country.
- Kemal, Muhammad Usman (2011) studied the changes in the profitability of Royal Bank of Scotland before and after the Mergers and Acquisition. They collect the financial statement of 4 years from 2006 to 2009 of 47 bank's annual reports and they used 20 different financial ratios in order to test the changes in the profitability of banks both before and after the mergers. Their study shows that only 6 ratios out of total 20 ratios were improved because of the merger. Banks were doing well before the merger as compare to their performance after the merger. Ratios that were satisfactory were liquidity, cash flow, leverage, assets management and profitability. They gave that the merger of the banks was not successful.
- Natarajan, P. and Kalaichelvan. K (2011) compared the operating performance for 5 years before and 5 years after the process of merger of banks. In their research they undertook the financial factors for study like operating performance, profitability and liquidity of banks after merger and gave that the banks were in better condition before the merger than after merger but this was not in the case of public sector banks which shows positive results. The liquidity position of private sector banks was negatively impacted and In case of public sector banks they show some negative impact with respect to the generated income in comparison of their investment in fixed assets but their net earnings was improved.
- Rhagendorff, Jens and Vallascas, Francesco (2011) conduct a research of Merger and Acquisition in terms of the risk related to merger of banks in cross border situation and merger of banks which are not cross border and concluded that Merger and Acquisition does not have any impact the risk-taking situation of acquiring banks if the merger is not cross border. They further gave that risk is always present when merger is between cross border firms, they said that it is doubtful to say that merger and

acquisition decreases the risk associated with the banks specially when merger is between cross border banks as it is not necessary that various gains from the mergers will improve the risk associated with the banks when they got merged together.

- Manoj and Jagandeep (2008) studied the impact on wealth of shareholders after the announcement of merger of five banks. Mergers studied by them were can be pointed out as the merger of Times Bank with HDFC Bank, the merger of ICICI Ltd with the ICICI Bank and Bank of Madurai, the merger of Global Trust Bank with Oriental Bank of commerce and merger of the Bank of Punjab with centurion Bank and gave that there is a positive impact of merger on equity of the all the merging banks.

### **Objective of the study.**

1. To study the impact of merger on the share prices of PNB.

### **Hypothesis of the study.**

1. There is no significance impact on share prices of PNB after merger.

### **Research Methodology**

#### **Sample Design:**

1. Punjab National Bank
2. Oriental Bank of Commerce
3. United Bank

#### **Data Collection:**

Secondary Data of share prices of banks for one year before and after the merger announcement is collected with reference to BSE.

#### **Analysis of the study.**

Share prices of Punjab National Bank, Oriental Bank of Commerce and United Bank of India are collected and observe by using line chart and trendline.

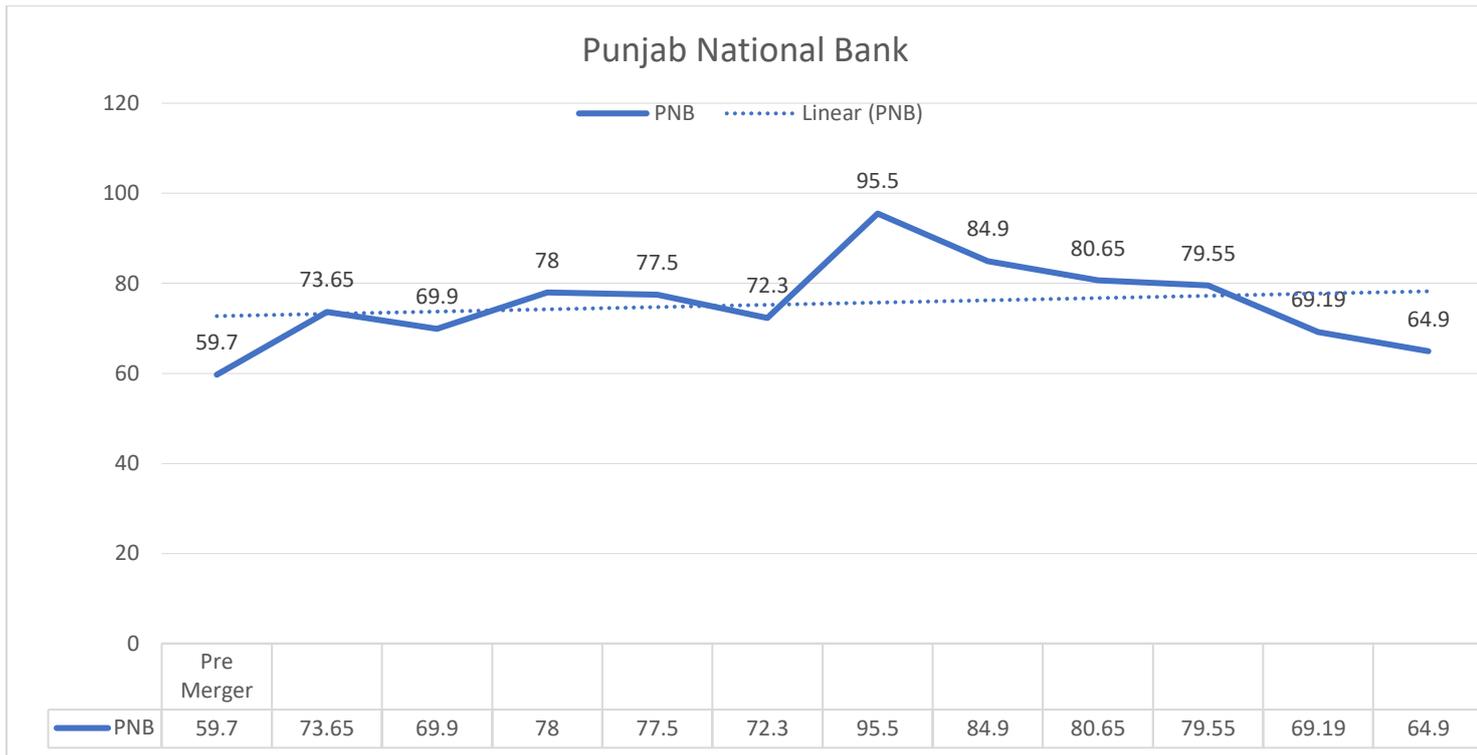


Figure 1.1

Above Figure 1.1 shows the performance of share prices of Punjab National Bank of 1 year before the announcement of merger, here trend line shows that the share price of the bank was increasing with very small growth rate as it increases from price of 59.7 to 64.9 in one year.



Figure 1.2

Figure 1.2 is of the share price of Oriental Bank of Commerce, here trend lines shows that the share price of this was decreasing rapidly one year before the announcement of merger, value of the share was declined from 91.5 to 43.25 in last one year.

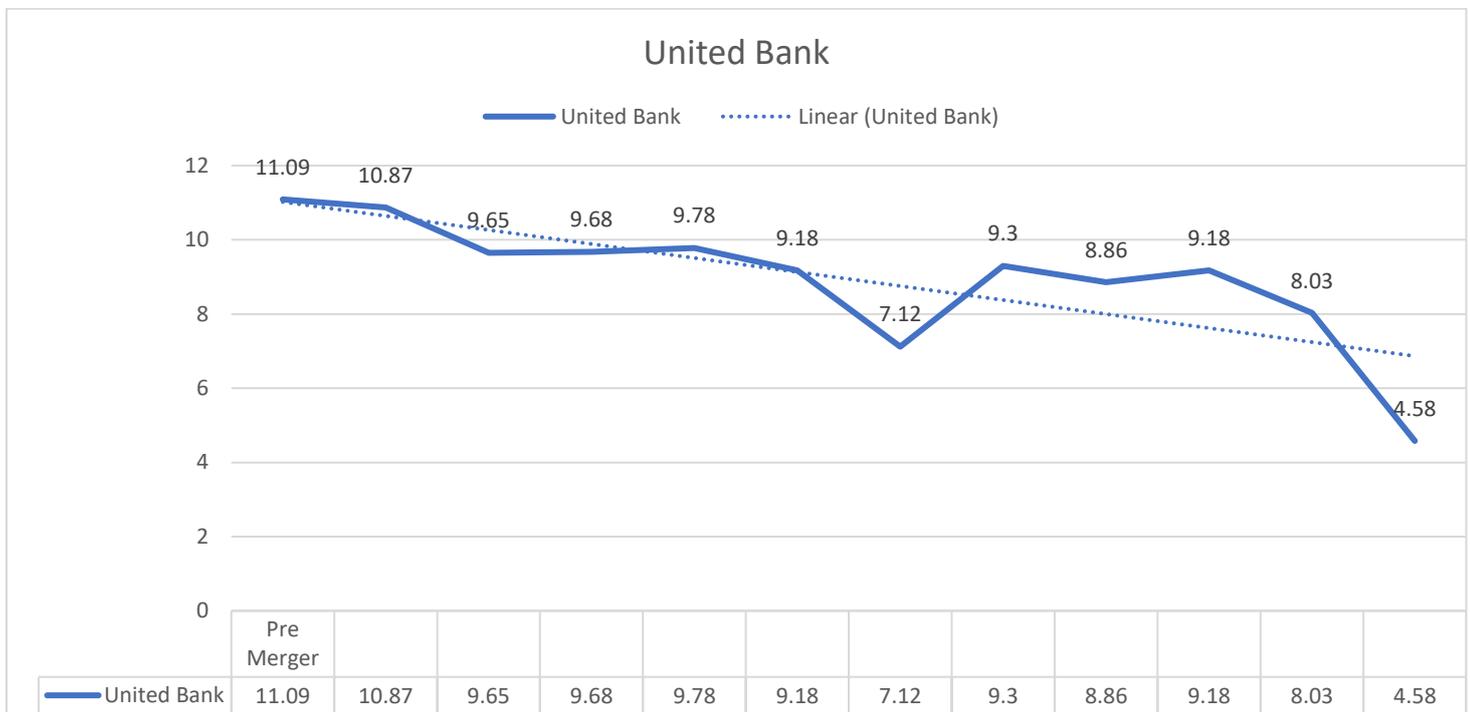


Figure 1.3

Figure 1.3 show the performance of share price of United Bank for last one year, here we can see that the value of share price of united bank was decreasing rapidly as, the value of the share price of the United Bank decreased from 11.09 to 4.58 in period of one year.

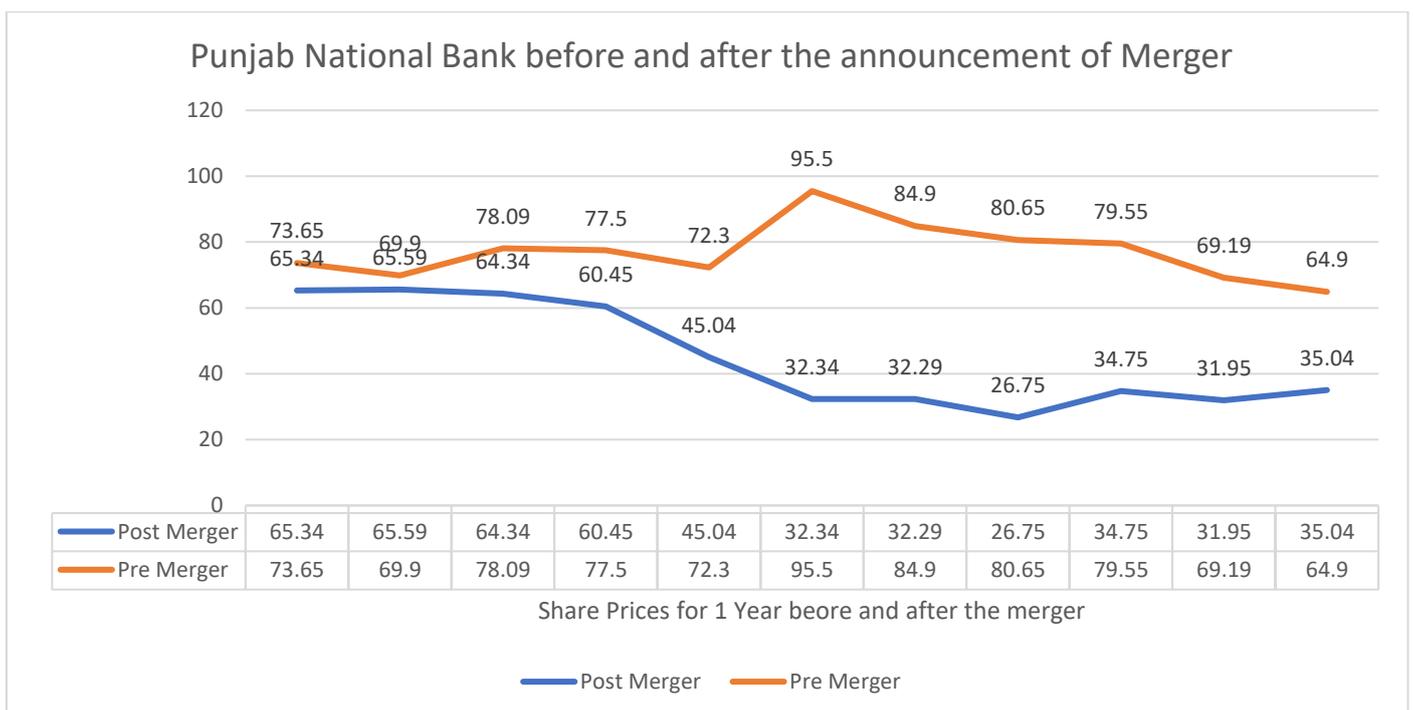


Figure 1.4

Above figure 1.4, compare the shows the value of share price of Punjab National Bank for one year before and one year after the announcement of the merger.

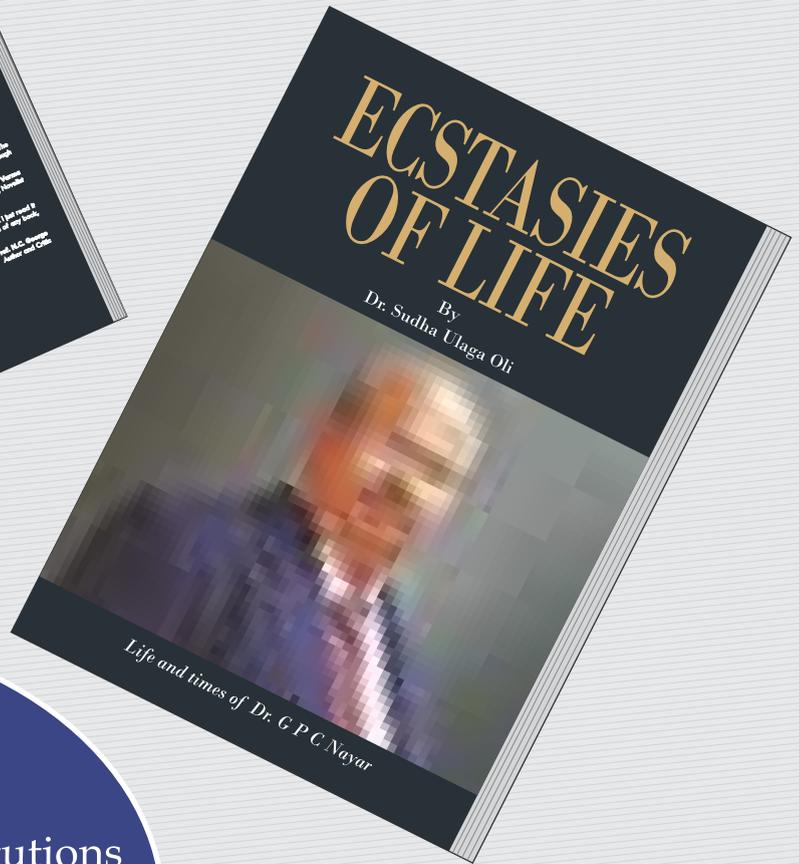
### **Findings and Conclusion of the study.**

This study was conducted to identify the impact of announcement of merger on the wealth of the share - holders of the bank in short term and long term. To identify the changes in the share prices of the bank a comparison has been done in the share prices of the Punjab National Bank for one year before and one year after the merger announcement of the banks. From the comparison of the share prices of Punjab National Bank in the period of one year before and after the announcement of the merger we observed from the line chart that the share prices of the Punjab National Bank were increased initially for next 3 months next after the merger announcement but after that the share prices of the banks drops drastically in period of one year as the share prices of the Punjab National Bank were dropped drastically from 65.34 to just 35.04 in one year only, there is a clear difference of 30.34 in the price of share of Punjab National Bank which is huge decline in the price of share. As the share prices of Punjab National Bank were initially increased with slow rate for 3 months after the announcement of merger it also increases the value of its shareholder's wealth so we can say that the announcement of merger is beneficial for the share-holders initially for the time of 3 months only but after 3 months share prices of the banks drops drastically, which result as the huge reduction in the wealth of the shareholders of the bank, therefore this study finally concludes that the announcement of merger Punjab National Bank increases the wealth of its share-holders therefore it has positively impacted the wealth of share-holders initially but as the share prices were reduced after 3 months drastically which result as the huge decline in the wealth of its shareholders it has an overall negative impact on the wealth of shareholders Punjab National Bank.

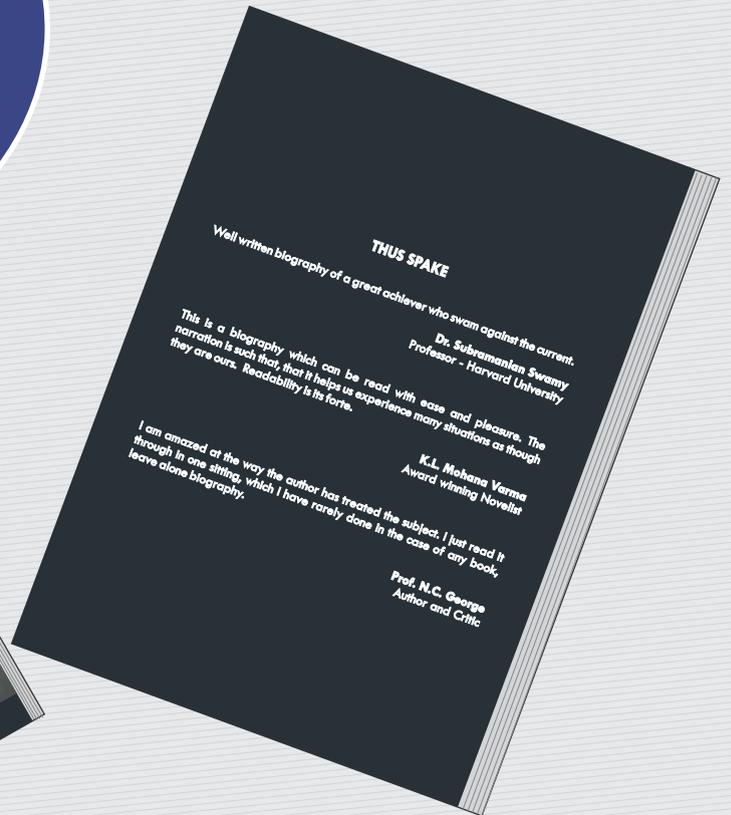
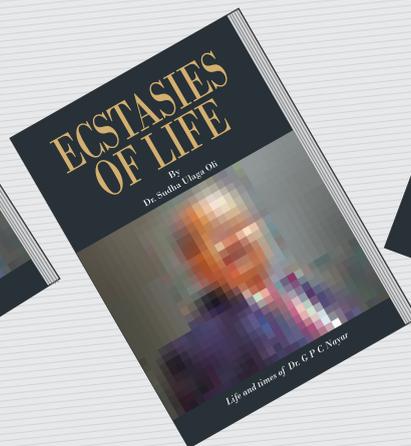
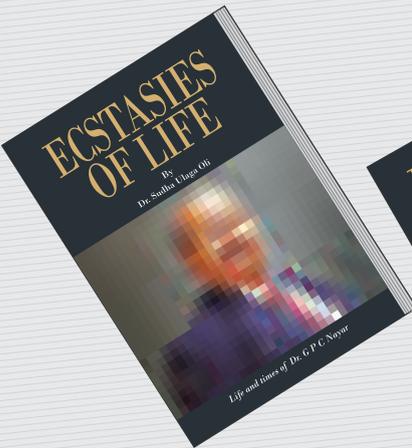
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## Chairman's Overview

The divide between human and machine is narrowing with every major advance in technology. On one side is Elon Musk's Neuralink developing neural laces to provide a common interface between human brains and digital technology, while on the other side, technologies such as artificial neural networks try to mimic human brain functioning in machine learning. Our lead article, this time about the applications of Artificial Neural Networks in accounting and finance, offers a fascinating glimpse into the literature published in this area and points out possible directions for future research.

As the world economy grapples with the long term effects of the pandemic induced slowdown, the second article in the issue offers empirically backed insights into risk mitigation strategies for investors. The authors investigate long- term and short- term BRICS Bond Market Integration through a variety of analytical tools and come up with some interesting findings and recommendations.

E-HRM and the factors that affect its implementation in IT companies is another study that is especially relevant to these times of increasing work from home culture. This issue also features a good mix of articles on subjects ranging from working capital management in the healthcare industry to earnings management in the banking industry. We have interesting perspectives on how employee demographics influence employee engagement, how goal setting is perceived by employees and the outcomes of such goal- setting, as well as how reward systems in public sector companies influence employee commitment. A qualitative study that explores identity construction and its effect on the subjective wellbeing and quality of life of aged women, as well as a comprehensive study on stock market integration across 35 indices in 5 continents, rounds out the collection of scholarly literature offered for your perusal.

I am confident that this issue will be truly informative and educative to our readers.

**Dr. G. P. C. NAYAR**

Chairman, SCMS Group of Educational Institutions.

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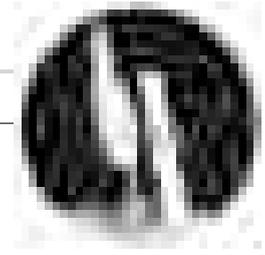
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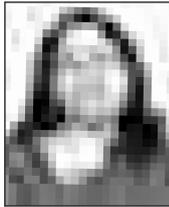


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## Editorial

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### Transformation through Disruption



Three months into 2021, as the new financial year is being ushered in, with the positive notes of large scale development and distribution of effective vaccines, it is finally possible to hope that normality will return with time, though the definition of what is normal will be changed forever. It is up to each individual and business to take on the challenge of embracing the new normal and making it one that is better and more humane.

Grappling with the crisis brought in by the pandemic has given business schools across the world a never-before opportunity- that of using real-time, real-world experiences that each individual is experiencing, as case studies, for teaching students' crisis management principles. The world has, in effect, become a gigantic case study- one that is replete with takeaway lessons for anyone with a mind that is willing to think, question and learn from the life unfolding around them. Businesses are coming out of the worst of the pandemic with new lessons learnt and fresh insights on the possibilities of managing disruptions and emerging stronger.

In many ways, this change is for good. There has been an opportunity for introspection and for re-evaluating the accepted norms and procedures followed. Hybrid delivery of classes- with a combination of offline and online sessions, seems to be increasingly preferred. Students are encouraged to be increasingly self-reliant in their learning, and physical classes are used as a platform for discussing and putting into practice what they have learned. The shakedown should result in the academic world re-evaluating its course contents and assessing whether students are actually learning the skills that it takes to navigate a world of uncertainty. We are witnessing the birth of a new culture- one that is characterized by a questioning of how things have always been done, to one that is willing to embrace the 'ifs' and 'buts', and grow and become stronger with the challenges.

**Dr. Radha Thevannoor**

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# A Meta-Analysis of the Application of Artificial Neural Networks in Accounting and Finance

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Artificial Neural Networks (ANNs) have emerged as a robust technique of forecasting and prediction in almost every part of the business. This study explores the development of ANNs over a period of time and provides an extensive and exhaustive literature review on the applications of ANN in various fields of accounting and finance, such as stock market prediction, bankruptcy, and many others. The findings of the study support the superiority of the ANN model over conventional statistical techniques in prediction, such as Linear Discriminant Analysis (LDA), Logit Model, etc. However, determining the optimal architecture of an ANN model is a time consuming and difficult process. The novelty of this study lies in the fact that there is a dearth of literature on applications of ANNs in some sub-areas of accounting and finance, namely time series forecasting, specifically in foreign exchange and commodity markets. Thus, ANN application can be explored in these sub-areas of accounting and finance.

**Keywords:** *Neural Networks (NNs), Artificial Neural Networks, Meta-Analysis, Bankruptcy, Stock Market Prediction.*

## 1. Introduction

“Artificial Neural Network is a system of hardware and software patterned after the operation of neurons in the human brain. It builds a relationship in the form of data through a process that mimics the way a human brain operates.” Artificial Neural Networks are dynamic in nature as they can adapt to changes in output so that they provide the best possible result without changing the input nodes. ANNs have shown huge potential in the field of finance where they are used for various purposes to enhance the productivity of the business in the global arena. ANN follows a series of algorithms that helps in finding the underlying relationship between the output and input variables. ANN consists of several neurons or nodes that are operated in parallel and arranged in layers or tiers. The layers are highly connected as each node from the tier N is connected to subsequent tiers N+1. The first layer receives raw input and transfers it to the preceding layer to generate the desired output, and the middle layer is called the hidden layer, which is responsible for connecting the first layer, i.e., the input layer and the last layer called the output layer. However, the number of nodes and layers depends on the desired accuracy to be achieved and also the complexity of the problem. Also, there can be a series of nodes in the output layer which forms an image in the readable format. In ANN, each node carries a weight that entirely depends on values that contribute to getting the correct answers. In other words, nodes that contribute to getting the desired results are awarded higher weights in comparison to nodes that don't. Initially, nodes are flooded with huge chunks of data and output is told to the network in advance. With advantages also come drawbacks and ANN is the one that is unaffected by this curse as the assumptions people make that causes bias during training has evolved as the biggest threat for the practitioners. If the data feeding is not neutral – the machine propagates bias.

Many scientists, practitioners and academicians have developed models based on ANNs in the past. The first computational model of Artificial Neural Networks, popularly called threshold logic which was based on mathematics and algorithms, was developed by Warren McCulloch and Walter Pitts in 1943. It splits the ANNs research into two approaches. The first approach was related to the biological process in the human brain, and the second approach was related to the application of ANNs. Later, Minsky and Papert (1969) discovered two critical issues with the Artificial Neural Network technique. The first one

was the ability of the machine to solve complex problems, and the second was the incapability of the computers to run large ANN models efficiently. This brought a slowdown in research on ANNs till the machines got fast processing circuit boards.

Due to its ability to learn and model non-linear relationships, its usage has gained popularity in different fields of business. They also allow users to build a strong and reliable model that can help in predicting future events. Nowadays, it is being used to check the reliability of a business plan, recognition of human faces, speech, characters and so on. Also, it is widely used in various areas of finance such as prediction of stocks, evaluation of loan application, analyzing the credit-worthiness of customers and many more. However, there is a dearth of review articles that combines the various applications of the ANN model in accounting and finance. Moreover, the authors believe that there is a great demand for comprehensive review articles that combine the various methods and current studies. Therefore, this study analyzes the various applications of the ANN model in different fields of accounting and finance.

This paper presents a review of articles comparing numerous models of ANN and conventional statistical techniques. Section 1 represents the introduction of the study, and section 2 consists of relevant literature in different areas of accounting and finance. The results of the study have been presented and summarized in section 3; section 4 deals with the future scope for research, and the last section deals with the conclusion part of the study discussing certain issues pertaining to ANN models.

## 2. A Review of Literature

Over the past few years, the usage of ANN has gained popularity due to its distinct ability to detect the underlying relationship between different sets of data. However, there are various factors that determine the accuracy of ANNs, which include the choice of input variables, architecture selected for a specified problem, training pattern of ANNs, etc. Thus, it becomes significantly important to study these factors before building an Artificial Neural Network. Also, various studies conclude that ANNs have provided a better statistical technique in forecasting when compared with other conventional prediction models. However, some studies also reveal that traditional statistical tools have outperformed ANNs in forecasting. Thus, it becomes important to identify the key areas where ANNs have shown good potential. This section provides a brief overview of applications of ANN in various areas of accounting and

finance, namely bankruptcy prediction, stock market prediction and other applications.

### **2.1. Bankruptcy Prediction**

Much of the research has been done on bankruptcy prediction as detection of accounting frauds, and bankruptcy is an important measure to evaluate a firm's performance. In the study of Odom et al. (1990), an analysis was performed on ratios using both discriminant and artificial neural network techniques. The authors have used the predictive abilities of both the models and the results show that neural networks might apply to this problem. Salchenberger et al. (1992) made a comparative analysis between a logit and ANN model, and to reduce the dimensionality of the model; the authors employed stepwise regression on twenty-nine variables resulting in five significant variables. The findings of the study reveal the ANN model has outperformed the logit model in terms of forecasting bankruptcy. Furthermore, the authors reported a reduction in type I and an increase in Type II error.

Tam and Kiang (1992) introduced a neural network approach to perform Linear Discriminant Analysis (LDA). They compared the performance of the ANN technique with linear classifier, logistic regression, k-Nearest Neighbour and ID3. The results show that ANN is a promising technique having the ability to outperform other traditional statistical models, especially in evaluating bank conditions. However, there are certain limitations too that includes limited interpretation ability of weights and computation time etc. The authors have also quoted that it is necessary to test the on-line capabilities before the full potential of ANNs is asserted.

One year later, Fletcher and Goss (1993) stated that ANN provides a better and accurate view of the given data. The author has used two methods to ascertain the firm's performance and stated that ANNs are more statistically accurate and viable than logit function as it has less variance and lowers forecasting risk as determined by the coefficient of variation. However, both methods failed to predict the performance of the firms implying the presence of missing explanatory variables in the model. After one year, Wilson and Sharda (1994) explained that the ANNs are better at forecasting the bankruptcy of firms in comparison to the traditional discriminant model. The author used five

variables and achieved 97% accuracy. The study argued that the number of variables has a direct relation with the accuracy of NNs, i.e. larger the number of variables higher will be the accuracy. However, NNs failed to predict correctly in the case of non-bankrupt firms due to limitations in the data set, methodology, and training. Still, when NNs were provided with balanced data sets, they outperformed discriminant analysis in forecasting non-bankrupt firms.

Later, in the same year, Fanning and Cogger (1994) determined two basic interpretations, ANNs should be viewed as a potential competitor, especially in the area of predicting financial distress of the firms and- ANNs can outperform other existing models that can be used in prediction. ANNs can be capitalized in the arena of forecasting as they are capable of exploring the underlying relationship between different data sets. The authors quoted that NNs have good potential that can be used in several other areas of business. Yang et al. (1999) examined four different methods to predict bankruptcy using financial ratios of the U.S. oil industry. Fisher Discriminant Analysis, back-propagation NN and probabilistic NN with and without patterns were used to determine the bankruptcy of firms, particularly in the oil industry, using deflated and non-deflated data. The authors quoted that the back-propagation NN model managed to achieve the highest accuracy using non-deflated data and the possible reason inferred was it predicted non-bankruptcy only. Another important finding of the study was that the discriminant analysis technique obtained the best results when using deflated data sets in both bankrupt and non-bankrupt firms.

Further, Zhang et al. (1999) explained that ANN techniques are superior to traditional statistical methods of prediction. In his study, the authors used the ANN technique to predict the bankruptcy of firms and also quoted that a better understanding of causes can substantially impact the financial and managerial decision-making process. The findings of the study reveal that ANN is the only known model that makes use of posterior probability to determine the underlying relationship of the unknown population. The study used a cross-validation technique to verify the robustness of neural classifiers, and the results reveal that ANNs are quite robust. The study also compared logistic regression with the ANN technique for classification purpose, and the results were very encouraging as ANNs were significantly superior to logistic regression in

determining the classification rate of the unknown population.

Charalambous et al. (2000) proved that ANNs show superior results in comparison to traditional methods of prediction in the current scenario. However, the author also argued that the reliability of the model majorly depends on the complexity of the problem and variables used, but researchers can apply the ANNs to their problems to find whether they indeed provide better results than commonly used statistical methods or not. Atiya (2001) explained that ANNs are better techniques, especially in predicting stock prices. However, the author also said that improvements must be made by way of better training methods, inputs, and architecture. The study showed this by improving the inputs resulting in improved performance of ANNs. Two years later, Lin et al. (2003) stated that Fuzzy Neural Networks (FNNs) outperformed other statistical models, and the performance of FNNs was compared with the logit model using fraudulent and non-fraudulent firm's data set. Both models have proved their potential in classifying non-fraud cases that will, in turn, enhance the validity and efficiency of the audit. However, the authors also quote that the Logit model was slightly better in forecasting non-fraud cases, and at the same time, FNN was substantially better than the Logit model in predicting fraud cases. Overall, when compared with other conventional statistical methods of forecasting, FNN was better in assessing the risk associated with the fraudulent firms. The study also recommends the auditors to implement these techniques as they offer the great potential that can enhance the effectiveness and efficiency of the audit.

West et al. (2005) explained ensemble ANNs are better predictors than "Single best" multilayer perceptron models, and this fact was supported by examples of three real-world financial data sets where generalization error was reduced by 3-4%, which is a significant reduction statistically. The author evaluated bagging and boosting strategies on the same data set and found bagging was more effective than boosting with the fewest number of variables and least noise. Later, Alfaro et al. (2008) compared two classification methods and showed improvement in accuracy that AdaBoost achieved against ANNs. The authors used these technologies to ascertain the corporate bankruptcy using financial ratios, and the results of the study indicate that the AdaBoost algorithm outperformed

the ANN technique both in the cross-validation and test set estimation in the classification error because AdaBoost makes use of a modified version of the training set to build consecutive classifiers. Also, the authors used accounting-based variables, the size of the firm, the industry and the organizational structure as inputs to evaluate the financial performance of the firm.

Celik and Karatape (2007) examined the performance of ANN in forecasting banking crises. The authors indicated by using a 25 input neurons ANN model that ANN is capable of forecasting banking crises, and ANN can be used for developing effective policies for the banking sector. Kim and Kang (2010) proposed an ensemble neural network for enhancing the performance of conventional ANN models for predicting bankruptcy. The results of the study indicate that the bagged and boosted ANN is a better predictor than traditional ANN models. Particularly, bagged ANN produced better accuracy than other classifiers. Also, the authors recommended more algorithms for future research. Rafiei et al. (2011) made the comparison of ANN, GA, and MDA for bankruptcy prediction. The results of the study indicate that the ANN is better than the other two models. However, the Genetic Algorithm has also evolved as a powerful technique of prediction. Olson et al. (2012) compared the forecasting ability of decision tree algorithms, artificial neural networks and support vector machines. The results of the study indicate that decision trees are more powerful predictors than ANN and SVM. Also, the authors indicate there were more rule modes than desired.

Lee and Choi (2013) analyzed the performance of ANN and MDA for a "multi-industry bankruptcy prediction model". The results indicate an ANN model outperformed the traditional MDA technique. Also, the authors quote the results will partially overcome the limitations of ANNs. Bredart (2014) developed a model to predict the bankruptcy of small and medium enterprises by using three financial ratios that are easily available and achieved 80 percent accuracy. Iturriaga and Sanz (2015) proposed a model based on ANNs to predict the bankruptcy of U.S. banks. The authors took into consideration some specific features of the financial crisis of 2014. Also, they combined multilayer perceptrons and self-organizing maps that can access the insolvency up to three years before bankruptcy occurs. The results reveal the proposed model to be more accurate due to the following reasons. First, the developed model has

outperformed other statistical tools. Second, it provides a better visualization of the complex structures. Third, it is simpler than other models proposed in the previous studies. However, the authors have also explained certain limitations that limit its usage.

Duan (2019) quoted that NNs can outperform traditional statistical tools. The author used Multi-Layer Perceptron (MLP) consisting of three hidden layers trained by the back-propagation algorithm to predict loan default. The study classifies the loan application into three categories: safe loan, risky loan and bad loan. The results of the study reveal that the accuracy level of MLP was much better than the conventional logistic model and the commonly used MLP with one hidden layer.

## **2.2. Stock Market Prediction**

During the past few decades, a precise prediction of the stock price has become a significant issue. Thus, ANN models are used extensively to predict stock price movement more precisely and accurately. Yoon et al. (1991) quoted that the precise forecasting of a stock price is a difficult and complex proposition. The findings revealed that artificial neural networks are capable of learning a function that maps input to output and encoding it in the magnitudes of the weights in the network's connection. The number of hidden layers employed in the model contributed to achieving a certain amount of viability. Also, the increase in the number of hidden units resulted in higher performance. However, additional hidden units beyond the point impaired the model's predictive performance. Furthermore, the results of the comparison reveal a superior performance of the ANN model than the MDA approach.

Chen et al. (2001) proposed that Probability Neural Networks (PNNs) have shown great potential in forecasting stock price movement as compared to the GMM-Kalman filter and the random walk model. The results of the study reveal that PNN guided trading strategies have obtained higher returns in comparison to strategies suggested by other models. The authors also recommend that Probability Neural Networks (PNNs) capability can be increased by including the threshold levels. Three years later, Cao et al. (2004) explained the superiority that ANNs have established over a period of time in predicting stock prices. ANNs indeed do provide an opportunity for the investors to

enhance their predictive ability that can, in turn, increase profitability. The findings of the study also suggest that the univariate model has shown more potential than multivariate models in predicting stock prices and also recommends using macroeconomic variables like volume; economic indicators can significantly enhance the accuracy estimates of NNs.

Kim and Lee (2004) proposed a genetically transformed ANN for stock market prediction. The results reveal that the proposed methodology is significantly better than the models considered for comparison in this study. Zhang and Wu (2009) proposed an integrated model consisting of IBCO and BPNN for the prediction of various stock indices. The authors used the IBCO algorithm to adjust the weights of the BPNN network and achieved better results than the traditional BPNN model. Further, Hadavandi et al. (2010) proposed a novel methodology based on the Genetic Fuzzy System and SOM Clustering for predicting stock price. In their study, the authors used the three-stage method to model the proposed structure. In the first stage, they used stepwise regression to choose significant variables, then in the second stage, they categorized the data into  $k$  clusters by SOM method, and in the last stage, they fed the clusters into a genetic fuzzy network to build the proposed model and validated the results using real-life datasets. In the end, the authors concluded that the proposed method outperforms all other models held for comparison. One year later, Guresen et al. (2011) compared simple MLP, DAN2 and Hybrid models that used GARCH to define input variables and reported that simple MLP outperforms the other two models in predicting NASDAQ stock exchange prices and recommended focusing on improving the architecture of DAN2 and hybrid models to improve accuracy measures.

Kara et al. (2011) analyzed the performances of ANN and Support Vector Machines (SVM) to predict the stock price movement. The results of the study clearly reveal the potential of the ANN model in determining the stock price movement in comparison to SVM with an average accuracy of 75.74%. Ticknor (2013) introduced a novel technique that combined the Bayesian regularization and ANN for predicting stock prices. The results of the study reveal the proposed methodology solves the problem of overfitting and local minima than commonly used ANNs. Later, Qiu et al. (2016) examined the NN approach to predict the return on

NIKKEI 225. The authors selected seventy-one variables with respect to the Stock Index of Japan, and then they made new combinations of eighteen input variables by fuzzy surfaces. The results showed that eighteen selected variables were capable of successfully predicting stock prices on NIKKEI 225. For selecting the best model, the authors conducted an experiment of nine hundred parameter combinations using the Back Propagation (BP) Algorithm. Also, the authors used a hybrid approach based on the Genetic Algorithm (GA) and Simulated Annealing (SA) that significantly enhanced the prediction ability of ANNs and outperformed the traditional BP algorithm.

Moghaddam et al. (2016) evaluated different architectures to predict the NASDAQ stock index. The results reveal that the network with 20-40-20 neurons has produced the highest level of accuracy. Inthachot et al. (2016) proposed a hybrid methodology for predicting the stock prices of Thailand's stock index. The results of the study indicate the proposed model is better than the previous model in terms of predicting stock prices. Ghasemieh et al. (2017) analyzed the performance of the ANN model using metaheuristic algorithms, and the results suggest that particle swarm optimization outperforms all other algorithms considered for a study that is cuckoo search, improved cuckoo search, improved cuckoo search genetic algorithm, and genetic algorithm.

Later, Alonso et al. (2018) explained the benefits of deep learning and the advantages that users can take while using it. The authors evaluated different ANN models to achieve the highest level of accuracy in time series and Long Short Term Model (LSTM) to be best suited because of the fact that autocorrelations, cycles, and non-linearity are present in time series. Furthermore, time-series data exhibits other challenging features such as estimations and non-stationarity. However, Eltman ANNs are also good candidates, but LSTMs have performed better in non-financial problems. Also, the authors have quoted it is not the performance of the LSTM, which is significant; the LSTMs have shown consistency in their predictions. In the end, the authors have concluded that LSTMs are powerful techniques in forecasting time series. Menon et al. (2018) stated that CNN outperformed all other models considered for the study. Furthermore, the author concluded that there exist underlying dynamics between the National Stock Exchange (NSE) and the New York Stock Exchange (NYSE).

### ***2.3 Other Applications in Accounting and Finance***

Other applications include time series forecasting, foreign exchange prediction, etc., which is a relatively new area of application for ANN as much of the research has focused on bankruptcy and stock market prediction. Jensen (1992) examined "the making and training of ANN to analyze the creditworthiness of the loan applicants is the practical and easy approach" The Author used 100 sample loan applications to train them and still achieved around 75-80% accuracy. The research has also highlighted the effectiveness of ANNs in forecasting. It is economically viable against other statistical methods of prediction. Later, Leung et al. (2000) examined the forecasting ability of a specific ANN architecture called the general regression neural network (GRNN) and compared its performance with numerous forecasting techniques, including a multi-layered feedforward network (MLFN), multivariate transfer function, and random walk models. The findings of the study reveal that GRNN achieved a higher degree of prediction accuracy but also performed significantly better than other models considered for the study. Later, West (2000) analyzed the prediction accuracy of ANN models for credit scoring applications by considering two real financial data sets. The results of the study suggest that ANN credit scoring models can enhance their accuracy level ranging from 0.5 to 3% by using advanced training methods and improved modelling skills. The author also suggests that radial basis ANNs and the mixture of experts are more accurate than other prevailing models in predicting the credit score of the applicant.

Further, Yao and Tan (2000) used the ANN technique to forecast the movement of exchange rates of the American dollar with respect to five major currencies "Japanese Yen, Deutsch Mark, British Pound, Swiss Franc, and Australian Dollar". The results are very encouraging for most currencies except Yen, and the reason could be the market of Japanese Yen is vaster and developed in comparison with other currencies selected for reference. The authors also recommend that ANNs can be best used when dealing with the real trading dataset. The findings of the study suggest using a more robust approach than Mean of Squared Errors (NMSE) for evaluating the performance of Neural Networks. However, sometimes it is important to have a small NMSE for testing and validation purpose. Later, Walczak (2001) analyzed that Neural Network incurs cost. It

can be in the form of money, time and effort. During his study, the author focused on training ANNs and argued that typically a Neural Network takes around 1 to 2 years to produce the best results through the back-propagation algorithm.

One year later, Nag and Mitra (2002) explained that ANNs had proved superiority over traditional statistical models in forecasting exchange rates in the past few decades. However, researchers argue that there is no theory available on the model building process as it depends on the decision of the model builder to choose an optimal number of hidden layers and a number of neurons in hidden and input layers to find the best solution. Therefore, the authors used a genetic algorithm optimization technique to overcome the shortcomings of traditional ANN models. The findings of the study revealed the potential of the proposed approach over conventional ANNs in forecasting foreign exchange rates. The researchers also quote that the proposed model is best suited to find the optimal topology of NNs, and further Malhotra and Malhotra (2003) compared the performance of Multiple Discriminant Analysis (MDA) and Artificial Neural Network in identifying potential loans. The findings of the study show that the ANN techniques consistently perform better than the MDA models in identifying potential loans and alleviating the problem of bias in the training set, and to examine the robustness of the model in identifying bad loans, the authors cross-validate the results through seven different samples of the data. In the same year, Zhang (2003) used a hybrid methodology consisting of ARIMA for linear modelling and ANN for non-linear modelling. The author concludes that the proposed hybrid methodology is significantly better than the traditional ANN model. Also, the authors validated the results by considering real-life data sets.

Later, Kumar and Bhattacharya (2006) stated ANNs outperformed Linear Discriminant Analysis (LDA) in both training and tests partition as they are capable of handling complex data sets and can be even employed to unseen data as it has the potential to determine the underlying relationship between the target and input variables. However, the author employed both techniques to check the credit score of companies by using financial statements and found NNs achieved a 79% accuracy level and the LDA technique achieved a 60% accuracy level which is very low

statistically. Also, the findings of the study suggest carefully choosing the variables after addressing the problem of multicollinearity in order to enhance the validity and reliability of the model. Weizhong (2012) proposed an automatic ANN modelling scheme that made use of a special type of network called GRNN. The author introduced several design parameters to automate the process of modelling ANN for time series forecasting. In the end, the results of the study conclude that GRNNs are robust and potentially good candidates for the automatic ANN modelling process.

Later, Wang et al. (2015) proposed the ADE-BPNN model to enhance the prediction accuracy of traditional BPNN. In their study, the authors concluded that ADE-BPNN outperforms conventional BPNN and statistical tools such as ARIMA in time series forecasting. Also, the authors validated the results by using two real-life cases. Khandelwal et al. (2015) proposed a novel methodology for time series forecasting that combines the unique features of Discrete Wavelet Transform (DWT), ARIMA and ANN. The results of the study were compared with Zhang's hybrid model and found to be significantly better. Parot et al. (2019) analyzed the performance of the hybrid model to forecast EUR/USD returns. The results of the model indicate that the proposed methodology is better than the traditional and classical forecasting models. Also, the authors recommend that post-processing is significant for increasing forecasting accuracy. Cao et al. (2019) introduced a novel methodology by combining the CEEDMAN and LSTM neural networks, and the results of the study indicate that the proposed method is better than other models used for comparison. Also, the authors say the proposed model can also be used for predicting other time series such as traffic and weather.

### 3. Findings

This paper presents a review of the application of ANN models in accounting and finance. The authors have reviewed 50 papers that have used ANN and other models to forecast in various areas of accounting and finance, namely bankruptcy prediction, stock market prediction and other applications such as time series forecasting, etc. An attempt is made to look at the literature more critically with respect to various criteria such as the number of variables, sample size chosen for the study, error measure, the model used in the study and the findings.

The articles discussed in the survey are summarized in tables 1-3. Each table provides a summary of each area in accounting and finance in order bankruptcy prediction, stock market prediction and other applications in accounting and finance. Each table consists of seven columns. Column 1 represents the year in which the study

was conducted, column 2 represents the names of the authors, column 3 illustrates the models used for the study, column 4 shows the number of variables, column 5 represents the sample size selected for the study, column 6 gives the error measure, and column 7 represents the findings of the respective studies.

**Table1: Applications of ANN in Bankruptcy Prediction**

Year	Author	RM	No. of Variables	Sample Size	Error Measure	Findings
1990	Odom and Sharda	NN and MDA	5	129	Confusion Matrix	NNs are better than MDA
1992	Salchenberger et al.	BPNN and LM	29	3479	Confusion Matrix	NNs outperformed Logit Model
1992	Tam and Kiang	NN, Linear Classifier, kNN, ID3 and LR	19, LR-14	236	Confusion Matrix	NN outperforms all three other statistical techniques
1993	Fletcher and Goss	BPNN and LM	3	36	Confusion Matrix, MSE	NN are better predictors than LM
1994	Wilson and Sharda	NN and MDA	5	129	Confusion Matrix	NN outperformed MDA
1994	Fanning and Cogger	GANNA, BPNN and LR	3	230	Confusion Matrix	GANNA outperformed the other two models
1999	Yang et al.	BPNN, PNN, FDA and MDA	5	122	Confusion Matrix	PNN is better than the other three models
1999	Zhang et al.	NN and LR	6	220	Confusion Matrix	NN outperforms LR
2000	Charamlambous et al.	LVQ, RBF and FFNN	7	139	Confusion Matrix	LVQ is better than the other two models
2001	Atiya	NN	5 and 6	911	Confusion Matrix	Proposed novel Indicators to improve performance of NNs
2003	Lin et al.	FNN and Logit	8	200	Confusion Matrix	Mixed Results
2005	West et al.	MLP, Cross-validation, Boosting, Bagging	24, 5	1000, 329	Confusion Matrix	Ensembles are better than single best MLP
2007	Celik and Karatape	ANN	25	350	RMS	ANN performs reasonably well.

2008	Alfaro et al.	AdaBoost and NNs	16	590	Confusion Matrix	AdaBoost outperforms NNs
2010	Kim and Kang	NN, Bagged NN, Boosted NN	32	1458	Type I and Type II	Bagged and Boosted NN is better than traditional NN.
2011	Rafiei et al.	ANN, GA and MDA	17	180	Confusion Matrix	ANN outperforms other models
2012	Olson et al.	Decision Tree, MLP, RBF, BPNN and SVM	18	1321	NA	Decision trees outperformed neural networks and SVM
2013	Lee and Choi	BPNN and MDA	46,40 and 58	6767	t-test	BPNN outperforms MDA
2014	Bredart	NN	3	3728	Confusion Matrix	NN achieves 80% accuracy
2015	Iturriaga and Sanz	MLP and SOM	32	386	ROC	The proposed model is better than other statistical techniques
2019	Duan	MLP and LM	28	887383	MSE, Confusion Matrix	MLP outperforms LM

Table 1 illustrates the application of ANN models in bankruptcy prediction. In most of the cases, the ANN model outperformed the other statistical models except for two. Olson et al. (2012) showed that decision tree algorithms are better predictors than ANN models and Alfaro et al. (2008)

showed the Adaboost algorithm is better than an artificial neural network. However, there are studies that compare the different kinds of ANN models. Also, it is clear from the table that the majority of the studies have used the confusion matrix as the most common error measure.

**Table 2: Applications of ANN in Stock Market Prediction**

Year	Author	RM	No. of Variables	Sample Size	Validation Method	Findings
1991	Yoon and Swales	NN and MDA	9	58	Confusion Matrix	NNs are better than MDA
2003	Chen et al.	PNN, RWM and GMM-kalman filter	4 and 6	128	Confusion Matrix	PNN outperformed the other two models
2004	Cao et al.	ANN and Fama and French's Model Fuzzy Transformation Model, Genetic	1 and 3	367	MAD, MAPE, SD, MSE	ANN is better than other statistical models
2004	Kim and Lee	Transformation Model, Linear Transformation Model	12	2348	Confusion Matrix	GTM outperform all other models
2009	Zhang and Wu	IBCO-BPNN and BPNN	1	2350	MSE	IBCO-BPNN outperformed BPNN

2010	Hadavandi et al.	Hybrid Model, ANN, ARIMA and CGFS	4	2047	MAPE	CGFS outperformed all other models
2011	Guresen et al.	MLP, DAN2, Hybrid models with GARCH	2	182	MSE and MAD	MLP outperform all other models
2011	Kara et al.	ANN and SVM	10	2733	RMS	ANN outperformed SVM
2013	Ticknor	Bayesian Regularized Artificial Neural Network (BRANN), ARIMA	6	734	MAPE	BRANN outperformed ARIMA
2016	Qiu et al.	BPNN and BPNN with GA and SA	18	180	MSE	The hybrid model outperformed traditional BPNN
2016	Moghaddam et al.	BPNN	5,10,20,40, 50,100,200	99	R-Square and MSE	Evaluated different architectures
2016	Inthachot et al.	ANN and GA	44	1464	MSE and MAPE	The hybrid Model outperformed the previous model.
2017	Ghasemieh et al.	ANN	28	1609	MSE	Particle Swarm Optimization Algorithm performs better than other algorithms
2018	Alonso et al.	NN and LSTM	50 and 53	560	MSE	LSTM is better than traditional NN
2018	Menon et al.	MLP, RNN, CNN, LSTM, ARIMA	NA	4861	MAPE	CNN outperform all other models

Table 2 illustrates the application of ANN in forecasting stock price. Over a period of time, different ANN models have been used for stock market prediction, and a comparative analysis is done with the other statistical

models and traditional ANN models. It is clear from the table that in recent times a hybrid model that combines two or more techniques has outperformed the traditional statistical techniques and conventional ANN models.

**Table 3: Other Applications of ANN**

Year	Author	RM	No. of Variables	Sample Size	Validation Method	Findings
1992	Jensen	NN	8	125	Confusion Matrix	NNs are quite practical and easy.
2000	Leung et al.	GRNN, MLFN, RWM	6	259	MAE and RMSE	GRNN outperformed all three models
2000	West	MOE, RBF, LVQ, FAR, MLP, kNN, LR, LDA, KD and CART	2 and 5	1000 and 690	Confusion Matrix	Mixed results

2000	Yao and Tan	NN and ARIMA	5 and 6	510	NMSE	NN outperformed ARIMA
2001	Wakczak	BPNN	2 and 3	125	Confusion Matrix	BPNN incurs cost
2002	Nag and Mitra	GANN, FGNN, ARCH, GARCH, EGARCH, AGARCH	NA	250	AAE, MAPE, Max AE, RSQ, MSE	GANN is better than other models
2003	Malhotra and Malhotra	MDA and NNs	6	1078	Confusion Matrix	NN outperformed MDA
2003	Zhang	NN and Hybrid Model	4	1133	MAD and MSE	Hybrid model outperformed NNs
2006	Kumar and Bhattacharya	LDA and ANN	25 and 8	129	Confusion Matrix	ANN is better than LDA
2012	Weizhong	GRNN	12	111	sMAPE	GRNNs performed well
2015	Wang et al.	BPNN and ADE-BPNN	12	168	RMSE, MAPE, MSE	ADE-BPNN outperforms BPNN
2015	Khandelwal et al.	DWT, ARIMA, ANN and Zhang's Hybrid Model	4	1133	MSE and MAPE	Proposed model outperformed all other techniques
2019	Parot et al.	ANN, VAR, VECM	20	4242	RMSE, MAE, MAPE	Proposed model is better than classical models
2019	Li et al.	CEEDMAN, LSTM, SVM and MLP	9951	128	MAE, RMSE and MAPE	The Proposed model is better than other models

Table 3 illustrates the application of ANN models in other areas of accounting and finance which includes time series forecasting and exchange rate prediction. Various models have been studied by the researchers and a comparison is made with other ANN models. The table shows a recent trend of using hybrid models instead of traditional ANN models.

**Table 4: Frequency of error measures used**

Error Measure	No. of Papers
Confusion Matrix	24
MSE/RMSE/NMSE	16
MAPE/MAE/MAPE/AAE	12
MAD	3
RMS	2
R square	2
ROC	1
Type I and Type II	1
t-test	1
SD	1
Max AE	1

Table 4 illustrates the error measures used in the studies to compare the performance of different techniques. Confusion matrix has been used most frequently, followed by MSE/RMSE/NMSE.

#### 4. Future Scope and Limitations

The present study has further scope for more comprehensive results. It can be explored in other areas of accounting and finance as there is a dearth of literature on applications of ANNs in other areas of accounting and finance such as time series forecasting, foreign exchange rate prediction and commodity market prediction. Furthermore, a comparative analysis can be done by comparing the forecasting accuracy of traditional ANN models and the hybrid models that combines two or more techniques. Also, the current study can be performed using different techniques such as the PRIMA method, bibliometric analysis, systematic analysis, etc.

Though ANN models find applications in a wide spectrum of areas like geo-engineering, marketing, operations etc., but the scope of this study is limited to applications of ANNs in the finance and accounting domain. Another limitation of this study is that it reviews research articles published over

the last three decades. Despite this limitation, the present study covers the entire gamut of applications of ANNs in accounting and finance.

#### 5. Conclusion

In this study, we have carried out a comprehensive literature review on the evolution of artificial neural networks over a period of time and the application of ANN models in various domains of accounting and finance. Since artificial neural networks have gained popularity over the last three decades due to which they have been applied to different domains. The review clearly points out the superiority of artificial neural networks over the conventional statistical models for classification and prediction problems. However, there have been studies where traditional statistical models outperformed the artificial neural network technique. One of the biggest advantages of this technique is it can model any non-linear function. This aspect is particularly useful where the relationship between the variables is unknown, as in the case of prediction of stock prices. However, the determination of various parameters like the number of hidden layers, number of nodes within the layers, the number of input variables is not straight forward and finding the optimal architecture is a time-consuming process.

Another disadvantage highlighted in most of the studies is the lack of interpretability of the weights obtained during the model building process. In this respect, the traditional statistical model stands out as they offer an interpretation of variables, and inferences can be drawn based on these variables. Further, most of the studies have compared the neural network with other statistical models such as logistic regression, linear discriminant analysis and artificial found neural networks to be more effective as they were capable of handling non-linear datasets and establish a relationship between them more precisely. This is particularly so because the performance of these conventional statistical models depends on the validity of the assumptions, which is not considered in the majority of the studies. Also, in most of the articles, the architecture of artificial neural networks is selected by trying out various models on the training data set, which is not done in the case of traditional statistical techniques. Furthermore, various studies have combined the artificial neural network technique with other statistical models and algorithms to enhance the predictive and classification ability of artificial neural networks, and results are very encouraging as they help in lowering down the error

rate by 3 to 5%, which is significant statistically. Therefore, the authors conclude that ANN has shown potential in the field of prediction, specifically in accounting and finance and outperforms the traditional statistical techniques. However, the predictability or accuracy level depends on the understanding of the problem statement. Thus, utmost care should be taken while designing the ANN model for a given problem.

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## Appendix

**The abbreviations used in tables 1 - 4 are described below:**

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Notation	Meaning
LR	Logistic Regression
MDA	Multivariate Discriminant Analysis
k-NN	k-Nearest Neighbour
NN	Neural Network
ANN	Artificial Neural Network
LM	Logit Model
BPNN	Back Propagation Neural Network
GANNA	Generalized Adaptive Neural Network Architectures
PNN	Probability Neural Networks
FDA	Fisher Discriminant Analysis
LVQ	Learning Vector Quantization
FFNN	Feed Forward Neural Network
FNN	Fuzzy Neural Network
RBF	Radial Basis Function
GA	Genetic Algorithm
MLP	Multilayer Perceptron
SVM	Support Vector Machine
SOM	Self-Organizing Maps
BRANN	Bayesian Regularized Artificial Neural Network
LSTM	Long Short Term Memory
CNN	Convolutional Neural Network
ARIMA	Auto Regressive Integrated Moving Average
GARCH	Generalized AutoRegressive Conditional Heteroskedasticity
RNN	Recurrent Neural Network
GFS	Genetic Fuzzy Systems
RWM	Random Walk Model
GMM	Generalized Methods of Moments
IBCO	Improved Bacterial Chemotaxis Optimization
DAN2	Dynamic Artificial Neural Network
GRNN	General Regression Neural Network
MLFN	Multi Layered Feed forward Network
MOE	Mixture of Experts
FAR	Fuzzy Adaptive Resonance

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KD	Kernel Density estimation
GANN	Genetic Algorithm Neural Networks
FGNN	Fixed Geometry Neural Networks
EGARCH	Exponential Generalized AutoRegressive Conditional Heteroskedasticity
AGARCH	Asymmetric Generalized AutoRegressive Conditional Heteroskedasticity
VECM	Vector Error Correction Model
CEEDMAN	Complete Ensemble Empirical Mode Decomposition with Adaptive Noise
ADE	Adaptive Differential Evolution
VAR	Vector AutoRegression
DWT	Discrete Wavelet Transformation
LDA	Linear Discriminant Analysis
MSE	Mean Squared Error
RMSE	Root Mean Squared Error
NMSE	Normalized Mean Squared Error
MAPE	Mean Absolute Percentage Error
MAE	Mean Absolute Error
ROC	Receiver Operating Characteristic Curve
SD	Standard Deviation
Max AE	Maximum Absolute Error
MAD	Mean Absolute Deviation
AAE	Average Absolute Error
sMAPE	Symmetric Mean Absolute Percentage Error

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# An Empirical Analysis of BRICS Bond Market Integration

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## A b s t r a c t

This paper aims to understand the financial linkages and interdependence of BRICS (Brazil, Russia, India, China and South Africa) nations through the Government security market considering the 10-year bond yield. Long-run and short-run linkages among the 10-year bond yield of these countries are investigated using Johansen and Juselius' co-integration method. Interdependence and Causal relationship are further explored using correlation, cross-correlation, Granger causality test and Wald test. The coefficients of correlation recorded very small values, yet positive, for the bond markets of BRICS economies except for Russia with Brazil and India. The results of cross-correlation, Granger causality tests and Wald tests suggested several statistically significant unidirectional linkages. The results of Johansen co-integration identified a single balanced relationship in the long run among BRICS countries. The paper suggests and supports the adoption of diversification through investments in these emerging market economies, especially in the long-term government security market, as few countries have revealed negative correlation which would induce in lessening the risk during financial distress.

**Keywords:** BRICS, government security market, financial linkages, Johansen and Juselius' co-integration, Granger causality test

## 1. Introduction

Brazil, Russia, India, China and South Africa, collectively known as BRICS economies, are a small group of countries that have acquired lots of consideration from researchers and investors during the past decade. The reasons are diverse, but the essential perception being these emerging economies of relatively large size could potentially deliver the anticipated push to augment the economic growth of the world. As a consequence of the Global Financial Crisis of 2007-2008, the yearly growth rate of per capita GNP at an international level has plunged to an average of 1.7% (measured in 2005 \$PPPs during 2008 to 2017). On the other hand, BRICS economies have been the major contributors to the growth of per capita GNP globally, at an average of 5.4% and are considered to outlast the key drivers of growth of the world by 2030. These economies are currently accounting for 30.4% of total world GNP.<sup>1</sup> Since 2015, these five countries have been sharing a GDP of \$ 16.6 trillion, which is equivalent to roughly about 22 percent of the gross world GDP. The estimated expansion in the growth rate of BRICS is 5.3% in 2019.<sup>2</sup>

This turn of the century has observed one of the most complex and major financial crisis so far. The crisis has escalated rapidly from the U.S. housing market to its own financial market and to the whole world financial market. The proliferating growth of the BRICS market has made them significantly financially dependent on other markets of the world. BRICS economies today are more matured, and thus their markets are exhibiting a higher level of financial integration and linkages with other developed markets of the world. BRICS stock market exhibit linkages with global stock market (S&P index), commodity markets (oil and gold) and U.S. stock market uncertainty (Mensi, Hammoudeh, Reboredo, & Nguyen, 2014). Furthermore, bilateral relations among BRICS nations are mainly based on equality, non-interference and mutual benefit (Lopes Jr, 2015). These five BRICS countries differ in their structural characteristics, economic policies and

geopolitical importance. Brazil and Russia are primarily natural resource-based economies, well-known for the export of commodities and are more open in terms of foreign trade. Their capital markets witness liberal regulation with limited control by the state as compared to the markets of India, China and South Africa. These three countries are relatively closed and highly populated amongst the five BRICS economies, where the majority of the population is living in the rural areas having a state-controlled capital market.

The remarkable fall in the equity market wealth resulting from the deteriorating consumption patterns worldwide could pose grave implications on the health of the economy as well as on its financial institutions (Dynam & Maki, 2001). The correlations between major asset classes (particularly stock markets and bond markets) are of major concern for financial regulators and monetary authorities alike. An enriching number of researches in this domain have analysed the characteristics of these linkages and their essence through which information flows between markets. The past literature has been focusing on studying the interaction among the BRICS economies and how / what they contribute to the global markets. The domestic asset prices shocks pose a substantial impact on assets prices; however, the international spillover, both within and across various asset classes, is more considerable (Ehrmann, Fratzscher & Rigobon, 2011). International bond markets hence play a very crucial role in determining asset prices for the developed markets of the world. Financial authorities can influence the term structure minimally. Fundamentally, the expected future inflation and the short term real interest rates determine the long term bond rates. The increased co-variation amongst the bond rates of different economies restricts the influence of higher monetary authorities towards the term structure.

The correlation between bond markets of different countries may crop up through various channels. It can be done by framing an internationally diversified portfolio or determination of real rates by global factors. Risks in the worldwide prices or 'flight to quality' in terms of financial stress may also cause this correlation. The indefinite measure of correlations amongst the key international bond markets indicated an increased association between these markets since the 1960s; however, the results of

<sup>1</sup> Mckinley, T. (2018, Apr 20). Brics to play a leading role in driving future global economic growth (Blog post). Retrieved from <https://www.ineteconomics.org/perspectives/blog/brics-to-play-a-leading-role-in-driving-future-global-economic-growth>

<sup>2</sup> Global Economic Prospects: Divergences and Risks, A World Bank Group Flagship Report, 2016

correlations were neutral in displaying any trend (Solnik, Boucrelle & Le Fur, 1996; Christiansen & Pigott, 1997). In spite of the fact that the absolute prices and measures of the international bond market correlations are not in a situation of increasing trends, the measures taken by the monetary authorities in balancing the yield curve by changing the short-term rates still prevails.

A generous number of studies have examined the linkages, co-movements and correlations amongst the stock markets of BRICS nations (Sharma, Singh, & Litt, 2011; Xu & Hamori, 2012; Chkili & Nguyen, 2014; Bekiros, 2014; Mensi et al., 2014). Many of them have also tried to find the integration of one of the BRICS nations with U. S. bond markets, but the present study is differentiated from the other research by studying the integration within the BRICS nations through the government security market. In the same direction, the impact of the bond price movement on the rest of the BRICS countries has also never been examined. Thus, the study is novel in its type and explores the same concepts with the new dimensions.

The present study attempts to investigate the relationship between the 10-year bond yields of BRICS economies. The empirical analysis uses monthly data from January 2008 to December 2017. At the first stage, the presence of unit root and order of integration of all five series was examined. Secondly, the test of correlation, cross-correlation and Granger causality were adopted to identify short-run linkages and Johansen and Juselius (1994) co-integration framework was used to examine the long term relationships among BRICS countries. Finally, the short-run relationship was verified and confirmed using the Wald test. The paper is further structured as follows: Section 2 provides the synopsis of previous studies. The methodology and description of data are presented in section 3. Estimated results and their rationales are enumerated in section 4, followed by a conclusion and final summary in section 5.

## 2. Literature Review

The crash of stock markets in October 1987 was one of the key stimulants to study the financial market associations. Koutmos and Booth (1995) find that the major stock markets of New York, London and Tokyo witnessed higher interdependencies after the crash of 1987. The 1997 financial crisis played an influential role in bringing the

integration of ASEAN stock markets with other economies (Janor, Ali, & Shaharudin, 2007). The globalisation of economies had driven this obvious increase in the linkages between the domestic equity markets, which in turn have increased the presence of international investors worldwide. The early studies of international financial integration and linkages were triggered by the motive of having an internationally diversified portfolio (Grubel, 1968; Hilliard, 1979; Becker, Finnerty, & Gupta, 1990; Hamao, Masulis, & Ng, 1990). The increased number of foreign investors and strong international market interrelations are motivated by the relaxed restrictions of the capital markets (Phylaktis & Ravazzolo, 2005). The contagion financial crisis of the developed countries along with their portfolio diversification has attracted researchers to investigate the topics of financial integration. The correlation between the BRICS and the USA is increasing since early 2009 after the global financial crisis (Dimitriou, Kenourgios & Simos, 2013). Tornell and Westermann (2002) show that many countries that liberalised their financial markets experienced the development of lending that sometimes resulted in twin crises. King and Wadhvani (1990) anticipated volatility transmission as a result of contagion effect because intermediaries do not measure the economic inference of news from the foreign market; rather, they are merely responding by reacting first and thinking (Shiller, Kon-Ya & Tsutsui, 1991; Taylor & Sarno, 1997; Calvo, 1998). Dhingra, Gandhi, & Bulsara (2016) also argued that the foreign portfolio investors are purely the feedback traders and hence, they increase the financial market volatility. Pereira (2018) investigated the contagion effect in the BRICS economies with special reference to the collapse of Lehman Brothers and the European Sovereign Debt Crisis. The relationship and co-movements between the BRICS markets are analysed using the co-integration, causality and VECM methodology. The results verified and confirmed the long run and short-run relationship between the BRICS nations; however, the same has significantly changed during the crisis period.

Some of the empirical papers have also studied the relationship between stock and bond markets. A VAR approach of Campbell and Shiller (1987) has been used by the studies of Shiller and Beltratti (1990) and Campbell and Ammer (1993) to decompose asset returns. The results

of this study recorded an unexplained change in excess returns, and hence these returns can be explained by future events which are predominantly driven by the future expected inflation rates. Norden and Weber (2009) studied inter temporal co-movement among stock return, Credit Default Swap (CDS) and bond market, where they clearly showed stock returns lead CDS and bond spread changes. A negative relationship is found between the uncertainty measures and the future correlation of stock and bond returns (Connolly, Stivers & Sun, 2005). The returns on the bond market are likely to be higher compared to returns on the stock market, particularly on those days when the volatility in the stock market increases significantly, and the turnover is unusually low or high.

Barr and Priestley (2004) study the integration of the selected world markets by applying the factors of returns on government bonds and expected risks. Their study applies a conditional asset pricing model, which allows changes in the price and risk exposure. The results of the conditional asset pricing model reveal a partial integration of national markets with the world markets. Nasir and Fan Fah (2012) investigate the dynamic relationship of bond yields using the government bond returns and yield curves of India, Japan, Malaysia, Singapore and Thailand. With the results of VECM (Vector Error Correction Model), they indicate a presence of co-integration among all considered nations except Japan. Lapodis (2010), using GARCH (Generalised Autoregressive Conditional Heteroskedasticity) and VAR (Vector Autoregression), identify the existence of short-run relationships for the sovereign bond market of four major economies; Germany, Japan, the U.S. and the U.K. He confirms that the U.S bond market volatility also affects the other countries bond yield. Chaieb, Errunza and Brandon (2020) studied the dynamics of bond market integration for 21 developed and 18 emerging markets of the world. Results revealed a higher degree of integration for factors like political stability, credit quality, lower level of inflation and lower illiquidity. The level of integration and its impact on borrowing cost is measured using an asset pricing model in this study.

To our knowledge, few studies like Yu, Fung and Tam (2007), Barr and Priestley (2004) and Clare, Maras, and Thomas (1995) investigated the relationships between international bond markets. Ahmad, Mishra and Daly (2018)

analysed the financial connectedness with the help of returns and volatility spillovers of BRICS with three global indices. DY model, correlation analysis and VAR were applied to investigate the volatility spillover. Russia and South Africa are found to be the net transmitters of shocks and may have an adverse impact on other BRICS nations. Conversely, China and India revealed weak connectedness. Mohammad and Palaniappan (2017) investigated the integration of stock markets of BRICS nations. Johansen Co-integration Test (1994) and Pairwise Granger Causality test were applied to measure the interdependency and dynamic linkages among these markets. The results supported the absence of a long-run relationship between these markets. The literature studying the relationship amongst the bond yield of BRICS nations are scant in number. The present paper aims to coincide with the existing literature on financial market linkages by analysing the links between government security markets.

### **3. Data and Methodology**

#### **3.1 Data**

To render a comprehensive account of interrelationships, integration, interdependencies and dynamic linkages of the BRICS economies through the government security market, monthly data of 10-year bond prices have been extracted and further considered for detailed analysis. The data set comprises 120 observations ranging from January, 2008 to December, 2017 (i.e. last ten years) for five series or variables (representing BRICS economies) viz. Brazil, Russia, India, China and South Africa.

#### **3.2 Preliminary Analysis**

The co-integration test in the time series analysis requires fulfilling the assumption of time series being integrated of the same order to make the regression equation balanced. Augmented Dickey-Fuller and Phillips-Perron unit root tests have been performed for checking the stationarity of individual series. Results of stationarity tests reveal that all the series are stationary at the first difference, that is, individually, they are  $I(1)$ . To verify autocorrelation among the residuals Ljung-Box  $Q$ -statistic is used, which suggests the absence of significant autocorrelations among the residuals. Akaike Information Criterion (AIC) and Schwarz Bayesian Criterion (BIC) are used to determine the optimal lag length.

### 3.3 Correlation Analysis

Correlation analysis is performed for getting the initial sign of dynamic linkages and integration among these EMEs through the government security market. The correlation test measures the direction and strength of the association between the considered series. However, Leong and Felmingham (2003) criticised the reliability of the correlation test since the coefficients of correlation tend to be more upward biased in nature if the series is suspect to heteroskedasticity.

### 3.4. Contemporaneous Cross-correlation Analysis

To measure the strength of linear dependence between any two series under consideration, the cross-correlation coefficients are calculated (Haugh, 1976). The cross correlation between  $X_t$  and  $Y_{t-m}$  is defined as

$$r_{XY}(m) = \frac{\sum_{t=m+1}^n (X_t - \bar{X})(Y_{t-m} - \bar{Y})}{\sqrt{\sum_{t=1}^n (X_t - \bar{X})^2 \sum_{t=1}^n (Y_{t-m} - \bar{Y})^2}} \quad \text{Equation 1}$$

Where  $\sigma_X$  and  $\sigma_Y$  are the standard deviation of  $X_t$  and  $Y_{t-m}$ , respectively and are assumed to be time-independent.

Non-zero value of  $r_{XY}(m)$  (where  $m > 0$ ) indicates that the series  $X_t$  leads the series  $Y_{t-m}$  at lag  $m$ , whereas the non-zero value of  $r_{XY}(m)$  (where  $m < 0$ ) implies that the series  $Y_{t-m}$  lags the series  $X_t$  at lag  $|m|$ .

### 3.5 Granger Causality Test

To eliminate the possible simultaneity bias, the Granger causality test (Granger, 1988) is performed, which uses standard  $F$ -test:

$$F = \frac{RSS_1 - RSS_2}{RSS_2} \cdot \frac{n-k-1}{k} \quad \text{Equation 2}$$

$\beta_j$  represents the coefficients between values of variable  $X_t$  at time  $t$  and variable  $Y_{t-k}$  at time  $t-k$ . The null hypothesis being variable  $j$  does not Granger cause variable  $i$  if all other coefficients of the polynomial  $\beta_j$  are set to zero.

The Granger Causality test involves estimating the following pair of equations:

$$X_t = \alpha + \beta_1 X_{t-1} + \beta_2 X_{t-2} + \dots + \beta_m X_{t-m} + \gamma_1 Y_{t-1} + \gamma_2 Y_{t-2} + \dots + \gamma_n Y_{t-n} + \epsilon_t \quad \text{Equation 3}$$

$$Y_t = \alpha + \beta_1 Y_{t-1} + \beta_2 Y_{t-2} + \dots + \beta_m Y_{t-m} + \gamma_1 X_{t-1} + \gamma_2 X_{t-2} + \dots + \gamma_n X_{t-n} + \delta_t \quad \text{Equation 4}$$

Where  $\epsilon_t$  and  $\delta_t$  are white noise processes;  $m$  is a suitably chosen lag length;  $t$  is the trend variable;  $\alpha$ ,  $\beta_j$ ,  $\gamma_i$  and  $\delta_j$  are the slope parameters. One pair of equations is estimated for each series of bond prices with the other four series of bond prices. While estimating this pair of equations, all the series are  $I(1)$ .  $\beta_j$  denotes the linear dependence of  $X_t$  on  $X_{t-j}$  in the presence of  $Y_{t-k}$ . Similarly,  $\gamma_i$  denotes the linear dependence of  $Y_t$  on  $Y_{t-i}$  in the presence of  $X_{t-k}$ .

### 3.6 Cointegration Test

To examine the presence of a long-run relationship among BRICS' bond markets, the VAR based co-integration approach has been adopted, which is given by Johansen and Juselius (1994). The pre-requisite for the application of this approach confirms the considered variables to be non-stationary at level and having the same order of integration. This method finds the co-integrating relationship between non-stationary variables using maximum likelihood estimation. To carry out the test, the first VAR of variables  $p$  and order  $k$  is formulated using equation 5.

$$Z_t = \alpha + \beta_1 Z_{t-1} + \beta_2 Z_{t-2} + \dots + \beta_k Z_{t-k} + \epsilon_t \quad \text{Equation 5}$$

Where,  $Z_t$  is the  $p$  vector containing the  $p$  variables ( $\alpha$ ,  $\beta_1, \beta_2, \dots, \beta_k$  are the matrix of parameters and  $\epsilon_t$  is an independently and identically distributed  $n$ -dimensional vector with zero mean and constant variance.

The reparameterisation of equation 5 would yield equation 6.

$$Z_t = \alpha + \beta_1 Z_{t-1} + \beta_2 Z_{t-2} + \dots + \beta_k Z_{t-k} + \epsilon_t \quad \text{Equation 6}$$

$r$ , in equation 6 is the rank of the matrix. It represents the number of co-integrating vectors. If rank  $r < p$ , the ma-

trix is null. In such a condition, equation 6 becomes the ordinary VAR with the first difference signifying that variables in  $X_t$  are not co-integrated. Value of the rank  $r$  indicates the presence of only co-integrating vector and  $\epsilon_t$  denotes the error term.  $\alpha$  suggests the existence of multiple co-integrating vectors.

One can obtain the existence of a number of co-integrating vectors by assessing the significance of characteristic roots of  $\alpha$  and  $\beta$  statistics can be used to check the number of characteristic roots that are significantly different from one.

The statistic given by equation 7 involves assessing the null hypothesis that the number of distinct co-integrating vectors is less than or equal to  $r$  against the alternative.

$$\lambda = \frac{1}{n} \sum_{i=1}^n \lambda_i \quad \text{Equation 7}$$

The second test  $\lambda$  represented by equation 8 assesses the null that the number of co-integrating vectors is  $r$  against the alternative  $r+1$  co-integrating vectors.

$$\lambda = \frac{1}{n} \sum_{i=1}^n \lambda_i \quad \text{Equation 8}$$

In equation 7 and 8,  $\lambda_i$  and  $\lambda_j$  are the estimated values of the characteristic roots, which are obtained from the estimated  $\alpha$  matrix, also known as eigen values, and  $n$  is the number of usable observations.

### 3.7 Wald Test

Toda and Yamamoto (1995) proposed the Granger Causality technique to determine the causal relationship between two variables. The technique became very popular among researchers due to its simple application, which does not involve pre-testing of the same level of integration and co-integrating properties of the considered variables. Toda and Yamamoto (1995) gave an augmented VAR( $p+d$ ) model estimated through equation 9, which is used to test the causality between integrated variables.

$$X_t = \alpha + \beta X_{t-1} + \epsilon_t \quad \text{Equation 9}$$

Where variables with circumflex represent the OLS estimates,  $p$  and  $d$  represent the order of the process and

the order of integration respectively of the considered variables.  $k^{th}$  element of  $X_t$  non-granger cause the  $j^{th}$  element of  $X_t$  becomes the null hypothesis. The test for causality between two variables in  $X_t$  can be written as equation 10, which is popularly known as Modified Wald (MWALD) test. The full set of coefficients in the model may be arrayed in a single coefficient vector,  $\gamma$ . Assume  $\hat{\gamma}$  to be the sample estimator of  $\gamma$  and  $V$  the estimated asymptotic covariance matrix. The Wald statistic for the null hypothesis  $H_0: \gamma = 0$  is.

$$W = \hat{\gamma}' V^{-1} \hat{\gamma} \quad \text{Equation 10}$$

The null hypothesis for the Granger causality test will be a certain sub-vector of  $\gamma$ , say  $\gamma_0$  equals zero, where the test statistic will be equation 11.

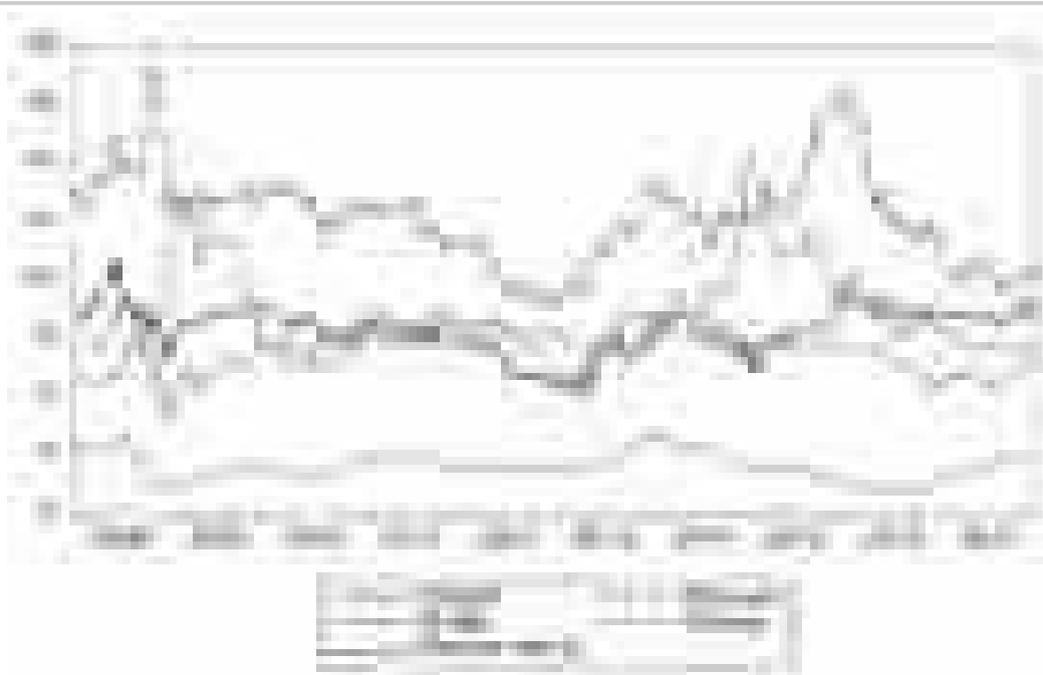
$$W = \hat{\gamma}_0' V_0^{-1} \hat{\gamma}_0 \quad \text{Equation 11}$$

Where  $V_0$  is the corresponding sub-matrix of  $V$ . The adequacy of the models is tested by serial correlation test and the test of heteroskedasticity. The null hypothesis for serial correlation is that residuals are not serially autocorrelated. For the heteroskedasticity test, the null hypothesis is that the residuals are homoskedastic. The proficiency of both the tests is measured by its  $p$  values. The value of the coefficient of determination that is  $R$ -square from the regression is an indication of the extent to which the conditional variance is explained. It helps to evaluate the adequacy of the models. The model having a high  $R$ -square suggests the good-fit.

## 4. Empirical Analysis and Discussion

### 4.1 Preliminary Analysis

The daily bond prices of BRICS (Brazil, Russia, India, China, and South Africa) economies are illustrated using a graph for the considered period of study in Figure 1. This plot hints at the likely nature of the time series. Figure 1 exhibits an upward and downward trend in the prices of bonds for BRICS economies, suggesting the changes in the mean values of different series and the series are confirmed to be of non-stationary nature.



Source: Author's analysis

**Figure 1: Daily bond prices of BRICS economies**

To achieve the objective of the study that is identifying long-run and short-run linkages among BRICS economies, Johansen co-integration test has been performed. This test pre-conditions that the variables under consideration should be in the same order of integration. Augmented Dickey-Fuller(ADF) Test and a Phillips-Perron (PP) Test are used

to examine the non-stationarity of the series. The results of both the tests of unit root in Table 1 confirm the presence of non-stationarity at level and stationarity at the first difference for all the series. All the series, therefore, are integrated at order one, that is  $I(1)$ .

**Table 1: Unit Root Test**

Variable	Level	First Difference	Level	First Difference
India	0.1234	-1.2345	0.0123	-1.9876
China	0.2345	-1.3456	0.0234	-2.0987
USA	0.3456	-1.4567	0.0345	-2.2098
UK	0.4567	-1.5678	0.0456	-2.3209
Japan	0.5678	-1.6789	0.0567	-2.4320

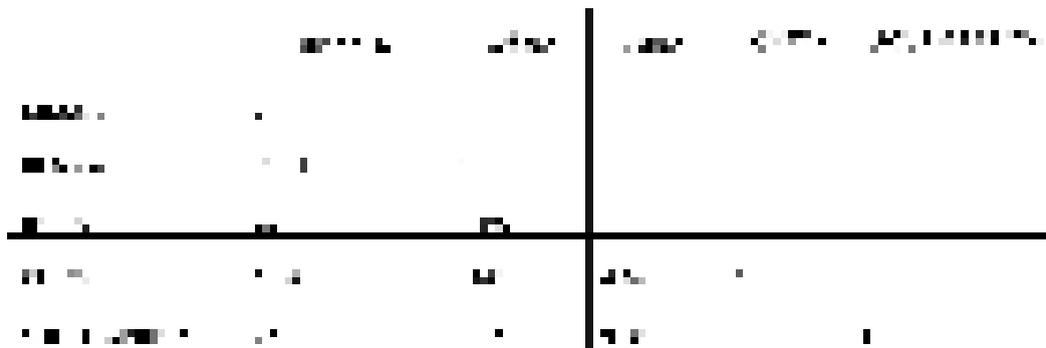
Note: Estimation procedure follows Ordinary Least Square (OLS) method. The null hypotheses are series contain unit root. '\*\*' denotes values significant at 1% level.

### 4.2 Correlation Analysis

The correlation analysis enumerated in Table 2 reveals that all bond price series are positively related to each other except the relationship of Russia with Brazil and India. All these coefficients do not support the strong association as these values are ranging between 0-0.3 except for the

correlation coefficient between Brazil and South Africa. The reason being that all the bond investments are related directly to policy rates, and they tend to be related for the long term. Investors cannot further exploit arbitrage opportunity in these markets due to the presence of interest rate parity.

**Table 2: Correlation Analysis**



Source: Author's analysis

### 4.3 Contemporaneous Cross-correlation Analysis

Table 3 shows the estimated cross-correlation coefficients of the first variable  $X(\pm i)$  up to 5 leads and lags. The “leads” and “lags” of the first variable are given in the first column as positive and negative integers. Lead coefficient suggests the influence of the first series that is the bond price of one country at time  $(t+1)$  on the other country bond price at time  $t$ . Similarly, the lag coefficient suggests the influence of the second series at time  $(t-1)$  on the bond price of the first series. Brazil bond price influences the bond prices of China and South Africa as the lead

coefficients of Brazil are statistically significant, whereas lag coefficients with Russia, India and South Africa are statistically significant. These suggest the bidirectional cause and effect relationship between Brazil and South Africa. Russia and India have a causal relationship flowing from each other. In the rest of the relationships between Russia - China, Russia - South Africa, India - China, India - South Africa and China - South Africa, the former causes change in the latter variable. A significant coefficient at lag 0 implies a contemporaneous two-way relationship for the selected variables.

**Table 3: Contemporaneous Cross-correlation Analysis**

Country 1	Country 2	Lag	Coefficient	Significance
Brazil	China	0	0.15	0.001
Brazil	India	0	0.22	0.001
Brazil	South Africa	0	0.35	0.001
Brazil	Russia	0	0.18	0.001
China	India	0	0.12	0.001
China	South Africa	0	0.10	0.001
China	Russia	0	0.08	0.001
India	South Africa	0	0.09	0.001
India	Russia	0	0.07	0.001
South Africa	Russia	0	0.06	0.001

	China	India	Russia	South Africa
China	0.0000	0.0000	0.0000	0.0000
India	0.0000	0.0000	0.0000	0.0000
Russia	0.0000	0.0000	0.0000	0.0000
South Africa	0.0000	0.0000	0.0000	0.0000
Asymptotic Standard Error	±0.1789	±0.1789	±0.1789	±0.1789

Note: Asymptotic standard error for the cross-correlation coefficients is  $\pm 0.1789$ . First column of the table denoted as “k” represents the leads/lags of first variable  $X(\pm i)$ . Here correlation is between  and other series and is denoted as . “\*” represents significant cross correlation coefficient which fall outside the asymptotic bounds.

#### 4.4 Granger Causality Test

Short-run causality among considered Emerging Markets has been analysed using an alternative approach. This approach involves estimating Granger causality statistics by applying the Toda–Yamamoto (1995) approach, which has its roots in the VAR model. Table 4 provides bivariate VAR framework-based results of the Granger causality test. The presence of unidirectional causality from Brazil to the other four countries has been confirmed from the results. Russia granger causes China at lag 2. However, the causality

in the case of India is flowing only towards Russia. The null hypotheses, “China does not Granger cause Brazil/India”, are rejected. The result further suggests that the China bond market contains useful information for Brazil and India. Similarly, South Africa contains useful information for Russia and India. These results are consistent with the results of the cross-correlation of Brazil and India.

**Table 4: Granger Causality Test**

The Granger Causality Test matrix shows the following significant relationships (shaded cells):

- Variable 1 causes Variable 2 (arrow from 1 to 2)
- Variable 2 causes Variable 1 (arrow from 2 to 1)
- Variable 2 causes Variable 3 (arrow from 2 to 3)
- Variable 3 causes Variable 2 (arrow from 3 to 2)
- Variable 3 causes Variable 4 (arrow from 3 to 4)
- Variable 4 causes Variable 3 (arrow from 4 to 3)

Note: Arrow “↘” shows unidirectional causality running from column variable to row variable. “-” indicates the absence of causal relationship at particular lag. Arrows represent significant *F*-statistics at 5% level. Number of lags have been determined using BIC criterion.

**4.5 Lag selection Criteria**

The first and foremost step to analyse either long-run or short-run relationship among considered series is to select a proper lag length for further analysis. To decide the lags to be included for estimating the Johansen – Juselius co-integration test (for long-run relationship) and the Wald

test (for short-run relationship), unrestricted Vector Auto Regression (VAR) has been estimated. The test statistics for lag selection criteria are shown in Table 5. FPE, AIC, SC and HQ unanimously select lag 2. Thus, the inclusion of variable up to two lags would make the model parsimonious and restrict us from over-parameterisation.

**Table 5: Lag selection criteria**

	1	2	3	4
LogL	1.23	1.23	1.23	1.23
LR	1.23	1.23	1.23	1.23
FPE	1.23	1.23	1.23	1.23
AIC	1.23	1.23	1.23	1.23
SC	1.23	1.23	1.23	1.23
HQ	1.23	1.23	1.23	1.23

Note: \* indicates selected lag order by the criterion at 5% significant level. LogL, LR, FPE, AIC, SC and HQ stands for Log Likelihood ratio, sequential modified LR test statistics, Final prediction error, Akaike information criterion, Schwarz information criterion and Hannan-Quinn information criterion, respectively.

#### 4.6 Cointegration Test

To ascertain whether the non-stationary bond price series share a long-run stochastic trend, Johansen – Juselius co-integration test is employed, and the results are shown in Table 6. The calculated values of  $\lambda_{max}$  and  $\lambda_{min}$  are reported in the second and fourth column. The considered series for all five variables are  $I(1)$ . From both the test statistics,

it is likely to accept the alternative hypothesis of the presence of one or more co-integrating vectors by rejecting the null hypothesis of no co-integrating vector, as the test statistics exceed the 5 per cent critical value. The values of the  $\lambda_{max}$  and  $\lambda_{min}$  statistics are such that the null hypothesis of no co-integration (i.e.,  $r=0$ ) is soundly rejected. As such, it is evident that there is only one co-integrating vector among the five BRICS variables.

**Table 6: Johansen Cointegration Test**

Note: “\*” denotes rejection of the hypothesis at the 0.05 level and “\*\*\*” MacKinnon-Haug-Michelis (1999) p-values

#### 4.7 Wald Test

To test the joint hypotheses of two or more coefficients, instead of using the classical  $F$ -test, the Wald test is used, which is a large sample test. The Wald statistics follow the  $Chi-square$  statistic with degrees of freedom equal to the number of regressors estimated. The null hypothesis, as in the usual  $F$ -test, is that all the regressor coefficients are zero simultaneously; that is, collectively, none of the regressors have any bearing on the endogenous variable. In our case, the  $Chi-square$  statistics are significant for Brazil, India, China and South Africa. Collectively, out of all the regressors India and China have an important impact

on the monthly bond prices of Brazil. For India, short-run causality is running from all other countries except Russia. China and South Africa are in a short-run equilibrium relationship with South Africa and Brazil, respectively. Although the co-integration test confirms the long-run relationship among the bond markets of all five countries, they also possess a short-term causal relationship with some of the countries under consideration. The findings of the Wald test are perfectly matching with the findings of the Granger causality test for Brazil, India and South Africa. It is interesting to note that the findings of the Wald test for Russia is quite different from the findings of the Granger causality test (Please refer Table 7).

**Table 7: Wald Test**

Country	Model	Wald Test			p-value		
		F-Statistic	D.F.	Asymptotic Significance	Asymptotic Significance	Asymptotic Significance	Asymptotic Significance
India	Model 1	1.234	3	0.75	0.92	0.88	0.95
	Model 2	1.567	3	0.68	0.85	0.82	0.90
	Model 3	1.890	3	0.60	0.78	0.75	0.85
China	Model 1	2.123	3	0.55	0.70	0.68	0.78
	Model 2	2.456	3	0.48	0.65	0.62	0.72
	Model 3	2.789	3	0.40	0.60	0.58	0.68
USA	Model 1	3.012	3	0.30	0.50	0.48	0.58
	Model 2	3.345	3	0.23	0.45	0.42	0.52
	Model 3	3.678	3	0.15	0.40	0.38	0.48
South Africa	Model 1	4.567	3	0.05	0.30	0.28	0.38
	Model 2	4.900	3	0.02	0.25	0.22	0.32
	Model 3	5.233	3	0.01	0.20	0.18	0.28

**4.8 Breusch-Godfrey Serial Correlation Test and Breusch-Pagan-Godfrey Heteroskedasticity Test**

The last step to validate the findings is checking the model fit by analysing the residuals for serial correlation and the presence of heteroskedasticity. Table 8 shows the results for the Breusch-Godfrey Serial Correlation Test and Breusch-Pagan-Godfrey Heteroskedasticity Test. The observed F-statistics for serial correlation fails to reject the null hypothesis that there is no serial correlation in the generated residuals series of the regression model. This

validates the results of Johansen – Juselius co-integration test and Wald test for the long run along with short-run linkages as the residuals are not victimised by autocorrelation throughout the series. The p-values for corresponding F-statistics in Breusch-Pagan-Godfrey Heteroskedasticity Test fails to reject the null hypothesis of the presence of Heteroskedasticity for all considered models except for South Africa. Thus one can conclude that the residuals are homoskedastic in nature.

**Table 8: Breusch-Godfrey Serial Correlation Test and Breusch-Pagan-Godfrey Heteroskedasticity Test**

Country	Model	Breusch-Godfrey Serial Correlation Test		Breusch-Pagan-Godfrey Heteroskedasticity Test	
		F-Statistic	p-value	F-Statistic	p-value
India	Model 1	1.234	0.75	1.567	0.68
	Model 2	1.567	0.68	1.890	0.60
	Model 3	1.890	0.60	2.123	0.55
China	Model 1	2.123	0.55	2.456	0.48
	Model 2	2.456	0.48	2.789	0.40
	Model 3	2.789	0.40	3.012	0.30
USA	Model 1	3.012	0.30	3.345	0.23
	Model 2	3.345	0.23	3.678	0.15
	Model 3	3.678	0.15	4.567	0.05
South Africa	Model 1	4.567	0.05	4.900	0.02
	Model 2	4.900	0.02	5.233	0.01
	Model 3	5.233	0.01		

## 5. Summary and Conclusion

The study of linkages and interdependencies between financial markets has been a highly researched topic in the field of finance. Several studies tried to find the linkages between the stock markets, money markets and bond markets of different countries. The BRICS nations in the past decade have already gone through noteworthy changes in their processes, international trade opportunities and financial integration (Pereira, 2018). The absence of linkages between markets results in an advantage for investors and leads to the creation of portfolio diversification in the global market. On the contrary, some studies revealed a negative performance in the portfolio returns due to the occurrence of extreme events such as financial crises and stock market catastrophes. In such cases, foreign investors should be allowed greater flexibility to switch between equity and debt assets which will make their investments more elastic. Such type of balance strategies may help to stabilise the movements of foreign investors in and out of any country. This kind of prudent measure would be an indirect effort to prevent asset price bubbles in the financial markets. This may result in imposing the ban on certain financial activities for a short time span by governments, as is deemed fit (Bulsara, Dhingra, & Gandhi, 2015; Dhingra et al., 2016).

The existing research is an empirical assessment of short-term and long-term integration among the bond values of BRICS (Brazil, Russia, India, China and South Africa) economies. In order to determine the co-integrating relationships for the bond markets of the five economies of BRICS, the co-integration approach given by Johansen was performed on these variable series. The data is ranging from January, 2008 to December, 2017. The results of the test strongly support the presence of a co-integrating relationship among the bond markets of these emerging economies. These results are consistent with the findings of Bianconi, Yoshino and De Sousa, 2013. This will benefit international investors by diversifying their portfolio internationally in the long run.

In order to assess the presence of co-variation and short-term co-movements contemporary correlation coefficients were calculated. The coefficients of

correlation recorded very small values, yet positive, among these countries' bond markets except Russia with Brazil and India. This result provides international investors with a chance to exploit the opportunity of possible diversification in the international bond market. The results of Granger causality tests and Wald tests confirm quite a few numbers of statistically significant unidirectional links. In the short run, Brazil is dependent on India and China, India is dependent on China and South Africa and South Africa is dependent on Brazil. These short-run relationships are not so strong for Russia and China if both the tests (Granger causality tests and Wald tests) are considered.

The Johansen co-integration test revealed the existence of a single balance long-run relationship among the BRICS countries. This co-movement may emerge due to the existence of some of the common factors, which restricts the independent movement of the bond prices of these countries and leaves scope for prediction. The certification of such relationships, in turn, facilitates the investment opportunities in international portfolio diversification. The results advocate the possibility for international investors in the long run to espouse the investment strategies which combine assets from the countries that do not show association in the long run, particularly in the government security market where inflow and outflow are not much frequent. The existence of these long-run and short-run relationships questions the legitimacy of the efficient market hypothesis. The prediction of the price movement of one series can be improved if the movements of the rest of the variable series in the model are known.

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# A Study on Employee Perception about the Use of E-HRM in IT

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## A b s t r a c t

In a digital economy, the use of online systems is pertinent for all organisations. The online systems have provided better connectivity and save a lot of time due to reduced paperwork. One such system is e-HRM which helps in smoothening the operations of the HR department. Since e-HRM helps in faster decision-making and better communication, therefore, it was found to be an important area for research. Thus, the present study was undertaken to find out the various factors that influence the implementation of e-HRM system. This forms the primary objective of this research. For this, data was collected from employees of IT organisations located in the National Capital Region, India. The sample size for the study was 320 employees using convenience sampling. The data was analysed using SPSS version 23. It was found that there are eight factors that influence the e-HRM system in IT organisations. These factors include ease of use of technology, experience of information technology, secure systems, technology usefulness, communication tools, risk perception, usage intention and organisational support. All these factors play an important role in the effective implementation of e-HRM. The study has several implications, important among which is that organisational support should be taken care of as the adoption of e-HRM requires that the employees should have the required support.

**Keywords:** *e-HRM, IT organisations, factors of E-HRM implementation, organisational support, usage intention*

## 1. Introduction

Over recent years, the majority of organisations have integrated their HR departments with IT using e-HRM systems to improve their performance. This shift has not been sudden, but the changes were gradual as the requirement for automated systems became a necessity. According to Strohmeier (2007), “e-HRM is the planning, implementation and application of information technology for both networking and supporting at least two individual or collective actors in their shared performing of HR activities.” However, moving from pen and paper to online systems has not been an easy task.

In developed countries, e-HRM is already being used on a large scale. However, its implementation in Indian organisations has taken place mostly in the past few years. In the present scenario, there is a need for revision in the HR department because now internet technology has been associated profoundly with HRM. The term e-HRM came into existence in the early 1990s. Now the trend is new innovative technological developments, which realised the concept of paperless work at the touch of a finger. In fact, e-HRM has transformed traditional HR into a more realistic, informative and interactive format. Everything, including our way of thinking, living, communicating, culture, economics, demographics and even society, has been affected by these technological changes.

The organisations were influenced by several factors in the implementation of these systems. The internal environment and several external variables included technology available, sense of security, ease of use, use of technology and many more. The e-HRM implementation has been the fastest in the IT industry in comparison to others as the employees of this industry are tech-savvy when compared to those in other industries. Therefore, the present study dealt with the various factors affecting the implementation of e-HRM in the IT industry.

## 2. Review of Literature

### 2.1 Implementation of e-HRM

Panayotopoulou et al. (2010) conducted a study in 13 European countries. They explored the impact of the background of the nation on e-HRM implementation. They

stressed the existence of front end and back end systems. The study outcomes revealed that there were three clusters, namely Northern, Central and South-Eastern, on the basis of diffusion of e-HRM. In another study, Stone and Dulebohn (2013) presented advanced theory and research on HRMS (Human Resource Management System) and e-HRM. They also enhanced the effectiveness of these systems in organisations. This article reviewed the evolution of HRMS and e-HRM and provided an overview of the existing literature. The authors examined how HR scholars may perceive HRMS and e-HRM. A conceptual study was conducted for the research. HRMS and e-HRM provided internal support for HR professionals, e-HRM applications provided access to all internal and external stakeholders. The study also found that strategic considerations influenced decision-making on e-HRM applications. Ruel and Kaap (2012) aimed to clarify the relationship between e-HRM usage and HR value creation by considering contextual factors. A sample of 450 was collected from three different large international organisations of the Netherlands through e-mail and an online questionnaire. This study clearly indicated that contextual factors moderates the relationship between e-HRM usage and HR value creation- as HRM facilitation increases, the relationship between usage and HRM value creation becomes weaker.

Pant et al. (2012), in their conceptual study, provided a framework for e-HRM implementation. The exceptional success of e-commerce systems motivated organisations to make use of e-HRM systems. These systems have created dramatic changes in the HR department along with improvement in performance. Through this study, the authors have tried to assess the benefits of implementing e-HRM systems. They have also tried to find the factors that influence the relationship of e-HRM implementation with its benefits. More recently, Subhashree and Vasantha (2020), in their study, reviewed previous literature related to the adoption of e-HRM. The study discussed the importance of automation of tasks which reduces the burden on HR and saves time. The study also found that the most important factors influencing e-HRM adoption were the implementation of IT infrastructure and the expertise of employees in the field of IT. Earlier, Al-kasasbeh et al. (2016) focused on a review of the literature regarding

electronic human resource management and proposed a model to integrate variables of e-HRM, workforce agility and organisational performance. This was a conceptual study. The result of the review was employed to develop the study's theoretical framework. The framework of the study comprised of integrating literature and models of electronic human resource management, e-HRM implementation at the firm level, organisational performance and workforce agility. Guenter et al. (2014) aimed to provide a conceptual framework for understanding how delays in information exchange negatively impacted employee outcomes. This was a conceptual study. It was found that managers and co-workers should focus on restoring control in employees in order to prevent delays and deterioration of workplace relationship. Delay in information exchange and its impact on co-worker relationship was important for researchers who studied temporal events at work as well as managers structuring workplace interactions. Similarly, Findikli and Bayarcelik (2015) focused on the perspectives for choosing the applications and perspectives about e-HRM for the system. A descriptive study was conducted for the research. A qualitative method with an open-ended questionnaire and semi-structured interviews was used. A limited number of respondents in the company were chosen from only the HR department without involving any level of management hierarchy or other departments. The study found that the primary motivators for e-HRM applications were time management, ease of acquiring, access to personal data and reduced administration cost. Nagendra and Deshpande (2014) found that to increase the effectiveness of HR planning, HRIS (Human Resource Information System) needs to offer more intelligent capabilities. The authors tried to investigate the contribution of HRIS subsystem, to the training recruiting subsystem, to the workforce planning of an organisation, and to the development of the workforce of an organisation through HRIS. Primary data was collected from a sample that included 50 senior and junior HR managers/ executives in three organisations in Pune. The findings of the paper clearly showed that senior HR executives were well aware that they can increase the efficiency of HR planning through HRIS.

## 2.2 Factors influencing e-HRM implementation

Sindu (2018) tried to find how various factors influence organisational culture in the adoption of e-HRM systems. The study made use of previous literature and models in order to find the impact of these factors. These included the Yale model of communication and persuasion, Theory of Planned Behaviour and Technology Acceptance Model. On the basis of previous literature, it was found that actorial, external and organisational factors influence e-HRM implementation. Heikkila (2013) studied the application of e-HRM and strategic IS (Information System). They also focused on how normative, cognitive and regulative institutional dimensions in MNC (Multi-National Companies) subsidiaries in China affect western-based e-HRM practices. Interview data from Beijing and Shanghai related to key informants in 10 MNC subsidiaries was collected. The study found that institutional pressures created both negative dysfunctional and positive transformational consequences for subsidiaries. They also found that the ability of the information system to achieve its strategic potential was based on subsidiary responses to these substantial pressures. Al-Dmour et al. (2013) used content analysis to collect data regarding the adoption and implementation of HRIS (Human Resource Information System). The authors found that many researchers had tried to find the factors affecting HRIS implementation. The authors categorised them as internal and external factors of the environment. However, it was found that many of the studies had conflicting results. Later, Azhar Naima (2019) conducted a study in Iraq to find the factors that influence the acceptance of e-HRM. The data was collected using a two-part questionnaire from a sample of 332 respondents. Random sampling was used for data collection. On applying regression analysis, the results of the study revealed that industry support, management support, IT expertise, compatibility, complexity and employee attributes influence the adoption of e-HRM. Earlier, Masum (2015) identified the factors influencing the adoption of e-HRM in Bangladeshi Banks. A sample of 265 bank employees was taken using stratified random sampling. A pre-tested questionnaire was used to collect

the data. The results of the study showed that industry pressure, IT infrastructure, management support and compatibility, and individual attributes had an influence on the adoption of e-HRM in banks of Bangladesh. Ibrahim and Yusoff (2015) investigated the antecedent factors of technostress towards e-HRM in government agencies of Malaysia. Semi-structured interviews were conducted with seven HRMIS (Human Resource Management Information System) experts in three state governments agencies of Malaysia. The findings of the paper focused on the implementation of HRMIS in Malaysian government agencies and solving the problem of training and development program. The HRMIS experts were of the opinion that three characteristics (attitude, technology readiness and readiness for change) were all related to components of technostress. Later, Rahman et al. (2018) researched on the Bangladeshi government organisations regarding e-HRM implementation. They tried to find the influence of various factors like social, legal, economic, political, organisational, environmental and technological. The study used a case study method as a part of qualitative research. Two government organisations were used as part of the study. The study busted certain myths surrounding the slow implementation of e-HRM in government agencies. It also provided empirical data for further research.

### **2.3. Research Gap**

The above literature review on e-HRM shows that there is a gap in the understanding of the e-HRM practices in the IT organisation. There is a need to explore the e-HRM practices used in IT organisation and the factors which affect the e-HRM. e-HRM practices focus on how the organisation can facilitate the employer-employee relationship by using information technology. E-HRM and its implementation have been studied in various sectors like manufacturing/mining, banking, hotels etc. There is a need to study the e-HRM and the factors affecting it in IT organisations as well.

### **2.4. Objective of the Study**

To find the factors influencing the effective implementation of e-HRM in IT organisations.

## **3. Research Methodology**

### **3.1 Sample size and population**

The study used a descriptive research design. The data was collected from IT companies located in the National Capital Region, India. A sample of 320 IT employees was taken using a non-probability sampling technique. A sample of above 300 was taken as it is considered to be a good sample size (Comrey & Lee, 1992). The mail-ids of employees were obtained for mailing the questionnaire.

### **3.2 Data collection**

Primary data was collected using a structured questionnaire using online Google forms. Secondary data was collected from research papers, books, magazines using keywords such as “e-HRM”, “factors affecting e-HRM”, “implementation of e-HRM”. The data was collected from May 2020 to August 2020.

### **3.3. Measures**

The questionnaire consisted of two sections the first section included statements related to factors influencing the effective implementation of e-HRM in IT organisations. In the second section demographic information of the respondents was recorded. The statements were developed by researchers using previous literature and expert opinion. Initially, a total of 40 statements were developed, but only 31 statements were used in the final questionnaire. The items were measured on a 5-point Likert scale ranging from 1 “strongly disagree” to 5 “strongly agree”.

4. Results

Table 1: Demographic Profile of IT employees

Demographic Variable	Category	Frequency	Percentage
Gender	Male	100	100%
	Female	0	0%
Age	18-25	10	10%
	26-35	40	40%
	36-45	30	30%
	46-55	20	20%
Education	Graduate	100	100%
	Post Graduate	0	0%
Experience	0-5	10	10%
	6-10	30	30%
	11-15	40	40%
	16-20	20	20%
Employment Status	Full Time	100	100%
	Part Time	0	0%
Job Role	Software Engineer	100	100%
	Other	0	0%

Source: Survey by author

4.1. Factor Analysis

Table 2: KMO and Bartlett's Test

Statistical Test	Value	Significance Level
KMO	.766	> .05
Bartlett's Test	10.234	< .001

Source: Survey by authors

Before applying factor analysis, the values of KMO and Bartlett's test of sphericity were checked. As seen from the table, the value of KMO was .766 and the significance

value ( $p < .001$ ) of Bartlett's test of sphericity was less than .05. As both the values were within range (Nunnally, 1978) factor analysis could be applied.

**Table 3: Total Variance Explained**

Extraction Method: Principal Component Analysis.  
Source: Survey by authors

On applying factor analysis, eight factors were generated. The total variance explained for the eight factors was 66.46 per cent. Further on applying varimax rotation the factor

loadings were above .5 for all the items. Since the factor loadings of all items were above the recommended values, all eight factors were retained

**Table 4: Rotated Component Matrix<sup>a</sup>**

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 6 iterations. Source: Survey by authors





will increase staff administration to use it, perceived usefulness of e-HRM increase the interest to use it, staff acceptance of e-HRM is proof that system is easy to use” (Voermans & Veldhoven, 2007).

#### **FACTOR 2: EIT (EXPERIENCE OF INFORMATION TECHNOLOGY)**

Experience of information technology was the second factor. The alpha value of the four statements of this factor was 0.836. The total percentage of variance explained by this was 8.82 and the eigen value was 3.8. Here also, the value of AVE and CR was above the recommended value of .5 and .8 respectively. This factor also included the four statements as: “ICT device which are available in the organisation enough to use e-HRM, the employee has the ability and skills to use e-HRM system, Employee must be trained continuously to reduce perceived risk of e-HRM system, the availability of computers and modern communications tools can reduce the risk of e-HRM” (Pant et al., 2012).

#### **FACTOR 3: SS (SECURE SYSTEMS)**

Secure system was analysed as the third factor through the factor analysis. The Cronbach’s alpha of system security was .806. The total variance explained and the eigen value was the second-highest for this factor. The eigen value was 2.7 and the total variance explained was 8.71. The value of AVE and CR was .58 and .84 respectively. This factor included four statements. The statements were: “High level of system security reduces the risk of e-HRM, I need more training on the e-HRM system to reduce mistakes and increase my knowledge of the tools available in it, e-HRM system should not take time to perform tasks through it to increase system efficiency, less time needed to use e-HRM increase system usefulness” (Rahman et al., 2018).

#### **FACTOR 4: TU (TECHNOLOGY USEFULNESS)**

Technology usefulness was the fourth important factor in the analysis. The value of Cronbach’s alpha for this factor was .814. The eigen value and total variance explained was 2.4 and 8.35 respectively. The value of AVE and CR was .81 and .93 respectively. The technology usefulness factor included four statements. The statements were: “The concept of e-HRM is clear, perceived usefulness of e-

HRM increase staff attitude to use it, perceived usefulness of e-HRM increase staff behaviour intention to use it, using e-HRM reduce employee mistakes in the work” (Voermans & Veldhoven, 2007).

#### **FACTOR 5: CT (COMMUNICATION TOOLS)**

Communication tools was the fifth factor. The Cronbach’s alpha value of this factor was .798, which was above the cutoff of .7. The total variance explained and the eigen value was 8.34 and 2.15. Here also, the value of AVE and CR was above the recommended value of .5 and .8 respectively. This factor included the four statements and these statements were as: “The lack in using communication tools reduces employee’s intention towards e-HRM, the lack in using communication tools increase e-HRM perceived risks, Employee must be trained continuously to reduce perceived risk of e-HRM system, the availability of computers and modern communications tools can reduce the risk of e-HRM” (Pant et al., 2012; Azhar Naima, 2019).

#### **FACTOR 6: RP (RISK PERCEPTION)**

Risk perception was the sixth factor generated through factor analysis. The value of Cronbach’s alpha for perceived risk was .798. The value of AVE and CR was .56 and .83 respectively. In this factor four statements were included. These statements were: “e-HRM must be difficult and complex to reduce perceived risk, my attitude decline if e-HRM system is not secured, perceived usefulness of e-HRM increase when perceived risk is decreased, e-HRM system within an organisation is clear and highly secure”. The eigen value of this factor was 1.55 and the total variance explained was 8.09 (Voermans & Veldhoven, 2007).

#### **FACTOR 7: UI (USAGE INTENTION)**

Usage intention was the seventh important factor of the analysis. The Cronbach’s alpha value of this factor was .747. The total variance explained by this factor was 7.25 and the eigen value was 1.4. Here also, the value of AVE and CR was above the recommended value of .5 and .8 respectively. The usage intention factor included the following three statements: “Perceived usefulness of e-HRM increase my desire to use it, I intend to use or continue to use e-HRM system, Employee adoption of e-HRM increase colleagues’ intention to use” (Rahman et al., 2018).

## **FACTOR 8: OS (ORGANIZATIONAL SUPPORT)**

Organisational support was the eighth and the last factor of the analysis. The alpha value of this factor was .735. The total variance explained was 6.08 and the eigen value was 1.3. Here also, the value of AVE and CR was above the recommended value of .5 and .8 respectively. This factor included the three statements and these statements were: “The organisation support to use e-HRM system increase employees’ intention to use it, the organisation decisions adoption of e-HRM reinforce employees’ attitude to use it, the organisation depends on the e-career system to attract the employees” (Azhar Naima, 2019).

## **5. Discussion**

In the context of the current study, it was found that e-HRM includes eight factors that were found to have a significant impact on its effective implementation. These factors included ease of use of technology, experience of information technology, secure systems, technology usefulness, communication tools, risk perception, usage intention and organisational support. These factors were critical to the implementation of e-HRM. Numerous researchers revealed that there were similar factors that affected e-HRM implementation (Voermans & Veldhoven, 2007; Pant et al., 2012; Rahman et al., 2018; Azhar Naima, 2019). The researchers had worked on different factors included ease of use of technology, technology usefulness, risk perception (Voermans & Veldhoven, 2007), experience of information technology, communication tools (Pant et al., 2012), secure systems, usage intention (Rahman et al., 2018), communication tools and organisational support (Azhar Naima, 2019). Among these, the most important factor was the ease of use of technology which was found to be having the highest value of explained variance that was more than 10 per cent. Employees of organisations, especially IT organisations in this case, find it suitable to use e-HRM as it is an easy-to-use technology. It makes their work simpler and convenient. No previous study had found all these factors contributing together to the effective implementation of e-HRM. Thus, the study made a significant contribution to the field of e-HRM by exploring the major factors affecting e-HRM.

## **6. Conclusion**

The implementation of e-HRM has been influenced by a number of factors. Previous authors have given factors like

security, the expertise of employees, infrastructure etc., as the main factors. In this study, the authors also tried to study factors affecting e-HRM implementation from the perspective of IT employees. The study revealed that there were primarily eight factors that were influential in e-HRM implementation. These factors included ease of use of technology, experience of information technology, secure systems, technology usefulness, communication tools, risk perception, usage intention and organisational support. The organisations should take care of these aspects when implementing e-HRM so that the process can be smoothened.

## **7. Implications**

The present study provided some useful implications for organisations and HR managers. The successful e-HRM implementation requires that the employees should have secure systems and communication tools. Next, organisational support was another important aspect that should be taken care of as the adoption of e-HRM requires that the employees should have the required support. Further, organisations should try to involve people with experience in information technology to initiate successful e-HRM implementation. The HR managers should also take an assessment of the risks involved when implementing e-HRM. These risks may be related to lack of technological support, lack of coordination between departments, shortage of skilled staff and training facilities. Organisations should try to overcome these risks for the smooth implementation of e-HRM.

## **8. Limitations**

The study was conducted only in the IT organisations of India and cannot be generalised to other industries. The study was conducted through questionnaires and thus was subject to respondent bias.

## **9. Future Research**

The present study focused only on the IT sector. But e-HRM is used in many other sectors also like banking, hospital, education, manufacturing, hotels, forecasting and many others which can also be studied in future. The majority of the respondents in the present study belonged to the younger age-group. There is a scope in future to study the adoption of technology among the senior employees working in an organisation.

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# Working Capital Management as a Determinant of Financial Performance: Accounting vs Market-based Approach

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The present study analyses the influence of working capital management on the financial performance of Indian healthcare companies. Considering a sample of 211 listed companies over a reference period of 10 years (2010 – 2019), the study examines the effect of inventory holding period and net receivable period on accounting (measured by return on assets – ROA) as well as stock market (measured by Tobin's Q ratio) based measures. Findings, based on panel data regression along with fixed and random effects estimation, have presented dynamic effects of working capital management and firm performance. The inventory holding period has reported a significant negative impact on ROA, whereas it has a strong positive effect on Tobin's Q ratio. On the contrary, the net receivable period has a negative effect on both measures but lacks statistical significance. The outcome of the current research will assist managers to understand the relevance of liquidity management, and it also bridges the gap in the existing literature by contributing to the pool of knowledge.

**Keywords:** Working Capital, Return on Assets, Tobin's Q, Healthcare, Panel data regression

## 1. Introduction

Functions of corporate finance are categorised into four major groups, i.e. investment, financing, working capital and dividend decision. Investment and financing are associated with a long-term horizon and are non-recurring functional areas. On the other hand, working capital management (WCM) is more concerned with the operating activities of business and is more episodic than other aspects. The quest for working capital starts with the procurement of raw material, transforming them into finished goods to cash collection from debtors (Soukhakian & Khodakarami, 2019). The importance of WCM has been recognised in financial literature and is evidenced by ample contribution by past researchers (Deloof, 2003; Lazaridis & Tryfonidis, 2006; Garcia-Teruel & Martinez-Solano, 2007; Muhammad, Jan, & Ullah, 2008; Aggarwal & Chaudhary, 2015; Afrifa & Tingbani, 2018). In practice, WCM is a process of striving for a balance between liquidity and profitability. Lowering investments in current assets such as stock and receivables can reduce cost and improve profitability (Afrifa & Tingbani, 2018), whereas disproportionate investment in current assets yields suboptimal returns (Raheman & Nasr, 2007). Efficient management of WCM can assist in maximisation of firms' value (Deloof, 2003) and have a critical impact on profitability and risk of the firm (Garcia-Teruel & Martinez-Solano, 2007).

Conventionally, the influence of WCM on profitability has been analysed using operating profit and return on assets (ROA) as a measure (Raheman & Nasr, 2007; Rahman, 2011; Vijayakumaran & Atchyuthan, 2017) which further extended to market-based measures like Tobin's Q ratio (Abuzayed, 2012; Afrifa & Tingbani, 2018). The present research work is aimed at assessing the effect of WCM on the financial performance of the Indian healthcare industry. The current study differs from existing work in two ways. Firstly, it adopts 'net receivables period' as a novel measure of WCM, as firms always attempt to balance between accounts receivable and payable period to reduce the need for excessive working capital financing; hence, the net period should be used due to offsetting effects. Secondly, the study examines the effect of WCM on accounting as well as market-based financial performance in the context of the Indian healthcare industry. Besides, past studies have revealed contradictory results, such as the research findings

of Ganesan (2007), Ramachandran and Janakiraman (2009), Aggarwal and Chaudhary (2015) and Vartak and Hotchandani (2019) have concluded that WCM has a negative effect on profitability whereas Muhammad et al., (2008), Sharma and Kumar (2011) and Makori and Jagongo (2013) have reported a positive impact. Such differing results create a need for further probing in this area.

The present article has been organised as follows. The first section highlights the theoretical foundation of WCM and its importance in research as well as corporate practice. The second section briefly describes the Indian healthcare industry, along with its position in the Indian economy. A review of past literature has been summarised in the third section, followed by the research methodology adopted for conducting research. Further, data analysis, scope of future research and concluding comments are included at the end.

### 1.1 Indian Healthcare Industry

Healthcare has become one of the largest sectors in India in terms of revenue as well as employment. The industry stood as the fourth largest employer in India in 2017 by employing more than 0.3 million people. The Indian healthcare sector is expected to grow at a CAGR of 22% by the fiscal year 2022 and will reach a size of USD 372 billion. Besides, the medical equipment and hospital industry will record a CAGR of 16% and will cross USD 143.82 billion by FY2022. Favourable demographic conditions such as increasing income, improving health attentiveness, lifestyle diseases and access to health insurance facilities are major growth drivers of this industry in India. The healthcare industry contributes nearly 14% to the nations' GDP, which is expected to increase to 19.7% by 2027.

Government and regulatory support is also acting as a major determinant of growth in the healthcare industry. Public expenditure on the health industry has grown at 1.4% of GDP in FY 2018, which will reach 2.5% by 2025. Policies such as allowing FDI, tax advantages on life-saving equipment, healthcare education and training, National Nutrition Mission and such other initiatives have witnessed encouraging steps of regulators. High potential and favourable government schemes attract competitors, and that leads to increasing mergers and acquisitions (M&A)

deals. In FY2019, the total value of M&A in the healthcare sector has recorded a 155% increment and crossed USD 1 billion. Cost-effective medical services have attracted medical tourism and the establishment of international R&D centres. Growing demand, coupled with a favourable regulatory environment, are major success drivers of the health care industry.

## 2. Review of Literature

WCM practices and their impact on financial performance has been studied extensively by researchers using different approaches. The majority of research work has focused on assessing the effect of WCM on accounting-based performance indicators such as gross operating profit, net operating profit, ROA and return on equity (ROE). Further, several researchers have concentrated on WCM and market-based performance measures like Tobin's Q ratio. Besides, few research articles have moderated the influence of WCM on firm performance by macro-economic variables such as GDP growth and inflation. The present section summarises the findings of past research work by classifying them into three broad categories as discussed.

### 2.1 WCM and Accounting based Financial Performance

Financial performance of business, as indicated by measures like gross profit margin, net operating profit, ROA, ROE, and earnings per share, is based on information recorded in the books of accounts. Deloof (2003) has considered gross operating income as a measure of firms' performance. He has concluded that profitability can be improved significantly by reducing receivable days and inventory conversion period. Hindered collections result in a cash deficit which further leads to delay in payments to creditors. Lazaridis and Tryfonidis (2006) have supported the findings of Deloof (2003) and proved the adverse effect of a longer cash conversion cycle (CCC) on profitability. The extension of credit to the customer may lead to collection delinquencies and bad debts. To incorporate this adverse effect, gross profitability should be replaced by net profitability, i.e. net operating profit. Raheman and Nasr (2007) and Ramachandran and Janakiraman (2009) have considered net operating profit as a measure of financial performance. They have shown the strong negative effect of various components of

working capital management on operating profit, indicating that longer conversion cycles adversely affect financial performance. Firms with lower profitability are persuaded to reduce the credit period allowed to customers to bridge the gap between cash requirement and its availability (Ramachandran & Janakiraman, 2009).

Profitability, when expressed as a percentage of assets or investments, enables peer comparison and assists in decision making. ROA has been one of the most widely used measures of accounting-based financial performance (Chowdhury & Amin, 2007; Rahman, 2011; Makori & Jagongo, 2013; Gaur & Kaur, 2017). However, Deloof (2003) advocated for the use of operating income ratio to measure financial performance. But, ROA incorporates the operating profits of the company as well as utilisation of available assets in generating such profits (Makori & Jagongo, 2013) and hence can be viewed as a comprehensive measure of profitability (Padachi, 2006). Following the past studies from Senanayake, Dayaratna, and Semasinghe (2017) and Vartak and Hotchandani (2019), the study adopts ROA as the accounting-based measure of financial performance. Liberal credit policy can increase sales which further boosts profitability, but it also extends the CCC, which is used as a wide-ranging measure of WCM of the firm. Hence, companies have to trade-off between profitability and liquidity. Higher cash holding enables companies to avoid high-cost financing and also provides autonomy in decision making (Vijayakumaran & Atchyuthan, 2017). Sharma and Kumar (2011) have concluded a similar positive relationship for Indian corporates by considering a large data set of 263 listed companies. The direct relationship between profitability and CCC is quite uncommon in empirical research and has been contradicted by the findings of Rahman (2011), Goel and Jain (2017) and Vartak and Hotchandani (2019). A longer conversion cycle may be the result of inefficiency in the production process and delay in receiving payments. CCC as a composite measure cannot assist in decision making directly because of its inclusiveness, and therefore, it has to be broken down into sub-parts, namely stock conversion period (SCP), receivable payment period (RPP) and creditor disbursement period (CDP). Research studies from Ganesan (2007), Muhammad et al. (2008) and Aggarwal and Chaudhary (2015) have augmented the single

measure of WCM, i.e. CCC, by incorporating activity-wise conversion time to assist managerial decision making. Holding inventory for a longer span of time is an indicator of poor financial performance as firms with deteriorating profits find their stock level intensifying (Deloof, 2003; Garcia-Teruel & Martinez-Solano, 2007; Sharma & Kumar, 2011). The delay in payments adversely affects the profitability and credit worthiness of an organisation, and hence profitable firms prefer to discharge their obligations on time (Vartak & Hotchandani, 2019). On the contrary, loss-making firms struggle to pay their dues and hence longer CDP adversely affects profitability (Ganesan, 2007; Muhammad et al., 2008; Seyoum, Tesfay, & Kassahun, 2016). In addition to the phases of operating cycle and time period involved, the working capital policy can be analysed using an activity ratio expressed as a frequency rather than number of days. Rehman and Anjum (2013) and Gaur and Kaur (2017) have considered current ratio, acid-test ratio, current assets to total assets and current assets to sales ratio as exploratory variables and assessed their impact on financial performance. Both research studies have confirmed a positive relationship between working capital management and the profitability of firms. Collectively, this section highlights the significant impact of WCM on firms' performance; however, it also reveals that the research findings are not consistent.

## **2.2 WCM and Tobin's Q Ratio**

Maximisation of shareholders' wealth is the central area of all financial decision making. The wealth of shareholders is expressed by the market value of the firm derived from the price of its equity shares listed on the capital market. Accounting measures cannot express the response of investors on firms' business practices, and hence it is inevitable to study the effects of financial practices such as capital budgeting, capital structure, dividend and working capital management on the market value of the firm. Further, the profitability of the firm is an outcome of historical revenue, whereas firm value is an estimation based on expected future revenue. Hence, the linkage between firm value and WCM may differ from that of profitability and WCM (Abuzayed, 2012). Firm value can be measured by market-based performance indicators as P/E ratio, market-to-book value ratio, and Tobin's Q ratio. Out of these, Tobin's Q ratio has been the most commonly

used measure in past studies (Nazir & Afza, 2009; Abuzayed, 2012; Altaf & Ahmed, 2019). Q ratio captures the reputational value effects of firms WCM capabilities on the performance (Afrifa & Tingbani, 2018), and it has more desirable distribution properties than other measures (McGahan, 1999). Therefore, following the extant literature, the study considers the Q ratio as a measure of market-based financial performance. Investors assess the efficiency of senior management in handling working capital issues, and the same has been reflected in the market price of shares. The findings of Abuzayed (2012) and Afrifa and Tingbani (2018) reveal that stockholders attach negative value to longer CCC as an investment in working capital needs external funds, which leads to borrowing cost. Nazir and Afza (2009) have examined the effect of working capital investment (measured by current assets) and working capital financing (measured by current liabilities) on shareholders' value creation and proved the significant positive effect of aggressive financing policy on the Q ratio. On the other hand, Altaf and Ahmed (2019) have found an inverted U-shaped relationship between Tobin's Q ratio and working capital financing. They have concluded that a low (high) level of working capital finance through short-term borrowings improves (deteriorates) financial performance. The above discussion implies that shareholders consider WCM as value-relevant while evaluating a company's performance. But, this area has been less explored, especially in emerging economies like India.

## **2.3 WCM and Financial Performance moderated by Macro-Economic variables**

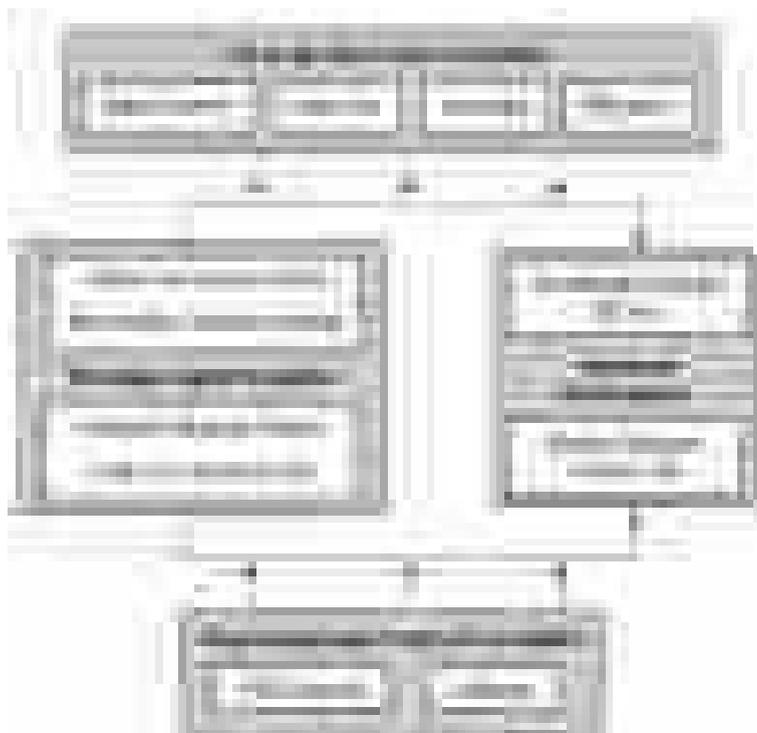
Macroeconomic conditions affect the financial performance of companies operating in a particular country. Favourable conditions such as increasing GDP, moderate inflation, virtuous balance of payments and exchange rates affect the profitability and investment activities in a progressive manner. One of the most commonly used proxies for macroeconomic conditions is the annual growth rate in GDP (Garcia-Teruel & Martinez-Solano, 2007; Nazir & Afza, 2009; Abuzayed, 2012; Soukhakian & Khodakarami, 2019). Garcia-Teruel and Martinez-Solano (2007) have concluded the positive and significant impact of GDP growth on ROA. The confidence of investors gets reinforced with the positive growth in GDP, which is reflected in the market value of

the firm (Nazir & Afza, 2009; Abuzayed, 2012). Soukhakian and Khodakarami (2019) have considered GDP growth and inflation rate as economic indicators and have concluded the direct and significant effect of these variables on financial performance. However, they lack evidence to support the moderating effect of economic factors on firm performance and WCM and have explained that the firm's WCM policy depends on company-specific factors. Lastly, the section concludes that the moderating effect of economic variables needs to be tested through further research.

#### 2.4 Research Gap and Conceptual Model

Though substantial literature focusing on working capital and firm performance is available, very limited research

work has concentrated on the linkage between WCM and shareholders' wealth as well as the market value of the firm. Besides, empirical studies focusing on this point are not carried out in the Indian context, especially in the healthcare sector. Moreover, past research work shows inconsistent results so far as WCM and financial performance are concerned. Hence, the current research will bridge the gap in the existing research by assessing the effect of WCM market based financial measures along with accounting measures. Figure – 1 presents the conceptual model highlighting the working capital, financial performance along with firm-specific and macroeconomic control variables identified from the review of literature.



(Source: Developed by Author)

**Figure 1. Conceptual Model**

### 3. Research Methodology

#### 3.1 Purpose, Variables of Study and Hypothesis

The present research aims to analyse the effect of working capital management on accounting and market based

financial performance of selected healthcare sector companies in India. The current study extends the research work of Nazir and Afza (2009) and Abuzayed (2012) in the Indian context. Based on the existing literature, the variables of the study are divided into three categories, i.e. (i)

financial performance, (ii) working capital, and (iii) control variables.

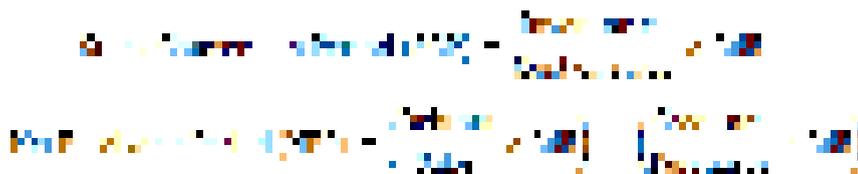
*Financial performance* has been considered as the dependent variable. Accounting and market performance

has been measured by return on asset (ROA), and Tobin's Q (TQ) ratio, respectively and are computed as mentioned below.



WCM, treated as the independent variable, has been measured using the stock conversion period (SCP) and net receivable period (NRP). As against past research work, CCC has been dropped as conclusions derived from it need

to be re-examined activity-wise for decision making. NRP is a novel measure calculated as the difference between the receivables collection period and creditors disbursement period.



*Controls*, as the financial performance is affected by several firm-specific factors other than WCM; hence, revenue growth (RG), size (SZ), leverage (LV) and efficiency measured by asset turnover ratio (AR) are considered as control variables. The annual percentage change in sales has been proxied for growth (Gaur & Kaur, 2017), whereas the size is measured by the natural log value of total assets (Vijayakumaran & Atchyuthan, 2017). Leverage is computed as the ratio of debt to assets (Makori & Jagongo, 2013), and the asset turnover ratio is measured as sales to total assets ratio. The present study adopts a descriptive methodology of research and analyses the effect of WCM on financial performance. Following hypothesis are formed and eventually tested using empirical results.

- H<sub>01</sub>: SCP does not have a significant impact on ROA
- H<sub>02</sub>: NRP does not have a significant impact on ROA
- H<sub>03</sub>: SCP does not have a significant impact on Tobin's Q Ratio
- H<sub>04</sub>: NRP does not have a significant impact on Tobin's Q Ratio

### 3.2 Sampling Plan and Data Collection

The present study focuses on the Indian healthcare industry; hence all listed companies are considered for inclusion in

the sample. The empirical results are based on the secondary data collected from the Centre for Monitoring Indian Economy (CMIE), Prowess and Ace Equity database. According to the CMIE database, 230 healthcare companies are listed on the Indian stock exchanges. To create a balanced panel dataset for the study period of 10 years (2010 – 2019), companies are selected using a multistage sampling technique. Continuous listing and availability of data for selected variables throughout the study period are the primary filters of sample selection. Finally, 211 companies are selected based on the requirement, which creates an ultimate dataset of 2110 firm-year observations.

### 3.3 Techniques of Data Analysis

Financial data collected from secondary sources have been analysed using descriptive analysis, correlation and multiple regression analysis. The data has been validated for assumptions like autocorrelation and multicollinearity using the Durbin-Watson (DW) test and Variance Inflation Factor (VIF), respectively. Panel data methodology has been adopted as it incorporates the potential endogeneity of variables arising from unobserved firm heterogeneity, which is ignored in the ordinary least square method (Vijayakumaran & Atchyuthan, 2017). Fixed effects model

assess the firm-wise variation in intercept assuming same slope, constant variations, and time-invariant individual effects whereas random-effects model treats individual intercept as a random variable with mean value  $\alpha$  and express intercept of each company as  $\alpha_i = \alpha + \varepsilon_i$  where  $\varepsilon_i$  is a random

error with zero mean (Gujarati, 2003). The suitability of fixed and random effects has been examined by a Hausman test with the null hypothesis that a random-effects model is a better estimate than fixed effects. Following regression models are formulated considering financial performance as the dependent variable and WCM as the independent variable.

*Fixed Effects Model*

$$ROA_{it} = \alpha_i + \beta_1 SCP_{it} + \beta_2 NRP_{it} + \beta_3 RG_{it} + \beta_4 SZ_{it} + \beta_5 LV_{it} + \beta_6 AR_{it} + u_{it}$$

$$TQ_{it} = \alpha_i + \beta_1 SCP_{it} + \beta_2 NRP_{it} + \beta_3 RG_{it} + \beta_4 SZ_{it} + \beta_5 LV_{it} + \beta_6 AR_{it} + u_{it}$$

*Random Effects Model*

$$ROA_{it} = \alpha + \beta_1 SCP_{it} + \beta_2 NRP_{it} + \beta_3 RG_{it} + \beta_4 SZ_{it} + \beta_5 LV_{it} + \beta_6 AR_{it} + \varepsilon_i + u_{it}$$

$$TQ_{it} = \alpha + \beta_1 SCP_{it} + \beta_2 NRP_{it} + \beta_3 RG_{it} + \beta_4 SZ_{it} + \beta_5 LV_{it} + \beta_6 AR_{it} + \varepsilon_i + u_{it}$$

Where,

$\alpha$  = Intercept

$\beta_1$  to  $\beta_6$  = Regression coefficients

$u_{it}$  = stochastic error of firm i and year t

i = Number of Firms

t = Time period from 2010 – 2019

**4. Data Analysis And Interpretation**

**4.1 Descriptive Results**

Descriptive statistics that assist in analysing the data and its variability have been summarised in Table 1. Indian healthcare companies generate an average ROA of 12.88% with a standard deviation of 7.88%, which indicates moderate volatility in returns. The mean and standard deviation values of the Q ratio are 1.1014 and 0.6930, respectively, indicating quite satisfactory results. The

average stock holding period of selected companies is approximately 67 days indicating a huge piling of inventory in the industry. The average net receivable period is close to 10 days, and its standard deviation is 38 days portraying firm-wise differences in collection and payment policies. The Healthcare industry has reported an average revenue growth of 15.71%, whereas its average debt ratio is only 0.2805, from which it can be inferred that healthcare companies rely more on owners' funds compared to borrowings.

**Table 1. Descriptive Statistics**

ROA	Mean	12.88%	Standard Deviation	7.88%	Q1	6.50%	Q3	19.26%
TQ	Mean	1.1014	Standard Deviation	0.6930	Q1	0.7000	Q3	1.5000
Inventory	Mean	67 days	Standard Deviation	38 days	Q1	30 days	Q3	104 days
Net Receivable	Mean	10 days	Standard Deviation	38 days	Q1	0 days	Q3	86 days
Revenue Growth	Mean	15.71%	Standard Deviation	10.50%	Q1	5.00%	Q3	26.42%
Debt Ratio	Mean	0.2805	Standard Deviation	0.1500	Q1	0.1500	Q3	0.4305

Source: Compiled from SPSS Output

### 4.2 Correlation Matrix

Results of Pearson correlation have been abridged in Table 2, indicating linear relationships among the selected variables. A significant negative correlation has been observed between ROA and both WCM indicators. The results indicate that a higher length of operating cycle will adversely affect the financial performance of selected companies. Reducing the storage period of inventory and minimising the gap between collection and payment days can significantly improve the profitability of firms. Past research from Deloof (2003), Lazaridis and Tryfonidis (2006) and Sharma and Kumar (2011) has also supported the inverse relationship. Analysing the result for Tobin's Q ratio, NRP has an indirect relation, but it is not significant, and only inventory holding has a significant positive relation which is contradicting previous studies. An explanation for such results can be given as the current market value of a firm is an indicator of future returns, and investors analyse inventory holding jointly with revenue growth. Increasing inventories are associated with higher sales which can further improve operating profitability (Abuzayed, 2012) and gives a positive signal towards future profitability. Further, among control variables, sales growth, asset turnover, and leverage have significant relation with ROA, whereas Q ratio is significantly related with only leverage and turnover ratio.

**Table 2. Correlation Matrix**

Source: Compiled from SPSS Output

### 4.3 Result of Econometric Models

To strengthen the conclusion on the effect of WCM on financial performance, multiple regression analysis has

been applied. Table 3 and Table 4 summarises the regression output of Model 1 and Model 2, respectively. The robustness of results has been analysed by estimating both equations using fixed-effects as well as random effects methods, and the Hausman test has been applied to check their suitability. The results support (Significance value < 0.05) rejection of the null hypothesis and confirms the applicability of fixed-effects for both econometric models. Further, DW statistic and VIF values are also within the acceptable range (DW = 1.5 to 2.5; VIF < 10), indicating that any problem of autocorrelation and multicollinearity has been controlled (Gujarati, 2003). The fit of regression models has been tested using F-statistics, and its probability value (<0.01) shows that both models are significant.

The output of regression Model 1 (see Table 3) portrays the negative impact of WCM variables on the profitability of selected companies. SCP has a significant adverse effect on ROA, whereas the impact of NRP has not been supported by statistical significance. Holding inventory for a longer span of time will increase the carrying cost that adversely affects the profitability of the firm. Likewise, increasing the gap between collection and payments creates a liquidity crunch and forces companies to resort to external financing that leads to interest and procurement cost. Critical values of regression coefficients of SCP and NRP concludes **rejection of H<sub>01</sub>** hypothesis whereas **failed to reject H<sub>02</sub>** hypothesis. The findings of the present research coincide with the conclusions drawn from the research work of Raheman and Nasr (2007), Ramachandran and Janakiraman (2009), Aggarwal and Chaudhary (2015) and Goel and Jain (2017). Makori and Jagongo (2013) have reported contradictory results and concluded the positive effect of stock holding on profitability as higher inventory reduces the possibility of production interruption and loss of sales. Among the control variables, only leverage and asset turnover ratio are found to be significant, and leverage reported negative impact, whereas turnover ratio improves profitability. Further, the fixed effects model can explain 56.30% variations in ROA, which is more than random effects validating the results of the Hausman test.

**Table 3. Regression Output of Model – 1 (ROA)**

Model	Variable	Coef.	Std. Error	t-Statistic	Prob. >  t
Model 1	Constant	0.0000	0.0000	0.0000	0.0000
	ROA	0.0000	0.0000	0.0000	0.0000
	Inventory	0.0000	0.0000	0.0000	0.0000
	Asset Turnover	0.0000	0.0000	0.0000	0.0000
	Other variables	0.0000	0.0000	0.0000	0.0000

Source: Compiled from E-views Output

The effect of WCM on the market value of firm measured by Tobin’s Q ratio has been highlighted in Table 4. As against ROA, SCP has a significant positive impact on the Q ratio, demonstrating that investors attach favourable signal to increasing inventory. Higher inventory reduces the procurement and operating risk and ensures undisturbed production. Further, as explained by Abuzayed (2012), the growing inventory level is linked with increasing sales which improves the profitability of the firm. This will further strengthen the expectations of future returns resulting in a positive effect on market value. Though this is in contrast with conventional understanding, the extant literature has not explored the relationship between the inventory holding period and Tobin’s Q ratio adequately.

Thus, these findings need further validation through future inquiries in this direction. On the contrary, increasing NRP reduces the cash reserve of companies which could have been utilised for profitable investment opportunities and thereby maximising shareholders’ returns. Hence, NRP has a negative impact on market performance, but the results are significant at a 10% level (Prob. value = 0.065). Hypothesis testing for Model 2 reveals a similar result as Model 1 and supports the **rejection of the H<sub>03</sub>** hypothesis, and **fails to reject the H<sub>04</sub>** hypothesis. The Asset Turnover Ratio has a positive and significant effect on Tobin’s Q ratio as it indicates efficient utilisation of fixed assets. Other control variables are found to be insignificant.

**Table 4. Regression Output of Model – 2 (Tobin’s Q)**

Model	Variable	Coef.	Std. Error	t-Statistic	Prob. >  t
Model 2	Constant	0.0000	0.0000	0.0000	0.0000
	Tobin's Q	0.0000	0.0000	0.0000	0.0000
	Inventory	0.0000	0.0000	0.0000	0.0000
	Asset Turnover	0.0000	0.0000	0.0000	0.0000
	Other variables	0.0000	0.0000	0.0000	0.0000

Source: Compiled from E-views Output

## 5. Conclusion And Research Extentions

Working capital management is an indispensable part of the decision making under corporate finance. The efficient management of current assets and current liabilities play a vital role in determining the profitability and value of a firm. The present research article examines the impact of working capital management on the financial performance of 211 healthcare companies in India by taking balanced panel data for ten years (2010 – 2019). Using panel data regression methodology, the study concludes the negative and significant effect of working capital measured by the inventory holding period on the accounting performance measures, whereas market measures have been favourably affected by the same. The net receivable periods has a negative influence on profitability and market value, but the relationship is significant at the 10% level. Hence, the findings conclude that firms can maximise their profitability and value by managing their working capital optimally. The outcome of research work will help practitioners to devise a suitable strategy for managing working capital, and it also bridges the gap in the existing literature by contributing to the pool of knowledge.

Though the present research attempts to provide a comprehensive view of WCM and financial performance, few areas still require further examination. The current research does not include macroeconomic variables, which can be explored for future research. The conceptual model developed from the literature review can be empirically tested with different industry datasets. Further, similar studies can be conducted by concentrating on small and medium enterprises (SMEs) as they are equally exposed to the problems of profitability and liquidity.

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# Employee Demography and Employee Engagement- An Empirical Study on IT Employees

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## A b s t r a c t

In order to survive and gain a competitive advantage in today's fast-changing organisational environment, competitive pressures, and stakeholder demands, organisations attribute more importance to their workforce. The recent buzz among the industry, consulting firms and academia, still with vast scope for research, is the concept of employee engagement. There is an increasing awareness that employee engagement is pivotal to the success of the organisation. That is the reason that the world today is paying increased attention to Employee Engagement. The objective of the study is to ascertain how Employee Engagement and its facets like Growth, Teamwork, Management Support and Basic Needs, differ with workers demographic factors, including gender, age, and experience. Data was collected through self-administered questionnaires from 223 working adults in the IT companies of Pune, Maharashtra. Findings were made with the help of standard statistical software such as SPSS, and complete model testing was done with the help of AMOS. One-way ANOVA, Post Hoc test and T-tests are also used.

The current study discovered that overall male employees have elevated engagement level than females. Female employees outscore men employees in the dimension of Basic Need of Employee Engagement, thus concluding that females are greatly engaged at the entry-level. Findings reveal that employees between 31-40 years, and employees with more experience are highly engaged. The study has practical implications as now the employers are aware that employee engagement in males on two dimensions, namely Growth and Management support, is more than as compared to females in the IT organisations.

This study gives a clear understanding of how demographic factors influences employee work engagement that supports human capital management strategy within organisations. It is suggested that HR professionals can deploy targeted employee engagement programs and strategies to engage employees with their work and with the organisation.

**Keywords:** Employee Engagement, Gender, IT, Experience, Age

## 1. Introduction

In today's high-velocity environment, competition is the order of the day. In this cut-throat scenario, it's important that both businesses and individuals strive hard to keep their competitive edge intact. In this dynamic and increasing hyper-competition, managers will have to focus on employees physical and mental wellbeing. According to The Harvard Business Review (2013), 71 per cent of respondents concur with the thought that (employee engagement is a substantial predictor for the economic success of the organisation). Gallup (2006) defines Employee Engagement as "engaged employees are more likely to view the organisation and job as a healthy environment and therefore more likely to support the organisation." Hence, employee engagement is a strong tool that can be beneficial in these tough times. Employee engagement will be considered as a strategic technique for the service organisations to survive and to sustain in the prevailing extreme competitive environment (Amabile et al., 2011). Because engaged employees have a huge amount of energy which is obtained from the emotions which they experience in their workplace, and these engaged employees are fervent about their employment (John & Raj, 2020).

The engaged employees are the ones who go beyond that extra mile – who invest that discretionary effort for the success of the organisation (Leary Joyce, 2004). Employee engagement is a factor related to many organisational issues and individual outcomes such as work performance (Laschinger et al. 2006; Paul & Anantharaman, 2004) or turnover intentions (Agarwal et al., 2012; Bailey et al., 2015; Soane et al., 2012), and more productivity (Gallup, 2013)

Employee Engagement trait is used to denote the emotional and cognitive factors of organisational loyalty, which is desired to be in tandem with the missions and goals of the organisation (Ehambaranathan, et al., 2014). Engagement and immersing one's self into the job completely brings out a happy and good performer who will be more creative, motivated, authentic, non-retaliatory and overall, a more passionate employee about the work. Gallup, in their most recent "State of the Global Workplace Report" (2017), says that 85 per cent of the workforce is not engaged at

the workplace. Hence explaining it further, Gallup declares that 18 per cent are actively disengaged, while 67 per cent show all the characteristics of not being engaged at the workplace at all. The above-mentioned employees may not be the most awful performers, but these employees have a couldn't care less attitude with respect to their employment. This explains that employees do give their organisations the time, but they are not involved in their work in totality. Hence, their findings revealed that due to disengaged employees, the businesses suffered a major financial loss of \$7 trillion (Gallup, 2017.) Therefore, the organisation should develop strategies that serve to enhance engagement.

The exponential advancement of the IT sector has created incredible work prospects for a large section of educated women. Singhal (1995) is of the opinion that "Participation of women in the workforce is essential for economic development and population planning." According to the Ministry of Electronics & Information Technology, there are 34 per cent female employees, out of a total of 39.68 lakhs employees in Information Technology and web-enabled services combined. This is a fairly sudden increase from 21 per cent of women workers in 2001 (NASSCOM, 2001) and 30 per cent in 2012 (NASSCOM, 2013), cited in Gupta (2015).

In our patriarchal society, where a female is generally a homemaker or a caregiver, striking the right amount of balance amidst job and family can be quite a daunting task. Balancing work and family was one of the frequently quoted challenges in a study on women in Information Technology (Adya, 2008). The Information Technology sector is making all the endeavours to improve the work engagement of their employees as engagement makes the employee perform better, which in turn increases the productivity of the organisation.

Different employees will have different expectations, requirements, wants, desires, anticipations, etc., from the employers because they all are from varied social-demographic backgrounds. Hence, the management should, therefore, try to understand the employees at an individual level. Balain and Sparrow (2009) opined that when the attitudes of the employees have to be assessed, the employee demography should be taken into consideration.

Owing to its significance, employee engagement is now a matter of contention and is on the rise quite steadfastly up the agenda of Human Resource professionals. The literature revealed that employee engagement (EE) is diminishing and that an increasing disengagement currently exists in the workforce (Kular et al., 2008). Therefore, the engagement of the employee factor is keeping the HR folks and the employers on their toes since leveraging this key business driver is significantly critical for achieving competitive advantage. (Soldati, 2007; HR Focus, 2006) and now, the concept of work engagement is being researched comprehensively. This paper, therefore, is an effort to fill the gap in the literature and provide a different perception to the outcomes of earlier studies about the role of various demographics like age, experience and gender in employee engagement in the organisations under study.

## 2. Literature Review

### 2.1 Employee Engagement

Employee engagement, of late, has surfaced as an important part of business success in today's competitive arena (Saks, 2006; Bakker & Schaufeli, 2008). Sadique (2014) considered engagement as an emotional connect to the workplace because he opined that employees who are enthusiastic and passionate about their work are dedicated and are empowered. Albrecht (2011) added that engagement takes a particularly important role in all organisations. It makes an employee give his best performance in terms of work activities, and thereby allow them to understand the corporate culture. The investment in employees will help the organisation improve leadership and the creation of technological innovation that will result in elevated financial gain. Organisations that execute employee engagement strategies, implies that their employees have full faith in the company that they will be unbiased in all respects. Work engagement is also defined as the involvement and contributions that employees put into their work (Kuok & Taormina, 2017).

When business leaders implement the policies or strategies on employee engagement, it elevates customer satisfaction, increases production and profit (Bowen, 2016), and reduces turnover intentions (Memon et al., 2016). Consequently, employees with heightened employee engagement work more efficiently and effectively because

they work with a lot of involvement in their work, along with emotional connect.

Kahn (1990) recommended that engaged employees are ones who put a lot of effort into their work beyond the minimum requirement for the work to be completed by giving extra time, passion, and intellect. Chartered Institute of Personnel and Development (2013), in their report, describes employee engagement as "being positively present during the performance of work by willingly contributing intellectual effort, experiencing positive emotions and meaningful connections to others."

Recent research has identified engagement as more of an emotional feeling towards their work (Baumruk, 2004; Richman, 2006). In short, there is a psychic income or non-pecuniary income at work which is respect, appreciation, admiration, self-actualisation needs getting fulfilled, etc., and that makes employees committed and socially acceptable (Camerer & Malmendier, 2007).

In the opinion of many researchers, employee engagement is substantially related to the feeling that the employees are "glued" to their work (Harter et al., 2002; Schaufeli & Bakker, 2004). Engaged employees have an emotional attachment with the organisation, which results in higher productivity, return on investment, retention, loyalty and lower absenteeism (Shukla et al., 2015).

Consequently, these engaged employees are better suited to cope up with the uncertain demands of their work. These engaged employees will seldom have an intent to exit from the organisation, which is evident from the study of Schaufeli et al. (2001), who investigated that workforce who are engaged with full involvement in their job are more content with it and enjoy their work.

### 2.2 Demographic Variables

#### 2.2.1 Gender

Men are from Mars and Women are from Venus and which means that women can be just as unique professionally and personally. Though they are walking tall with men in the workplace, they have not become replicas of men. Both male and females exhibit different behaviours in the workplace.

Kelkar and Nathan (2002) stated in their study that the development of information technology (IT) in Asia has had a significant impact on women. Clark and Sekher (2007) assert in their study that IT employment to women has enhanced their socio-economic status. This has been reinforced by the findings of Shanker (2008), who also observed that Information Technology employment has contributed to the upliftment of the women employees pertaining to economic capital, social capital and symbolic capital.

Eagly's (1987) gender socialisation and social role theory stated that women are more focused on emotional relation investment by which they complete a task by emotionally connecting with the team, whereas men are supposed to be "agentic" and move directly to the project goal. Females believe in building relationships with people while on the task or job (Donelson, 2010; Eagly, 1987; Gilligan, 1982; Farrell & Finkelstein, 2007; and Knowles and Moore, 1970). This nature of females can be because they are highly compassionate and emotional and have great team-building skills. Ramamurthy and Flood (2004) reported in their study that women in general reported higher emotional attachment than men. The outcomes of many studies also indicate that the disparity in employee engagement between the genders is prevalent (Kong, 2009; Mauno et al., 2005; Rothbard, 2001).

Maitland (2001) suggested that in this dynamic environment, the women workforce will fill the gap of competent and well-trained talent in the workplace internationally. However, IT employers are facing a challenge when it comes to hiring and retaining skilled female employees. In spite of women-friendly retention policies, this is proving to be a substantial challenge in the Information Technology sector (Pfleeger & Mertz, 1995).

Shuttleworth (1992) found out that females in the IT companies are majorly participating in routine kinds of jobs, whereas men are involved in decision making and executive jobs. Many have advocated that enhancing the representation of females to decision-making levels and policy implementations will definitely make the workplace more conducive for women to work. On the contrary, many past studies have reinforced the fact that womenfolk in the IT field are at the lower and middle levels, and very few of them reach the top of the pyramid in the organisational

hierarchy (Myers, 1990; Benditt, 1992) Based on the research of Reid et al. (2010) and Trauth et al. (2012), the "equality argument" criticises existing world power structures, where men occupy most of the top positions in the IT field and elsewhere. Raghuram et al. (2017), in their research, found that 51 per cent of entry-level hires represent women; a little over 25 per cent of women reach the managerial level, but <1 per cent are at the senior executive level. Marcus and Gopinath (2017) signify in their study of professionals that gender as a demographic variable has no influence on employee engagement, i.e., no significant difference between male and female respondents with respect to the drivers of employee engagement in IT companies. Hence we propose:

H01: There is no significant difference in engagement levels of male and female employees.

### 2.2.2 *Experience of employees*

Robinson, Perryman and Hayday (2004) carried out a survey of around ten thousand employees in fourteen organisations and discovered that employee engagement decreased when the age and tenure in the organisation increased. Mahboubi et al. (2015) identified a significant association between work engagement and length of employee work experience. Employees who have spent more time with the employer are more likely to reach a level where there is no advancement in career (Allen, Poteet, & Russell, 1998) and thus feel low engagement level as compared to those who spend less time in the organisation. Jaupi and Llaci (2015) observed changes in the engagement levels of employees due to the longevity of experience with the organisation. Some studies conducted suggested that the engagement of the employee is not affected by the demographic factors such as gender, age, position, and income of the respondents (Madan & Srivastava, 2015; Sarath & Manikandan, 2014). Hence it is imperative to propose:

H02: There is no significant difference in engagement levels of employees with different years of experience.

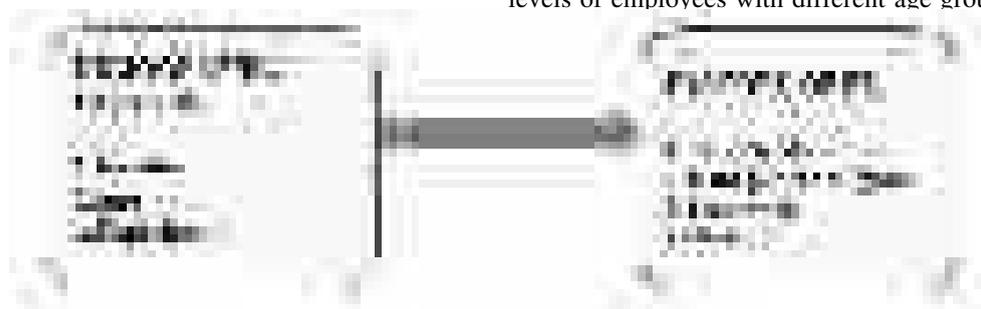
### 2.2.3 *Age of Employees*

Not many researches have been conducted for examining the linkage between the age of an employee and employee engagement. Whatever researches have been conducted on

this critical area has given us quite contradictory outcomes. Age has been identified as a predictor of work engagement (Kim & Kang, 2017). Bezuidenhout and Cilliers (2011) and Douglas and Roberts (2020) stated that there exists a positive association between age and work engagement of employee, which suggests that employee engagement increases with age. Vijay et al. (2016) posited that employee engagement does not vary with the demographic factors, namely gender, age, position and income of the respondents. Pitt-Catsoupes and Matz-Costa (2008) did the analysis from data which was obtained from 20 organisations and highlighted the importance of job flexibility and reported that flexibility in the job was more important to older employees in comparison to young employees, and this could be the driver for employee engagement. Similarly, their work was substantiated by Brough, O'Driscoll and Kalliath 2005 and De Cieri et al.

2005, who examined the effects of flexibility at work on employee engagement, and their outcomes of the study revealed that more the flexibility more the employee engagement. George & Ben (2017) posited that age and gender have a statistically significant effect on the engagement level of employees. It was found those workers whose age was more than 45 years was more engaged. In research conducted by Wolfe (2004), it is indicated that the highest level of employee engagement is felt when the employees are in the first year of the job, and then it subsequently comes to stagnation and then again falling in the 5–10-year bracket. The age of an employee and the amount of work experience an employee has should increase the likelihood of engagement. Therefore, we propose

H03: There is no significant difference in the engagement levels of employees with different age groups.



**Figure 1: Conceptual framework**

### **2.3 The Information Technology (IT) Industry of India**

India has evolved as one of the primary IT service breadwinners in the World since it has a skilled and intellectual knowledge base. IT Services is the segment that is growing by leaps and bounds. According to the latest report by NASSCOM, 2018, the Information Technology sector is projected to make exports revenues of the order of US\$ 69.3 billion in the year 2017-18 as compared to US\$ 66.0 billion in the year 2016-17.

Quick advancement in technologies along with multi-dimensional projects or flexi-timings and multi-linguistic, multicultural employees stationed all across boundaries, in different time zones (Sharma, 2014). With the amalgamation of these factors, the IT industry is dynamic and unique at the same time. The advent of globalisation and huge development and advancement in Information Technology saw greater career opportunities.

Subsequently, Information Technology's dynamism and its technological advancement have increased the attentiveness of the academic attention of scholars in the recent past. Yet, very few studies have been carried out with respect to employee engagement in the Indian IT industry. Computer-aided disciplines are known to be project-based and normally operate with multi-dimensional tasks catering to customers who have varied demands, hence the demand for such personnel who can contribute emotionally to their job has risen. The IT industry has ever been trying to mitigate the challenge of lack of skilled manpower and the burning problem of retention of employees. (Pereira V & Budhwar P, 2015). The subtle nature of abilities of employees due to steadfast progressing hi-tech expertise, mergers, support and use of talent has become of significant value, and this empirical research attempts to study the effect of demographic variables on employee engagement of the employees across the IT companies of the city of Pune, Maharashtra.

## 2.4 The Current Study

This study explores the relationships of demographic attributes with employee engagement. We broaden the information in this realm by organising research and learning how employee engagement differs with the change in demographic factors, including age, gender, and experience.

## 3. Research Method

### 3.1 Research Setting

The research design is a quantitative research design that was deemed appropriate for this study. This study was conducted at the IT companies in Pune. The selection of samples was made by the judgement of the researcher. A total of 250 questionnaire surveys were administered to the prospective respondents from ten IT companies, out of which 223 usable responses were received, so the response rate was 89 percent. Participant ages ranged from < 30 years to > 50 years of age. There were 91 males and 132 females with less than 5 years of experience to more than 15 years of experience.

### 3.2 Description of the instrument

In this study, the information was collected through self-administered questionnaires distributed personally to the subjects by the researcher. The 12 items encompassing the Gallup Q12 (also known as the “Gallup Workplace Audit”) were used to review employee opinions of engagement. This scale is a four-factor scale consisting of 12 items intending to assess the four representing factors of employee engagement, i.e., Basic Needs, Management Support, Teamwork, and Growth. All items are scored on a seven-point Likert scale ranging from 1 (Strongly Agree) to 7 (Strongly Disagree).

It is important to note that each of the Q12 items relates to four psychological conditions promoting engagement: Basic Needs, Management Support, Teamwork, and Growth. For example, Items 1 and 2 relate to workers’ resources, i.e., possessing resources may be construed as being valued in the workplace, which is supposed to be a factor of Basic Needs. Items 3, 4, 5, and 6 describes the style, procedure, and method that the management uses to complete a certain task which is a part of psychological

Management Support. Item 7,8,9, and 10 refers to relations amongst the team members and managers, which is a component of Teamwork. Items 11 and 12 refer to progress in work or success in the competition of the task, which is a part of growth.

### 3.3 Data Analysis Technique

This is an applied research-based study. For analysis of multiple-choice questions, a computer program called Statistical Package for Social Sciences -SPSS 23 and AMOS was used. At first descriptive statistics (results have been shown in table 1 and 2) was used to study the characteristic of the statistical sample. One-Way Analysis of variance (ANOVA) and T-test is used to analyse how the mean of a variable is affected by different combinations of factors. In the study, the relationship of demographic variable, namely - age designations and gender and each of the factors of engagement, are analysed. The subsequent sections throw light on the relevance of the factors of employee engagement based on the age of the respondents using ANOVA, t-test, Fisher’s Least Significant Difference (LSD) is used to identify the pairs of means that are different.

### 3.4 Reliability

Cronbach’s alpha ( $\alpha$ ) values were applied to test the reliability of all the four factors of Employee Engagement so as to achieve a reliable result of “internal consistency” of the instrument which is measuring the variable. The outcomes of the reliability test show that for all four factors, alpha ( $\alpha$ ) values are more than .7 (Nunnally, 1994), which is a threshold value. This suggests a good “internal consistency” of all the items.

### 3.5 Validity

The validity refers to how well an instrument measures what it is supposed to measure. Content validity is called as logical or curricular validity. The scale used to measure Employee Engagement was adopted from the existing literature. To test the validity of the scale, specialists of the IT industry, academicians and IT employees were given the questionnaire, and every item in the questionnaire was assessed by the panel, and hence the validation of the scale was completed for further study. Confirmatory Factor Analysis was used to examine the construct and



Management Support dimension. Female employees gain more scores than males on the dimension of Basic Needs. The studies show that women are less engaged in the growth dimension. According to the NASSCOM-Mencher report (2009), the senior management women represent only five percent, the rationales ascribed to the above statement are: (1) ‘stereotyped female professionals’, (2) ‘personal sense of mid-career guilt’, and (3) ‘glass ceiling effect’.

Female employees are thus clustered at the lower level of the career climbing ladder; hence it leads to a certain feminisation of jobs. The percentage of female workers reaching the top level is exceptionally low (Kelkar et al. 2002; Upadhya, 2006). Shanker (2008) reiterated the similar outcomes in Bangalore that female employees’ show less level of engagement at the senior level but are highly engaged at the entry-level, as most of the times, they fail to upgrade their technical proficiencies; they refrain from job-hopping and remain loyal to one company for a pretty long time (Shanker, 2008). Their family responsibilities forbid them to put up late hours in their work to establish networking (Upadhya, 2006). Their

choice of career is governed by distance from home, family obligations, the security of the work and other social reasons that make the women less engaged when they climb up the ladder.

Our findings reveal that overall, the males have higher employee engagement as compared to females. This finding was in line with the study of Kong (2009). At the same time, female employees showed higher scores on the dimensions of the basic needs of employee engagement than their male counterparts. However, Madan and Srivastava (2015) reported that demographic variables such as age, gender and marital status do not have a significant impact on employee engagement. However, we conclude that there is a significant difference between male and female respondents with respect to the drivers of employee engagement in IT companies in Pune. Therefore, we reject the null hypothesis(H03). The only factor which was insignificant between the gender of the respondents was Teamwork.

**Table 2: Comparisons of dimensions of Employee Engagement between Females and Males (T-Test)**

4.2.2 Experience

In table three, Fisher’s LSD post hoc test was applied to compare the four factors of work engagement among three groups, namely D1, D2 and D3, it comprised of employees who have less than 5 years experience, 5-15 years experience and employees who have more than 15 years of experience respectively. There was a significant difference which was found in employee engagement, Growth, Teamwork, Management Support and Basic Needs between D1/D2, D1/D3, and D2/D3. Employees of the D2 group showed higher employee engagement and Teamwork (M= 4.59, SD= .888) than employees of group D1 (M=

3.6, SD= .85881, F= 66.699). Workers comprising of group D3 exhibited elevated employee engagement and Teamwork (M= 6.2940, SD= .601) as compared to those who were in group D1 (M= 3.61, SD= .85881, F= 66.699). Employees who were a part of the D3 group showed higher employee engagement and Teamwork (M= 6.290, SD= .601) than employees in the D2 group (M= 3.61, SD= .85881; F= 66.699).

Hence, workers with different tenure in the organisation differ substantially in the study as regards their engagement levels. Employees having more experience will be more

engaged than employees having fewer years of employee experience in the organisation. Similarly, Sibiya et al. (2014) too opined that years of service were positively related to employee engagement, implying that longer-tenured employees were more engaged. Having said that, more experienced workers go the extra mile, exercise more discretionary effort, and are likely to keep customers satisfied and generate more revenue for the Organisations. This may be because, with the increase in the length of service, the match between individuals' values and the organisational values gradually increases as individuals get edified (Yang, 2010). Besides, while their work experience gradually accumulates, and they have better work proficiency, they gradually enjoy higher positions and salaries. Thus, the sense of achievement and recognition coming from work gradually increases, which is reflected as increased job engagement and a sense of responsibility (Xudong et al., 2016).

In the survey done by Business World (2008), it was indicated that senior professionals with respect to

experience are highly engaged. Sharma et al. (2017) identified a statistically significant difference in the work engagement level of employees based on different years of experience. Employees who have more experience and have spent more time in the organisation are not mere employees in the organisation; they are the institution in themselves. They have remained with a company through all the challenges and been a witness to the strategies, policies, changes in personnel, mergers and acquisitions and redefining of competitive landscapes. The research conducted by Chaudhary and Rangnekar (2017) was in the same continuation with our findings where junior, middle, and senior employees with respect to work experience show different levels of engagement (Mathieu & Zajac, 1990).

Based on our above findings, we reject the null hypothesis ( $H_0$ ) that there is no significant difference in engagement levels of employees with different years of experience. Instead, there is a significant difference in the engagement levels of employees with different years of experience.

**Table 3: Comparisons of Dimensions of Work Engagement among Three Experience Groups**

Dimensions	Less than 10 years			10-20 years			20-30 years			F-Value	Sig.
	Mean	SD	N	Mean	SD	N	Mean	SD	N		
Basic Needs	3.21	0.85	100	3.45	0.78	100	3.68	0.72	100	12.34	.000
Management Support	3.15	0.92	100	3.38	0.85	100	3.52	0.78	100	10.12	.001
Teamwork	3.28	0.88	100	3.51	0.81	100	3.74	0.75	100	11.56	.000
Growth	3.18	0.95	100	3.42	0.88	100	3.65	0.82	100	9.87	.002

**4.2.3 Age**

In table four, Fisher's LSD post hoc test was performed to compare the four factors of employee engagement among four age groups. A1, A2 and A3, A4 comprised of age less

than 30, 31-40 years and 41-50 years and above 50 years, respectively. Significant difference was found in employee engagement and Growth, Teamwork, Management Support and Basic Needs between A1/A2, A1/A3 and A2/A4.

Employees who were in group A2 showed higher employee engagement and Teamwork ( $M= 4.36$ ,  $SD= 1.00$ ,  $F=8.065$ ) as compared to those who were present in group A1 ( $M= 3.41$ ,  $SD= 1.10$ ;  $F= 8.065$ ). Employees who were in group A3 showed higher employee engagement and Teamwork ( $M= 3.922$ ,  $SD= 1.025$ ) than employees in group A1 ( $M= 3.41$   $SD= 1.10$ ;  $F= 8.065$ ). Employees who were in group A2 showed higher employee engagement and Teamwork ( $M= 4.36$ ,  $SD= 1.00$ ) than employees who were a part of group A4 ( $M= 3.995$ ,  $SD= 1.0588$ ,  $F= 8.065$ ).

Thus, we can say that the respondents who were in the 31-40 years bracket showed the highest level of employee engagement. This group of respondents are the ones who are looking at this particular work or job with their whole career in front of them. They show more engagement towards their work because they have their future professional life at stake more than the employees who are older in age as compared to them. These employees are possibly a little more stable, experienced and matured in comparison to employees who are less in age and who are inexperienced. This group between 31-40 years may be less demanding or have limited wants and desires and are less materialistic about the trivial needs that can detract them or irritate them about the working culture of the organisation. Hence these employees exhibit high levels of engagement at this juncture as they are more focused on their careers and their professional life.

Employees who are old or aged show low levels of accommodation with the circumstances and situations, are less ebullient, slow in their work, take extra sick days, etc., and hence appears to be having low levels of engagement. The real issue of older workers is absenteeism. It is known to be an ageing workforce tendency. There can be many reasons for their absence from work; either it is their health, or they are disengaged, that is, they are not motivated enough to work. The reason can be any, that does not matter; what matters is that the company has to incur that cost. Older employees seem to be less engaged.

As per the findings, employees under the age of 30 were least engaged when compared to other employees.

According to “The Qualtrics 2020 Employee Experience Trends” report, the employees under the age of 30 were found to be most at risk of attrition, with many of them looking to switch jobs within twelve months and the rest of them look for jobs within two years.

The teamwork dimension scored the highest amongst all the other factors of Employee Engagement, indicating that Worker engagement increases markedly when employees are able to work together in teams and show a team spirit. Employee engagement is enhanced tremendously when workers work in effective collaborations and together. The mantra for Google’s success and its efficient and effective team performance is attributed to the combined independence to take risky decisions, which paves the way for creativity and innovation. Hence when workers think they can voice their ideas, they have this feeling of sharing; those employees are engaged emotionally and connected to the work.

A global study of engagement was carried out by ADP Research Institute (2020), and the outcomes stated that when employees feel that they belong to a team, it elevates their engagement towards the work. A similar trend was found in a study by Mckinsey (2020), where it was found out that employees working in teams exhibit a great amount of engagement because the team leaders develop trust in the employees. Trusting one’s team members and regarding him to be as helpful is viewed as a significant job- resource that helps in the achievement of personal as well as organisational goals associating substantially with employee engagement (Schaufeli & Bakker, 2004). May et al. (2004) were of the opinion that amicable and cordial relations with one’s team members could establish emotional safety in the organisation, leading to better job performance, thus being more engaged. On the contrary, employees who do not have good relations with other employees gives rise to mistrust resulting in disconnection in the workplace, contributing to disengaged employees. Ducharme and Martin’s (2000) results advocate those employees who have sound interpersonal relations exhibit heightened job satisfaction that will yield more employee engagement (Harrison et al., 2006).

**Table 4: Comparisons of dimensions of Work Engagement among four age group**

## 5. Discussion and Conclusion

The study was conducted on Indian IT employees. We found that there is a difference in the employee engagement among IT workers of different genders, which is consistent with the results of some earlier studies (Li, 2011; Zhu et al., 2015). Our findings reveal that the employee engagement of women in this study is generally lower than that of men (Schaufeli, Martínez, Marques Pinto, Salanova, & Bakker, 2002; Zhou, 2013; Pang, 2014).

Domestic responsibilities may make women less likely to pursue an avenue for upward mobility (Britton, 2003; Rothbard, 2001). This implies that men in general (relative to women) have better status and influences in their positions, and thereafter are more likely to experience psychological meaningfulness and employee engagement. Of course, we have examples of career successes and upward mobility of several women moving into higher ranks of organisations. This may suggest that at least some organisations may have paid attention to improving the work engagement of female employees. It also suggests that successful women may also have invested an extra amount of hard work and resources in overcoming gender-discriminatory structures and cultures.

Employees in the age group of 31-40 years and employees who have more years of experience have a significant part to play in keeping the employees engaged by building trust in them, putting forth the goals and values of the company

and communicating what is expected of the employees by the management. They are an especially important and critical resource for the organisation, and that is why they can be termed as the ‘central nervous system’ of the organisation as they are highly engaged employees. Highly engaged employees bring spirit and energy to the workplace. Their motivation and drive to succeed don’t take long to spread to others. Such employees motivate others to achieve their tasks. Such employees are a lot more active to take up tasks and participate in activities. They facilitate in executing and implementing the plans and changes formed by the management in day-to-day activities because they naturally become company advocates. They feel a sense of pride to be a part of the organisation. These employees play a key role in setting a clear vision for what can be achieved through the implementation of senior management decisions (Parker & Williams, 2001).

All highly engaged employees put in the extra effort in terms of time, energy and passion in their work. The clients are satisfied with them, and they contribute more towards the organisational level outcomes of growth and productivity (Bulińska-Stangrecka & Iddagoda, 2020).

### 5.1 Implications

Engagement is a psychological state. Researchers call engagement “an amalgamation of commitment, loyalty, productivity and ownership” (Wellins & Concelman, 2005). It is much more than making employees feel happiness and paying them a hefty paycheck.

The current research will add to researchers endeavours in comprehending the relationship between employee engagement and demographic factors in the Information Technology sector. This research provides new findings to the management of the organisations by leading a discussion as it shows how employee engagement varies with diverse demographic attributes.

Male employees in the organisations were found to be more engaged in their jobs as compared to their female counterparts in the dimensions of Growth and Management Support. It was found that females are more engaged at the entry-level than their male counterparts. When they first enter the organisation, they are of the belief about the equal opportunities to achieve their potential as men, and subsequently, this enthusiasm and passion diminishes over time because what females observe and experience has an adverse effect on their belief system about the gender disparity. This was the most significant finding of this research.

It was also found that employees' having high experience were more engaged than employees' having less experience. Another outcome of this research was that the results pointed towards employees between the range of 31-40 years as the most engaged amongst all the employees. However, the Teamwork dimension of Employee Engagement was found to be of insignificant value in male and female employees of the IT workforce.

The findings of this study will help management and HR professionals to design strategies so that employee engagement can be enhanced to a great extent. Consequently, the employers need to understand that having an engaged workforce in the organisations will lead to enhanced productivity, happy, satisfied employees and fewer turnover intentions.

The organisations also need to develop strategies to engage the female workforce during the whole life cycle of their career. Due to family, travelling concerns, and in an effort to strike a balance in work and family life, the women employees are forced to remain in the organisation, at times which may not be conducive for them to stay, due to which

they become disengaged. This could lead to untoward consequences both for the employees and employer. So, engaging the women workforce by analysing the female-oriented issues should be a primary concern for the organisations. Organisations ought to give equal prospects to the female folk because a feeling of getting ignored or neglected conveys a malevolent shade on employee engagement levels. An engagement programme exclusively for women employees will build a better organisational culture where there is no scope for gender discrimination or biases against women.

Difference due to age can prove to be detrimental for employee interpersonal relationships, which can turn out to be a challenge for the engagement of employees in their employment. Hence the companies should involve staff members of diverse attitude, skills and age in team outings, outdoor activities and also execute programs like 'reverse mentoring.' Such activities will foster comradeship among the employees, and in general, the silo mentality can be broken.

The study also value adds to the sparse literature on employee engagement especially related to Information Technology that is undergoing huge turmoil and vagaries of business in the form of retentions, hiring skilled manpower, acquisitions, mergers, leaning the manpower and suffering from business closures.

### **5.2 Limitations of the Study**

This paper has its own limitations. The study is based on a cross-sectional design, which is one limitation. Secondly, the sample size is less, due to which the outcomes are limited in generalisability.

### **5.3 Directions for future Research**

The present results add to our knowledge in comprehending that employee engagement varies with demographic features, and it acquires a larger sample from many more Information Technology Companies. In future, more studies can be carried out while considering the seniority level/ hierarchy level of employees in the organisation to investigate their employee engagement level. It would also be interesting to know employee engagement differences across generations.

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# Goal Setting: Its Impact on Employee Outcome

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## A b s t r a c t

The research investigated the individual perception of goal setting and its relationship with employee outcome. Using the 10-factor model of Goal Setting, 640 executives of Central Public Sector Enterprises (CPSEs) judged the quality of the goal-setting program in their respective organisations. The study also tried to establish the relationship between goal-setting factors and employee outcome. The results provided empirical evidence of a moderate implementation of the goal-setting program in the CPSEs. The correlation analysis further established the relationship between goal setting and employee outcome. The present study helped to figure out a more comprehensive picture of the influence of a goal-setting program on employee outcome, thereby providing important insights into the individual differences regarding the implementation of a goal-setting program.

**Key Words:** *Goals, 10-factor model, Public Sector, Job performance, Job Satisfaction, Employee Engagement, Motivation*

## 1. Introduction

Present-day organisations aim at maximising employee performance and achieving the highest level of quality output. In order to achieve these, the organisations need to translate their organisational objectives into individual and group level objectives. Performance Management System serves as a critical tool for achieving these objectives. The organisation that prioritises effective goal setting will succeed in its performance management, in developing its employees' skills and confidence, and in its business in general. One of the key components of performance planning is the setting of individual goals and objectives. It primarily refers to the process of setting the work-related activities in the form of job objectives that are integrated with the department or unit goals which are further tied to corporate goals and strategies. The goal-setting process needs to be properly planned and administered in order to achieve a desired level of performance. This study aims at investigating the perceptions of executives regarding the goal-setting process and analysing the possible relationship between goal setting with employee outcome.

## 2. Literature review

The modern understanding of goal setting and motivation was pioneered by Locke in 1968, where he highlighted that employees work more productively when guided by clear and achievable goals, given the appropriate feedback (Locke, E.A., 1968, 1982). His findings were validated by Latham and Baldes (1975) by stating that the performance increases immediately after assigning specific and hard goals. Kim and Hamner (1976) further found that goal setting without formal feedback can enhance performance, but when supervisory feedback and praise was added to a formal goal-setting program, performance was enhanced even more. Latham, Mithchell and Dossett (1978) found that employee participation in goal- setting led to higher goals being set than in a case when the supervisor assigns goals to the employee. In 1984, a 53-item questionnaire was developed by Locke and Latham that attempted to measure the core goal attributes of "specificity and difficulty" in addition to other attributes of the goal-setting process such as perceptions regarding participation in goal setting, supervisor support, conflict and stress. In 1990, however, a more comprehensive Goal Setting theory of motivation was presented by Edwin A. Locke and Gary P.

Latham on the basis of nearly 400 empirical studies conducted nearly over a 25-year period. These studies were conducted in Asia, Australia, Europe and North America, at individual, group and organisation levels, in both laboratory and field settings involving more than 40000 subjects, 88 different tasks, in different time spans and taking different performance criteria. The two core findings of these studies were; first, there is a linear relationship between goal difficulty and performance. Second, specific and difficult goals lead to higher performance than vague or abstract goals. (Locke & Latham, 1990, 2002, 2013). Over the years, the studies relating to goal setting was expanded across many domains. Lee et al. (1991) carried out a principal component analysis of the goal-setting questionnaire developed by Locke and Latham (1984) and extracted 10 meaningful factors consisting of both positive and negative factors. The positive factors were found to be positively associated with job performance and job satisfaction, whereas negative factors were found to be negatively associated for the same. Orpen (1995) found that the impact of goal setting was stronger among poor performers than among good performers and that this relationship was moderated by superior relations with the employees. Medlin and Green Jr (2009) investigated the relationships between goal setting, employee engagement, workplace optimism and individual performance and found that goal setting leads to engaged employees, which in turn leads to higher levels of workplace optimism that improves the individual performance of employees. Mahbod (2007) in their study, provided an integrated approach that prioritised organisational key performance indicators (KPIs) in terms of the criteria of SMART (Specific, Measurable, Attainable, Realistic, Time-sensitive) goals. Bipp and Kleingeld (2011) found that employee perception of a goal-setting system is related to both job satisfaction and goal commitment. Devrajan et al. (2018) studied the role of goal setting in the creation of work meaningfulness and found a positive association between goal rationale and work meaningfulness. Hoek et al. (2018) studied the extent and utility of goal setting at the team level within the public sector and its effect on their performance. From the individual and group level, the research on goal setting has been further extended to a more macro-level where the organisation as a whole is being studied. Goal-setting was proven in the literature to have increased the performance

among individuals, teams, and the organisation in Germany (Asmus, Karl, Mohnen & Reinhart, 2015; Bipp & Kleingeld, 2011), Spain (Morelli & Braganza, 2012), Taiwan (Chiu, Chen, Lu, & Lee, 2006), Sweden (Thorgren & Wincent, 2013) and India (Bhattacharya & Neogi, 2006; Mishra & Srivastava, 2008).

### 3. Conceptual Framework

Goal Setting is an open theory, and there is no limit to the discoveries that can be made between the goal-setting theory and other theories (Locke & Latham, 2006). Longitudinal studies are needed to gain insight into the perceptions of a goal-setting program and its effect on performance-related variables (Bipp & Kleingeld, 2011).

According to Latham et al. (2008), goal setting has a role to play in public sector management, and it being combined with self-management techniques can prove equally important in the Public Sector. The past literature found limited studies considering all the relevant variables of the goal-setting scale developed by Locke and Latham in 1984 (Lee et al., 1991; Bipp & Kleingeld, 2011). However, most of these studies did not consider the overall employee outcome as one of its variables. Therefore, the present study mainly focuses on the relationship of the 10-factor model developed by Lee et al. (1991) with Employee Outcome. Therefore, a structural model is being theorised, incorporating Goal Setting as an antecedent to Employee Outcome, which is shown in Fig.1.1.

**Fig. 1.1: Hypothesised structural model.**



Source: From author's study

#### 3.1 Goal Setting variables

*Goal clarity* describes the clarity and specificity of goals and the prioritisation of those goals. *Goal rationale* is concerned with the clarity of performance-goal relationships and the reason behind those goals. *Goal efficacy* relates to the existence of proper action plans, job training and feedback and one's happiness on achieving

the goals. *Supervisor Support* relates to the supervisor's supportiveness and willingness to let subordinates participate in setting goals and strategies. *Use of goal setting in performance appraisal* describes the use of goal setting in the performance appraisal and review process. *Rewards* represent the probability that goal achievement will lead to security, pay raise and opportunity for promotions etc. *Organisational facilitation* for goal achievement relates to teamwork, company resources and

policies that facilitate goal achievement. *Goal stress* relates to the difficulty and stressfulness of goals and employee's failure to attain them. *Dysfunctional effects of goal* deals with punitive measures such as a non-supportive supervisor or top management, using goals as a mode of punishment rather than to facilitate performance. And *Goal Conflict* describes different types of goal induced conflicts such as inter-role conflicts, too many goals and personal value related conflicts (Lee et al., 1991).

### 3.2 Employee Outcome variables

Job performance refers to "employee behaviours that are consistent with the expectations and that contribute to organisational effectiveness (Judge & Mueller, 2012). Harter et al. (2002) defines the term employee engagement as "an individual's involvement and satisfaction with as well as enthusiasm for work". According to Locke (1976), job satisfaction is a pleasurable or positive emotional state resulting from the appraisal of one's job or job experiences. Motivation is defined by Pinder (1998) as "a set of energetic forces that originates both within as well as beyond an individual's being, to initiate work-related behaviour, and to determine its form, direction, intensity and duration" (cited in Tremblay et al., 2009).

## 4. Research Methodology

Based on the conceptual framework, a research design has been laid down to follow the study in a systematic way. Goal Setting is considered to be the primary independent variable and Employee Outcome is considered to be the key dependent variable for the present study.

The study is focused on the CPSEs present in Assam. The study has been conducted with respect to the presence of MoU based Goal Setting process in CPSEs. Only those Executives/Officers who are assigned with individual Key Result Areas (KRAs)/ Key Performance Areas (KPA) are taken into consideration for the study. Four behavioural attributes were taken into consideration while measuring the employee outcome.

### 4.1 Objectives

The study aims to fulfil the following objectives;

i) To measure employee perception regarding the quality of Goal Setting in Central Public Sector Enterprises in Assam.

ii) To examine the relationship between Goal Setting and Employee Outcome.

### 4.2 Sampling design

The data was collected from 640 participants from six profit-making CPSEs present in Assam, Oil and Natural Gas Corporation Ltd (ONGC), Indian Oil Corporation Ltd. (IOCL), Power Grid Corporation of India Ltd (PGCL), Oil India Ltd. (OIL), Airport Authority of India (AAI), North Eastern Electric Power Corporation Ltd. (NEEPCO). Judgement sampling was used to identify the top profit-making CPSEs from each category present in Assam (PE survey report, 2014-15). Non-probability purposive sampling method was used to select the sample for the present study. Purposive sampling, also known as judgment sampling basically involves selecting a sample that is believed to be representing the population (Gay & Diehl, 1992). Moreover, for the purpose of our research, the selection of cases was based on the following criteria;

- a. The respondent should be of Executive Level.
- b. The respondent should be assigned with goals and should be involved in the goal-setting process.

All the items in the questionnaire were measured in 5-point Likert Scale ranging from "Strongly Agree" to "Strongly Disagree".

### 4.3 Research tools

In order to measure the perception of goal setting, the 10-factor model developed by Lee et al. (1991) is being used. These 10 factors are a reduced version of the goal-setting questionnaire developed by Locke and Latham in 1984.

In order to measure Employee Outcome, four behavioural outcomes were selected, viz., Job Performance, Motivation, Employee Engagement and Job Satisfaction. It should be noted that the items that are related to individual job and job-related goals are included in the questionnaire. As such, the Job Performance scale by Koopmans et al. (2013), Work Motivation scale by Shouksmith (1989) and Tremblay et al. (2009), Employee Engagement scale by Harter, Schmidt & Hayes (2002), and the Job Satisfaction Scale by Macdonald and Macintyre (1997) and SHRM Report (2014), were taken into consideration for measuring these outcome variables.

#### 4.4 Hypotheses

The hypotheses for the present study were set in the following manner;

H1: Goal Setting is positively related to Employee Outcome.

H2: The positive aspects of Goal Setting are positively related to Employee Outcome variables.

H3: The negative aspects of Goal Setting are negatively related to Employee Outcome variables

#### 5. Analysis

The responses (n=640) are subjected to analysis using the SPSS 20 version. The reliability test revealed the Cronbach's Alpha for Goal Setting to be .89 and for Employee Outcome to be .92. These values fall under the acceptable range of 0.70 to 0.95 (Tavakol & Dennick,

2011). Descriptive analysis is carried out in order to find the mean scores for analysis of the first objective, and Correlational Analysis is done for the analysis of the second objective.

#### 5.1 Perception of Goal setting

The mean scores obtained from descriptive analysis were interpreted based on the criteria given by Kraetschmer et al. (2004) and Francois (2014), where mean scores less than 3 was termed as 'low level', 3 to 3.99 as 'moderate level' and 4 to 5 as 'high level' perception. The data on perception of executives of CPSEs regarding Goal Setting and its factors are displayed in the following manner, as shown in Table 1.1.

The mean scores (Table 1.1) indicated that the Goal Setting score (3.81) in CPSEs was 'Moderate'. This implied that the quality of Goal Setting process was perceived by the executives to be moderate in the CPSEs.

**Table 1.1 : Mean Scores of Goal Setting variables.**

Source: Primary data

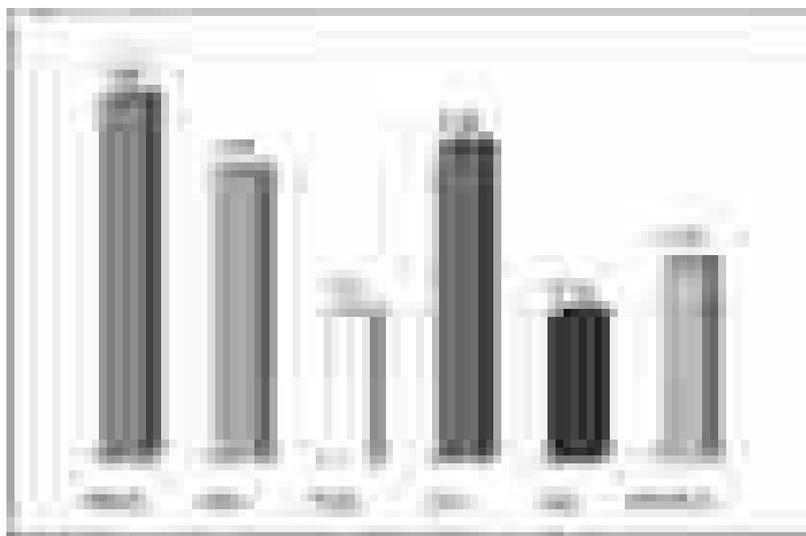
If the individual factors were analysed, the mean score of Goal Clarity (4.43), Goal Efficacy (4.14) and Supervisor Support (4.03) was found to be 'High' for the CPSEs. This implied that the executives of CPSEs have specific and clear goals set for the executives with proper prioritisation. They have all the skills and capabilities to achieve their goals. They are properly trained for the particular job assignments. There existed a participative relationship between the Supervisor and the Subordinate regarding Goal setting. The supervisors were found to be highly supportive

and helpful towards the executives in achieving their goals. It was also found that the other positive aspects, i.e., Goal Rationale (3.95), Use of Goals in Performance Appraisal (3.85), Rewards (3.34) and Organizational Facilitation (3.97), have scored 'Moderate'. This implied that the executives had moderate knowledge about their assigned goals and the use of those goals in their appraisal process. They perceived that they have a moderate level of goal-related rewards and that achievement of their goals is not directly linked to rewards like PRP, Promotion etc. It

should be noted that the executive's rewards are based on other factors as well, such as the Profit of CPSE, Executive's Grade, MoU rating, Performance review rating and the recommendations by the Remuneration Committee (DPE OMs dated 26.11.08 & 09.02.09). The negative aspects, viz., Goal Stress (3.44), Dysfunctional Effects (3.50) and Goal Conflict (3.46) of Goal setting were also found to be present at a 'Moderate' level in the CPSEs. This implied that executives experience a moderate level of difficulty and stressfulness in relation to their goals.

They have a moderate level of managerial dysfunctions and conflicts arising during their goal-setting process.

The mean scores of goal setting across CPSEs were analysed and are displayed in Fig.1.2. The total Goal Setting score was 'Moderate' for all the CPSEs indicating that all the CPSEs had a moderate level of Goal Setting Process. The opinions of executives were subjected to one-way ANOVA in order to find out the significant difference of opinion regarding Goal Setting across CPSEs.



Source: Primary Data

**Fig.1.2: Goal setting scores across CPSEs**

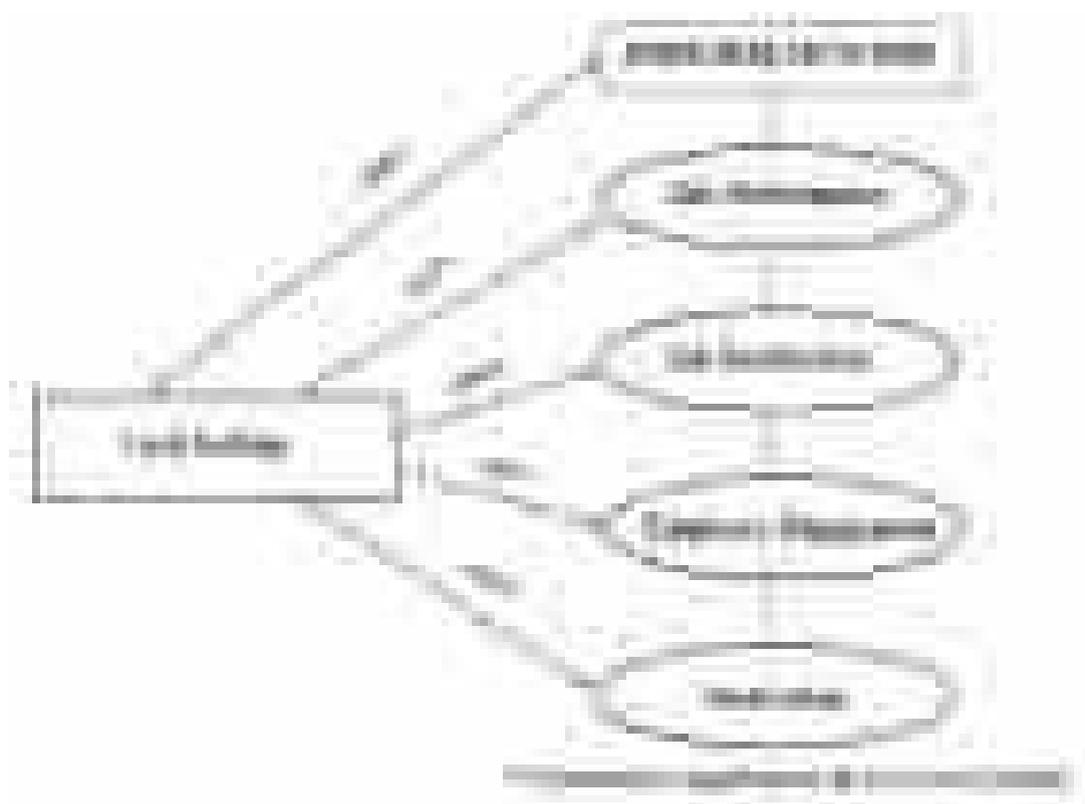
The result revealed a significant difference of means regarding goal setting ( $p=.033$ ,  $p<.05$ ) across CPSEs, implying that the executives differ in their opinion regarding goal setting across the six CPSEs.

### **5.2 The relationship between Goal Setting and Employee Outcome**

Correlation analysis was used in order to find out any significant relationship between Goal Setting and Employee Outcome. The effect sizes for the coefficients were assumed as .10 to be Small/Weak, .30 to be Medium, .50 to be Strong/High and .70 and above as Very Strong correlation (Kotrlík & Williams, 2003).

Figure 1.3 below shows a 'Strong' positive correlation between Goal Setting and Employee Outcome ( $p=.680$ ,

$p<.001$ ). This indicated Goal Setting to be strongly associated with the Employee Outcome in CPSEs. Similarly, Goal Setting was found to have a significant positive correlation with the sub-variables of Employee Outcome. All the sub-variables showed a strong correlation except for only Job Performance that was found to have scored a moderately significant correlation with Goal Setting. This implied that when the quality of Goal Setting is increased, the sub-variables, viz., Job Satisfaction, Motivation and Employee Engagement increases at a higher rate and Job Performance increases in a moderate manner. Therefore, supporting H1, it can be said that at the .01 level of significance, Goal Setting was positively related to Employee Outcome.



*Source: Author's analysis*

**Fig. 1.3. Figure showing Correlation coefficients between Goal Setting and Employee Outcome.**

Again, correlation analysis between Goal Setting variables with sub-variables of Employee Outcome was carried out in order to find out any significant relationships. The results are shown in Table. 1.2.

In the case of Goal Setting variables and Employee Outcome, it can be seen that all the variables have a p-value less than .01, which indicate a significant correlation between Goal setting and Employee Outcome. Goal Clarity, Goal Rationale, Goal Efficacy, Supervisor Support,

Goal Setting in PA and Organizational Facilitation were found to have a strong positive relationship with Employee Outcome. This meant that the higher the level of these variables, the higher is the Employee Outcome. Rewards are found to have a moderate positive relationship with Employee Outcome. And the negative factors such as Goal Stress, Dysfunctional Effects of Goal and Goal Conflict is found to have a 'Weak' negative relationship indicating that the increase in these variables decreases Employee Outcome in a similar manner (Refer to Table 1.2)

**Table. 1.2. Table showing Correlation coefficients between Goal Setting Variables and Employee Outcome variables**

	Goal Setting	Employee Outcome	Goal Setting	Employee Outcome	Goal Setting	Employee Outcome
Goal Setting	1	0.463	Goal Setting	1	Goal Setting	1
Employee Outcome	0.463	1	Employee Outcome	1	Employee Outcome	1
Goal Stress	-0.15	-0.12	Goal Satisfaction	0.18	0.15	0.18
Goal Clarity	0.22	0.18	Goal Commitment	0.25	0.22	0.25
Goal Motivation	0.18	0.15	Goal Persistence	0.20	0.18	0.20
Goal Self-efficacy	0.15	0.12	Goal Resilience	0.18	0.15	0.18
Goal Flexibility	0.12	0.10	Goal Adaptability	0.15	0.12	0.15
Goal Innovation	0.10	0.08	Goal Creativity	0.12	0.10	0.12
Goal Risk-taking	0.08	0.06	Goal Proactivity	0.10	0.08	0.10
Goal Autonomy	0.06	0.04	Goal Responsibility	0.08	0.06	0.08
Goal Accountability	0.04	0.02	Goal Integrity	0.06	0.04	0.06
Goal Transparency	0.02	0.01	Goal Honesty	0.04	0.02	0.04
Goal Openness	0.01	0.00	Goal Trustworthiness	0.02	0.01	0.02

\* Correlation is significant at the 0.01 level (2-tailed).

Source: Primary Data

When the relationship between the Goal Setting variables and the sub-variables of Employee Outcome are analysed, it can be seen that all the positive aspects of Goal setting have a significant positive correlation. The strength of the co-efficient ranged from strong to weak (refer to Table 1.2). This implied that when the positive aspects of Goal setting increased, the sub-variables of Employee Outcome also increased in the given manner. Therefore, supporting H2, it can be said that .01 level of significance, the positive aspects of Goal setting are positively related to Employee Outcome variables.

When the negative aspects of Goal setting and Employee outcome variables are analysed, it can be seen that except for Goal Stress and Job Satisfaction, all the other variables are found to have a significant weak negative correlation with the Employee Outcome and its sub-variables. This implied that when these negative variables have increased, the Employee Outcome is decreased. Therefore, with the

exception mentioned above and supporting H3, it can be said that at the .01 level of significance, the negative aspects of goal setting are negatively related to Employee Outcome variables.

### 5.3 Impact of Goal Setting on Employee Outcome

The correlation analysis only helped in determining the degree of the relationship, and it was not sufficient to prove causality. As such, a regression analysis was used to measure the impact of goal setting on employee outcome. The value of R<sup>2</sup> for Employee Outcome was found to be .463, indicating that the model explains 46.3% variance in the Total Employee Outcome; the estimated regression parameters were found to be β<sub>0</sub> = 1.571(intercept) and β<sub>1</sub> = .684 (slope), indicating a positive linear relationship. This regression line can be interpreted as, when X= 0, the value of Y is 1.571.

**i.e., Employee Outcome = 1.571 + .684 × Goal Setting**

This implies that goal setting has a positive impact on Employee Outcome and that Employee Outcome increases with a better goal-setting process.

Again, Multiple Regression analysis is carried out to find out the major predictors of Goal Setting that affects Employee Outcome. With an R<sup>2</sup> value of .576, the regression coefficients are shown in Table 1.3.

**Table. 1.3. Table showing regression coefficients.**

Goal Setting Factor	Regression Coefficient (β)	p-value	Significance
Goal Clarity	.182	p=.000<.01	Significant
Goal Efficacy	.161	p=.000<.01	Significant
Supervisor Support	.105	p=.000<.01	Significant
Organizational Facilitation	.173	p=.000<.01	Significant
Goal Stress	-.073	p=.000<.01	Significant
Goal Conflict	-.064	p=.001<.01	Significant

\* Significant at .01 level.

Source: Primary Data

The regression coefficients Table 1.3 reveals that Goal Clarity (β=.182, p=.000<.01), Goal Efficacy (β=.161, p=.000<.01), Supervisor Support (β=.105, p=.000<.01), Organizational Facilitation (β=.173, p=.000<.01), and Goal Stress (β= -.073, p=.000<.01), and Goal Conflict (β= -.064, p=.001<.01) significantly predicts Employee Outcome. The positive aspects of Goal setting such as, Goal Clarity, Goal Efficacy, Supervisor Support and Organisational facilitation were found to have a positive impact on Employee Outcome and the negative aspects such as Goal Stress and Goal Conflict were found to have a negative impact on employee outcome. This can be summarised in quadratic form as shown below;

$$i.e., \text{Employee Outcome} = 1.337 + .182 \times \text{Goal Clarity} + .161 \times \text{Goal Efficacy} + .105 \times \text{Supervisor Support} + .173 \times \text{Organisational Facilitation} - .073 \times \text{Goal Stress} - 0.064 \times \text{Goal Conflict}$$

Thus, the results from regression analysis suggest that Goal Setting significantly predicts Employee outcome and six out of the ten Goal Setting factors (i.e., Goal Clarity, Goal Efficacy, Supervisor Support, Organizational Facilitation, Goal Stress and Goal Conflict) were found to have the significant power to predict Employee Outcome.

### 6. Conclusion

Organisations nowadays rely highly on effective performance management and goal setting interventions. This study contributes to the practical and theoretical knowledge of Goal Setting and its relationship with different behavioural outcomes. The study provided information on how the employees perceived their goal-setting process and how this can be used as a tool for further policymaking. The study brought upon some interesting facts about the relationship between Goal Setting in Central

Public Sector Enterprises (CPSEs) and Employee Outcome. Firstly, the results supported the notion that executives scoring high on goal setting variables have a better understanding of the goal-setting process. Secondly, the Goal Setting process is found to be of moderate level in the CPSEs present in Assam. This raised an important question regarding the credibility of the individual goal of the executives of these profit-making CPSEs. It is argued that the targets set in CPSEs are much lower than actual achievements (Sharma, 2013; Althaf & Ramesh, 2013; Shirley, 1998; Yadav & Dabhade, 2013). Therefore, the CPSEs should attempt to re-evaluate the goal-setting process and focus on all the other factors that make the goal-setting process more effective. Thirdly, the study of possible relationships between Goal Setting and Employee Outcome leads the researcher to conclude that positive perception of Goal Setting increases Employee Outcome and all the 10-factors are significantly associated with Employee Outcome. Lastly, the significant relationships between Goal Setting and Employee Outcome found from Regression analysis revealed Goal Setting to be a significant predictor of Employee Outcome and six factors, viz., Goal Clarity, Goal Efficacy, Supervisor Support, Organizational Facilitation, Goal Stress and Goal Conflict were found to significantly predict Employee Outcome. Therefore, the CPSEs should focus more on increasing the positive aspects and reducing the effects of the negative aspects. Further, the organisations can provide the employees with high goal-specific support so that they can obtain realistic expectations with respect to goals. Thus, the conclusion suggests that Employee Outcome can be enhanced through proper goal setting and those goal-setting variables have a direct impact on Employee Outcome.

### 6.1. Limitations

The present study is limited to only six CPSEs and their executives present in Assam. As such, the data is limited to a specific sample, given that the data was collected only from the units of the organisation present in Assam. As such, the small size effects, especially in correlation analysis, was difficult to detect. Since the measurement of items is subjective, it needs to be interpreted with caution. For example, differing interpretation of items by subjects may lead to socially desirable answers, which may, in turn, lead to bias. The employee outcome is limited to behavioural aspects only.

### 6.2 Scope for future research

Future research can be done for the development and refinement of the goal-setting questionnaire. Studies can be done either in the qualitative or quantitative areas of goal setting and its relationships with other outcome variables. Given that the study conducted is limited to CPSEs only, it would be interesting to look at differences in opinions among two or more organisations, preferably between public and private organisations.

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# Earnings Management in Banking Industry: A Systematic Review of Literature

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Scams in the banking sector have diverted stakeholders' attention towards manipulated financial figures that reduce the authenticity of accounting numbers. There is an urgent need to investigate and plug the loopholes. The objective of the present paper is to review the literature on earnings management (EM) in the banking industry and to develop a conceptual framework. The review is based on 129 selected papers published between 1988 to 2019 in peer-reviewed journals. The literature is mapped on the basis of databases, publication year, country of study, number of citations, and approaches used to measure EM. The proposed conceptual framework of EM in the banking industry comprises of its determinants, approaches, consequences and mitigators.

**Keywords:** *Earnings Management, Banking Industry, Scams, Systematic Literature Review, Conceptual Framework, Loan Loss Provision*

## 1. Introduction

Collapse of banks and financial institutions have always landed the economies around the globe into trouble with a number of shocks to the stakeholders. The story starts with the collapse of the Medici Bank, founded by Giovanni di Bicci in the year 1397, in Florence in Italy. History witnessed another collapse of the Overend Gurney & Co. bank of the United Kingdom in the year 1866. During the twentieth century, banks such as the Danat-bank (1931, Germany), the Herstatt Bank (1974, Germany), the Lincoln Saving and Loan Association (1989, California), the Bank of Credit and Commerce International (1991, Pakistan), the Nordbanken (1991, Sweden) and the Barings Bank (1995, Britain) became bankrupt. The advent of the twenty-first century has made the situation worse. In the year 2008, seven prominent banks became bankrupt such as Bear Stearns (USA), Northern Rock (Britain), Lehman Brothers (USA), Washington Mutual (USA), Royal Bank of Scotland Group (Britain), ABN-Amro (The Netherlands) and Bankwest (Australia) (“List of corporate collapses and scandals,” 2019).

Banks in developing countries are not far behind in this race. The recent Indian examples include the Punjab National Bank (2018) and the Punjab Maharashtra Co-operative Bank (2019). “In the last 11 fiscal years, a total of 53,334 cases of fraud were reported by banks involving a massive amount of ₹ 2.05 trillion, the RBI data said” (Press Trust of India, 2019). This has resulted in a significant increase in the percentage of bad loans (non-performing assets) from below 3% in 2006-2008 to 11.5% by 2018 (Mistry, 2019), pressurising banks to manipulate earnings. The most common element in all these scams was misreporting of financial numbers. In the case of Lehman Brothers, “A March 2010 report by the court-appointed examiner indicated that Lehman executives regularly used cosmetic accounting gimmicks at the end of each quarter to make its finances appear less shaky than they really were” (“Lehman Brothers,” 2019). In another example of Punjab and Maharashtra Cooperative (PMC) Bank, “The bank misled auditors of the Reserve Bank of India (RBI) by replacing legacy accounts of the company with dummy accounts, dating back to 2008, to show a healthy balance sheet” (Roy & Panda, 2019). These collapses did not happen overnight, but were hidden initially

in the guise of window dressed financial statements. The primary reasons responsible for the collapse of banks are irregularities in financial statements, inadequate provisioning, non-recognition of NPAs, bad governance practices, etc. Earnings Management (EM) can be described as the manipulation of earnings in a desired direction by managers within the flexibility provided by accounting standards and laws to fulfil their personal motives. Though it does not violate any standard or law, it deviates from the spirit of the standard or law. This has not only downgraded banks’ image but has also shattered the investors’ and depositors’ confidence in banking systems in general. So, it has become essential to curb the malpractice of EM.

The concept of EM has evolved over a period of time. Schipper (1989) defines EM as, “disclosure management in the sense of a purposeful intervention in the external financial reporting process with the intent of obtaining some private gain.” According to Healy and Wahlen (1999), “EM occurs when managers use judgement in financial reporting and in structuring transaction to alter financial reports to either mislead some stakeholders about the underlying economic performance of the company or to influence contractual outcomes that depend on reported accounting numbers.” Managers are supposed to apply professional judgement and ethics in accounting as the situation demands so that the financial statements report true and fair information. However, the accounting professional’s judgement gets biased by personal motives, hidden corporate agendas and the flexibility provided by the regulatory environment. Magrath and Weld (2002) view EM as a value-maximising function as it helps in meeting the regulatory requirements, avoiding violation of debt covenants and achieving the analyst’s expectation regarding stock prices. Dutta and Gigler (2002) found that shareholders do not find it appropriate to restrict EM as it helps in reducing the cost of low-earnings prediction by managers. Discussing the divergent views of practitioners, regulators and accounting academics, Dechow and Skinner (2000) opine that regulators and practitioners see EM as a troublesome practice that needs immediate corrective actions, while accounting academicians believe that EM does not have any significant effect on financial statements, and for small effects, investor’s attention is not necessary. So, it is a matter of conflict whether EM is good or bad, and till now, there are no conclusive answers to this.



## Classification of Literature

Further, classification of the selected articles (129) is done on the basis of databases, year of publication, the approaches used to detect EM, country of study and the number of citations. The articles published between 1988 to 2019 were classified according to the database (Figure 1). The richest sources of selected articles were Google Scholar and Elsevier's Science Direct, which contributed 80 articles. Emerald (27), JSTOR (13), Taylor & Francis (5) and SAGE (4) contribute 21%, 10%, 4% and 3% of the total selected articles respectively. The higher percentage of articles from Google Scholar is due to its free availability. It has articles from many databases such as Wiley, Kulwer, American Accounting Association, etc.



**Figure 1: Article Classification by Database**

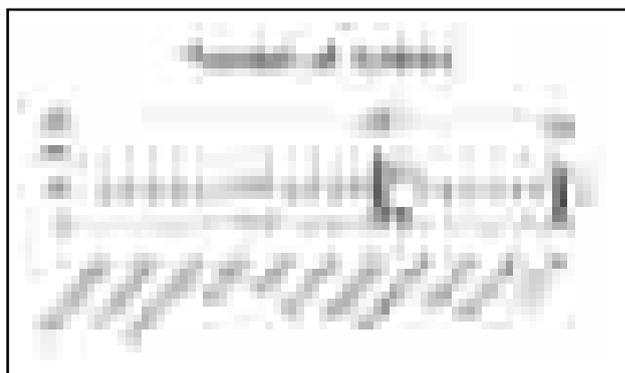
The articles are arranged on the basis of the year of publication (1988 to 2019) to pinpoint the trend of publication and development of research on EM in the banking industry (Figure 2). Only a few studies got published during the period of 1988-2010, and after 2010 the number of published research papers has increased tremendously, exhibiting that in the past decade, researchers in the area of finance and accounting have shown keen interest in explaining EM practices in the banking industry. Post 2010, banks across the globe were at the centre of controversies due to underperformance, stressed assets and governance issues. The subprime crisis further posed a question mark on the credibility of major

banks. These circumstances motivated the researchers to re-examine the issues at the heart of the problem fuelling research in the area of EM.



**Figure 2: Classification of Articles by Publication Year**

The articles are distributed on the basis of countries in which the study is conducted or from where data is collected. The country-wise classification (Figure 3) shows that the research on EM practices in the banking sector is primarily confined to 21 countries. The majority of the studies focus on a single-country approach, whereas 40 empirical papers use a multi-country approach. The multi-country studies are helpful in making cross-country comparisons of the EM behaviour of banks. Of the single-country studies, the majority (around twenty-eight percent) are conducted in the USA. There is a dearth of studies in European countries and other parts of the world, including from emerging markets.



**Figure 3: Classification of Articles by Country**

The literature is also categorised on the basis of the approaches used to detect EM (Figure 4). Specific Accrual,

Total Accrual and Real Activities are the alternative approaches used. The analysis reveals that 68.21% of articles use the Specific Accrual model due to its popularity in the banking industry. This helps in identifying the important factors that have a potential impact on accruals.

Total Accrual, Real Activities and Specific Accrual approaches are also used. The ‘Distribution Approach’ is not popular in the banking industry because it is a relatively new approach and is primarily helpful in detecting the benchmark-beating behaviour of bank managers.



**Figure 4: Classification of Articles by Approaches of EM**

Citation of research papers denotes scholarly or intellectual use of one’s research by another scholar in the same or related area. Citation analysis helps to locate the most critical and influential papers/ researchers in a specific field. The information about citations was gathered from Google Scholar in February 2020. Out of 129

selected papers, 104 have been cited. Table 3 includes papers that have more than 100 citations. Ahmed et al. (1999) is the most cited (1067 citations) article, followed by Beatty et al. (2002), Beatty et al. (1995), Laeven and Majnoni (2003), and so on.

**Table 3: List of Articles According to Citations**

Sl. No.	Author(s)	Citations	Sl. No.	Author(s)	Citations
1	Ahmed et al. (1999)	1067	11	Beatty et al. (2002)	100
2	Beatty et al. (1995)	100	12	Beatty et al. (1995)	100
3	Beatty et al. (1995)	100	13	Beatty et al. (1995)	100
4	Beatty et al. (1995)	100	14	Beatty et al. (1995)	100
5	Beatty et al. (1995)	100	15	Beatty et al. (1995)	100
6	Beatty et al. (1995)	100	16	Beatty et al. (1995)	100
7	Beatty et al. (1995)	100	17	Beatty et al. (1995)	100
8	Beatty et al. (1995)	100	18	Beatty et al. (1995)	100
9	Beatty et al. (1995)	100	19	Beatty et al. (1995)	100
10	Beatty et al. (1995)	100	20	Beatty et al. (1995)	100
11	Beatty et al. (1995)	100	21	Beatty et al. (1995)	100
12	Beatty et al. (1995)	100	22	Beatty et al. (1995)	100
13	Beatty et al. (1995)	100	23	Beatty et al. (1995)	100
14	Beatty et al. (1995)	100	24	Beatty et al. (1995)	100
15	Beatty et al. (1995)	100	25	Beatty et al. (1995)	100
16	Beatty et al. (1995)	100	26	Beatty et al. (1995)	100
17	Beatty et al. (1995)	100	27	Beatty et al. (1995)	100
18	Beatty et al. (1995)	100	28	Beatty et al. (1995)	100
19	Beatty et al. (1995)	100	29	Beatty et al. (1995)	100
20	Beatty et al. (1995)	100	30	Beatty et al. (1995)	100



company and to overcome this behaviour, compensation of managers' is attached to the firm's performance (Jensen & Meckling, 1976). This results in upward manipulation of earnings to increase current managerial remuneration and downward manipulation to increase future remuneration. Cornett et al. (2009) found that CEO pay-for-performance has a positive relation with EM. When a bank's capital adequacy ratio is close to the minimum regulatory requirement, an increase in the level of equity incentives leads to an increase in the level of EM (Cheng et al., 2011). Uygur (2013) concludes that EM is positively affected by bank executive's incentives.

Watts and Zimmerman (1986) hold *debt covenants* responsible for manipulation in accounting numbers. Debt covenants are the agreement between a company and creditors stating certain limits regarding earnings or financial ratios that a company should not breach. To avoid the violation of these agreements, managers tend to manage earnings. Kanagaretnam et al. (2003) and Kanagaretnam et al. (2004) found that debt to loan ratio is positively associated with income smoothing, and banks indulge in income smoothing through discretionary LLP to reduce the cost of external financing. In accordance with the literature, income smoothing and EM can be used interchangeably (Uygur 2013). Othman and Mersni (2014) also found a positive relation between loan to deposit ratio and discretionary LLP. Moghaddam and Abbaspour (2017) discussed a positive and significant effect of financial leverage on EM.

**Threshold Management** theory describes that managers use discretion to manipulate earnings in order to achieve a target 'threshold'. Burgstahler and Dichev (1997) suggest two thresholds: 'zero threshold' or loss avoidance and 'nil variation threshold' or avoiding the negative changes in earnings. A new variant, 'analyst expectation threshold', has been added by Degeorge et al. (1999). These thresholds create incentives for managers to manipulate earnings. Robb (1998) states that when market analysts are unanimous about the earnings forecast of the bank, the bank managers get highly motivated to manage earnings. Beatty et al. (2002) claim that public banks, when compared with private counterparts, are more actively engaged in EM by announcing more consecutive strings of increase in earnings and circumventing small earnings reduction. Shen and Chih (2005) found that banks use EM to eliminate negative variation in earnings and earnings losses.

A **bank** may face different types of *risks* like credit risk, liquidity risk, operational risk and market risk. In high-risk situations, bank managers resort to EM to hide their inefficiency or financial difficulties. Operational risk has a positive association with discretionary accruals, indicating the use of EM by managers to hide their operational deficiencies, whereas systematic risk has no significant relation with discretionary accruals, implying that general risk faced by all the sectors of an economy does not motivate banks to manage their earnings (Mohammad et al. 2011; Abaoub et al. 2013), firm-specific risk is negatively associated with EM (Mohammad et al. 2011), and total risk has no significant impact (Abaoub et al. 2013) on EM. Cohen et al. (2014) conclude that EM can successfully predict a bank's tail risk. Ozili (2017a) found that non-performing loans and loans outstanding have a positive impact on discretionary LLPs.

"The **ownership structure** is defined by the distribution of equity with regard to vote and capital, but also by the identity of equity owner" (Wahl, 2006). Different ownership structures affect EM differently. If majority shares are held by a few investors the ownership is concentrated. It is found that concentration of ownership has a positive impact on EM (Bouvatier et al., 2014; Lassoued et al., 2017; Lassoued et al., 2018), suggesting that the few controlling shareholders encourage managers to manage earnings to maximise their personal benefits. State and institutional ownership have a positive impact on EM (Lassoued et al., 2017; Lassoued et al., 2018), indicating that these investors are interested in current earnings. Family ownership has a negative impact on EM (Lassoued et al., 2017).

Rules and regulation that are specifically meant for a particular industry are referred to as **Industry-specific Regulations**. In the banking industry, various regulatory authorities, primarily the central bank, impose capital adequacy requirements to curtail the risk exposure of banks. It is found that banks use discretionary LLP to meet their minimum capital ratio requirement in order to avoid the cost associated with violating the norms (Moyer, 1990; Lobo & Yang, 2001). Ahmed et al. (1999) reported that before changes in capital regulation of banks in the USA in the year 1990, LLP had a negative association with capital ratio and subsequent to the changes, the coefficient exhibited a positive association with LLP, indicating a

declining trend of managing capital via LLP because of stricter regulations. Chipalkatti and Rishi (2007) investigated Indian banks and found that after 1999 banking reforms, the banks which are less profitable and poorly capitalised understate their non-performing assets and LLP. Another study by Ghosh (2007) on Indian banks marks that LLP is used by managers to manage capital ratio. On the contrary, Anandarajan et al. (2003) found that in the new capital ratio regulatory environment, banks do not engage in managing capital via LLP. Further, Kanagaretnam et al. (2003) noted that managers of well-capitalised banks have a higher propensity to indulge in income smoothing than managers of weakly-capitalised banks, as the well-capitalised banks are less prone to regulatory scepticism. Few studies, such as Kanagaretnam et al., 2004; Chang et al., 2008 and Pérez et al., 2008, exhibit that capital ratio does not incentivise managers to use discretionary LLP in Spanish banks.

**Auditor's independence** implies that the external auditor does not have any relation with the parties that have a financial interest in the company. Lack of auditor independence provides an opportunity for managers to manipulate earnings. Kanagaretnam et al. (2010a) found that in the case of large banks, abnormal audit fees are not linked with EM as Federal Deposit Insurance Corporation Improvement Act, 1991 holds auditors of large banks responsible for ensuring the effectiveness of internal control system. On the other hand, small banks are exempt

from these requirements resulting in strong negative relation of abnormal non-audit fees and abnormal total fees of audit paid to auditor with discretionary LLP. Jayeola et al. (2017) and Akintayo and Salman (2018) reinforce that audit independence has a positive association with EM.

**CEO Turnover** is the replacement of an existing CEO with a new one. Bornemann et al. (2015) testified that the incoming CEO reports more discretionary expenses in the turnover year irrespective of low credit risk, to blame his predecessor for poor performance. The results are stronger when the incoming CEO is an outsider as the new internally promoted CEO cannot blame his predecessor, unlike an incoming outsider CEO, because of his previous position in the company.

Different phases of growth in an economy are termed as **Business Cycle**. Many studies endorse negative relation between GDP growth and LLP (Laeven & Majnoni, 2003; Bikker & Metzmakers, 2005; Ozili, 2017a; Ozili, 2017c; Ozili & Outa, 2018) indicating that banks do not make adequate provision for bad loans in a boom period and during a recession in the economy they increase such provisions to cope with increased credit risk. Liu and Ryan (2006) reported that in a pre-boom period bank managers increase their earnings via reducing LLP and during the boom period they decrease earnings via increasing provision for loan losses. Abu-Serdaneh (2018) found no evidence of procyclicality in Jordanian banks.

**Table 4: Determinants of EM**

Determinant	Relation with EM
Capital Ratio	Negative
Auditor's Independence	Positive
CEO Turnover	Negative
Business Cycle	Negative
Profitability	Negative
Asset Quality	Negative
Liquidity	Negative
Systemic Risk	Negative
Bank Size	Negative
Country Risk	Negative
Regulatory Environment	Negative
Market Structure	Negative
Bank Capitalisation	Negative
Bank Profitability	Negative
Bank Asset Quality	Negative
Bank Liquidity	Negative
Bank Systemic Risk	Negative
Bank Size	Negative
Country Risk	Negative
Regulatory Environment	Negative
Market Structure	Negative
Bank Capitalisation	Negative
Bank Profitability	Negative
Bank Asset Quality	Negative
Bank Liquidity	Negative
Bank Systemic Risk	Negative

#### 4.2 Approaches for Detecting Earnings Management

The application of managerial discretion is the genesis of EM. Researchers have developed different approaches to detect EM. Sun and Rath (2010) have discussed critically the approaches used to detect EM, i.e. real activities, specific accrual, earnings distribution approach, total accruals and changing accounting choices. The present paper elaborates on the EM methods used in the banking industry (Table 5).

In the **Total Accruals Approach**, Healy (1985) used the discretionary accruals model to detect EM for the first time, but he assumed the non-discretionary portion of total accrual as a constant, which led to the detection of EM with error. To overcome this limitation, Jones (1991) introduced another model which controlled the change in the non-discretionary portion of total accruals. Dechow et al. (1995) presented a new model, called the Modified Jones model, after making some modifications in the Jones model whose power to test for EM was low. Earnings have two parts; one is accruals, and the other is cash flow. Total accruals are the adjustment in cash flows as per the judgement and estimates of management and can be segregated into non-discretionary and discretionary accruals. Non-discretionary accruals refer to those adjustments in cash flows that are dictated by accounting regulations, whereas discretionary accruals refer to the adjustment in cash flow at the will of the managers but within the flexibility provided by accounting regulations (Sun & Rath, 2010). Thus, discretionary accruals are used as a measure to detect EM.

The **Specific Accrual Approach** is widely used in the banking industry. In the specific accrual model, a single accrual is used to calculate EM. In the banking industry, LLP forms a major part of total accruals and has been extensively used by researchers. "An LLP is an expense set aside as an allowance for uncollected loans and loan payments. This provision is used to cover a number of factors associated with potential loan losses, including bad loans, customer defaults, and renegotiated terms of a loan that incur lower than previously estimated payments" (Kagan, 2019). The discretionary part of LLP is used to detect EM and has a negative relation with EM. When managers want to manage earnings upward, they decrease LLP and vice-versa. Nevertheless, some studies like Beaver

and Engel (1996) use loan loss reserve to detect EM. More than 50% of studies have used this approach, thereby exhibiting its popularity in the banking industry, where single accrual (LLP) forms a major part of the total accruals portfolio.

Schipper (1989) recognised that the **Real Activities Approach** can be used to detect EM. Gunny (2010) (as cited in Ruiz 2016, p. 6) explains that real activity manipulation refers to actions of managers that cause a change in financial or investment transaction or restructuring operations with the purpose of reaching a desired level of earnings. Real EM can be done in many ways, such as (i) increasing sales through lenient credit terms, (ii) overproduction to reduce fixed cost per unit, (iii) deliberately cutting research and development expenses or advertisement expenses, (iv) selling or purchasing of securities, etc. In the banking industry, realised securities gains and losses (RSGL) is used as a measure to manipulate earnings; however, some studies exhibit that commission and fee income (CF) are also used. Greater information asymmetry in public banks gives them an incentive to indulge in EM more than private banks by manipulating securities gains and losses (Beatty & Harris, 1998). Ozili (2017b) concludes that banks manage earnings through commission and fee income.

In the **Specific Accrual and Real Activities Approach**, a combination of two approaches is used to evaluate EM. Beatty et al. (2002) developed this approach in which discretionary LLP is calculated by applying the model developed by Beatty et al. (1995), and discretionary realised securities gains and losses are calculated by applying the model developed by Beatty and Harris (1998). EM is the difference between discretionary realised securities gains and losses and discretionary LLP.

The **Earnings Distribution Approach** is a relatively new, innovative and less explored approach in the literature. Burgstahler and Dichev (1997) developed this approach. This approach is mostly used in those cases where the achievement of earnings benchmark provides greater incentives to managers. Burgstahler and Dichev (1997) and DeGeorge et al. (1999) recognise three benchmarks, which are loss avoidance, positive change in earnings and analysts' consensus forecast.

The selection of the right kind of approach is a tough task for detecting EM accurately. So, one should take into consideration the pros and cons of every approach before making a final selection. McNichols (2000) concludes that in the specific accrual approach, a direct relation can be estimated between the specific accrual and explanatory factors, and it helps researchers in developing an instinct for the important factors that have a potential impact on accruals, but it can be applied to only those industries where a single accrual forms a major portion of total accruals. The total accrual approach can be applied to all industries

which is the main reason for its wider acceptability. Sun and Rath (2010) explained that managers favour the accrual approach to manipulate earnings rather than resorting to manipulation through real activities. On the other hand, the use of managerial discretion in altering real activities needs to be disclosed and hence is easily detectable. Within accruals, the total accrual approach is good as it measures the effect of various accruals in aggregate, unlike in the case of specific accrual, but in the banking industry, specific accruals approach is more useful.

**Table 5: Constructs Used as Approaches in Detecting EM**

Construct	Definition	Measurement	References
Specific Accrual	Change in the value of specific accruals	Change in the value of specific accruals	McNichols (2000)
Total Accrual	Change in the value of total accruals	Change in the value of total accruals	McNichols (2000)
Real Activities	Change in the value of real activities	Change in the value of real activities	Sun and Rath (2010)
Managerial Discretion	Change in the value of managerial discretion	Change in the value of managerial discretion	Sun and Rath (2010)
Banking Industry	Change in the value of banking industry	Change in the value of banking industry	Sun and Rath (2010)

### 4.3 Consequences of Earnings Management

Researchers have investigated the consequences of EM on banks' performance and banks' responsibility towards stakeholders in the form of Corporate Social Responsibility (CSR) (Table 6). **Bank Performance** can be estimated through various measures such as Return on Equity, Return on Assets, Earning Per Share, etc. The financial performance of banks has a negative and significant relationship with LLP (Wu et al., 2016; Ujah et al., 2017; Ashfaq & Saeed, 2017), implying that with the increase in EM, the performance of bank decreases. Alhadab and Al-Own (2017) found that in European banks, a high level of EM results in inferior performance measured through return on asset and return on equity. Umoren et al. (2018) revealed that return on assets has a negative relation with EM. On the other hand, Saidu et al. (2017) did not

find any relationship between EM and bank performance. On the contrary, Abbas (2018) marked that both income-increasing and income-decreasing EM behaviour have a positive impact on bank value. A bank uses different resources of society to run its operations smoothly; therefore, it also has a responsibility towards society in terms of providing employment and providing services or goods at reasonable rates termed as **Corporate Social Responsibility (CSR)**. Grougiou et al. (2014) found that EM and CSR are positively and significantly associated with each other, indicating that the banks that are practising EM are also actively engaged in CSR activities. Bank managers view CSR as a pre-emptive approach to build a positive image and to avert the attention of outsiders from EM activities. Pertiwi and Violita (2017) found that the quality of the CSR report of Islamic banks is not affected by the presence of EM.

**Table 6: Constructs used as consequences of EM**

Construct	Measurement
Bank Performance	Return on Equity, Return on Assets, Earning Per Share, etc.
Corporate Social Responsibility (CSR)	Quality of CSR report, engagement in CSR activities

### 4.4 Mitigators of Earnings Management

EM has both good and bad sides to it. Few managers use EM to further the interests of other parties instead of their own, thereby creating wealth for the stakeholders. On the contrary, bad EM practices lead to fraud (Yaping, 2005). Schipper (1989) opined that it is not advisable to eliminate EM completely. He further clarifies that if compensation contracts are removed, it would result in the lower performance of managers. Dechow and Skinner (2000) also opined that complete elimination of EM is not an adequate solution because earnings that are influenced by managerial predictions and judgement about the future are a better measure of the economic performance of a company than cash flows. Table 7 provides a list of articles that have examined the variables that help to mitigate EM.

**Corporate Governance** is a system of monitoring and controlling the actions, policies, procedures and decisions of corporations. Zhou and Chen (2004) opined that good governance experts in the audit committee, active audit committee and board of directors play a significant role in

restraining EM. Board independence is negatively associated with EM (Cornett et al., 2009; Akintayo & Salman, 2018; Oladipupo & Ademola A, 2018), though board size has no impact on EM (Akintayo & Salman, 2018; Oladipupo & Ademola A, 2018). It is seen that corporate governance has a negative association with EM (Leventis et al., 2012; Jallow et al., 2012). The presence of foreign investors can help in reducing EM. Wu et al. (2012) observed that foreign strategic investors' presence in Chinese banks reduces loss avoidance EM. Ugbede et al. (2013) while investigating Malaysian and Nigerian banks, found that Nigerian banks resort to a higher level of EM compared to Malaysian banks. Mersni and Ben Othman (2016) found that large board size, presence of audit committee and small size of Shariah Supervisory Board (SSB) play a significant role in constraining the use of discretionary LLP to manipulate earnings. Kumari and Pattanayak (2017) revealed that in public banks, the size of the board and the number of audit meetings have a negative association with EM. On the other hand, in private

banks, independence of the board and the number of committees in the board play a significant role in mitigating EM. The reasons attributed to these differences are dissimilarity of ownership structure, regulatory requirements and other environmental variables. García-Sánchez et al. (2017) found that gender diversity and the presence of financial experts on board positively influence earnings quality.

**Auditors** are the persons who examine the company's financial records and assess the integrity and reliability of financial statements. It is evident that the specialisation of the auditor in the banking industry restrains the income-increasing EM (Kanagaretnam et al., 2010b; Deboskey & Jiang, 2012) and the type of auditor moderates bank's behaviour of avoiding losses and meeting or beating previous year earnings (Kanagaretnam et al., 2010b). Further, high quality of audit is also helping in mitigating EM behaviour of bank managers (Bouvatier et al., 2014; Nawaiseh, 2016). Jayeola et al. (2017) remarked that joint audit and audit specialisation negatively influence EM. **Adoption of IFRS** by banks helps in controlling EM. Onalo et al. (2014) opined that the adoption of IFRS significantly reduces EM behaviour in Malaysian and Nigerian banks. Hassan (2015) revealed that different attributes, i.e., size, growth, profitability, liquidity and leverage of a bank have no relation with earnings quality in the pre-IFRS period, but subsequent to the adoption of IFRS, all the attributes get positively related with earnings quality except leverage. Adzis et al. (2016) marked that adoption of IAS 39 (International Accounting Standards) has led to the reduction of income smoothing behaviour in Hong-Kong banks. Ozili and Outa (2018) explained that the

implementation of IFRS creates an opportunity for managers to indulge in income smoothing practices instead of curbing them.

In banks, **sturdy regulations** regarding investor protection, effective supervision, accounting disclosure, accounting enforcement, etc., would prove helpful in reducing EM. It is found that stricter requirements related to accounting disclosure (Shen & Chih, 2005; Fonseca & Gonzalez, 2008; Uwuigbe et al., 2017), stringent supervisory regulations (Bouvatier et al., 2014), restrictions on activities of banks, effective private and official monitoring, and greater protection to investors (Fonseca & Gonzalez, 2008) play a significant role in controlling EM. In the case of Euro-countries that have adopted higher protection for creditors and sound banking regulation (Curcio & Hasan, 2015), and in the case of tighter legal protection to shareholders in the Middle East and North African (MENA) countries (Bourkhis & Najar, 2017), it has resulted in acting as a constraint to manipulating earnings. Di Martino et al. (2017) found that new banking regulations have a negative association with LLP. Dal Maso et al. (2018) found that accounting enforcement is directly related to earnings quality, as the rise in accounting enforcement results in a decline in the loss avoidance and the use of discretionary LLP to manage earnings behaviour of banks. **Religiosity** shows that someone holds strong religious beliefs. The organisational structure of banks also differs across countries due to **religiosity and cultures**. Kanagaretnam et al. (2015) discerned that countries where people are highly religious are less prone to EM. Religiosity decreases the benchmark-beating EM behaviour.

**Table 7: Constructs used as mitigators of EM**

Construct	References
Corporate Governance	Chen & Chen (2010), Gao et al. (2010), Li & Wang (2010), Wang et al. (2010), Wang et al. (2011), Wang et al. (2012), Wang et al. (2013), Wang et al. (2014), Wang et al. (2015), Wang et al. (2016), Wang et al. (2017), Wang et al. (2018), Wang et al. (2019), Wang et al. (2020), Wang et al. (2021), Wang et al. (2022), Wang et al. (2023), Wang et al. (2024), Wang et al. (2025)
Auditor related variables	Dechow et al. (1994), Dechow et al. (1998), Dechow et al. (2000), Dechow et al. (2001), Dechow et al. (2002), Dechow et al. (2003), Dechow et al. (2004), Dechow et al. (2005), Dechow et al. (2006), Dechow et al. (2007), Dechow et al. (2008), Dechow et al. (2009), Dechow et al. (2010), Dechow et al. (2011), Dechow et al. (2012), Dechow et al. (2013), Dechow et al. (2014), Dechow et al. (2015), Dechow et al. (2016), Dechow et al. (2017), Dechow et al. (2018), Dechow et al. (2019), Dechow et al. (2020), Dechow et al. (2021), Dechow et al. (2022), Dechow et al. (2023), Dechow et al. (2024), Dechow et al. (2025)
Adoption of IFRS	Onalo et al. (2014), Hassan (2015), Adzis et al. (2016), Ozili and Outa (2018)
Sturdy Regulations	Shen & Chih (2005), Fonseca & Gonzalez (2008), Uwuigbe et al. (2017), Bouvatier et al. (2014), Curcio & Hasan (2015), Bourkhis & Najar (2017), Di Martino et al. (2017), Dal Maso et al. (2018)
Religiosity and Cultures	Kanagaretnam et al. (2015)

#### 4.5. Research Gap and Area for Future Research

Research on EM in the banking industry is still evolving. The review helped to identify research gaps or the areas related to EM that need to be explored in the banking industry. There is a dearth of research on EM by banks in developing countries like India. The results drawn from the studies in developed countries are not applicable at par to the banking system of developing countries due to differences in regulatory mechanisms and banking structures. Financial markets have globalised. Bank manager's motivations to indulge in EM and methods of manipulating earnings differ across countries. Thus, in future studies, samples can be drawn from different countries to make an international comparison of EM behaviour. The specific accrual model has been extensively used to calculate EM, whereas few studies have used a combination of models simultaneously. Researchers can use more than one approach to measure EM to assess which approach better explains EM behaviour.

#### 5. Conclusion

Manipulation of earnings in banks can badly hit the growth of an economy. When managers indulge in EM, the financial statements fail to convey accurate information about the bank's value and its risk level, and it may also not be able to provide early warning signals which may lead to bankruptcy at later stages. This paper examined EM in the banking industry through a systematic literature review. In this review paper, articles are classified on the basis of publication year, country of study, journal of publication, citation analysis etc., to give a comprehensive idea of all the articles. A conceptual framework of EM is also developed. It is concluded that bank managers take undue advantage of discretion in accounting choices to hide their inefficiencies, to increase their compensation, to avoid debt covenant violation, to signal private information to stakeholders, and there may be many other factors such as threshold achievement, bank risk, capital adequacy regulations etc. that motivate managers to indulge in EM practices. Though EM may be measured through various approaches, the most popular approach in the banking industry is the specific accrual approach in which LLP is widely taken as a proxy for EM. Further, the paper discloses that EM influences banks' profitability and reduces the reliability of the CSR report. Thus, there is a need to control and mitigate EM practices through effective corporate governance, implementation of IFRS in the true spirit, enhanced audit quality, sturdy regulations and

propagation of ethical business practices in the bank. Only good quality financial reports can help in gaining the confidence of the public and providing valuable and relevant information to the stakeholders.

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# The Impact of Extrinsic and Intrinsic Rewards on Employee Commitment in the Public Sector Manufacturing Companies in India

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## A b s t r a c t

Rewards are very critical to attracting, motivating, and retaining talents. Reward satisfaction plays a determinant role in shaping employee attitudes, those reflected in their performance. This study is intended to assess the impact of extrinsic and intrinsic rewards on employee commitment among the public sector employees in India. The sample subjects are chosen from ten public sector companies using the method of stratified random sampling and the data is analysed through Structural Equation Modelling (SEM). The results reiterated the impact of extrinsic and intrinsic rewards on employee commitment and the importance of intrinsic rewards over extrinsic rewards. The findings are beneficial to the practicing managers in formulating typical reward packages based on employee preferences by mixing extrinsic and intrinsic rewards in varying proportions.

**Keywords:** *Reward management, Total rewards, Extrinsic rewards, Intrinsic Rewards, Employee Commitment*

## 1. Introduction

The employee expectations and perceptions are rapidly changing due to the fast changes taking place in the organisational context (Stairs, 2005). A shift of employee interest from physical requirements to psychological needs is evident in the present-day literature as part of these contextual changes. Employee responses towards these changes is an area of attention of employers, and this has resulted in finding out new approaches to manage employee rewards, both extrinsically and intrinsically, so as to satisfy both physical and psychological requirements (Harter et al., 2002; Luthans, 2002; Linley et al., 2005). This realisation about the change in employee expectations, on another side, led the management to study and research the effect of employee perceptions in determining the financial performance of the organisations and the impact of people management strategies and policies on shaping employee behaviours. Employee commitment has a determinant role in ensuring customer commitment towards the organisation. It is necessary for every organisation to maintain committed employees for organisational success and wellbeing (Fischer, 2003). Rucci et al. (1998) clearly identified a strong bond between employee commitment and customer commitment within the organisation. As per their study, a five percent increase in employee commitment may cause a three percent change in customer commitment.

Traditionally reward management is supposed to attract, retain, and motivate employees in a desirable manner so as to get optimum employee performance. This connection of rewards with performance is the reason for developing the 'pay for performance strategy'. Over the last decade, employers are practising reward strategy by aligning employee performance with the organisation's strategic goals (Higgs, 2004; Brown, 2006; Gerhart, Rynes, & Fulmer, 2009). This concept is the core of strategic human resource management, where the HRM strategies are aligned with business strategies for leveraging the value of human capital for improved organisational performance (Gratton & Truss, 2003; Christainsen & Higgs, 2006). Many studies reported that performance pay is not the solution for organisational performance (Kohn, 1993; Pink, 2009; Ledford, Gerhart & Fang, 2013). According to Kohn (1993), extrinsic rewards are less effective than intrinsic rewards, and on many occasions, it seems to reduce intrinsic motivation. This finding led the researchers

to develop a comprehensive reward strategy that encompasses all the tangible and intangible rewards within a single package. This movement has resulted in developing a comprehensive rewarding system known as the Total Reward Strategy (TRS). Many professional reward management organisations such as WorldatWork (2006 and 2015); SHRM (2007); Hay Group (2008); Aon Hewit (2012); Towers Watson (2012), and many more developed their own distinct TRS models with different components and elements representing extrinsic and intrinsic forms of rewards. Herzberg's (1966) two-factor theory illustrates the dichotomous nature of rewards and their employee values. The hygiene factors of rewards consisting of the major elements of extrinsic rewards such as basic pay and benefits, by themselves, are not sufficient to motivate employees at their workplaces. Even though these factors significantly contribute to demotivation, the real motivators are the intrinsic form of rewards such as work by its content and context, career development, authority and responsibility.

This study is an attempt to examine the influence of extrinsic and intrinsic rewards in shaping employee commitment among the public sector manufacturing employees in India. This study is also intended to examine the relative importance of each category of rewards and its components. This information can be used by the management while formulating a rewarding mix that is capable of satisfying the employees optimally.

## 2. Literature Review

### 2.1 Extrinsic and Intrinsic Rewards

Rewards are very important to employees. Rewards comprise everything offered to the employees by the employer as a return to their services towards the organisation. The study of Sarvar and Abugre (2013) revealed that higher rewards and satisfied employees contribute more to organisational performance and profit. All the goals of the organisation can be achieved by offering a good rewarding system that can motivate employee (Lawler, 1993), and a well-defined rewarding system can attract, retain and motivate employees (Mc Cormic, 2015). Rewarding an employee is not merely paying salary and benefits, but it is equally concerned about non-financial rewards such as recognition, increased job responsibility, and learning and development opportunities (Armstrong, 2010).

Extrinsic rewards are the tangible and visible form of rewards offered to the individual or employee for his/her contribution to achieving something. The monetary part of rewards such as salary, incentives, bonus, etc. and benefits such as medical care, various kind of allowances, fringe benefits those have some financial content indirectly are considered as extrinsic rewards (Mottaz, 1985; Mahaney & Lederer, 2006). Extrinsic rewards are important for employees because it is instrumental to their personal, family, and social existence. Most of the employees' physical needs are satisfied with this form of rewards, and therefore it is the basic requirement for their existence. Literature shows that while employees at the lower levels of hierarchy are more concerned about extrinsic rewards, the employees at higher levels prefer intrinsic rewards (Stumpf, Tymon Jr, Favorito & Smith, 2013)

Intrinsic rewards differ from extrinsic rewards which are in tangible form. Intrinsic rewards are generally qualitative (intangible) in form and critical in motivating employees. This non-physical form of rewards which is emotionally connected to the employees comprises challenging jobs, sense of achievement, recognition, work freedom, participation in decision making, the content of authority, attracting positions in the hierarchy, etc. (Mottaz, 1985; Mahaney & Lederer, 2006). The degree of influence of these elements may differ from individual to individual. This represents the portion of rewards that satisfy an individual's psychological needs. Wherever a job is intrinsically rewarding, the individual involves with more enthusiasm and accomplishes the task more effectively (Mahaney & Lederer, 2006). Intrinsic rewards are the positive feelings an employee experiences at the workplace that energises him to do the task in a personally fulfilling manner (Deci & Ryan, 1987; Thomas & Tymon, 1997; Thomas, 2009). Thomas, Jansen & Tymon (1997) reported that when individuals get opportunities to do meaningful work with a sufficient level of freedom and choice, they feel intrinsically motivated. Tymon Jr, Stumpf and Doh (2010) argued that intrinsic rewards can improve organisational satisfaction even in low extrinsic rewards. It is possible to provide many non-financial or less financial benefits, which can bring satisfaction to the employees and better performance (Mohamood, Ramzan & Akbar, 2012). A higher level of hygiene factors (extrinsic rewards) can make good results

only with an adequate level of intrinsic rewards (Tremblay, Sire & Balkin, 2000). The study conducted by Tymon Jr., Stumpf and Doh (2010) rejects the argument of Deci and Ryan (1987) that extrinsic rewards have a tendency to reduce intrinsic motivation.

## 2.2 Employee Commitment and Reward

Employee commitment is the reflection of a psychological attachment of the employee towards his organisation that reflects in higher employee performance, increased citizenship behaviour and reduced turnover (O'Reilly & Chatman, 1986; Williams & Anderson, 1991). When employees perceive a caring approach from the side of the employer, they demonstrate committed behaviours to achieve organisational goals (Ajmal, Bashir, Abrar & Khan, 2015). Committed employees always show a willingness to accept company values and targets as their own and do whatever possible to achieve the goals (Porter, Steers, Mowday & Boulian, 1974). Allen and Meyer (1985, 1990) proposed three dimensions for employee commitment. These three dimensions of commitment refer to the relationship with an organisation that reflects on the desire of the employee to remain with the organisation and contribute more for the benefit of the organisation (Wo<sup>3</sup>owska, 2014). The first dimension of affective commitment refers to the willingness and likeness of the employee to remain with the organisation due to psychological attachment towards the organisation and the need to be known as part of the organisation. Continuous commitment refers to the awareness of the individual about the cost of leaving the job for another one, and so he wants to stay with the organisation anyhow (Allen & Meyer, 1985). Normative commitment reflects in employees' determination to remain with the organisation even at bad times and it shows a moral obligation. Mehtha, Singh, and Bhasker (2010) observed employee commitment as a component of the emotional dimension of employee loyalty.

Work rewards refer to the benefits that an employee receives as part of the employment relationship from the employer and is considered as the determinant of employee commitment (Malhotra et al., 2007). Employee perceptions of reward fairness significantly influence employee attitudes, behaviours and performance (Scott, Mac Mullen, & Royal, 2011; Munir, 2016; Hareendrakumar,

2020). Turkyilmaz, Ali., Akman, Gulsen., Ozkan, Coskum., and Pastuszak (2011), and Ajmal et al. (2015) reported that both extrinsic and intrinsic rewards play a significant role in determining employee loyalty and commitment through the mediating variable of job satisfaction. The study conducted by Kokubun (2017) among the employees of Japanese companies in Thailand revealed a strong relationship between extrinsic and intrinsic rewards with employee commitment.

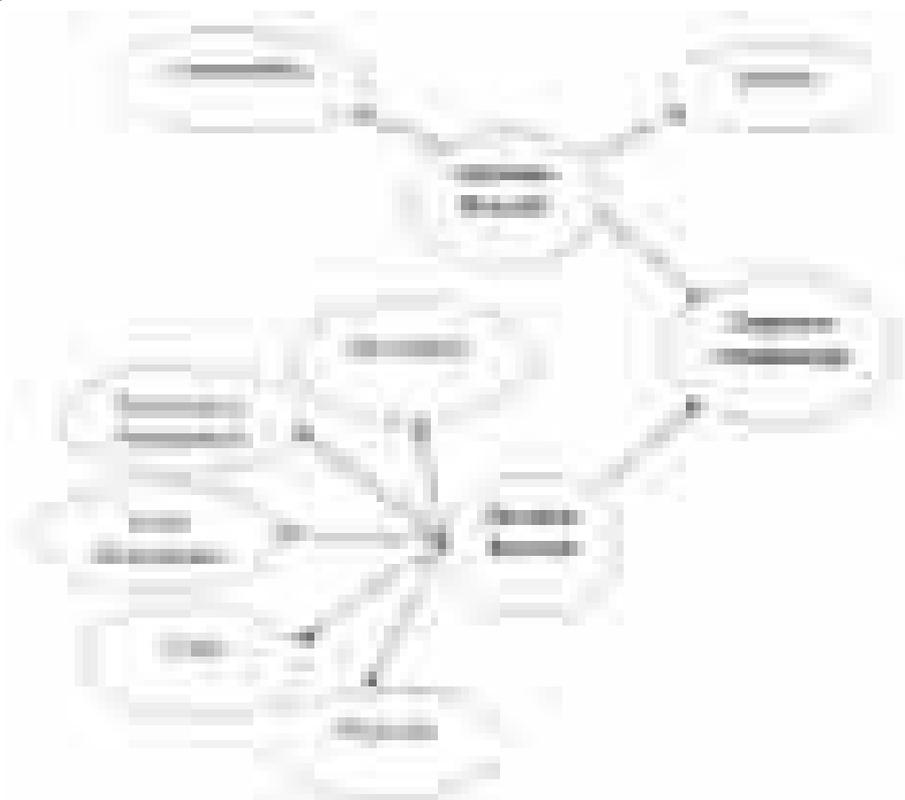
Milcovitch and Newman (2008) commented that the way in which employees are paid affects their behaviours, and a good compensation system would help the organisation to achieve its goals effectively. Mishandling of compensation issues is likely to affect employee and organisational performance due to a lack of employee loyalty (Gomez, Balkin, and Cardy, 2005). Schultz (2005) opined that rewards can induce changes in the observed behaviour of individuals and can act as a reinforcement for the behaviour that creates better rewards. Obicci (2015) observed a strong bond between extrinsic and intrinsic

rewards and employee engagement, which is a demonstration of employee commitment itself. The study of Allen and Grisaffe (2001) also supported the relation of extrinsic and intrinsic rewards with employee behaviours.

### 3. Methodology

#### 3.1 Model development

The total reward is a newer concept of rewarding employees by incorporating all the intrinsic and extrinsic elements of rewards, those that are valued by the employees, in unique proportions. To develop a conceptual model, this study adapted the Total Reward model consisting of seven dimensions developed by Hareendrakumar et al. (2020). In this model, extrinsic reward satisfaction is measured by two dimensions (Compensation and Benefits), and intrinsic reward satisfaction is measured through five dimensions (Recognition, Performance Management, Talent Development, Work, and Work-life) as shown in the



Source: prepared by the author

**Figure 1: Conceptual diagram**

conceptual model. While the two extrinsic dimensions are focused on the financial content of rewards, which are necessary to satisfy the basic needs of employees, the five intrinsic dimensions are concerned about the non-financial form of rewards, which are necessary to satisfy the psychological needs of individuals. The model hypothesises that extrinsic and intrinsic rewards positively influence employee commitment.

### 3.2 Scale development

All the scales to measure the dimensions of extrinsic and intrinsic rewards are adapted from the literature (Hareendrakumar, 2020). The scale to measure employee commitment is adapted from Meyer and Allen (1990). Thus a comprehensive instrument containing 46 items (Compensation-7, Benefits-6, Recognition-5, Performance Management-5, Talent Development-5, Work-5, Work Life-5, and Commitment- 8) have been developed to measure all the eight latent variables under study. The pilot study is conducted among the employees of a large scale public sector company at Thiruvananthapuram and found that all the constructs have reliability (Cronbach alpha) greater than 0.7.

### 3.3 Hypotheses of the study

The following two hypotheses are set to test the significance of multiple relationships between the latent variables.

**H 1:** Intrinsic Rewards significantly influences Employee Commitment in the public sector companies in India

**H 2:** Extrinsic Rewards significantly influences Employee Commitment in the public sector companies in India

### 3.4 Population and sample

The population of interest comprises all the employees working in the public sector manufacturing companies in India. The public sector manufacturing companies are grouped under various sectors such as electrical, electronics, engineering, chemical, textile, traditional, etc. The sample size is fixed at 400. The sample units are selected by following the method of stratified random sampling.

### 3.5 Research design

Even though the topic of study is qualitative in nature, a mixed approach is followed, and the data is collected in a quantitative manner. Structured questionnaires, the instrument for data collection, are served to the respondents and requested to mark their degree of agreement/disagreement in a five-point Likert scale, using numeric values ranging from 1 (strong disagreement) to 5 (strong agreement). This quantitative data collected in the form of numbers is used for statistical analysis and to test the significance of relationships between the variables.

### 3.6 Data collection

The sample data is collected from 418 employees chosen from ten public sector companies in South India. Out of 418 instruments collected, after eliminating 14 instruments with extreme values/ missing responses, 404 instruments are taken for final statistical analysis.

## 4. Analysis and Discussion

### 4.1 Demography and Descriptive Statistics

More than forty percent of the sample subjects have service of more than twenty years and are of age above forty. Hence the responses can be considered as highly reliable in revealing the realistic character of the attributes through the employee lens. As shown in Table 1, the sample comprises candidates from all levels of the hierarchy, starting from unskilled labour to senior managers and qualification ranging from matriculation to post-graduation. Most of the participants are from the non-executive category (74.6 %). Only one third belongs to the executive category. Among the total, around 25 percent are from technical backgrounds and seventy-five percent are from non-technical backgrounds.

Table 2 shows the descriptive statistics of the sample. The mean for the eight latent variables ranges from 2.6 to 3.5, and the standard deviation ranges from 0.709 to 0.986. The correlation coefficients range from 0.202 to 0.609. All the dimensions of independent variables show a good correlation with the dependent variable. The descriptive statistic shows that work and work-life are the most correlated one, among the seven dimensions, to employee commitment.

**Table 1: Demography of the sample**

Demographic Variable	Category	N	%	Mean	SD	Min	Max	
Gender	Male	211	86	3.21	0.45	1	4	
	Female	31	12	3.16	0.42	1	4	
	Age	18-24	11	4	20.5	2.5	18	24
		25-34	1	0	29.0	0.0	25	34
		35-44	6	2	37.5	3.5	35	44
		45-54	13	5	40.0	3.0	45	54
Education	Below High School	1	0	12.0	0.0	12	12	
	High School	11	4	12.5	0.5	12	12	
	Some College	1	0	15.0	0.0	15	15	
	College	11	4	16.5	0.5	16	16	
	Postgraduate	16	6	17.5	0.5	17	17	

Source: Primary Data

**Table 2 Descriptive statistics and inter correlation coefficients**

Variable	Mean	SD	1	2	3	4	5	6	7	8	9	
Control	3.21	0.45	1									
Trust	3.16	0.42	0.12	1								
Perceived Ethical Climate	3.18	0.43	0.15	0.18	1							
Whistleblowing Intentions	3.19	0.44	0.16	0.19	0.17	1						
Organizational Commitment	3.20	0.45	0.17	0.20	0.18	0.16	1					
Work Ethic	3.22	0.46	0.18	0.21	0.19	0.17	0.15	1				
Organizational Identification	3.23	0.47	0.19	0.22	0.20	0.18	0.16	0.14	1			
Organizational Dissociation	3.24	0.48	0.20	0.23	0.21	0.19	0.17	0.15	0.13	1		
Organizational Identification	3.25	0.49	0.21	0.24	0.22	0.20	0.18	0.16	0.14	0.12	1	
Organizational Dissociation	3.26	0.50	0.22	0.25	0.23	0.21	0.19	0.17	0.15	0.13	0.11	1

Source: Primary Data, \*\*p < .01

**4.2 Structural Equation Modeling (SEM)**

To assess the causal relationships between variables and to test the hypotheses, the method of Structural Equation Modeling (SEM) is employed using IBM SPSS Amos 22. SEM analysis comprises a two-step assessment (i) measurement model assessment and (2) structural model assessment.

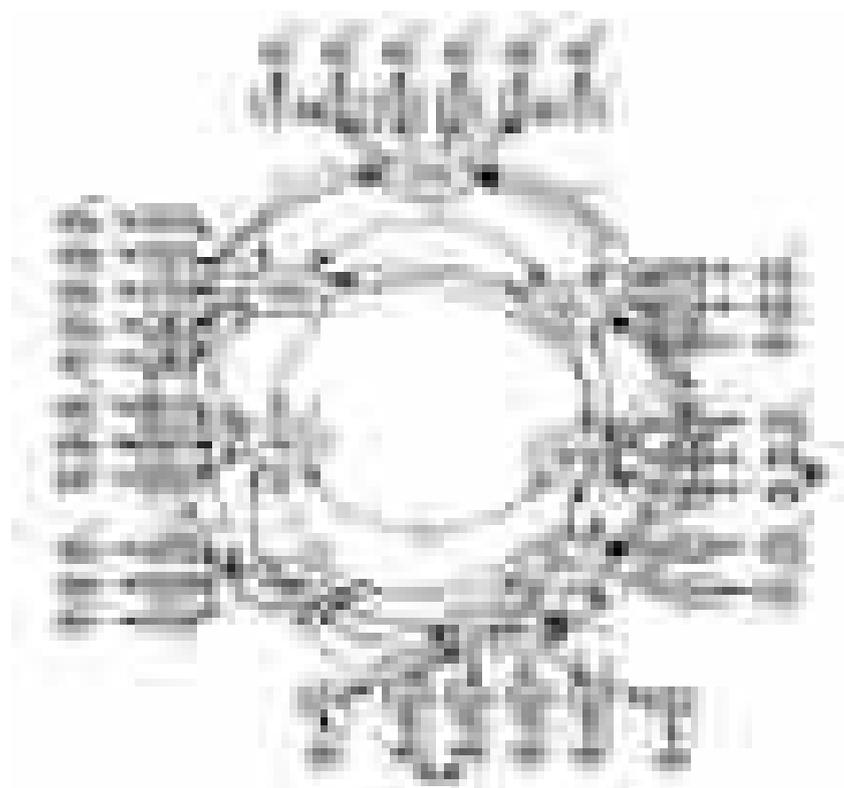
**4.2.1 Measurement model assessment**

In this first step, also known as the confirmatory analysis, the researcher develops a measurement model with all the variables under study and test for the reliability and validity of the scales used. In this study, the measurement model

has been developed with all the first-order variables and correlated, as shown in Figure 2. Prior to CFA, it is necessary to ensure the fitness of the model with the data, and this is done by comparing the fit indices with the recommended threshold values. At this stage, fifteen items (Compensation-1, Benefit-1, Recognition-2, Performance Management-2, Talent Development-2, Work-2, Work-life-3 and Commitment-2) are eliminated to achieve a sufficient level of fitness as per the recommendations. Thus the final model has only thirty-one items under the eight latent variables. The values in Table 3 show that the model is adequately fit with the data as per the recommended fit measures and good for further statistical analysis.

**Table 3: Fit indices of measurement model**

Fit Index	Value	Recommended Value
Chi-Square	123.45	< 200
Df	120	> 100
P-Value	0.000	> 0.05
RMSEA	0.08	< 0.10
GFI	0.95	> 0.90
NFI	0.98	> 0.95
TLI	0.99	> 0.95
CFI	0.99	> 0.95



Note: COM- Compensation, BEN-Benefit, REC- Recognition, PRM- Performance management, TD-Talent development, WOR- Work, WL-Work life, COMM- Commitment

**Figure 2: Measurement model**

4.22 Reliability of indicators and constructs

After ensuring the fitness of the data, the next step is to assess the reliability of the indicators and the constructs in measuring the attributes which are intended to measure. In this part, the researcher ensures whether the items and the set of items under different constructs are unidimensional in measuring the construct and whether the scale items are consistent with different time of measurement. For this purpose, the usual practice is to evaluate the factor loadings of each indicator variable to assess the indicator reliability and Cronbach Alpha and Composite Reliability (CR) to assess the reliability and internal consistency of various constructs. Factor loading above 0.5 is considered as a good measure for indicator liability (Hair, Black, Babin, &

Anderson, 2010; Kline, 2010; Mishra. 2016). Cronbach's Alpha and Composite Reliability greater than 0.7 indicates adequate reliability of constructs (Gefen, Straub & Boudreau, 2000). In this study, all the indicator variables have loadings greater than 0.5, and all the constructs have alpha and CR greater than 0.7 (Table 4). Hence it is assumed that the indicators and constructs have sufficient internal consistency and reliability in measuring the related attributes.

4.2.3 Validity assessment

To assess the validity of the scale, the researcher has to examine both content and construct validities simultaneously. Content validity examines whether the scale items are capable of measuring the characteristic which the researcher intended to measure (Lawshe, 1975).

**Table 4: Reliability, Internal Consistency and Convergent Validity**

Construct	Indicator	Factor Loading	Cronbach's Alpha	Composite Reliability	Construct Validity
C1	IT1	0.72	0.85	0.88	0.85
	IT2	0.68			
	IT3	0.75			
C2	IT4	0.71	0.82	0.85	0.82
	IT5	0.69			
	IT6	0.73			
C3	IT7	0.70	0.80	0.83	0.80
	IT8	0.67			
	IT9	0.74			
C4	IT10	0.73	0.84	0.87	0.84
	IT11	0.69			
	IT12	0.76			
C5	IT13	0.71	0.81	0.84	0.81
	IT14	0.68			
	IT15	0.74			

In this study, the content validity is ensured with the help of the literature and collecting opinions from the practitioners of various public sector companies in Kerala. Construct validity of the scale is generally evaluated by assessing two subsets of validity measures, namely convergent validity and discriminant validity. The criterion that is generally followed to assess convergent validity is to ensure the Average Variance Extracted (AVE) as recommended for the purpose. AVE refers to the extent of variance explained by

the set of variables under a construct. AVE greater than 0.5 is regarded as a good indication of sufficient convergent validity (Fornell & Larcker, 1981; Bagozzi & Yi, 1988; Chin, 1998). To assess discriminant validity, the method is to compare the squared root of AVE of a construct with the intercorrelations of that construct with other constructs. A higher squared root of AVE than the intercorrelations ensure the discriminant validity of the construct (Fornell & Larcker, 1981).

**Table 5: Fornell-Larcker criteria for Discriminant validity**

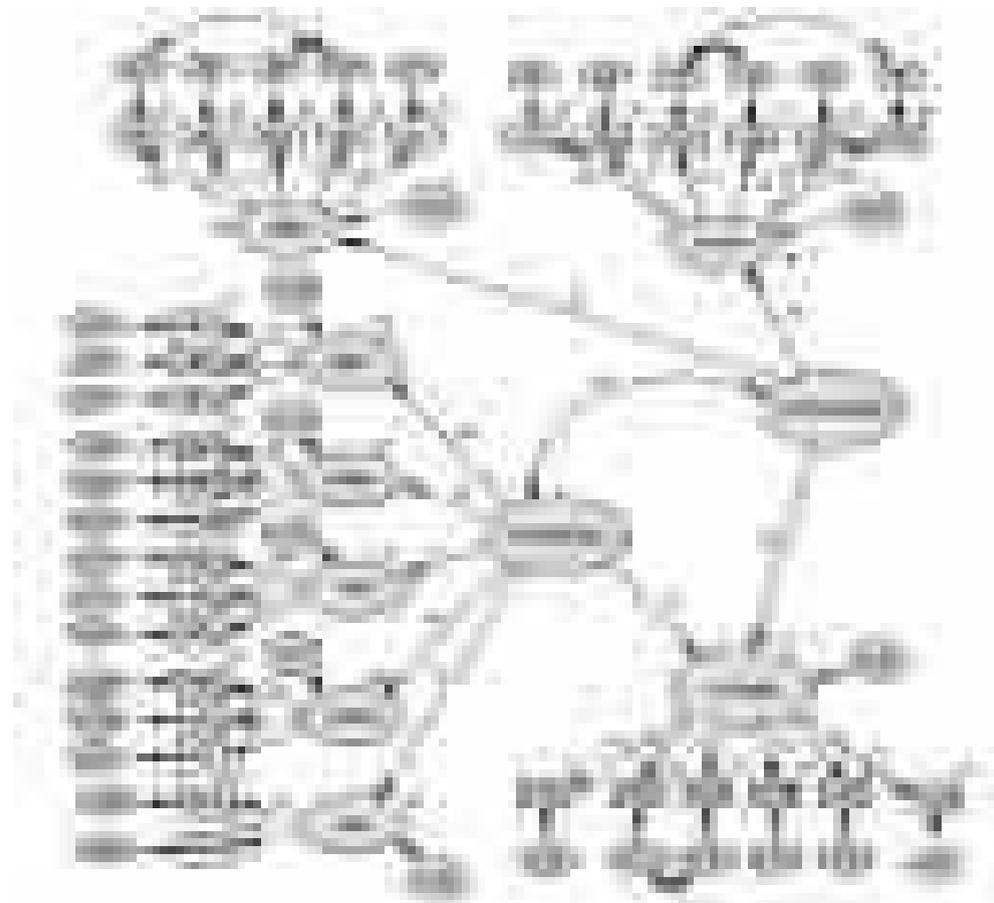
	1	2	3	4	5	6	7	8
1	<b>0.527</b>							
2	0.12	<b>0.68</b>						
3	0.15	0.18	<b>0.57</b>					
4	0.18	0.22	0.25	<b>0.62</b>				
5	0.21	0.25	0.28	0.31	<b>0.58</b>			
6	0.24	0.28	0.31	0.34	0.37	<b>0.55</b>		
7	0.27	0.31	0.34	0.37	0.40	0.43	<b>0.53</b>	
8	0.30	0.34	0.37	0.40	0.43	0.46	0.49	<b>0.51</b>

Note: Bold diagonal value represents square root of AVE

In this study, all the AVE measures are > 0.5 ranging from 0.527 to 0.715 (Table 4), and the squared root of the AVE of each construct is greater than the intercorrelations of the construct with other constructs (Table 5). The compliance of these two criteria ensures adequate convergent and discriminant validity of the constructs. From Table 4, it is evident that all the indicator variables have factor loadings above 0.5, Cronbach Alpha and CR greater than 0.7 and AVE

greater than 0.5. The squared root of AVE for every construct, given as diagonal values in Table 5, is greater than the intercorrelations of that construct with other constructs. The correlation between variables shows the presence of sufficient nomological validity for the latent variables (Table 2). Figure 3 shows that there is a moderate correlation between the second-order constructs of extrinsic and intrinsic rewards ( $r = 0.68$ ).

4.2.4 Assessment of Structural Model



Source: Prepared by the author  
 Note: COM- Compensation, BEN-Benefit, REC- Recognition, PRM- Performance management, TD-Talent development, WOR- Work, WL-Work life, COMM- Commitment

**Figure 3: Structural Equation Model for hypotheses test (with standardized regression coefficients)**

The structural model is the inner part of the Structural Equation Model that represents the multiple relationships between variables. The structural model assessment enables the researcher to interpret the causal relationships between variables and to test the hypotheses. In this multi-factor

second-order structural equation modelling, there are two exogenous variables, namely extrinsic and intrinsic rewards, and one endogenous variable, employee commitment. The various fit measures for the structural model are given in Table 6.

**Table 6: Fit measures of the Structural model**

Fit Measure	Value	Interpretation
Chi-square	123.45	Significant
Df	100	
p-value	0.000	Significant
RMSEA	0.08	Acceptable
GFI	0.92	Good
NFI	0.95	Good
TLI	0.97	Good
CFI	0.98	Good

Source: Calculated by the author

Most of the fit indices are as per the recommendations, and the others are very close to the recommended values, which indicate a satisfactory or moderate fit of the data with the proposed model. The correlated exogenous variables-extrinsic and intrinsic rewards - could explain 83 percent of the variation of the dependent variable, employee commitment.

The two dimensions of extrinsic rewards showed good R<sup>2</sup> values ranging from 0.63 to 0.95. The R<sup>2</sup> values for the five intrinsic dimensions range from 0.38 to 0.60 (Table 7). All these measures are found significant at the level p < 0.001. The regression coefficients (standardised beta coefficients) between the first and second-order constructs are found significant at the level p < 0.001 (Table 8).

**Table 7: R-square values for the first order constructs**

Construct	R-squared		F	Sig.	R-squared	F	Sig.
	Model	Change					
Employee Commitment	0.83	0.83	100.00	0.000	0.83	100.00	0.000
Extrinsic Rewards	0.63	0.63	100.00	0.000	0.63	100.00	0.000
Intrinsic Rewards	0.38	0.38	100.00	0.000	0.38	100.00	0.000

Table 8 shows the comparative contribution of each reward component under the extrinsic and intrinsic rewards. Among the extrinsic rewards, employee benefit is found more significant with a beta value of 0.972. As such, all the five

dimensions of intrinsic rewards are also found significant at the level p < 0.001. Recognition, Talent Development and Work are found more influential in determining employee commitment with beta values 0.80, 0.77 and 0.76, respectively.

**Table 8: Unstandardized and Standardized beta values with level of Significance**

Predictor	Extrinsic Rewards		Intrinsic Rewards		Sig.
	B	β	B	β	
Employee Commitment	0.972	0.972	0.80	0.80	0.000
Recognition	0.77	0.77	0.76	0.76	0.000
Talent Development	0.76	0.76	0.77	0.77	0.000
Work	0.76	0.76	0.76	0.76	0.000
Employee Benefit	0.972	0.972	0.76	0.76	0.000

Source: Prepared by the author, \*\*\*, P < 0.001 level (2-tailed).

The beta coefficients in Table 9 show that extrinsic and intrinsic rewards have a significant impact on employee commitment and hence the statistical conclusion is to reject the null hypotheses of no impact for the exogenous variables on the endogenous variable. This finding supports the study conducted by Obicci (2015), Ajmal et al. (2015), and Turkyilmaz et al. (2011). As far as employee commitment is concerned, the intrinsic reward is found highly influential in

comparison with extrinsic rewards with a standardised beta coefficient of 0.759 (p < 0.001), which is two times higher than the extrinsic rewards (beta coefficient = 0.20, p < 0.001). The regression values indicate that unit change in the intrinsic rewards would cause for 0.759 unit change in employee commitment while the same change in extrinsic rewards would cause for 0.203 unit change in employee commitment.

**Table 9: Hypotheses test results**

\*\*\*significant at the level  $p < 0.001$  (2-tailed).

## 5. Managerial Implication

The findings of this research are highly beneficial to the HR managers who are responsible for formulating and implementing tailor-made rewarding systems for their employees. From the results, it is clear that employee attitudes are determined mainly by non-financial rewards. It highlights the possibility of influencing employee attitudes without spending additional money. This greater importance of intrinsic rewards due to employee preference helps the managers to make good reward packages by blending more non-financial rewards with the extrinsic rewards in unique proportions. All the intrinsic rewards are highly influential on employee commitment. Hence management of public sector companies in India must give more attention to offer intrinsic motivators to attract, motivate, and retain talents with their organisation. The results of this study revealed the relative importance of each reward component to the employees, and it can be taken as a base for formulating or modifying the prevailing rewarding systems in the public sector companies in India.

## 6. Conclusion

This study once again established the strong bond between rewards and employee commitment. The management can never undermine the importance of either extrinsic or intrinsic rewards. Among the two dimensions of extrinsic rewards, employee benefits showed high significance with employee commitment (0.972,  $p < 0.001$ ). In this era, the new generation of employees is more concerned about the indirect financial rewards that provide more work comfort and security feeling to them. The results show that the employees in public sector manufacturing companies are highly concerned with their intrinsic rewards. The difference in regression coefficients between these two

predictor variables gives a vital message of employee preference towards the intrinsic rewards over the extrinsic rewards. In determining employee commitment, intrinsic rewards are three times more powerful than extrinsic rewards. This reveals the potential power of intrinsic motivation over extrinsic motivation in shaping employee attitudes at the workplace. This expectation of employees towards the intrinsic form of rewards may be the result of their higher level of satisfaction with extrinsic rewards. The regression values show that among the intrinsic rewards, performance recognition, talent development and challenging work are the highest influencers. Performance management comparatively showed a less value (0.62;  $p < 0.001$ ). This may be due to the lack of proper performance management schemes in the public sector industries.

## 7. Limitation and Scope for Further Research

This study has been conducted among the public sector employees in south India. It would be better to conduct a wide study by including more samples from North Indian states also. As the working conditions and pay patterns are different across the states, such a study will yield better results that are more reliable in a Nationwide context.

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# Dialectics of Constructed Identities as Tools of Oppression – Concept of Reverse Metamorphosis as a factor Reinforcing Ageism

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## **A b s t r a c t**

Self-identities and social identities on ageing are constructed on the basis of ‘conditions’ and ‘experiences’ in the life of the aged. Using Bourdieu’s Theory of Habitus, the study tried to understand the dialectics of self and social identity constructions on subjective well being and quality of life of aged women. Qualitative analysis using narratives and photo-elicitation method was used. The study consisted of 14 elderly women aged 70 years and above living in Kerala. Results showed that perceptions about age identity have both direct and indirect impact on subjective well being. Corresponding to the nature of self-identity, both positive and negative influences are observed. Disengagements from active roles and power positions, attitude towards old age as a definite period of dependency, belief in the inevitability of ill health, pessimism about cure for health problems, fear and anxiety about miseries and unpredictability in life were the leading self-identity statements. Identity constructions, when used deliberately as a tool of oppression, results in Reverse Metamorphosis. Unlike biological metamorphosis– where the process brings life to an active, vibrant, beautiful stage till the end of life, in Reverse Metamorphosis, aged women enter into cocoons of identities and images that label their life as passive, inactive, shadeless and unattractive. Gender and widowhood add to the process by setting limits to the conditions of life. Reverse metamorphosis is reinforced through marginalisation, isolation, neglect and abuse leading to depression, poor subjective well being and reduced quality of life. Suggestions are made to use Social, Cultural, Economic and Symbolic Capitals envisaged by Bourdieu to influence the identity constructions, explore designs for Inclusive Social Spaces and gender sensitisation to reduce ageism.

**Keywords :** *Quality of life, Habitus, Reverse Metamorphosis, Ageism, Inclusive Social Spaces*

## 1. Introduction

World Health Organization explains ageism as the stereotyping, prejudice, and discrimination against people on the basis of their age. Ageism is a widespread and insidious practice that has harmful effects on the health of older adults. For older people, ageism is an everyday challenge. Overlooked for employment, restricted from social services and stereotyped in the media, ageism marginalises and excludes older people in their communities.

Ageism is everywhere, yet it is the most socially “normalised” of any prejudice and is not widely countered – like racism or sexism. These attitudes lead to the marginalisation of older people within our communities and have negative impacts on their health and well-being. In low-and middle-income countries, older people face daily discrimination and are largely invisible. Ageism leaves people excluded, considered different, restricted in what they can do or simply treated like they don’t exist. It means older people are often at risk of violence, are excluded from health services and face disproportionate levels of poverty.

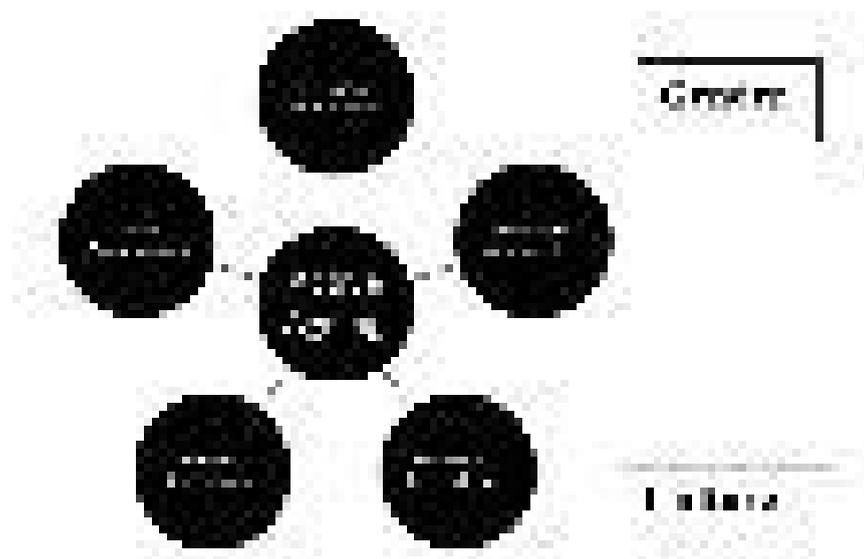
Gender is the major intersecting factor that explains discrimination, exploitation and marginalisation. Women outlive men in nearly all countries in the world. Currently, in the developed world, differences in mortality favour women at all ages and especially so at the oldest ages. In developing countries, seventy percent of females have a life expectancy at birth of more than 80 years, compared to 52 percent in developed countries, while no males have a life expectancy over 80 (Help Age International, 1996).

Gender is a powerful determinant of mental health that interacts with such other factors as age, culture, social support, biology, and violence. For example, studies have shown that the elevated risk for depression in women is at least partly accounted for by negative attitudes towards them, lack of acknowledgement for their work, fewer opportunities in education and employment, and greater risk of domestic violence. The risk of mental illness is

also associated with indicators of poverty, including low levels of education and, in some studies, with poor housing and low-income (Patel & Kleinman, 2003). Gender shapes older women’s experience of ageing, health, and ill health. Previous researches identify that ageing, gender, and health are intrinsically linked and collectively shape older women’s experience.

Elderly women, especially in Third World countries like India, face several threats. They are likely to be illiterate or poorly educated, unlikely to be employed, most likely to be widowed and dependent on others, and they suffer from malnutrition and disabling symptoms as well as report higher psychological distress. The vulnerability of the ageing women, special types of problems they are likely to encounter over the life span, and factors that marginalise them need to be better understood. There is no clear awareness as yet, of the potential contribution of ageing women to the development process as ageing women are stereotypically perceived as burdens on the national economy (Prakash, 1997). This again gives strength to the fact that ageism manifests in various forms in the life of aged women, making them vulnerable.

Humphries (1991) links women’s health status to their access to control of production. In societies where women are viewed as an economic burden, not only is their status lower, but this in turn adversely affects their access to education, food and health. The dependence of women within the family, coupled with cultural norms, promotes discrimination at a number of levels. For example, food allocation in many households often leaves women and female children undernourished. The intra- household allocation of food and its impact upon women have received little attention from gerontologists and remains a significant factor in determining the quality of later life. Long term malnourishment has severe implications for women who survive into older ages, and these are particularly significant for the contemporary developing world. The following chart shows how gender and culture are determining the concept of active ageing in the world.



**Figure 1 – Gender and Culture Determinants of Active Ageing**

*Source: Active Ageing: A Policy Framework, WHO, 2002*

International efforts span back to the Vienna Action Plan on Ageing (1982) to address the developmental potential and dependency needs of older persons, World Summit for Social Development in Copenhagen (1995) that aimed to integrate “age” into a “Society for all”, the Madrid Plan of Action on Ageing (2002) that focused on “Building a Society for all Ages”. All of these efforts were for materialising certain key areas like older persons and their development, advancing health and well being into old age, ensuring and enabling supportive environments, etc. Recently, the Sustainable Development Goals also put forward inclusive growth, good health and well being of the people, reducing gender inequalities etc., into the forefront of the global action plans. However, ageism continues to be a threat in achieving the target of active, healthy and successful ageing and the motto of adding life to years and not just years to lives.

### **The Study**

In determining the health and well being of a population, the physical and social environments play a major role along with our biological and genetic factors. Especially the socio-cultural environments hold a vital role in designing the physical and mental capacity across a person’s life

course. The accommodation and realisations of one’s own condition in old age determine the whole process by which she adapts to her environment, manipulates her conditions and overcomes the challenges. Aged people are always heterogeneous based on the conditions they are exposed to and the variation of experiences they have. Both older people and their environments will always be diverse, dynamic and changing. The interaction between both the conditions and experiences during the life course have enormous potential to decide whether or not the aged women will be successful in leading a healthy, successful, active aged life that is devoid of ageism.

In this background, the study tries to explain three major objectives. What are the conditions and experiences of the aged women that design or help to design the identities in which they live? Images of ageing exist at two levels; personal or self-identity and societal or social identity. To understand ageing holistically, it is imperative to understand how self-identity is influenced by the process of ageing and what is the mutual interaction between the two identities in the life of the aged women? This interaction related to the production and reinforcement of ageism became the third major objective of the study.



dimension. Ageist connotations can be identified as the major factors. Willingly or unwillingly, aged women step into the socially constructed threshold and are forced to follow the norms of society that depicts certain things as normal or ideal for those who are aged- women, widowed, and financially dependent.

Here, influenced by the conditions and experiences in their lives, identity constructions can be observed as existing in

two ways - positive and negative. When the constructions are positive, it becomes a refuge or support for the women to age successfully. On the contrary, negative self and social identity creations prove to be a risk. Compared to positive identity constructions, what we see in a patriarchal, highly stratified society is the construction and deep-rooted existence of negative age identities.

**Table 2 – Positive and negative self-identities developed by the respondents.**

Positive self-identities		Negative self-identities	
1. I am a strong woman.	2. I am a confident woman.	1. I am a weak woman.	2. I am a dependent woman.
3. I am a capable woman.	4. I am a resilient woman.	3. I am a fragile woman.	4. I am a vulnerable woman.
5. I am a self-reliant woman.	6. I am a determined woman.	5. I am a helpless woman.	6. I am a timid woman.
7. I am a hardworking woman.	8. I am a goal-oriented woman.	7. I am a lazy woman.	8. I am a pessimistic woman.
9. I am a responsible woman.	10. I am a proactive woman.	9. I am a negligent woman.	10. I am a passive woman.

**Table 3 – Positive and negative social-identities developed by the respondents.**

Positive social-identities		Negative social-identities	
1. I am a respected woman.	2. I am a valued woman.	1. I am a disrespected woman.	2. I am a devalued woman.
3. I am a dignified woman.	4. I am a dignified woman.	3. I am a dishonored woman.	4. I am a dishonored woman.
5. I am a well-regarded woman.	6. I am a well-regarded woman.	5. I am a poorly regarded woman.	6. I am a poorly regarded woman.
7. I am a socially accepted woman.	8. I am a socially accepted woman.	7. I am a socially rejected woman.	8. I am a socially rejected woman.
9. I am a socially integrated woman.	10. I am a socially integrated woman.	9. I am a socially isolated woman.	10. I am a socially isolated woman.

Narratives also showed that positive self and social identity constructions are mutually nurturing. It gives the capacity for the aged women to have high self-esteem, assertiveness

in their behaviour, feeling of fulfilment and freedom, self-sufficient and happy to gracefully embrace the changes related to ageing.

**Table 4 – Narratives and corresponding constructs by the respondents showing positive self and social identities.**

<p>“I understand that I am getting old. But that does not mean that I am unhealthy. I do all my household works. I leave the rest to god.”</p> <p>“What else is there for me to worry about? I have fulfilled all my duties. Now I have to obey my son and demand only genuine needs”.</p> <p>Constructs – Aged women can experience inner peace and fulfilment when they can understand their own limitations and come into terms with the process of aging.</p>
<p>“I do not have much demands. I have secured enough for my old age. Now until death comes, I have to live calmly”.</p> <p>Constructs – Aged women should feel satisfied with the conditions of life and stay calm. In doing so, they can find dignity and meaning in the later years when physical and biological senescence progresses.</p>
<p>“I was an atheist. But after 65, when I felt alone after my husband’s death and daughter’s marriage, I found GOD as a companion to share everything. I talk with the GOD. He is like a friend to me. I feel he is with me when I talk. After that I feel lightened”.</p> <p>Constructs – More dependent on ‘God’, but not necessarily on religion.</p>
<p>“Even when there is financial crisis, my daughter and son take care of me very well. We - my husband and me - do not have any savings. Whatever we have earned were spend for the children. We didn’t have any worries. Life will go like that.”</p> <p>Constructs – Even in low socio-economic conditions they feel supported and cared by the significant others. “I have to live without my husband since my younger ages. Had faced everything till now. I do not easily get worried by crisis. I have lived all my years through crisis. I have made them (children) realise the struggles I have been through. So expect that they will stand by me”</p> <p>Constructs – They can retrospect, face challenges in later life with optimism.</p>
<p>“I know what I want. I am still independent. I will hire according to my demands and never bother my children. But I will inform them. Because nowadays there is lot of insecurity around.”</p> <p>Constructs – Observed sense of freedom – physical, mental and economical.</p>
<p>“I have changed a lot. Earlier I used to worry a lot. Was angry almost all the time. But now there is a sense of detachment from everything. But I enjoy the solace in life.”</p> <p>Constructs – Detaching from worldly pleasures and practicing asceticism are identified as self-realisation in old age.</p>

### The Dialectics

When the identities are constructed negatively, they become risks for the survival, happiness, and well being of the aged women. These negative identities function as tools of oppression perpetuating ageism in society. Knowingly or unknowingly, standards are being set, and images are being projected in such a way that self and social identities are built at the expense of each other. At various junctures, social identity can be seen as dominating self-identity. Through this domination, social identities control the self-identity constructions in aged women. Self-identities constructed by the aged women always tend to be in

confirmation with the one projected by social identities. When this process continues for a longer period of time, it automatically reaffirms the existing ageist social identities into concrete social identities through actions and interactions. It gets normalised in society as a synonym for old age and aged women. Gender, widowhood and negative social identities perpetuate ageism through processes of discrimination, exploitation and marginalisation. In this sense, there is a vicious cycle of the structuring of ageist negative identities and processes of ageism. The processes may take the following forms:

**Table 5 – Synthesis of ageism**

<p>Biological metamorphosis refers to the change in anatomical and physiological form through a series of life stages. Complete adult stage is the epitome of beauty, vibrant life and happiness. What we always propagate through the concept of healthy, active, successful ageing is comparable to the life stages of a butterfly/ metamorphosis whereby life is added to ages. However, in reality, ageism is the stumbling block for the aged, especially aged women, to achieve this target. The researcher uses the concept of Reverse Metamorphosis for explaining the process due to the negative identity constructions. It is a two-way process that influences the self and social identities and the processes of ageism. Unlike simple disengagement from the active life entirely due to physiological or functional limitations resulting from the biological processes of ageing, there is a deliberate oppression of self-identities in ageism. Reverse metamorphosis starts with the self-identity pronouncing sacrifice, renunciation, passive, withdrawal from the social world. With added vulnerabilities like gender, widowhood and asset-lessness, social identity constructions project</p>	<p>aged women as weak, inefficient, less adaptive, burdening the young productive population, and easy prey for exploitation. The stereotyping progress into labelling and limiting conditions for the aged women within the mind, family and society. They set boundaries around themselves, indirectly leading to reaffirming the negative images. Internalised self-identities become social identity and vice versa, creating cocoons of identities that confine oneself within the barriers in an effort to confirm with the norms of social identity. Mostly this results in low quality of life and low subjective well-being.</p>	<p>The dominance of social identity over self-identity, when remained unchecked, leads to designing the future of identity creations. This becomes a cyclical process whereby constantly reaffirmed self-identities develop constantly oppressive social identities and vice versa. Gradually, it becomes a process of social construction that inherently bear the capacity to reduce the freedom, liberty and equality of elderly women. It emerges as an anti-democratic process that continues to oppress the already vulnerable, marginalised section of elderly women in our society.</p>
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**Negative identity constructions and Reverse Metamorphosis**

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**Table 6 – Conversations, conditions and experiences of ageism faced by aged women**

Conditions	Experiences
<p>‘Give away the charge of kitchen’, ‘give room for active and smart family members’, ‘don’t waste time’, ‘give way, you can’t move fast’, ‘try to understand’</p> <p>Self and social restrictions to withdraw from active roles</p>	<p>Live a passive life.</p> <p>Considered as burden to family and society</p>

Conditions	Experiences
‘It’s time for prayers’, ‘request god not to make you suffer’, ‘you are aged’, ‘it’s not suitable for the aged women’, ‘you are an aged widow’, ‘obey your son/daughter’ Imposes to take shelters in “age molds or labels.”	Socially isolated and experience loneliness
‘Vegetarianism, bhajans, temples, prayers, soft colour traditional wears, television series of bhakthi/god/devotion’ Change in tastes- dress, food, entertainments, frequency of travels.	Cocoons of age is developed. Spiritually modified space and materials Market value as ‘spiritual consumers’
‘You can wait’ Less prioritised	Neglect in resource allocation and prioritisation
‘It’s enough,’ ‘what else do you want?’ Spared with less resources	Marginalisation
‘You have lived your life, now let us live ours’, ‘we have to build our career and home’, ‘we are busy, try to understand’, ‘ you always have lot of complaints’, ‘ you are hard to manage.’ Lack of social support and care	Alienation

### Ageism explained by Habitus

Habitus emerges over time and acts like a durable ‘structuring structure’. It comes from practice, and it shapes practice. It predisposes people to think and act in patterned ways. In this sense, habitus can be used to explicate what are the socio-cultural underpinnings of ageism in a multicultural society like India- a risk leading to reverse metamorphosis in later life. Stereotyped age identities are so ingrained that people often mistook the feel of being marginalised as a natural process associated with ageing instead of identifying it as culturally developed. This often leads to justifying social inequality because it is mistakenly believed that some sections of the population are disposed to the finer things in life while others are not. Aged women, as a group with multiple vulnerabilities like widowhood, lack of personal financial assets, cognitive as well as physical limitations that increases with age, social and cultural constructions of subordinate power possessions, set the foundation for limiting their social world. Self-identity created on this basis becomes the foundation for constructing social identity about the aged women. Bourdieu’s concept of habitus as “a structuring

structure, which organises practices and the perception of practices” fittingly explains this situation.

### Managing Ageism and the Action Plan

Examining the WHO Strategy on a global action plan on ageing and health, we can see that the plan focuses on five strategic objectives:

- Commitment to action on Healthy Ageing in every country;
- Developing age-friendly environments;
- Aligning health systems to the needs of older populations;
- Developing sustainable and equitable systems for providing long-term care (home, communities, institutions); and
- Improving measurement, monitoring and research on Healthy Ageing.

### Application of theory

A key point within Bourdieu’s theory is that habitus constrains but does not determine thought and action. If

an individual is both reflective and aware of their own habitus, they possess the potential to observe social fields with relative objectivity. Bourdieu outlines four species of capital that are linked with habitus. Species capital is located as part of the structuring process of habitus. This can be used by individuals within the relative field as a tool for gaining dominance and power. Bourdieu breaks species capital down into:

1. **Social capital** which can be defined as the circles of friends, groups, memberships and social networks (also virtual within online communities).
2. **Cultural capital** which is an individual's knowledge, experience and connections. (Academic background, credentials and work-life).
3. **Economic capital** is the economic assets held (property owned, earning ability).
4. **Symbolic capital** is the honour, prestige and recognition relative to the individual (a veteran in a certain field, an aged person, a respectful person).

Older women can age gracefully depending on their effective utilisation of all the four capitals. They should learn new ways to build community, find spiritual and cultural interests and continue to render services even it is limited. Habitus has the potential to influence our actions and to construct our social world as well as being influenced by the external. By modifying their identity constructions, they can mould their identities to support successful, positive ageing. Society is the essential counterpart for attaining the purpose. Support for the efforts of aged women in this direction can be pragmatically achieved by restructuring age identities through inclusive age-friendly - gender-friendly initiatives done by governmental, non - governmental and community level programs.

### Conclusion

Around the globe, the fastest-growing population group is the group of people over 60 years of age. It is estimated that by 2050, one in six people will be over the age of 65. This demands the need that ageism is to be urgently tackled at every level possible, whether it is at the global, national or community level.

Describing the need for a global strategy and action plan on ageing and health, WHO recognises that it is the need of the hour. We cannot move blindfolded towards the future in an ageing population. With some of the rapidly ageing low- and middle-income countries, promoting healthy ageing and building systems to meet the needs of

older adults will be sound investments in a future where older people have the freedom to be and do what they value. (WHO, May 2016)

Creating environments that are truly age-friendly requires action in many sectors: health, long-term care, transport, housing, labour, social protection, information and communication, and by many actors – government, service providers, civil society, and older people and their organisations, families and friends. The study suggests that combating ageism, enabling autonomy, supporting healthy ageing and age-inclusive policies at all levels are certain key approaches that are relevant to all stakeholders.

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# Co-Integration and Causality Among Stock Market Indices: A Study of 35 Indices Across 5 Continents

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This paper analyses the nature and level of interdependence of various stock markets of the world. The study explores stock market interdependencies and dynamic interactions among selected global indices. The paper also ascertains the degree of association between developed and emerging markets. The findings show that a considerable amount of interdependency exists among the Indian stock market and other global stock markets. Findings suggest that there is an association between developed and emerging markets. These results are recommended to policymakers, regulators and researchers on the one hand and firms' managers as well as investors. These results provide insights to investors for portfolio diversification.

**Keywords:** *co-integration, cross-correlation, stock markets, market efficiency, interdependence, causality, international financial markets,*

## 1. Introduction

Global capital market integration over the last thirty years has been noticed through major strategic deviations under which international investment limits were reduced, exchange control was almost eliminated, free movement of capital, humans and technology was promoted, and the fundamental structures of most worldwide markets were transformed. Such progress in markets can change the relationship among different markets across the globe. Market integration has been promoted through liberalisation, which has critical implications on investment decisions and policies.

The stock market is connected with a sharp increase in uncertainty both in developed and emerging markets. Stock market behaviour analysis offers information about the future evolution of the stock market.

The dynamics of the progress of economy is inevitable. Nowadays, there is great attention towards the analysis of linkages among global stock markets. Through financial integration, native country can be linked with international capital markets. Increasing regional integration of financial markets helps to diversify the risk. The cost of financial contagion and crisis can be avoided by global financial openness (Cyn & Jong, 2011).

Integration can be deliberated from different standpoints: first is the general integration process at the global level, and the second is the economic integration process. The general integration process explores the level of global financial integration and its impact on economic growth. Previous studies by Lane and Milesi-Ferretti (2003), Arestis and Basu (2003) and Edison et al. (2002) concluded that the impact of financial integration on economic growth is dependent on various factors such as financial growth, economic development, legal progress etc. The economic integration is more critical as it focuses on the relationship between the financial markets as part of economic integration. Such integration can change the relationship among stock prices in various countries. Such market integration leads to international diversification, which results in better benefits to investors. Integrated markets are likely to have a higher transmission of market turbulence among different countries. Few previous studies like Errunza and Losq (1985) and Jorion and Schwartz (1986)

concluded that global capital markets were moderately integrated.

The probable reason behind co-integration comes from the efficient market hypothesis (EMH). According to EMH, asset/stock prices reflect the new information arrival in the market. The change in stock prices of one market due to change in other stock indices is not constant. Hence, it is important to analyse the change in the stock price in one market due to changes in different variables in different markets. The cause of co-integration among various stock indices is due to increased global market capitalisation based on the factors like development in MNCs, advances in technology, deregulation of financial systems, increase in capital flows due to relaxed foreign exchange policies etc. Such movement of stock prices across the markets leads to superior profits and better diversification which will lead to co-integration of stock markets globally.

According to Jorion and Schwartz (1986), lower co-integration of stock prices propels the investors to take advantage of diversification by investing across various stock markets globally. Mukherjee (2007) found that the Indian stock market had very high co-integration with stock markets of the USA, Russia, Korea, Japan and Hong Kong due to the ADRs and GDRs listed by the Indian companies in these markets.

Co-integration among the stock markets can be studied to understand if there are any mutual factors that determine the returns of stocks or indices or if an individual market or stock is driven by its own fundamentals. If mutual factors are found across markets, they are perfectly correlated with each other over a long period of time and are found to be more prone to contagion and ripple effects. The study of co-integration and causality among the markets can help to reduce such risks.

Khan (2011) explained two major reasons for co-integration in his study, namely global liberalisation of capital flows and a better network of communication which made it easier for investors to invest in global markets. He also concluded that co-integration has also happened due to a financially and economically integrated world which would result in an efficient international financial scope, and various markets would not be able to show independent behaviour of prices. Other studies by Domowitz (1995),

Lee (1998), Domowitz and Steil (1999), Cybo-Ottone et al. (2000), Shy and Tarkka (2001), Hasan and Schmiedel (2004), Armanious (2007) and Nicolini (2010) confirmed that mergers, acquisitions, strategic alliances, cross-listing and other forms of restructuring and co-operative movements between various stock markets as well as derivatives indices could lead to co-integration to increase the value of stock exchanges across the world. According to Dorodnykh (2014), “co-integration is a complex process, and it depends on various macroeconomic, structural, cultural-geographical and operative forces, where different stakeholders can also affect the integration decision.”

In order to obtain the variations in the degree of integration among markets, correlations can be used as a technique to observe the discrepancies in the stock values over the years. A higher correlation can be implied as an increase in the degree of integration and can have a much significant tendency that impacts in one country can be spread to others. As such, this methodology is not found to be much informative as the correlations can be found as a result of short and long-term relationships.

Co-integration is the study of a long-term relationship or co-movements between two variables in an equilibrium setup. The co-integration relationship in stock markets indicates the presence of a common trend that connects the stock markets. The presence of co-integration between stock markets reduces the portfolio risk diversification opportunities since the co-integrated stock markets share similar investment risks. The implications of no integration between international stock markets increase the benefits of investing in different stock markets. Therefore, the International investors looking out for global investment opportunities can formulate portfolios that include securities of either single asset class or multiple classes but spread in different countries' stock markets that are not co-integrated. Further, the non-integrated stock markets have fewer implications of global news affecting their domestic stock markets. The research in stock market co-integration helps international investors, mutual fund houses and hedge funds to look for investment opportunities across international stock markets.

The studies on the co-integration between the stock markets have been a vital topic in the financial literature ever since the works of Granger (1983) formalised the concept of

co-integration. Later studies of Granger and Weiss (1983); Engle and Granger (1987) evolved into a model to test the linear relationships among the financial markets. The unfavourable events in one market cause fluctuations in stock prices. Due to the interlinkages with other markets, the fluctuations are spread as a Contagion to the interlinked markets.

The co-integrated and interlinked stock markets can lead to a worldwide crash to begin with a particular news event in one country (Roll, 1989). The studies of Arshanapalli and Doukas (1993), Masih and Masih (1997), and Kizys and Pierdzioch (2011), among others, have reported the interlinkages among developed markets of USA, Japan and Europe. The interlinkages between the US, Japan and Asian markets were evidenced by Arshanapalli et al. (1995), Anoruo et al. (2003), Asgharian et al. (2013), among others. Further, these studies attributed the decline in the stock indices after the United States stock market crash of October 1987, the Asian Financial Crisis of 1997 and the Global Financial Crisis of 2008 to co-integration and interlinkages of stock markets.

Normally, the long-term equilibrium relationship is specified by a bivariate co-integration relationship. In such a relationship, the deviation from the equilibrium relationship is found to be stationary with a mean value of zero. It can be interpreted into an application that can be assessed as a combination of two non-stationary series, which itself is stationary. According to Engle and Granger (1987), such bivariate series is considered to be co-integrated.

Such bivariate relationships can be expanded to a multivariate relationship. In such relationships, a deviation in the price factors from the long-term relationship can be created from a grouping of all the time series. Though it looks like a complicated structure, the concept remains the same. Multivariate co-integration is a long-term relationship among the non-stationary time series, and there is a combination of non-stationary time series, which is stationary. In such a situation, a bivariate relationship can lead to inappropriate results and inference.

It has been observed that co-integration is expected to be found more in larger systems than smaller ones, which can be explained as representing the broader association among

international stock markets, and these markets are integrated to a greater extent. A change in the degree of co-integration among the factors/variables can explain the long-term relationship among global stock markets. This can be achieved through the comparison of the co-integration relationship over various sub-sample periods. In this study, the multivariate approach of co-integration is adopted to investigate the co-integration of multiple countries.

## 2. Literature Review

There had been a number of studies done by various researchers over the years emphasising different parameters of co-integration such as risk, return, volatility, prices etc.

Corchy Rad and Urbain (1995) studied the relationship among various stock markets by applying the Granger causality test for the period of 1981 to 1991 and found that there was no co-integration among these stock markets. Darrat, Elkhail and Hakim (2000) studied about the integration of emerging stock markets in the Middle East. Modelling techniques such as co-integration and error correction were associated with the international stock markets, and the stock prices in each country have been equalised by the arbitrage force. They found many differences between the trading patterns, which have especially been marked in regard to the market integration at a national level. Macroeconomic shocks throughout the economy have affected the capital markets at the international level. Free-flowing information and capital across international borders are some of the levels which have characterised the foreign market integration effectively.

Schleicher (2001) observed co-integration between the Eastern European Market and the Western European Market. The study had used a VAR model with multivariate GARCH and concluded that Eastern markets were more influenced by the Western markets.

According to Brooks and Negro (2002), the international equity market has a low degree of correlation returns across the stock markets at a national level. Emerging stock markets have constituted only the data with a small fraction. They pointed out that the stock market has been considered as the benchmark portfolio in most of the cases. They emphasised on the regional perspectives of international stock markets and market integration.

Click and Plummer (2003), Majid et al. (2009) and Phuan et al. (2009) studied about the stock market integration in ASEAN after the financial catastrophe and found that the co-integration of five ASEAN markets have not been completed in an economic sense. Serwa and Subramanian (2008) studied the relationship among five stock exchanges in East Asia. He used co-integration test and Granger causality test to study the relationship and concluded that these stock exchanges were co-integrated and diversification across various markets can be beneficial in the short-term but not in the long-term.

Mukherjee and Mishra (2005) observed long-term co-integration among the Indian stock market and other Asian stock markets.

A study done by Guidi (2010) has shown contradictory results that there was no co-integration found in the Indian stock market and Asian stock markets. The study revealed that the long-term benefits of investing in India are very limited. Another study done by Chittedi (2010) observed the relationship between developed countries stock markets and the Indian stock market and found that these markets were not co-integrated. He used the Granger causality test and found a uni-directional relationship between the Indian stock market, US market and Japan, whereas the UK and Australia were found to have no causality. Nath and Verma (2003) found that there is no co-integration among three South Asian stock markets, i.e. India, Taiwan and Singapore.

Thalassinos and Thalassinos (2006) studied the integration analysis of the stock market and analysed that there were significant changes in the market integration degree among various stock markets using different econometric techniques. The EMU establishment has affected the European stock market integration highly when compared to others. They also concluded that there has been a significant relationship between the dependence of bilateral import and the degree of stock market integration.

Alagidede (2008) studied the African stock market integration with implications for portfolio diversification and international risk sharing. Integration of stock markets has tended to be more efficient when compared to the segmented markets. Co-integrating vector numbers have revealed the integration extent across stock markets. Geographical proximity has not clearly dealt with the

African stock markets. Further, they suggested that the efforts at integrating African stock markets have remained futile to date.

Tirkkonen (2008) studied the stock and bond market integration with evidence from Russian financial markets. Long-run relationships testing with the autoregressive model (VAR) has played an important role in the Russian stock market integration.

Wang and Moore (2008) studied the stock market integration for the transition economies by using time-varying conditional correlation. They found a very high level of correlation after entering to the European Union. Financial market integration has seemed to be a largely self-fuelling process, and it also has a dependence on the development of the financial sector at the existing levels.

Chen and Shen (2009) studied the co-integration among stock markets of U.K., U.S.A., Japan and Germany Markets by using Granger causality and co-integration test and found the integration among markets. Chancharat (2009) studied stock market integration by using econometric techniques such as the Co-integration test, factor analysis and GARCH models, which are found to be useful to investigate the relationship among the economic variables and the stock market integration. These techniques also have the tendency to examine whether the international stock markets have the capability to move together in the context of the stock market integration.

Erdogen (2009) concluded that co-integrated stock markets have created greater chances for global investors by discarding country-specific risks. It was found that co-integrated markets reduce the capital cost, which helps the growth of an economy. Co-integrated markets have the capability to intensify the sector effects and nullify country effects. Co-integration among developing stock markets in Asia was studied by Raju and Khanapuri (2009), and they found the existence of a high degree of co-integration among the markets used in the sample.

Baumöhl and VÝrost (2010) analysed co-integration using the Granger causality test with respect to non-synchronous trading effects. They used classical mean-variance methodology and concluded that there was no significant lead-lag relationship of stock market integration in the pre

and post-crisis period. Karagöz and Ergun (2010) observed market co-integration among Balkan countries and found that economic and financial integration has helped to reduce the political risk and to promote the stability of the economy and local markets size. Yeoh et al. (2010) studied co-integration between Malaysia and Singapore stock markets. They concluded that the Malaysian stock market was having a higher degree of co-integration.

Babecký et al. (2012) studied co-integration between Chinese and Russian stock markets by using beta-convergence and sigma-convergence approaches. Bhunia and Das (2012) studied about the financial market integration from India and selected south Asian countries. The global crisis of finance has focused more attention on the linkages among the Asian countries stock market. Authors have predicted that the stock index of the Indian stock market has not co-integrated with the developed markets. Indian stock market has integrated with the mature markets effectively.

Birau and Trivedi (2013) studied stock market co-integration and contagion of emerging markets with respect to the global financial crisis. The financial system turbulence resulted in the heavy reduction on the stock market around the world. Joshi (2013) examined the co-integration among BRIC's stock indices and concluded that India had a long-term equilibrium relationship with Russia and China but not with Brazil.

Park (2013) studied co-integration among Asian stock markets and found that there was an increased correlation between the movement of assets prices, and the degree of stock market co-integration was enhanced over time from one market to another. Mohamed (2014) investigated the existence of co-integration among GCC stock markets. Most of the GCC stock markets are relatively small, closed to foreign investors, which also have led to the blocking of inflows of foreign portfolio investment effectively.

Patel (2014) proposed a study regarding the co-integration of Indian and selected Asian stock markets. This study examined the Indian stock market independence with other equity markets of Asia like Sri Lanka, Pakistan, Korea, Japan, Malaysia, China, Singapore and Taiwan. The study concluded that all Asian stock indices are first difference stationary, and there is an existence of long-term

equilibrium relationship among Asian markets. It found that the stock market of India is influenced by stock indices of China, Sri Lanka, Singapore and Japan. The major suggestion derived is that the government of India must supervise the Asian equity markets movements very closely because a crisis in any country of Asia may influence the Indian stock market performance.

Seth and Sharma (2015) studied the co-integration among the Asian and US markets by applying the Granger causality test, Johansen co-integration test and found the existence of short term and long term co-integration among the market. Mitra and Bhattacharjee (2015) found a co-integration of BSE with other markets.

Bhattacharjee and Swaminathan (2016) studied the stock market integration of India and few selected countries and found that co-integration of the Indian market with other indices have improved over the years due to liberalisation, and during the recession, the Indian market was more responsive to Asian markets.

Everaert and Pozzi (2016) studied co-integration among 19 European stock markets for a period from 1970 to 2015 by using a panel of monthly stock market returns. They developed a model of dynamic factor, which decomposes equity risk premium into a country risk factor of Europe with stochastic volatilities and time-varying factor loadings. This model was evaluated using Bayesian MCMC (Markov Chain Monte Carlo) methods. The study concluded that there was an existence of co-integration in few developed European countries from the late 1980s to early 1990s, but also neither euro area membership nor European Union has developed the integration of the stock market. Shahzad, Kanwal, Ahmed and Rehman, (2016) studied co-integration among the stock markets applying ARDL and found the existence of co-integration among the markets.

Patel (2017) explored the co-integration among 14 stock markets. The correlation analysis showed that BSE remained somewhat positively correlated. Results of the Johansen co-integration test concluded that there was a long-run relationship among selected stock markets.

Kiviet and Chen (2018) reviewed the literature on the analysis of co-integration between the price indices of

stocks or their realised returns at various markets and registered frequently recurring methodological deficiencies such as omitted regressor problems, neglecting to verify agreement of estimation outcomes with adopted model assumptions, employing particular statistical tests in inappropriate situations and, occasionally and lack of identification.

Nautiyal and Kavidayal (2018) examined cross-country returns and co-integration of 11 stock indices of developed and developing countries by using VECM and found that there was a slow but significant price adjustment and stock market co-integration was found.

### 3. Data and Methodology

#### 3.1 Data Sources

This study included closing values of daily prices of various indices from January 2005 to December 2018, which were collected from the respective websites of the stock exchanges. The stock market behaviour and the extent of co-integration were investigated among 35 stock indices from 5 continents (Africa, America, Asia, Europe and Australia) in the world. The major stock indices of the Asian markets (SENSEX, HSI, JAKARTA, KLSE, KOSPI, NIKKEI 225, NZSE50, SHANGHAI, STRAITS, TAIWAN and NIFTY), stock indices of European markets (AEX, ATX, BEL20, BIST100, CAC40, DAX, FTSE100, IBEX, OMX, OSE ALL SHARE, RTSI, SMI and STOXX50), index AORD from the Australian market and stock indices of the American market (DJIA, GSPC, IBOVESPA, IPC, Merval, NASDAQ, NYSE and S&P TSX) were selected for this study.

#### 3.2 Methodology and Hypothesis

This study involved a two-stage methodology. In the first part, normality, stationarity and causality of the time series were tested using statistical techniques like Jarque-Bera Statistic, ADF Test and Granger Causality Test, respectively. The hypothesis statements were developed for each test as follows.

$H_0^1$ : Stock indices prices are normally distributed.

$H_0^2$ : A Unit Root is present in the stock indices prices. (Dickey & Fuller, (1979 & 1981))



The descriptive statistics show that mean returns of most of the indices in the sample were positive though it was found that the mean daily return of the JALSH index was highest (0.2) among all the indices followed by the Merval index, whereas the average daily return of OSE index was lowest (-0.02) among all. The fact that the emerging markets are more volatile is evident from statistics on the standard deviation of daily returns in these markets. In general, the developed market returns are less volatile with a standard deviation lesser than the emerging markets. The South African market, though, provides the highest magnitude of maximum daily returns, along with a maximum standard deviation of 5.5, followed by Russia (2.25) and India (1.52). The Developed markets exhibit high volatility in US DJIA (4.71), and the least volatility in the developed market sample is exhibited by the Australian Market (1.08).

Skewness values of emerging markets like Russia and China exhibit an asymmetrical distribution with a long tail to the left, while India situation is near to zero exhibiting only asymmetrical distribution. In developed markets, the US stock market exhibits symmetric distribution around the average value. While other developed markets like the UK, Japan and Singapore exhibits left-skewed distribution. All the Kurtosis values of the stock markets investigated in this study display a value of more than three, showing a leptokurtic curve, which demonstrates that the distribution of stock returns in these countries contain extreme values. The values of Kurtosis accompanied by those of Jarque-Berra statistic clearly indicate that the returns of developing markets are not normally distributed. These findings are consistent with Harvey (1995) and Bekaert et al. (1998). Under large departure from normality, the mean-variance criterion given by Markowitz (1952) can lead to the application of wrong portfolio weights (Jondeau and Rockinger, 2005). For risk-averse investors, the use of sub-optimal mean-variance criterion in portfolio construction can result in substantial opportunity cost. The non-normality of returns in emerging markets, therefore, compels the international investors to use distinct and typical models for determining expected returns of portfolios comprising emerging-market assets.

#### 4.2 Examining Stationary of Variables

In order to check the co-integration, a requirement is to check that all factors are non-stationary. The ADF test was used to determine that the variables are stationary or not. AIC was used to find out that the optimal lag structure for conducting the test.

The ADF test was performed for each of the indices in the sample included. The findings of the ADF test are shown in Table 1. As can be seen from Table 1, that the p-value is less than 1% for all the variables at the 1<sup>st</sup> difference level. It was found that all the stock indices prices are non-stationary at the original level, and they are stationary at the 1<sup>st</sup> difference.

#### 4.3 Test for Causality

Granger causality test was performed to examine the causal relationship among these markets. Since co-integration—at any level—exists, the Granger causality testing is appropriate for bilateral pairs of markets. As Granger (1988) pointed out, if two variables are co-integrated, causality must exist at least uni-directional.

The Granger causality test was conducted by dividing the data into three sub-periods (Period 1: 2005 – 2009; Period 2: 2010 – 2014; Period 3: 2015 – 2018). For most of the indices, the causality remained the same during all sub-periods. But in the case of some indices, the causality was found during one sub-period (either bi-directional or uni-directional) with an index but was not found in another sub-period. In a couple of cases, it also happened that for one sub-period, causality between two indices was uni-directional, for another sub-period, it was bi-directional, and for the third sub-period, there was no causality between those two indices. This led to a very interesting change of trends during short-term Granger causality results. These results for each of the sub-period are shown in the table below. In the last column of the table, the results show bi-directional or uni-directional causality of an index with other indices for the long-term, i.e. for the entire duration of the study. These long-term results are the combination of all short-term results, which include the bi-directional and uni-directional causality of an index with other indices, which were found in all three sub-periods as mentioned below. For instance, for bi-directional causality, the ATX index causes 12 indices during 2005-2009, 13 indices during 2010-2014 and 11 indices during 2015-2018. Out of these indices, ATX causes 11 indices during all three sub-periods, which is cited as long-term causality.

From the causality analysis, it can be inferred that there is an existence of bi-directional causality. Among 35 indices, AEX index causes 14 indices, AORD causes 9 indices, ATX causes 11 indices, Bel20 causes 11 indices, CAC40 causes 11 indices, DAX causes 8 indices, DJIA causes 3 indices, FTSE100 causes 12 indices, GSPC S&P500 causes 14 indices, HIS causes 9 indices, IBEX causes 8 indices,



<p>1. <b>Introduction</b></p> <p>2. <b>Literature Review</b></p> <p>3. <b>Methodology</b></p> <p>4. <b>Data Collection</b></p> <p>5. <b>Results and Discussion</b></p> <p>6. <b>Conclusion</b></p>	<p><b>1. Introduction</b></p> <p>The purpose of this study is to investigate the impact of digital marketing on the sales performance of small and medium-sized enterprises (SMEs) in India. The study is based on a quantitative approach using a survey of 100 SMEs. The data is analyzed using statistical methods to determine the relationship between digital marketing activities and sales performance.</p> <p><b>2. Literature Review</b></p> <p>The literature review discusses the theoretical framework of digital marketing and its impact on sales performance. It highlights the importance of digital marketing in the current business environment and the need for SMEs to adopt digital marketing strategies to remain competitive.</p> <p><b>3. Methodology</b></p> <p>The study uses a quantitative approach to collect data from 100 SMEs. The data is analyzed using statistical methods to determine the relationship between digital marketing activities and sales performance.</p> <p><b>4. Data Collection</b></p> <p>The data is collected through a survey of 100 SMEs. The survey includes questions about digital marketing activities, sales performance, and other factors that may influence sales performance.</p> <p><b>5. Results and Discussion</b></p> <p>The results of the study show a positive relationship between digital marketing activities and sales performance. The study also discusses the implications of these findings for SMEs and the need for further research in this area.</p> <p><b>6. Conclusion</b></p> <p>The study concludes that digital marketing has a significant positive impact on the sales performance of SMEs in India. The study also provides recommendations for SMEs to improve their digital marketing strategies and sales performance.</p>	<p><b>1. Introduction</b></p> <p>The purpose of this study is to investigate the impact of digital marketing on the sales performance of small and medium-sized enterprises (SMEs) in India. The study is based on a quantitative approach using a survey of 100 SMEs. The data is analyzed using statistical methods to determine the relationship between digital marketing activities and sales performance.</p> <p><b>2. Literature Review</b></p> <p>The literature review discusses the theoretical framework of digital marketing and its impact on sales performance. It highlights the importance of digital marketing in the current business environment and the need for SMEs to adopt digital marketing strategies to remain competitive.</p> <p><b>3. Methodology</b></p> <p>The study uses a quantitative approach to collect data from 100 SMEs. The data is analyzed using statistical methods to determine the relationship between digital marketing activities and sales performance.</p> <p><b>4. Data Collection</b></p> <p>The data is collected through a survey of 100 SMEs. The survey includes questions about digital marketing activities, sales performance, and other factors that may influence sales performance.</p> <p><b>5. Results and Discussion</b></p> <p>The results of the study show a positive relationship between digital marketing activities and sales performance. The study also discusses the implications of these findings for SMEs and the need for further research in this area.</p> <p><b>6. Conclusion</b></p> <p>The study concludes that digital marketing has a significant positive impact on the sales performance of SMEs in India. The study also provides recommendations for SMEs to improve their digital marketing strategies and sales performance.</p>
<p><b>References</b></p> <p><b>Appendix</b></p>	<p><b>References</b></p> <p>1. Kotler, P., &amp; Armstrong, G. (2009). <i>Principles of Marketing</i>. Upper Saddle River, NJ: Pearson Education.</p> <p>2. Kotler, P., &amp; Armstrong, G. (2009). <i>Principles of Marketing</i>. Upper Saddle River, NJ: Pearson Education.</p> <p><b>Appendix</b></p> <p>Appendix A: Survey Questions</p> <p>Appendix B: Statistical Analysis Results</p>	
<p><b>References</b></p> <p><b>Appendix</b></p>	<p><b>References</b></p> <p>1. Kotler, P., &amp; Armstrong, G. (2009). <i>Principles of Marketing</i>. Upper Saddle River, NJ: Pearson Education.</p> <p>2. Kotler, P., &amp; Armstrong, G. (2009). <i>Principles of Marketing</i>. Upper Saddle River, NJ: Pearson Education.</p> <p><b>Appendix</b></p> <p>Appendix A: Survey Questions</p> <p>Appendix B: Statistical Analysis Results</p>	



#### 4.4 Co-integration Test

The Johansen (1988, 1991, 1995) efficient maximum likelihood test was used to examine the existence of a long-term relationship among indices. A model of the Johansen procedure was used: the one with a linear trend in level and intercept in the co-integrating equations (CE). This version was found to be more appropriate to our data since we have trending series with stochastic trends. The test was performed using a formulation of a VAR model with lag length determined according to AIC and Akaike's Final Prediction Error (FPE). Determination of co-integration rank ( $r$ ) depends on the values of eigenvalue and trace statistics.

Maximum likelihood estimators of the co-integrating vectors for an autoregressive process were derived by Johansen (1988) and Johansen and Juselius (1990) by considering the following equation.

$$X_t = \alpha + \beta X_{t-1} + \epsilon_t \quad (1)$$

VAR model can be estimated at the first level difference, i.e.  $I(1)$ , a majority of time series variables are non-stationary at level  $I(0)$ . The above-mentioned equation (1) of Johansen and Juselius (1990) can be represented by introducing a first level difference operator as follows:

$$\Delta X_t = \alpha + \beta X_{t-1} + \epsilon_t \quad (2)$$

Matrix can be used to trace co-integration. The first level difference, i.e.  $I(1)$ , might be preferred when all  $X_t$  values are found to have unit roots which can be determined if  $p \times p$  matrix has rank 0.

The Johansen co-integration test was performed for the set of 35 stock exchanges to investigate the integration of these markets as a group. Analysis using the multiple

equations was based on a VAR model, which is required before constructing a related VECM system. The VAR model of order 2, which was chosen according to AIC, contains a  $5 \times 1$  vector that contains logarithms of the share price index of the five markets. The multivariate approach examined the existence of a co-integrating vector in the stochastic matrix and a sequence of hypotheses test using maximum likelihood methods, establishing the greatest possible number of vectors within the system. In this study, the null hypotheses assumed for each row of numbers: zero and at most one co-integrating equations. The alternative hypothesis states one, co-integrating equations, respectively, for each row. As long as trace statistics exceed critical values at 5 or 1 percent, the alternative hypothesis was accepted (the null hypothesis was rejected).

Table 3 shown co-integration between the SENSEX and other indices. At  $r=0$ , the trace statistic was higher than the critical value at 5 percent; therefore, the null hypothesis of no co-integration was rejected. The result implied that there was at most one co-integrating equation between the two variables. The findings of the co-integration test of BSE and WALSH were consistent with the finding of the correlation analysis, which determined that the relationship between movements in the two stock markets was strongly positive. Positive co-integration was compatible with the concept of stock market integration, which assumed a similarity in securities offerings and the ability of investors from each market to hold investments in all securities.

As illustrated in Table 3, trace statistics and Eigenvalue statistics indicated one co-integrating vector at the 5 percent significance level among the markets. Since the trace statistic exceeds the 5 percent critical value, it is possible to reject the null hypothesis of no co-integrating vectors, indicating that there are one or more co-integrating equations.

**Table 3: Results of Co-integration Test for All Indices**

Indices	Co-integration tests	No. of variables	Eigen values	Eigen			Maximum Eigen value	
				Eigen statistics	F value	Significance	10% Eigen statistics	F value
A&P	Co-integration tests	Rank 5	0.212	135.49	13.49	0.21	135.49	13.49
		at least 1*	0.173	794.81	1.00	0.17	794.81	1.00
A&P&B	Co-integration tests	Rank 5	0.203	136.75	13.49	0.20	136.75	13.49
		at least 1*	0.165	731.11	1.00	0.17	731.11	1.00
A&P&C	Co-integration tests	Rank 5	0.186	651.23	1.00	0.18	651.23	1.00
		at least 1*	0.151	764.09	1.00	0.17	764.09	1.00
A&P&D	Co-integration tests	Rank 5	0.204	137.00	13.49	0.20	137.04	13.49
		at least 1*	0.171	764.09	1.00	0.17	764.09	1.00
A&P&E	Co-integration tests	Rank 5	0.204	136.75	13.49	0.20	136.75	13.49
		at least 1*	0.173	794.81	1.00	0.17	794.81	1.00
A&P&F	Co-integration tests	Rank 5	0.207	136.99	13.49	0.20	137.04	13.49
		at least 1*	0.170	764.09	1.00	0.17	764.09	1.00
A&P&G	Co-integration tests	Rank 5	0.213	136.99	13.49	0.21	137.11	13.49
		at least 1*	0.170	764.09	1.00	0.17	764.09	1.00
A&P&H	Co-integration tests	Rank 5	0.212	137.07	13.49	0.21	136.87	13.49
		at least 1*	0.169	870.83	1.00	0.17	870.83	1.00
A&P&I	Co-integration tests	Rank 5	0.199	661.11	1.00	0.19	661.11	1.00
		at least 1*	0.161	764.09	1.00	0.17	764.09	1.00
A&P&J	Co-integration tests	Rank 5	0.201	136.41	13.49	0.20	136.99	13.49
		at least 1*	0.171	764.09	1.00	0.17	764.09	1.00
A&P&K	Co-integration tests	Rank 5	0.201	137.07	13.49	0.20	137.04	13.49
		at least 1*	0.169	868.24	1.00	0.18	868.24	1.00
A&P&L	Co-integration tests	Rank 5	0.203	136.99	13.49	0.20	137.19	13.49
		at least 1*	0.168	868.24	1.00	0.17	868.24	1.00
A&P&M	Co-integration tests	Rank 5	0.202	136.75	13.49	0.20	137.11	13.49
		at least 1*	0.169	864.01	1.00	0.18	864.01	1.00
A&P&N	Co-integration tests	Rank 5	0.204	137.19	13.49	0.20	136.71	13.49
		at least 1*	0.169	767.09	1.00	0.17	767.09	1.00



coefficients can be interpreted as those having significant linkages. On the other hand, low correlation reflects the separation property of stock markets and, therefore, the existence of an opportunity to diversify risk. Further, markets in the common region are more correlated because these markets are more prone to get influenced by their regional news and developments and also because of reasons such as trade and economic ties. The correlation structure of emerging and developed markets has been examined to detect preliminary evidence on potential diversification benefits in the region.

One of the procedural issues to be handled in the context of the log return correlation matrix in the table is the existence of timing difference or difference in trading hours between emerging stock markets and select developed stock markets, especially for the US stock market. Remaining all the markets taken in the sample interact within a single day of each other because all the emerging markets under study operate in the same time zone. On account of this, the contemporaneous correlation among the US market and the selected markets is not of much importance. Therefore, the correlation matrix is derived, taking into account the one day lagged returns for the US market. The same approach is followed for subsequent analysis of return data throughout the study.

The examination of the correlation structure of log returns from Table 4, 5 and 6 gives the following important findings:

The emerging markets exhibit mixed correlation coefficients with each other and also with select developed stock markets. At the same time, it can be observed that in general, however, the emerging equity markets share low correlation coefficients (less than 0.50) during the whole sample period. The Russian stock market exhibits high correlation coefficients with developed stock markets such as Japan as well as the UK and USA, positive correlations with both India and China, and having a negative correlation with Singapore. In an emerging market context, both India and China stock markets are having a relatively low degree of correlation coefficients with other counterparts.

The Indian stock market exhibits significant correlation coefficients with Singapore and with the Japanese stock markets. The lowest correlation coefficients with respect

to the Indian stock market is with Germany's (European) stock market, and India does not share a negative correlation with any index. Chinese stock market exhibit negative correlation coefficients with respect to US and European stock markets. This indicates that the Chinese market is by far the most isolated market in the region, which further is an indication of potential diversification benefits. The developed US stock market has a positive correlation coefficient with emerging market Russia followed by India and China.

Sensex and Nifty Index are positively correlated with all the indices. Sensex is highly correlated with other stock market indices, i.e. STRAITS (0.562) and HIS (0.536). It indicates that Sensex, BIST100, SMI and DAX indices following the same trend. There is a low positive correlation existing between Sensex and BIST100, SMI and DAX.

The below table is representing the test result of cross – Correlation between Developing Countries and Developed Countries. In this table, all the sample countries' stock returns are compared with the US stock return. In these cross-correlation tests, the results data is significant at 1% levels.

In the case of developed countries, Germany cross-correlation test results, most of the values of the lags are positive, which shows the positive association of Germany stock return with the USA stock return. It is clear that the Germany stock returns and the US stock returns move together. We can say that the Germany stock return is dependent on the US stock return. In the case of the UK, cross-correlation test results, 7 lags values are positive out of 11, which shows the positive association of the UK stock market with the USA stock market. It is clear that the UK stock market and US stock market move together. We can say that the UK stock market is dependent on the US stock market.

The cross-correlation results of Japan and Canada show that there are mostly negative lags values that show a negative association with the US stock return. We can say that Japan and Canada stock markets are not dependent on the US stock market. The cross-correlation results of France and Italy show that there are mostly positive lags values that show a positive correlation with US stock return. It is clear that France and Italy stock markets move with the US stock market.

In the case of developing countries, the cross-correlation results of India and Malaysia show that there are mostly positive lags values that show a positive correlation with US stock return. It is clear that the Bangladesh and Malaysia stock market is related to the US stock market. In the case of Turkey, the cross-correlation test clearly shows that the

Turkey stock market was not associated with the US stock market. The Egypt stock return, Pakistan stock return, and the Indonesia stock return show that there are many negative lags values that show a negative association with US stock return. The findings and inference of the cross-correlation are shown in the table below.

**Table 4: Findings and Inference of High Correlation of Indices**

<b>Highly Correlated :&gt;0.50</b>	
Bel20	FTSE100
CAC40	FTSE100 and Bel20
IBEX	FTSE100, Bel20 and CAC40
S&P TSX	FTSE100
NASDAQ	FTSE100, Bel20, CAC40, IBEX and S&P TSX
OMX	FTSE100, BEL20, CAC40, IBEX
HIS	AORD and STRAITS
NIFTY50	STRAITS and HIS
IBOVESPA	FTSE100, Bel20, CAC40, S&P TSX, Nasdaq, NYSE and OMX
ATX	FTSE100, Bel20, CAC40, IBEX, NYSE and OMX
KOSPI	AORD, STRAITS and HIS
OSE	FTSE100, CAC40, OMX and ATX
Sensex	STRAITS, HIS and Nifty50
Nikkei225	AORD, STRAITS, HIS and KOSPI
GSPC S&P500	FTSE100, BEL20, CAC40, S&P500, NASDAQ, NYSE, OMX and IBOVESPA
IPC	FTSE100, BEL20, CAC40, S&P500, NASDAQ, NYSE, OMX, IBOVESPA and S&P500
AEX	FTSE100, BEL20, CAC40, IBEX, NASDAQ, NYSE, OMX, IBOVESPA, S&P500, ATX, OSE and IPC
RTSI Russia	FTSE100, BEL20, CAC40, OMX, ATX and AEX
Merval	Nasdaq, NYSE, IBOVESPA, S&P500 and IPC
JLSH	DJIA
STOXX50	FTSE100, BEL20, CAC40, IBEX, NASDAQ, NYSE, OMX, IBOVESPA, S&P500, ATX, IPC, AEX, RTSI RUSSIA
TAIWAN	AORD, STRAITS, HIS, KOSPI and NIKKEI225
NZSE50	AORD

**Table 5: Findings and Inference for High Degree of Anti-correlation**

**Table 6: Findings and Inference for Low Degree of Anti-correlation**

To examine if there is a problem of serial correlation, the Durbin Watson statistics of the model is 2.141974, which infers that there is no problem of serial correlation. Regression is spurious if the residual of the regression is auto-correlated, i.e. they are not stationary at level. Autocorrelation among residuals is checked using a correlogram of residuals and unit root test; estimates of Q-statistics are statistically insignificant for all 36 lags. This means the null hypothesis of no autocorrelation cannot be rejected, i.e. confirming the non-spurious regression model.

Stationary estimates (using ADF-Test) of residual shows that the residuals of the estimated function are stationary at the I(0) order of integration. Thus if the variable is integrated of the same order and the linear combination among them is stationary, indicating the presence of co-

integration. This finding implies the existence of a long-run equilibrium relationship among the variables. In this case, OLS estimation is consistent, and there is no problem of spurious regression and t, as well as F statistics, are valid.

**4.6 Hurst Exponent Analysis**

There is a basic assumption in theories of quantitative finance that the changes in stock prices are independent. Such changes can be exhibited using Brownian motion. For this purpose, Hurst exponent analysis is used as a test for independence in time series data. Hurst exponent value of 0.5 explains that the time series is independent. But predetermined Brownian motion data will give a value of Hurst exponent, which can be higher or lower than 0.5. Such values can be wrongly inferred as evidence of long-term memory in the case of the absence of a proper test.





the diversification benefits from the markets that have a weak correlation. Therefore, the investors who diversify their portfolio across various countries can improve the portfolio's expected return without increasing the risk of the portfolio. FIIs and individual investors can use this study to understand the correlation structure and interdependence of the global stock indices for better and effective portfolio diversification.

Further, these results are recommended to policymakers, regulators and researchers on the one hand and firms' managers as well as investors on the other. FIIs, HNIs, individual, institutional, and public investors can make decisions regarding their investments based on co-integration among the markets, which may be of short as well as long-run. These results provide insights to the investors for portfolio diversification which can help reduce the systematic risk of the portfolio.

### 5.2 Limitations of the Study

This study is constructed on the secondary data of stock market indices which included daily closing prices. This study does not involve the weekly or monthly prices, which can be used for further analysis, such as seasonality in stock indices.

One of the procedural issues to be handled in the context of the log return correlation matrix is the existence of timing difference or difference in trading hours between emerging stock markets and select developed stock markets, especially for the US stock market. Another limitation of the study is that it does not cover event-specific co-integration.

### 5.3 Scope for Further Research

The study has further scope of research. The dependency of each market to other markets can be studied using the Regression analysis. The analysis of dependency can help in taking the investment in a better way. The effect of volatility among markets can also be analysed.

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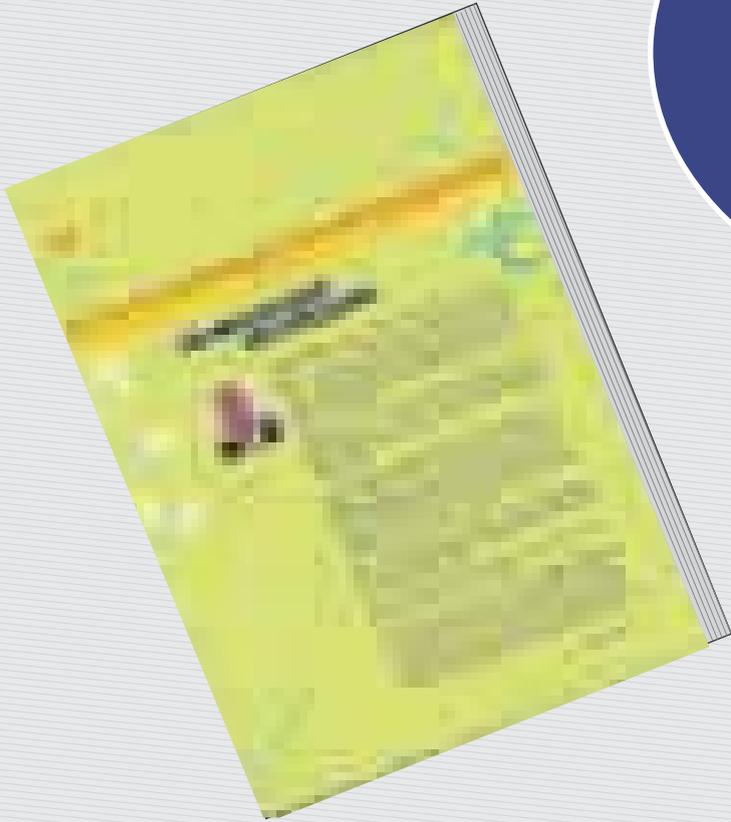
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# REVIEW ON ACTION RECOGNITION IN VIDEOS PROCESSING

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**Abstract** - The introduction of actions in the video is currently in the focus of scientific research due to improvements carried out in automatic analysis of static images and greater availability of processing power. This paper provides a general description of the key model and method for the introduction of actions consisting of models and human methods based on shared track estimates, silhouettes and matching temporal local templates and descriptors. To handle compound actions and activities, the semantic action model is proposed with the help of expert knowledge. Because the task of recognizing actions depends on the domain, methods and models are built and tested on the domain specific database. This paper provides general reviews and descriptions of the latest video datasets made to develop the introduction method of action, with emphasis on datasets with additional modalities such as depth images or accelerometer data.

## I. INTRODUCTION

Automatic video analysis is currently focusing on research interest. This is caused by their independence in ordinary life and usability in many different fields such as security supervision, process automation based on visual reference, detection of all kinds of abnormalities, and anything connected with visual observations.

The important part of automatic video analysis is recognition of individual actions, such as falling down, or jumping. Recognized actions can be used per se, for example to interact with electronic devices, or can function as the starting point towards recognizing activities that require further interpretation, such as distinguishing between normal meetings or threatening approaches.

Over the years, many techniques have been proposed to complete the task of recognizing human actions in the video. Most of them use several types of supervised machine learning approaches, where the model of actions that must be recognized is built using training data consisting of features extracted from the appropriate video. Fig.

1. Shows a typical workflow from a supervised learning approach, where the prediction model is made at first workflow and then is used in the second workflow to make a prediction.



Figure 1. Traditional model of action recognition

In Another knowledge-based approach, the model of the action used for recognition is built mainly by encoding by providing expert knowledge using descriptive language operators and logic.

Lately, the new type of machine learning approach to the introduction of actions using neural networks has emerged. This approach has been used for automatic features that will be used for recognition of instead of handmade features in classical ml style, as well as an integrated feature extraction and classification framework where the two processes are handled completely in deep tissue.

The purpose of this paper is to provide an overview of the most widely used models and methods for the introduction of activities with their strengths and weaknesses. A list of datasets that are appropriate for this purpose will also be presented.

## II. MODELS AND METHODS

Raw Video sequences are not suitable for modeling and classification because of the very high dimensions (proportional to the dimensions of the image and time), where most dimensions do not really contain relevant information for the introduction of action. On the other hand, the machine classifies only based on primary elements such as pixels or features. That is why the first step after acquiring the video is usually an extraction of features. Simply put, features are an interesting part of the images that are changed in a way that can be used by the machine. Some common levels of low levels are edges (divided between lighter and darker parts of the image), the angle (point where the edge intersects), lumps (the image area is too subtle to detect advantages), etc.

In recognition of actions, its features can be roughly divided into those who encode or trajectories from different body parts, into those who aim to track all numbers and become local features operating on interesting points in videos without paying attention to someone or not. Features based on body parts and number-based features require additional video processing to detect, group and track people in the video, which is a non-trivial task. Local features, on the other hand, have an advantage because it does not require any people's pelocations, so they have recently become increasingly attractive to researchers in the field.

### A. Body Based Model

Representation of features for the introduction of actions based on the human body parts using 2D and 3D features such as stick numbers (Fig. 3), silhouette (Fig. 4) or volume (Fig. 5) to represent information about position and movement of different body parts[1].

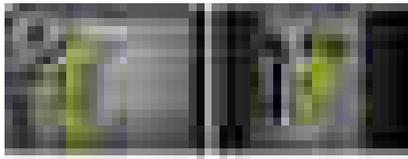


Figure 2. Stick figure from the Cornell Activity Datasets database [2]

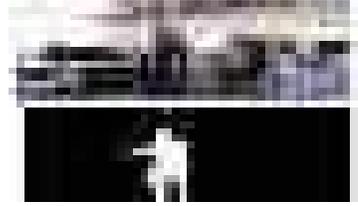


Figure 3. A video frame depicting a person walking (left) and the corresponding silhouette mask (right) [3]

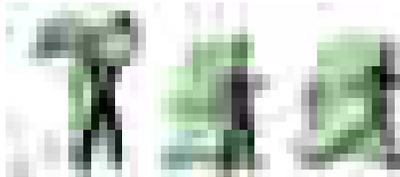


Figure 4. Volumes formed by stacking the silhouettes of persons while performing actions [4]

Most Approaches using the explicit model of the human body, such as a stick model, and strives to optimize the compatibility between model projections and image frames observed while simultaneously maintaining correspondence from the frame. The representation produced is a set of connections trajectories in 2D-time space or 3D-time space, as shown in Fig. 5.



Figure 5. Tracked trajectories of joints generated by performing different actions [4]

The drawback of 2D-time representations is that they are Depending on, meaning that features for the same actions will be very different depending on the relative orientation of the camera and the person taking action. On the other hand, estimates of 3D poses from a single display require a more complex model. If the Requirements for a single camera relax, the solution uses multiple cameras to reconstruct the depth information has been proposed, such as [4]. Lately, affordable depth cameras have emerged that capturing 3D depth information using infrared sensors along with RGB videos, which can be very helpful in the estimated combined position in 3D, but still limited to use because of the simple depth sensing range. Additional consideration is whether the camera display is stationary or cellphone [4], whether a single camera is used or there are several displays available [3] to reconstruct 3D representations the world or to mitigate the effect of occlusions and expand the field of view.

Precise The full poses reconstruction is a difficult task, and the results are unreliable because of noise and occlusion, but it is not necessary for the introduction of action. Thus, different research directions are focused on representation of actions using body silhouettes, without trying segments or matching individual body parts to the model. It has been used in the initial work [6] where the vector quantization scheme is used to change the order of silhouettes into a sequence of symbols. The sequence of symbols is used to train the Hidden Markov model (HMMS) actions, which are applied in the recognition phase to find the most suitable model with observed symbol sequences, thus combining flexibility in the duration of action.

In newer works [4], the action is represented as a template that is formed by the volume by stacking the silhouette of people who take action along the time axis (Fig. 4), and matching is done by matching templates. The disadvantage of the silhouette and based on the volume that representation is the fact that silhouette segmentation can be difficult in the noisy environment, and see dependence, which can be reduced by forming different models for different views.

#### A. Visual word model bag

Recognition of actions using local features and bags of visual words that have the advantage of the approach that rely on body model, because local features extraction does not require a type of human model or localization personalization. Local features are extracted by first using flower point detectors and then extracting the local descriptor from the flower point. Descriptors are grouped into visual words. Every picture later represented by a bag of visual words (BOW) which is then used for learning, Fig. 6.



Figure 6. Bag-of-features learning diagram

Following Division in [7], flower point detectors can be grouped into 3 groups - contour-based, based intensity and parametric based. Contour-based detectors extract contours to find the most interesting edges and angles. Intensity-based detector calculates interest points directly from gray value. Parametric-based identification angle in the image using the analytic estimate of the gray value structure [8]. Harris 3D Detector [9] Calculates spatio-temporal angles at each video point and determines the final location of the flower point of the space-time with a local maximum. Cube-shaped detector based on Gabor filter [10] detects regions with different distinguishing spatial characteristics that experience complex movements. Hessian [11] Detects spatio-temporal lumps and solid sampling [12] is extracting 3D patches at regular positions with variation in scale.

After Interest points or trajectory of information about the shape and movement in the surrounding area were successfully detected, they were presented using flower points descriptors. The feature trajectory is usually extracted using a cannade-lucas-tomasi tracker (KLT) or by matching the SIFT descriptor [14] between the frame.

The majority of descriptors are under the spectrum descriptor group based on the amount calculated such as the intensity of color and light, local area gradients, statistical features and moments, surface norms and sorted data such as 2D or 3D histograms of spectral types.

Descriptor 3D, 4D, volumetric and multimodal becomes more interesting because of the development of affordable 3D sensors and accelerometers built into cellular devices. Because of the 3D feature description fields earlier in development, which method will not be widely adopted. The most prominent at this time is 3D HOG [15], 3D SIFT [16] and Hon 4D [17] which is based on the familiar 2D method expanded to spatio-temporal 3D space.

The extracted features are then encoded using a fisherman's arc or vector approach [18].

General classification methods are used along with the above features for recognition of actions such as multi-layer perceptron (MLP) in [19], and supports vector machines (SVM) [10,9,20,21].

#### A. Deep learning approaches

Motivated With success that has been achieved by in-depth learning methods such as convolutional neural networks (CNNs) [22], used in the classification of images and videos [23], there is an increase in interest to apply the approach in the field of action recognition as well. CNN can learn to extract features automatically from a large number of images labeled and outperform classic ML approaches using handmade features for image classification tasks. In [24] the CNN method classification of images is expanded to handle temporal video dimensions. The proposed architecture uses several layers of 3D convolution ranging from cubes in the initial 7-frame, which generates many analog information channels with handmade features, and subsampling layers that reduce the vector dimensions of the feature. The classification itself is also carried out by the last layer of neural networks.

The architecture in which two parallel networks captures spatial and temporal information proposed in [25]. One network operates on individual video frames, introduces actions from photo images, and others operate on the optical flow explicitly describing the movement between frames and forming a temporal introduction flow. The output of these two networks is integrated into the final decision score using the SVM classifier. The results obtained with CNNs in the introduction of action show the similar performance as classical methods [24,25].

### III. ACTIVITY UNDERSTANDING

The previously mentioned methods, due to intensive research that has been done are very accurate in recognition of simple actions but they lack the ability to deal with more complex and hierarchically related actions and activities.

Therefore, More descriptive models and logical operators must be used to present such activities with the help of expert knowledge.

The author [26] provides an overview of the current research in the field of understanding of activities and the overall model of activities of understanding activities, consisting of abstraction and modeling action, image.7. Abstraction is related to the problem of translating motion image input into the form can be understood by the action model to determine whether interesting actions have occurred. The final output can be in the form of certain activities or summaries of action. ABSTRACT is done using pixel features, objects and properties or logical knowledge facts. Modeling action includes traditional classification methods for actions, state models for knowledge representation in the space-time domain and semantic model for reasons for sequential actions. State modeling formalism includes: Machine Speed State (FSM), Bayesian Network (BN), Hmm, etc. The semantic model uses an interesting subset of action determined by the semantic relationship between their sub-actions. The semantic model depends on expert domain knowledge to classify an activity. It is usually applied if there is more complex actions that vary in their appearance [27, 28, 29]. Semantic models including grammar, petri nets, constraint satisfaction, etc. The deterministic nature of the semantic model makes it sensitive to inaccuracies in the lower level recognition, therefore the mechanism of fuzzy reasoning to handle uncertainty in observation and interpretation is generally desirable [30]. Writer [31, 32] uses a fuzzy knowledge representation scheme that allows uncertain knowledge modeling about the relationship between entitiesthatcouldbeusedforindistinctinterpretationofborders between actions in motion image sequence.



Figure 7. Activity understanding model after [26]

### IV. DATASETS

To Start building models for activity introduction, it is important to obtain a good video sample dataset that reflects the desired activity. There are many datasets available to the public for scientific research including recent datasets with additional information obtained using RGB-D sensors, accelerometers and position markers placed directly on models being observed, some sources, etc. In this paper it will be heredatasets.

**Princeton Tracking Benchmark** [33] Introduced 2013 consists of 100 datass tracking RGB-D with tracking software and online shipping scripts. The dataset includes real world recordings of various actions made by humans, pets and objection objects in the form of RGB(8bitPNGformat)and

accompanying Depth picture (16 bit PNG) picture (GBR. 8). Annotation is per-frame in the form of the Bounding box only cover the target object. This dataset is more relevant to tracking than doing an action identification but can function as an initial point in segmentation scenery.

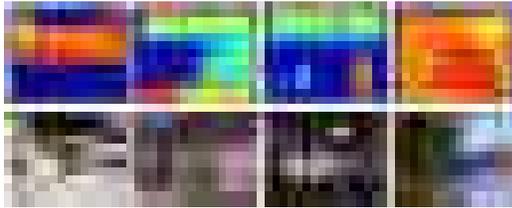


Figure 8. Princeton Tracking Benchmark [33]

**Cornell Activity DataSet: CAD-60 & CAD-120 [2].** CAD-60 comes with 60 RGB-D videos of 2 men and 2 women in the real world of closed environments: offices, kitchens, bedrooms, bathrooms, and living rooms that explain 12 activities: Mouth rinsing, brushing teeth, wearing contact lenses, talking phones, drinking water, opening pills containers, cooking (cut), cooking (stirring), talking on the couch, relaxing on the couch, writing on the board, working on a computer, Figure 9. CAD-120 consists of 120 videos RGB-D with the same number of people in the same environment. Activities are divided into 10 high-level activities (making cereals, taking medication, stacking objects, objects that are not stopped, micro food, objects, cleaning objects, take food, arrange food) and 10 sub-activity labels (reach, move, pour, Eat, drink, open, place, close, rub, null) with an object preaction label as you can reach, move, destite, closed. Position and orientation with a skeleton are labeled on each frame. RGBD data has a resolution of 240 times 320. RGB is saved as three-channel 8-bit PNG file and depth is saved as single-channel 16-bit PNGfile.



Figure 9. Cornell Activity Datasets: CAD-60 & CAD-120 [2]

**Northwestern-UCLA Multiview Action 3D Dataset [34]** contains RGB, depth and human skeleton data captured simultaneously by three Kinect cameras. This dataset include 10 action categories: pick up with one hand, pick up with two hands, drop trash, walk around, sit down, stand up, donning, doffing, throw, carry (Fig. 10). Each action is performed by 10 actors in a library from a variety of viewpoints.



Figure 10. Northwestern-UCLA Multiview Action 3D Dataset [34]

**RGB-D People Dataset [35]** collected by a three kinect sensor mounted vertically in the tower around

1.50 m high. It contains 3000+ RGB-D frames obtained in the University Hall and mostly contain people who stand upright and stand seen from different orientations and with various levels of occlusion, Figure 11. Annotation is made in a square box form. Deep images are stored as 16 bits, 1 PGM image channel - 640 by 480. They contain raw data content from the Kinect sensor. Namely, each pixel has a value between [0, 1084]. RGB images are stored as 8 bits, 3 channels of PPM - 640 by 480. Datasets do not provide activity annotations but offer material for art galleries research.

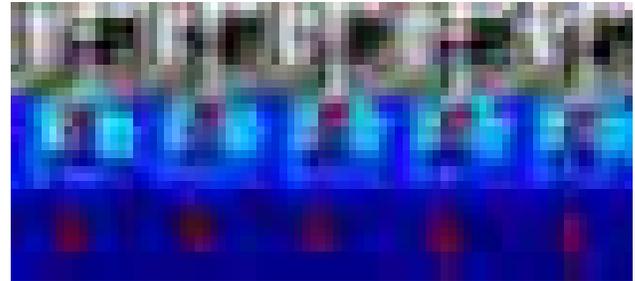


Figure 11. RGB-D People Dataset [35]

**UTD Multimodal Human Action Dataset (UTD-MHAD) [36] [36]** Collected using Kinect sensors and inertia sensors that can be used in the indoor environment. The dataset contains 27 actions taken by 8 subjects (4 women and 4 men). Each subject repeats every action 4 times. The dataset includes 861 data sequences. Four RGB video data modalities, deep videos, skeletal joints, and signal sensor inertia are recorded in three channels or utas (Fig. 12). One channel is used for simultaneous arrests of deep videos and the position of the skeleton, one channel for RGB videos, and one channel for signal sensor inertia (3-axis acceleration and 3-axis rotation signal). For data synchronization, the time stamp for each sample is recorded. Inertial sensors are charged on the right wrist subject or right thigh (see the picture below) depends on whether the action is mostly arm or a leg type of action.



Figure 12. UTD Multimodal Human Action Dataset (UTD-MHAD)

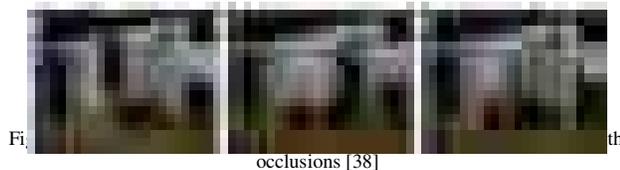
**Berkeley Multimodal Human Action Database (MHAD) [37]** contains 11 actions performed by 7 male and 5 female subjects in the range 23-30 years of age except for one elderly

subject. All subjects do 5 repetitions of each action, generate around 660 sequence of actions that match about 82 minutes from the total recording time. In addition, T poses for each subject are recorded that can be used for the extraction of a framework along with background data (with and without seats used in several activities). The specified set of actions consists of actions with movement on the upper and lower limb, actions with high dynamics on the upper extremities and actions with high dynamics in the lower limb. Each action simultaneously captured by five different systems: optical motion-taking system, four multi-view stereo vision camera arrays, two Microsoft Kinect cameras, six wireless accelerometers and four microphones. (Fig.13).



Figure 13. Berkeley Multimodal Human Action Database (MHAD) [37]

**Dataset of a human performing daily life activities in a scene with occlusions** [38] Consisting of 12 RGB-D video sequences someone who moves in front of Kinect in the scene with obstacles, Figure .. In addition to the image of depth and RGB, each sequence contains the synchronized basic truth data obtained from the Qualisys motion system with 8 infrared cameras. 3D representation of the human model is achieved using 15 position markers: one for head, neck and stem and 2for shoulders, elbows, wrists, hips andknees.



Fi. occlusions [38]

Recording Videos are another way to acquire datasets. Using a personal dataset allows adjustments to adopt the desired method, however, it takes time and requires significant resources to collect the desired record.

When building a personal dataset one of the things to consider is the approach of the camera number will be the most suitable. When one camera is used, the perception of lost depth and observed objects can be completely or partially hidden. Some cameras concentrate on observation objects from different positions providing more information. The camera position can be calculated as in [39] for optimal solutions. Some cameras can be set two ways. The camera field can overlap, which is more suitable for detailed action checks, or they can be placed side by side, called "Art Gallery". This method is used more in supervision [40]. Art gallery, too, allows greater submitted coverage with the same resource but sharing problem as one camera approach, only partial image is visible.

Overlapping The camera provides info about objects from different perspectives but there is an occlusion problem. This can be avoided using algorithms such as in [41] where inputs from different cameras are used sequentially which require a few samples and computing power.

Art galleries and one camera approach generally suffer from the absence of depth perceptions. Fortunately, the latest developments in the game industry carry affordable RGB-D sensors such as Microsoft Kinect and Asus Xtion which provide depth based on two cameras and wide use using the infrared spectrum. However, even though this sensor performs well, they are still inferior compared to marker-based systems [39].

## V. CONCLUSION

In This paper, the model overview, method for the introduction of actions is presented. Human models and methods based on trajectories, silhouettes and matching templates, spatio local descriptors and methods based on descriptors are presented along with their advantages and disadvantages. Recognition of actions that use local features has advantages compared to the classical approach, because local feature extraction does not require any type of human model or peer of people. There is an increase in interest in using convolutional neural networks that can automatically learn to extract features, and show sophisticated performance.

In terms of recognition of more complex actions and activities, the semantic model that uses expert knowledge is generally proposed.

In addition, paper gifts, in detail, the available image database is suitable for tasks in the introduction of actions with additional information obtained using RGB-D sensors, accelerometers and position markers.

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## VIDEO PROCESSING BASED ACTION RECOGNITION USING CONVOLUTIONAL NEURAL NETWORKS

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### Abstract

In This paper, the introduction of human actions using hybrid neural networks is presented. This method consists of three stages: preprocessing, feature extraction, and pattern classification. For feature extraction, we propose a modified convolutional neural network (CNN) which has a three-dimensional receptive field. CNN produces a set of maps of features of the descriptor of actions that come from spatiotemporal volume. Weighted Fuzzy Min-Max (WFM) neural network is used for the pattern classification stage. We introduce the selection technique feature using the WFMM model to reduce the dimensions of the feature space. Two types of relevance factors between features and pattern classes are defined to analyze prominently features.

### I. INTRODUCTION

#### 1.1 Action Recognition

Recognition of human actions is very important for various practical applications such as intelligent autonomous systems, human-computer interactions, and visual supervision. However, one of the difficulties in developing action recognition systems is to complete the translation and distortion of features in different patterns included in the same class of action. Previous works about representation and recognition of actions have suggested several different approaches to overcome this obstacle. In [2], Davis and Bobick have developed a new view-based approach to representation and recognition of actions by building motion history images where pixel intensity represents the novelty of motion. Yamato et al. [3] Using the Hidden Markov model, which can be applied to analyze the time series with spatiotemporal variability, by transforming one set of Sequential images of time become sequences of symbols with vector quantization. Recently, Yilmaz and Shah proposed a new action

representative method called the action sketch resulting from the volume of view-invariant by accumulating only the object area of the input frame in a row [4]. Our work is motivated by the technique proposed Yilmaz and Shah for representation of combat templates.

In this paper, we propose a modified convolutional neural network model (CNN) that has a three-dimensional receptive field to extract the translation invariant feature of the volume of three-dimensional action. CNNs is a multilayered hierarchy nerve network inspired by BIO which reaches several degrees of change and invariant deformation using three ideas: local receptive fields, shared weight, and spatial subsamples [5, 6]. In our previous work [10], we proposed a weighted Fuzzy Min-Max (WFMM) neural network for pattern classification based on Simpson model [7]. The WFMM model is a hyperbox-based pattern classifier and provides a simple and powerful learning algorithm. This model has a gradual learning skills and can be used for feature selection techniques and reduce the dimensions of features. Two types of relevance factors between features and pattern classes are defined to analyze the similarity of features. The rest of this paper is compiled as follows. Part 2 provides a general description of the system recognition of the proposed action. In section 3, the feature extraction method uses the modified volume and CNN served. Part 4 Explain the technique of classification of action patterns using the WFMM model.

#### 1.2 Motivation

There Many bundles for the Ubiquity framework movement that combines video recovery, supervision, health care, human computer interactions and media outlets. Modern procedures of industrial systems that occur in risky conditions

for humans are usually directed with CCTV guidelines. There are many strategies in synthetic businesses, parts of the reactor or community for atomic fuel assembly. Unique cameras for several reasons incorporating a test camera test and thermographic camera which is a license administrator to the level of procedure. Traffic checks many cities and free systems have outstanding traffic after framework, utilizing a TV cap circuit to find clogs and watch accidents. Comparative framework is being developed as a way to recognize vehicles taken, criminals enter into the vehicle and so on. Observation camera also fill in as guests requirement cameras.

### 1.3 PROBLEM STATEMENT

There are various various human exercises. Depending on multifacetable properties, this is quite classified into 4 top notch levels 1. Signal, 2. Activities, 3. Connections, and 4. Collection activities.

1. The movement is the development of a casing, especially hands and heads that describe a large movement of an individual. Lifting hands, stretching arms is a very big motion. 2. Activities are the advantages of men or women who combine many signals. MIS: Walk, wave, run, bounce and so on

3. Connections include at least two people or objects acting on human exercises. Ex: hands vibrate between individuals, pick up items from other characters. four. Collection activities are developments wrapped in people or different contraptions. MIS: Fight, walk and so on. In this theory, we mainly consider developments to order to class. In this proposition the human movement recognition is carried out by the use of regulated learning. This procedure requires preparation and see the video dataset. At first the instrument was advanced to capture different developments. After Les Gadget, investigate the video treated with Classifier for classification. In this theory, we consider each the Simple single human activities and a few human developments. Area 1.5 portray about the various assortments of activities taken from the indistinguishable vintage database used to capture the moves utilizing this framework.

### 1.4 RESEARCH CHALLENGES

Human Action Recognition is a significant and testing research subject. The chief problem in development notoriety is that a similar activity can be cultivated in numerous methodologies by way of exceptional people and even by means of equivalent women and men as well. In this manner, to find a correct case of an activity is troublesome. The other trouble moving acknowledgment is because of impediment, see changes, demeanor, digicam, development, legacy mess, and variation in execution rate, anthropometry (logical see of the measurement and level of the human edge).

### 1.5 DATASETS

In this fragment the datasets utilized for the human movement acknowledgment are introduced. These datasets are utilized eminently in the examination field. These datasets contain the video recorded in a homogeneous memorable past. Weizmann developments The Weizmann activities dataset comprises of ten dioerent sorts of movement classes: bowing downwards, running, strolling, skipping, jumping jack, bouncing forward, hopping set up, dashing sideways, waving with two hands, and waving with one hand proven in

Figure.1.



**Figure 1 Weizmann actions dataset**

Each class actions performed by 9 subjects resulted in a total of 93 video sequences. Background in the video is homogenous and static. The nature of the video at the Weizmann dataset is the type: (. Avi) file VLC media Dimensions: 180 x144 Frame rate: 25 frames per second.

### 1.6KTH action

The Kth Dataset action is shown in Figure 4.2. Kth datasets consist of six human action classes dioerent: walk, jogging, running, boxing, waving and clapping. Every action class is done several times by 25 subjects. The sequence is recorded in

four scenarios different: outside the S1, outdoors with various scales of S2, S3 outerwear different, and in the S4A room illustrated below in Figure 2. The background is homogeneous and static in most of the sequence. In total, the data consists of 2391 sample video

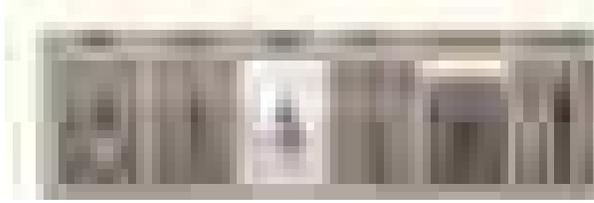


Figure 2 KTH dataset

### 1.7 Types of Activity Recognition

Premium principles stand out by combining spatial tracking systems increase with new data to prepare and study the technical framework for presenting various human practices (Tanzeem Choudhury et al.; Nishkam Ravi et al., 2005). For example, edge telephones) provide adequate data locators related to the capacity to replace the recognition of physical intrigues to be flexibly to estimate the revenue of vitality throughout the lifestyle. Leisure-based recreational activities are based on everywhere specialist agreeing with it with a guide to allow the current PC framework and sensor to take the best advertiser behavior (under Assent), the PC is better material to follow up for our benefit.

### 1.8 Project Aim

Perceiving Human interest in the video stream with a unique state has produced a significant subject in the PC vision bundle. Increased business objectives to recognize and describe human disorders from famous human articles in the video stream. The fundamental driver of this assignment is gracefully the advanced methodology that gets visual measurement of outline through video succession, and to represent this reality of definite utilization delineation. Moreover, a semantic depiction of this interest is produced. The reason for existing is to amplify the precision in both movement representation and notoriety. Basically the endeavor builds up a gadget dependent on speaking to and spotting human exercises: strolling and hand-forgoing.



Fig. 3. Overview of the proposed .

### . REVIEW OF LITERATURE

Recognition Human actions in videos are a challenging task that has received a large amount of attention to the research community. Compared to the classification of still images, temporal video components provide additional features for recognition, because a number of actions can be recognized more accurately based on the information of the human movement. In addition, videos provide natural data augmentation for single image classification. Video recognition research is mostly driven by progress in the image recognition method, which is often adapted and expanded to handle video data. But such methods involve the complexity of intensive computing which makes it not suitable for large datasets. Some methods have discussed the issue of estimating human poses using neural networks which are approaches that eliminate congestion joints when the computer vision approach is employed.

**Toshev et al. [5]** have estimated the human pose using a Deep Neural Network. The authors use a novel method using DNN's for visual classification and precise localization of articulated objects to the problem of human pose. Their method is able to capture the full context of each body joint and that a cascade of DNN- based pose predictors gives increased precision of joint locations. They are also able to achieve a running time of 0.1 seconds per image on a 12-core CPU. Despite the fast computation speed, their DNN-based regression method is still unable to give precise joint localization when the joints are occluded which was one of the problems of the earlier computer vision approach.

**Baccouche et al. [6]** developed a fully automated two-step neural-based deep model for human action

recognition without any prior knowledge. The first part extends the CNN to 3D case thereby learning spatio-temporal features. Then, using the learned features a recurrent neural network is used to classify the video. This automated steps removes the need for hand-crafted features for every specific task which can be highly problem dependent. They achieved an overall accuracy of 94.39% on the KTH dataset on cross validation with five runs. However, their method, since it involves a 3D Convolution has very high computation time which is a major drawback.

**Feichtenhofer et al. [7]** use a novel spatiotemporal architecture with a convolutional and temporal fusion layer to incorporate motion information for both appearance in still images and stacks of optical flow to mitigate the problem of occlusion of joints which occur frequently in real-life scenarios. They extend the work on the two-stream convolutional network for action recognition in videos by **Simoyan and Zisserman [14]** which had the problem of pixel-wise correspondences between spatial and temporal features. When the method is tested on the UCF-101 data, they report a 4.5% improvement in recognition when using a VGG-16 for both streams. However, these results can further be improved by combining Convolutional Network predictions with FV-encoded IDT features. Since all these approaches uses the spatio-temporal architecture, the computational time can become a big problem. The concept introduced by **Bilen et al. [8]** on the compact representation of videos which can be used in CNN's called dynamic images (RGB image which summarizes the whole video in a compressed format) would be good solution to the above problem. To achieve this, they build the dynamics of a video directly from the image pixels instead of an intermediate feature representation. This reduces the complexity, compression factor and the efficiency of the CNN whereas capturing the dynamic image. They report a 2- 3% accuracy improvements in the UCF-101 dataset and that dynamic images pooled on top of static RGB frames lead to better results. In order to improve the accuracy, the authors propose combining the dynamic images with sophisticated encodings.

**Hei Ng et al. [4]** propose two CNN architectures to process individual video frames, AlexNet and GoogLeNet. They investigate LSTM networks capable of learning from temporally ordered

sequences and various feature pooling architectures. GoogLeNet stacks Inception modules to form a network of 22 layers. It outperforms **Karpathy et al. [1]** by a margin of 4.3-5.6%.

Several methods exist to recognize actions by various methods.

**Sung et al. [9]** have devised a method to sub-sequences of the various activities using a two-layered maximum-entropy Markov model. They use a supervised learning method approach where the ground truth of the labeled data is given for training. They have reported an 84.3% accuracy for activity recognition on their dataset. The strength of their method is that it reports a neutral value most of the time which reduces the prediction error and also learn new actions. But, their method cannot be used when there is any occlusion and it cannot recognize actions where the human interacts with the environment. Meanwhile, Gupta et al. [10] in his work has shown that modelling of interaction between human poses and objects in a 2D video gives better performance for the tasks of object detection and activity recognition. But, it does not take into account the 3D relations between activity and the data and also the reduction in quality when using 2D data. Several approaches to the action recognition problem have used the human skeletal structure to predict actions. Although, these works have significant accuracy, their approaches are based on Recurrent Neural Network (RNN) and Hidden Markov Models (HMM) which don't use the inherent advantages of using a CNN which removes the problem of overfitting and has shown to significantly increase the accuracy of other image classification methods.

**Yong Du et al. [11]** divide the human skeleton into five parts according to the human physical structure and use five separate neural networks. They use a novel hierarchical bidirectional RNN to recognize the action of a human and compare it with four other architectures on the MSR Action 3D dataset. Their hierarchical RNN architecture outperforms all the other four architectures. But, one problem in their method arises from the overfitting and underfitting during training. Also, it becomes difficult to distinguish human actions only from the skeletal joints. Thus, the presence of more features in the recurrent neural network would improve the precision of human action recognition.

However, the use of RNN can lead to overfitting when the number of features is less when dealing with temporal data.

**Woo Young Kwon et al. [12]** developed an improved skeleton tracker and complexity based motion features by combining the joint positions from a Kinect sensor and a Kalman filter framework. They used a supervised learning with a deep recurrent neural network for this purpose. They use their own dataset which consists of 16 activity classes to test their method. They are able to achieve an accuracy of 70% which is around 11% greater than other baseline methods. But, their method is computationally complex since it involves computing the Kalman Filter at each time step of the video.

**Di Wu and Ling Shao [13]** use a hierarchical dynamic framework to extract the high level skeletal joint features and use deep neural networks to predict the probability distribution over the states of the Hidden Markov model. They choose a HMM due to the fact that an RNN tends to overemphasize the temporal information in the presence of insufficient data which can lead to overfitting. Their work is able to achieve better results on the MSRC 12 dataset when compared to Randomized Forest and Structured Streaming Skeletons with an F-score increase of around 0.01, but still cannot address the issue of overfitting which is present in RNN.

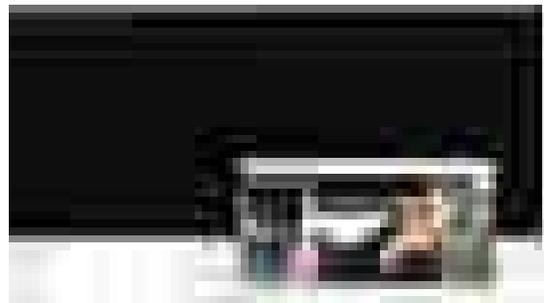
### III, WORKING RESULT OUTPUT



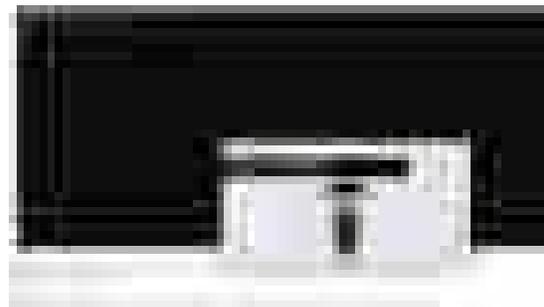
**Figure 3** This figure main graphical user inter face there is 11 videos



**Figure 4** in this figure we are detection are wrestling action from video



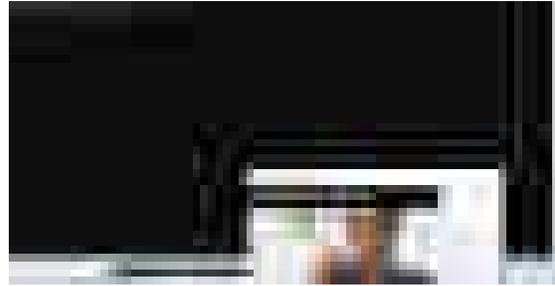
**Figure 5** In this figure we are detecting smoking in car action form video frames



**Figure 6** In this video detect belly dancing action from video frames.



**Figure 7** In this video detect Balloon blowing action form video.



**Figure 11** this video brushing teeth action detection from video



**Figure 8** In this figure bench pressing action detection from video.



**Figure 9** In this Figure braiding hair action detection from video.



**Figure 10** In this figure robot dancing action detection in video.

#### IV. CONCLUSIONS AND DISCUSSION

Conclusion And this paper outlook presented a new idea for the introduction of sensor-based activities. We introduce implementation of recognition of activities in the inner neural network model and visualization of data features in deep learning. Furthermore, most importantly that we visualize sensor-based activity data features extracted from CNN and data features are abstracts for a large number of researchers. This article is intended to provide a way of thinking for scholars, so we make an in-depth analysis of the map of visual features in one dataset mustp, which includes the visualization of the graph of activity data features extracted from layer layer and three. - CNN. After analysis, we manually extract important data characteristics for our model that has a greater impact on activities. We then verify the truth of the manual feature extraction of two aspects of theory and experiment. Classification accuracy increased to 96.1%. Experiments reveal that this paper can help solve problems in Chapter 2.1. Therefore, verified by experiments that our proposed idea promises, which laid the foundation for the next precision classification. Through in-depth analysis of features, we have identified relationships between activities, sensor data, and features. In addition, we analyze how in the neural network model in recognizing activities based on these features. The significant features mentioned in the experiment can be used not only in the paper method but also in other methods and ideas, which have a major significance of increased recognition of activities. Through visualization, we have a deeper understanding of mechanisms in neural networks. The ideas, findings and conclusions in the experiment are applicable not only to the field of activity recognition but also to other areas of deep

learning. However, in practice, the manual extraction of features is difficult to verify, particularly in the case of theoretical verification. It is necessary to know the location of sensor when each activity occurs. In future work, we will first present a method for extracting main features automatically. In addition, we ensure the accuracy of the enhancement by considering that we present a fusion model that combines the main features with the original features to enhance the data.

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# Deep learning application for sensing available spectrum for cognitive radio: An ECRNN approach

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## Abstract

Spectrum sensing (SS) is a concept of cognitive radio systems at base transceiver stations that can find the white space i.e. licensed spectrum owned by primary users (PU), for transmission over a wireless network without any channel interference. The cognitive radio network is designed to overcome the problem of the limited radio frequency spectrum as most of the applications are dependent on wireless devices in 5G. The major concern that arises here is the detection of spectrum availability. The traditional approaches can solve this issue but consume a large amount of time and prior information about PU and spectrum. The objective of this paper is to give a solution to resolve such issues. In this paper, we have used the learning capabilities of deep learning algorithms such as Convolution neural network (CNN) and Recurrent neural network (RNN) for spectrum sensing without prior knowledge of PU. The proposed model is termed ensemble CNN and RNN (ECRNN) to learn the features of spectrum data and predict the spectrum availability at base transceiver stations in 5G. The simulation result of the ECRNN showed the improvement of accuracy of the system with a reduction in losses that occurred during the false alarm of prediction as well as an improvement in the probability of detection. ECRNN had analyzed PU statistics and result in better spectrum sensing. This paper also supported multiple SUs that would increase the speed of spectrum sensing and data transmission over the available limited spectrum at the same time.

**Keywords** Cognitive radio · 5G · Spectrum sensing · Deep learning · Probability of detection

## 1 Introduction

The advancement of 5G technologies and modern wireless communication systems had led to the scarcity of spectrum resources [1]. From different studies, it has been reported that

there is a variation of spectrum usage from 7% to 34%. So, to overcome the scarcity of the limited spectrum resources, Cognitive radio (CR) appeared as a potent approach that can balance the trade-off of demand and availability of spectrum resources [2, 3]. The main concept of CR is to reuse the

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available unused frequency bands. These are also termed white spaces or spectrum holes. This method also ensures that there is no interference in the spectrum of licensed users [4]. The licensed user is technically termed a primary user (PU) whereas unlicensed users are termed as a secondary user (SU) (Fig. 1). The CR technology allows SU to access the available unused spectrum frequency bands in a non-interfering way to PU [5]. This makes spectrum sensing highly robust and efficient. An intelligent, multi-dimensional, adaptive, and wireless communication device that learns from its experience, plans, and determines future behavior to meet customer needs, can be described simply as a cognitive radio [6]. Cognitive radio has two major characteristics. One is the cognitive capacity that collects the information from its radio environment is the skill of cognitive radio technology. The second is reconfigurability that makes it possible to dynamically program the cognitive radio according to the radio environment necessary.

The four key functions of Cognitive Radio [7] are spectrum sensing, management, sharing, and mobility. Radio is continually looking for the unused bandwidth known as the void in the spectrum. This cognitive radio property is known as spectrum sensing. Once the spectrum holes are located, the available hole or channel is chosen by the cognitive antenna. This cognitive radio property is referred to as spectrum management. As long as the primary user does not require it, the property of cognitive radio to delegate the spectrum holes to secondary users is called spectrum sharing. It is the property where, when a licensed (primary) user is identified, the cognitive radio (CR) vacates the channel.

One of the aspects of 5G transmission is spectrum sensing for fast data transmission and utilization of limited spectrum

band. Empty spectrum was utilized for the elimination of congestion created due to traffic of a large amount of data. An efficient spectrum sensing algorithm is integrated with current 5G technologies. There is no way for disruption or delay of communication. Radio frequencies only can obtain spectrum sensing in cognitive radio [8]. To make the idea of cognitive radio performance, witnessing a licensed user's unused spectrum is important. Thus, the primary user is sensed to enable the mobility of the SU's channel in another part of the spectrum; if the primary user initiates the transmission. Efficient hardware is needed with minimal error. The detection threshold is the key. The intervention in the worst-case scenario should be considered. Future study of the spectrum and decisions rely on the right sensing of the primary consumer. This is known as the dynamic management of the spectrum.

Parametric and non-parametric schemes are two categories for spectrum sensing (SS). In the condition of parametric sensing, there is a need for prior PU activity information. Whereas in non-parametric schemes there is no need for any prior information. Therefore, non-parametric SS is preferred over parametric SS [9]. There are some conventional non-parametric (SS) techniques, for example, matched filter, cyclostationary, and energy detection are commonly used to their low computational complexity [10]. The matched-filter detection is used when the CR has previous information about PU. In this condition, a matched-filter can be considered to be the best detection technique. It's precise since the signal-to-noise ratio (SNR) is maximized. The matched filter coincides with the time version of the received signal. The primary user presence is calculated by a contrast between the final output of the corresponding filter and the specified threshold. Therefore, the matched filter will work weakly if this information is not correct. Similarly, a spectrum sensing technique that can distinguish the modulated signal from the additive noise is the implementation of a Cyclostationary function detector. Cyclostationary is a signal, provided it has a normal mean and autocorrelation. The identification of cyclostationary features will differentiate PU signal from noise and use the information present in the PU signal that is not present in the noise at a very low Signal to Noise Ratio (SNR). Due to its low computational and application complexity, energy detection is the most common means of spectrum sensing. No prior information about the primary users is required by the receivers. An energy detector (ED) essentially considers the primary signal as noise and, depending on the energy of the signal detected, determines the presence or absence of the primary signal. Even though these conventional SS methods have low computational complexity but these low detection rate with increasing communication advancements.

With the advancement of communication technologies from 5G to 6G, it is needed not only to adapt to the changing environment but also to adapt its hardware [11]. The current spectrum sensing techniques for cognitive radio network

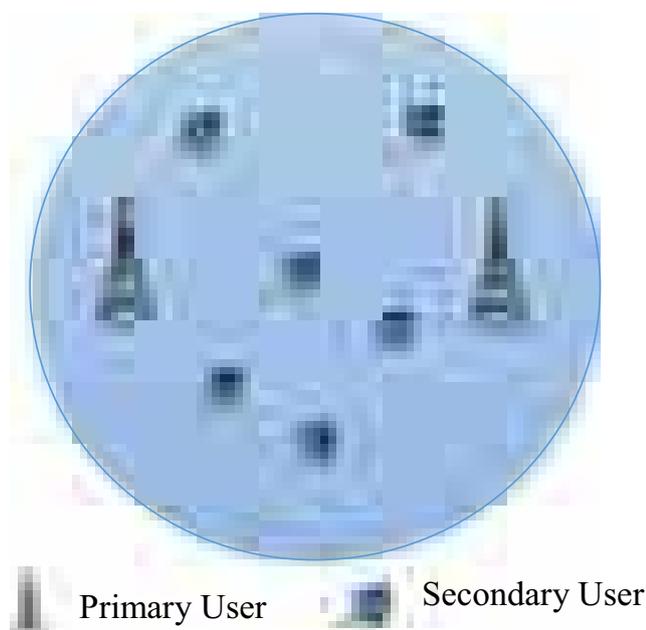


Fig. 1 An Example of Cognitive Radio Network

(CRN) requires the adoption of artificial intelligence or machine learning features. The journey of the communication system towards 6G needs deep learning trained transmission control because the traditional approaches consume a large amount of time and need prior information about PU and spectrum. So, to resolve issues of the traditional approach in CRN, this paper presented an application of computational intelligence algorithms (machine learning or deep learning) due to their learning ability so that they can learn the features of spectrum data and predict the spectrum availability at base transceiver stations in 5G.

### 1.1 Scope of the research

This paper is focused to design a blind spectrum sensing algorithm with the application of deep learning for cognitive radio (CR) system. The main scope of this paper is to mitigate the limitations of existing spectrum sensing algorithms for PU misdetection and to allow interference-free sensing of the spectrum. Based on the properties of the input data covariance matrix, this paper formulates the application of deep learning for spectrum sensing techniques. This paper employs the approach to detect PU activities in a blind state in which the sensing unit doesn't have prior knowledge about the PU activities or channel state. To overcome the limitations of practical spectrum sensing, aggregation of the most advanced method is expected. The data covariance matrix has different descriptive features such as energy, eigenvalues, etc.

It can be noted that the CNN model can learn the 2-D structured input data matrix. It has the powerful capability to extract correlation features from input covariance matrices. Whereas at the same time RNN can extract temporal features and can find time-shifted correlation features from the covariance matrix. In this paper, we propose the hybrid ensemble approach of CNN and RNN to extract energy correlation as well as temporal correlation to learn the PU's activities and pattern for spectrum sensing.

### 1.2 Key contributions of research

The key contributions of this paper are as follows:

In this paper, a state-of-the-art about spectrum sensing in cognitive radio is discussed along with detection techniques and associated challenges. Related works of researchers are also focused in this paper to explore their advantages and limitations for further improvement.

- We have proposed an ensemble deep learning model that supports a non-linear function termed ensemble CNN and RNN (ECRNN) to test the presence of PU in data samples.
- Further, we have also conducted simulation analysis under different test conditions to prove the efficiency of the proposed model concerning existing models.

### 1.3 Organization of Paper

The remaining section of this paper are illustrated to be as follows: Section 2 describes related works about spectrum sensing or detection in cognitive radio networks. In Section 3 paper illustrates the problem statement summarized from existing works. Section 4 gives a descriptive overview of the system model. Section 5 gives information about the performance parameters used. Finally, in Section 6 conclusion, limitations and future research scope are discussed.

## 2 Related work

In CRN, one of the major research topics for industrial application is spectrum sensing as the demand for high-speed data transmission is increasing day by day. The major function of spectrum sensing technologies is to sense the availability of spectrum. In the last few years, there is the development of different techniques for spectrum sensing for different scenarios such as blind, semi-blind, and non-blind. One of the approaches for the blind scenario was proposed by [9] termed as maximum to average eigenvalue ratio detector (MAER) and arithmetic to the geometric mean detector (AGM) [10] in which there is no need for known noise power. Similarly, in [12], a maximum eigenvalue detector (MED) and generalized likelihood ratio test-based signal subspace eigenvalues detector (GLRT-SSE) [13] was developed for the semi-blind scenario. This is termed semi-blind because there is a need for known noise power. Whereas in the condition of non-blind network scenario, sensing samples are needed for the detection process of PU. It has been reported in [14] that in non-blind conditions, there is the transition of PU from the silent state to transmission state and remains in the same period for the entire process. The Hidden Markov Model [15], had resolved the issues related to PU for such activities. In the current research area, machine learning or deep learning is also proposed for spectrum sensing. The local spectrum sensing quality can be improved by introducing the concept of cooperative spectrum sensing (CSS) whose function is to combine the local sensing information. In [16], the application of deep reinforcement learning (DRL) was adopted to classify the SU signals and resolved the CSS issues by reducing the signaling of SUs. Another deep learning approach such as long short-term memory (LSTM) [17] and convolutional neural networks (CNNs) [18] was proposed to detect available spectrum by learning the correlation between the energy of PU signals. In [19] hierarchical CNN model was proposed to learn co-relation between the energy of PU signals as well as the pattern of PU activities recorded from previous sensing data to enhance future sensing performance. It should be noted that CNN has shown up its capabilities to learn spatial features extracted from signals. At the same time, LSTM had shown up their capabilities for extraction of temporal features from energy correlation samples.

In [20] a combined CNN-LSTM detector was used. The energy correlation features are extracted from multiple sensing inputs and PU activity pattern was learned. The detection probability was increased by analyzing PU activities. The limitation of CNN-LSTM is that its computational complexity is somehow dependent on its input. In [21] spectrum sensing was proposed using LSTM which established the temporal correlation from spectrum data. The PU activity is also exploited to improve the performance of CR. The PU activities such as off period and the duty cycle is used as statistics to train the LSTM network. The detection process and classification accuracy were improved in terms of training time and execution time. The drawback of [21] was observed that it doesn't support multiple PU and SU scenarios which are considered to be a generic scenario. In [22] efficiency of DL is presented for spectrum sensing. But still in these DL algorithms learning process is generally based on a single feature that degrades performance in the noisy scenario. Furthermore, in [23] spectrum sensing is performed using two-autoencoder for OFDM scenario that gives better performance over traditional OFDM. In [24] CNN model is used for cooperative spectrum sensing (CSS) for multiple secondary users in a cognitive radio network (CRN) by using spectral and spatial correlation of each sense. In [25] deep reinforcement learning was used to explore the spectrum sensing issues in CRN. Even though these existing deep learning algorithms improve the detection performance that needs prior statistical knowledge. These methods are vulnerable to noise uncertainty.

### 3 Problem statement

The main working principle of spectrum sensing techniques to sense the available spectrum at base transceiver stations and to check whether the primary user is present or not. So, this arises an issue to track all channel statistics, spectrum characteristics to predict the available spectrum with high probability. During the last decade, there are much research presented, the most used statistic is the covariance matrix that contains different discriminative detection features. The key problem associated with spectrum sensing traditional techniques there is a requirement of prior knowledge about both PU signal and noise then only optimal performance is achieved. In traditional non-cooperative detection methods such as energy detection or cyclostationary detection algorithm there arise the problem of hidden terminal that generally occurs when cognitive radio is shadowed due to very low SNR values and detection methods cannot SNR sense the PU's presence. Designing an effective and robust spectrum sensing technique is a quite challenging task due to the level of complexity, accuracy, computational cost, error rate, etc. These performance parameters create a trade-off between the spectrum sensing technique and its requirements. Therefore, to resolve these issue

that arises a need for prior knowledge about primary users, computational intelligence algorithms showed up their efficiency. But still, there is a need to improvise their performance in terms of probability and accuracy of detection with reduced complexity. So, this paper had adopted a deep learning approach for detection and classification of statistics as PU and SU.

## 4 Methodology

### 4.1 System model

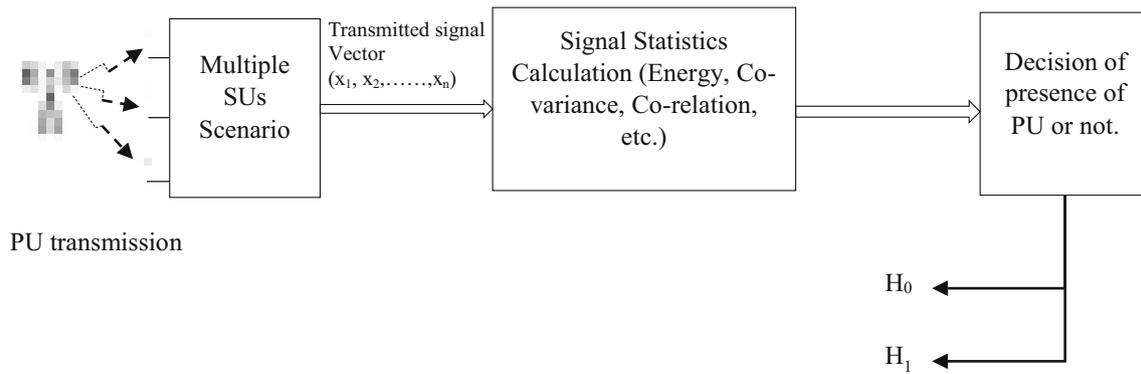
In this model, we have considered a multi-antenna scenario of cognitive radio, as shown in Fig. 2. This figure illustrates multi-antenna ( $A_m$ ) with observation vector ( $V_n$ ) for spectrum sensing. The spectrum sensing problem is formulated on the following hypothesis, Eqn (1):

$$\begin{aligned} H_0 : Y_n &= U_n \\ H_1 : Y_n &= h_n X_n + U_n \end{aligned} \quad (1)$$

Where,  $H_0$  represents the hypothesis of absence of PU i.e., PU is silent whereas  $H_1$  represents the hypothesis of the presence of PU i.e., PU is in an active state.  $X_n$  and  $Y_n$  represents the PU transmitted signal vector as well as the received signal vector.  $h_n \in C_m$ , that represents the channel index between PU and SU.  $U_n$  represents the received noise. In some scenarios, it may suffer some path loss or fading. As per the signal vector, we can design the decision statistics that detect PU state to be  $H_1$  in test statistics (T) based on decision threshold ( $D_s$ ). If the  $T > D_s$  then it will represent the presence of PUs otherwise, the PUs are absent. As illustrated in Fig. 2, the conventional framework for spectrum sensing in which transmitted signals are sampled together and the further test statistic is calculated for decision making. The CR will collect all signal vectors from multiple SUs system and further features associated with a signal vector such as energy, covariance matrix, co-relation, etc. to design the decision statistics methods such as ED [7, 26], MED [12], CM-CNN [18], CAV [26], etc. Based on a threshold value, test statistics will compare and finally decide the presence of PU. Hence, it can be stated that test statistics have importance for detection performance improvement. So, in this paper, we have focused on the deep learning model to design decision statistics to show its efficiency over existing techniques.

### 4.2 CNN-based framework for Spectrum sensing

We have adopted the deep learning approach and termed it as ensemble CNN and RNN (ECRNN). As compared to machine learning, deep learning showed up its proficiency of great learning capacity. Another issue with the machine learning problem is the overfitting problem that is resolved by deep learning.



**Fig. 2** Conventional framework for spectrum sensing

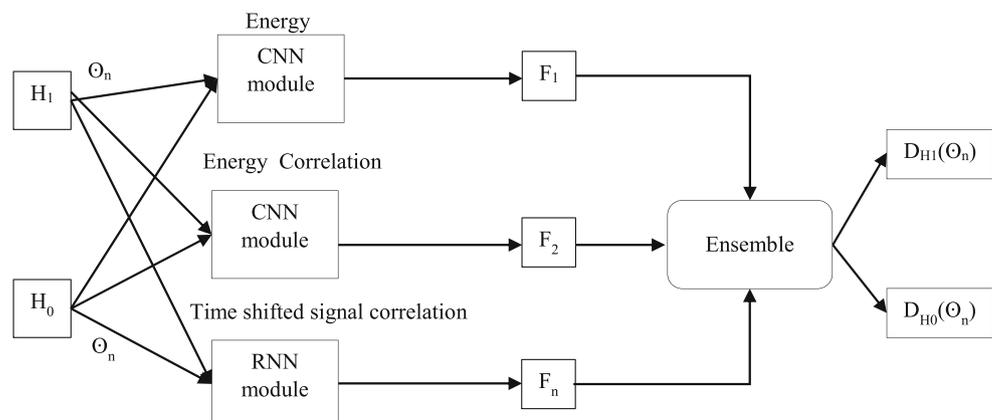
Therefore, we have adopted deep learning for PU presence from previous signal statistics. While training there is a requirement of labeled data, even for the deep learning (DL) approach. In this paper, we have taken  $Y = \{(x_1, l_1), (x_2, l_2), (x_3, l_3), \dots, (x_N, l_N)\}$  where  $Y$  is termed as a training set having training data of size 'N' with input data,  $x_N$  and  $l_N$  represents the labeled data. The PU presence is represented by  $Y$ . As it is observed that with the increased size of training input, the computational complexity increases. For PU sensing, sampling statistics may contain redundant data, because it may be from the same distribution source. Therefore, there is a requirement to pre-processing the input data before the start of the training process. The energy correlation and cyclostationary correlation are the two most important features that are applied in this paper.

In this paper, we have proposed an ensemble deep learning approach using CNN, as illustrated in Fig. 3. In this, two inputs, sample covariance matrix ( $\odot_n$ ) are fed into two CNN layers and one RNN layer respectively, as covariance matrix is considered to be the complex mathematical problem that contains real and imaginary parts. CNN and RNN layers are illustrated in Figs. 4 and 5 respectively. Here RNN is used for time-shifted correlation feature extraction because it can work effectively in time series data. In the case of the  $H_0$  hypothesis, the feature information such as energy is given in diagonal elements of the real part of the

matrix whereas, in the case of the  $H_1$  hypothesis, feature information is scattered. The difference between features of  $H_0$  and  $H_1$  is enough for the learning process of CNN. The training covariance matrices ( $\odot_n$ ) of both hypotheses are fed into three layers of CNN. Then each layer works on three different feature vectors out of the input covariance matrix. In this architecture, three features are considered, energy, correlation, and time-shift signal correlation, individually and lastly their decisions are ensemble together to make a final decision of either presence of PU,  $D_{H_1}(\odot_n)$  or absence of PU,  $D_{H_0}(\odot_n)$ , such that  $D_{H_0}(\odot_n) + D_{H_1}(\odot_n) = 1$  where  $D$  stands for decision parameters of CNN.

The convolution component in our spectrum sensing structure consists of three sub-blocks. Each sub-block also consists of a convolution layer a leaky rectified linear unit (LReLU) layer, which is also linked together in tandem. The retrieved spatial features of input data are fed into a 2D convolution layer. Each filter is set to  $3 \times 3$  in the convolution layer. The convolution layer depth for the basic  $i_{th}$  sub-block is set to  $C_i$ . To keep the result as same as that of the input set the stride to one and use the zero paddings. The LReLU layer activation layer complements non-linearity to the CNN. The convolution layer is linear that cannot classify non-linear data without the presence of LReLU. The fully connected layer classifies the function by obtaining the results of extraction of the function. At last, a fully connected (FC) layer is applied that performs classification process taking

**Fig. 3** The network structure of ensemble CNN



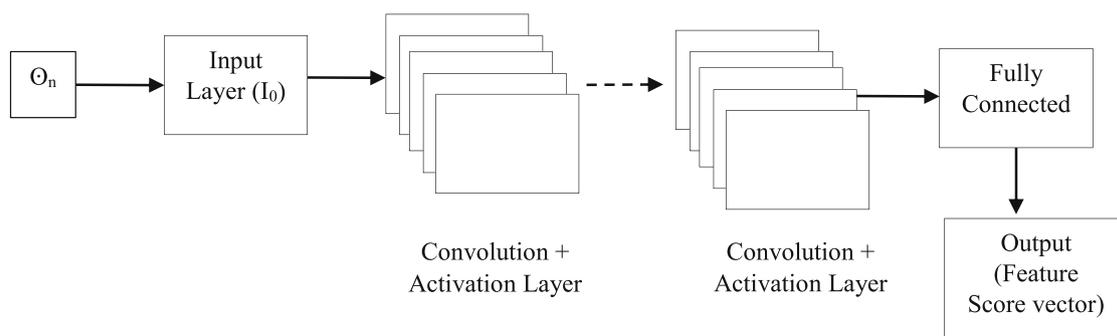


Fig. 4 CNN Architecture

input from the output of the previous convolution layer. The performance of the FC layers is then integrated into the ensemble classification system. By applying the ensembling approach final decision about the presence of PU or absence of PU is taken with the boosting function. Indexes 1 and 0 will present the presence and absence of PU respectively. The performance of CNN can be decreased there is no information about the presence of SU that makes the learning process difficult. Here, many CNN models with multiple SU permutations can be trained simultaneously that can achieve the highest accuracy. A permutation operation is performed for the correct order of the SU index that can be found in a data array to boost SS efficiency such that the sensing result of neighboring SU is located close to one another. The trained model can then be used to evaluate  $H_1$  state or  $H_0$  state based on different detecting outcomes. While preparation for the spectrum sensing process can lead to computational overhead, the conclusion of the final sensing result can, as shown later in the performance assessment, be carried out with relatively low overhead so that the operation of our proposed system in real-time is feasible.

### 4.3 Network training and complexity analysis

#### 4.3.1 Network training

When dealing with the offline based training modules the unlabelled samples are accumulated and constructed to bring about the formation of training data set,  $(X, L) = \{(x_1, l_1), (x_2, l_2), (x_3, l_3), \dots, (x_N, l_N)\}$ . The  $(X, l)$  is the training sample in the equation and the value of the example persisting in it. While taking into account only a single example in this set,  $(x, l)$  then they in it

is indicative of the input value provided to the neural network for the training purpose. The value  $y$  as an input can be a raw observation vector or can also be utilized in the form of the test statistic that has been derived from the observational vector. The  $X$  and  $L$  are indicative of the collections comprising the data associated with  $x$  and data associated with  $l$  respectively. The architectural design for the training has been done by utilizing the ensembling of CNN and RNN architecture to extract the features from the training set. The study concludes the ECRNN training requires to be dealing with the classification problems as the spectrum identification and sensing is a binary testing challenge. Therefore, the  $(x_N, l_N)$  being a single part of the set, the label for it can be encoded as one vector, Eqn (2):

$$l_N = \begin{Bmatrix} [1]^N, & H_1 \\ [0]^N, & H_0 \end{Bmatrix} \quad (2)$$

The Training process of ECRNN shall maximize the likelihood,  $L(\odot)$ , based on Eqn (3).

$$L(\odot) = P(L|X; \odot) = \prod_{k=1}^k \left( D(\odot)_{H_1}(x_N) \right)^{l_N} \left( D(\odot)_{H_0}(x_N) \right)^{1-l_N} \quad (3)$$

In terms of log-likelihood:

$$\begin{aligned} l(\odot) &= \log L(\odot) \\ &= \sum_{n=1}^N l_N \log D(\odot)(x_N) + (1-l_N) \log(1-D(\odot)(x_N)) \end{aligned} \quad (4)$$

This can be used for maximizing the cost function,  $C_f$ . The posterior probability enhancement  $P(L|X)$ , can only be achieved by the optimal  $\odot$  evaluation that forms the key objective for the proposed model training process.

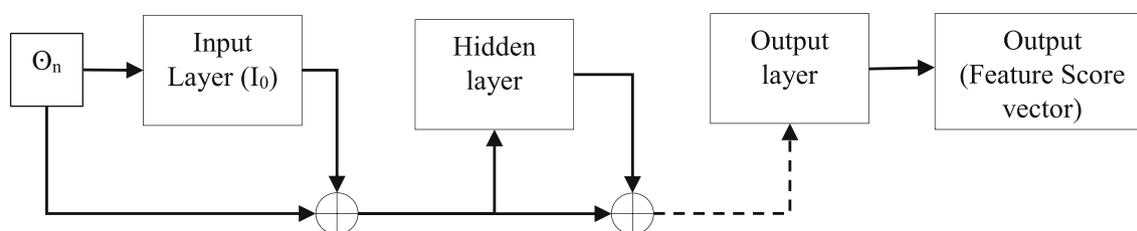


Fig. 5 RNN Architecture

$$C_f = \max(P(L|X), \odot) \quad (5)$$

The derivation of a well-trained ECRNN model is achieved by continuously updating the ECRNN network parameters via another backpropagation algorithm of calculation that is dependent on the cost function achieved the well-trained network is represented as Eqn (6):

$$D_{\odot}^*(x) = \begin{bmatrix} D(\odot)_{|H_1}^*(x) \\ D(\odot)_{|H_0}^*(x) \end{bmatrix} \quad (6)$$

The expression comprises of the well-trained CNN network having input as  $x$  which is indicated by  $D_{\odot}^*(x)$ . The expression  $D(\odot)_{|H_1}^*(x)$  depicts the class score for  $H_1$  or  $H_0$ . These can be used to derive the posterior probabilities associated with two hypotheses, Eqn (7):

$$\begin{aligned} H_1 : P(H_1|x) &= D(\odot)_{|H_1}^*(x) \\ H_0 : P(H_0|x) &= D(\odot)_{|H_0}^*(x) \end{aligned} \quad (7)$$

When the system is completely and efficiently trained with respective parameters, we can say that the training process is converged as well as “well trained”. On referring to the Bayes theorem Eqn (8) [28]:

$$\begin{aligned} P(x|H_1) &= \frac{P(H_1|x) \cdot P(x)}{P(H_1)} = \frac{D(\odot)_{|H_1}^*(x) \cdot P(x)}{P(H_1)} \\ P(x|H_0) &= \frac{P(H_0|x) \cdot P(x)}{P(H_0)} = \frac{D(\odot)_{|H_0}^*(x) \cdot P(x)}{P(H_0)} \end{aligned} \quad (8)$$

Where,  $P(x|H_i)$  = conditional probability,  $P(H_i)$  = prior probability of  $H_i$ , and  $P(x)$  = marginal probability.  $P(x|H_1)$  and  $P(x|H_0)$  are calculated and the conclusion is drawn that the NP is indicative of the optimum statistic for the test which is the likelihood ratio (LR).

### 4.3.2 Neyman Pearson detection

To maximize the probability of detection ( $P_d$ ) for a given PFA, we decide  $H_1$  if

$$P_d = \frac{P(x|H_1)}{P(x|H_0)} > D_s \quad (9)$$

The derivation of the ECRNN has been made as Eqn (10),  $x$  utilizing the above equations.

$$\begin{aligned} L_{ECRNN}(x) &= \frac{D(\odot)_{|H_1}^*(x)}{D(\odot)_{|H_0}^*(x)} \cdot \frac{P(H_0)}{P(H_1)} \\ &= \frac{D(\odot)_{|H_1}^*(x)}{D(\odot)_{|H_0}^*(x)} \geq D_s \end{aligned} \quad (10)$$

The  $D_s$  is the threshold value selected that is derived by the false alarm constraint and the  $L_{ECRNN}(x)$  is the test statistic framework indicating the ECRNN. The ECRNN testing framework helps in acquiring posterior probabilities for two distinct hypotheses by training the data set of  $(X,L)$ . However, it has been found that the training process generates posterior probabilities associated expressions that were not suitable for testing the samples that command the requirement of the conditional probability-based derivation of the ECRNN during the detection process. To achieve this  $P(x|H_1)$  and  $P(x|H_0)$  are being derived as the conditional probability that utilizes the Bayes' hypothesis for derivation. The process follows the attaining ECRNN that lays on the NP theorem. Further, the decision-making process shall inculcate comparison with a detection threshold ( $D_s$ ). The threshold value can even be determined with a method referred to as the Monte Carlo process that aids in achieving the  $P_d$  required. The training process is performed using Algorithm as shown below:

---

#### Algorithm 1 Training algorithm

---

- 1: Procedure Training parameter (Max\_epochs, Batch\_size, X, y,  $\alpha$ )
  - 2: for  $i = 1$ :Max\_epochs do
  - 3: Input[ $Y = \{(X_1, l_1), (X_2, l_2), (X_3, l_3), \dots, (X_N, l_N)\}$ ]
  - 4: Feature Vector( $F_v$ )  $\leftarrow$  extract(X)
  - 5: Train(DNN)  $\leftarrow$   $F_v$
  - 6: If likelihood ratio ( $L_r$ ) > threshold ( $\lambda$ ), {Maximize Probability of detection ( $P_d$ )}
  - 7: End if
  - 8: End for
- 

### 4.3.3 Testing process

The test data that is to be utilized during the detection based on the test framework is represented as  $\tilde{X}$  for a single as well as multi SU system that aims at achieving this data as a set of unlabelled samples. The ECRNN is trained for  $\tilde{X}$  samples of the collected data and further the ECRNN steps are processed for the test samples, this is denoted by the Eqn (11):

$$L_{ECRNN}(\tilde{X}) = \frac{D(\odot)_{|H_1}^*(x)}{D(\odot)_{|H_0}^*(x)} \geq D_s \quad (11)$$

The inherent comparison with the threshold value that has been preset previously, can bring about the decision-making process after achieving the test statistic. It has also been found that currently, an existing algorithm such as DL-based sensing of the spectrum has the capability of completely replacing the system with the neural network for end-to-end analysis and detection. The work in this process shall not comprise of the provision to define the threshold for attaining the  $P_d$ . The ECRNN based schemes for spectral identification hold within itself the framework for determining the current practical threshold value during the function other than other frameworks, whose objective of to

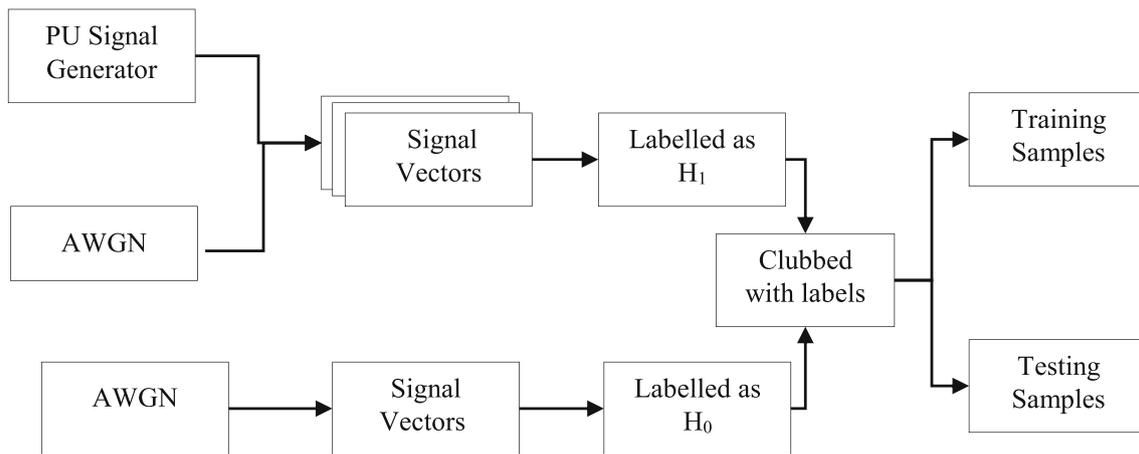


Fig. 6 Dataset Preparation for ECRNN

keep updating the threshold value to achieve the desired  $P_d$ . The complete algorithm of ECRNN (called Spectrum Sensing algorithm using ECRNN) is given below :

Algorithm 2 Spectrum Sensing using ECRNN

- 1: Initialization
- 2: Set epoch =1
- 3: Start Training (X,L)
- 4: Feature Vector( $F_v$ )  $\leftarrow$  extract(X)
- 5: Train(DNN)  $\leftarrow$   $F_v$
- 6: While epoch<max\_epochs
- 7: do
- 8: Update  $D_s$
- 9: epoch =epoch+1
- 10: End for
- 11: Set  $D_s$
- 12: Input Test ( $\tilde{X}$ )
- 13: Feature Vector ( $\tilde{F}_v$ )  $\leftarrow$  extract( $\tilde{X}$ )
- 14: Compare with  $D_s$
- 15: Identify PU activity
- 16: End

#### 4.3.4 Complexity analysis

While training any network, the complexity of CNN for processing one data sample is evaluated to be as in Eqn (12) [29]:

$$O\left(\sum_{p=1}^P N_{k,p-1} S_{k,p}^2 n_{c,p} O_{k,p}^2\right) \quad (12)$$

where  $P$  = Number of convolution layer with  $N_{k,p-1}$  to be the number of input channels. With  $N_{k,p}$  as number of convolutional kernels for  $p$ th kernel with the spatial size of  $S_{k,p}^2$  that generates  $O_{k,p}^2$  of the output feature map. We have designed the CNN layer of ECRNN with two convolution layers and taken the input of real and imaginary data of size  $(S \times S \times 1)$ . The CNN stride is set to 1 to reduce the computational complexity. While for the RNN network, the computational complexity is dependent on the number of neurons and internal parameters of the network. This can be illustrated in Eqn (13):

$$O(n_i) \quad (13)$$



Fig. 7  $P_d$  versus SNR



Fig. 8  $P_f$  versus  $P_d$



**Fig. 9**  $P_f$  versus  $P_m$

Where  $n_i$  is the number of neurons present in hidden layers. Therefore, the complexity of ECRNN for one data sample is represented as in Eqn (14):

$$O\left(\sum_{p=1}^P N_{k,p-1} S_{k,p}^2 n_{c,p} O_{k,p}^2 n_i\right) \quad (14)$$

#### 4.3.5 Dataset preparation

In this subsection, the dataset required for training the proposed ECRNN model is prepared. The spectrum data is used for training and test validation purposes. The data is captured through a simulation setup (Fig. 6). The clean PU signal is generated from the generator and its spectrum power is measured as  $\sigma_x^2$ .

The Additive white Gaussian noise (AWGN),  $n$ , is added to achieve a required signal-to-noise ratio (SNR). This noise is added to PU signal for timestamp  $t$ .

$$X = [x_1, x_2, \dots, x_t]^T \quad (15)$$



**Fig. 10** ROC Curve for single SU

For this study, approx. 5000 data samples are generated in the SNR range  $-15$  dB to  $+5$  dB having equal number of PU signal and AWGN signals. The generated dataset is divided into 2 sets 70% training and 30% testing samples.

## 5 Results and discussions

In this section, the simulation setup of ECRNN is presented. In our implementations, we have utilized the MATLAB platform for training and testing scenarios. The training is performed with different data samples having two classes i.e.  $H_1$  and  $H_0$ . The individual CNN or RNN are trained on different signal features and their results are ensembled together to generate the final result.

For training, the model simulation was performed with 10,000 data samples in which 7000 data samples are used for training and 3000 data samples are used for testing. The learning rate was set to be 0.0003 and 64 sample patches are used. The performance metrics are used to show the relationship between the probability of false alarm rate ( $P_f$ ), probability of detection ( $P_d$ ), and probability of misdetection ( $P_m$ ). The variation of  $P_d$  concerning  $P_f$  is also observed. The training process is performed using Algorithm 1. While Algorithm 2 is used to test the data samples for the presence of PU.

### 5.1 Relation between $P_f$ and $D_s$

**Theorem 1** In spectrum sensing, theoretically, the probability of false alarm ( $P_f$ ) is related to decision threshold ( $D_s$ ) value as following in Eqn (16):

$$P_f = (1 - D_s)^{M-1} \quad (16)$$

**Proof** When there is the presence of noise in the channel, the Cumulative Distribution Function (CDF) of  $D_s$  is evaluated as Eqn (17):



Fig. 11 ROC Curve varying SNR for single SU

$$F_d = 1 - (1-d)^{M-1}, 0 \leq d \leq 1 \quad (17)$$

Where  $P_f$  is represented as Eqn (18):

$$P_f = P_r[d \geq D_s | H_0] = 1 - F_d \quad (18)$$

Where  $H_0$  represents the absence of PU.

By substituting the value of  $F_d$  into Eqn (19), it has been proved the relationship between a false alarm and decision threshold. So, the threshold can be computed as:

$$D_s = P_f^{\frac{1}{M-1}} \quad (19)$$

## 5.2 Relation $P_m$ and $P_d$

**Theorem 2** For  $t$  cyclostationary detection, the Probability of misdetection ( $P_m$ ) is calculated as in Eqn (20):

$$P_m = 1 - P_d \quad (20)$$

Proof: Probability of detection ( $P_d$ ) is calculated as in Eqn (21):

$$P_d = P_r[d \geq D_s | H_1] \quad (21)$$

Where,

$Q(\cdot)$  = q-function.

$d$  = signal-to-noise ratio (SNR) at the receiver and  $H_1$  represents the presence of PU.

The probability of misdetection ( $P_m$ ) is calculated as in Eqn (22):

$$P_m = 1 - P_d \quad (22)$$

Figure 7 represents the graph of Probability of detection ( $P_d$ ) concerning SNR whereas Fig. 8 represents the graph of  $P_f$  concerning the probability of detection  $P_d$ . The figure shows that with an increasing number of samples (NoS) the  $P_d$  increases. Similarly, Fig. 9 represents the probability of misdetection ( $P_m$ ) with respect  $P_f$ . The figure concludes that with increasing samples the  $P_m$  decreases.



Fig. 12 ROC Curve varying NoS for single SU

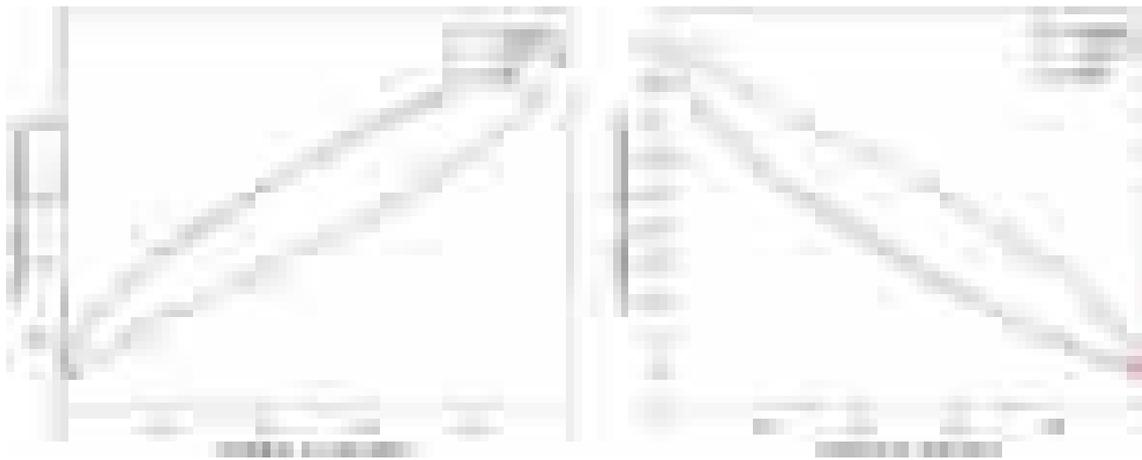


Fig. 13 ROC Curve for multiple SUs

### 5.3 Performance parameters

While simulating the proposed ECRNN model, the performance parameters used here are Receiver Operating Characteristics (ROC) for  $P_d$  against  $P_f$  for single and multiple PU. The ROC curve represents the area to show the relationship between  $P_d$  and  $P_f$ . The area increases with increased model performance. Three scenarios are created 1st is to observe at fixed SNR, the second with variable SNR, and the third is variable NoS. The performance of ECRNN is compared with CNN [19] and ED. Another parameter used to evaluate the performance of the proposed ECRNN are computational time and error rate. The time represents the total execution time for performing training as well as testing simulation. The error rate represents the mean square error (MSE) that occurred during training. This is evaluated by finding the mean of the squared difference between target and reconstructed value. MSE is calculated as in Eqn (23).

$$loss_{mse} = \frac{\sum_{i=1}^N (x_t - x_r)^2}{N} \quad (23)$$

Where,  $x_t$  = target value,  $x_r$  = reconstructed value,  $N$  = Number of samples.

### 5.4 Result analysis

Figure 10 illustrates the comparative ROC curve for different spectrum sensing methods. The figure is plotted for SNR = -15 dB. For comparison, the NoS taken is 20. In the comparison of ECRNN with other techniques such as ED [7] and CNN [30] the training data and scenario are kept the same. This simulation was performed for single PU and single SU and trained accordingly. As each module contains different features and input to CNN is single column so, we have taken a 1-D CNN network. The model was created, trained, and tested on the MATLAB platform using the deep learning library. We can analyze from the graph plot that ECRNN gives a better result as compared to other sensing techniques even at SNR of -15 dB. Due to the ensembled architecture of ECRNN, it gives better performance because it combines the combined results from different features while other existing



Fig. 14 ROC Curve varying SNR for multiple SUs



**Fig. 15** ROC Curve varying NoS for multiple SUs

techniques give results on a single feature such as energy correlation. Figure 9 represents the ROC for the probability of detection ( $P_d$ ) concerning false alarm ( $P_f$ ) as well as ROC for the probability of misdetection ( $P_m$ ) concerning  $P_f$ . Figure 11 represents the ROC curve for the  $P_d$  concerning  $P_f$  as well as the ROC curve of  $P_m$  concerning  $P_f$ . In this scenario, a comparison was performed with varying SNR values from 0 dB to -15db. The graph illustrates that with increasing SNR the  $P_d$  decreases and  $P_m$  increases. Figure 12 represents the ROC curve for the  $P_d$  concerning  $P_f$  as well as the ROC curve of  $P_m$  concerning  $P_f$ . In this scenario, the comparison was performed with varying data samples with -15 dB SNR. The graph illustrates that with an increasing sample the  $P_d$  increases and  $P_m$  decreases. Figure 13 illustrates the comparative receiver operating characteristics (ROC) curve for different spectrum sensing methods. The figure is plotted for SNR = -15 dB for multiple SUs scenarios and the NoS taken is 20. The graph represents the ROC for the probability of detection ( $P_d$ ) concerning false alarm ( $P_f$ ) as well as ROC for the probability of misdetection ( $P_m$ ) concerning  $P_f$ . Figure 14 represents the ROC curve for the  $P_d$  concerning  $P_f$  as well as the ROC curve of  $P_m$  concerning  $P_f$ . In this scenario, a comparison was performed with a varying number of SU, and the values of SNR are -15db. The graph illustrates that with an increasing number of SU the  $P_d$  decreases and  $P_m$  increases. Figure 15 represents the ROC curve for the  $P_d$  concerning

$P_f$  as well as the ROC curve of  $P_m$  concerning  $P_f$ . In this scenario, a comparison was performed with varying data samples with -15 dB SNR under multiple SUs scenario. The graph illustrates that with an increasing sample the  $P_d$  increases and  $P_m$  decreases.

Similarly, Table 1 represents the computational time evaluated in seconds for training and testing samples using the ECRNN algorithm. The algorithm is implemented in MATLAB and executed on a PC with an Intel Core i5 3.71GHz CPU and 2 GB Nvidia graphics with 8GB RAM. In summary of existing work, the proposed method achieves the optimal solution concerning detection. Even though the ECRNN had achieved optimal solution but still there is needed to reduce the computational complexities. If this model is parallelly executed on GPU, then it would be very much helpful to reduce computational complexity. Similarly, in Table 2 error rate is evaluated for the detection process and it can be inferred that ECRNN achieved less training error as compared to the CNN model.

## 6 Conclusion

This paper is dedicated to spectrum sensing problems using the application of CNN models. For this ensemble, CNN and RNN technique is developed and termed as ECRNN and presented over single and multiple user scenarios. In the first

**Table 1** Computational Time Analysis (in seconds)

Algorithms	ECRNN
For Single SU	85.97 s
For Multiple SUs	166.14 s
For Varying SNR	314.26 s
For Varying Samples	297.011 s

**Table 2** Error Evaluation

Algorithms	ECRNN	CNN [15]
For Single SU	0.0004320	0.0094
For Multiple SUs	0.000220	0.0125
For Varying SNR	0.000275	0.0115
For Varying Samples	0.0004378	0.0098

scenario, a single SU is considered under a varying NoS and varying SNR. Whereas in the second scenario, multiple SUs was considered with varying number of samples, SU and SNR. For training energy, correlation and time-shifted correlation was considered to be as a feature vector and individual DL model was trained and their results are ensembled together to give the final result. The detection of test data samples was performed using an ensemble approach which results in the optimal solution. The simulation results were performed and performance was evaluated by ROC curve analysis as well as time complexity and error rate. The result analysis showed better performance concerning the CNN model as well as the traditional ED model.

In this paper, we provide a theoretical analysis of the advantages of ECRNN over other methods. Then simulation experiments are performed for the probability of detection concerning variable SNR and showed up its robustness as well as scalability. The results have shown that the proposed CM-CNN method could achieve almost the same performance as that of the optimal E-C detector whether the PU signals are independent or correlated.

The limitation of this work is that with increasing SU there is a decrease in detection performance which needed to be optimized. These limitations can be improved in the future by deciding the optimal number of SU that can be handled. In the future, this work will also be enhanced with a path fading channel scenario along with noise.

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## Internet of things oriented elegant parking method for smart cities

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## ABSTRACT

As of late, the idea of brilliant urban areas have picked up incredible fame. Steady actions are made in meadow of IoT to augment the competence and dependability of metropolitan framework concerns. The gridlock, restricted vehicle leaving offices and street well-being are being tended by IoT. In this paper, we present an IoT based cloud coordinated rich parking lot framework using IR sensor and ultrasonic sensor. The proposed parking scaffolds encompass of an IoT module that is exploited to VDT and signalize the circumstance of convenience of each sole parking dot. An OLED which consents an end patron to verify the openness of parking dot which is controlled by a Wi-Fi module. The paper additionally illustrates an elevated point perspective on the frame-work design.

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## 1. Introduction

Smart parking system is a compelling apparatus for the board of parking space through better access control and parking income strategy in occupied territories in enormous urban areas, for example, shopping edifices, arenas and other famous spots, particularly during their pinnacle hour. Smart parking is smart parking system which helps in reducing and tackling the regular issue of distributing parking space [1-4]. Smart Parking System improves security, productivity and versatility, enhances the parking monetary execution and expands vehicle turn, and, likewise helps in keeping away from clog and henceforth lessens contamination. To oversee and check the parking openings, smart parking system is created, implemented and tried. There is a requirement for smart parking system since it is easier contrasted with other and establishment is simple. A smart parking system has been intended to encourage parking of vehicles. Probably the most goal of this exertion is to dissect how human direct could be diminished from finding the parking territory. The Proposed technique connected with is to persistently observing the accessible of void parking openings; this system is effective and smart approach to robotize the administra-

tion of the parking system that assigns a proficient parking space utilizing web of things innovation [5-7].

With developing prominence of tidy cities, up there is consistently an interest for smart answers for each area. The modern IoT has empowered the chance of elegant cities with it's above the web manage protocol. An individual can manage the gadgets introduced in home from anyplace on the planet by utilizing a medium electronic phone or any web associated gadgets [8,10]. There are different spaces in a stylish city and elegant parking is one of the famous areas in the elegant city. Today comparative methodology will be pursued and a stylish parking arrangement will be assembled which definitely utilize a ultrasonic sensor to identify automobile occurrence and trigger the door to release or close consequently with mystery solution for approval [9,11].

## 2. Related work

Rico et al. (2013) proposed a smart parking strategy for office territories. The entire territory of parking openings is separated into various zones. Every region has three least parking spaces. In a parking space the presence of vehicle is distinguished by sensor circuit. The sensor circuit comprises of two primary parts IR transmitter and IR beneficiary and comparator IC LM358. IR transmitter communicates the IR light, if vehicle is available, the infrared light is emanated back and gotten by IR collector [12]. These signs are

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analyzed by operational speaker IC LM358 which will go about as comparator, if there is transmitted heartbeat got by IR beneficiary it produces high yield and in the event that there is no radiation, at that point it creates low yield beat. The comparator yield signal is given to 20 pin regulator IC 89C4051. The comparator yield are given to the port 3 of IC 89C4051. The LCD is interfaced with the regulator to speak to condition of parking openings in that specific zone [13-15]. The sensors data is then sent to dominate regulator's sequential transport UART 1. The sequential port of slave regulator and ace regulator UART 1 are interfaced. Presently Zigbee gadget is interfaced to UART 0 sequential transport of expert regulator (LPC2148). This Zig-bee gadget is utilized to communicate sensor information remote to another zig-bee gadget which is interfaced to worker through USB-TTL circuit. Crafted by this worker is to show sensor information data in Graphical User Interface (GUI).

Zheng et al. (2015) proposed parking system dependent on the bluetooth correspondence and client approval gadgets. The model ought to permit the client to enter/leave a parking part ceaselessly the vehicle. A comparable rule is additionally utilized for electronic cost assortment on motorways, despite the fact that with other identification methods [17]. The client begins a suitable application on their cell phone prior to arriving at the parking territory, for instance, prior to incoming of the vehicle. On beginning the submission, the client foliage the telephone where most appropriate situation. The client at that point budges the vehicle on the way to the parking sector [16,18]. The cell phone is continually through ultrasonic sensors. Subsequent to getting data from IR sensor, through servomotor entry doors are opened. At that point vehicle can move without much of a stretch left in a given opening. Checking the blue-tooth climate, the periods of automobile ingoing a parking parcel is introduced. The methodology of the vehicle, where the telephone isn't inside the scope of a bluetooth module

at the passageway. The cell phone starts sending orders and information to the manage element to approve the client on effective approval and is protected to bring down the boundary blast, forestalling the possible harm to the vehicle and to the obstruction itself.

Botta et al. (2014) proposed model for smart parking system has parking part comprises of a gathering of parking spaces. The condition of a parking part is the quantity of consumed spaces versus all out spaces. Each parking parcel approaches utilizing Internet to speak with the administration system and clients, and offer parking data with other parking parts. In each parking parcel, reservation authority is sent for confirming individual client's character and reservation demand [19]. In the engineering three parts in smart parking model, including parking zones, clients and the information base smart parking system. The administration system decides parking costs and broadcast lives parking accessible data to clients (likewise drivers). After accepting parking data, client chooses wanted parking parcel and holds a space. Primary System Architecture shows the Smart Parking System dependent on reservation. The applications are expand on Android Platform. Two distinctive applications are utilized in SPSSG. One is at the client end and another is administrator at the parking parcel. The Parking application in the client's telephone is utilized to save space in wanted parking parcel. Client needs to initially make a record to have the option to utilize administrations gave. When record is join, client can login with its portable number as username and secret key. Client would then be able to choose fitting parking parcel and check accessibility. In the event that free spaces are accessible, at that point client can continue with space reservation. One client is hold just one space. For booking, client needs to enter its vehicle's recognizable proof number with start time and end season of reservation. Client is furnished with a help that permits cli-

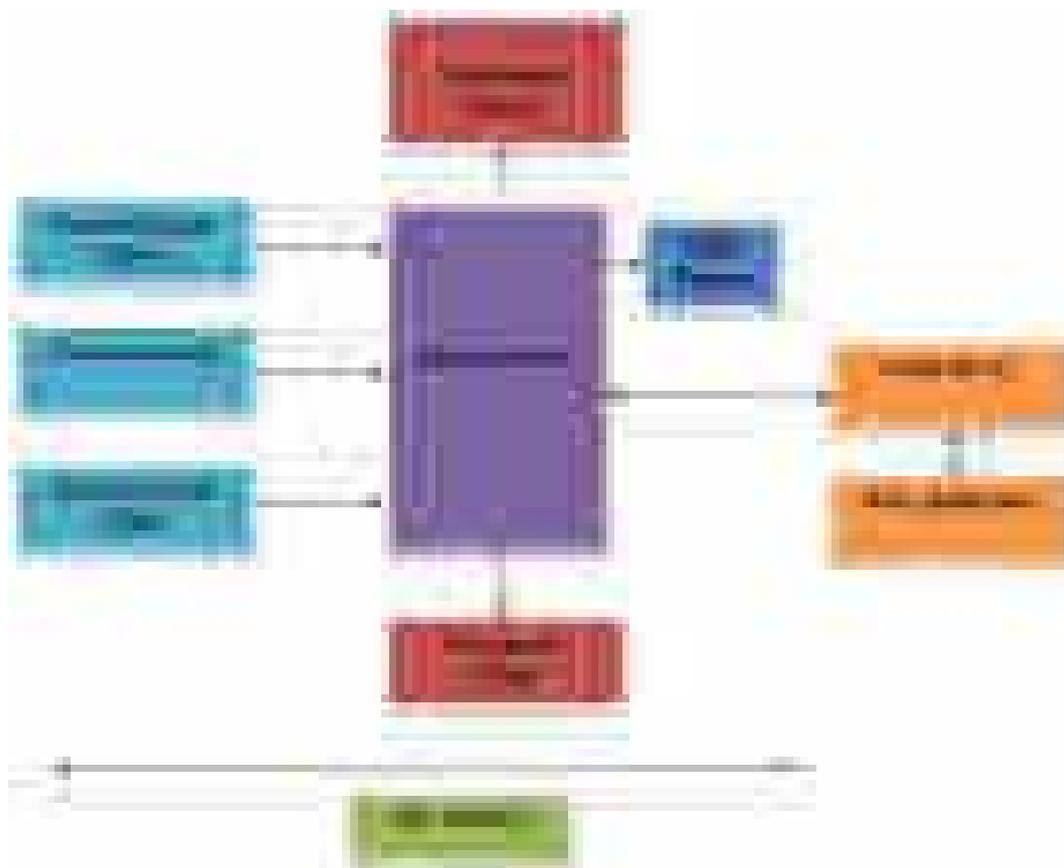


Fig. 1. Architecture of the proposed system.

ent to defer start time by 15 min. In the event that the client can't show up inside the all-encompassing time, at that point the booking is disposed of. Client is likewise allowed to defer finishing time. Administrator can see all parking opening subtleties. Parking spaces would be shown as graphical boxes hued as Red, Green and White. Each shading shows one of the imperatives. Green Indicates opening is held, White demonstrates the space free and Red shows terminated openings. Such terminated spaces have the choice of erase which would turn them in to free openings [20].

### 3. Proposed system

The smart parking system proposed in this paper comprising of the accompanying segments. They are IR sensor, ultrasonic sensor, Servo engine, hub MCU, OLED and Wi-Fi coordinated PC [21-28]. IR sensor used to recognize the presence of vehicle. The ESP8266 hub MCU will be utilized here as the fundamental regulator to control all the peripherals appended to it, as it has integral help for Wi-Fi to associate with web. The ultrasonic sensor sent inside each parking office and it is utilized to recognize the presence of vehicle with in the parking parcel and elicit the entryway to untie or close naturally. The distance between vehicles to ultrasonic sensor is least 20 cms, it will send the data to OLED for giving parking spaces accessibility and non-accessibility data all through the parking zone and it will show the passage of the door. Thus, we can leave the vehicles easily [22,23,25,29-33]. The proposed architecture is shown in Fig. 1.

An infrared sensor is an electronic gadget that discharges to distinguish few ingredients of the environmental factors. An IR sensor can estimate the warmth just as association [34-45]. These sorts of sensors calculate infrared emission, as opposed to discharging it that is known as a latent IR sensor. For the most part, the infrared assortment, articles derive several type of warm rays. These radiations are undetectable by eyes but identified by an IR sensor.

A servo engine is an electrical gadget which can push or turn an item with extraordinary accuracy. On the off chance that you need to turn and protest at some particular points or distance, at that point you utilize servo engine. Servo engine chips away at PWM

(Pulse width tweak) standard, implies its point of pivot is constrained by the length of applied heartbeat to its Control pin. Servo engine can be pivoted from 0 to 180 degree, yet it can go up to 210 degree, contingent upon the assembling [46-54,54]. This level of turn can be constrained by applying the Electrical Pulse of appropriate width, to its Control Pin. SSD1306 is a solitary chip CMOS OLED/PLED driver with regulator for natural/polymer light producing diode dab framework realistic presentation system. It comprises of 128 fragments and 64commons. This IC is intended for Common Cathode type OLED board (Figs. 2 and 3).

### 4. Results and discussions

The Circuit graph for IoT oriented motor vehicle parking structure is given beneath. It includes two hybrid IR sensor, two hybrid servo engines, one hybrid ultrasonic sensor and one bright combo16x2 LCD. Here the controller will organize the total cycle and furthermore hurl the parking accessibility data to Google database so it tends to be observed from anyplace on the planet over the web [55-60]. Two hybrid IR sensors are utilized at passage and leave door to recognize the occurrence of vehicle and consequently unfasten or close the entryway. IR hybrid sensor is utilized to dis-



Fig. 3. Hardware setup of the proposed system.

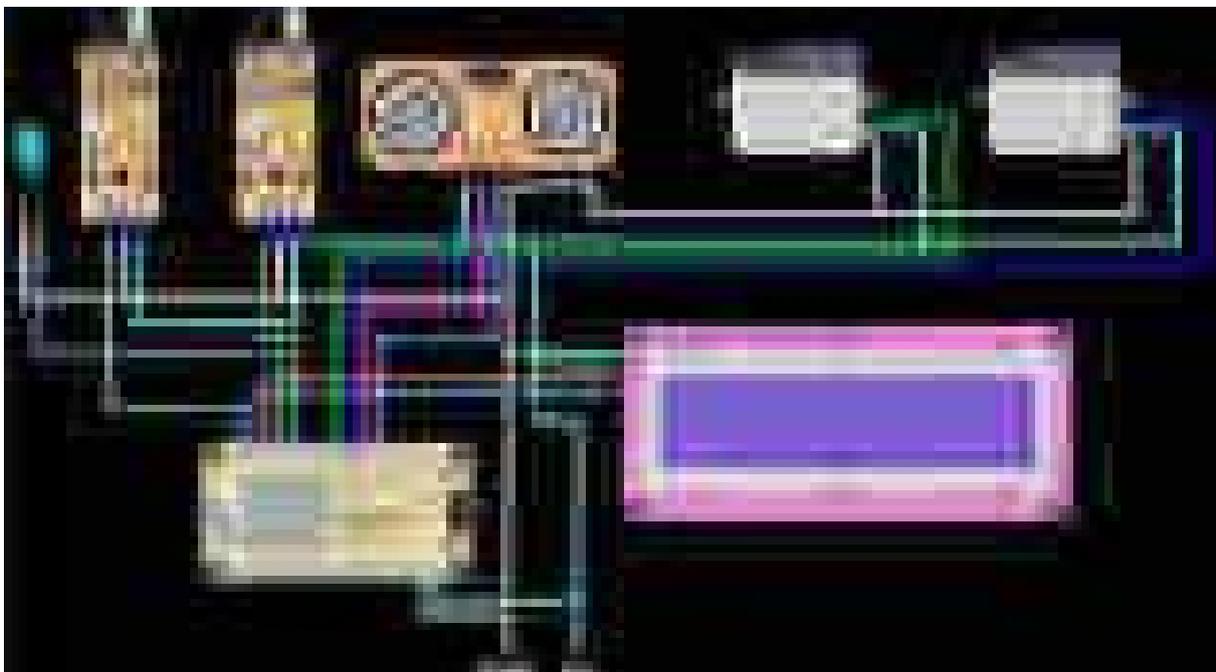


Fig. 2. Schematic of the proposed system.

**Table 1**  
Various sensor and servomotor action of proposed system.

S. No.	Parking Lot	IR sensor status	Ultrasonic sensor status	Servomotor Action and Display Message
1.	Parking Lot 1	Open [Status = 1]	Open [Status = 1]	Close
2.	Parking Lot 1	Close [Status = 0]	Close [Status = 0]	Open
3.	Parking Lot 2	Open [Status = 1]	Open [Status = 1]	Close
4.	Parking Lot 2	Close [Status = 0]	Close [Status = 0]	Open
5.	Parking Lot 3	Open [Status = 1]	Open [Status = 1]	Close
6.	Parking Lot 3	Close [Status = 0]	Close [Status = 0]	Open
7.	Parking Lot 4	Open [Status = 1]	Open [Status = 1]	Close
8.	Parking Lot 4	Close [Status = 0]	Close [Status = 0]	Open

tistinguish any item by transfer and accepting the IR beams. Two servos will go about as section and leave entryway and they pivot to open or close the door [61-64]. At last a Ultrasonic sensor is utilized to recognize if the parking gap is accessible or involved and fling the information to controller appropriately.

The smart parking system proposed in this paper comprising of the accompanying components. They are IR sensor, ultrasonic sensor, Servo engine, hub MCU, OLED and Wi-Fi coordinated laptop. IR sensor used to identify the presence of vehicle. The ESP8266 hub MCU will be utilized here as the main regulator to control all the peripherals joined to it, as it has inbuilt help for Wi-Fi to interface with web. There is a more prominent feeling that all is well with the world. Discharge are incredibly cut down and diminished. There is no requirement for driving while at the same time searching for an accessible space. There are less possibility of crushing. The significant function in establish better climate by decreasing the discharge of CO<sub>2</sub> and different poisons Smart parking empowers better and constant checking and overseeing of accessible parking space. Present-day, smart parking system is picking up ubiquity across the world and now it has become the world's quickest developing smart city arrangements. Air terminals, strip malls, city carports, colleges, private parking parcels and other business parking parts have started understanding the articulated points of interest of computerized parking innovation. As a matter of fact, it is the Internet of Things, capacity to associate dissect and computerize information accumulated from gadgets that make the smart parking conceivable.

Smart parking system includes usage of continuous information, applications and ease sensors that encourages clients to look and discover accessible spaces. A definitive objective is to computerize and restrain the time spent physically looking for the ideal parking parcels, space or floor. A few arrangements are expected to furnish total arrangements and in this way inserted with the total set-up of administrations including parking time warnings, online instalments and even vehicle scanning functionalities for an altogether enormous parking part. A smart parking system and arrangement gives advantages to both the client and the part proprietor. Vehicle expands traffic as they are cruising all over looking for parking space or parts. A very much oversaw parking system lets individuals discover the closest parts or space effectively and in this manner altogether turn down the traffic. The various sensor and servomotor action are tabulated in Table 1.

Clients proficiently locate the best spot accessible, saving time, exertion and assets. Parking parts can be productively occupied and space can be used at most extreme limit by business and corporate elements. Study uncovers that right around 1,000,000 barrels of oil are scorched every day by vehicles looking for parking parcels and space. So an ideal and very much oversaw parking system and arrangement will help in bringing down the driving time and along these lines bring down the everyday utilization of fuel and lessen the unsafe vehicle outflow that at last brings diminished worldwide natural impression. Smart parking innovation may bring different sorts of new incomes streams. For example, parking part proprietors can utilize layered installment choices according

to parking space area. In addition, reward projects can be utilized to energize the recurrent clients into existing models.

## 5. Conclusion

Every day clients can utilize account invoicing just as application installment from their smartphone rather than manual money installments. This would appear to be productive in support of client dedication and significant client input. Presently it turns out to be simple for all cycle including driver's installment, area search, spot distinguishing proof, time notice and a lot more and these are planned from the appearance to the objective consistently and in less time. The high level parking system saves a great deal on schedule, as vehicles can move quicker with the controlled recurrence too. Smart parking system and arrangement can give continuous information that includes connections and patterns of parcels and clients. These information will be important to parcel proprietors as it will help in fear as how to make changes and upgrades to drivers. In this manner the "Smart parking system for smart urban areas utilizing IBM Watson" is actualized and tried effectively. It has been improved by coordinated highlights of all the equipment segments utilized. The system has been tried to work consequently. The IR sensors distinguish the vehicle. On the off chance that the vehicle is run over the entryway, the IR sensor forward the sign to the Node MCU board which enacts the door to open and give the space number to individual vehicle. At the point when the specific vehicle came to, the system hangs all alone and the door is shut. Accordingly, the usefulness of the system has been tried altogether and it is said to work effectively.

## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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# Integration of Deep Learning for Improved Diagnosis of Depression using EEG and Facial Features

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## ABSTRACT

Now-a-days, due to mental stress a major section of society is affected by depression. There may be several reasons for depression especially in adults. As different person has different symptoms and its identification is a major challenge. Most of the people feel shy to accept that they are suffering from depression while some people are unaware of their depressed mental health. The objective of this paper is to design and develop an effective tool or model to diagnose depression. In this work, a hybrid system is designed and simulated for detecting depression using EEG features as well as facial features as biological feature gives accurate diagnosis. In this paper a deep learning approach termed as bidirectional long short-term memory (BiLSTM) is proposed with feature fusion from EEG data as well as facial data. The result analysis shows comparative analysis with other existing model and shows effectiveness of the proposed model.

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## 1. Introduction

Depression is defined as the mental illness of a person that has influenced more than 350 million individuals all over the world till now. This illness is not only affecting one person but it also includes families of person suffering from depression. The World Health Organization (WHO) has declared that depression will be the second foremost reason of further disease by the year 2020. On the other hand, appraisal strategies for diagnosing depression were based on clinical and patient reports of relentlessness of a person. Apparent drawbacks associated with patient rejection, low sensitivity, subjective bias and inaccuracies were common to have in current diagnostic technique [1]. Finding a target, exact and useful strategy for recognizing depression stays a challenge. In introductory stages when depression is in its mild form, early discovery of depression in a person is helpful for both the individual as well as society [2]. This includes the following symptoms mentioned below [3]:

- Trouble in thinking, concentrating, making decisions and remembering things is also slowed by person dealing with depression.
- They feel tired all the time due to which small tasks took lot of time and effort.
- A person may feel tearful, sad, alone, and hopeless because of many scenarios running in his life.
- Some people feel anxious, agitated and restless all the time whereas some people feel worthless or guilty, fixating on past failures or self-blame.
- A person undergoing depression loses interest and pleasure in many normal activities like sex, sports, hobbies, family gatherings etc.
- In some cases, a person's appetite is reduced resulting in weight loss whereas in some cases a person's cravings for food increases resulting in excessive weight gain.
- A person gets very angry, irritable or frustrated even at very small issues.
- During the time when a person is depressed, it is difficult for them to take proper sleep. They also feel insomniac and sometimes they were taking too much sleep.
- Their thinking, speaking and body movements is slowed.

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- Suicidal thoughts, suicide attempts and suicide were frequent during these periods.

Depression doesn't affect not only person's health but it also affects the family and relationships. According to World Health Organization it has been reported as one of the major health concerns by 2020. But the current assessment methods are dependent on patient report and clinical judgements. But these systems have some drawbacks due to denial of patient as well as subjective biases. All these drawbacks make the inaccurate diagnosis [4].

Preferably, machine learning tools for identifying depression ought to approach a similar information flow utilized by a doctor during diagnosis. As a result, the functionalities worn by these classifiers should symbolize any form of communication:

**Visual Indicators:** Visual indicators have been broadly studied for the analysis of depression, including body movements, gestures, subtle expressions and periodic muscle movements [5].

**Speech Indicators:** Ongoing research has revealed that the use of language as a diagnostic and monitoring tool for depression is promising. Vocal production system of an individual is extremely unpredictable, and hence small cognitive or physiological changes can cause changes in acoustic language. This thought drove researchers to utilize language as an objective indicator for depression. Depressive language has been efficiently connected with an assortment of prosodic, origin, training and spectral indicators.

**Textual Indicators:** In introductory stages when depression is in its mild form, early discovery of depression in a person is helpful for both the individual as well as society [6]. Numerous studies that center around discovery of the relationship between linguistic characteristics of a written text and the level of the emotional state of depression were also introduced. The attention is on non-content (non-semantic) computational linguistic markers of a written text [6].

**Biological Indicators:** In this type, EEG signals and eye movement tracking are considered as input signal to analyze the depression level [7–10].

Recently, machine learning has showed up their efficiency to analyze the biological signals such as facial expressions, audio, body movement, eye tracking, EEG, etc. for depression detection. However, still there are some research gaps that are focused in this paper.

## 2. Related work

Among all biological signals, EEG (Electroencephalogram) is most adaptive way that can reflect actual mental state. EEG signals are generated by nervous system when any external stimulus occurs which can be used to correctly diagnosis of mental health of an individual. Many existing researchers are exploring their knowledge to show the efficiency of EEG as a reliable mode for detecting depression. X. Li et al. [11] proposed GreedyStepwise (GSW) feature selection method based on Correlation Features Selection (CFS) and classified using KNN classifier and achieve 91% accuracy rate for mild depression detection. Mahato et al. [8] used alpha, betam delta and theta signals for depression diagnosis. MultiCluster feature selection was used with support vector machine (SVM) classifier and achieved accuracy of 88.33%. Mahato et al. [9] extended his work and by combining linear and non-linear EEG features and improved the accuracy rate upto 93.33%. Betul et al. [1] proposed deep learning approach such as convolutional neural network (CNN) and long-short term memory (LSTM) for classification of signal generated from left and right hemisphere of the brain and achieved accuracy rate of about 99.12% and 97.66%. Li et al. (2019) proposed convolutional neural network termed as ConvNet for depression detection and achieved 85.62% for

mild depression. G. Degottex [2] has developed a document on the freely accessible and programmed area or repository called COV-AREP that has the capability of processing the algorithms associated with the speech input. Karthika [5] focused on development of a Gabor wavelets based calculative algorithm for discriminatory feature extraction that has been made possible by performing a convolving a face picture with the coefficients of Gabor filter at different orientations and scaling. The classifier used is derived by utilizing SVM an acronym for support vector machines and the data set analyzed is ORL based that is available free of cost. The proposed algorithms has been tested and cross validated and the paper came up with results having a recognition rate of 94% which describes its authenticity in detection. Harati et al. [4], has mainly focused on the impacts of the treatment on the facial expressivity of the patients. The focused research area is to provide an examination of the methodologies for clinical depression recognition[7], [10].

## 3. Methodology

This section describes the proposed methodology in the field of depression detection from EEG signals and facial expressions. The proposed methodology flow chart is depicted in Fig. 1. The proposed model will deep biological feature fusion and classification using BiLSTM network to identify a person is depressed or not.

### 3.1. Signal acquisition

In this paper, for simulation of proposed methodology, dataset is taken from the BCI project for EEG signal and frontal facial data is taken.

### 3.2. EEG signal pre-processing

The procured information of the ECG is normally expected to be comprising of certain noise and therefore calls for procedure for noise extraction from them. The objective of filtration of the information was achieved by using a filter of 8 and 25 Hz which was a band pass filter utilizing Butterworth filter carrying out elimination of undesired artifacts. The band pass filtration is accomplished by association of a high pass filter along with the low pass filter that finally permits only foreordained frequency to pass along it. The cutoff points for the decisive cancellation of frequencies is calculated for both the higher frequencies and lower frequency referred to as  $f_H$  and  $f_L$  respectively. The clear and proper gap has to be defined between the two cutoff points that shall avoid

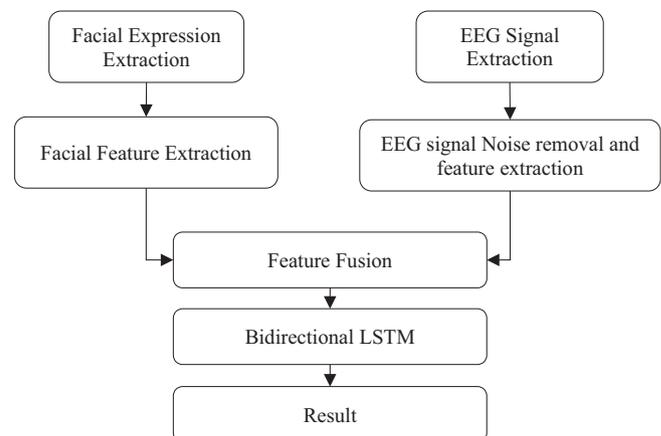


Fig. 1. Proposed Flow Diagram.

the intermixing of the frequencies. The overall voltage gain has been characterised by the amplifier along with the required necessary gap between the two stages.

### 3.3. Feature extraction

#### 3.3.1. Facial feature extraction

The process of depression identification in any individual is carried upon by keen observation of person's body movements that is inclusive of the eye ball rotation, mouth movement specifically of the corners, time and frequencies at which person's eyes blink along with the eyebrow's movement.

- Eyes: The eyes are studied for the pupil movement inside it and the responses with the distance between the left and right pupil.
- Eyebrows: The main feature points of study include the distances across the left and right eye brows.
- Corners of mouth: The feature extraction points include the points at the corners of mouth along with the tip of nose. The continuous analysis of the movement in these areas with their minimum and maximum deviation has been recorded for the feature study and analytical measurement of changes in the facial expression.

The features are extracted from the facial images such as eyebrows, eyes, nose, etc. For these features following parameters are evaluated:

- Standard deviation
- Mean
- Maximum
- Minimum
- Blink frequency of eyes

#### 3.3.2. EEG feature extraction

DWT features are being extricated from the ECG data set frequency band after their elimination of the noisy component in them. In the cases which administer huge data set collection those which are enormously huge to be processed comprising of little information about the data then it is being proposed to change the data set into more reliable set of features with reduced data that is often being portrayed as features vector. The alteration of the input data based on their feature to form a set of features classification is referred to as the process of feature extraction. The process has been found fruitful in bringing a reduction in the length of the data that has been selected for the processing by achieving extraction of key selective features from the set of information and conversion into feature vector by relevant information compression and redundancy avoidance. The feature extraction procedure is carried upon by the use of Discrete Wavelet transform technique from a set of available information that is followed upon after the filtration step via low and high pass stages. The wavelet coefficients are found to be the progressive continuation of the approximated along with the detail coefficients. The fundamental process of feature extraction is composed of the below procedures:

- The first step is to achieve the coefficients both approximated and detailed by allowing decomposition of the signal into N various level by making use of the DWT, filtration and decimation process.
- The second step is meant of finally extract the available features from the coefficients of the DWT.

Out of the extracted DWT features, some signal parameters are evaluated which are discussed as below:

Mean: Mean ( $\mu$ ) is termed as average value of data values. It is mathematically computed as in Eq. (1):

$$\text{Mean} = 1/N \sum_{i=1}^n x_i \quad (1)$$

Where,

$x_i$  = It represents data value

N = total data samples

Median: Median represents the mid value of some data values. It also represented as probability distribution of data values in upper and lower half of the data samples.

Variance: It represents the squared difference between mean value and data values. Mathematically it is represented as in Eq. (2):

$$\text{Variance} = \sum_{i=1}^n (x_i - \mu)^2 / (N - 1) \quad (2)$$

Standard deviation: It is evaluated as square root mean of data value from mean value. It is mathematically represented as Eq. (3):

$$\text{Standard Deviation} = \sqrt{\sum \frac{(x_i - \mu)^2}{N}} \quad (3)$$

Skewness: It represents the probability distribution of data values about the mean value. It is mathematically represented as in Eq. (4):

$$\text{skewness} = E[(X - \mu\sigma)^3] \quad (4)$$

Kurtosis: It represents the data distribution about the peak of the signal generated as compared to normal distribution. It is mathematically represented as in Eq. (5):

$$\text{kurtosis} = \mu_4 / \sigma^4 \quad (5)$$

Where,

$\mu_4$  = It represents the fourth moment about the mean

$\sigma$  = It represents the standard deviation

Complexity: It represents the frequency of the signal generated and mathematically represented as in Eq. (6):

$$\text{Complexity} = \text{Mobility} \left( \frac{dy(t)}{dt} \right) / \text{Mobility}(y(t)) \quad (6)$$

Where,

y = signal frequency

Mobility: It represents the standard deviation of the power spectrum of signal and mathematically, it is represented as in Eq. (7):

$$\text{Mobility} = \sqrt{\text{var} \left( \frac{dy(t)}{dt} \right) / \text{var}(y(t))} \quad (7)$$

### 3.4. Feature fusion

Both biological features extracted in above step are combined together and fed into bidirectional LSTM for classification.

### 3.5. Classification

Long short-term memory (LSTM) is one of the prominent recurrent neural networks (RNN). It is a neural network approach that involves in-depth analysis and consists of various neural network modules. The following units form the LSTM network (Fig. 2):

- Input unit
- Output unit
- Memory cell
- Forget unit

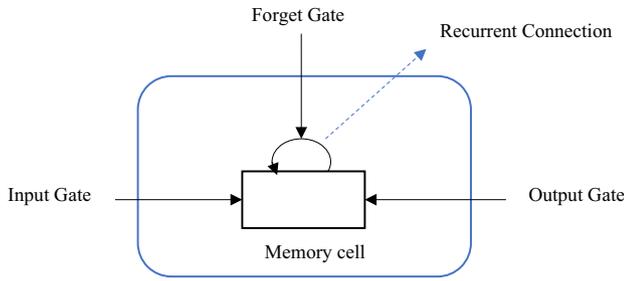


Fig. 2. Long Short-Term Memory (LSTM) Units.

The data values are stored in the memory unit for a very short interval of time and the evaluation of output value is done by regulating the flow of data values through the rest of the units. The bidirectional LSTM is represented by BiLSTM, which implies that the propagation of signal is in forward as well as backward direction.

A set of vectors is involved in each time step  $t$ , which include

- Forget gate  $f_t$
- Input gate  $i_t$
- Memory cell  $C_t$
- Output gate  $o_t$

The output pertaining to the hidden layer is evaluated by employing the above mentioned gates as follows:

$$f_t = \sigma(W_f * x_t + U_f * h_{t-1} + b_f) \quad (8)$$

$$i_t = \sigma(W_i * x_t + U_i * h_{t-1} + b_i) \quad (9)$$

$$\hat{C}_t = \tanh(W_c * x_t + U_c * h_{t-1} + b_c) \quad (10)$$

$$C_t = i_t * \hat{C}_t + f_t * C_{t-1} \quad (11)$$

$$o_t = \sigma(W_o * x_t + U_o * h_{t-1} + b_o) \quad (12)$$

$$h_t = o_t * \tanh(C_t) \quad (13)$$

$\sigma$  = sigmoidactivationfunction

$x_t$  = input at time  $t$

$\tanh$  = hyperbolic tangent function

To regulate the input, weight matrices such as  $W_i$ ,  $W_c$ ,  $W_f$ ,  $W_o$ ,  $U_i$ ,  $U_c$ ,  $U_f$ ,  $U_o$  are employed

Bias vectors =  $b_i, b_c, b_f, b_o$

The LSTM network involves the following steps:

Step 1:

The very first step involves the determination of information that should be wiped out from the cell state. This is represented by the forget gate values  $f_t$ . The output from the previous step  $h_{t-1}$  and input  $x_t$  are considered as input in this step. The output values between 0 and 1 are obtained through the sigmoid activation function. The value 1 represents “remembering everything” and a value 0 represents “let nothing through”.

Step 2:

This step involves the determination of values that should be added to the cell state. The input in this step are  $x_t$  and  $h_{t-1}$ . In order to determine the cell state parts that should be updated, a sigmoid layer is applied over the input by the input layer. The new candidate values  $C_t$  are created through a tanh layer. In order to get the cell state  $C_t$  updated, the two layers are combined in the upcoming step.

Step 3:

In this step, the memory flushes out the data from the memory cell that are of no use anymore and update the new data.

Step 4:

The final output is determined by the layer, i.e.  $h_t$ . The sigmoid function is applied to evaluate the output value from the previous output layer,  $h_{t-1}$  and input value  $x_t$ . The cell values are represented by 0 and 1. If BiLSTM is employed as a classifier, at the end softmax does the job of a classifier.

## 4. Result and discussions

This section describes the analytical and experimental description of proposed methodology for depression detection. The Simulation is performed using MATLAB platform to evaluate the performance. Section 4.1 states the performance measures used in this work.

### 4.1. Performance parameters

#### 4.1.1. Accuracy

It is the one of the most important parameter for determination of efficiency of the classifier. It represents the total correctly classified output either depressive or normal data. The mathematical representation of accuracy is represented as in Eq. (14):

$$Accuracy = \frac{(TP + TN)}{(TP + TN + FP + FN)} \quad (14)$$

Where,

TP = True Positive (This represents the total number of test samples that are predicted depressive and actual label of them are also depressive).

TN = True Negative (This represents the total number of test samples that are predicted normal and actual label of them are also normal).

FP = False Positive (This represents the total number of test samples that are predicted depressive and actual label of them as normal).

FN = False Negative (This represents the total number of test samples that are predicted normal and actual label of them as depressive).

#### 4.1.2. Precision

Similarly, another parameter for performance evaluation is precision that determines all correct depressive classification out of all predicted depressive samples. Mathematically, precision is represented as in Eq. (15):

$$Precision = \frac{TP}{(TP + FP)} \quad (15)$$

#### 4.1.3. Recall

Another parameter is recall that determines all the depressive prediction out of all actual depressive samples. Mathematically it is represented as in Eq. (16):

$$Recall = \frac{TP}{(TP + FN)} \quad (16)$$

#### 4.1.4. F\_Measure

The harmonic mean between recall and precision is termed as  $f\_measure$ . Mathematically it is represented as in Eq. (17):

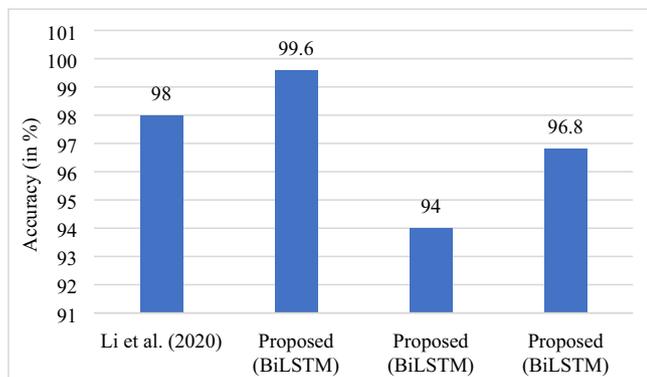
$$F_{measure} = \frac{2 * Recall * Precision}{(Recall + Precision)} \quad (17)$$

**Table 1**  
Performance Evaluation.

	Facial Features	EEG Features
Accuracy	94	99.66
Recall	98	99.34
Precision	96	100
F_Measure	97	99.67

**Table 2**  
Comparative Accuracy Evaluation.

Models	Feature	Accuracy
Li et al. [12]	EEG	98
Proposed (BiLSTM)	EEG	99.6
	Facial	94
	EEG + Facial	96.8

**Fig. 3.** Comparative Accuracy Evaluation.

#### 4.2. Result analysis

Performance evaluation of methodology proposed in this paper is represented in table 1. As depression detection in this paper is evaluated by using biological feature fusion such as EEG features as well as facial features and classified using BiLSTM. The performance is evaluated on the basis of accuracy, precision, recall and f\_measure. Different testsets are taken to illustrated the effectiveness of the model.

Table 2 and Fig. 3 represents the comparative performance evaluation with research work presented by Li et al. (2020).

#### 5. Conclusion

At current scenario, depression is considered to be one of the major issues of health. Depression causes as well as symptoms varies from person to person. So, it makes quite difficult to analyze manually. This paper is intended towards implementation of

robust, adaptable, reliable and accurate designing of model to achieve effective depression detection. Biological features such as Electroencephalogram (EEG) and facial features have been widely used for depression detection. As these features are easy to track and are non-invasive in nature. In this paper, two biological features are considered for effective diagnosis of depression. Many researchers focused towards unimodal diagnosis system, but in this paper hybrid model is designed to improve diagnosis accuracy. The result analysis of the proposed model has shown effective results as compared to other existing unimodal diagnosis system.

#### CRedit authorship contribution statement

**Danniel Shazmeer Bin Abdul Hamid:** Conceptualization, Methodology, Software, Visualization, Writing - original draft. **SB. Goyal:** Data curation, Supervision, Software, Validation. **Pradeep Bedi:** Writing - review & editing.

#### Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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## **A Study on Role of Employee Engagement in Organizational Performance and Individual Well Being**

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### **Abstract**

An engaged employee is one who is taking the interest in the organizational work and showing initiative in the benefit of organization. Employee Engagement has been a topic of study from many years. Many researchers in the past tried to associate it with many topics of organization and individual interest. This study is an attempt to find out the relationship of employee engagement with Organizational Performance and Individual Well-being on the basis of existing literature and research. Organizational Performance can be defined as the total of organizational outcomes while Individual Well-being is, doing the welfare of individual employee. The study is theoretical and concept based in nature. The study resulted into a significant relationship between Employee Engagement and Organizational Performance; Employee Engagement and Individual Well Being. The results were also supported with previous research findings.

Key Words: Individual well-being, Employees, Performance, Success

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### **Introduction**

There is a paradigm shift in human resource and management practices from job satisfaction, job selection, selection and recruitment process, to employee engagement and employee involvement. Employee engagement is relatively new. In organizations every individual is accountable for his or her own engagement; anyone with direct reports must coach team members to higher levels of engagement and manage his or her own engagement; and executives

set the tone for high morale and motivation plus shoulder the responsibilities of individuals and managers.

Employee engagement is the level of commitment and involvement an employee has towards their organization and its values. Engagement at work was conceptualized by Kahn, (1990) as the ‘harnessing of organizational members’ selves to their work roles. In engagement, people employ and express themselves physically, cognitively, and emotionally during role performances.

There are various distinctive HR researches that are often repeated all through the research of HRM. However, what types of performance that these HR practices, or systems of them, are measured against varies. Financial/ market performance, operational performance and employee attitude & behavior. These are three categories of the performance which are frequently used in the research field. However, there is also a more subjective side to the financial and market performance data in the research field of HRM and performance – that is perceived organizational performance, which is often utilized in those instances when objective data is difficult obtain. Specific examples of financial and market performance are return on assets, return on equity, revenue, market share, and market value. In this study the main objective of this research is to examine how the employee engagement influences the performance of organization and individual well being.

## **OBJECTIVE OF THE STUDY**

1. To understand the concept of employee engagement, organizational performance and individual well-being.
2. To study the relationship between employee engagement, organizational performance and individual well-being.

## **Review of Literature**

Nidan (2016) conducted an exploratory study on employee engagement, employee productivity and motivational level in employee. This research was conducted in India and the retail outlets are the base of studies. Employee engagement was the independent variable and the dependent variables were employee productivity and motivational level. The sample size of the study was 500 but research was taken ahead with 380. The questionnaire was self-designed, the factors on the basis of which questionnaire was constructed were Motivation, performance and commitment. The major findings of the researcher were that there exists relationship between all the three as employee engagement increases all other also increases. Other than that it is also said that employee engagement also depends upon the working environment of the company if it is positive everything will be as per organizations choice.

Markos and Sridevi (2010) also developed a conceptual paper on employee engagement, job satisfaction, employee commitment and organizational citizenship behavior. Many scholars suggested that if any organization wants to develop itself i.e. its performance than it has to keep an eye over engagement of their employees. If the employees are more engaged with organization then they will be emotionally close to the organization and they will try to strive the goals of the organization. In the paper the scholars have suggested ten tablets i.e. ten points through which the organization may have engaged employees few are as follows: start it on the day one, start it from the top, enhance employee engagement through two way communication, give satisfactory opportunities for development and advancement, ensure employees have everything that they need to perform their job, give employees appropriate training and so on. Even though the literature of the paper suggests that the employee engagement and organizational performance outcome are closely linked with each other. If the employees are highly engaged then it will have low level of turnover and high level of performance.

Chandani et al. (2016) developed a conceptual paper on employee engagement. This paper has variables under study were engagement, retention, performance and organization. The authors suggested that if organization wants an engaged employees then they must use different strategies to make the employee engaged like for new employees' induction program, for old

employees training sessions. By creating meaning to the job the employee feels satisfied and becomes engaged in his work.

Devi (2017) in her study on evaluated the relationship between employee engagement and organizational performance. Questionnaire was filled by 150 employees of private bank at Jammu, India. In this paper scholar found that there is a significant relationship between both the variables and those employees were highly engaged, performed in the best way they can and in return organizational performance also improved. Due to high level of engagement the organizations were ahead of their competitors in profit. So the scholar draw a conclusion over there that if an employee is highly engaged than his/her productivity will increase, due to which the organization performance will also improve.

Kazimoto (2016), also conducted similar study on employee engagement and organizational performance in retail enterprises. In this paper the researcher want to study the factors of employee engagement and performance of organization and the relationship between employee engagement and organizational performance based on non-financial factor. This research was conducted at retailing enterprises in Wobulenzi- Luweero City, Uganda. Using purposive sampling technique 120 participants were selected from 20 retail outlets and convincing sampling technique was used to select 6 participants from each group. Karl Pearson's correlation method was used to ascertain the relationship between both the variables. The study reveals that there is a positive relationship found between job satisfaction and employee engagement.

Albrecht (2012), conducted a research on employee well-being, employee engagement, employee behavior and commitment. This research was conducted in Australia and Asia. The employees were from large mining industry where total respondents were 4,182 within which only 3,515 were usable questionnaires. Correlation and two tailed t-test was used to ascertain the relationship between employee engagement, commitment, well-being and behavior. The results stated that all are associated with each other positively. Each variable has its impact on another.

Bakker (2011) gave a work engagement model. Through this model the researcher wants to suggest that if the employees are physically, cognitively and emotionally attached with their work they won't quit rather they perform better than that of prior. Even if an individual is well engaged they will try to attain their goals and by which the performance of the organization all increases. So here the model of work engagement proves to be true if an employee is satisfied and do job crafting but always try to achieve the goal then the organization will productivity and performance will increase.

Taris and Schaufeli gave a theoretical and conceptual overview in their paper "Individual well-being and performance at work" according to their overview they are correlated with each other if well-being increases than the performance also increases. In their paper Grant et.al (2007) if the person wishes to increase both performance and well-being then they must check out all the long term consequences.

Shmailan(2016) worked on the relationship between job satisfaction, job performance and employee engagement: an explorative study. The objective was to find factor influencing employee satisfaction and performance and to define the correlation between job satisfaction and performance and employee engagement. The study is exploratory in nature and methodology used in this paper is based on review of literature. The researcher found out that employee satisfaction has a direct link to employee engagement and employee engagement can vary country to country. The author also added that poor employee engagement can cause problem to organization as lower down the profits, poor customer service.

Sibanda, muchen and ncube(2014) worked on employee engagement and organizational performance in a public sector organization in Zimbabwe. The objective was to find out how employee engagement may be used to unlock organizational performance. The public sector organization Zim-PSO was used for research. The sample of 50 was taken as 16 interviews were conducted for managerial employees and questionnaire was distributed to remaining 34 non-managerial employees. They found out that if employee engagement is influenced by the problems of an organization then it will ultimately affect their performance.

Simha and vardhan(2015) worked on enhancing “performance and retention” through employee engagement. The objective of the study was to know the relation between employee engagement and performance. The researchers found out that employee engagement drives performance by customer loyalty, productivity, safety and profitability. Further they added that engaged employees are not likely to quit their jobs and are more focused and care about the job.

Harter,et.al(2012) conducted a study on the relationship between engagement at work and organizational outcomes. The objective of the study was to check the relationship and the consistency of the employee engagement and performance. The data was collected through 263 research studies and 192 organizations in 49 industries and 34 countries. They applied hunter-schmidt meta-analysis method to estimate the true relationship between employee engagement and performance. They found out high consistency across the relationship between employee engagement and the performance at the business level.

Karina, Paauwe & Veldhoven (2011), suggested that employee well-being is connected with organizational performance. Objective of this study was to examine the role of employee well-being. They focused on the previous quantitative studies of employee well-being and related variables. Almost 36 studies were included in this research from 1995 to May 2010.

Employee engagement is critical issue, in today’s competitive business environment employee engagement is main focus of each organization to improve the performance and productivity. Andrew & Sofian (2012), tried to add in the existing concept of employee engagement. This study involved 104 HR officers of Malaysia. Statistics used by the researcher was t-test and multiple regression to find out the factors of employee engagement. After analyzing the data author finds that co-employees are major factor that influence employee engagement and performance.

Employee engagement in organization will be maximum on the point when employees and employers both have good working environment and they satisfied by the environment and organizations are providing the benefits to both. Suresh, Manivannan and Krishnaraj (2015),

assured that employees are emotionally attached to their work and job, which increases the employee engagement and improve the organizational performance. Authors gave their suggestion about employee engagement and performance on the basis of existing literature in the field of employee engagement.

Anitha (2013), focused on the concept of employee engagement and impact of employee engagement on the performances of employees. To understand the concept and to find out the impact researcher conducted causal study with the sample size of 700 in the area of Coimbatore and focused on the small industries. Data was analyzed through the regression and structural equation modelling was used to find out the relationship between employee engagement and employee performance. The main finding of study were employee engagement has impact on the performance of employees and this relationship was mediated by the work-environment, relationship with employers and co-workers.

Taris & Schreurs (2009), said that if employees are happy it will have positive impact on the productive work. This study represents a large-scale organizational level test for happy productive employee hypothesis, and assumes that if individual well-being is high then individual performance will also high, which improves the overall organizational performance. Data for the study was collected from the 66 Dutch home care organization, and regression analysis were used to examine the relationship. The results showed that improving well-being not only improves the performance of employees but it also have positive impact on organization and their stakeholders.

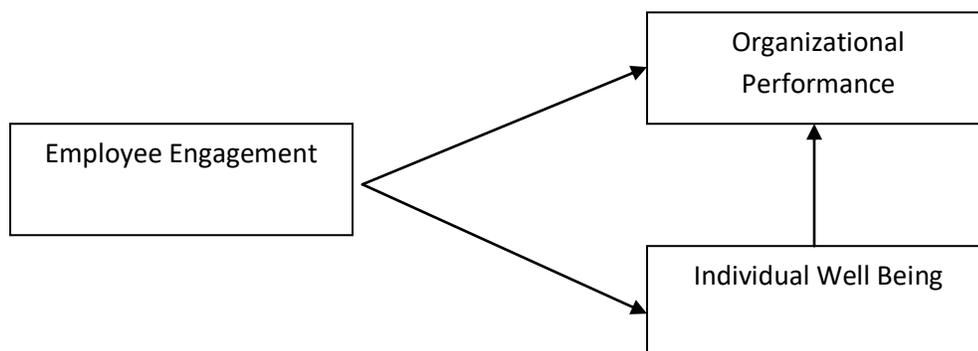
Bhuvanaiah & Raya (2014), their study aims to describe the concept of engagement, and to explain positive things related with engagement. The past literature on the employee engagement showed that employee engagement fulfills the requirement of organization on individual as well as organizational level. Employee will engage with the organization if work is meaningful and challenging for them, they have freedom to take their own decisions, opportunity for career advancement should be there, all of these will improve employee engagement and well-being of employees. To improve the employee engagement, management should take care of few things

like, work-environment, provide appropriate resources to the employees, continuous guiding should be there so that employees has clear idea about their work and role in the organization.

## FINDING

Employee engagement has play an important role in today's continuous changing business world. Employee engagement is used by organization to build their organization stronger and retain their talented employees. Employee engagement contributes towards better performance. On the basis of past research and literature, it is found that employee are key factor towards the growth of the organization. It is required for the organization to engage their employees in the organization by provide them challenging and innovative task and activities which increase the level of employee engagement. Employee engagement increase the motivation level of employee and they feel as a part of organization which automatically lead to higher organizational performance. Employee engagement also leads to individual well-being which initiate the good organizational performance. Employee engagement is an approach which make managers to capable from which they focus each and every employee separately which improve individual well-being and create a cordial relationship between the management and employee at individual, group as well as organizational level.

**Figure No. 1: Following is the proposed model**



Employee engagement leads to organizational performance as well as individual well-being, whereas individual well-being indirectly also relation to improved organizational performance.

## Conclusion

Employee engagement has been a much discussed concept but contributes towards better performance. Individuals well-being, though similar sounding concept yet it has a different perspective. The research indicates that employee engagement enhances organizational performance and well-being significantly. It was also found that Individual Well-being is significantly influencing the Organizational Performance. Though high level of engagement requires commitment that may result in to poor well-being but the sense of performing better improves well-beingsignificantly. Hence a balanced approach of managing both employee engagement and well-being may result in to better performances. Organization need to give emphasis on improving the employee engagement. More an employee is engaged, more he would focus on the organizational objectives. Organisation also has to focus on employee welfare and must provide all the benefits to the employee. These practices will definitely lead the organizational performance towards the higher degree.

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## START-UP ECOSYSTEM IN INDIA: A STUDY WITH FOCUS ON ENTREPRENEURSHIP AND UNIVERSITY BUSINESS INCUBATORS

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### ABSTRACT:

*On one side India is growing to be one of world's biggest markets after China. The incomes and consumption of not just the thriving middle class but even the rural economy is rapidly growing. On the other hand India has lot of really big problems to be solved - be it in education, infrastructure, agriculture, logistics, retail, healthcare etc. This combination is the most fertile ground for startups. The big businesses are comfortable making money off the shortcomings rather than solving them or changing their existing established business models. It's the startups that will come up with innovative disruptive business models to solve the challenges India faces. And this is the biggest impact startups will have on the Indian economy.*

*But entrepreneurship is not an easy path and the more you grow the more challenges you face. From awareness and sustainability of businesses to regulations associated with legality and enforceability, the list of challenges is long. Given these challenges, it can be hard to get started on your entrepreneurial journey without guidance and assistance. So how does one move forward and get ahead? Where do entrepreneurs get their dose of skill and know-how supplements to turn their startup ideas into reality? Incubators have an answer to the problem.*

*The present paper develops an in-depth understanding of the startup ecosystem in India. This paper discusses the role of Incubators in producing and nurturing successful business ventures. It also studies the government's policy measures in fostering entrepreneurship*

# Ablation of Hepatic Tumor Tissues with Active Elements and Cylindrical Phased Array Transducer



Sarita Zutshi Bhan, S. V. A. V. Prasad, and Dinesh Javalkar

## 1 Introduction

The high-intensity focused ultrasound (HIFU) treatment method for treating various tumors like prostate cancer [7], breast cancer [8], bone metastases [9] and malignant renal tumors [10] has proved one of the best ways of treating various solid tumors. The recent studies regarding HIFU treatment for treating liver tumor have depicted promising results out of this technology for this type of tumor which has always been a challenge for all researchers as well as surgeons because of continuous movement of liver tissues due to continuous breathing. This HIFU technique is an excellent alternative to conventional tumor treatment methods due to its non-invasive nature and fast recovery time [11]. The HIFU treatment can be delivered via one of the two mechanisms, i.e., via thermal effect or via mechanical effect [12] while thermal effect being the more dominant method due to its mechanism of creating extra damage of target tissue due to excessive heat generated there; however, few studies suggested to introduce exogenous synergists so as to exploit the pure mechanical effect of HIFU by adjusting the in sonication parameters which results in increase in treatment efficacy and is also responsible for prevention of unwanted heat-related side effects. In order to deliver such treatment method, the equipment required for this method needs to be designed with high level of accuracy. The major parts being the function generator for generating a high frequency, the power amplifier for providing high power to the high-frequency ultrasound waves and the transducer for focusing these

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high-frequency high-power ultrasound waves at the target tissue site. The function generator and the power amplifier have been designed using state-of-the-art active elements, while the transducer has been simulated for more accurate center frequency, i.e., 1 MHz with reduced power of 60 watts as compared to the band of frequencies, i.e., 0.8–1.6 MHz with power output of 70 watts. The results were generated in Multisim Version 12.0 software for function generator and power amplifier while MATLAB software was used for generation of results for transducer.

## **2 Literature Survey**

### ***2.1 Liver Tumor and Available Treatments***

The various methods available for treatment of liver tumor are liver transplant, freezing cancer cells, injecting chemotherapy drugs, heating cancer cells, targeted drug therapy, injecting alcohol and high-intensity focused ultrasound (HIFU). Out of all these methods, the HIFU method is the most advanced method for treating liver tumor at various stages. In this method, the tumorous cell is ablated due to high-intensity ultrasound beams focused at it. It is the only non-invasive method that has more fast recovery time.

### ***2.2 Liver Tumor and High-Intensity Focused Ultrasound***

The authors in [13], Kim and et al., said that the treatment given to primary liver cancer patients with HIFU along with transarterial chemo embolization (TACE) depicts little damage of normal liver tissues along with higher overall remission rate as compared to treatment given with TACE alone.

In [14], the authors conducted the HIFU ablations on 15 patients in Phase I–IIa. 30 HIFU ablations were created by them very precisely with a precision of 1 to 2 mm within 40 s, and they observed that the ablation size is typically dependent upon the transducer characteristics; however, a typical size of lesion is generally found to be of 1.3 mm in transverse and 8 to 15 mm along the beam axis of the transducer.

In [15], the authors Ulrik Carling and et. al. conducted HIFU ablation of liver in six male land swine under general anesthesia. These ablations were made using a frequency of 1.2 MHz with a power of 200 W. The patients immunity for any treatment is a major concern before planning any treatment method for him. It was Baofengma and et.al in [16] who presented the clinical observations of a study carried out on 96 patients with primary liver cancer, out of which there were 66 males and 30 females. In their research work, they observed the patients for three months after giving the HIFU treatment and their observation concluded that the symptoms of Jaundice, the

pain in the abdomen, the anorexia and ascites were relieved as compared to their values observed before the treatment.

### **2.3 Active Elements**

The operational amplifiers had been versatile building blocks until their performance was found to be less as compared to the current driven latest state-of-the-art active elements [17]. The current conveyor introduced by Sedra and Smith in 1968 was the initial breakthrough for development of active elements that were found to be more expedient than operational amplifiers. It was in 1996 that first CMOS-based differential operational floating amplifier was introduced that was further used for implementing current mode filters [18]. Sooner more members for the family of active elements came into existence like current differencing buffered amplifier (CDBA), fully differential current conveyor (FDCCII), voltage current controlled conveyor transconductance amplifier, voltage differencing transconductance amplifier (VDTA), CMOS realization of voltage differencing buffered amplifier (VDBA), and many more [19–25].

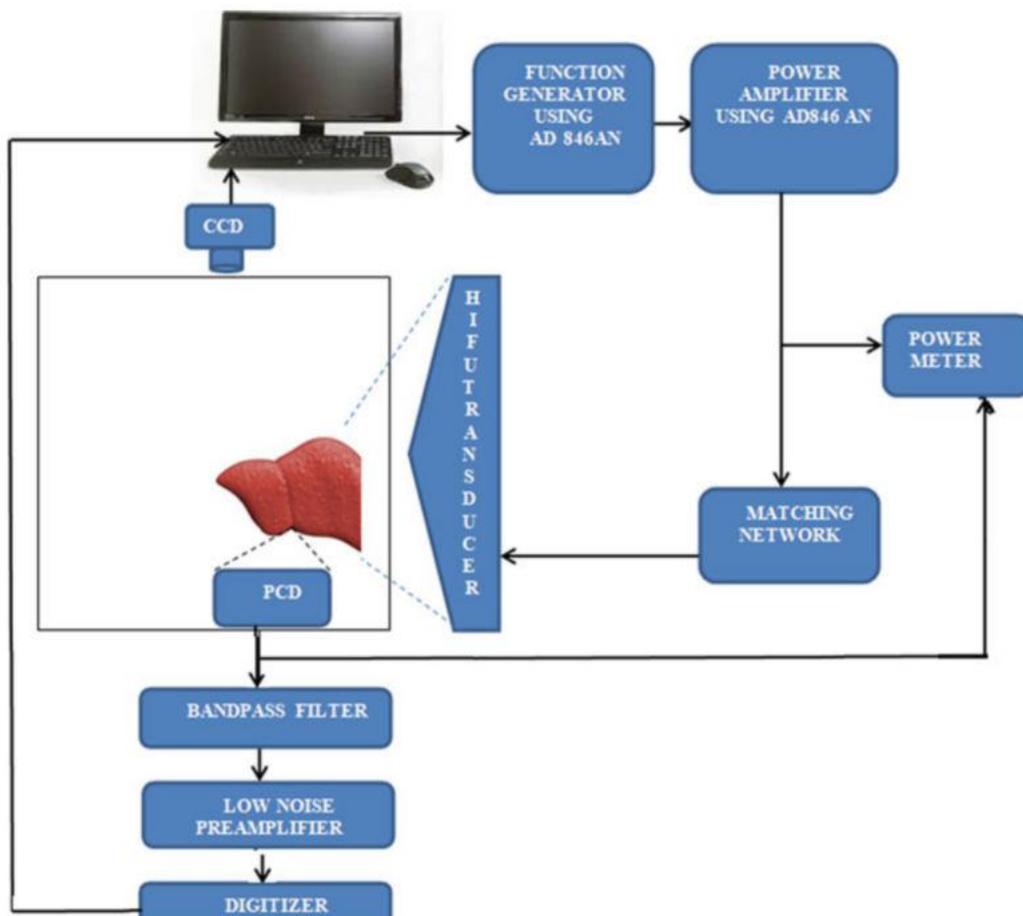
### **2.4 HIFU Transducers**

The authors Raffaula Righetti and et al. used a HIFU transducer that was air backed, single and spherical with center frequency at 1.5 MHz approximately, 80 mm radius of curvature and 100 mm diameter to generate the focused ultrasound field. This transducer maintained the RF power of 20 W and generated the lesions of liver tumor cells by exposing them to focal intensities ranging between 750 and 1565 W cm<sup>-2</sup>. The time for sonication was varied from 8 to 20 s [26]. Allain Sibbille and et. Al. performed several clinical experiments with extra corporeal HIFU on rabbit liver. They created a lesion of coagulation necrosis of tumorous liver tissue [27]. The authors Song Peng and et.al in [28] used the lower transducer out of lower and upper transducer of HIFU machine, i.e., FEP-BY02 made by China. They adjusted the treatment power as per the tumor dimensions and its location. The transducer used by them was a phased array transducer with 251 elements and was built using piezo lead zirconate (PZT) material. The HIFU transducers aperture was of 37 cm in diameter with 255 cm of focal length.

### 3 Experimental Configuration and Working Mechanism of HIFU Equipment

The experimental configuration used for HIFU equipment is depicted in Fig. 1. Its main blocks consist of a computer system, function generator, power amplifier, power meter, matching network, HIFU transducer, phantom (of Liver), phantom cavity detector (PCD), band pass filter, low noise preamplifier and digitizer.

The computer system with HIFU software loaded in it is used to send starting pulse to function generator to produce high-frequency pulses of 1 MHz. These high-frequency pulses are fed to high-frequency power amplifier to produce high frequency with 60 W power which is measured by the power meter continuously. These high-frequency pulses are then given to the matching network before feeding them to the HIFU transducer. The HIFU transducer focuses these high-frequency pulses at phantom at the focal length of 8.99 cm. The HIFU transducer is selected whose outer radius is 2.5 cm, inner radius is 1 cm, focusing depth is 10 cm, working frequency is 1 MHz, output power is 60 W.

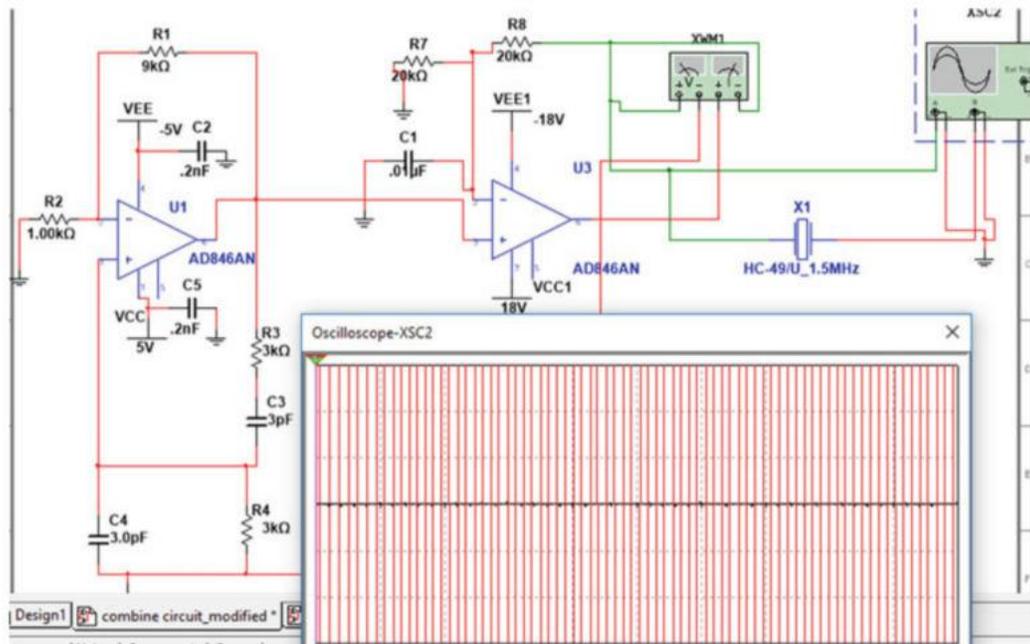


**Fig. 1** Experimental configuration of HIFU equipment

The high-frequency ultrasound waves are hit by the target which results into the generation of reflected echo signals that are captured by PCD, i.e., phantom cavity detector which is again a type of transducer that receives the echo signals from phantom. These signals are filtered by bandpass filter so as to eliminate the unwanted signals coming from the system. These filtered signals are further amplified using low noise preamplifier. In this block, the noise from received echo signals is minimized and the strength of such signals is raised. Since these signals need to be analyzed to take further decisions on creating lesions at target tissues in phantom, a digitizer is used for converting the echo signals into digital signals. These digital signals are then fed to the computer system where the preloaded software is capable to take further decisions on the basis of such received echo pulses.

### 3.1 Circuit Implementation Using Multisim Software

The HIFU equipment's main blocks excluding the transducer part were implemented using Multisim software. Fig. 2 depicts the implementation of oscillator (as the main part of function generator), power amplifier, power meter and matching network implemented using Multisim software. The oscillator and power amplifier have been implemented using the state-of-the-art active elements AD846AN [29, 30].



**Fig. 2** Implementation of proposed model using active element AD846AN

### 3.2 Circuit Implementation Using MATLAB Software

The transducer has been implemented using MATLAB software in which the different parameters of the transducer were fed in using HIFU Simulator toolbox. The equation coefficients for simulating the transducer using MATLAB are given below:

1. Peak Pressure at transducer face( $P_0$ )

$$= \sqrt{(2 * \rho * c * P / \Pi / ((a/100)^2 - (b/100)^2)}$$

where,

- $\rho$  Mass density of phantom in  $\text{kg/m}^3$
- $c$  Small-signal sound speed = 1482 m/s
- $P$  Output power of transducer = 60 W
- $a$  Outer radius of transducer = 2.5 cm
- $b$  Inner radius of transducer = 1 cm.

2. Nonlinear coefficient

$$= 2 * \Pi * P_0 * \beta * (d/100) * f / \rho / c^3$$

where,

- $P_0$  Peak pressure at transducer face in  $\text{kg/m}^3$
- $\beta$  Nonlinear parameter = 3.5
- $d$  Focusing depth of transducer = 8.99 cm
- $f$  Frequency of transducer = 1 MHz.

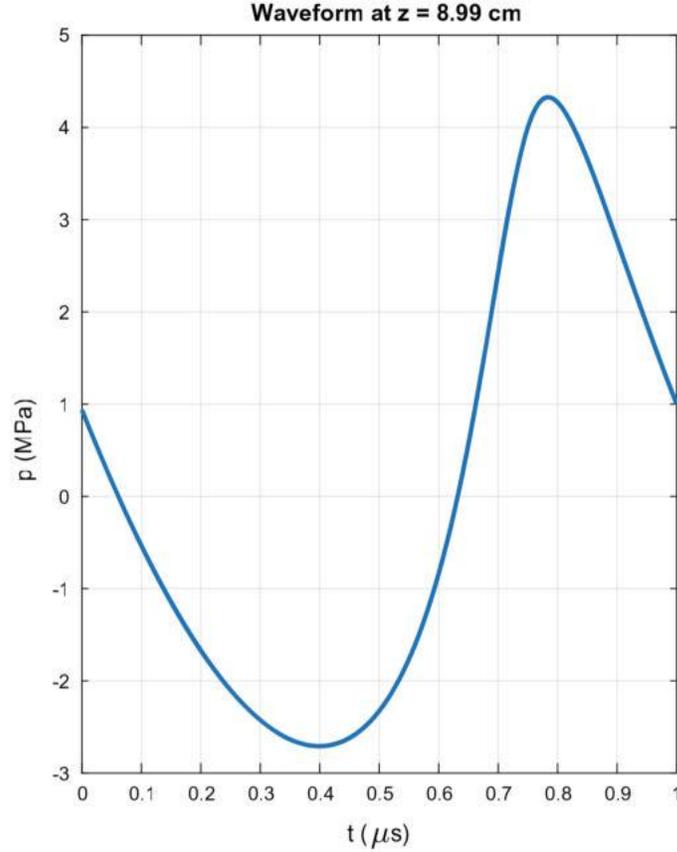
3. Linear Pressure Gain

$$= \Pi * (a/100)^2 * f / c / (d/100).$$

The various graphs obtained after simulating KZK equation in MATLAB are shown in Figs. 3, 4, 5, 6, 7, 8, 9 and 10.

In Fig. 5, it is observed that a peak pressure of 4 MPa is observed within short sonication period of 0.8  $\mu\text{s}$  while it is clear in Fig. 6 that this peak pressure is observed at an axial distance of around 9 cm. In Fig. 7, the focal intensity with transducer whose radius of curvature is 0.5 cm is observed to be of around 250  $\text{W/cm}^2$ , and Fig. 8 depicts that this intensity comes at a little less axial pressure of around 3.5 MPa. The radial heating rate is observed to be of more than 35  $\text{W/cm}^3$  at the focal depth which gives rise to axial heating rate of more than 50  $\text{W/cm}^3$  that gradually leads to focal intensity of around 350  $\text{W/cm}^2$ , and this heating rate becomes sufficient to create coagulative necrosis of phantom tissue immersed in degassed water tank as shown in Fig. 4. This irreversible cell death leads to lesion that removes the tumorous tissue permanently from the phantom.

**Fig. 3** Temporal waveform (on axis) at distance where peak pressure occurs



## 4 Result and Analysis

The circuit implementation of proposed model was done using Multisim 12.0 software and MATLAB software. The design and simulation of high-frequency oscillator and high-frequency and high-power amplifier has already been described in [29, 30]. The simulation results of HIFU transducer are mentioned below.

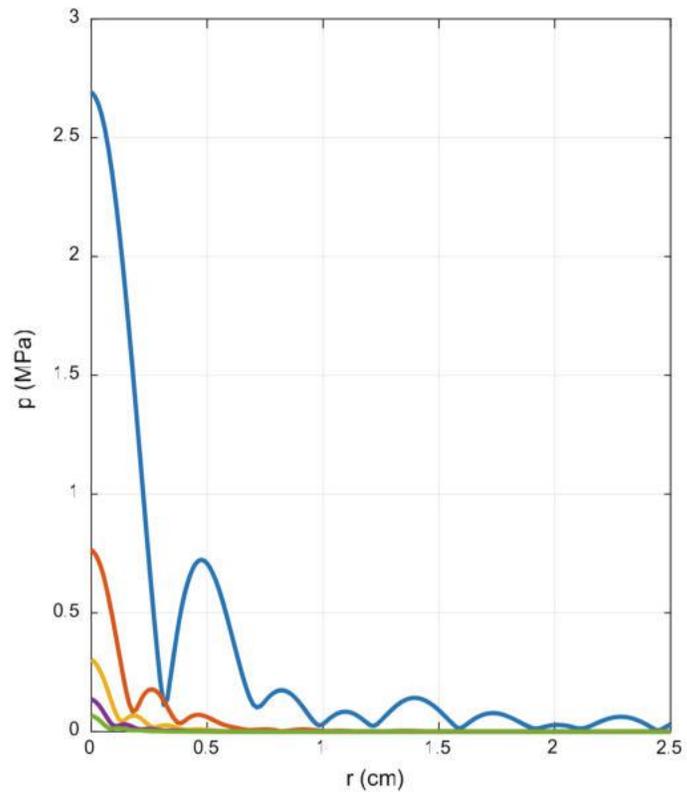
### 4.1 Simulation of High-Frequency Ultrasound Transducer

The HIFU transducer was simulated with the help of KZK equation given below:

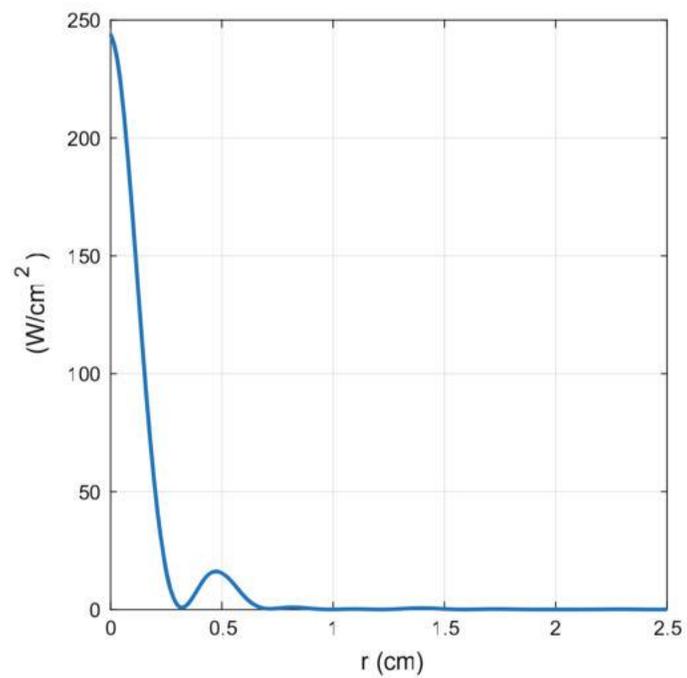
$$\frac{\partial}{\partial \tau} \left( \frac{\partial p'}{\partial x} - \frac{\varepsilon}{\rho_0 c_0^3} p' \frac{\partial p'}{\partial \tau} - \frac{b}{2\rho_0 c_0^3} \frac{\partial^2 p'}{\partial \tau^2} \right) = \frac{c_0}{2r} \frac{\partial}{\partial r} \left( r \frac{\partial p'}{\partial r} \right) \quad (1)$$

where,  $p'$  is acoustic pressure,  $\rho_0$  is medium density at rest,  $c_0$  is speed of sound,  $\varepsilon$  is nonlinearity parameter,  $b$  is dissipation coefficient of the medium,  $\tau = t - x/c_0$  is time in the coordinate system. The results obtained after simulating the KZK equation given in (1) are depicted in Table 1. The density of material used for simulation

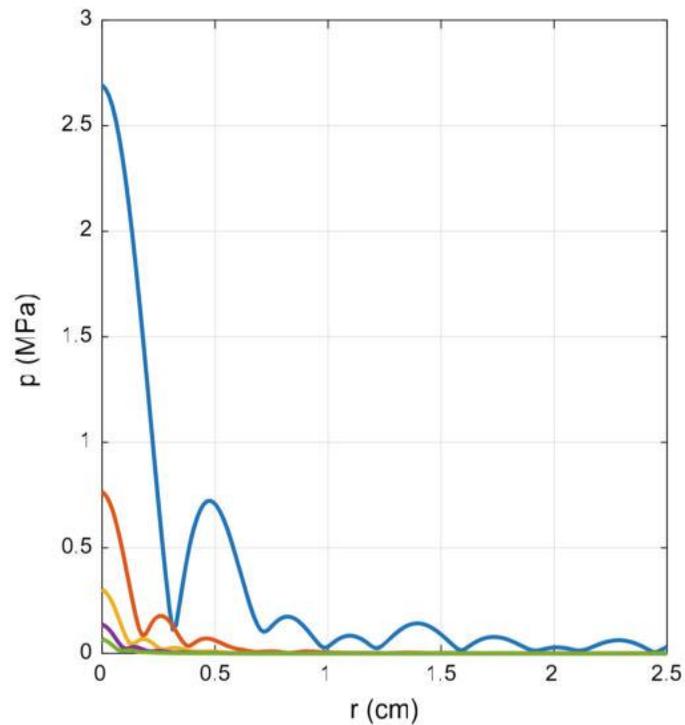
**Fig. 4** Axial pressure amplitude of the first five harmonics



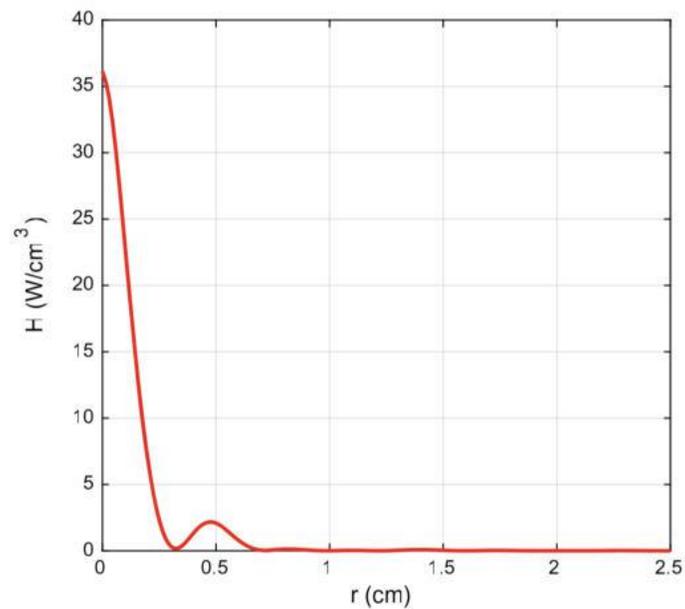
**Fig. 5** Radial intensity at focus



**Fig. 6** Radial pressure amplitude of the first five harmonics

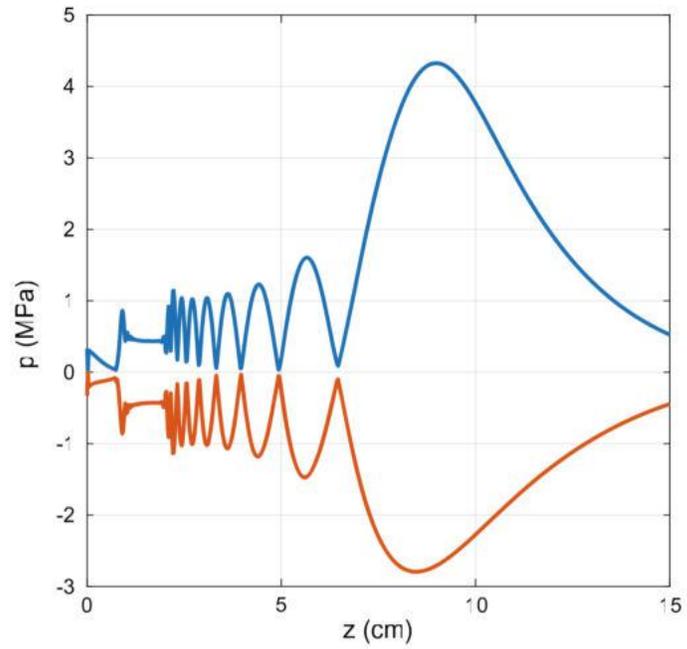


**Fig. 7** Radial heating rate at focus

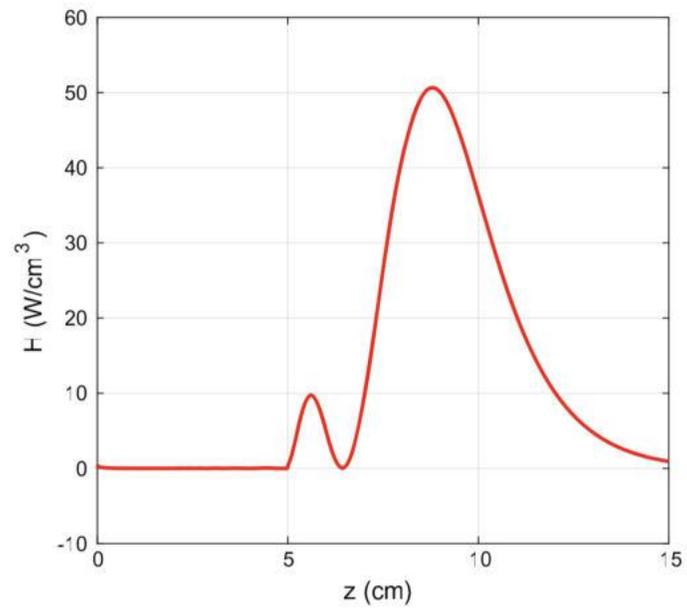


purpose is  $1000 \text{ kg/m}^3$  whose absorption at the frequency of  $1 \text{ MHz}$  is set around  $0.217 \text{ dB/m}$  maintaining the small-signal sound speed at  $1482 \text{ m/s}$  which is sufficient for the high-frequency ultrasound waves to reach at the target site. While the transition distance of material is fixed at  $5 \text{ cm}$ , the focusing depth is maintained at  $8 \text{ cm}$  and frequency of transducer is fixed at  $1 \text{ MHz}$  which is the improvement over past records

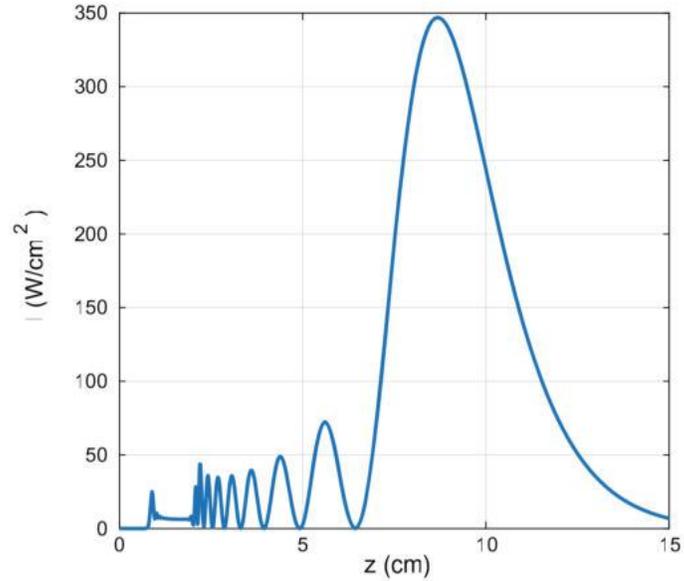
**Fig. 8** Axial peak positive and pressures



**Fig. 9** Axial heating rate



where the frequency is varied in the range of 0.8–1.6 MHz. With these settings, it is observed that the peak pressure is experienced after a time delay of just 0.8  $\mu$ s.

**Fig. 10** Axial intensity**Table 1** List of all HIFU transducer parameters (Calculated and observed ones)

Parameter	Symbol	Value	
Material related	Mass density	$\rho$	1000 kg/m <sup>3</sup>
	Absorption at 1 MHz	$\alpha$	0.217 dB/m
	Small-signal sound speed	$c$	1482 m/s
	Exponent of absorpition versus frequency curve	$\eta$	2
	Material transition distance	$z_0$	5 cm
	Nonlinear parameter	$\beta$	3.5
Transducer related	Outer radius	$a$	2.5 cm
	Inner radius	$b$	1 cm
	Frequency	$f$	1 MHz
	Focusing depth	$d$	8 cm
	Power	$p$	60 W
Computational domain	Max radius	$R$	a cm
	Max axial distance	$Z$	1.5 d cm
	Number of harmonics	$K$	128
Observations after simulation	Temporal waveform (on axis) at distance where peak pressure occurs	$\rho$ versus $t$	4 MPa < $\rho$ < 5 MPa at around 0.8 $\mu$ s
	Radial Intensity at focus	$I$ versus $r$	250 W/cm <sup>2</sup> at 0 cm
	Radial heating at focus	$H$ versus $r$	36 W/cm <sup>3</sup> at 0 cm
	Axial heating rate	$H$ versus $z$	50 W/cm <sup>3</sup> at < 10 cm
	Axial intensity	$I$ versus $z$	350 W/cm <sup>2</sup> at < 10 cm

## 5 Conclusion

The coagulative necrosis of liver tumorous tissue is possible in more effective way while maintaining the parameters of the required HIFU transducer at more comfortable and accurate ranges instead of a wide range that ultimately leads to increase in treatment time due to more adjustments in the transducer parameters even for the same patient. Also, the improvised HIFU equipment with the help of latest active elements will be a boon in improving the treatment time and thus reducing the anxiety of patients at the treatment table. This HIFU equipment gives high accuracy with repeatable results as is visible in result section.

## 6 Future Scope

The HIFU equipments are the need of future medical treatment techniques for various diseases. Diagnosing and planning treatment for patients with the help of previous case histories shall reduce the treatment time and can help radiologists to plan the treatment procedure more accurately when they shall be provided the database of such cases. Hence, with the introduction of artificial intelligence and smart database maintenance in future shall undoubtedly ensure its more effective utility in medical world.

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Dr. Madan Mohan Sahu

Dr. Rajendra G. Patil

Dr. Anil Singh Yadav

Dr. Vikas Pare

Dr. Vipin Shrivastava

Dr. Yogesh Dewang

Dr. V. N. Bartaria

Dr. Neeraj Dubey

Dr. T Ravi Kiran

Dr. Arun Kumar Wamankar

Dr. Shubha Agrawal

Dr. Anil Ku. Saxena

Dr. Sushil Kumar Mittal

Dr. Praveen Kumar Singhai

Dr. Soumitra Chakraborty

Dr. Amit Shrivastava

Dr. Sachin Tiwari

Dr. Anand Singh

Dr. Amol Barve

Dr. Anwar Ahmad Ansari

Dr. K.N. Shukla

Dr. Manju Khare

# RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

Accredited with 'A' grade by NAAC



Rajiv Gandhi Proudhyogiki Vishwavidyalaya (RGPV), accredited with 'A' grade by NAAC, established in the year 1998 is truly a picture of modernization offering learner-centric programmes in Engineering, Pharmacy, Architecture & Management. University is sprawled over a vast campus of 241.4 acres, marching towards development into a center of excellence in the arena of Technical Education, Research and Innovations.

Under its umbrella there are 05 UTD's 188 affiliated Engineering Colleges, 69 Pharmacy Colleges, 25 MCA Colleges and 05 Architecture colleges imparting Graduate level instructions running 23 under graduate level courses & 84 post graduate level courses. Situated amidst an aesthetic and hilly surrounding the University is offering Ph.D. in eight faculties. RGPV has been selected by Ministry of Human Resource Development (MHRD) as one of the Affiliating Technical Universities (ATUs) among ten across the country for receiving TEQIP-III grant. The main objective of Faculty Development Programme (FDP) is to improve quality and equity in engineering teachers in order to up-grade the knowledge, enhancing research and teaching skills.

# JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD (TELANGANA)

Accredited with 'A' grade by NAAC



Jawaharlal Nehru Technological University, Hyderabad, was established on 2nd October 1972 by the Legislature of the State of Andhra Pradesh as the first Technological University in the country. After 36 years of existence it was restricted into 4 different Universities by the Government vide Government Ordinance No.30 dated September 2008 and this new University has been designated as Jawaharlal Nehru Technological University Hyderabad (JNTUH). It has been in the forefront for the past 44 years in providing quality technological education and situated in a sprawling 89-acre campus at Kukatpally,

Hyderabad. It has now Four Constituent Engineering Colleges and 15 other constituent units in Hyderabad campus.

JNTUH offers B.Tech. programmes in 21 disciplines and B.Pharm at UG level; Integrated 5-year dual degree Masters programme; M.Tech. Programmes in 68 disciplines, M.Pharm. in 11 disciplines; M.Sc. in 4 disciplines; MCA, MBA and Double Degree Programmes at P.G. level; in addition to M.S., M.Phil., Ph.D. Research Programmes in various disciplines of Engineering, Technology, Science, Management and Humanities. JNTUH has 300 affiliated colleges spread over the Telangana State. JNTUH has more than 3.50 lakhs students on rolls. The University has Memoranda of University with many National and International organizations. JNTUH is identified as TEQIP-III University under subcomponent 1.3ATU.

# LNCT GROUP OF COLLEGES



LNCT Group of Colleges is one of the oldest and largest educational group in central India. Founded in 1994 Lakshmi Narain College of Technology, Bhopal has the privilege of being the First Private (self financed) institute of M.P. , LNCT Group offers program from Diploma, Bachelor, Master's and Doctorate level programs. With campuses in five locations in Madhya Pradesh &

Chhattisgarh including the cities of Bhopal, Indore, Gwalior, Jabalpur and Bilaspur to meet the ever increasing demands of higher education in central India, LNCT Group is one of the largest Group central India to offer programs in field of study: Engineering, Management, Pharmacy, Medical, Homeopathy, Dental and professional studies. This includes the students a feeling of responsibility and concern and makes them comprehend the world a bit better. Each one is better endowed to face the world and the satisfaction of having fulfilled their social responsibility is an added bonus.

The L. N. Medical College & Research Centre located at Bhopal, MP. It is a part of LNCT Group of College, which are runs a hospital with 750 Beds and Medical courses affiliated with Barkatullah University, All group institutions have the finest relations among the industry and academics. Today, prospective students will find 58 undergraduate, graduate as well as post graduate programs. People who wish to pursue a career in Engineering, Management, Pharmacy, Medicine, Dentistry and Nursing.

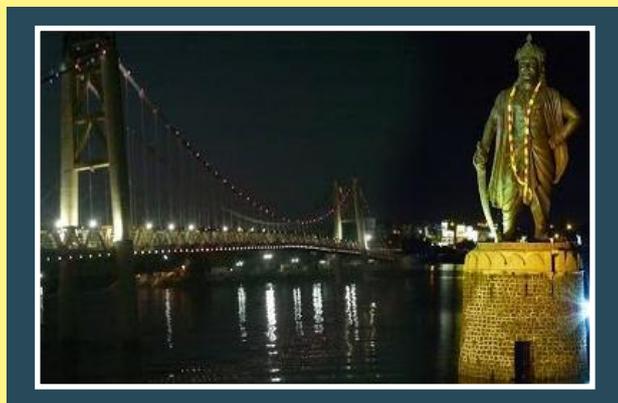
## **ABOUT ORGANIZING INSTITUTE & DEPARTMENT**



Lakshmi Narain College of Technology & Science, Bhopal is devoted to excellence in teaching, research and innovation and to develop leaders who will make a difference to the world. LNCT&S, which is based in Bhopal since 2006. The record breaking placement at LNCT&S is an apt testimony to its focus on upholding the highest academic standards right from selecting top faculty, introducing world class pedagogical practices to personality development to the students.

The department of Engineering Mathematics, one of the vibrant department of the institution, established in the year 2006. Department functions as a service agency providing support to UG inculcate analytical skills in mathematical sciences so as to enable the students to apply and formulate in solution making approaches of their technical subjects. Definitely the learning of mathematics will enhance and widen the mathematical aptitude, analytical skills, logical reasoning and systematic thinking of the students.

## **ABOUT BHOPAL**



Bhopal, capital city of Madhya Pradesh, is known as city of lakes. Founded by Raja Bhoj, the city has many natural and artificial lakes and it is one of the greenest cities in the country. The main cultural center of Bhopal is Bharat Bhavan. The State Museum has fossils, paintings and rare Jain sculptures. Taj-ul-Masjid is one of Asia's largest mosques, with white domes, and minarets. Van Vihar National Park, located in the middle of the city, has many species of animals living in their natural habitat. A large number of institutes of national importance have been

established in Bhopal. Climate of Bhopal is pleasant in the month of November.

## ABOUT INTERNATIONAL CONFERENCE

The purpose of this international conference is to discuss recent findings and new emerging trends in the field. It is intended to promote fruitful collaboration between various communities and institutes by bringing together a small number of scientists in inspiring surroundings. Some priority is given to young scientists to orally present and defend their own work. This will be a great opportunity for budding researchers particularly in the local region to explore the new aspects and global relations.

They would get ample scope to exchange views and thoughts besides presenting their research. The conference aims to provide a common platform to researchers working in various sub-disciplines of the theme.

## Course Objective

The course objective of this international conference is to bring together leading researchers and academics in the field of applied mathematics and engineers in order to debate current and interdisciplinary topics in mathematical modelling and high performance computing and their applications in science. The aim of this conference is to promote the interconnection of mathematical modeling, and High performance computing used in solving complex (real-world) problems. The lectures will be prepared with a broad multidisciplinary audience in mind, and ranging from modeling to scientific computing, will be covered. All submitted papers will be peer-reviewed by referees and accepted papers with great quality will be published in **International Journal of Scientific Research in Mathematical and Statistical Sciences (UGC Approved, Journal No. 63061)**.

**Main topics:** Mathematical modelling and High-Performance Computing in Science and Technology is a premier international conference on topics at the confluence of high performance and large scale computing systems, their use in modeling and simulation, their design, performance and use, and their impact, and related issues.

- ◆ Mathematical modeling the future Internet and developing future Internet security technology
- ◆ High Performance Computing (HPC)
- ◆ Mathematical Models and Information-Intelligent Systems on Transport
- ◆ Computational Methods for Linear and Nonlinear Optimization
- ◆ Numerical Methods for Solving Nonlinear Problems
- ◆ Bio-mathematics
- ◆ Mathematical Models for Computer Science
- ◆ Industrial Mathematics
- ◆ Mathematical Models for Computer Science
- ◆ Computational Modeling in Engineering and Science
- ◆ Mathematical modelling of Man-made Natural disasters: forest fire & environmental pollution
- ◆ Numerical Linear Algebra Methods for Large Scale Scientific Computing
- ◆ Machine Learning Techniques in Bioinformatics
- ◆ Processing, modelling, and describing time series

जीतू पटवारी

मंत्री,

खेल एवं युवा कल्याण, उच्च शिक्षा,  
मध्यप्रदेश शासन



कार्यालय भोपाल :

डी-13, 74 बंगला, भोपाल (म. प्र.)

दूरभाष क्र. : 0755-2441620, 2446227

जावक क्र. 785.....

दिनांक 03/02/2020.....

## MESSAGE

It gives me immense pleasure to know that the Department of Engineering Mathematics, Lakshmi Narain College of Technology & Science, Bhopal, is Organizing **"International Conference on Mathematical Modeling and High Performance Computing in Science and Technology (ICMMHPCST-2020)"** sponsored by TEQIP-III, Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal (Madhya Pradesh) and in association with Jawaharlal Nehru Technological University, Hyderabad (Telangana) on February 12-13, 2020.

A galaxy of scientists and mathematicians, not only in India but across the globe, are coming to attend the International Conference.

I extend my best wishes to participants, members of managing committee and organizers of the International Conference (ICMMHPCST-2020) a grand success and also for the successful publication of the Souvenir and in all its future endeavors.

(Jitu Patwari)

कार्यालय इन्दौर : मेन रोड बिजलपुर, राजेन्द्र नगर थाने के सामने, ए. बी. रोड, इन्दौर (म. प्र.)—452012

टेलीफैक्स : 0731-4983133

ई-मेल : highedu.ministrymp@gmail.com / sports.youthministrymp@gmail.com



**Prof. Sunil Kumar**  
Vice-Chancellor

राजीव गांधी प्रौद्योगिकी विश्वविद्यालय  
(मध्यप्रदेश का तकनीकी विश्वविद्यालय)  
**Rajiv Gandhi Prodyogiki Vishwavidyalaya**  
(State Technological University of Madhya Pradesh)

Do Letter No. *RGPV/VCO/2020/19.*  
दिनांक/Date *27-01-2020*

### MESSAGE

It gives me immense pleasure to learn that Department of Engineering Mathematics, **Laxmi Narayan College of Technology and Science, Bhopal** under the sponsorship of TEQIP-III, Rajiv Gandhi Prodyogiki Vishwavidyalaya, MP is organizing an International Conference on "**Mathematical Modeling and High Performance Computing in Science and Technology (ICMHPCST -2020)**" on February 12-13, 2020.

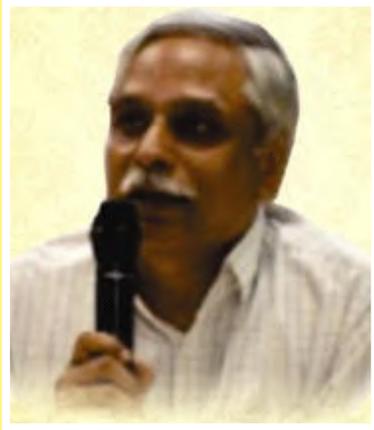
Mathematics is the backbone for the development of scientific and technical fields, scientific computing, the thrust area provides the basis for all round development of humanity and improvement of its well being.

I hope this Conference will provide a forum for interaction of researchers in the field of mathematical science, computer science and interdisciplinary researchers.

I am glad that **Laxmi Narayan College of Technology and Science, Bhopal** is providing the opportunity to large number of professional, academicians and researchers to generate high level of intellectual deliberations and would inspire younger scientists and faculty to go to greater heights.

My warm greetings to the organizers and wish the Conference all success to achieve its desired goals.

(Prof. Sunil Kumar)



**Dr. S.C Choube**

Coordinator TEQIP-III

Rajiv Gandhi Proudyogiki Vishwavidyalaya  
Bhopal (M.P.)

## MESSAGE

It's delightful to learn that the Department of Engineering Mathematics, Lakshmi Narain College of Technology & Science, Bhopal, is Organizing “**International Conference on Mathematical Modeling and High Performance Computing in Science and Technology (ICMMHPCST-2020)**” sponsored by TEQIP-III, Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal (Madhya Pradesh) in association with Jawaharlal Nehru Technological University, Hyderabad (Telangana) on February 12-13, 2020.

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I extend my best wishes to participants, members of managing committee and organizers of the **ICMMHPCST-2020** a grand success and also for the successful publication of the Souvenir and in all its future endeavors.

A handwritten signature in black ink, which appears to read 'S.C. Choube'. The signature is written in a cursive style and is positioned above a horizontal line.

**(Dr. S.C. Choube)**



**Jai Narayan Chouksey**  
Chancellor LNCT, University, Bhopal  
&  
Chairman LNCT Group of Colleges, Bhopal

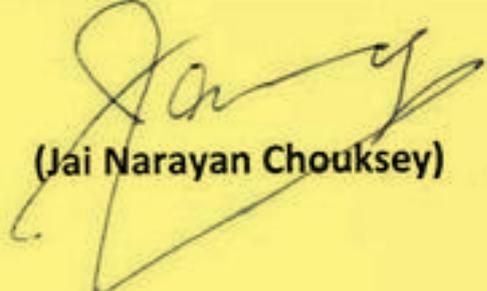
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“**ICMMHPCST-2020**” is successive efforts in the series of Mathematical Modeling and High Performance computing for the enhancement of knowledge and interest of one and all n research scholar and faculty members.

This conference is serving as an open platform for promoting and upbringing knowledge in the relevant area.

I heartily wish for the success of this conference and hope that all those are associated with this venture may achieve the most out of it.



(Jai Narayan Chouksey)



**Poonam Chouksey**  
Vice- Chair Person  
LNCT Group of Colleges, Bhopal

## MESSAGE

I am pleased to know that the Department of Engineering Mathematics, Lakshmi Narain College of Technology & Science, Bhopal, is Organizing **“International Conference on Mathematical Modeling and High Performance Computing in Science and Technology (ICMMHPCST-2020)”** sponsored by TEQIP-III, Rajiv Gandhi Proudhyogiki Vishwavidyalaya, Bhopal (Madhya Pradesh) in association with Jawaharlal Nehru Technological University, Hyderabad (Telangana) on **February 12-13, 2020.**

The topics to be covered in this International Conference are comprehensive and will be adequate for developing and understanding about new developments and emerging trends in this area. I hope the goal of the conference is to update the knowledge of faculty members, young researchers and PG students. I shall be glad to receive a path forward drawn from the conference.

I congratulate the organizers for taking this initiative and extend my best wishes for the successful conduction of event.

  
(Poonam Chouksey)



**Dr. Anupam Chouksey**  
Secretary,  
LNCT Group of Colleges, Bhopal

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**(Dr. Anupam Chouksey)**



**Shweta Chouksey**  
Director  
LNCT Group of Colleges, Bhopal

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(Shweta Chouksey)



## Dr. Ashok Kumar Rai

Director, Administration, LNCT, Bhopal  
Conference Convener (ICMMHPCST-2020)

### MESSAGE

It is the matter of great pleasure and pride that the Department of Engineering Mathematics, Lakshmi Narain College of Technology & Science, Bhopal, is Organizing “**International Conference on Mathematical Modeling and High Performance Computing in Science and Technology (ICMMHPCST-2020)**” sponsored by TEQIP-III, Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal (Madhya Pradesh) and in association with Jawaharlal Nehru Technological University, Hyderabad (Telangana) on **February 12-13, 2020**.

This conference brings together leading academicians, scientists & researchers to exchange and share their experiences and research results in all aspects of Mathematical Modeling and High Performance Computing. It also provides a premier interdisciplinary platform for researchers, practitioners and educators to present and discuss the most recent innovations, trends and concern as well as practical challenges encountered and solutions adopted in the field of mathematical modeling and High Performance Computing.

We are grateful to all the delegates participating around the globe, the sponsors of this conference to help us in making this Endeavour a great success. On behalf of LNCT family, I wish all of you pleasant stay and fruitful participation in the conference.

A handwritten signature in black ink, appearing to read 'Ashok Rai'.

**(Dr. Ashok Kumar Rai)**  
**Conference Convener**  
**(ICMMHPCST-2020)**



**Dr. Anug Garg**  
Director, Training & Placement  
LNCT Group of Colleges, Bhopal

## MESSAGE

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ICMMHPCST-2020 is going to be a premier forum for presentation of new research and advances in this field and attract the industry people to get associated with the Lakshmi Narain College of Technology & Science, Bhopal.

I would like to encourage the academics fraternity to make use of this opportunity for themselves and thus contribute for the benefits of students and society

I whole heartily wish for the mega success of conference

A handwritten signature in black ink, appearing to read 'Dr. Anug Garg', written over a light yellow background.

**(Dr. Anug Garg)**



**Dr. Amit Bodh Upadhyay**  
OSD, LNCT&S, Bhopal

## MESSAGE

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A handwritten signature in black ink that reads 'Amit'.

**(Dr. Amit Bodh Upadhyay)**



**Dr. Sunil Singh**  
OSD, LNCTE, Bhopal

## MESSAGE

I am happy to know that the Department of Engineering Mathematics, Lakshmi Narain College of Technology & Science, Bhopal, is Organizing “**International Conference on Mathematical Modeling and High Performance Computing in Science and Technology (ICMMHPCST-2020)**” sponsored by TEQIP-III, Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal (Madhya Pradesh) in association with Jawaharlal Nehru Technological University, Hyderabad (Telangana) on **February 12-13, 2020**.

The conference assumes significance in the context of increasing use of mathematical modeling and high performance computing. The technological institutes need to take academics leadership in this sphere. I hope the expert would focus attention on this aspect.

I wish the conference a grand success in its objectives.

A handwritten signature in black ink, consisting of a series of loops and a long vertical stroke, set against a light yellow background.

**(Dr. Sunil Singh)**



## Dr. Sanjeet Kumar

Professor & Head

Department of Mathematics, LNCT&S, Bhopal  
Conference Coordinator (ICMMHPCST-2020)

## MESSAGE

I feel so enthusiastic to share that the Department of Engineering Mathematics, Lakshmi Narain College of Technology & Science, Bhopal, is Organizing “**International Conference on Mathematical Modeling and High Performance Computing in Science and Technology (ICMMHPCST-2020)**” sponsored by TEQIP-III, Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal (Madhya Pradesh) in association with Jawaharlal Nehru Technological University, Hyderabad (Telangana) on **February 12-13, 2020**.

The combination of mathematical modeling and high performance computing is very often ignored in the scientific community although only the combination of these two technologies allows us to get better simulation results for many pressing problems in science and engineering.

The presence of large number of professionals, academicians and researchers would be able to generate high level of intellectual deliberations and would inspire younger scientists and faculty to go to greater heights.

I am sure the delegates and speakers will enjoy the Sessions and will carry with them pleasant memories of the Conference and the College Campus. I hope the Conference will create a strong group of specialists in the area of High Performance Computing and its Applications.

A handwritten signature in black ink, appearing to read 'Sanjeet Kumar', with a large, stylized flourish extending from the end.

**Dr. Sanjeet Kumar**

1. <b>Mathematical Modeling: An application to Corrosion in a Petroleum Industry</b>	<b>01</b>
<i>Arihant Jain</i>	
2. <b>Evaluation of some parameters of <math>Gd^{3+}</math> activated <math>Sr_2ZnSi_2O_7</math> host lattices synthesized by sol-gel procedure</b>	<b>01</b>
<i>Vijay Singh, S.Kokate, Manoj K. Tiwari, N. Singh and R. Kokate</i>	
3. <b>Face Recognition from Surveillance using Sequential CNN-Model</b>	<b>02</b>
<i>Ashwin Perti, Mukul Pratap Singh, Harsh Panwar and Harsh Tyagi</i>	
4. <b>Some Elliptic-Type Integrals and Their Hypergeometric Forms</b>	<b>02</b>
<i>Sanjay Sharma, Richa Gupta, Bhupendra Tripathi, Roshni Sharma</i>	
5. <b>Mathematical Modeling of Man- Made Natural Disasters: Forest Fire &amp; Environmental Pollution</b>	<b>03</b>
<i>Kirti Verma</i>	
6. <b>An analysis of Operational Efficiency of Major Airports in India</b>	<b>03</b>
<i>Sapna and Ruchi Gupta</i>	
7. <b>Common Fixed Point Theorem for Weekly Compatible Self Mapping in Menger Space</b>	<b>04</b>
<i>Geetanjali Sharma, Richa Gupta, Pankaj Tiwari and Rajesh Shrivastava</i>	
8. <b>Common Fixed Points for a Pair of Self Mapping in Generalized Menger Spaces with a Graph</b>	<b>04</b>
<i>N. S. Rajpoot, Brajendra Tiwari, Pankaj Tiwari and Bhupendra Tripathi</i>	
9. <b>Some Fixed Point Theorem Satisfying General Contractive Condition of Integral Type</b>	<b>04</b>
<i>Himanshu Tiwari and Subhashish Biswas</i>	
10. <b>Integral Relation of I-Function</b>	<b>05</b>
<i>Aradhna Mishra, Neelam Pandey and Jyoti Mishra</i>	
11. <b>Analytic Study of Fixed Point Theorems in a Soft Metric Space with Integral Type Mapping</b>	<b>05</b>
<i>Abid Khan, Ramakant Bhardwaj and Deepti Shakti</i>	
12. <b>Bianchi Type-I Bulk Viscous Cosmological Models with Decaying Cosmological Term</b>	<b>05</b>
<i>Abhay Singh, Bhupendra Tripathi and Roshni Sharma</i>	
13. <b>Fixed Point Theorem for <math>(\beta\alpha)</math>, Admissible Mappings in Metric-like space with respect to Simulation Function</b>	<b>06</b>
<i>Shiv Kant Tiwari and Lakshmi Narayan Mishra</i>	
14. <b>A Formal Solution of Certain Simultaneous Quadruple Integral Equations Involving I-Functions</b>	<b>06</b>
<i>R. K. Sakale</i>	
15. <b>Dynamics and stability analysis in the population dynamics by introducing a vaccination strategy and computational simulation</b>	<b>06</b>
<i>Rachna Soni</i>	
16. <b>On Vehicle routing Problem using Mixed Integer Non-Linear Programming</b>	<b>07</b>
<i>Mamta Raipuriya, Richa Gupta, Vivek Prasad Patel and Sushma Jat</i>	
17. <b>The Two Contiguous Hypergeometric Function of the Some Linear Combination</b>	<b>07</b>
<i>Aradhana Mishra &amp; Poonam Mishra</i>	
18. <b>Variational Inclusion Governed By <math>H(.,.)</math>- <math>\mu</math>- <math>\eta</math> Mixed Accretive Mapping</b>	<b>08</b>
<i>Sanjeev Gupta</i>	
19. <b>Solution for Congestion Control and Challenges of Mobile Ad Hoc Network</b>	<b>08</b>
<i>Harsh Pratap Singh, Divakar Singh, Rashmi Singh and Narendra Sharma</i>	
20. <b>The Direct Method for the Optimal Solution of a Transportation Problem</b>	<b>09</b>
<i>Priyanka Malviya, Sushma Jain and Rina Agrawal</i>	
21. <b>Coincidence Points &amp; Common Fixed Points of Expansive Mappings in <math>\mathbb{R}</math>-Metric Space</b>	<b>09</b>
<i>Anil Bakhru, Richa Gupta and Manoj Ughade</i>	
22. <b>Some Common Fixed Point Theorems in complete Fuzzy Metric Spaces</b>	<b>09</b>
<i>Ajay Soni and Pooja Jain</i>	
23. <b>Projective Semi-Symmetric Connections on Almost Para-Contact Manifolds</b>	<b>10</b>
<i>S. K. Pal, M. K. Pandey and R. N. Singh</i>	
24. <b>The Cosmic-ray Spectra at Spherical Termination Shocks</b>	<b>10</b>
<i>Brijesh Singh Chauhan</i>	
25. <b>Computational Numerical Methods for Solving Nonlinear Problems</b>	<b>11</b>
<i>Gurusharan Kaur &amp; Jyoti Gupta</i>	

26. <b><i>k</i>- Lipschitzian Mappings On Hyperconvex Metric Space</b>	11
<i>Qazi Aftab Kabir, Rupali Verma, Rizwana Jamal</i>	
27. <b>Fixed point results for F-contractive type mappings in Cone b-metric spaces</b>	12
<i>M.S. Chauhan, Rajesh Shrivastava, Rupali Verma and Qazi Aftab Kabir</i>	
28. <b>Review on Performance Analysis and Flow Features of Swirl Diffuser in a Floor Based Air Conditioning System</b>	12
<i>Deenoo Pawar, Anil Chourasia, Sandeep Mahore and Sachin Kumar Nikam</i>	
29. <b>Mathematical Modeling of Dilute Biphasic Fluid Flow in Industrial Aero-cyclone Dust Separators</b>	13
<i>A N Sinha, V N Bartaria and Rakesh Dwiwedi</i>	
30. <b>Fuzzy EOQ Inventory Model Using Trapezoidal Fuzzy Number with Shortages</b>	14
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## Mathematical Modeling: An application to Corrosion in a Petroleum Industry

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**Abstract:** Mathematical modeling is richly endowed with many analytic computational techniques for analyzing real life situations. Recent reports have confirmed that several billion dollars were lost to corrosion, in addition to environmental pollution and economic wastage in cleaning up the environmental mess caused by corrosion. This paper considers application of mathematical modeling to corrosion problems. It uses the mathematical modeling techniques to forecast the life expectancy of industrial equipment in the refinery, petroleum reservoirs and gas pipelines' distribution. The models considered in this direction are the heat-mass transfer equation, Zhim-Hoffman's equation, equations arising from electrolysis and finally gas pipeline distribution.

**Keywords and Phrases:** Mathematical models, corrosion, phase transition, heat equation, galvanic corrosion.

**AMS Subject Classification :** 73V and 80A.



## Evaluation of some parameters of $Gd^{3+}$ activated $Sr_2ZnSi_2O_7$ host lattices synthesized by sol-gel procedure

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**Abstract:** In this study, a series of  $Sr_{2-x}ZnSi_2O_7 \cdot xGd$  (where  $x = 0.01$  to  $0.11$ ) samples were synthesized using the sol-gel procedure. X-Ray powder diffraction (XRD), scanning electron microscope (SEM), and photoluminescence (PL) spectroscopy were employed to analyze the crystal characteristics, surface morphologies, and spectral characteristics of these samples. The dominant emission peak due to  ${}^6P_{7/2} \rightarrow {}^8S_{7/2}$  transition of  $Gd^{3+}$  was obtained for the prepared samples. The electron spin resonance (ESR) and PL analyses of the samples confirmed the presence of the  $Gd^{3+}$  in the  $Sr_2ZnSi_2O_7$  lattice. ESR studies suggested that  $Gd^{3+}$  ions occupy distorted  $Sr^{2+}$  sites in the host lattice. Photon interaction parameters in the photon energy range 1 keV–100 GeV for mixture of  $Sr_2ZnSi_2O_7$  and gadolinium (mass attenuation coefficients and effective atomic numbers) for have been calculated. These photon interaction parameters are varying largely for the energy range 1 keV–100 MeV with the compositions with a maximum for the highest gadolinium.

**Keywords:** Ultraviolet radiation; Sol-gel; ESR;  $Gd^{3+}$ ;  $Sr_2ZnSi_2O_7$ ; Gamma-ray

## Face Recognition from Surveillance using Sequential CNN-Model

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**Abstract:** Now-a-days there is lot of research going on face recognition and identification, with the increase in computational power working on images became easy and many complex and deep neural networks are implemented on images. There are many applications which updates automatic attendance and face recognition, we just wanted to extend to super market problem. This paper solves the problem of identification of customer and employees in super market. We have used deep convolution network and Siamese network to train images to classify in to customers, important customers and employees from cameras. This also compares the results from different models.

**Index Terms:** Neural network, Siamese network

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## Some Elliptic-Type Integrals and Their Hypergeometric Forms

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**Abstract:** In the paper, we established Hyper geometric forms of different elliptic – type integrals have been studied due to their importance and applications in certain problems involving computations of the radiation field off axis from a uniform circular disc radiating according to an arbitrary angular distribution law.

## Mathematical Modeling of Man- Made Natural Disasters: Forest Fire & Environmental Pollution

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**Abstract:** Mathematics is an extraordinary exercise of the human mind in abstracting the results of observation to find similarities and differences between phenomena. These relations between phenomena make it possible to organize the natural world into discrete sets of objects that can be studied using similar mathematical objects and methods. Natural disasters cannot be prevented; scientists can use Mathematical Modeling to help limit the damage. Mathematical models are used to summarize relationships between the characteristics of natural disasters. They are ultimately used to answer questions that humans have about natural disasters, and predict the results of events that have not occurred, but may be possible or even likely. In this paper, Mathematical models of some problems related to Natural disaster are discussed.

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## An analysis of Operational Efficiency of Major Airports in India

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**Abstract:** This paper deals with major airport's data of India for the year 2017-2018 and analysis for their respective efficiencies. This empirical study evaluates the operational efficiencies of 30 major India airports using data envelopment analysis and some of its recent developments. Various airport characteristics are evaluated to determine their relationship to an airport's efficiency. In this model, we have taken number of runways, number of passenger terminals and total expenditure as input variables and ASQ rating, aircraft movements, number of passengers, freight and logistics and revenue generated, as output variables.

The model focused in this paper is DEA model (Data Envelopment Analysis) and calculation is done using MS Excel.

**Index Terms:** Airport Efficiency, ASQ, ATQ, DEA Model.

## Common Fixed Point Theorem for Weekly Compatible Self Mapping in Menger Space

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**Abstract:** In this paper, we prove the nation of Menger space and prove a common fixed point theorem for pairs of weakly compatible self mapping. Which generalize the well known results.

**Keywords:** Common fixed points, Metric space, Menger space, t-norm and Weakly Compatible mappings.

**AMS Subject Classification (2000)** – 45H10, 54H25.

## Common Fixed Points for a Pair of Self Mapping in Generalized Menger Spaces with a Graph

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**Abstract:** In this paper, we prove the existence and uniqueness of points of coincidence and common fixed points for a pair of self-mappings defined on generalized metric spaces with a graph. Our results improve and extend several recent results of metric fixed point theory.

**Keywords:** Coincidence and common fixed points, Metric space, Menger space, self-mappings.

## Some Fixed Point Theorem Satisfying General Contractive Condition of Integral Type

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**Abstract:** In this paper, we establish a fixed point theorem for a pair of self maps satisfying a general contractive condition of integral type. This theorem extends and generalizes some early results of Boikanyo [4] and Jaggi and Dass [12].

**Keywords:** Lebesgue- integrable map, Complete metric space, Common fixed point

**AMS Subject Classification (2000):** 54H25, 47H10.

## Integral Relation of I-Function

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**Abstract:** I- Function formulae play an important role in special function. In this paper we aim to establish some new integral relation of I- function of one variable. Some special cases also presented in this paper.

**Keywords:** I- Function, Multivariable polynomial.

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## Analytic Study of Fixed Point Theorems in a Soft Metric Space with Integral Type Mapping

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**Abstract:** In the present paper we established fixed point and common fixed point theorems in soft metric space with integral type mappings. Analytic results of fixed points will be established.

**Key-words** - common fixed point; rational conditions; compact metric spaces;

**AMS Classification:** 47H10, 54H25, 55M20.

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## Bianchi Type-I Bulk Viscous Cosmological Models with Decaying Cosmological Term

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**Abstract:** Bianchi type I cosmological models with varying cosmological term  $\Lambda$  and bulk viscous fluid are investigated. Exact solutions of Einstein's field equations have been studied by assuming the law for variation of Hubble's parameter that yields a constant value of deceleration parameter. Physical and kinematical properties of the models are also discussed.

**Keywords:** Cosmological term  $\Lambda$ , Deceleration parameter  $q$ , Hubble parameter  $H$ , Scale factor  $S$ .

## Fixed Point Theorem for $(\beta\alpha)$ -Admissible Mappings in Metric-like space with respect to Simulation Function

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**Abstract:** In this paper, we have introduced some new type simulation function of  $(a,b)$ -admissible mappings with respect to  $Z$ -contraction in the complete metric-like space and our results improved several recent results in the metric-like space. Also, we supported example for justification of theorem.

**Keywords:** Simulation function, Admissible mapping, Fixed point, Contraction mapping

## A Formal Solution of Certain Simultaneous Quadruple Integral Equations Involving I-Functions

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**Abstract:** The problem discussed is to obtain the solution of simultaneous quadruple integral equations involving I-functions. The method followed is that of fractional integration. The given simultaneous quadruple integral equations have been transformed by the application of fractional Erdelyi-Kober operators to four others simultaneous integral equations with a common Kernel. Here for the sake of generality the I-function is assumed as unsymmetrical Fourier kernel. Here with the help of theorems of Mellin transform, the solution of simultaneous Quadruple Integral equations is obtained. Some interesting particular cases have been derived.

## Dynamics and stability analysis in the population dynamics by introducing a vaccination strategy and computational simulation

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**Abstract:** In this paper, we have studied the dynamical behavior of the population due to the presence of demographic changes such as; fertility changes, population growth rate, mortality rate, mortality etc. This complication arises due to the environmental changes which are affected by pollution and the unavailability of the healthy food resources. To overcome from these difficulties, we can introduce the vaccination strategy to increase the immunity system of the body. The main aim of this study deals with the changes arise in the Malthusian growth model by including the vaccination rate in the equation of this model and obtained the stability conditions of all the existing equilibrium state of the proposed model. Some computational simulations are also performed to justify the results obtained.

**Keywords:** Equilibrium state, Malthusian growth model, stability analysis, vaccination

## On Vehicle routing Problem using Mixed Integer Non-Linear Programming

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**Abstract:** The family of (VRPs) has received remarkable attention in the field of combinatorial optimization after its introduction in the paper of Dantzig and Ramser. VRPs determine a set of vehicle routes in order to accomplish transportation requests at minimum cost. In this paper we develop a mixed-integer non-linear programming model for vrp and apply it in electric vehicle charging.

**Keywords:** Vehicle Routing Problems, mixed-integer non-linear programming, electric vehicle charging.

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## The Two Contiguous Hypergeometric Function of the Some Linear Combination

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**Abstract:** The aims of this paper are to give using some contiguous relations. The asymptotic behaviour of some linear combination of two symmetric contiguous hypergeometric functions under some conditions of their parameters. The hypergeometric function belongs to an important class of special function they are very useful in many fields of physical and astronomical researches in mathematical analysis and its application they have significant properties identities of special values. And transformation formula. These properties have many interesting application in combinational analysis and arithmetic geometric. The first systematic and thorough study of hypergeometric series was carried out. An hypergeometric function is called contiguous to the other function if one. Two. Or three of the parameter are increased or diminished by an integer;

## Variational Inclusion Governed By $H(\cdot, \cdot) - \varphi - \eta$ -Mixed Accretive Mapping

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**Abstract:** In this paper, we look into a concept of accretive mappings called  $H(\cdot, \cdot)$ - $\varphi$ - $\eta$ -mixed accretive mappings in Banach spaces. We extend the concept of proximal-point mappings connected with generalized  $m$ -accretive mappings to the  $H(\cdot, \cdot)$ - $\varphi$ - $\eta$ -mixed accretive mappings and study its characteristics like single-valued property as well as Lipschitz continuity. Since proximal point mapping play an important role to solve variational inclusion problem. Therefore, we frame an iterative algorithm to solve variational inclusion problem as an application of introduced proximal point mapping and show its convergence with considerable assumptions.

**Keywords:**  $H(\cdot, \cdot)$ - $\varphi$ - $\eta$ -mixed accretive mapping, proximal point mapping, iterative algorithm, variational-like inclusion

## Solution for Congestion Control and Challenges of Mobile Ad Hoc Network

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**Abstract:** Congestion is a serious problem in mobile ad hoc network. In such network each and every node behaves as the router and has the capacity to convey the packet from correspondent to respondent. Because of the limited capacity of the bandwidth every node may transmit the packet at the same time due to this congestion arises which incur long delay and high packet loss which degrades the performance of the network. This network has dynamic topology and has shared behavior, it automatically forms the network temporarily which helps in transmission earl. To overcome these difficulties many approaches has been suggested earlier. This paper, presents the overview of the existing approaches and also discussing difference between these congestion control techniques.

**Keywords:** Congestion, Mobile ad hoc network, Bandwidth, Shared behavior, Dynamic topology

## The Direct Method for the Optimal Solution of a Transportation Problem

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**Abstract:** In this paper, we discuss a new approach for solving both balanced and unbalanced transportation problem. Here we present a paper entitled “The direct method for finding the optimal solution of a transportation problem”, which is proposed to find an optimum solution. The algorithm for proposed method discussed in this paper gives an initial as well as either optimal solution or near to optimal solution. Some numerical examples has been given to show the efficiency of the proposed methodology. Also the results of new approach are compared with the MODI's method and we can see that the proposed method gives either same or less optimal cost as compare to MODI's method within shorter time period and also it is easy to use.

**Keywords:** Balanced and unbalanced Transportation Problem, Basic Feasible Solution, Optimal Solution, MODI method, Proposed method.

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## Coincidence Points & Common Fixed Points of Expansive Mappings in *Ab*-Metric Space

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**Abstract:** In this paper, we prove some fixed point theorems for expansive mapping on *Ab*-metric spaces. Our results extend/generalize many pre-existing results in literature.

**Keywords:** *Ab*-metric space; expansive mapping; fixed point.

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## Some Common Fixed Point Theorems in complete Fuzzy Metric Spaces

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**Abstract:** In this paper we introduce the concept of common fixed point in the framework of L-fuzzy metric space and establish a fixed point theorem for self mappings. This result generalizes and extends the existing result et al. [3] on common fixed point on fuzzy metric space to L-fuzzy metric space using weak compatible mapping. In the support of our result.

## Projective Semi-Symmetric Connections on Almost Para-Contact Manifolds

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**Abstract:** In this paper, we have extended the study of the projective semi-symmetric connections on almost Para-contact manifold. We have shown that the projective semi-symmetric connection on P-Sasakian manifold becomes a special projective semi-symmetric connection. We also prove that if curvature tensor of projective semi-symmetric connection vanishes, then SP-Sasakian manifold admits an  $\eta$ -parallel Ricci tensor.

**Keywords and phrases:** Projective semi-symmetric connection, curvature tensor, Para-cantact manifold.

**AMS Mathematics Subject Classification (2010):** 53C12.

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## The Cosmic-ray Spectra at Spherical Termination Shocks

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**Abstract:** We discuss the nature of the steady-state spectra of particles accelerated at stationary spherical shocks, such as the solar wind termination shock. In addition to the two well-known spectral regions characterized by a power-law momentum dependence and a high-energy cut off, This consists of an enhancement of the cosmic-ray intensity just below the cut off similar features have been seen previously in multidimensional models and cosmic-ray modified shocks, where they were explained by acceleration and drift in the latitudinal direction along the shock face and decreasing effective shock compression ratio, respectively We show that a similar bump may be obtained in a purely spherically symmetric geometry with no drifts, and that this effect may also have contributed to the previous results. We attribute this effect to increased shock acceleration efficiency at certain energies. We also demonstrate that a one-dimensional planar shock with a reflecting wall upstream can give a similar effect. We conclude that care is necessary in interpreting observed bumps in any given situation.

## Computational Numerical Methods for Solving Nonlinear Problems

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**Abstract:** This paper will make it possible to tackle difficult non linear problems and deepen their understanding of problem solving using numerical methods. Multipoint methods are of great practical importance, as they determine sequences of successive approximations for evaluative purposes. The method involved here is beneficial to achieve the highest computational efficiency and accuracy of solution. It provides a deep understanding of the usefulness of each method which is supportive to a wide range of research areas along with many numerical examples. The rapid development of digital computers and advanced computer arithmetic have created a need for new methods useful for solving practical problems in a multitude of disciplines such as applied mathematics, computer science, engineering, physics, financial mathematics, and biology. In a clipped way, it enables to implement a wide range of useful and important numerical algorithms for solving research problems. It also illustrates how numerical methods can be used to study problems which have applications in engineering and sciences, including signal processing, control theory and financial computation. Further, it facilitates a deeper insight into the development of methods, numerical analysis of convergence rate and very detailed analysis of computational efficiency. It is a powerful means of learning by systematic experimentation with some of the many fascinating problems in science includes highly efficient algorithms convenient for the implementation into the most common computer algebra systems such as Mathematica, MatLab and Maple.

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### $k$ -Lipschitzian Mappings On Hyperconvex Metric Space

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**Abstract:** In this paper we established a fixed point theorem for non-expansive mappings in hyperconvex metric space which generalize the fixed point theorem to the case of uniformly  $k$ -lipschitzian mappings in hyperconvex metric space. Our results are the extensions of the results obtained by kabir *et.al* [6] to the case of hyperconvex metric space. We conclude with an example to support our main results.

**Keywords:** Fixed point theorem, hyperconvex space, uniformly  $k$ - lipschitzian mapping, nonexpansive mapping.

## Fixed point results for F- contractive type mappings in Cone b-metric spaces

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**Abstract:** In the present paper, we define  $F$ -contractive type mappings in Cone b-metric space and prove some fixed point theorem. Our main result unifies, generalizes and improves existing results in  $F$ -contractive mappings, b-metric space and Cone b-metric space in the literature.

**Keywords:** Fixed point; b-metric space; Cone metric space; Cone b-metric space;  $F$ -contraction

**AMS Subject Classification No (200):** 47H10; 47H09; 54H25

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## A Review on Performance Analysis and Flow Features of Swirl Diffuser in a Floor Based Air Conditioning System

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**Abstract:** An air diffuser is the mechanical device that is designed to control the characteristics of a fluid at the entrance to a thermodynamic open system. Diffusers are used to slow the fluid's velocity and to enhance its mixing into the surrounding fluid. Swirl diffusers can create better air mixing to enhance indoor air quality and help achieve compliance through air change effectiveness measure. Swirling vanes are used in air diffusers to create swirling outflow jet, so that more rapid mixing with ambient air can be achieved. The air change effectiveness calculation depends strongly on the flow characteristics produced by the diffuser outlet that vary considerably between different modelling set ups. Proper calibration and correct definition of performance related parameters are important to affect the radially diffusing flow pattern. This study demonstrates the common approaches, identifies the critical design parameters, analyses and discusses the differing outcomes in terms of flow pattern, air distribution.

**Keywords:** Air swirl, Diffuser, Effectiveness, Swirling Blades Angle, Air Flow

## Mathematical Modeling of Dilute Biphasic Fluid Flow in Industrial Aero-cyclone Dust Separators

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**Abstract:** Cyclone is a device used for removal of dust in industrial complex having the biphasic fluid of air-dust mixture. A standard reverse flow cyclone with tangential inlet is the basic model based on empirical formulae derived by experiments which is exhaustively used in industry with comparatively less efficiency. Design analysis based on the governing equations of two phase dilute fluid flow will improve the efficiency of Cyclone. Though the operating principle of a cyclone is very simple, the turbulent flow-field in a cyclone is very complex due to presence of swirl and interaction between particles, fluid and walls. A tangential entry and cyclone geometry give rise to a strong swirling flow. The flow acquires a rotational movement along the cyclone wall (free or outer vortex) and it descends down to a certain axial location near the cyclone bottom where the axial velocity acquires a reverse flow (forced or inner vortex) towards the upward direction and finally exit through a central duct known as vortex finder. Particles entering the cyclone are rebound, re-circulated and re entrained all along the outer and inner vortex. Consequently, the variables controlling the centrifugal force become highly complex. The primary purpose of vortex finder (air outlet) is to guide the dust particles to a central point for easy handling and disposal.

The governing equation for the turbulent, steady, isothermal and incompressible fluid flow in a cyclone is given by the Navier Stokes equation. The integration of the force balance on the particle yields the trajectory of a particle and the same equates the particle inertia with the forces acting on the particle. Navier-Stokes equations for turbulence modeling of cyclone flow field uses Reynolds averaging ( time averaging) that yields the solution of exact Navier Stokes equations into the mean ( time averaging ) and fluctuating Components. , the discrete phase has been considered for modeling dilute phase industrial cyclone in this work.

The Finite volume technique is used in this work on the approach to satisfy the integral form of the Navier Stokes equations to suitable approximation for each of the many contiguous control volume which cover the solution domain. Based on FVM, CFD tool is used to understand the complex flow structures typical of cyclones for optimal design of it and make possible to exclude the need of experimental studies, a cumbersome ,inefficient, time consuming based on empirical formulae & thumb rules.

## Fuzzy EOQ Inventory Model Using Trapezoidal Fuzzy Number with Shortages

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**Abstract:** In this paper, an EOQ inventory model with shortages has been considered by using Fuzzy. Our aim is to optimize the total cost and the order quantity for the proposed fuzzy EOQ inventory model. The Trapezoidal fuzzy numbers have been introduced in order to achieve this goal. The computation of economic order quantity (EOQ) is carried out through defuzzification process by using signed distance method. To illustrate the results of the proposed model, we have given examples and presented the computational results.

**Keywords:** EOQ, Fuzzy Inventory model, Trapezoidal Fuzzy number, Defuzzification, Shortages.

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## Bayesian Approach for a Periodic Review Inventory Model with Emergency orders using Weibull Distribution for Demand Function

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**Abstract:** In this paper we consider a periodic review inventory model. we consider demand function as a random variable which follows weibull distribution with two parameters  $\lambda$  and  $\beta$ . There is provision for placing order only at discrete time points in periodic review inventory system. If the time between two consecutive review is large in the presence of random demands, there could be heavy shortages, and the profitability of the system could suffer more so when the shortage cost is high. However it may not be feasible/profitable to carry a high level of stoke in anticipation of the uncertain demand especially if the holding cost is significant to meet the excess demand in such situation, one or more emergency orders can be placed before the end of review period. Taking into account the nature of the demand and the supply source, the timing and size of the emergency order can be determine optimally. Therefore for the optimization of the model an accurate estimation of demand is important.

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## Fractional Integral Operators Associated with certain Generalized Hypergeometric Function for Real Positive Definite Symmetric

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**Abstract:** In the present paper, fractional integral operators related with I-function for real positive symmetric definite matrix have been talked about .These operators have a wide scope of uses in the field of mathematical physics and linear differential equations .Various special cases of our operators have been referenced.

**Keywords:** Hypergeometric Function, I-function

## HR Management and Employee Performance Using Ethics: A Critical Analysis

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**Abstract:** Recent corporate changing aspects have led to the developing attentiveness in business ethics, both in academia and in the professional practice. Nevertheless, ethical hiatuses endure to happen in human resource management activities, leading HR academics and professionals to reconsideration what to do to reinvent new strategies to successfully manage ethics in HRM functions. Performance is understood as achievement of the organization in relation with its set goals. It includes outcomes achieved, or accomplished through contribution of individuals or teams to the organization's strategic goals. The term performance encompasses economic as well as behavioural outcomes. The objective of this critical literature review therefore is to establish the role ethics can play in human resource management to improve organizational performance. The methodology used was critical review of relevant literature with the scope of the study encompassing qualitative research of theories and comparative nature of ethics in HRM.

**Keywords:** Employee Performance, Ethics, Human Resource Management, Ethical climate, HR academics.

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## Application of Graph Theory in Airline Transportation Control

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**Abstract:** Graph theory mathematics study of how collections of points can be connected is used to day to study problems in economics, physics, chemistry, sociology, and communication and counts other fields. The analysis of airline networks has focused on easily quantifiable characteristics of the countries as well as the basic topological properties of the networks. The coefficient of determination attests to the fact that numerous pertinent causal factors remain incident field. The numbers of vertices,

**Keyword:** Airline networks, Graph Networks, weighted Graph, Graph Modeling, Graph coloring

## A Mathematical Model for Study Breast Cancer Development and Analyze their Prevention and Treatment

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**Abstract:** Mathematical modeling is art of translating real world problems into mathematical problems, solving the mathematical problems and interpreting these solutions in the language of the real world. A mathematical model is a description of a system using mathematical concepts and language. Breast cancer is the second most commonly diagnosed cancer and leading cause of cancer death for women worldwide. Breast cancer (BC) is the main cause of cancer mortality in women. Breast cancer accounts for approximately 40% of all the cancer types in women. Computational and mathematical models are gradually being used to help us understand the breast cancer. The goal of this research is to improve the accuracy of predicting the breast cancer (BC) development and their accurate treatment using the ordinary differential equations, partial differential equation and interpolation formulas for mathematical model

**Keywords:** Mathematical modeling, Breast cancer, Carcinogenic agents, Cancer treatment

## A Mathematical Model for the Slip Condition of the Blood flow through a Stenosed artery using Casson-fluid flow

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**Abstract:** The mathematical model is developed by considering blood as Casson fluid through the asymmetric artery with the stenosis. The non-Newtonian fluid behaviour is characterized by using Casson-fluid flow model. The analytic expression for flow rate, resistance to flow and skin friction are derived by using this model. We observed that the flow rate decreases when the yield stress and viscosity coefficient increases, the skin-friction increases with the increase of yield stress in presence of slip velocity for velocity coefficient parameter. The results are derived in detail with the help of graphs for the variation of different flow parameter. Flow rate, resistance to flow, and skin-friction and impedance analysis of the casson fluid have been shown graphically by varying the yield stress.

**Keywords:** Stenosis; artery blood flow, flow rate, blood flow and Casson fluids model

**Mathematics Subject Classification [MSC] 2010 No.:** 76Z05, 92C35

## Some Important Results on Fixed Point Theorem using Generalized Metric Spaces

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**Abstract:** In this paper we shall study the some important results on fixed point theorem using the generalized metric spaces. Some important generalization in previous paper of Kannan's fixed point theorem in the ordinary metric space and Das's fixed point theorem in generalized metric space. We will work the paper of Ali Fora, Azzeddine Bellour and Adnan Al-Bsoul regarding generalized metric space.

**Keywords:** Fixed point, Generalized metric space.

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## The Involving in I-Function of Two Variables and General Class of Polynomials

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**Abstract:** This paper presents in the some derivative formulas of I- Function of Two variables involving general class of polynomials. The well known H-function of one variable defined and proved the H-function as a symmetric. The H-function is often called fox's H-function. Later on many researchers studied and developed H-function. Introduced a new function in the literature namely the I-function which is useful in Mathematics. Physics and other branches of applied mathematics. In the present paper we establish derivative of I-function of two variables involving general class of polynomials. The generalized derivatives of product of general class of polynomials and I- function of two variables transformed as I-function of two variables but expression involving more terms. Also one can find same formulae involving general class of polynomial, I-function of r variables. The special case of our derivatives yields interesting result;

**Keywords:** I-function; Rathie Arjun A new generalization of generalized hypergeometric function.

## Classification of Large Data Set for Social Websites using Hadoop

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**Abstract:** Large data set is a kind of collection of **data** in a **huge size**. Large data set is a term used to define a group of data that is large in size and yet growing mounting with time. This data is so large and also complex that none of the conventional data management tools are able to store it or process it efficiently. From blogger post, there data to Google using online search to predict incidence of the Twitter, YouTube, Instagram and Facebook are using troves of information. Online and offline actions are being chased, gathered, and analyzed at dizzying rates. Facebook or Google retrieve the data like what application user install they verify and access with user permission allow contact, photo, video and if user connect with and check the demand of the user and notify, using various applications on our computer, can be recorded and analyzed. We can find this analyze to splurge on weekdays. We can be more efficient at work by realizing we spend time more than we thought on Facebook. These are stored in Data warehousing and retrieve data through data mining are connected terms, as is NoSQL. With data firmly in hand and with the ability given by large data set using flume in hadoop Technologies to effectively store and analyze this data, we can find answers to these questions and work to enhance every aspect of our behavior. Twitter, Facebook, Instagram, Google can know every post and searching you ever viewed by analyzing large data gathered over the years. Facebook can analyze large data and tell you the birthdays of people that you did not know you knew. With the initiation of many digital modalities all this data has grown to large data and is still on the rise. In the end large Data technologies can exist to improve decision-making and to provide greater vision faster when needed but with the downside of loss of data secrecy.

**Keyword:** Large Data Set, Twitter, Facebook data set, flume in Hadoop, MapReduce

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## Incomplete Mittag-Leffler Function

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**Abstract:** This paper devoted to the study of incomplete Mittag-Leffler function and some of its properties in terms of incomplete Wright function.

**Keyword:** Mittag-Leffler function

Mathematics Subject Classification (2000): 33E12, 33B15, 11S80.

## Extreme Values Analysis for Finding Outliers Detection Using Machine Learning to Detect Predicted Data Points

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**Abstract:** An outlier is usually measured as an observation which is extensively found distant from the other well thought-out observations. In the era of ready-to-go analysis of n-dimensional datasets, data quality is essential for economists to guarantee robust results. Many machine learning algorithms are sensitive to the range and distribution of attribute values in the input data. Outliers in input data can skew and mislead the training process of machine learning algorithms resulting in longer training times, less accurate models and ultimately poorer results. Even before predictive models are prepared on training data, outliers can result in misleading representations and in turn misleading interpretations of collected data. Traditional techniques for outlier detection tend to exclude the tails of distributions and ignore the data generation processes of specific datasets. Various methods for detecting different kinds of outliers in high-dimensional data sets from two different perspectives, i.e. detecting the outlying aspects of a data object and detecting outlying data objects of a data set. N-dimensional data can be seen as part of the variety challenge of machine learning.

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## Fuzzy EOQ Model for Deteriorating Items with Stock-Dependent Demand and Partial Backlogging

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**Abstract:** In this paper, we have considered an economic order quantity inventory model with deteriorating items with stock-dependent demand and Partial Backlogging under fuzzy environments by employing trapezoidal fuzzy numbers. A fully-fuzzy inventory model is developed where the input parameters and decision variables are fuzzified. For this fuzzy model, an expected value method of defuzzification is employed to find the estimate of the profit function in the fuzzy sense. In addition, a rigorous methodology is constructed to examine for the optimal solution of fully-fuzzy inventory model. The optimal policy for the developed model is determined using the proposed algorithm after defuzzification of the profit function. Finally, a numerical illustration is provided in order to define the sensitiveness in the decision variables with respect to fuzziness in the components.

**Keywords:** Fuzzy, Deteriorating item, Partial Backlogging, EOQ

## Comparison of Wavelet and Fourier Transform-A Case Study

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**Abstract:** The wavelet analysis is the advance based on Fourier transform and it is an innovation of the Fourier Analysis. Wavelet transforms are a mathematical means for performing signal analysis when signal frequency varies over time. Wavelet analysis is an exciting new method for solving difficult problems in mathematics, physics and engineering. Fourier transform is a powerful tool for analysing the components of a stationary signal. But it is failed for analysing the non-stationary signal whereas wavelet transform allows the components of a non-stationary signal to be analysed. Both the Fourier and wavelet transforms measure similarity between a signal and an analysing function. Both transforms use a mathematical tool called an inner product as this measure of similarity. A comparative study of Fourier and Wavelet transforms has been conducting in the present study and the main goal of this study is to find out the advantages of wavelet transform compared to Fourier transform.

**Keywords:** Fourier transform, wavelet transform, time-frequency, signal analysis, inner product.

## Customization of the WRF model over Gurgaon region by Sensitivity of PBL schemes for their application of Pollutant Dispersion

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**Abstract:** Accurate simulations of surface meteorological variables are important for the transport and dispersion of air pollutants and air quality in the lower atmosphere. In this study, the surface meteorological variables over Gurgaon region were simulated using the Advanced Research Weather Research and Forecasting (WRF-ARW) mesoscale model. To study the evolution of PBL parameters and the thermo dynamical structure, the sensitivity tests were conducted with five different planetary boundary layer (PBL) schemes (Yonsei University, Mellor–Yamada–Janjic, Asymmetric Convective Model v. 2, Mellor-Yamada Nakanishi and Niino Level 2.5 PBL and Quasi-Normal Scale Elimination) and three different horizontal grid resolutions (27, 9 and 3 km) by using the  $1 \times 1^\circ$  NCEP Final Analysis meteorological fields for initial and boundary conditions. After carefully examination of the simulated parameters with the available in situ data, the present results suggest that PBL schemes, namely YSU and ACM2 performed better on behalf of the boundary-layer parameters and may useful for pollutant dispersion studies.

**Keywords:** Planetary boundary layer, WRF, mesoscale, thermo dynamical structure

## Analysis of Average Rainfall Phailin Cyclone by using Double Integration Technique

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**Abstract:** India's eastern coastline is one of the most violent wind inclined regions on the planet. Despite the fact that the coastline of Orissa has been just about 17% of the Indian eastern coastline, yet Orissa has been influenced by about 35% of all cyclonic and serious cyclonic tempests that have crossed the eastern coastline and related tempest floods that have been regularly immersing huge areas along the coasts. A Cyclone is an enormous scale air mass that turns around a solid focal point of low climatic weight caused due to low atmospheric pressure over oceans resulting in rainfall at coastal region. We will calculate average rainfall during the cyclone Phailin using Double integration

## Optimization of Some Transportation Problem by Proposed Method

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**Abstract:** The transportation model is a typical case of LPP (Linear Programming Problem) in which the main objective is to transport people or goods from multiple origins to different points at minimal cost, like air, water and land transport including railway and road transport. In this paper, a method for finding an optimal key solution in short iterations is proposed and obtained result is compared with Vogel's approximation method. This method is used for both cases of large and small size transport problem. A numerical example is also given to examine the validity of the transport model.

**Keywords:** Transportation, Linear Programming Problem, Vogel's approximation method

## A Mathematical Model to Solve the Huxley Equation by New Homotopy Perturbation Method

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**Abstract:** In this paper, New Homotopy Perturbation Method (NHPM) is introduced for obtaining solutions of non-linear Huxley equations. The approximate solutions of the Huxley equations are compared with the solution by using Adomian's decomposition and variational iteration method as well as with the exact solutions. The present method is very simple, effective and convenient analytical method with small computational overhead. The capability and reliability of the method, several examples are provided and MATLAB used to calculate the series obtained from NHPM.

**Keywords:** Adomian's decomposition method, Homotopy Perturbation Method, Huxley equation.

## Health Risk Assessment by using Fuzzy Logic Application

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**Abstract:** The fuzzy logic (FL) application has been used first time in thirty six year ago (1982) for purpose of insurance. In present, the insurance industry has several areas with latent applications for FL. In this paper involved to diagnosis the health risk which is related to Blood Pressure and Kidney function. The Glomerular Filtration Rate (GFR) has been used for investigate the level of the blood pressure with the help of kidney function. For this purpose, in this study FL control system has been used to represent the factors which may cause the hazard for human health and analysis by using rule base factor which was implemented in MAT Lab. The present study, advocates that FL may be suitable to take appropriate decision at the right time for giving treatment to the patients immediately and it may be monitoring from the treatment in future.

**Keywords:-**Fuzzy logic, Blood Pressure, Kidney Function, Diagnosis, Health risk

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## Analysis of Aircraft activity by using method of Numerical Integration

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**Abstract:** The takeoff and landing of an airplane are the most perilous periods of flight in real environment. So, the investigation regarding takeoff and landing performance play a vital role for airplane structure and security. In the paper, a high-accuracy numerical calculation for takeoff and landing execution by force analysis to develop dynamic equations, which sets up and tackles the conditions of elements during departure and landing process. The proposed strategy is equipped for figuring departure and landing execution under various situations. The impacts of height, temperature, departure and landing weight and wind speed are analyzed.

**Keywords:** departure execution, landing execution, Numerical integration

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## Use of Fuzzy Expert System for Investigating the Child Anaemia-A Case Study

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**Abstract:** In present, the fuzzy logic applications are mostly using to investigating medical disease. In this study the Fuzzy Expert System (FES) has been introduced to define the child anaemia. Anaemia is haematological disorder and the most common identifying in children. The fuzzy expert system has been designed to investigate the level of iron paucity in children. For this propose, the laboratory records have been obtained for child anaemia patients, the applicable factors have quantified. The FES for disease risk, child anaemia was shortly described. This system help to physician in the decisions risk. This study advocate that, in many cases FES can help to the doctors in diagnostics, treatment of sickness and etc. The number and the other disagreement that support our claim can be found in this study.

**Key words:** Fuzzy expert system, medical disease, Child anaemia, diagnostics, treatment.

## Application of CFD Numerical Modeling in Air Quality Assessment and Executing Mitigation Measures

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**Abstract:** Air quality primarily describes the pollutants contained in the air. As it appears to have grave pollution problems, real time air quality index (AQI) in most of the major cities of the world has now become a major concern to know the transient air quality levels. Various indices for measurement of air quality have been developed and are being used by different countries. The measurements are indicative of concentrations of air pollutants quantitatively. Air quality assessment indicative of various quantities may either involve the direct measurement of these quantities or deterministic of the impact of pollution and possible hazards. Fractional concentration of criteria pollutant species such as volatile and semi-volatile organic compounds and natural or anthropogenic aerosols determine the quality of air.

Apart from the measurements, air quality estimations may also be performed using Gaussian plume model and Solution of three dimensional Navier-Stokes equations and pollutant transport equations. The Computational Fluid Dynamics (CFD) modeling needs the identification of the relevant physical process describing the pollutants dispersion into the atmosphere. These processes involve the emission and transport of pollutants which may take place by bulk convection, turbulent dispersion and gravity effects. Adhesion among other forces and factors cause the settling of particle pollutants on the physical surfaces. Recombination reactions and electrostatic precipitation may also contribute in the pollutant deposition. Numerical modeling of air pollution problems with the help of CFD provides the detailed description of physical sources of pollutants, meteorological processes and changes occurring in physical and chemical behavior of pollutants effectively when the governing equations based on the assumptions of the mass, momentum, energy and pollutant species conservation of the mathematical model are in the appropriate form. The solution is obtained by solving the mathematical equation numerically.

This paper deals with the possible solution of the most concerned pollution problem and especially in dealing with the problems of smog forming in major cities and threatening the human life. It is suggested to perform a real time modeling of the smog problem by 3D modeling of the smog field using CFD and if coupled with the real time measured environmental data, simulation results will provide the severity of the pollution in the form of contours, plots and quantity in order to execute appropriate mitigation measures.

## Increase network lifetime optimisation efficiency and increase the stability period using the Gravitational Energy Sensitive Energy Hierarchy Protocol

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**Abstract:** The need for wireless sensor networks has been increased day by day, but when we work on it we find two well-known major problems that are cluster head selection and routing for this purpose decreasing their lifespan and increasing the number of dead nodes. The energy savings of each Node sensor are associated with high computational complexity, which depends on the monitoring of algorithms. This study developed a community base algorithm called "A Gravitational Energy Sensitive Energy Hierarchical Protocol," which increases its value but decreases the network life of dead network nodes. Technique where each node has heterogeneity-ordained energy levels of a protocol that selects a (cluster head) CH separately on the basis of their initial energy relative to the other nodes in the selected network. We provide some test results together with plotted results in this paper. In addition, analysis and simulation was performed with the implementation of the internal energy node 0.5, 1 J, 1.5 J, and 2J in different cases. After the analysis results have been achieved we have found that our algorithm provides the best results compared with other results of different algorithms. This is an important task, and in small and large networks our GESEHP protocol can produce improved results. All of this simulation work was carried out in Matlab.

**Keywords:** Gravitational, Efficiency, Throughput, IEEE 802.11, unicast and broadcast packet, network, L-LEACH, Quality of Service, W-LEACH, routing protocol, Energy Sensit.

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### About Families of Pairwise Connected Sets

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**Abstract-** The notion of connectedness in bitopological spaces was introduced and studied by W.J. Pervin and I.L. Reilly. Continuing the study we prove a few results concerned with a family of connected sets in bitopological spaces.

**Key Words-** Pairwise connected spaces, Connectedness in bitopological spaces, Pairwise mutually separated spaces.

**AMS Subject Classification-** 54A05, 54A99, 54D05

## Dual Cryptography with Mobile GPS location Mechanism

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**Abstract:** Cryptography is the type of security which internet usually uses and in today's world its not sufficient to safeguard our data and account. Here we come with a new concept of Dual Cryptography (DCPT) for the user and the communication channel as well. By the time its mandatory to use Location (MGPS) wise security which is possible through Mobile Computing. Location and Cryptography both are used in such a different way to provide internet security. Location Based Cryptography (LBDC) is the work which actually works on today's scenario.

**Keywords:** Cryptography, DCPT, MGPS, LBDC.

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## Feeling Detection dependent on Images and Captions on Social Media

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**Abstract:** Nowadays, Internet has grow to be an crucial element in every person's lifestyles. Social networking has regularly grow to be a recurring for people to submit their photos, opinions and remarks. People percentage their emotions on line in a completely casual language. Thus, it is very tough mission to research actual sentiment hidden inside the text of natural language. Emotion detection is the sphere of study that analyses people views and feelings. Human emotion can be expressed through numerous approach which include speech, facial expressions, gestures and textual facts. This paper proposes the gadget which makes use of present emotion detection thru facial features using deep mastering and supports it with the evaluation of textual information received thru captions of pics on social networking websites to ensure greater accurate outcomes. There is no characteristic on social networking sites to kind feelings of photos which motivate us to classes posts based on emotions. Emotion detection from each captions and photos collectively is efficient due to the fact most effective text isn't always enough to apprehend the feelings of customers. This hybrid approach offers promising results in both the class of feelings as well as in acting emotion detection.

**Keywords:** Emotion detection, Convolutional Neural Networks, Social Networks, Deep Learning, Sentiment Analysis

## Content Based Facial Emotion Recognition Model utilizing Machine Learning Algorithm

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**Abstract:** Emotion reputation or sentiment analysis is recognized as a critical studies topic in pc vision community. The challenges include identity of face, popularity of accurate emotion, suitable database and so forth. We have proposed and implemented a fashionable Convolution Neural community (CNN) building framework for emotion popularity. The model is formalized by means of developing a coincident gadget which fulfills the duties of face detection and emotion classification the usage of our proposed CNN structure. The version is verified using the FER-2013 dataset. In the proposed paintings, we talk the applicability of the proposed CNN model. This model lays a valuable evaluation of the effect of changing the network size, pooling, and dropout. For a given model, the very last accuracy at the validation facts is round 63%.

## Survey on Photoluminescence of Some Recent Work on Silicate Based Phosphors

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**Abstract:** Photoluminescence is the process, in which the excitation is accomplished by the absorption of photons. The radiation sources may be infra-red, visible, ultraviolet or X-ray. The fluorescent lamp used in household and general lighting is the principal example of this type of luminescence. The silicate matrix is a typical melilite. Phosphors based on silicate material are usually low cost and are chemically and physically stable. They have been studied widely with Eu<sup>2+</sup> doping, which shows that a blue emission and long persistent luminescence by co-doping with some other rare earth ions. We focus on the development of new silicate phosphors for a white LED. In the europium doped silicate system, four LED phosphor candidates found luminescent properties under near UV and visible excitation were investigated for the new Eu<sup>2+</sup> doped LED silicate phosphors. These new phosphors have a relatively strong absorption band in a long wavelength region.

## Common Fixed Point Results in Menger Spaces

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**Abstract:** The purpose of the paper is to prove a common fixed point theorem in Menger spaces by using five compatible mappings.

**Keywords:** Menger space, t-norm, Common fixed point, Compatible maps, Weak - compatible maps.

## Application of Graph theory in operations Research

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**Abstract:** One of the common themes in operation research is the modeling approach, many accurate model of operations research. Problems turn out to be intractable when subjected to standard technique this research paper show that how graph theory and networks may be profitably used to model certain discrete operations research problem from a different view-point effective algorithms.

**Keyword:** Graph, Direct graph, Graph networks, Simple graphs

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## Emergence of Cloud Computing in Higher Education

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**Abstract:** Cloud Computing is the term in which we are using a network of interconnected networks on the internet with the help of IAAS, PAAS, SAAS, where storage, management, processing are possible along with the processing of data beyond a local server or personal computer. Higher Education is a system for pedagogical excellence of students for higher studies along with a proper system of education, management, governmental schemes etc. This paper presents the emergence of Cloud implementation for betterment of Higher Education with the help of MOOC.

**Keywords:** Cloud Computing, IAAS, PAAS, SAAS, Pedagogical, MOOC

## A Bingham plastic and peripheral layer model of blood flow in the presence of stenosed artery

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**Abstract:** The present work deals with the blood flow through the stenosis assuming that flowing blood is represented by a two layered model. We considered a two-layered blood flow model to study the axisymmetric flow of blood by assuming the core layer as Bingham plastic (non-Newtonian fluid) and the peripheral layer (Newtonian fluid) in through the stenosis in the arteries. The analytical expressions for flow rate, resistance to flow and wall shear stress have been developed in this model. We have depicts the effect of stenosis on resistance to flow and wall shear stress. This study gives an insight into the effects of slip velocity on the volumetric flow rate, resistance to flow and wall shear stress.

**Keywords:** Stenosis, blood flow, core layer, peripheral layer and Bingham plastic

**AMS Subject Classification (2010):** 76Z05, 92C35

## A non-Newtonian fluid flow model for the slip condition on blood flow through a stenosed artery using power-law fluid

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**Abstract:** In this paper, the effects of boundary conditions on power-law fluid through an artery with stenosis have been studied. We considered the blood as power law fluid in this model. Numerical and computational models are developed to analyze the variation of resistance to flow, yield stress and wall shear stress across the stenotic region. The analytic expressions for flow resistance, wall shear stress with mild stenosis are derived by using this model, which shows that resistance to flow  $\lambda$  increases with increasing of stenosis height and wall shear stress  $\tau$  increases as stenosis size increases. The results have been shown graphically at different flow characteristics.

**Keywords:** Physiological flow, stenosed artery, wall shear stress, resistance to flow, Power-law fluid model and slip velocity

**AMS Subject Classification No. (2010):** 76Z05, 92C35

## Mathematical Modeling of Linear and Nonlinear Equations

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**Abstract:** This paper reviews some of the recent research and notes that plays an important role in mathematical modeling of linear and non linear equations. The process of developing a mathematical model is termed mathematical modeling. Mathematical models are used in the [natural sciences engineering](#) disciplines as well as in the [social sciences](#). This paper is taught that introduce the basic principles and methods that helps to explain a system and to study the effects of different equations and behavior. If all the operators in a mathematical model exhibit [linearity](#), the resulting mathematical model is defined as linear. A model is considered to be nonlinear otherwise. The definition of linearity and nonlinearity is dependent on context, and linear models may have nonlinear expressions in them. a differential equation is said to be linear if it can be written with linear [differential operators](#), but it can still have nonlinear expressions in it. In a [mathematical programming](#) model, if the objective functions and constraints are represented entirely by [linear equations](#), then the model is regarded as a linear model. If one or more of the objective functions or constraints are represented with a [nonlinear](#) equation, then the model is known as a nonlinear model. Mathematical models can take many forms, including [dynamical systems](#), [statistical models](#), differential equations, or [game theoretic models](#).

## Fixed point results for contractive type mappings in Cone b-metric spaces

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**Abstract:** In the present paper, we define F-contractive type mappings in Cone b-metric space and prove some fixed point theorem. Our main result unifies, generalizes and improves existing results in F-contractive mappings, b-metric space and Cone b-metric space in the literature.

**Keywords:** Fixed point; b-metric space; Cone metric space; Cone b-metric space; contraction

**AMS Subject Classification No. (2000):** 47H10; 47H09; 54H25

### IOT Based Smart Crop Monitoring in Farm Land

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**Abstract:** As new technologies has been invented and utilized in modern world, there is a need to bring an elevation in the field of agriculture also. A lot of researches have been made to improve crop production. In order to enhance the crop productivity effectively, it is necessary to monitor the environmental conditions in and around the field. The motive of this paper is to propose an IOT based Smart crop monitoring system which aims in making use of progressing technology i.e. IOT and Smart Farming. Internet of Things (IOT) has become a trending technology nowadays which is being used in several real time applications. IOT is a system which consists of several sensors or actuators that provides connectivity to the internet directly or indirectly. IOT based smart farming improves the entire agricultural system. As it is well known, agriculture is the backbone of our Indian economy that contributes to the overall economic growth of the country. With the help of sensors and interconnectivity, IOT in agriculture has saved the time of farmers to a greater extent and has enhanced the traditional way of farming. Online crop monitoring using IOT helps the farmers to stay connected to his field from anywhere and anytime. Also with the innovation of IOT in farming there has been drastic reduction in extravagant use of valuable resources such as water and electricity. Various different types of sensors are connected to the field that monitors and collects information about the field conditions. Collectively all the captured farm conditions are sent to the farmer through GSM technology. Thus this way farmer is able to monitor his field without being there physically. Finally, based on this thorough review, we identify current and fore coming trends of IOT in agriculture and highlight potential research challenges.

**Keywords:** IOT, Sensors, GSM technology, Smart farming.

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### Matlab A Fourth-Generation Programming Language of New Era: A Review

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**Abstract:** MATLAB has evolved over a period of years with input from many users. In university environments, it is the standard instructional tool for introductory and advanced courses in mathematics, engineering, and science. In industry, MATLAB is the tool of choice for high-productivity research, development, and analysis. It features a family of application-specific solutions called toolboxes. Very important to most users of MATLAB, toolboxes allow as to learn and apply specialized technology. Toolboxes are comprehensive collections of MATLAB functions (M-files) that extend the MATLAB environment to solve particular classes of problems. Areas in which toolboxes are available include signal processing, control systems, neural networks, fuzzy logic, wavelets, simulation, and many others. It is an interactive system whose basic data element is an array that does not require dimensioning. This allows you to solve many technical computing problems, especially those with matrix and vector formulations, in a fraction of the time it would take to write a program in a scalar non interactive language such as C or FORTRAN.

## Some Fixed Point Results in $A$ -Metric Space and $A_b$ Metric Space

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**Abstract:** Our goal of this article is to vindicate some fixed point theorems for contractive mappings in  $A$ -metric space and  $A_b$  metric space, which unify, develop and generalize most of the prevailing coherent fixed point results from the literature.

**Keywords:**  $A$ -metric space;  $A_b$  metric space, contractive mapping; fixed point

## Some Fixed Point Theorem Satisfying General Contractive Condition of Integral Type

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**Abstract:** In this paper, we establish a fixed point theorem for a pair of self maps satisfying a general contractive condition of integral type. This theorem extends and generalizes some early results of Boikanyo[4]. And Jaggi and Dass [12]

**Key Words:** Lebesgue-integrable map, Complete metric space, Common fixed point.

**AMS Subject Classification (2010):** 54H25, 47H10.

## CFD Modeling and Simulation in the Heat Transfer Studies in Solar Air heating

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**Abstract:** Solar air heater is solar energy collection device and this collected solar energy is utilized for low temperature heating purpose, agriculture drying purpose etc. The rate of conversion of solar energy to heat energy is low in solar air heater because of the nature of fluid which is air having poor thermal conductivity which influence the rate of heat transfer from the absorber plate to air. The value of heat transfer coefficient for this heat exchange is low and it can be increased by creating turbulence in flow field. The turbulence is created by providing artificial roughness on absorber plate of various geometries. In this paper the numerical modeling of heat transfer through the absorber plate has been discussed. The heat transfer in a rectangular duct of a solar air heater having trapezoidal rib roughness on the absorber plate is numerically studied by using Computational Fluid Dynamics (CFD). The effect on Nusselt number, heat transfer coefficient, velocity, and temperature parameter are analyzed. This CFD simulation is done using commercial software Fluent 6.3. The  $K$ - $\epsilon$  numerical model consisting of the governing mathematical equations based on the principles of conservation of mass, momentum and energy have been used.

## Time Synchronization using Hierarchical Clustering for reliable data service in MANET

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**Abstract:** Time synchronization in any network like wired and wireless is one of the crucial issue because of synchronized the communication in between sender and receiver. In Mobile ad hoc network nodes are continuously changing their situation in a surrounding environment. The data sending and receiving is performed without any supervision or centralized communication. In this research we proposed a new time synchronization technique with multicast routing in dynamic network. The multicast routing protocol is able to perform the group communication and in each group is made from some nodes with one group coordinator and each node has different clock time. The proposed research is synchronized the clock of each mobile node according to the average time beacon of all group in MANET. The proposed multicast Average Time Clock beacon Synchronization (Avg-SYN-CLK) communication performance is improves the network performance. The proposed scheme performance is compare with the Maximum Clock Time Synchronization (MAX-SYN-CLK) beacon broadcasting technique and Asynchronies Clock Time Performance (ASYN-CLK) and observe that the proposed technique is provides better performance with minimum end to end delay and packet loss.

**Keyword:** Clock Synchronization, MAODV, Mobile Ad hoc, Clock Detection, Multicasting, Average Clock Time.

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## A smart way of Compression

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**Abstract:** The advancement of information technology has affected all walks of our life. Data base technology has also grown from a simple file system to data navigation system, and over a last two to three decades a majority of business institutions, organizations, industries etc. have adopted the computerization process and as a result have been flooded with data. In this report it is investigated that for experimental result shows the proposed scheme provides significant improvement in compression efficiencies. The main proposal of this report is to reduce the memory space and the transmission time and achieving good compression ratio. In this work proposed techniques manages the compressed database such that standard operations like retrievals, insertion, deletion and modifications are supported.

## A Digitalized Development Competency in Industrial Internet of Things

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**Abstract:** The competences of IoT aidproducers or investors to gain superiorprominence and insights into their further actionsthrough the effectual use of data and the tighter amalgamation of disparate systems. This opens up the leeway for producers of moving away from merely selling goods to becoming a provider of services and firming the bond they have with the end users of their products. It goes in to the heart of how an industrial manufacturer perceives itself and the extent to which digital change will be central to its tactic and therefore requires that additional care is taken and better caution is exercised. This means that IoT can offer more than traditional process efficiency improvements on the factory floor. This paper will converse the impacts of IoT and other developing technologies in making a manufacturing system automated.It will include conversation on economy, cutting-edgetechnology.

**Keyword:** IOT, Automation of Industry.

## A Review Paper on Electro Automotive Smart Systems Using Internet of Things

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**Abstract:** Electricity consumption grows up rapidly all over world during up-coming decades. Nowadays we can generate electricity through a smart way by using different techniques. By implementing a speed breakers on roads through roller mechanism. In this mechanism, by using a rack and pinion system we can generate electricity. And the second technique was traffic windmill which this method used on high ways. In this method by using a vertical axis blade we can generate electricity. And one more method was smart street lights on highways. In this method by using a sensor called LDR (light dependent resistor).

**Keywords:** Electricity extraction, Electricity utilization, Rack and pinion, Vertical axis wind mill.

## Glaucoma diagnosis using discrete wavelet transforms and Histogram features from fundus images

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**Abstract:** Glaucoma is one of the main eye diseases; it cause progressive deterioration of optic nerve fibres due to increased fluid pressure. The existing methods of glaucoma diagnosis are time consuming, expensive and require practiced clinicians to understand the eye problems. Hence fast, cheap and more accurate glaucoma diagnosis methods are needed. This paper presents an innovative idea for diagnosis of glaucoma using third level two dimensional discrete wavelet transform (2D DWT) and histogram features from fundus images. The 2D DWT is used to decompose the glaucoma and healthy images and histogram features are extracted from 2D DWT decomposed sub band images. The least square support vector machine (LS-SVM) is used as a classifier which classifies the glaucoma and healthy images using the extracted features.

## Results on Multivalued Mappings in Intuitionistic Fuzzy Metric Spaces

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**Abstract:** In this paper we obtain some common fixed point theorems for multivalued mappings in intuitionistic fuzzy metric space containing rational terms. Wegenerelizeand extend results.Of [I. Kubiacyk and S. Sharma, Common fixed point in fuzzy metric space, J. Fuzzy Math. 11(1)and [RezapourSh.:Common fixed point of self-maps in intuitionistic fuzzy metric spaces , Mat.Vesnik 60(4)(2008), 261-268] by contributing rationalization from their previous versions.

**Keywords:** Common fixed point, Multivalued map, intuitionistic fuzzy metricspace.

**Mathematics Subject Classification (2000).** 54A40, 54H25.

## An Application of Compatibility and Weak Compatibility in Intuitionisticfuzzy Metric Spaces

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**Abstract.** The object of this paper is to obtain some new results in intuitionistic fuzzy metric spacesby the applicability of the property ( $S-B$ ) and the notion of R-weak commutativity of type ( $Sp$ )and weakly compatible maps of type ( $Sp$ ) and prove the intuitionistic fuzzy version of Pantstheorem. Our results are substantiated with example. The established results generalize and extends several existing fixed point results in intuitionistic fuzzy metric spaces, metric spaces and fuzzy metric spaces.

**Keywords:** Intuitionistic fuzzymetric space, ( $S-B$ ) property, R-weak commutativity of type( $Sp$ ),Weakly compatible map, Common fixed point.

**Mathematics Subject Classification (2010):** 47H10, 54H25.

## Neural Network Approach to Predict Soaked CBR of Routine Subgrade soil

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**Abstract:** This study presents the application of a method of artificial neural networks for the prediction of the California bearing ratio (CBR) with routine properties of subgrade soils. A database is developed containing grain size distribution, Atterberg limits, maximum dry unit weight and optimum moisture content of the soils. A set of 231 experimental results were used to construct the ANN model. The correlation between the basic properties of soil and CBR were obtained from the trained neural network. A Commercial software MATLAB-7.5 was used for trained the ANN models, Multilayer Perceptrons neural network(or LMB model). Three Levenberg-Marquardt Backpropagation ANNs models (LMB-4, LMB-5, and LMB-6) for predicting CBR, (in which the number of input variables is changed seven to four) were employed in the analysis. In these models, the input layer consists of maximum six nodes, one node for each of the independent variables, namely % fines (Silt and clay fraction) , % of Sand content(S),% of Gravel, optimum moisture content (OMC) ,Maximum dry density ( $\gamma_d$ ) , plasticity index (PI) , and liquid limit ( $W_L$ ) respectively . The output layer consists of only one node—CBR. The strengths of the developed models are examined by comparing the predicted CBR values with the experimental values with respect to the regression coefficient ( $R^2$ ) and Mean Square Error (MSE) values. In addition, the experimental results were compared to different LMB networks predicted results. It was concluded that the performance of the model with six inputs (LM-6) is better than other model.

**Keywords:** California bearing ratio (CBR), Neural Network, MLPN, Subgrade

## A Unique VLSI Primarily Based Structure for Computation of 2D-DCT Image Compression

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**Abstract:-**Statistics photograph compression is the deficiency, of redundancy in statistics illustration to attain deficiency, in storage cost. The implementation and optimization of FPGA primarily based 2D-DCT with quantization and zigzag with parallel pipe lining the usage of HDL. The 2-D DCT calculation is made using the 2-D DCT separability property, such that the whole architecture is divided into two 1-D DCT separability assets and calculations with the aid of the use of a transpose buffer. The coding is simulated using Xilinx 9.2i ISE synthesized the usage of spartan-3E XC3S250. The 2nd-dct structure makes use of 600 slices, 6 I/O pins, and 4 multiplier and working frequency 135 MHz and pipe lining latency 140 clock cycles.

**Keyboards:** JPEG, DCT, quantization, zigzag, FPGA, Xilinx 9.2i ISE.

## Human Area Networking using Red Tacton Technology

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**Abstract:**-So far we've seen LAN, MAN, WAN, internet and plenty of extra networks. However now here is a new concept of "RED TACTON" which allows the communication via touching and makes the human body floor as a conversation network, this is referred to as human area community which is the rising fashion in the area of conversation. The Red Tacton takes a one of a kind technical viewpoint rather than counting on electromagnetic or light waves to hold facts it makes use of feeble electric powered discipline on the surface of the frame as a transmission medium. Verbal exchange with the aid of that is secure as the modern which flows via the frame is in very small voltage range with excessive pace network transmission direction and is viable the usage of any surface of the frame like hand, fingers, toes, face, legs or torso. It additionally works through footwear and clothing as nicely. Further to the human body, numerous conductors and dielectric may be used as transmission media and also they may be used in aggregate. Transmission velocity does no longer deteriorate in congested areas in which many people are communicating at the equal time with a maximum pace of 10mbit/sec.

**Keywords:** Red Tacton Mechanism, IEEE802.3, Human area network.



## Indoor Positioning System using Ultra Wide-band Technology

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**Abstract:** An indoor positioning machine is a network of device used to locate humans or object wherein GPS and other satellite TV for pc technology lack precision or fail entirely. UWB (excessive bandwidth, low frequency) can skip signals thru a wide type of limitations, along with wall. It can also supply accurate positioning information in a high fresh charge. A area tag of UWB indoor positioning gadget can send area information for the tracked items as much as five times according to second and also can accumulate statistics for up to two years without recharge as a consequence it has low electricity intake which adds into decrease renovation value for indoor monitoring. It has minimum radio interference which permits it to exist in concord with other radio indicators inclusive of those emitted by means of smart phones, Wi-Fi gadget and bluetooth gadgets. A high consumer density isn't a trouble to localization of specific assets because the person can differentiate one song asset and consider the data for it the usage of a visible dashboard. It is vulnerable to interference with the aid of steel and different materials, which makes it a suitable option for asset monitoring in production side.

**Keywords:** Sensor Network, Positioning Algorithms, Wireless Positioning Techniques, Object Tracking

## Common Fixed Point Theorems in Partially Ordered Metric Spaces with Altering Distance Function

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**Abstract:** The aim of this paper is to prove certain fixed point theorems for multi-valued and single-valued mappings in such spaces, by using altering distance function. Fixed point theory in partially ordered metric spaces has greatly developed in recent times. Our results improve and extend several recent results of fixed point theory.

**Keywords:** Common fixed points, Metric space, Partially Metric space, Altering distance function, Multi-valued and Single-valued mappings



## Numerical solutions of Schrödinger equations with Harmonic Oscillator describing motion of Quantum Oscillator

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**Abstract:** In this paper, an effective, powerful analytical scheme, popular as Homotopy perturbation sumudu transform method (HPSTM) is employed to attain approximate solutions of nonlinear time fractional Schrödinger equations with Harmonic Oscillator. These nonlinear time fractional Schrödinger equations occurs in the many fields of physics and technology such as quantum mechanics, optics, fluid dynamics, nonlinear physics, nanotechnology and in many more. The nonlinear time fractional Schrödinger equations with Harmonic Oscillator describe the various phenomena such as motion of quantum oscillator, lattice vibration, propagation of electro-magnetic waves, fluid flow etc. The main objective is to apply an alternative method of solution, which do not require small parameters and avoid linearization and physically unrealistic assumptions. The results show that HPSTM is very efficient and convenient and can be applied to a large class of problems. This study shows that the approximate results obtained by the HPSTM are very accurate and effective for analysis the nonlinear behaviour of systems. This study also states that HPSTM is much easier, more convenient and efficient than other available analytical methods.

**Keywords:** Quantum mechanics, Schrödinger equations, Harmonic Oscillator, Sumudu transform, Homotopy perturbation method, He's polynomials.

## Binary Topological Space

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**Abstract:** Topology is playing a key role in almost every field of applied sciences and several branches of mathematics. This is very useful concept especially in information system, particle physics, quantum physics, high energy physics etc. In 2002 Csaszar [4] introduced and studied the concept of generalized topology and generalized continuity. In 2011 Nithyanantha Jothi S and Thangavelu P, [18] have introduced the concept of binary topology between two sets and studied different properties. In this paper we introduce and studied  $\mu$ -binary topological spaces and investigate its basic properties

**Keywords:** Binary topological spaces, binary topological spaces, closure interior

## Mathematical Concept of Compound Redundant system with availability and reliability parameter under supplementary variable method

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**Abstract:** In this paper author has assume that a compound system have 2-subsystems selected as " and " connected in chain. Subsystem " consists of Nunlike units in chain and the subsystem " consists of 3- like components in parallel redundancy. In this system it is assume that the system goes to complete crash state if any unit of subsystem " fails or more than 1-unit of subsystem " is in the failed state. Also, the system works with degraded efficiency if 1-unit of subsystem " failed. The system may also fail due to environmental reasons.

**Keywords:** Availability, Reliability, Abel lemma, MTTR, Ergodic behaviour and Laplace Transform and Supplementary variable

## A Basic generalized properties of Transprocal Matrix and Transprocose Matrix.

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**Abstract:** In this paper we have to generalize some definition and properties of I-matrix, J-matrix Transprocal of certain matrix, transpose of transprocal matrix, can be represented by this matrix. On the other hand, the abstract treatment of linear algebra presented later will generalize a new sight into the structure of these matrices.

## Machine Learning Algorithms in WSNs: A Review Article

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**Abstract:** Wireless sensor network (WSN) is a recent leading technology that is used in realistic applications due to its variable size, cost-effectiveness and type of deployment. Sensor nodes battery in WSN cannot be recharge and nodes also cannot be replaceable due to which nature of WSN changes dynamically. The traditional approaches in WSN cannot adopt the changes dynamically. To overcome the drawbacks of traditional approaches, machine learning (ML) techniques are adopted to react accordingly. In this article, survey based on ML techniques with WSNs application is presented which covers from 2002 to 2018. In addition, drawbacks and advantages of each and every technique have been discussed. Finally, some open issues in WSN is mentioned for the future research direction.

## Iwalk- A Smart Blind Stick

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**Abstract:** Independence is the building methodology in achieving dreams , goals and objectives in life . Visually impaired persons find themselves challenging to go out independently . There are millions of visually impaired or blind people in this world who are always in need of helping hands . Blind stick is an innovative electronic stick . Blind people have big problem when they walk on the street or stairs using white cane , instead of this white cane the electronic walking stick will help them by providing more convenient means of life . The main aim of this paper is to contribute our knowledge and services to the people of blind disabled society .

**Keywords:-** ATmega 2560 , Ultrasonic sensors , Sim Gsm/Gprs , SD Card Module , LDR , Water sensor , Registers , LED's ,Battery(9V) , buzzers , speaker .

## Analysis of Triaxility Stress and Damage in Hot Extrusion Process of AL2024 using Finite Element Method

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**Abstract:** Hot Extrusion process is a manufacturing process in which block of metal is reduced in cross section by forcing it to flow through a die orifice under high pressure. In general, extrusion is used to produce cylindrical bars or hollow tubes, but shapes of irregular cross section may be produced from the more readily extrudable metals, like aluminum. Heavy forces required in extrusion, most metals are extruded hot under conditions where the deformation resistance of the metal is low. However, cold extrusion is possible for many metals and has become an important commercial process. The reaction of the extrusion billet with the container and die results in high compressive stresses which are effective in reducing the cracking of materials during primary breakdown from the ingot. In this research work numerical simulation of hot extrusion process has been considered and carried out the finite element analysis has been carried out. Focused on the stress and strain behavior, triaxility stress and on the bases of deformation aiming on the damage and its behavior, taguchi method has been used for the validation of the design of experiment. For FEA DEFORM 3D software has been applied and for modeling of parts AUTOCAD has been used.

**Keywords:** Hot Extrusion, FEA, triaxility Stress, Damage.

## Finite Element Analysis of Hot Rolling for an Aluminium 2024 Plate

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**Abstract:** Now a day numerical modelling an important tool in the manufacturing industry to analysis the all the parameters of machining and geometrical. The two dimensional rolling model is common in manufacturing industries. In the present research work is based on a two dimensional finite element model for hot rolling of aluminum (Al2024) plate has been used. This model is used to study the behavior of the material under different values of coefficient of friction, roller diameter and initial thickness of the plate for attaining a required dimensional thickness of the rolled plate. The effect of friction, initial thickness of plate and roller diameter on maximum stress, equivalent plastic strain and reaction force has been studied. The current work has been carried out using the Finite Element software ABAQUS 6.10

**Keywords:** Hot Rolling, FEA, Stress- Strain.

## Class(es) of Estimators under Non-Response and Measurement Error in Surveys

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**Abstract:** While in sample surveys, it is expected to assume that respondents are obtainable to provide information correctly asked by interviewers. Unfortunately, in real circumstances it is rarely happens. Often respondents are not available; often do not understand to interviewer and often show unwillingness for correct answer. This causes a sample to be incomplete. According to theory of survey sampling, investigators are recommended to revisit those units found non-responded but even then the problem remains the same. Over the issues of personal respect and prestige bias, respondents often produce over or under estimated response instead of the true value. This causes appearance of measurement error in sample values. This paper presents method of mean estimation in the setup of non-response and measurement error together. It contains method to impute the values which are non-responded in sample containing measurement error on study variable. Expressions of optimized mean squared error are derived and theoretical results are supported by numerical illustration. This is an attempt for a most general approach for the problem of estimation in sample surveys.

**Key words:** Non-response, Measurement error, Bias, Mean squared error, Imputation, Auxiliary information.

## Lie Algebra and q Special Functions of Mathematical Physics

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**Abstract:** In this paper we will present important interrelationships between the theory of Lie groups and algebras, and special functions. We will study two specific Pseudo groups, namely  $SO_q(2)$  and  $SU_q(2)$ , and we prove that similar properties of Lie groups and study about the role of q special function in mathematical physics.

## Banach (E,1) Summability of the Derived Fourier Series

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**Abstract:** The aim of our paper is to study the Banach (E,1) product summability of derived series of Fourier series by generalizing the result of Tripathy and Pandey [9]

**Keywords:** (E,1) summability; Banach\_(E,1) summability; Banach summability.

**Mathematics Subject Classification (2010):** 42A24, 42A20 and 42B08

## Common Fixed Point Results for F-contraction in Complete b - Metric Spaces

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**Abstract:** In this paper, we consider two F- contractive self mappings on a complete b- metric spaces. Object of this paper is to establish a unique common fixed point theorem for F - contractions. The results extend and generalize some results in the literature.

**Keywords :** Complete b- metric space, common fixed points, F-contractions.

## Some Fixed Point Theorems for Expansive Type Mappings in Dislocated Metric Space

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**Abstract:** The present paper extend and generalize fixed point theorems for expansive type mappings in Dislocated Metric Space.

**Keyword:** Dislocated Metric Space, Fixed Point Theorems,

**Mathematics Subject Classification:** 47H10,54H25

### On Ricci Quarter Symmetric Metric Connection

Teerathram Raghuwanshi<sup>1</sup>, Swati Jain<sup>2</sup>, Anil Goyal<sup>3</sup> and Manoj Pandey<sup>4</sup>

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**Abstract:** The object of the present paper is to study a type of Ricci quarter symmetric metric connection on a quasi-Einstein manifold and  $N(k)$ -Quasi Einstein manifold. We have shown that curvature tensor of the connection satisfies Bianchi's first identity and also that the conformal curvature tensor is an invariant of such a transformation. Apart from this, we have studied some more curvature conditions.

### A Taylor Series Method for the Solution of the Newman Boundary Value Problems for Partial Differential Equations

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**Abstract:** In this paper, a numerical method for solving the Neumann problems for partial differential equations with constant coefficients and analytic Neumann conditions in two and three independent variables is presented. The technique is based upon the Taylor series expansion. Properties and the operational matrices for partial derivatives for the Taylor series in two and three variables are first presented. These properties are then used to reduce the solution of partial differential equations in two and three independent variables to a system of algebraic equations. The procedure can be extended to linear partial differential equations with more independent variables. The Taylor series may not converge if the solution is not analytic in the whole domain, however, the present method can be applied to Neumann boundary-value problems for linear partial differential equations, when the solution is analytic in the interior of the domain and also on some open subsets for each distinct part of the boundary. The method is computationally very attractive and applications are demonstrated through illustrative examples.

### DSSSWMS: An Improved Approach For The Decision Support System In Solid Waste Management System

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**Abstract:** India is a developing country, all the developing countries facing a sustainable waste management problem for a long time. The quantity of MSW is growing very rapidly and governments are not capable of disposal 100% of solid waste as per compare to generation. Improper waste management affects the environment and human being direct. Peoples suffer from many types of diseases due to improper solid waste management. To deal with this problem the Indian government makes policies and updates them from time to time. Now this time we need new technology that can be work of an integrate form with waste management models and help to improve the efficiency of the municipal solid waste management process. Decision support systems model such types of tools that can be the help of organizations or decision-makers to take proper decisions for a particular problem. A decision support system is a fully computerized system that can be work with the help of data mining technology.

## Mathematical Modeling of Indoor Air Pollutants: A Review

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**Abstract:** With the global concern over the pollution, the indoor environment is also to be kept safe and within the prescribed air quality standards as most of the people spend their 80% of the time indoor whether it is at home, office or any other place. The pollutant concentration in indoor is more than in outdoor atmosphere and can affect negatively human health and productivity. Therefore, prediction of indoor pollutant concentration will help in making the necessary arrangements to improve indoor environment in order to keep the human health and productivity up to the desired levels. Several studies have been made over four decades in developing, testing, and evaluating the performance of mathematical models for predicting pollutant concentrations in the indoor atmosphere. These studies provide the data pertaining to risk assessment and enable the regulatory bodies to provide guidelines for the appropriate steps for a given level of smoking, Chemically Reactive Pollutants activity etc. This paper reviews the Balance-Based Model for Indoor Air Pollutant Concentration Modelling, Mathematical Modelling of Chemically Reactive Pollutants in Indoor Air and Mathematical Models for Predicting Indoor Air Quality from Smoking Activity.

## Generalized Fractional Kinetic Equations involving Generalized Extended-- $\tau$ Hypergeometric Function

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**Abstract:** Recently, introduced an extension of generalized  $\tau$ Hypergeometric function  ${}_3\Gamma_2^T(2)(z)$  (R. K. Gupta et al. [5]), [6]. In the present paper, authors have established further generalization of fractional kinetic equations involving generalized extended  $\tau$ -Hypergeometric functions. The solution of these generalized fractional kinetic equations were obtained in term of Mittag-Leer function using Laplace transform.

**Keywords:** Generalized extended incomplete Hypergeometric Function, Fractional kinetic equation, Laplace transforms, Mittag-Leer function, Fractional calculus.

**Mathematics Subject Classification (2010):** 26A33, 33B15, 33B20, 33C20, 44A10, 33E20.

## Global Stability Analysis of SITRS Model of Influenza

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**Abstract:** Numerous people all over the world are suffering from influenza every year. It is an acute respiratory infectious disease which is caused by influenza virus. The purpose of this paper is to study the spread of disease when individuals have tendency to become susceptible again after recovery. A SITRS deterministic model is proposed and analyzed. In this paper basic reproduction number  $R_0$  is obtained, local stability of disease free equilibrium and endemic equilibrium is studied and discussed global stability of disease free equilibrium. It is observed that disease free equilibrium is locally and globally stable when  $R_0 < 1$  and endemic equilibrium is stable when  $R_0 > 1$ . Numerical simulations are performed using MATLAB to check the effect of movement of individuals from recovery class to susceptible class and results are shown graphically.

## Coupled fixed-point theorem using E.A property in complex valued rectangular (generalized) metric space.

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**Abstract:** In this paper coupled fixed point is obtain for four mapping using E.A property in complex valued rectangular (generalized) metric space.

**Keywords:** Complex- valued metric space, coupled fixed point, E.A property.

## Parametric excitation of high-frequency surface Plasma waves in Bismuth-Metal Interface

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**Abstract:** The problem concerning the excitation of high-frequency surface Plasma waves (SPW) propagating across an external magnetic field at a plasma-metal interface is considered. A homogeneous electric pump field is applied in the direction transverse with respect to the plasma-metal interface. Two high-frequencies SPW from different frequency ranges of existence and propagating in different directions are shown to be excited in this pump field. The instability threshold pump-field values and increments are obtained for different parameters of the considered waveguide structure. The results associated with saturation of the nonlinear instability due to self-interaction effects of the excited SPW are given as well. The results are appropriate for both gaseous and semiconductor plasmas. A surface plasma wave (SPW) over bismuth-Metal interface has a signature of mass anisotropy of free electrons. For SPW propagation along the trigonal axis there is no birefringence. The damping rate of waves at low temperatures is low. The surface plasma wave may be excited by an electron beam of current 100 mA propagating parallel to the interface in its close proximity.

## Artificial Neural Network Modeling for Estimation of Carbon Monoxide Concentration

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**Abstract:** The lack of environmental data is a common feature for many developing countries. Accurate estimation technique is highly required to overcome with this problem and the artificial neural network (ANN) is regarded as cost effective and better suited technique for estimation as compare traditional statistical techniques. In this paper an attempt is made to estimate concentration of CO gas based on historical data using artificial neural network (ANN). Eleven years (1996-2006), night time (22.00-06.00 Hrs.) CO emission data from ITO square of Delhi has been employed for modelling and simulation study. The results of ANN studies predicted CO concentrations with great accuracy and closer-to-reality which can be helpful to alleviate the excessive CO accumulations.

**Keywords:** Concentration, Artificial Neural Network (ANN), Real time analysis, Modelling.

## Intelligent Phishing Detection Classification Using Hybrid Approach

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**Abstract:** The so-called phishing attacks refers to an attacks in which a legitimate website is mimicked, in order to steal sensitive statistics from end-users. Phishing attacks are one of the significant threats to individuals and corporations on the Internet today. In recent years, this problem has been actively researched by academia and industry. There are two main approaches to try to provide an effective phishing solution: The first is to identify phishing attacks by comparing the similarities between phishing and the target site. The second method is to observe the underlying characteristics of the attack. This paper proposes a phishing technique based on web page uniform resource locator (URL) authentication. The proposed solution is able to distinguish legitimate web pages from fake web pages by verifying the Uniform Resource Locator (URL) of the suspicious web page. Check URLs against specific features to verify phishing pages. Prevention of detected attacks is reported. The performance of the proposed solution was evaluated using the Phistank and Yahoo Directory datasets. The obtained results suggest that the detection mechanism is deployed and can detect various types of phishing attacks while maintaining a low rate of false alarms.

**Keywords:** Phishing, malicious URL, KNN, machine learning, cybersecurity.

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## Review on mathematical modelling of an Internal Combustion Engine

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**Abstract:** In this article, we are focussed and discussed on different types of mathematical modelling and its application used in internal combustion engine. A mathematical model usually describes a system by a set of variables and a set of equations that establish relationships between the variables such as combustion, performance and emission parameters. By the use of mathematical modelling different parameter of internal combustion engine can be correlate and analyse the effect of one parameter to another. After developing a mathematical model different types of fuel blend can be easily analyse the effect on combust, performance and emission at different loads within the experimental domain. Author's analysed and found from previous published paper related to mathematical modeling and experimental output predicted should be closer to developed mathematical model.

## Kinetic Model for Performance Prediction of Anaerobic Digester

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**Abstract:** Anaerobic Digestion (AD) is a biological process that happens naturally when bacteria breaks down organic matter in environments in the absence of oxygen. Anaerobic digestion (AD) is a microbial decomposition of organic matter into methane, carbon dioxide, inorganic nutrients and compost in oxygen depleted environment and presence of the hydrogen gas. Bacterial growth is a complex process involving numerous anabolic (synthesis of cell constituents and metabolites) and catabolic (breakdown of cell constituents and metabolites) reactions. Ultimately, these biosynthetic reactions result in cell division. Several distinct growth phases can be observed within a growth curve lag phase ,the exponential or log phase, the stationary phase, the death phase. During exponential growth the rate of increase of cells in the culture is proportional to the number of cells present at any particular time. One can mathematically describes cell growth during the exponential phase . Equation has been developed from a series of experiments performed. The results of these experiments shows that at low substrate concentrations, growth rate becomes a function of the substrate concentration .Thus, designed Equation to describe the relationship between the specific growth rate and the substrate concentration.The most important determinants of good living conditions for anaerobic bacteria and therefore efficient gas production. Acetogenic (acid forming bacteria) and methanogenic are naturally present in cow dung.However, their number is quite small. Acid forming bacteria proliferate fast and increase their number, while methanogenic bacteria develop very slowly. Therefore, for the initial reaction, small amount of sludge of another digester is generally used as seeding or inoculum.This sludge contains high concentration of acetogenic and methanogenic bacteria which could enhance the process of anaerobic digestion of organic materials. Some study has shown that the seeding materials can be mixed with the input slurry up to the ratio of 30 to 50 percent. If inoculum is increased further, less volume of gas is obtained due to reduced inputs fed to the digester. Anaerobic digestion occurs best within a pH range of 6.8 to 8.0.

## Emotion Detection based on Images and Captions on Social Media

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**Abstract:** Nowadays, Internet has grow to be an crucial element in every person's lifestyles. Social networking has regularly grow to be a recurring for people to submit their photos, opinions and remarks. People percentage their emotions on line in a completely casual language. Thus, it is very tough mission to research actual sentiment hidden inside the text of natural language. Emotion detection is the sphere of study that analyses people views and feelings. Human emotion can be expressed through numerous approach which include speech, facial expressions, gestures and textual facts.This paper proposes the gadget which makes use of present emotion detection thru facial features using deep mastering and supports it with the evaluation of textual information received thru captions of pics on social networking websites to ensure greater accurate outcomes. There is no characteristic on social networking sites to kind feelings of photos which motivate us to classes posts based on emotions. Emotion detection from each captions and photos collectively is efficient due to the fact most effective text isn't always enough to apprehend the feelings of customers. This hybrid approach offers promising results in both the class of feelings as well as in acting emotion detection.

**Keywords:** Emotion detection, Convolution Neural Networks, Social Networks, Deep Learning, Sentiment Analysis

## Content Based Facial Emotion Recognition Model using Machine Learning Algorithm

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**Abstract:** Emotion reputation or sentiment analysis is recognized as a critical studies topic in pc vision community. The challenges include identity of face, popularity of accurate emotion, suitable database and so forth. We have proposed and implemented a fashionable Convolution Neural community (CNN) building framework for emotion popularity. The model is formalized by means of developing a coincident gadget which fulfills the duties of face detection and emotion classification the usage of our proposed CNN structure. The version is verified using the FER-2013 dataset. In the proposed paintings, we talk the applicability of the proposed CNN model. This model lays a valuable evaluation of the effect of changing the network size, pooling, and dropout. For a given model, the very last accuracy at the validation facts is round 63%.

**Keywords:** Convolutional neural network (CNN), Facial expression recognition, Deep neural networks.

## Role of SODAR in the Climate Observing and Predicting System

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**Abstract:** Climate Change is our time's defining problem and we are at a defining moment. The effects of climate change are global in scope and unprecedented in scale, from changing weather patterns that threaten the human life and livelihood due to the rising risk of hydro meteorological disasters like flood, hurricanes, cyclones, drought etc. Without dramatic intervention today, it will be harder and more expensive to adapt to these hydro-meteorological effects in the future. Many methods have been created and are being developed for curbing the catastrophic effect caused due to hydro-meteorological disasters. Remote sensing was one of those techniques that had a huge effect on disaster management. This technology has been widely used in recent decades to explain the extent of the impacts of earthquakes, tsunamis, hurricanes, floods, wildfires etc. Remote sensing techniques have proved important effectiveness in quantifying post-disaster harm after major disaster through high resolution optical imaging and active sensors. Before these disasters happen and create a dreadful situation (humanly in terms of economy and socially), however, it is necessary to estimate and predict them. The present study focused to develop environmental models that enable prior prediction of these disasters via estimation of extreme climate change before it could cause detrimental effects. The research deploys Sound Detection and Ranging (SODAR) for collection of data in relation to wind speed and direction, atmospheric boundary layer for specific locations in India that are hit by hydro-meteorological catastrophe for evaluating the role of SODAR and environmental modelling in prediction of climatic trends, thereby avoiding the disaster hit consequences. The study also addresses the wider applications and advantages of using SODAR than other remote sensors and the models which uses wind speed and direction for the prediction of climate changes and thus helping in pre preparedness before the disaster. Therefore, there is an apparent connection between climate change and rising climate-related risks, generally suggesting the need to assert about the need for its predication through environmental modelling. This project will take the help of environmental modelling to ascertain about the upcoming climate change which will enable an estimation of climatic havoc leading to pre-precautionary measures before these disasters affect the people.

## Security Concerns, Matters and Methods for Wireless Sensor Network

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**Abstract:** A Mobile ad hoc networks (MANETs), a class of flexible and self-autonomous wireless networks that can be rapidly deployed and reconfigured without infrastructure support or centralized management, are highly promising to provide communication support [1]. The mobile nodes can move from one location to another. The mobile nodes are formed as a network without help of central management [1, 2, 18]. The Nodes in networks make use of an equivalent random access channel, cooperating in an especially friendly manner to contributing themselves in multihop forwarding. With the worldwide use of wireless sensor networks in different field and for various applications such as health care, military, ecological, and earth sensing, surveillance system monitoring. By reason the restrictions/ limitations of sensor nodes in terms of energy, storage and computational capacity, the use of insecure wireless communication channels concerns have ascended in these applications. To countermeasure the limitation various techniques and algorithm has been developed by the researchers. In this paper, we present the security issues, challenges occur and different techniques to overcome these security issues with their merits and demerits.

**Keywords:** Wireless sensor network, Sensor node, Security, Health care, Energy

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## Mathematical Modeling of Heat Exchange in the Under Ground Pipe of an Earth Air Heat Exchanger System

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**Abstract:** The tropical countries like India where heating and cooling of air is mostly required during particular season in a year. Conventional heating and cooling systems consume a great amount of energy reaching up to the level of almost one-third of the total energy consumption. As the current energy requirements are mostly fulfilled by the fossil fuel based energy generation systems, this extensive consumption of the energy contributes to green house emissions and affecting the environment adversely. A promising technology of heating and cooling of air by the earth air heat exchanger system has been becoming important in the present scenario of emphasis on reducing energy demand on space heating and cooling. This renewable and passive system of heating and cooling reduces the energy demand and thus protect the environment also. The design of the earth air heat exchanger system involves various parameters such as the thermo-physical properties of the soil, thermal and flow characteristics of the air in the pipe, material, orientation and dimensions of pipes buried in the earth and the heat exchange for the optimum performance. This paper presents the mathematical modeling of the heat exchange in the underground pipe. The mathematical model will provide the necessary input data for the design of an efficient earth air heat exchanger system. Thus the space heating and cooling can be more effectively done with the saving of energy and protecting the environment.

## Extreme Values Analysis for Finding Outliers Detection Using Machine Learning to Detect Predicted Data Points

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**Abstract:** An outlier is usually measured as an observation which is extensively found distant from the other well thought-out observations. In the era of modern machine learning analysis of n-dimensional datasets, data quality is essential for economists to guarantee robust results. Many machine learning algorithms are sensitive to the range and distribution of attribute values in the input data. Outliers in input data can skew and mislead the training process of machine learning algorithms resulting in longer training times, less accurate models and ultimately poorer results. Even before predictive models are prepared on training data, outliers can result in misleading representations and in turn misleading interpretations of collected data. Traditional techniques for outlier detection tend to exclude the tails of distributions and ignore the data generation processes of specific datasets. Various methods for detecting different kinds of outliers in high-dimensional data sets from two different perspectives, i.e. detecting the outlying aspects of a data object and detecting outlying data objects of a data set. N-dimensional data can be seen as part of the variety challenge of machine learning.

**Keywords:** Outlier detection, Machine Learning, High-Dimensional Data, Intrinsic Dimension (ID), k-Nearest Neighbour (k-NN)

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## Review of Artificial Neural Network and Its Applications

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**Abstract:** In this paper, we are elaborating Artificial Neural Network or ANN, its areas of applications. An Artificial Neural Network (ANN) is an information processing paradigm that is inspired by the way biological nervous systems, such as the brain, process information. In our brain, there are billions of cells called neurons, which processes information in the form of electric signals. ANN works on this concept. ANN provides a very exciting alternatives and other application which can play important role in today's computer science field. This paper gives overview of Artificial Neural Network of ANN. It also explains the application and advantages of ANN.

**Keywords :** Artificial neural network, information, process, electric signal, biological nervous system.

## Role of AI in Designing Smart Homes

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**Abstract:** Smart Homes have become firmly established as an active research area with potential for huge social and economic benefits. The concept of a Smart Home refers to the enrichment of a living environment with technology in order to offer improved habitual support to its inhabitants and therefore an improved quality of life for them. In this research paper we purpose how advances from the device and technological side have not necessarily been matched with a similar level of development in processing of the information recorded within the living environment from an algorithmic or 'intelligent' perspective. We surmise how traditional areas in Artificial Intelligence can bridge this gap and improve the experience for the user within a Smart Home. Smart Homes offer many benefits to its inhabitants and people with special needs. ANN (Artificial neural Network) technology appear to have potential, especially in the automated monitoring and control of smart home devices and the relevant space as well as the well being of inhabitants. With the rapid advances in technology , especially in wireless sensors and sensor networks, it is expected that it is not far when many of the dreams of the smart homes will be realized.

## Application of Intuitionistic Fuzzy Soft Matrix Theory in Decision Making in Real Life Problem

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**Abstract:** Soft set theory is a newly mathematical tool to deal with uncertain problems. It has a rich potential for application in solving practical problems in economics, social science, medical science etc. The concept of fuzzy soft sets extended fuzzy soft set to Intuitionistic fuzzy soft sets .In this paper we proposed intuitionistic fuzzy soft matrices and defined different types of intuitionistic fuzzy soft matrices and some operators. Finally a practical example that explains the best solution is analysed and demonstrate the application of the proposed decision making method.

**Keywords:** Soft sets, Fuzzy soft matrix (FSM), Fuzzy soft set (FSS), Intuitionistic fuzzy soft matrix (IFSM), Addition of IFSM, Complement of IFSM , Subtraction of intuitionistic fuzzy soft matrix.

## Generalized the Result on Common Fixed Point Theorem in Complex Valued b- Metric Space

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**Abstract:** In this paper we generalized a common fixed point theorem for four self-mappings satisfying rational contraction has been proved in complex valued b-metric space. Then, examples are provided to verify the effectiveness and usability of our main results. Finally, we validate our results by proving both the existence and the uniqueness of a common solution of the system of Urysohn integral equations and the existence of a unique solution for linear equations system.

**Keywords:** complex valued b-metric space, common fixed point, compatible mapping, weakly compatible mapping, integral equations, linear system.

**AMS Subject Classification No. (2010):** 47H10; 54H25

## **Big Data Analytics and High Performance Computing: Issues, Challenges and Paradigms**

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**Abstract:** Data has grown with the advent of technology, capture and store data and then analyze it. Big data is a primary concern with the management of computational models that require improvement. Big data and then later the rise of big data analytics which changed the whole perspective of data and data handling. Satisfied growing analytical needs for Big Data with extremely high performance computing models. As a result, a lot of research in this area has been seen in recent years, several paradigms for Big Data Analytics emerge. Simultaneously, the spread of Big Data Analytics in various domains, concerns about the effectiveness of the new analytical paradigm are also being seen. This paper highlights the major analytical models and concerns and challenges in High Performances Computing.

**Keywords:** Big Data, High performance computing, Computational Model

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## **Assortment of Data on Life table with Role of control of Internal Parasite in calf**

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**Abstract:** The assortment of information on life-table at various stages gives a significant undertaking for control of Internal Parasite in calf at various ecological conditions. Accordingly, in present examinations, age and stage explicit life table of were utilized at different stages.

**Keywords:** Life table, age explicit life and stage explicit life.

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## **Review Analysis of IOT based Solar Energy System**

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**Abstract:** A smart solar photovoltaic system is an advent of innovation coherence of information and communications knowledge with power systems control engineering via the internet. This paper designs and demonstrates a smart solar photovoltaic off grid system that self-healing, ecological and consumer friendly, but also with the ability to put up other renewable sources of energy generation seamlessly, creating healthy spirited energy industry and optimizing energy assets efficiency. This work also discuss the modeling of an competent dynamic smart solar photovoltaic power system by exploring the most power point tracking efficiency, optimization of the smart solar photovoltaic array through modeling and simulation to get better the quality of design for the solar photovoltaic module. Using the Internet of Things Technology for supervise solar photovoltaic power generation can greatly enhance the performance, monitoring and maintenance of the plant. The discussion in this project work is based on implementation of new cost effective methodology based on IOT to remotely monitor a solar photovoltaic plant for performance evaluation. This will facilitate preventive upholding, fault uncovering, historical study of the plant in totaling to real time monitoring.

**Keyword:** Solar, IOT, Power System, Optimization

## Glaucoma diagnosis using discrete wavelet transforms and Histogram features from fundus images

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**Abstract:** Glaucoma is one of the main eye diseases; it causes progressive deterioration of optic nerve fibres due to increased fluid pressure. The existing methods of glaucoma diagnosis are time consuming, expensive and require practiced clinicians to understand the eye problems. Hence fast, cheap and more accurate glaucoma diagnosis methods are needed. This paper presents an innovative idea for diagnosis of glaucoma using third level two dimensional discrete wavelet transform (2D DWT) and histogram features from fundus images. The 2D DWT is used to decompose the glaucoma and healthy images and histogram features are extracted from 2D DWT decomposed sub band images. The least square support vector machine (LS-SVM) is used as a classifier which classifies the glaucoma and healthy images using the extracted features.

**Keywords:** Glaucoma; 2DWT; LS-SVM.

## Some fixed point theorems for generalized Kannan type mappings in b-metric spaces

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**Abstract:** In this paper, we prove some fixed point theorems in b-metric spaces using subadditive altering distance function. Some of these results generalize many existing fixed point theorems for Kannan type mappings. The results are justified with suitable examples.

## Strong convergence of a general algorithm for nonexpansive mappings in Banach spaces

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**Abstract:** In this work, we consider a general algorithm for a countable family of non expansive mappings in Banach spaces. We proved that the proposed algorithm converges strongly to a common fixed point of a countable family of non expansive mappings which solves uniquely the corresponding variational inequality. It is worth pointing out that our proofs contain some new techniques. Our results improve and extend the corresponding ones announced by many others.

## Speech Recognition Application without Internet Connection

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**Abstract:** Artificial Intelligence, in all its forms is trying to make life simpler for humans, by utilizing the thinking power of man in creating machines which can think and do work for man. It is an area of computer science which focuses on developing intelligent, decision making machines which work and react like humans. There are millions of applications of Artificial Intelligence, one of them being: Speech Recognition. It is an area which enables translation of man-spoken words into machine readable format. Consequently, the machine understands the language, processes the words and responds depending upon the decision made by it. In this digital era, everyone knows how to use Google Assistant. Siri and Cortana have made everything easy for us. But still, these speech recognition softwares cannot work without proper internet connectivity. The research paper is entitled to demonstrate a solution to make use of artificial intelligence without internet. The main idea is to use integrated circuits as a medium to store the data required for processing of decisions. Also, computer's cache can be used to store frequently asked questions so as to deliver the solutions at a faster rate. This would make use of artificial intelligence in setting up of smart alarm clocks, in handling of event management, redirect users while travelling through frequent routes without using GPS system. This strategy would help make the speech recognition software a standalone application, and would provide reliability and faster response time as well.

**Keywords:** Artificial Intelligence, Speech Recognition, Response Time, Reliability

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## AI based chatbot with the help of Image processing for Medical Assistance

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**Abstract:** The aim of this paper is to present the idea of a chatbot which would give medical assistance to the patient at their home. It would also make use of image sensing to process image given by user and detect the disease. It would also be having a feature for emergency service. The chatbot would be user friendly and would communicate with user in natural language. The chatbot will be providing immediate home remedies which the patient could use at home to get quick and effective results.

**Keywords:** Chatbot, Artificial Intelligence, Image Processing, Dialog Flow

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## A.I based Chat Bots for Providing Health Related Information

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**Abstract:** Chat bots in health care have the potential to provide patients with access to immediate medical information. Health Care chat bots could help patients better manage their own health, improve access and timelines to care. This can be done by using a conversational chatbot which will ask for various symptoms of a disease and will try to find out the type of disease along with it's home remedy using machine learning. It will also provide the details of the nearest hospital in case of an emergency.

**Keywords:** Chatbots, Machine learning, Dialogflow, Human-computer interaction.

## A Novel Technique to Early Detection and Avoidance of Congestion in MANET

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**Abstract:** MANETs have different features that make congestion management more difficult. This paper examines a similar approach to congestion solving situations and minimizing loss of packets in wireless networks. The method of using the concept of trust aware with Queue status for bandwidth aware routing is introduced. We use NS2 simulator and we have demonstrated our approach improves system performance and reduces the number of packets deposited on the network, so improving system performance.

**Keywords:** MANET's, Congestion control, Packet loss, Congestion controlling techniques.

## A Security Issues and Approaches in Cloud Computing

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**Abstract:** This paper discusses the data security in computing of cloud and also focuses on the study of information in the cloud and all aspects that are related to concerning security. It also discusses the probable fear of data security in the cloud environment and their solutions adopted by an assortment of service providers to defend security of data. Research paper will depart into details of defense for data rules with approaches used to ensure maximum fortification of data by decreasing risks as well as threats. Data availability in the cloud is advantageous for numerous applications. For the more perspective, research focus on confidentiality of data perpetuation which becomes more complex with flexible data sharing among a vibrant user group. It requires the concealment of outsourced data and a competent sharing of decryption keys between different certified users. For this reason a variety of methods are offered some of them focus on the use of attribute based cryptography ABC with AES.

**Keywords:** Data Security, Cryptography, Public key, Data Protection, Privacy, Risks and threats

## Common Fixed Point Theorem for Multivalued Generalized Fuzzy Mapping in b-metric space

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**Abstract:** In this paper, we are proving  $\alpha$ -fuzzy fixed point and common  $\alpha$ -fuzzy fixed point theorems for Multi-valued fuzzy mapping in complete b-metric space. Our result extends and generalizes the result of A. Shahzad with new rational expression.

**Keywords:** Multi-valued Mapping, b-metric space, fixed point, Common fixed point.

## Optimal solution method for Transportation problems of multiple variables

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**Abstract:** Transportation problem is considered a vitally important aspect that has been studied in a wide range of operation including research domain. As such it has been used in simulation of several real life problems. The transportation problem is a special class of model. It deals with the situation in which a commodity from several sources is shipped to different destinations with the main objective to minimize the total shipping cost .optimizing transportation problem of variable has remarkably been significant to various disciplines .It this paper , multiple variable will be optimized to reduce from-transportation cost using multiple method which will include. Northwest corners method, least cost method, Vogel method and mode method. This will mainly aim at finding the best and cheapest route on how supply will be used to satisfy demand at specific points,

**Keyword:** Optimization techniques, transportation problem, northwest corner, least cost, Vogel, model.

## Reliability of System with Two Repair Facilities

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**Abstract:** The aim of this paper is to present a reliability analysis of two unit cold standby system with repair facilities. The system consists of two units with each one with operable or failed state. At any time, one unit is operating while other is in cold standby. The failure has been divided into two parts major and minor. Minor failure requires minor repair facility and major repair requires major repair facility. Thus there are two repair facilities available. System has perfect switching for units .The system completely fails on the failure of both the units. The failure and repair times follow exponential and general time distribution. Partial Differential Equations and Laplace Transforms of various state probabilities have been obtained. Reliability of the system has been derived in the form state probabilities.

**Keywords:** cold standby system, major and minor repair facilities.

## Modelling of the Risk of Cancellation of Policies using Fuzzy Logic Approach

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**Abstract:** The preventive avoidance of cancellation is a key problem facing insurance companies. A conversation with the client held prior to latter's decision to cancel a contract increases the likelihood of contract continuity. So companies are in need of reliable expert system that can help them to evaluate the risk of cancellation of the policies in future. With the help of fuzzy system it is possible to identify clients who may potentially cancel and take timely measure to safeguard the portfolio. Here a model is presented, which is designed by using fuzzy mathematics and expert system to provide indicative results on the risk of cancellation of the policies in future.

**Keywords:** Fuzzy logic, Insurance, Risk classification, Inference system, MATLAB, Index of vagueness.

## Availability Evaluation of 1-Unit System with 2-Warm Standbys

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**Abstract:** This paper extracts the availability of a warm standby system with reboot delay and switching failures. The system is studied under the assumption that the time-to-failure and the time to repair of the primary and standby units are exponentially and generally distributed, respectively. There is a possibility of failures during the switching from standby state to primary state. Reboot delay happens in this switching procedure of a standby unit to primary unit. The reboot time is assumed to be exponentially distributed. It is assumed that there is a significant probability of a switching failure. Primary and warm standby units can be considered to be repairable. Using the supplementary variable technique we develop the explicit expressions for the steady state availability.

## Investigation about Stock Market Timing using Fuzzy Inference System

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**Abstract:** To determine the buy and sell time is one of the most important issue for investors in the stock market. Stock investment has become an important investment activity and internet makes it easier exchange stock information and to make stock transaction. Trading in the stock market is full of uncertainly so there is vagueness in the market. Predicting the market is very difficult since it depends on several unknown factors. A person cannot observe that what is going to be happening and therefore investors often lose their money due to unclear investment objective. In this work a fuzzy approach to stock market timing is investigated. The proposed fuzzy model helps in identifying the stock market which is very bullish, bullish, neutral or very bearish, bearish. The four input factor are fuzzified to get a output using fuzzy logic, the stock market which is either very bullish, bullish, very bearish, bearish or neutral continues to some extent. For fuzzifying these input data, trapezoidal membership function is used, and center of gravity method is used for defuzzification of fuzzy output. The results found suggest that fuzzy modeling for this purpose is very promising.

**Keywords:** Stock market, fuzzy logic, timing, trapezoidal membership function.

## Fuzzy Logic Concatenation in Biometric Identification Systems

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**Abstract:** Security of information is one of the most important factors of information technology and communication. So systems need strong procedures to protect data and resources access from unauthorized users. There are number of ways to prove authentication and authorization. But the biometric authentication beat all other techniques. Biometric-based authentication systems represent a valid alternative to conventional approaches. As Multimodal biometric identification system is more powerful, more accurate, less noisy data than the Single/Unimodel biometric system. This paper introduce three biometric techniques which are face recognition, fingerprint recognition, and iris recognition (i.e. Multi Biometric System) & aims at concatenating three biometric features namely face, fingerprint and iris to minimize False Accept Rate(FAR) and False Reject Rate(FRR). And shows using these biometrics has good result with high accuracy using fuzzy logic at decision level. In greater detail, fuzzy logic based approach at decision level is used for concatenation. Fuzzy logic is used for the effect of each biometric result combination. The proposed multimodel system achieves interesting results with several commonly used databases.

**Keywords:** Biometric, Multibiometric (face, fingerprint, iris), fuzzy logic.

## Reliability of Three Unit System with Two Type of Repair

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**Abstract:** This paper represents the reliability of a redundant system, which consists of three units with each one operable or failed. The failure can further divided into minor or major. Minor failure can be repaired by minor repair, but a major failure required a major repair. So two repair facilities are considered. The system completely fails on the failure of all units. Three similar units are in the system where one unit works as main and others in cold standby. An imperfect switch is used to on standby unit which takes sometime in switching. Failure rate and repair rate and repair rate are constant. Failure rate and repair rate follow exponential distribution. Differential equation and Laplace transformation are used. Hence reliability is obtained by the sum of the probabilities of all operable states.



## A New Common Fixed Point Theorem for Two Pairs of Mappings Satisfying Implicit Contraction Condition in Triangular Intuitionistic Fuzzy Metric Spaces

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**Abstract:** Our goal of this paper is to prove a new general common fixed point theorem for two pair of mappings under a different set of conditions using the idea of weakly compatible mappings satisfying a general class of contractions defined by an implicit relation in the frame work of triangular intuitionistic fuzzy metric space, which unify, extend and generalize most of the existing relevant common fixed point theorems from the literature. Some related results and illustrative an example to highlight the realized improvements is also furnished.

**Keywords:** Triangular intuitionistic fuzzy metric space; common fixed point; implicit relation; weakly compatible mappings; contractions.

## A Survey on Development of Association Rule Mining Model for Gender Classification Over Fingerprint Database

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**Abstract:** Each person's fingerprint structure is unique and is developed for biometric authentication system than others because fingerprints have advantages such as: feasible, differ from each other (distinct) permanent, accurate, reliable and acceptable all over the world for security and person identity. Fingerprints are considered as legal proof of evidence in courts of law all over the world. Fingerprint recognition for Gender classification method done through various techniques like Support Vector Machines (SVM), Neural Network(NN), Fuzzy- C Means (FCM). Comparatively a small number of machine vision techniques have been suggested for gender recognition and classification so identifying the gender from fingerprints is an important step in forensic anthropology to shorten the list of suspect search. Very few researchers have worked on gender classification using fingerprints and have gained competitive results. This paper presents Gender classification using association rule mining and classification approach. It is also proposed to combines the elaborate study of various methods and strategies with their comparative measures and to forecast results. This will help the researcher to undertake a comprehensive review and to carry out further research in association rule mining model for gender classification over fingerprint.

**Keywords:** Support Vector Machines , Neural Network, Fuzzy- C Means , Gender classification

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## Different explicit rules of Combinatorics in ancient India

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**Abstract:** The topic 'Combinatorics' deals with counting problems, which are usually associated with selection of some objects from a given collection and their arrangements in a certain situation. The principles and methods of solving different combinatorial problems were well-known to the scholars of ancient India since the Vedic period. But no chronological account of contributions of Indian scholars in the field has been made available so far. In this paper author's mentioned some work of Combinatorics by ancient mathematicians, astronomers, ancient scientist and medical scribe. Author also highlighted various mathematical formulae and different explicit rule given by the ancient Indian mathematician time to time.

## Common Fixed Point Theorems in *Ab*-Metric Space

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**Abstract:** In this paper, I prove some Common Fixed Point Theorems satisfying new type of rational inequality in the  $n$ -dimensions *Ab*-Metric Spaces. In this paper, I modify new contractive conditions and give an application to verify the obtained results.

**Keywords:** common fixed point; *Ab*-Metric space; contractive mapping;

**AMS Subject Classification (2010):** Primary 47H10, Secondary 54H25

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## Influence of Wind on Urban Atmospheric Boundary Layer characteristics at the Capital Region Delhi

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**Abstract:** Remote sensing techniques play a significant role in understanding the dispersion behaviour of air pollutants with the study of Atmospheric Boundary Layer (ABL) height and characteristics. The vertical structure of the ABL plays an important role in meteorological and environmental prospect as it impacts the pollutant concentrations near surface and wind velocity. Acoustic Sounder (SODAR) technology employs the use of echograms to study the specific ABL parameters which includes the depth of ABL and its structure. Complex phenomenon associated with Atmospheric Boundary Layer can be better understood with the help of SODAR echograms and it can be better utilized for understanding the entire complex phenomenon happening in lower layer of atmosphere i.e., lower part of troposphere. The present study incorporates the SODAR echograms data for the analysis of the correlation between the parameters influencing the climate and the ABL height. The research also considers the variable structures produced by the SODAR during the month of January 2020. SODAR echograms represent different structures considering the atmospheric fluctuation due to the turbulence. This turbulence is mainly influenced by the wind gradient and wind shear. The sensors installed at the apex of the Acoustic & Vibration Metrology building, CSIR-National Physical Laboratory, New Delhi is taken into account for establishing the correlations between the variables.

**Keywords:** SODAR, Wind, Atmospheric Boundary Layer, Turbulence

## Characteristics Ventilation Coefficient over Delhi during summer

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**Abstract:** The diurnal and seasonal variation of ventilation coefficient studied using a Remote sensing technique SODAR (Sound Detection and ranging); it gives real-time continuous ABL (Atmospheric Boundary Layer) height data and attached metrological sensors give metrological parameters data such as wind speed/direction, relative humidity and temperature. The diurnal variability is a dominant feature of the ABL, which plays an important role in the exchanges of heat, momentum, moisture, and chemical constituents between the surface and free atmosphere. The ventilation coefficient is calculated using ABL height and average wind speed. The ventilation coefficient is an atmospheric condition that indicates the air quality and pollution potential. This study is for the period of summer (April to June) 2019 over National capital Delhi and its outskirts. The height of the ABL during the different stages of its diurnal evolution, namely, the Stable Inversion layer, convective boundary layer (CBL), and Nocturnal boundary layer (NBL), are discussed and the effect of convection and wind speed on the ventilation coefficient is also analyzed. In this study, the correlation between the wind speed, temperature and relative humidity with the ventilation coefficient is determined. Diurnal and seasonal variation of ventilation coefficient gives knowledge about the day to day weather phenomena for air quality management. The result shows that the Temperature and wind speed are influencing positively to the ventilation coefficient during the summer seasons and convective boundary layer height growths and falls during the day time depending on the increase and decrease of temperature.

## A study of queuing model with the analysis of payment mode and waiting time in supermarket

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**Abstract:** This paper deals with digital payments and cash payments in supermarkets. Initially we take two counters for comparison of digital and cash payments. The first counters for digital payments and the second for cash payments, and calculate billing times from both counters. Our aim is to reducing the customers waiting time by increasing the number of servers according to the conditions, both digital and cash payments. The analysis of various parameters of the queuing system, calculate utilization factor, service rate, arrival rate, calculate idle bill payment counter, customer satisfaction rates, and waiting time. After analyzing the parameters of the parameters of queuing system model, it is observed that digital payments save time.

## Diagnosis of ocular diseases by processing OCT images

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**Abstract:** Optical Coherence Tomography (OCT) images is a current active area in medical image analysis to assist ophthalmologist in the early diagnosis of ocular diseases such as blindness due to diabetes. Machine Learning and Deep Learning algorithms are used to predict the disease occurrence using image dataset. The proposed work is integration of collection of OCT image dataset(online and offline), feature extraction and preprocessing of dataset, implementation of image processing and linear prediction model using python for data science. Feature-based HOG-LSVM is applied for the features like inner limiting membrane, Bruch's Membrane, retinal pigmented epithelium, geographic atrophy. The results will be demonstrated for the performance measures precision, recall, accuracy, AUC, average correlation coefficient, Cohen's kappa ( $\kappa$ ),and distance-based disagreement (DbD) factors.

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IIT, BHU, Varanasi (U.P).

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**Dr. Nilay Khare**, MANIT, Bhopal

**Dr. Geeta Modi**, MVM, Bhopal

**Dr. Anil Rajput**,

C.S. Azad Govt. P G Nodal College, Sehore (M.P.)

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Dr. Kirti Verma

Dr. Akanksha Mishra

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Dr. Manju Khare

# RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

Accredited with 'A' grade by NAAC



Rajiv Gandhi Proudhyogiki Vishwavidyalaya (RGPV), accredited with 'A' grade by NAAC, established in the year 1998 is truly a picture of modernization offering learner-centric programmes in Engineering, Pharmacy, Architecture & Management. University is sprawled over a vast campus of 241.4 acres, marching towards development into a center of excellence in the arena of Technical Education, Research and Innovations.

Under its umbrella there are 05 UTD's 188 affiliated Engineering Colleges, 69 Pharmacy Colleges, 25 MCA Colleges and 05 Architecture colleges imparting Graduate level instructions running 23 under graduate level courses & 84 post graduate level courses. Situated amidst an aesthetic and hilly surrounding the University is offering Ph.D. in eight faculties. RGPV has been selected by Ministry of Human Resource Development (MHRD) as one of the Affiliating Technical Universities (ATUs) among ten across the country for receiving TEQIP-III grant. The main objective of Faculty Development Programme (FDP) is to improve quality and equity in engineering teachers in order to up-grade the knowledge, enhancing research and teaching skills.

# JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD (TELANGANA)

Accredited with 'A' grade by NAAC



Jawaharlal Nehru Technological University, Hyderabad, was established on 2nd October 1972 by the Legislature of the State of Andhra Pradesh as the first Technological University in the country. After 36 years of existence it was restricted into 4 different Universities by the Government vide Government Ordinance No.30 dated September 2008 and this new University has been designated as Jawaharlal Nehru Technological University Hyderabad (JNTUH). It has been in the forefront for the past 44 years in providing quality technological education and situated in a sprawling 89-acre campus at Kukatpally,

Hyderabad. It has now Four Constituent Engineering Colleges and 15 other constituent units in Hyderabad campus.

JNTUH offers B.Tech. programmes in 21 disciplines and B.Pharm at UG level; Integrated 5-year dual degree Masters programme; M.Tech. Programmes in 68 disciplines, M.Pharm. in 11 disciplines; M.Sc. in 4 disciplines; MCA, MBA and Double Degree Programmes at P.G. level; in addition to M.S., M.Phil., Ph.D. Research Programmes in various disciplines of Engineering, Technology, Science, Management and Humanities. JNTUH has 300 affiliated colleges spread over the Telangana State. JNTUH has more than 3.50 lakhs students on rolls. The University has Memoranda of University with many National and International organizations. JNTUH is identified as TEQIP-III University under subcomponent 1.3ATU.

# LNCT GROUP OF COLLEGES



LNCT Group of Colleges is one of the oldest and largest educational group in central India. Founded in 1994 Lakshmi Narain College of Technology, Bhopal has the privilege of being the First Private (self financed) institute of M.P. , LNCT Group offers program from Diploma, Bachelor, Master's and Doctorate level programs. With campuses in five locations in Madhya Pradesh &

Chhattisgarh including the cities of Bhopal, Indore, Gwalior, Jabalpur and Bilaspur to meet the ever increasing demands of higher education in central India, LNCT Group is one of the largest Group central India to offer programs in field of study: Engineering, Management, Pharmacy, Medical, Homeopathy, Dental and professional studies. This includes the students a feeling of responsibility and concern and makes them comprehend the world a bit better. Each one is better endowed to face the world and the satisfaction of having fulfilled their social responsibility is an added bonus.

The L. N. Medical College & Research Centre located at Bhopal, MP. It is a part of LNCT Group of College, which are runs a hospital with 750 Beds and Medical courses affiliated with Barkatullah University, All group institutions have the finest relations among the industry and academics. Today, prospective students will find 58 undergraduate, graduate as well as post graduate programs. People who wish to pursue a career in Engineering, Management, Pharmacy, Medicine, Dentistry and Nursing.

## **ABOUT ORGANIZING INSTITUTE & DEPARTMENT**



Lakshmi Narain College of Technology & Science, Bhopal is devoted to excellence in teaching, research and innovation and to develop leaders who will make a difference to the world. LNCT&S, which is based in Bhopal since 2006. The record breaking placement at LNCT&S is an apt testimony to its focus on upholding the highest academic standards right from selecting top faculty, introducing world class pedagogical practices to personality development to the students.

The department of Engineering Mathematics, one of the vibrant department of the institution, established in the year 2006. Department functions as a service agency providing support to UG inculcate analytical skills in mathematical sciences so as to enable the students to apply and formulate in solution making approaches of their technical subjects. Definitely the learning of mathematics will enhance and widen the mathematical aptitude, analytical skills, logical reasoning and systematic thinking of the students.

## **ABOUT BHOPAL**



Bhopal, capital city of Madhya Pradesh, is known as city of lakes. Founded by Raja Bhoj, the city has many natural and artificial lakes and it is one of the greenest cities in the country. The main cultural center of Bhopal is Bharat Bhavan. The State Museum has fossils, paintings and rare Jain sculptures. Taj-ul-Masjid is one of Asia's largest mosques, with white domes, and minarets. Van Vihar National Park, located in the middle of the city, has many species of animals living in their natural habitat. A large number of institutes of national importance have been

established in Bhopal. Climate of Bhopal is pleasant in the month of November.

## ABOUT INTERNATIONAL CONFERENCE

The purpose of this international conference is to discuss recent findings and new emerging trends in the field. It is intended to promote fruitful collaboration between various communities and institutes by bringing together a small number of scientists in inspiring surroundings. Some priority is given to young scientists to orally present and defend their own work. This will be a great opportunity for budding researchers particularly in the local region to explore the new aspects and global relations.

They would get ample scope to exchange views and thoughts besides presenting their research. The conference aims to provide a common platform to researchers working in various sub-disciplines of the theme.

## Course Objective

The course objective of this international conference is to bring together leading researchers and academics in the field of applied mathematics and engineers in order to debate current and interdisciplinary topics in mathematical modelling and high performance computing and their applications in science. The aim of this conference is to promote the interconnection of mathematical modeling, and High performance computing used in solving complex (real-world) problems. The lectures will be prepared with a broad multidisciplinary audience in mind, and ranging from modeling to scientific computing, will be covered. All submitted papers will be peer-reviewed by referees and accepted papers with great quality will be published in **International Journal of Scientific Research in Mathematical and Statistical Sciences (UGC Approved, Journal No. 63061)**.

**Main topics:** Mathematical modelling and High-Performance Computing in Science and Technology is a premier international conference on topics at the confluence of high performance and large scale computing systems, their use in modeling and simulation, their design, performance and use, and their impact, and related issues.

- ◆ Mathematical modeling the future Internet and developing future Internet security technology
- ◆ High Performance Computing (HPC)
- ◆ Mathematical Models and Information-Intelligent Systems on Transport
- ◆ Computational Methods for Linear and Nonlinear Optimization
- ◆ Numerical Methods for Solving Nonlinear Problems
- ◆ Bio-mathematics
- ◆ Mathematical Models for Computer Science
- ◆ Industrial Mathematics
- ◆ Mathematical Models for Computer Science
- ◆ Computational Modeling in Engineering and Science
- ◆ Mathematical modelling of Man-made Natural disasters: forest fire & environmental pollution
- ◆ Numerical Linear Algebra Methods for Large Scale Scientific Computing
- ◆ Machine Learning Techniques in Bioinformatics
- ◆ Processing, modelling, and describing time series

जीतू पटवारी

मंत्री,

खेल एवं युवा कल्याण, उच्च शिक्षा,  
मध्यप्रदेश शासन



कार्यालय भोपाल :

डी-13, 74 बंगला, भोपाल (म. प्र.)

दूरभाष क्र. : 0755-2441620, 2446227

जावक क्र. 785.....

दिनांक 03/02/2020.....

## MESSAGE

It gives me immense pleasure to know that the Department of Engineering Mathematics, Lakshmi Narain College of Technology & Science, Bhopal, is Organizing **"International Conference on Mathematical Modeling and High Performance Computing in Science and Technology (ICMMHPCST-2020)"** sponsored by TEQIP-III, Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal (Madhya Pradesh) and in association with Jawaharlal Nehru Technological University, Hyderabad (Telangana) on February 12-13, 2020.

A galaxy of scientists and mathematicians, not only in India but across the globe, are coming to attend the International Conference.

I extend my best wishes to participants, members of managing committee and organizers of the International Conference (ICMMHPCST-2020) a grand success and also for the successful publication of the Souvenir and in all its future endeavors.

(Jitu Patwari)

कार्यालय इन्दौर : मेन रोड बिजलपुर, राजेन्द्र नगर थाने के सामने, ए. बी. रोड, इन्दौर (म. प्र.)—452012

टेलीफैक्स : 0731-4983133

ई-मेल : highedu.ministrymp@gmail.com / sports.youthministrymp@gmail.com



**Prof. Sunil Kumar**  
Vice-Chancellor

राजीव गांधी प्रौद्योगिकी विश्वविद्यालय  
(मध्यप्रदेश का तकनीकी विश्वविद्यालय)  
**Rajiv Gandhi Prodyogiki Vishwavidyalaya**  
(State Technological University of Madhya Pradesh)

Do Letter No. *RGPV/VCO/2020/19.*  
दिनांक/Date *27-01-2020*

### MESSAGE

It gives me immense pleasure to learn that Department of Engineering Mathematics, **Laxmi Narayan College of Technology and Science, Bhopal** under the sponsorship of TEQIP-III, Rajiv Gandhi Prodyogiki Vishwavidyalaya, MP is organizing an International Conference on "**Mathematical Modeling and High Performance Computing in Science and Technology (ICMHCST -2020)**" on February 12-13, 2020.

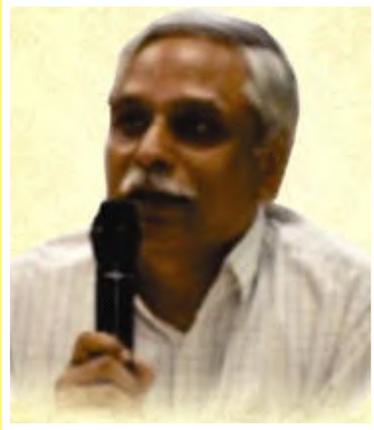
Mathematics is the backbone for the development of scientific and technical fields, scientific computing, the thrust area provides the basis for all round development of humanity and improvement of its well being.

I hope this Conference will provide a forum for interaction of researchers in the field of mathematical science, computer science and interdisciplinary researchers.

I am glad that **Laxmi Narayan College of Technology and Science, Bhopal** is providing the opportunity to large number of professional, academicians and researchers to generate high level of intellectual deliberations and would inspire younger scientists and faculty to go to greater heights.

My warm greetings to the organizers and wish the Conference all success to achieve its desired goals.

(Prof. Sunil Kumar)



**Dr. S.C Choube**

Coordinator TEQIP-III

Rajiv Gandhi Proudyogiki Vishwavidyalaya  
Bhopal (M.P.)

## MESSAGE

It's delightful to learn that the Department of Engineering Mathematics, Lakshmi Narain College of Technology & Science, Bhopal, is Organizing “**International Conference on Mathematical Modeling and High Performance Computing in Science and Technology (ICMMHPCST-2020)**” sponsored by TEQIP-III, Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal (Madhya Pradesh) in association with Jawaharlal Nehru Technological University, Hyderabad (Telangana) on February 12-13, 2020.

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I extend my best wishes to participants, members of managing committee and organizers of the **ICMMHPCST-2020** a grand success and also for the successful publication of the Souvenir and in all its future endeavors.

A handwritten signature in black ink, which appears to read 'S.C. Choube'. The signature is written in a cursive style and is positioned above a horizontal line.

**(Dr. S.C. Choube)**



**Jai Narayan Chouksey**  
Chancellor LNCT, University, Bhopal  
&  
Chairman LNCT Group of Colleges, Bhopal

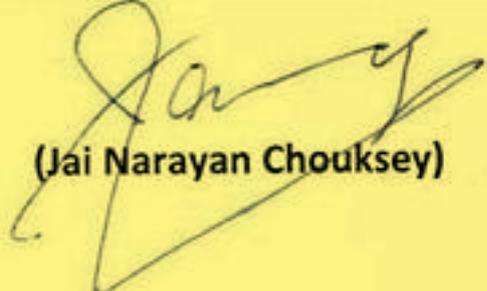
## MESSAGE

It's delightful to learn that the the Department of Engineering Mathematics, Lakshmi Narain College of Technology & Science, Bhopal, is Organizing **“International Conference on Mathematical Modeling and High Performance Computing in Science and Technology (ICMMHPCST-2020)”** sponsored by TEQIP-III, Rajiv Gandhi Proudhyogiki Vishwavidyalaya, Bhopal (Madhya Pradesh) in association with Jawaharlal Nehru Technological University, Hyderabad (Telangana) on February 12-13, 2020.

**“ICMMHPCST-2020”** is successive efforts in the series of Mathematical Modeling and High Performance computing for the enhancement of knowledge and interest of one and all n research scholar and faculty members.

This conference is serving as an open platform for promoting and upbringing knowledge in the relevant area.

I heartily wish for the success of this conference and hope that all those are associated with this venture may achieve the most out of it.



(Jai Narayan Chouksey)



**Poonam Chouksey**  
Vice- Chair Person  
LNCT Group of Colleges, Bhopal

## MESSAGE

I am pleased to know that the Department of Engineering Mathematics, Lakshmi Narain College of Technology & Science, Bhopal, is Organizing **“International Conference on Mathematical Modeling and High Performance Computing in Science and Technology (ICMMHPCST-2020)”** sponsored by TEQIP-III, Rajiv Gandhi Proudhyogiki Vishwavidyalaya, Bhopal (Madhya Pradesh) in association with Jawaharlal Nehru Technological University, Hyderabad (Telangana) on **February 12-13, 2020.**

The topics to be covered in this International Conference are comprehensive and will be adequate for developing and understanding about new developments and emerging trends in this area. I hope the goal of the conference is to update the knowledge of faculty members, young researchers and PG students. I shall be glad to receive a path forward drawn from the conference.

I congratulate the organizers for taking this initiative and extend my best wishes for the successful conduction of event.

  
(Poonam Chouksey)



**Dr. Anupam Chouksey**  
Secretary,  
LNCT Group of Colleges, Bhopal

## MESSAGE

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**(Dr. Anupam Chouksey)**



**Shweta Chouksey**  
Director  
LNCT Group of Colleges, Bhopal

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(Shweta Chouksey)



## Dr. Ashok Kumar Rai

Director, Administration, LNCT, Bhopal  
Conference Convener (ICMMHPCST-2020)

### MESSAGE

It is the matter of great pleasure and pride that the Department of Engineering Mathematics, Lakshmi Narain College of Technology & Science, Bhopal, is Organizing “**International Conference on Mathematical Modeling and High Performance Computing in Science and Technology (ICMMHPCST-2020)**” sponsored by TEQIP-III, Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal (Madhya Pradesh) and in association with Jawaharlal Nehru Technological University, Hyderabad (Telangana) on **February 12-13, 2020**.

This conference brings together leading academicians, scientists & researchers to exchange and share their experiences and research results in all aspects of Mathematical Modeling and High Performance Computing. It also provides a premier interdisciplinary platform for researchers, practitioners and educators to present and discuss the most recent innovations, trends and concern as well as practical challenges encountered and solutions adopted in the field of mathematical modeling and High Performance Computing.

We are grateful to all the delegates participating around the globe, the sponsors of this conference to help us in making this Endeavour a great success. On behalf of LNCT family, I wish all of you pleasant stay and fruitful participation in the conference.

A handwritten signature in black ink, appearing to read 'Ashok Rai'.

**(Dr. Ashok Kumar Rai)**  
**Conference Convener**  
**(ICMMHPCST-2020)**



**Dr. Anug Garg**  
Director, Training & Placement  
LNCT Group of Colleges, Bhopal

## MESSAGE

Its delightful to learn that the Department of Engineering Mathematics, Lakshmi Narain College of Technology & Science, Bhopal, is Organizing **“International Conference on Mathematical Modeling and High Performance Computing in Science and Technology (ICMMHPCST-2020)”** sponsored by TEQIP-III, Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal (Madhya Pradesh) in association with Jawaharlal Nehru Technological University, Hyderabad (Telangana) on **February 12-13, 2020**.

ICMMHPCST-2020 is going to be a premier forum for presentation of new research and advances in this field and attract the industry people to get associated with the Lakshmi Narain College of Technology & Science, Bhopal.

I would like to encourage the academics fraternity to make use of this opportunity for themselves and thus contribute for the benefits of students and society

I whole heartily wish for the mega success of conference

A handwritten signature in black ink, appearing to read 'Dr. Anug Garg', written over a light yellow background.

**(Dr. Anug Garg)**



**Dr. Amit Bodh Upadhyay**  
OSD, LNCT&S, Bhopal

## MESSAGE

It is the matter of great pleasure and pride that the Department of Engineering Mathematics, Lakshmi Narain College of Technology & Science, Bhopal, is Organizing **“International Conference on Mathematical Modeling and High Performance Computing in Science and Technology (ICMMHPCST-2020)”** sponsored by TEQIP-III, Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal (Madhya Pradesh) in association with Jawaharlal Nehru Technological University, Hyderabad (Telangana) on **February 12-13, 2020.**

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A handwritten signature in black ink that reads 'Amit'.

**(Dr. Amit Bodh Upadhyay)**



**Dr. Sunil Singh**  
OSD, LNCTE, Bhopal

## MESSAGE

I am happy to know that the Department of Engineering Mathematics, Lakshmi Narain College of Technology & Science, Bhopal, is Organizing “**International Conference on Mathematical Modeling and High Performance Computing in Science and Technology (ICMMHPCST-2020)**” sponsored by TEQIP-III, Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal (Madhya Pradesh) in association with Jawaharlal Nehru Technological University, Hyderabad (Telangana) on **February 12-13, 2020**.

The conference assumes significance in the context of increasing use of mathematical modeling and high performance computing. The technological institutes need to take academics leadership in this sphere. I hope the expert would focus attention on this aspect.

I wish the conference a grand success in its objectives.

A handwritten signature in black ink, consisting of a series of loops and a long vertical stroke, set against a light yellow background.

**(Dr. Sunil Singh)**



## Dr. Sanjeet Kumar

Professor & Head

Department of Mathematics, LNCT&S, Bhopal  
Conference Coordinator (ICMMHPCST-2020)

## MESSAGE

I feel so enthusiastic to share that the Department of Engineering Mathematics, Lakshmi Narain College of Technology & Science, Bhopal, is Organizing “**International Conference on Mathematical Modeling and High Performance Computing in Science and Technology (ICMMHPCST-2020)**” sponsored by TEQIP-III, Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal (Madhya Pradesh) in association with Jawaharlal Nehru Technological University, Hyderabad (Telangana) on **February 12-13, 2020**.

The combination of mathematical modeling and high performance computing is very often ignored in the scientific community although only the combination of these two technologies allows us to get better simulation results for many pressing problems in science and engineering.

The presence of large number of professionals, academicians and researchers would be able to generate high level of intellectual deliberations and would inspire younger scientists and faculty to go to greater heights.

I am sure the delegates and speakers will enjoy the Sessions and will carry with them pleasant memories of the Conference and the College Campus. I hope the Conference will create a strong group of specialists in the area of High Performance Computing and its Applications.

A handwritten signature in black ink, appearing to read "Sanjeet Kumar", with a long horizontal stroke extending to the right.

**Dr. Sanjeet Kumar**

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## Mathematical Modeling: An application to Corrosion in a Petroleum Industry

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**Abstract:** Mathematical modeling is richly endowed with many analytic computational techniques for analyzing real life situations. Recent reports have confirmed that several billion dollars were lost to corrosion, in addition to environmental pollution and economic wastage in cleaning up the environmental mess caused by corrosion. This paper considers application of mathematical modeling to corrosion problems. It uses the mathematical modeling techniques to forecast the life expectancy of industrial equipment in the refinery, petroleum reservoirs and gas pipelines' distribution. The models considered in this direction are the heat-mass transfer equation, Zhim-Hoffman's equation, equations arising from electrolysis and finally gas pipeline distribution.

**Keywords and Phrases:** Mathematical models, corrosion, phase transition, heat equation, galvanic corrosion.

**AMS Subject Classification :** 73V and 80A.



## Evaluation of some parameters of $Gd^{3+}$ activated $Sr_2ZnSi_2O_7$ host lattices synthesized by sol-gel procedure

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**Abstract:** In this study, a series of  $Sr_{2-x}ZnSi_2O_7 \cdot xGd$  (where  $x = 0.01$  to  $0.11$ ) samples were synthesized using the sol-gel procedure. X-Ray powder diffraction (XRD), scanning electron microscope (SEM), and photoluminescence (PL) spectroscopy were employed to analyze the crystal characteristics, surface morphologies, and spectral characteristics of these samples. The dominant emission peak due to  ${}^6P_{7/2} \rightarrow {}^8S_{7/2}$  transition of  $Gd^{3+}$  was obtained for the prepared samples. The electron spin resonance (ESR) and PL analyses of the samples confirmed the presence of the  $Gd^{3+}$  in the  $Sr_2ZnSi_2O_7$  lattice. ESR studies suggested that  $Gd^{3+}$  ions occupy distorted  $Sr^{2+}$  sites in the host lattice. Photon interaction parameters in the photon energy range 1 keV–100 GeV for mixture of  $Sr_2ZnSi_2O_7$  and gadolinium (mass attenuation coefficients and effective atomic numbers) for have been calculated. These photon interaction parameters are varying largely for the energy range 1 keV–100 MeV with the compositions with a maximum for the highest gadolinium.

**Keywords:** Ultraviolet radiation; Sol-gel; ESR;  $Gd^{3+}$ ;  $Sr_2ZnSi_2O_7$ ; Gamma-ray

## Face Recognition from Surveillance using Sequential CNN-Model

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**Abstract:** Now-a-days there is lot of research going on face recognition and identification, with the increase in computational power working on images became easy and many complex and deep neural networks are implemented on images. There are many applications which updates automatic attendance and face recognition, we just wanted to extend to super market problem. This paper solves the problem of identification of customer and employees in super market. We have used deep convolution network and Siamese network to train images to classify in to customers, important customers and employees from cameras. This also compares the results from different models.

**Index Terms:** Neural network, Siamese network

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## Some Elliptic-Type Integrals and Their Hypergeometric Forms

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**Abstract:** In the paper, we established Hyper geometric forms of different elliptic – type integrals have been studied due to their importance and applications in certain problems involving computations of the radiation field off axis from a uniform circular disc radiating according to an arbitrary angular distribution law.

## Mathematical Modeling of Man- Made Natural Disasters: Forest Fire & Environmental Pollution

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**Abstract:** Mathematics is an extraordinary exercise of the human mind in abstracting the results of observation to find similarities and differences between phenomena. These relations between phenomena make it possible to organize the natural world into discrete sets of objects that can be studied using similar mathematical objects and methods. Natural disasters cannot be prevented; scientists can use Mathematical Modeling to help limit the damage. Mathematical models are used to summarize relationships between the characteristics of natural disasters. They are ultimately used to answer questions that humans have about natural disasters, and predict the results of events that have not occurred, but may be possible or even likely. In this paper, Mathematical models of some problems related to Natural disaster are discussed.

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## An analysis of Operational Efficiency of Major Airports in India

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**Abstract:** This paper deals with major airport's data of India for the year 2017-2018 and analysis for their respective efficiencies. This empirical study evaluates the operational efficiencies of 30 major India airports using data envelopment analysis and some of its recent developments. Various airport characteristics are evaluated to determine their relationship to an airport's efficiency. In this model, we have taken number of runways, number of passenger terminals and total expenditure as input variables and ASQ rating, aircraft movements, number of passengers, freight and logistics and revenue generated, as output variables.

The model focused in this paper is DEA model (Data Envelopment Analysis) and calculation is done using MS Excel.

**Index Terms:** Airport Efficiency, ASQ, ATQ, DEA Model.

## Common Fixed Point Theorem for Weekly Compatible Self Mapping in Menger Space

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**Abstract:** In this paper, we prove the nation of Menger space and prove a common fixed point theorem for pairs of weakly compatible self mapping. Which generalize the well known results.

**Keywords:** Common fixed points, Metric space, Menger space, t-norm and Weakly Compatible mappings.

**AMS Subject Classification (2000)** – 45H10, 54H25.

## Common Fixed Points for a Pair of Self Mapping in Generalized Menger Spaces with a Graph

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**Abstract:** In this paper, we prove the existence and uniqueness of points of coincidence and common fixed points for a pair of self-mappings defined on generalized metric spaces with a graph. Our results improve and extend several recent results of metric fixed point theory.

**Keywords:** Coincidence and common fixed points, Metric space, Menger space, self-mappings.

## Some Fixed Point Theorem Satisfying General Contractive Condition of Integral Type

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**Abstract:** In this paper, we establish a fixed point theorem for a pair of self maps satisfying a general contractive condition of integral type. This theorem extends and generalizes some early results of Boikanyo [4] and Jaggi and Dass [12].

**Keywords:** Lebesgue- integrable map, Complete metric space, Common fixed point

**AMS Subject Classification (2000):** 54H25, 47H10.

## Integral Relation of I-Function

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**Abstract:** I- Function formulae play an important role in special function. In this paper we aim to establish some new integral relation of I- function of one variable. Some special cases also presented in this paper.

**Keywords:** I- Function, Multivariable polynomial.

## Analytic Study of Fixed Point Theorems in a Soft Metric Space with Integral Type Mapping

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**Abstract:** In the present paper we established fixed point and common fixed point theorems in soft metric space with integral type mappings. Analytic results of fixed points will be established.

**Key-words -** common fixed point; rational conditions; compact metric spaces;

**AMS Classification:** 47H10, 54H25, 55M20.

## Bianchi Type-I Bulk Viscous Cosmological Models with Decaying Cosmological Term

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**Abstract:** Bianchi type I cosmological models with varying cosmological term  $\Lambda$  and bulk viscous fluid are investigated. Exact solutions of Einstein's field equations have been studied by assuming the law for variation of Hubble's parameter that yields a constant value of deceleration parameter. Physical and kinematical properties of the models are also discussed.

**Keywords:** Cosmological term  $\Lambda$ , Deceleration parameter  $q$ , Hubble parameter  $H$ , Scale factor  $S$ .

## Fixed Point Theorem for $(\beta\alpha)$ -Admissible Mappings in Metric-like space with respect to Simulation Function

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**Abstract:** In this paper, we have introduced some new type simulation function of  $(a,b)$ -admissible mappings with respect to  $Z$ -contraction in the complete metric-like space and our results improved several recent results in the metric-like space. Also, we supported example for justification of theorem.

**Keywords:** Simulation function, Admissible mapping, Fixed point, Contraction mapping

## A Formal Solution of Certain Simultaneous Quadruple Integral Equations Involving I-Functions

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**Abstract:** The problem discussed is to obtain the solution of simultaneous quadruple integral equations involving I-functions. The method followed is that of fractional integration. The given simultaneous quadruple integral equations have been transformed by the application of fractional Erdelyi-Kober operators to four others simultaneous integral equations with a common Kernel. Here for the sake of generality the I-function is assumed as unsymmetrical Fourier kernel. Here with the help of theorems of Mellin transform, the solution of simultaneous Quadruple Integral equations is obtained. Some interesting particular cases have been derived.

## Dynamics and stability analysis in the population dynamics by introducing a vaccination strategy and computational simulation

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**Abstract:** In this paper, we have studied the dynamical behavior of the population due to the presence of demographic changes such as; fertility changes, population growth rate, mortality rate, mortality etc. This complication arises due to the environmental changes which are affected by pollution and the unavailability of the healthy food resources. To overcome from these difficulties, we can introduce the vaccination strategy to increase the immunity system of the body. The main aim of this study deals with the changes arise in the Malthusian growth model by including the vaccination rate in the equation of this model and obtained the stability conditions of all the existing equilibrium state of the proposed model. Some computational simulations are also performed to justify the results obtained.

**Keywords:** Equilibrium state, Malthusian growth model, stability analysis, vaccination

## On Vehicle routing Problem using Mixed Integer Non-Linear Programming

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**Abstract:** The family of (VRPs) has received remarkable attention in the field of combinatorial optimization after its introduction in the paper of Dantzig and Ramser. VRPs determine a set of vehicle routes in order to accomplish transportation requests at minimum cost. In this paper we develop a mixed-integer non-linear programming model for vrp and apply it in electric vehicle charging.

**Keywords:** Vehicle Routing Problems, mixed-integer non-linear programming, electric vehicle charging.

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## The Two Contiguous Hypergeometric Function of the Some Linear Combination

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**Abstract:** The aims of this paper are to give using some contiguous relations. The asymptotic behaviour of some linear combination of two symmetric contiguous hypergeometric functions under some conditions of their parameters. The hypergeometric function belongs to an important class of special function they are very useful in many fields of physical and astronomical researches in mathematical analysis and its application they have significant properties identities of special values. And transformation formula. These properties have many interesting application in combinational analysis and arithmetic geometric. The first systematic and thorough study of hypergeometric series was carried out. An hypergeometric function is called contiguous to the other function if one. Two. Or three of the parameter are increased or diminished by an integer;

## Variational Inclusion Governed By $H(\cdot, \cdot) - \varphi - \eta$ -Mixed Accretive Mapping

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**Abstract:** In this paper, we look into a concept of accretive mappings called  $H(\cdot, \cdot)$ - $\varphi$ - $\eta$ -mixed accretive mappings in Banach spaces. We extend the concept of proximal-point mappings connected with generalized  $m$ -accretive mappings to the  $H(\cdot, \cdot)$ - $\varphi$ - $\eta$ -mixed accretive mappings and study its characteristics like single-valued property as well as Lipschitz continuity. Since proximal point mapping play an important role to solve variational inclusion problem. Therefore, we frame an iterative algorithm to solve variational inclusion problem as an application of introduced proximal point mapping and show its convergence with considerable assumptions.

**Keywords:**  $H(\cdot, \cdot)$ - $\varphi$ - $\eta$ -mixed accretive mapping, proximal point mapping, iterative algorithm, variational-like inclusion

## Solution for Congestion Control and Challenges of Mobile Ad Hoc Network

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**Abstract:** Congestion is a serious problem in mobile ad hoc network. In such network each and every node behaves as the router and has the capacity to convey the packet from correspondent to respondent. Because of the limited capacity of the bandwidth every node may transmit the packet at the same time due to this congestion arises which incur long delay and high packet loss which degrades the performance of the network. This network has dynamic topology and has shared behavior, it automatically forms the network temporarily which helps in transmission earl. To overcome these difficulties many approaches has been suggested earlier. This paper, presents the overview of the existing approaches and also discussing difference between these congestion control techniques.

**Keywords:** Congestion, Mobile ad hoc network, Bandwidth, Shared behavior, Dynamic topology

## The Direct Method for the Optimal Solution of a Transportation Problem

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**Abstract:** In this paper, we discuss a new approach for solving both balanced and unbalanced transportation problem. Here we present a paper entitled “The direct method for finding the optimal solution of a transportation problem”, which is proposed to find an optimum solution. The algorithm for proposed method discussed in this paper gives an initial as well as either optimal solution or near to optimal solution. Some numerical examples has been given to show the efficiency of the proposed methodology. Also the results of new approach are compared with the MODI's method and we can see that the proposed method gives either same or less optimal cost as compare to MODI's method within shorter time period and also it is easy to use.

**Keywords:** Balanced and unbalanced Transportation Problem, Basic Feasible Solution, Optimal Solution, MODI method, Proposed method.

## Coincidence Points & Common Fixed Points of Expansive Mappings in $Ab$ -Metric Space

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**Abstract:** In this paper, we prove some fixed point theorems for expansive mapping on  $Ab$ -metric spaces. Our results extend/generalize many pre-existing results in literature.

**Keywords:**  $Ab$ -metric space; expansive mapping; fixed point.

## Some Common Fixed Point Theorems in complete Fuzzy Metric Spaces

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**Abstract:** In this paper we introduce the concept of common fixed point in the framework of L-fuzzy metric space and establish a fixed point theorem for self mappings. This result generalizes and extends the existing result et al. [3] on common fixed point on fuzzy metric space to L-fuzzy metric space using weak compatible mapping. In the support of our result.

## Projective Semi-Symmetric Connections on Almost Para-Contact Manifolds

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**Abstract:** In this paper, we have extended the study of the projective semi-symmetric connections on almost Para-contact manifold. We have shown that the projective semi-symmetric connection on P-Sasakian manifold becomes a special projective semi-symmetric connection. We also prove that if curvature tensor of projective semi-symmetric connection vanishes, then SP-Sasakian manifold admits an  $\eta$ -parallel Ricci tensor.

**Keywords and phrases:** Projective semi-symmetric connection, curvature tensor, Para-cantact manifold.

**AMS Mathematics Subject Classification (2010):** 53C12.

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## The Cosmic-ray Spectra at Spherical Termination Shocks

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**Abstract:** We discuss the nature of the steady-state spectra of particles accelerated at stationary spherical shocks, such as the solar wind termination shock. In addition to the two well-known spectral regions characterized by a power-law momentum dependence and a high-energy cut off, This consists of an enhancement of the cosmic-ray intensity just below the cut off similar features have been seen previously in multidimensional models and cosmic-ray modified shocks, where they were explained by acceleration and drift in the latitudinal direction along the shock face and decreasing effective shock compression ratio, respectively We show that a similar bump may be obtained in a purely spherically symmetric geometry with no drifts, and that this effect may also have contributed to the previous results. We attribute this effect to increased shock acceleration efficiency at certain energies. We also demonstrate that a one-dimensional planar shock with a reflecting wall upstream can give a similar effect. We conclude that care is necessary in interpreting observed bumps in any given situation.

## Computational Numerical Methods for Solving Nonlinear Problems

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**Abstract:** This paper will make it possible to tackle difficult non linear problems and deepen their understanding of problem solving using numerical methods. Multipoint methods are of great practical importance, as they determine sequences of successive approximations for evaluative purposes. The method involved here is beneficial to achieve the highest computational efficiency and accuracy of solution. It provides a deep understanding of the usefulness of each method which is supportive to a wide range of research areas along with many numerical examples. The rapid development of digital computers and advanced computer arithmetic have created a need for new methods useful for solving practical problems in a multitude of disciplines such as applied mathematics, computer science, engineering, physics, financial mathematics, and biology. In a clipped way, it enables to implement a wide range of useful and important numerical algorithms for solving research problems. It also illustrates how numerical methods can be used to study problems which have applications in engineering and sciences, including signal processing, control theory and financial computation. Further, it facilitates a deeper insight into the development of methods, numerical analysis of convergence rate and very detailed analysis of computational efficiency. It is a powerful means of learning by systematic experimentation with some of the many fascinating problems in science includes highly efficient algorithms convenient for the implementation into the most common computer algebra systems such as Mathematica, MatLab and Maple.

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### $k$ -Lipschitzian Mappings On Hyperconvex Metric Space

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**Abstract:** In this paper we established a fixed point theorem for non-expansive mappings in hyperconvex metric space which generalize the fixed point theorem to the case of uniformly  $k$ -lipschitzian mappings in hyperconvex metric space. Our results are the extensions of the results obtained by kabir *et.al* [6] to the case of hyperconvex metric space. We conclude with an example to support our main results.

**Keywords:** Fixed point theorem, hyperconvex space, uniformly  $k$ - lipschitzian mapping, nonexpansive mapping.

## Fixed point results for $F$ - contractive type mappings in Cone b-metric spaces

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**Abstract:** In the present paper, we define  $F$ -contractive type mappings in Cone b-metric space and prove some fixed point theorem. Our main result unifies, generalizes and improves existing results in  $F$ -contractive mappings, b-metric space and Cone b-metric space in the literature.

**Keywords:** Fixed point; b-metric space; Cone metric space; Cone b-metric space;  $F$ -contraction

**AMS Subject Classification No (200):** 47H10; 47H09; 54H25

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## A Review on Performance Analysis and Flow Features of Swirl Diffuser in a Floor Based Air Conditioning System

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**Abstract:** An air diffuser is the mechanical device that is designed to control the characteristics of a fluid at the entrance to a thermodynamic open system. Diffusers are used to slow the fluid's velocity and to enhance its mixing into the surrounding fluid. Swirl diffusers can create better air mixing to enhance indoor air quality and help achieve compliance through air change effectiveness measure. Swirling vanes are used in air diffusers to create swirling outflow jet, so that more rapid mixing with ambient air can be achieved. The air change effectiveness calculation depends strongly on the flow characteristics produced by the diffuser outlet that vary considerably between different modelling set ups. Proper calibration and correct definition of performance related parameters are important to affect the radially diffusing flow pattern. This study demonstrates the common approaches, identifies the critical design parameters, analyses and discusses the differing outcomes in terms of flow pattern, air distribution.

**Keywords:** Air swirl, Diffuser, Effectiveness, Swirling Blades Angle, Air Flow

## Mathematical Modeling of Dilute Biphasic Fluid Flow in Industrial Aero-cyclone Dust Separators

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**Abstract:** Cyclone is a device used for removal of dust in industrial complex having the biphasic fluid of air-dust mixture. A standard reverse flow cyclone with tangential inlet is the basic model based on empirical formulae derived by experiments which is exhaustively used in industry with comparatively less efficiency. Design analysis based on the governing equations of two phase dilute fluid flow will improve the efficiency of Cyclone. Though the operating principle of a cyclone is very simple, the turbulent flow-field in a cyclone is very complex due to presence of swirl and interaction between particles, fluid and walls. A tangential entry and cyclone geometry give rise to a strong swirling flow. The flow acquires a rotational movement along the cyclone wall (free or outer vortex) and it descends down to a certain axial location near the cyclone bottom where the axial velocity acquires a reverse flow (forced or inner vortex) towards the upward direction and finally exit through a central duct known as vortex finder. Particles entering the cyclone are rebound, re-circulated and re entrained all along the outer and inner vortex. Consequently, the variables controlling the centrifugal force become highly complex. The primary purpose of vortex finder (air outlet) is to guide the dust particles to a central point for easy handling and disposal.

The governing equation for the turbulent, steady, isothermal and incompressible fluid flow in a cyclone is given by the Navier Stokes equation. The integration of the force balance on the particle yields the trajectory of a particle and the same equates the particle inertia with the forces acting on the particle. Navier-Stokes equations for turbulence modeling of cyclone flow field uses Reynolds averaging ( time averaging) that yields the solution of exact Navier Stokes equations into the mean ( time averaging ) and fluctuating Components. , the discrete phase has been considered for modeling dilute phase industrial cyclone in this work.

The Finite volume technique is used in this work on the approach to satisfy the integral form of the Navier Stokes equations to suitable approximation for each of the many contiguous control volume which cover the solution domain. Based on FVM, CFD tool is used to understand the complex flow structures typical of cyclones for optimal design of it and make possible to exclude the need of experimental studies, a cumbersome ,inefficient, time consuming based on empirical formulae & thumb rules.

## Fuzzy EOQ Inventory Model Using Trapezoidal Fuzzy Number with Shortages

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**Abstract:** In this paper, an EOQ inventory model with shortages has been considered by using Fuzzy. Our aim is to optimize the total cost and the order quantity for the proposed fuzzy EOQ inventory model. The Trapezoidal fuzzy numbers have been introduced in order to achieve this goal. The computation of economic order quantity (EOQ) is carried out through defuzzification process by using signed distance method. To illustrate the results of the proposed model, we have given examples and presented the computational results.

**Keywords:** EOQ, Fuzzy Inventory model, Trapezoidal Fuzzy number, Defuzzification, Shortages.

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## Bayesian Approach for a Periodic Review Inventory Model with Emergency orders using Weibull Distribution for Demand Function

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**Abstract:** In this paper we consider a periodic review inventory model. we consider demand function as a random variable which follows weibull distribution with two parameters  $\lambda$  and  $\beta$ . There is provision for placing order only at discrete time points in periodic review inventory system. If the time between two consecutive review is large in the presence of random demands, there could be heavy shortages, and the profitability of the system could suffer more so when the shortage cost is high. However it may not be feasible/profitable to carry a high level of stoke in anticipation of the uncertain demand especially if the holding cost is significant to meet the excess demand in such situation, one or more emergency orders can be placed before the end of review period. Taking into account the nature of the demand and the supply source, the timing and size of the emergency order can be determine optimally. Therefore for the optimization of the model an accurate estimation of demand is important.

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## Fractional Integral Operators Associated with certain Generalized Hypergeometric Function for Real Positive Definite Symmetric

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**Abstract:** In the present paper, fractional integral operators related with I-function for real positive symmetric definite matrix have been talked about .These operators have a wide scope of uses in the field of mathematical physics and linear differential equations .Various special cases of our operators have been referenced.

**Keywords:** Hypergeometric Function, I-function

## HR Management and Employee Performance Using Ethics: A Critical Analysis

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**Abstract:** Recent corporate changing aspects have led to the developing attentiveness in business ethics, both in academia and in the professional practice. Nevertheless, ethical hiatuses endure to happen in human resource management activities, leading HR academics and professionals to reconsideration what to do to reinvent new strategies to successfully manage ethics in HRM functions. Performance is understood as achievement of the organization in relation with its set goals. It includes outcomes achieved, or accomplished through contribution of individuals or teams to the organization's strategic goals. The term performance encompasses economic as well as behavioural outcomes. The objective of this critical literature review therefore is to establish the role ethics can play in human resource management to improve organizational performance. The methodology used was critical review of relevant literature with the scope of the study encompassing qualitative research of theories and comparative nature of ethics in HRM.

**Keywords:** Employee Performance, Ethics, Human Resource Management, Ethical climate, HR academics.

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## Application of Graph Theory in Airline Transportation Control

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**Abstract:** Graph theory mathematics study of how collections of points can be connected is used to day to study problems in economics, physics, chemistry, sociology, and communication and counts other fields. The analysis of airline networks has focused on easily quantifiable characteristics of the countries as well as the basic topological properties of the networks. The coefficient of determination attests to the fact that numerous pertinent causal factors remain incident field. The numbers of vertices,

**Keyword:** Airline networks, Graph Networks, weighted Graph, Graph Modeling, Graph coloring

## A Mathematical Model for Study Breast Cancer Development and Analyze their Prevention and Treatment

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**Abstract:** Mathematical modeling is art of translating real world problems into mathematical problems, solving the mathematical problems and interpreting these solutions in the language of the real world. A mathematical model is a description of a system using mathematical concepts and language. Breast cancer is the second most commonly diagnosed cancer and leading cause of cancer death for women worldwide. Breast cancer (BC) is the main cause of cancer mortality in women. Breast cancer accounts for approximately 40% of all the cancer types in women. Computational and mathematical models are gradually being used to help us understand the breast cancer. The goal of this research is to improve the accuracy of predicting the breast cancer (BC) development and their accurate treatment using the ordinary differential equations, partial differential equation and interpolation formulas for mathematical model

**Keywords:** Mathematical modeling, Breast cancer, Carcinogenic agents, Cancer treatment

## A Mathematical Model for the Slip Condition of the Blood flow through a Stenosed artery using Casson-fluid flow

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**Abstract:** The mathematical model is developed by considering blood as Casson fluid through the asymmetric artery with the stenosis. The non-Newtonian fluid behaviour is characterized by using Casson-fluid flow model. The analytic expression for flow rate, resistance to flow and skin friction are derived by using this model. We observed that the flow rate decreases when the yield stress and viscosity coefficient increases, the skin-friction increases with the increase of yield stress in presence of slip velocity for velocity coefficient parameter. The results are derived in detail with the help of graphs for the variation of different flow parameter. Flow rate, resistance to flow, and skin-friction and impedance analysis of the casson fluid have been shown graphically by varying the yield stress.

**Keywords:** Stenosis; artery blood flow, flow rate, blood flow and Casson fluids model

**Mathematics Subject Classification [MSC] 2010 No.:** 76Z05, 92C35

## Some Important Results on Fixed Point Theorem using Generalized Metric Spaces

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**Abstract:** In this paper we shall study the some important results on fixed point theorem using the generalized metric spaces. Some important generalization in previous paper of Kannan's fixed point theorem in the ordinary metric space and Das's fixed point theorem in generalized metric space. We will work the paper of Ali Fora, Azzeddine Bellour and Adnan Al-Bsoul regarding generalized metric space.

**Keywords:** Fixed point, Generalized metric space.

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## The Involving in I-Function of Two Variables and General Class of Polynomials

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**Abstract:** This paper presents in the some derivative formulas of I- Function of Two variables involving general class of polynomials. The well known H-function of one variable defined and proved the H-function as a symmetric. The H-function is often called fox's H-function. Later on many researchers studied and developed H-function. Introduced a new function in the literature namely the I-function which is useful in Mathematics. Physics and other branches of applied mathematics. In the present paper we establish derivative of I-function of two variables involving general class of polynomials. The generalized derivatives of product of general class of polynomials and I- function of two variables transformed as I-function of two variables but expression involving more terms. Also one can find same formulae involving general class of polynomial, I-function of r variables. The special case of our derivatives yields interesting result;

**Keywords:** I-function; Rathie Arjun A new generalization of generalized hypergeometric function.

## Classification of Large Data Set for Social Websites using Hadoop

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**Abstract:** Large data set is a kind of collection of **data** in a **huge size**. Large data set is a term used to define a group of data that is large in size and yet growing mounting with time. This data is so large and also complex that none of the conventional data management tools are able to store it or process it efficiently. From blogger post, there data to Google using online search to predict incidence of the Twitter, YouTube, Instagram and Facebook are using troves of information. Online and offline actions are being chased, gathered, and analyzed at dizzying rates. Facebook or Google retrieve the data like what application user install they verify and access with user permission allow contact, photo, video and if user connect with and check the demand of the user and notify, using various applications on our computer, can be recorded and analyzed. We can find this analyze to splurge on weekdays. We can be more efficient at work by realizing we spend time more than we thought on Facebook. These are stored in Data warehousing and retrieve data through data mining are connected terms, as is NoSQL. With data firmly in hand and with the ability given by large data set using flume in hadoop Technologies to effectively store and analyze this data, we can find answers to these questions and work to enhance every aspect of our behavior. Twitter, Facebook, Instagram, Google can know every post and searching you ever viewed by analyzing large data gathered over the years. Facebook can analyze large data and tell you the birthdays of people that you did not know you knew. With the initiation of many digital modalities all this data has grown to large data and is still on the rise. In the end large Data technologies can exist to improve decision-making and to provide greater vision faster when needed but with the downside of loss of data secrecy.

**Keyword:** Large Data Set, Twitter, Facebook data set, flume in Hadoop, MapReduce

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## Incomplete Mittag-Leffler Function

Dharmendra Kumar Singh and Saurabh Porwal

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**Abstract:** This paper devoted to the study of incomplete Mittag-Leffler function and some of its properties in terms of incomplete Wright function.

**Keyword:** Mittag-Leffler function

Mathematics Subject Classification (2000): 33E12, 33B15, 11S80.

## Extreme Values Analysis for Finding Outliers Detection Using Machine Learning to Detect Predicted Data Points

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**Abstract:** An outlier is usually measured as an observation which is extensively found distant from the other well thought-out observations. In the era of ready-to-go analysis of n-dimensional datasets, data quality is essential for economists to guarantee robust results. Many machine learning algorithms are sensitive to the range and distribution of attribute values in the input data. Outliers in input data can skew and mislead the training process of machine learning algorithms resulting in longer training times, less accurate models and ultimately poorer results. Even before predictive models are prepared on training data, outliers can result in misleading representations and in turn misleading interpretations of collected data. Traditional techniques for outlier detection tend to exclude the tails of distributions and ignore the data generation processes of specific datasets. Various methods for detecting different kinds of outliers in high-dimensional data sets from two different perspectives, i.e. detecting the outlying aspects of a data object and detecting outlying data objects of a data set. N-dimensional data can be seen as part of the variety challenge of machine learning.

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## Fuzzy EOQ Model for Deteriorating Items with Stock-Dependent Demand and Partial Backlogging

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**Abstract:** In this paper, we have considered an economic order quantity inventory model with deteriorating items with stock-dependent demand and Partial Backlogging under fuzzy environments by employing trapezoidal fuzzy numbers. A fully-fuzzy inventory model is developed where the input parameters and decision variables are fuzzified. For this fuzzy model, an expected value method of defuzzification is employed to find the estimate of the profit function in the fuzzy sense. In addition, a rigorous methodology is constructed to examine for the optimal solution of fully-fuzzy inventory model. The optimal policy for the developed model is determined using the proposed algorithm after defuzzification of the profit function. Finally, a numerical illustration is provided in order to define the sensitiveness in the decision variables with respect to fuzziness in the components.

**Keywords:** Fuzzy, Deteriorating item, Partial Backlogging, EOQ

## Comparison of Wavelet and Fourier Transform-A Case Study

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**Abstract:** The wavelet analysis is the advance based on Fourier transform and it is an innovation of the Fourier Analysis. Wavelet transforms are a mathematical means for performing signal analysis when signal frequency varies over time. Wavelet analysis is an exciting new method for solving difficult problems in mathematics, physics and engineering. Fourier transform is a powerful tool for analysing the components of a stationary signal. But it is failed for analysing the non-stationary signal whereas wavelet transform allows the components of a non-stationary signal to be analysed. Both the Fourier and wavelet transforms measure similarity between a signal and an analysing function. Both transforms use a mathematical tool called an inner product as this measure of similarity. A comparative study of Fourier and Wavelet transforms has been conducting in the present study and the main goal of this study is to find out the advantages of wavelet transform compared to Fourier transform.

**Keywords:** Fourier transform, wavelet transform, time-frequency, signal analysis, inner product.

## Customization of the WRF model over Gurgaon region by Sensitivity of PBL schemes for their application of Pollutant Dispersion

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**Abstract:** Accurate simulations of surface meteorological variables are important for the transport and dispersion of air pollutants and air quality in the lower atmosphere. In this study, the surface meteorological variables over Gurgaon region were simulated using the Advanced Research Weather Research and Forecasting (WRF-ARW) mesoscale model. To study the evolution of PBL parameters and the thermo dynamical structure, the sensitivity tests were conducted with five different planetary boundary layer (PBL) schemes (Yonsei University, Mellor–Yamada–Janjic, Asymmetric Convective Model v. 2, Mellor-Yamada Nakanishi and Niino Level 2.5 PBL and Quasi-Normal Scale Elimination) and three different horizontal grid resolutions (27, 9 and 3 km) by using the  $1 \times 1^\circ$  NCEP Final Analysis meteorological fields for initial and boundary conditions. After carefully examination of the simulated parameters with the available in situ data, the present results suggest that PBL schemes, namely YSU and ACM2 performed better on behalf of the boundary-layer parameters and may useful for pollutant dispersion studies.

**Keywords:** Planetary boundary layer, WRF, mesoscale, thermo dynamical structure

## Analysis of Average Rainfall Phailin Cyclone by using Double Integration Technique

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**Abstract:** India's eastern coastline is one of the most violent wind inclined regions on the planet. Despite the fact that the coastline of Orissa has been just about 17% of the Indian eastern coastline, yet Orissa has been influenced by about 35% of all cyclonic and serious cyclonic tempests that have crossed the eastern coastline and related tempest floods that have been regularly immersing huge areas along the coasts. A Cyclone is an enormous scale air mass that turns around a solid focal point of low climatic weight caused due to low atmospheric pressure over oceans resulting in rainfall at coastal region. We will calculate average rainfall during the cyclone Phailin using Double integration

## Optimization of Some Transportation Problem by Proposed Method

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**Abstract:** The transportation model is a typical case of LPP (Linear Programming Problem) in which the main objective is to transport people or goods from multiple origins to different points at minimal cost, like air, water and land transport including railway and road transport. In this paper, a method for finding an optimal key solution in short iterations is proposed and obtained result is compared with Vogel's approximation method. This method is used for both cases of large and small size transport problem. A numerical example is also given to examine the validity of the transport model.

**Keywords:** Transportation, Linear Programming Problem, Vogel's approximation method

## A Mathematical Model to Solve the Huxley Equation by New Homotopy Perturbation Method

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**Abstract:** In this paper, New Homotopy Perturbation Method (NHPM) is introduced for obtaining solutions of non-linear Huxley equations. The approximate solutions of the Huxley equations are compared with the solution by using Adomian's decomposition and variational iteration method as well as with the exact solutions. The present method is very simple, effective and convenient analytical method with small computational overhead. The capability and reliability of the method, several examples are provided and MATLAB used to calculate the series obtained from NHPM.

**Keywords:** Adomian's decomposition method, Homotopy Perturbation Method, Huxley equation.

## Health Risk Assessment by using Fuzzy Logic Application

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**Abstract:** The fuzzy logic (FL) application has been used first time in thirty six year ago (1982) for purpose of insurance. In present, the insurance industry has several areas with latent applications for FL. In this paper involved to diagnosis the health risk which is related to Blood Pressure and Kidney function. The Glomerular Filtration Rate (GFR) has been used for investigate the level of the blood pressure with the help of kidney function. For this purpose, in this study FL control system has been used to represent the factors which may cause the hazard for human health and analysis by using rule base factor which was implemented in MAT Lab. The present study, advocates that FL may be suitable to take appropriate decision at the right time for giving treatment to the patients immediately and it may be monitoring from the treatment in future.

**Keywords:-**Fuzzy logic, Blood Pressure, Kidney Function, Diagnosis, Health risk

## Analysis of Aircraft activity by using method of Numerical Integration

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**Abstract:** The takeoff and landing of an airplane are the most perilous periods of flight in real environment. So, the investigation regarding takeoff and landing performance play a vital role for airplane structure and security. In the paper, a high-accuracy numerical calculation for takeoff and landing execution by force analysis to develop dynamic equations, which sets up and tackles the conditions of elements during departure and landing process. The proposed strategy is equipped for figuring departure and landing execution under various situations. The impacts of height, temperature, departure and landing weight and wind speed are analyzed.

**Keywords:** departure execution, landing execution, Numerical integration

## Use of Fuzzy Expert System for Investigating the Child Anaemia-A Case Study

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**Abstract:** In present, the fuzzy logic applications are mostly using to investigating medical disease. In this study the Fuzzy Expert System (FES) has been introduced to define the child anaemia. Anaemia is haematological disorder and the most common identifying in children. The fuzzy expert system has been designed to investigate the level of iron paucity in children. For this propose, the laboratory records have been obtained for child anaemia patients, the applicable factors have quantified. The FES for disease risk, child anaemia was shortly described. This system help to physician in the decisions risk. This study advocate that, in many cases FES can help to the doctors in diagnostics, treatment of sickness and etc. The number and the other disagreement that support our claim can be found in this study.

**Key words:** Fuzzy expert system, medical disease, Child anaemia, diagnostics, treatment.

## Application of CFD Numerical Modeling in Air Quality Assessment and Executing Mitigation Measures

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**Abstract:** Air quality primarily describes the pollutants contained in the air. As it appears to have grave pollution problems, real time air quality index (AQI) in most of the major cities of the world has now become a major concern to know the transient air quality levels. Various indices for measurement of air quality have been developed and are being used by different countries. The measurements are indicative of concentrations of air pollutants quantitatively. Air quality assessment indicative of various quantities may either involve the direct measurement of these quantities or deterministic of the impact of pollution and possible hazards. Fractional concentration of criteria pollutant species such as volatile and semi-volatile organic compounds and natural or anthropogenic aerosols determine the quality of air.

Apart from the measurements, air quality estimations may also be performed using Gaussian plume model and Solution of three dimensional Navier-Stokes equations and pollutant transport equations. The Computational Fluid Dynamics (CFD) modeling needs the identification of the relevant physical process describing the pollutants dispersion into the atmosphere. These processes involve the emission and transport of pollutants which may take place by bulk convection, turbulent dispersion and gravity effects. Adhesion among other forces and factors cause the settling of particle pollutants on the physical surfaces. Recombination reactions and electrostatic precipitation may also contribute in the pollutant deposition. Numerical modeling of air pollution problems with the help of CFD provides the detailed description of physical sources of pollutants, meteorological processes and changes occurring in physical and chemical behavior of pollutants effectively when the governing equations based on the assumptions of the mass, momentum, energy and pollutant species conservation of the mathematical model are in the appropriate form. The solution is obtained by solving the mathematical equation numerically.

This paper deals with the possible solution of the most concerned pollution problem and especially in dealing with the problems of smog forming in major cities and threatening the human life. It is suggested to perform a real time modeling of the smog problem by 3D modeling of the smog field using CFD and if coupled with the real time measured environmental data, simulation results will provide the severity of the pollution in the form of contours, plots and quantity in order to execute appropriate mitigation measures.

## Increase network lifetime optimisation efficiency and increase the stability period using the Gravitational Energy Sensitive Energy Hierarchy Protocol

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**Abstract:** The need for wireless sensor networks has been increased day by day, but when we work on it we find two well-known major problems that are cluster head selection and routing for this purpose decreasing their lifespan and increasing the number of dead nodes. The energy savings of each Node sensor are associated with high computational complexity, which depends on the monitoring of algorithms. This study developed a community base algorithm called "A Gravitational Energy Sensitive Energy Hierarchical Protocol," which increases its value but decreases the network life of dead network nodes. Technique where each node has heterogeneity-ordained energy levels of a protocol that selects a (cluster head) CH separately on the basis of their initial energy relative to the other nodes in the selected network. We provide some test results together with plotted results in this paper. In addition, analysis and simulation was performed with the implementation of the internal energy node 0.5, 1 J, 1.5 J, and 2J in different cases. After the analysis results have been achieved we have found that our algorithm provides the best results compared with other results of different algorithms. This is an important task, and in small and large networks our GESEHP protocol can produce improved results. All of this simulation work was carried out in Matlab.

**Keywords:** Gravitational, Efficiency, Throughput, IEEE 802.11, unicast and broadcast packet, network, L-LEACH, Quality of Service, W-LEACH, routing protocol, Energy Sensit.

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### About Families of Pairwise Connected Sets

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**Abstract-** The notion of connectedness in bitopological spaces was introduced and studied by W.J. Pervin and I.L. Reilly. Continuing the study we prove a few results concerned with a family of connected sets in bitopological spaces.

**Key Words-** Pairwise connected spaces, Connectedness in bitopological spaces, Pairwise mutually separated spaces.

**AMS Subject Classification-** 54A05, 54A99, 54D05

## Dual Cryptography with Mobile GPS location Mechanism

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**Abstract:** Cryptography is the type of security which internet usually uses and in today's world its not sufficient to safeguard our data and account. Here we come with a new concept of Dual Cryptography (DCPT) for the user and the communication channel as well. By the time its mandatory to use Location (MGPS) wise security which is possible through Mobile Computing. Location and Cryptography both are used in such a different way to provide internet security. Location Based Cryptography (LBDC) is the work which actually works on today's scenario.

**Keywords:** Cryptography, DCPT, MGPS, LBDC.

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## Feeling Detection dependent on Images and Captions on Social Media

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**Abstract:** Nowadays, Internet has grow to be an crucial element in every person's lifestyles. Social networking has regularly grow to be a recurring for people to submit their photos, opinions and remarks. People percentage their emotions on line in a completely casual language. Thus, it is very tough mission to research actual sentiment hidden inside the text of natural language. Emotion detection is the sphere of study that analyses people views and feelings. Human emotion can be expressed through numerous approach which include speech, facial expressions, gestures and textual facts. This paper proposes the gadget which makes use of present emotion detection thru facial features using deep mastering and supports it with the evaluation of textual information received thru captions of pics on social networking websites to ensure greater accurate outcomes. There is no characteristic on social networking sites to kind feelings of photos which motivate us to classes posts based on emotions. Emotion detection from each captions and photos collectively is efficient due to the fact most effective text isn't always enough to apprehend the feelings of customers. This hybrid approach offers promising results in both the class of feelings as well as in acting emotion detection.

**Keywords:** Emotion detection, Convolutional Neural Networks, Social Networks, Deep Learning, Sentiment Analysis

## Content Based Facial Emotion Recognition Model utilizing Machine Learning Algorithm

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**Abstract:** Emotion reputation or sentiment analysis is recognized as a critical studies topic in pc vision community. The challenges include identity of face, popularity of accurate emotion, suitable database and so forth. We have proposed and implemented a fashionable Convolution Neural community (CNN) building framework for emotion popularity. The model is formalized by means of developing a coincident gadget which fulfills the duties of face detection and emotion classification the usage of our proposed CNN structure. The version is verified using the FER-2013 dataset. In the proposed paintings, we talk the applicability of the proposed CNN model. This model lays a valuable evaluation of the effect of changing the network size, pooling, and dropout. For a given model, the very last accuracy at the validation facts is round 63%.

## Survey on Photoluminescence of Some Recent Work on Silicate Based Phosphors

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**Abstract:** Photoluminescence is the process, in which the excitation is accomplished by the absorption of photons. The radiation sources may be infra-red, visible, ultraviolet or X-ray. The fluorescent lamp used in household and general lighting is the principal example of this type of luminescence. The silicate matrix is a typical melilite. Phosphors based on silicate material are usually low cost and are chemically and physically stable. They have been studied widely with Eu<sup>2+</sup> doping, which shows that a blue emission and long persistent luminescence by co-doping with some other rare earth ions. We focus on the development of new silicate phosphors for a white LED. In the europium doped silicate system, four LED phosphor candidates found luminescent properties under near UV and visible excitation were investigated for the new Eu<sup>2+</sup> doped LED silicate phosphors. These new phosphors have a relatively strong absorption band in a long wavelength region.

## Common Fixed Point Results in Menger Spaces

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**Abstract:** The purpose of the paper is to prove a common fixed point theorem in Menger spaces by using five compatible mappings.

**Keywords:** Menger space, t-norm, Common fixed point, Compatible maps, Weak - compatible maps.

## Application of Graph theory in operations Research

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**Abstract:** One of the common themes in operation research is the modeling approach, many accurate model of operations research. Problems turn out to be intractable when subjected to standard technique this research paper show that how graph theory and networks may be profitably used to model certain discrete operations research problem from a different view-point effective algorithms.

**Keyword:** Graph, Direct graph, Graph networks, Simple graphs

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## Emergence of Cloud Computing in Higher Education

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**Abstract:** Cloud Computing is the term in which we are using a network of interconnected networks on the internet with the help of IAAS, PAAS, SAAS, where storage, management, processing are possible along with the processing of data beyond a local server or personal computer. Higher Education is a system for pedagogical excellence of students for higher studies along with a proper system of education, management, governmental schemes etc. This paper presents the emergence of Cloud implementation for betterment of Higher Education with the help of MOOC.

**Keywords:** Cloud Computing, IAAS, PAAS, SAAS, Pedagogical, MOOC

## A Bingham plastic and peripheral layer model of blood flow in the presence of stenosed artery

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**Abstract:** The present work deals with the blood flow through the stenosis assuming that flowing blood is represented by a two layered model. We considered a two-layered blood flow model to study the axisymmetric flow of blood by assuming the core layer as Bingham plastic (non-Newtonian fluid) and the peripheral layer (Newtonian fluid) in through the stenosis in the arteries. The analytical expressions for flow rate, resistance to flow and wall shear stress have been developed in this model. We have depicts the effect of stenosis on resistance to flow and wall shear stress. This study gives an insight into the effects of slip velocity on the volumetric flow rate, resistance to flow and wall shear stress.

**Keywords:** Stenosis, blood flow, core layer, peripheral layer and Bingham plastic

**AMS Subject Classification (2010):** 76Z05, 92C35

## A non-Newtonian fluid flow model for the slip condition on blood flow through a stenosed artery using power-law fluid

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**Abstract:** In this paper, the effects of boundary conditions on power-law fluid through an artery with stenosis have been studied. We considered the blood as power law fluid in this model. Numerical and computational models are developed to analyze the variation of resistance to flow, yield stress and wall shear stress across the stenotic region. The analytic expressions for flow resistance, wall shear stress with mild stenosis are derived by using this model, which shows that resistance to flow  $\lambda$  increases with increasing of stenosis height and wall shear stress  $\tau$  increases as stenosis size increases. The results have been shown graphically at different flow characteristics.

**Keywords:** Physiological flow, stenosed artery, wall shear stress, resistance to flow, Power-law fluid model and slip velocity

**AMS Subject Classification No. (2010):** 76Z05, 92C35

## Mathematical Modeling of Linear and Nonlinear Equations

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**Abstract:** This paper reviews some of the recent research and notes that plays an important role in mathematical modeling of linear and non linear equations. The process of developing a mathematical model is termed mathematical modeling. Mathematical models are used in the [natural sciences engineering](#) disciplines as well as in the [social sciences](#). This paper is taught that introduce the basic principles and methods that helps to explain a system and to study the effects of different equations and behavior. If all the operators in a mathematical model exhibit [linearity](#), the resulting mathematical model is defined as linear. A model is considered to be nonlinear otherwise. The definition of linearity and nonlinearity is dependent on context, and linear models may have nonlinear expressions in them. a differential equation is said to be linear if it can be written with linear [differential operators](#), but it can still have nonlinear expressions in it. In a [mathematical programming](#) model, if the objective functions and constraints are represented entirely by [linear equations](#), then the model is regarded as a linear model. If one or more of the objective functions or constraints are represented with a [nonlinear](#) equation, then the model is known as a nonlinear model. Mathematical models can take many forms, including [dynamical systems](#), [statistical models](#), differential equations, or [game theoretic models](#).

## Fixed point results for contractive type mappings in Cone b-metric spaces

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**Abstract:** In the present paper, we define F-contractive type mappings in Cone b-metric space and prove some fixed point theorem. Our main result unifies, generalizes and improves existing results in F-contractive mappings, b-metric space and Cone b-metric space in the literature.

**Keywords:** Fixed point; b-metric space; Cone metric space; Cone b-metric space; contraction

**AMS Subject Classification No. (2000):** 47H10; 47H09; 54H25

### IOT Based Smart Crop Monitoring in Farm Land

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**Abstract:** As new technologies has been invented and utilized in modern world, there is a need to bring an elevation in the field of agriculture also. A lot of researches have been made to improve crop production. In order to enhance the crop productivity effectively, it is necessary to monitor the environmental conditions in and around the field. The motive of this paper is to propose an IOT based Smart crop monitoring system which aims in making use of progressing technology i.e. IOT and Smart Farming. Internet of Things (IOT) has become a trending technology nowadays which is being used in several real time applications. IOT is a system which consists of several sensors or actuators that provides connectivity to the internet directly or indirectly. IOT based smart farming improves the entire agricultural system. As it is well known, agriculture is the backbone of our Indian economy that contributes to the overall economic growth of the country. With the help of sensors and interconnectivity, IOT in agriculture has saved the time of farmers to a greater extent and has enhanced the traditional way of farming. Online crop monitoring using IOT helps the farmers to stay connected to his field from anywhere and anytime. Also with the innovation of IOT in farming there has been drastic reduction in extravagant use of valuable resources such as water and electricity. Various different types of sensors are connected to the field that monitors and collects information about the field conditions. Collectively all the captured farm conditions are sent to the farmer through GSM technology. Thus this way farmer is able to monitor his field without being there physically. Finally, based on this thorough review, we identify current and fore coming trends of IOT in agriculture and highlight potential research challenges.

**Keywords:** IOT, Sensors, GSM technology, Smart farming.

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### Matlab A Fourth-Generation Programming Language of New Era: A Review

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**Abstract:** MATLAB has evolved over a period of years with input from many users. In university environments, it is the standard instructional tool for introductory and advanced courses in mathematics, engineering, and science. In industry, MATLAB is the tool of choice for high-productivity research, development, and analysis. It features a family of application-specific solutions called toolboxes. Very important to most users of MATLAB, toolboxes allow as to learn and apply specialized technology. Toolboxes are comprehensive collections of MATLAB functions (M-files) that extend the MATLAB environment to solve particular classes of problems. Areas in which toolboxes are available include signal processing, control systems, neural networks, fuzzy logic, wavelets, simulation, and many others. It is an interactive system whose basic data element is an array that does not require dimensioning. This allows you to solve many technical computing problems, especially those with matrix and vector formulations, in a fraction of the time it would take to write a program in a scalar non interactive language such as C or FORTRAN.

## Some Fixed Point Results in $A$ -Metric Space and $A_b$ Metric Space

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**Abstract:** Our goal of this article is to vindicate some fixed point theorems for contractive mappings in  $A$ -metric space and  $A_b$  metric space, which unify, develop and generalize most of the prevailing coherent fixed point results from the literature.

**Keywords:**  $A$ -metric space;  $A_b$  metric space, contractive mapping; fixed point

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## Some Fixed Point Theorem Satisfying General Contractive Condition of Integral Type

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**Abstract:** In this paper, we establish a fixed point theorem for a pair of self maps satisfying a general contractive condition of integral type. This theorem extends and generalizes some early results of Boikanyo[4]. And Jaggi and Dass [12]

**Key Words:** Lebesgue-integrable map, Complete metric space, Common fixed point.

**AMS Subject Classification (2010):** 54H25, 47H10.

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## CFD Modeling and Simulation in the Heat Transfer Studies in Solar Air heating

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**Abstract:** Solar air heater is solar energy collection device and this collected solar energy is utilized for low temperature heating purpose, agriculture drying purpose etc. The rate of conversion of solar energy to heat energy is low in solar air heater because of the nature of fluid which is air having poor thermal conductivity which influence the rate of heat transfer from the absorber plate to air. The value of heat transfer coefficient for this heat exchange is low and it can be increased by creating turbulence in flow field. The turbulence is created by providing artificial roughness on absorber plate of various geometries. In this paper the numerical modeling of heat transfer through the absorber plate has been discussed. The heat transfer in a rectangular duct of a solar air heater having trapezoidal rib roughness on the absorber plate is numerically studied by using Computational Fluid Dynamics (CFD). The effect on Nusselt number, heat transfer coefficient, velocity, and temperature parameter are analyzed. This CFD simulation is done using commercial software Fluent 6.3. The  $K$ - $\epsilon$  numerical model consisting of the governing mathematical equations based on the principles of conservation of mass, momentum and energy have been used.

## Time Synchronization using Hierarchical Clustering for reliable data service in MANET

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**Abstract:** Time synchronization in any network like wired and wireless is one of the crucial issue because of synchronized the communication in between sender and receiver. In Mobile ad hoc network nodes are continuously changing their situation in a surrounding environment. The data sending and receiving is performed without any supervision or centralized communication. In this research we proposed a new time synchronization technique with multicast routing in dynamic network. The multicast routing protocol is able to perform the group communication and in each group is made from some nodes with one group coordinator and each node has different clock time. The proposed research is synchronized the clock of each mobile node according to the average time beacon of all group in MANET. The proposed multicast Average Time Clock beacon Synchronization (Avg-SYN-CLK) communication performance is improves the network performance. The proposed scheme performance is compare with the Maximum Clock Time Synchronization (MAX-SYN-CLK) beacon broadcasting technique and Asynchronies Clock Time Performance (ASYN-CLK) and observe that the proposed technique is provides better performance with minimum end to end delay and packet loss.

**Keyword:** Clock Synchronization, MAODV, Mobile Ad hoc, Clock Detection, Multicasting, Average Clock Time.

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## A smart way of Compression

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**Abstract:** The advancement of information technology has affected all walks of our life. Data base technology has also grown from a simple file system to data navigation system, and over a last two to three decades a majority of business institutions, organizations, industries etc. have adopted the computerization process and as a result have been flooded with data. In this report it is investigated that for experimental result shows the proposed scheme provides significant improvement in compression efficiencies. The main proposal of this report is to reduce the memory space and the transmission time and achieving good compression ratio. In this work proposed techniques manages the compressed database such that standard operations like retrievals, insertion, deletion and modifications are supported.

## A Digitalized Development Competency in Industrial Internet of Things

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**Abstract:** The competences of IoT aidproducers or investors to gain superiorprominence and insights into their further actionsthrough the effectual use of data and the tighter amalgamation of disparate systems. This opens up the leeway for producers of moving away from merely selling goods to becoming a provider of services and firming the bond they have with the end users of their products. It goes in to the heart of how an industrial manufacturer perceives itself and the extent to which digital change will be central to its tactic and therefore requires that additional care is taken and better caution is exercised. This means that IoT can offer more than traditional process efficiency improvements on the factory floor. This paper will converse the impacts of IoT and other developing technologies in making a manufacturing system automated.It will include conversation on economy, cutting-edgetechnology.

**Keyword:** IOT, Automation of Industry.

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## A Review Paper on Electro Automotive Smart Systems Using Internet of Things

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**Abstract:** Electricity consumption grows up rapidly all over world during up-coming decades. Nowadays we can generate electricity through a smart way by using different techniques. By implementing a speed breakers on roads through roller mechanism. In this mechanism, by using a rack and pinion system we can generate electricity. And the second technique was traffic windmill which this method used on high ways. In this method by using a vertical axis blade we can generate electricity. And one more method was smart street lights on highways. In this method by using a sensor called LDR (light dependent resistor).

**Keywords:** Electricity extraction, Electricity utilization, Rack and pinion, Vertical axis wind mill.

## Glaucoma diagnosis using discrete wavelet transforms and Histogram features from fundus images

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**Abstract:** Glaucoma is one of the main eye diseases; it cause progressive deterioration of optic nerve fibres due to increased fluid pressure. The existing methods of glaucoma diagnosis are time consuming, expensive and require practiced clinicians to understand the eye problems. Hence fast, cheap and more accurate glaucoma diagnosis methods are needed. This paper presents an innovative idea for diagnosis of glaucoma using third level two dimensional discrete wavelet transform (2D DWT) and histogram features from fundus images. The 2D DWT is used to decompose the glaucoma and healthy images and histogram features are extracted from 2D DWT decomposed sub band images. The least square support vector machine (LS-SVM) is used as a classifier which classifies the glaucoma and healthy images using the extracted features.

## Results on Multivalued Mappings in Intuitionistic Fuzzy Metric Spaces

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**Abstract:** In this paper we obtain some common fixed point theorems for multivalued mappings in intuitionistic fuzzy metric space containing rational terms. Wegenerelizeand extend results. Of [I. Kubiacyk and S. Sharma, Common fixed point in fuzzy metric space, J. Fuzzy Math. 11(1)and [RezapourSh.:Common fixed point of self-maps in intuitionistic fuzzy metric spaces , Mat.Vesnik 60(4)(2008), 261-268] by contributing rationalization from their previous versions.

**Keywords:** Common fixed point, Multivalued map, intuitionistic fuzzy metricspace.

**Mathematics Subject Classification (2000).** 54A40, 54H25.

## An Application of Compatibility and Weak Compatibility in Intuitionisticfuzzy Metric Spaces

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**Abstract.** The object of this paper is to obtain some new results in intuitionistic fuzzy metric spacesby the applicability of the property ( $S-B$ ) and the notion of R-weak commutativity of type ( $Sp$ )and weakly compatible maps of type ( $Sp$ ) and prove the intuitionistic fuzzy version of Pantstheorem. Our results are substantiated with example. The established results generalize and extends several existing fixed point results in intuitionistic fuzzy metric spaces, metric spaces and fuzzy metric spaces.

**Keywords:** Intuitionistic fuzzymetric space, ( $S-B$ ) property, R-weak commutativity of type( $Sp$ ),Weakly compatible map, Common fixed point.

**Mathematics Subject Classification (2010):** 47H10, 54H25.

## Neural Network Approach to Predict Soaked CBR of Routine Subgrade soil

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**Abstract:** This study presents the application of a method of artificial neural networks for the prediction of the California bearing ratio (CBR) with routine properties of subgrade soils. A database is developed containing grain size distribution, Atterberg limits, maximum dry unit weight and optimum moisture content of the soils. A set of 231 experimental results were used to construct the ANN model. The correlation between the basic properties of soil and CBR were obtained from the trained neural network. A Commercial software MATLAB-7.5 was used for trained the ANN models, Multilayer Perceptrons neural network(or LMB model). Three Levenberg-Marquardt Backpropagation ANNs models (LMB-4, LMB-5, and LMB-6) for predicting CBR, (in which the number of input variables is changed seven to four) were employed in the analysis. In these models, the input layer consists of maximum six nodes, one node for each of the independent variables, namely % fines (Silt and clay fraction) , % of Sand content(S),% of Gravel, optimum moisture content (OMC) ,Maximum dry density ( $\gamma_d$ ) , plasticity index (PI) , and liquid limit ( $W_L$ ) respectively . The output layer consists of only one node—CBR. The strengths of the developed models are examined by comparing the predicted CBR values with the experimental values with respect to the regression coefficient ( $R^2$ ) and Mean Square Error (MSE) values. In addition, the experimental results were compared to different LMB networks predicted results. It was concluded that the performance of the model with six inputs (LM-6) is better than other model.

**Keywords:** California bearing ratio (CBR), Neural Network, MLPN, Subgrade

## A Unique VLSI Primarily Based Structure for Computation of 2D-DCT Image Compression

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**Abstract:-**Statistics photograph compression is the deficiency, of redundancy in statistics illustration to attain deficiency, in storage cost. The implementation and optimization of FPGA primarily based 2D-DCT with quantization and zigzag with parallel pipe lining the usage of HDL. The 2-D DCT calculation is made using the 2-D DCT separability property, such that the whole architecture is divided into two 1-D DCT separability assets and calculations with the aid of the use of a transpose buffer. The coding is simulated using Xilinx 9.2i ISE synthesized the usage of spartan-3E XC3S250. The 2nd-dct structure makes use of 600 slices, 6 I/O pins, and 4 multiplier and working frequency 135 MHz and pipe lining latency 140 clock cycles.

**Keyboards:** JPEG, DCT, quantization, zigzag, FPGA, Xilinx 9.2i ISE.

## Human Area Networking using Red Tacton Technology

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**Abstract:**-So far we've seen LAN, MAN, WAN, internet and plenty of extra networks. However now here is a new concept of "RED TACTON" which allows the communication via touching and makes the human body floor as a conversation network, this is referred to as human area community which is the rising fashion in the area of conversation. The Red Tacton takes a one of a kind technical viewpoint rather than counting on electromagnetic or light waves to hold facts it makes use of feeble electric powered discipline on the surface of the frame as a transmission medium. Verbal exchange with the aid of that is secure as the modern which flows via the frame is in very small voltage range with excessive pace network transmission direction and is viable the usage of any surface of the frame like hand, fingers, toes, face, legs or torso. It additionally works through footwear and clothing as nicely. Further to the human body, numerous conductors and dielectric may be used as transmission media and also they may be used in aggregate. Transmission velocity does no longer deteriorate in congested areas in which many people are communicating at the equal time with a maximum pace of 10mbit/sec.

**Keywords:** Red Tacton Mechanism, IEEE802.3, Human area network.

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## Indoor Positioning System using Ultra Wide-band Technology

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**Abstract:** An indoor positioning machine is a network of device used to locate humans or object wherein GPS and other satellite TV for pc technology lack precision or fail entirely. UWB (excessive bandwidth, low frequency) can skip signals thru a wide type of limitations, along with wall. It can also supply accurate positioning information in a high fresh charge. A area tag of UWB indoor positioning gadget can send area information for the tracked items as much as five times according to second and also can accumulate statistics for up to two years without recharge as a consequence it has low electricity intake which adds into decrease renovation value for indoor monitoring. It has minimum radio interference which permits it to exist in concord with other radio indicators inclusive of those emitted by means of smart phones, Wi-Fi gadget and bluetooth gadgets. A high consumer density isn't a trouble to localization of specific assets because the person can differentiate one song asset and consider the data for it the usage of a visible dashboard. It is vulnerable to interference with the aid of steel and different materials, which makes it a suitable option for asset monitoring in production side.

**Keywords:** Sensor Network, Positioning Algorithms, Wireless Positioning Techniques, Object Tracking

## Common Fixed Point Theorems in Partially Ordered Metric Spaces with Altering Distance Function

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**Abstract:** The aim of this paper is to prove certain fixed point theorems for multi-valued and single-valued mappings in such spaces, by using altering distance function. Fixed point theory in partially ordered metric spaces has greatly developed in recent times. Our results improve and extend several recent results of fixed point theory.

**Keywords:** Common fixed points, Metric space, Partially Metric space, Altering distance function, Multi-valued and Single-valued mappings



## Numerical solutions of Schrödinger equations with Harmonic Oscillator describing motion of Quantum Oscillator

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**Abstract:** In this paper, an effective, powerful analytical scheme, popular as Homotopy perturbation sumudu transform method (HPSTM) is employed to attain approximate solutions of nonlinear time fractional Schrödinger equations with Harmonic Oscillator. These nonlinear time fractional Schrödinger equations occurs in the many fields of physics and technology such as quantum mechanics, optics, fluid dynamics, nonlinear physics, nanotechnology and in many more. The nonlinear time fractional Schrödinger equations with Harmonic Oscillator describe the various phenomena such as motion of quantum oscillator, lattice vibration, propagation of electro-magnetic waves, fluid flow etc. The main objective is to apply an alternative method of solution, which do not require small parameters and avoid linearization and physically unrealistic assumptions. The results show that HPSTM is very efficient and convenient and can be applied to a large class of problems. This study shows that the approximate results obtained by the HPSTM are very accurate and effective for analysis the nonlinear behaviour of systems. This study also states that HPSTM is much easier, more convenient and efficient than other available analytical methods.

**Keywords:** Quantum mechanics, Schrödinger equations, Harmonic Oscillator, Sumudu transform, Homotopy perturbation method, He's polynomials.

## Binary Topological Space

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**Abstract:** Topology is playing a key role in almost every field of applied sciences and several branches of mathematics. This is very useful concept especially in information system, particle physics, quantum physics, high energy physics etc. In 2002 Csaszar [4] introduced and studied the concept of generalized topology and generalized continuity. In 2011 Nithyanantha Jothi S and Thangavelu P, [18] have introduced the concept of binary topology between two sets and studied different properties. In this paper we introduce and studied  $\mu$ -binary topological spaces and investigate its basic properties

**Keywords:** Binary topological spaces, binary topological spaces, closure interior

## Mathematical Concept of Compound Redundant system with availability and reliability parameter under supplementary variable method

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**Abstract:** In this paper author has assume that a compound system have 2-subsystems selected as " and " connected in chain. Subsystem " consists of Nunlike units in chain and the subsystem " consists of 3- like components in parallel redundancy. In this system it is assume that the system goes to complete crash state if any unit of subsystem " fails or more than 1-unit of subsystem " is in the failed state. Also, the system works with degraded efficiency if 1-unit of subsystem " failed. The system may also fail due to environmental reasons.

**Keywords:** Availability, Reliability, Abel lemma, MTTR, Ergodic behaviour and Laplace Transform and Supplementary variable

## A Basic generalized properties of Transprocal Matrix and Transprocose Matrix.

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**Abstract:** In this paper we have to generalize some definition and properties of I-matrix, J-matrix Transprocal of certain matrix, transpose of transprocal matrix, can be represented by this matrix. On the other hand, the abstract treatment of linear algebra presented later will generalize a new sight into the structure of these matrices.

## Machine Learning Algorithms in WSNs: A Review Article

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**Abstract:** Wireless sensor network (WSN) is a recent leading technology that is used in realistic applications due to its variable size, cost-effectiveness and type of deployment. Sensor nodes battery in WSN cannot be recharge and nodes also cannot be replaceable due to which nature of WSN changes dynamically. The traditional approaches in WSN cannot adopt the changes dynamically. To overcome the drawbacks of traditional approaches, machine learning (ML) techniques are adopted to react accordingly. In this article, survey based on ML techniques with WSNs application is presented which covers from 2002 to 2018. In addition, drawbacks and advantages of each and every technique have been discussed. Finally, some open issues in WSN is mentioned for the future research direction.

## Iwalk- A Smart Blind Stick

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**Abstract:** Independence is the building methodology in achieving dreams , goals and objectives in life . Visually impaired persons find themselves challenging to go out independently . There are millions of visually impaired or blind people in this world who are always in need of helping hands . Blind stick is an innovative electronic stick . Blind people have big problem when they walk on the street or stairs using white cane , instead of this white cane the electronic walking stick will help them by providing more convenient means of life . The main aim of this paper is to contribute our knowledge and services to the people of blind disabled society .

**Keywords:-** ATmega 2560 , Ultrasonic sensors , Sim Gsm/Gprs , SD Card Module , LDR , Water sensor , Registers , LED's ,Battery(9V) , buzzers , speaker .

## Analysis of Triaxility Stress and Damage in Hot Extrusion Process of AL2024 using Finite Element Method

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**Abstract:** Hot Extrusion process is a manufacturing process in which block of metal is reduced in cross section by forcing it to flow through a die orifice under high pressure. In general, extrusion is used to produce cylindrical bars or hollow tubes, but shapes of irregular cross section may be produced from the more readily extrudable metals, like aluminum. Heavy forces required in extrusion, most metals are extruded hot under conditions where the deformation resistance of the metal is low. However, cold extrusion is possible for many metals and has become an important commercial process. The reaction of the extrusion billet with the container and die results in high compressive stresses which are effective in reducing the cracking of materials during primary breakdown from the ingot. In this research work numerical simulation of hot extrusion process has been considered and carried out the finite element analysis has been carried out. Focused on the stress and strain behavior, triaxility stress and on the bases of deformation aiming on the damage and its behavior, taguchi method has been used for the validation of the design of experiment. For FEA DEFORM 3D software has been applied and for modeling of parts AUTOCAD has been used.

**Keywords:** Hot Extrusion, FEA, triaxility Stress, Damage.

## Finite Element Analysis of Hot Rolling for an Aluminium 2024 Plate

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**Abstract:** Now a day numerical modelling an important tool in the manufacturing industry to analysis the all the parameters of machining and geometrical. The two dimensional rolling model is common in manufacturing industries. In the present research work is based on a two dimensional finite element model for hot rolling of aluminum (Al2024) plate has been used. This model is used to study the behavior of the material under different values of coefficient of friction, roller diameter and initial thickness of the plate for attaining a required dimensional thickness of the rolled plate. The effect of friction, initial thickness of plate and roller diameter on maximum stress, equivalent plastic strain and reaction force has been studied. The current work has been carried out using the Finite Element software ABAQUS 6.10

**Keywords:** Hot Rolling, FEA, Stress- Strain.

## Class(es) of Estimators under Non-Response and Measurement Error in Surveys

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**Abstract:** While in sample surveys, it is expected to assume that respondents are obtainable to provide information correctly asked by interviewers. Unfortunately, in real circumstances it is rarely happens. Often respondents are not available; often do not understand to interviewer and often show unwillingness for correct answer. This causes a sample to be incomplete. According to theory of survey sampling, investigators are recommended to revisit those units found non-responded but even then the problem remains the same. Over the issues of personal respect and prestige bias, respondents often produce over or under estimated response instead of the true value. This causes appearance of measurement error in sample values. This paper presents method of mean estimation in the setup of non-response and measurement error together. It contains method to impute the values which are non-responded in sample containing measurement error on study variable. Expressions of optimized mean squared error are derived and theoretical results are supported by numerical illustration. This is an attempt for a most general approach for the problem of estimation in sample surveys.

**Key words:** Non-response, Measurement error, Bias, Mean squared error, Imputation, Auxiliary information.

## Lie Algebra and q Special Functions of Mathematical Physics

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**Abstract:** In this paper we will present important interrelationships between the theory of Lie groups and algebras, and special functions. We will study two specific Pseudo groups, namely  $SO_q(2)$  and  $SU_q(2)$ , and we prove that similar properties of Lie groups and study about the role of q special function in mathematical physics.

## Banach (E,1) Summability of the Derived Fourier Series

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**Abstract:** The aim of our paper is to study the Banach (E,1) product summability of derived series of Fourier series by generalizing the result of Tripathy and Pandey [9]

**Keywords:** (E,1) summability; Banach\_(E,1) summability; Banach summability.

**Mathematics Subject Classification (2010):** 42A24, 42A20 and 42B08

## Common Fixed Point Results for F-contraction in Complete b - Metric Spaces

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**Abstract:** In this paper, we consider two F- contractive self mappings on a complete b- metric spaces. Object of this paper is to establish a unique common fixed point theorem for F - contractions. The results extend and generalize some results in the literature.

**Keywords :** Complete b- metric space, common fixed points, F-contractions.

## Some Fixed Point Theorems for Expansive Type Mappings in Dislocated Metric Space

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**Abstract:** The present paper extend and generalize fixed point theorems for expansive type mappings in Dislocated Metric Space.

**Keyword:** Dislocated Metric Space, Fixed Point Theorems,

**Mathematics Subject Classification:** 47H10,54H25

### On Ricci Quarter Symmetric Metric Connection

Teerathram Raghuwanshi<sup>1</sup>, Swati Jain<sup>2</sup>, Anil Goyal<sup>3</sup> and Manoj Pandey<sup>4</sup>

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**Abstract:** The object of the present paper is to study a type of Ricci quarter symmetric metric connection on a quasi-Einstein manifold and  $N(k)$ -Quasi Einstein manifold. We have shown that curvature tensor of the connection satisfies Bianchi's first identity and also that the conformal curvature tensor is an invariant of such a transformation. Apart from this, we have studied some more curvature conditions.

### A Taylor Series Method for the Solution of the Newman Boundary Value Problems for Partial Differential Equations

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**Abstract:** In this paper, a numerical method for solving the Neumann problems for partial differential equations with constant coefficients and analytic Neumann conditions in two and three independent variables is presented. The technique is based upon the Taylor series expansion. Properties and the operational matrices for partial derivatives for the Taylor series in two and three variables are first presented. These properties are then used to reduce the solution of partial differential equations in two and three independent variables to a system of algebraic equations. The procedure can be extended to linear partial differential equations with more independent variables. The Taylor series may not converge if the solution is not analytic in the whole domain, however, the present method can be applied to Neumann boundary-value problems for linear partial differential equations, when the solution is analytic in the interior of the domain and also on some open subsets for each distinct part of the boundary. The method is computationally very attractive and applications are demonstrated through illustrative examples.

### DSSSWMS: An Improved Approach For The Decision Support System In Solid Waste Management System

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**Abstract:** India is a developing country, all the developing countries facing a sustainable waste management problem for a long time. The quantity of MSW is growing very rapidly and governments are not capable of disposal 100% of solid waste as per compare to generation. Improper waste management affects the environment and human being direct. Peoples suffer from many types of diseases due to improper solid waste management. To deal with this problem the Indian government makes policies and updates them from time to time. Now this time we need new technology that can be work of an integrate form with waste management models and help to improve the efficiency of the municipal solid waste management process. Decision support systems model such types of tools that can be the help of organizations or decision-makers to take proper decisions for a particular problem. A decision support system is a fully computerized system that can be work with the help of data mining technology.

## Mathematical Modeling of Indoor Air Pollutants: A Review

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**Abstract:** With the global concern over the pollution, the indoor environment is also to be kept safe and within the prescribed air quality standards as most of the people spend their 80% of the time indoor whether it is at home, office or any other place. The pollutant concentration in indoor is more than in outdoor atmosphere and can affect negatively human health and productivity. Therefore, prediction of indoor pollutant concentration will help in making the necessary arrangements to improve indoor environment in order to keep the human health and productivity up to the desired levels. Several studies have been made over four decades in developing, testing, and evaluating the performance of mathematical models for predicting pollutant concentrations in the indoor atmosphere. These studies provide the data pertaining to risk assessment and enable the regulatory bodies to provide guidelines for the appropriate steps for a given level of smoking, Chemically Reactive Pollutants activity etc. This paper reviews the Balance-Based Model for Indoor Air Pollutant Concentration Modelling, Mathematical Modelling of Chemically Reactive Pollutants in Indoor Air and Mathematical Models for Predicting Indoor Air Quality from Smoking Activity.

## Generalized Fractional Kinetic Equations involving Generalized Extended-- $\tau$ Hypergeometric Function

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**Abstract:** Recently, introduced an extension of generalized  $\tau$ Hypergeometric function  ${}_3\Gamma_2^T(2)(z)$  (R. K. Gupta et al. [5]), [6]. In the present paper, authors have established further generalization of fractional kinetic equations involving generalized extended  $\tau$ -Hypergeometric functions. The solution of these generalized fractional kinetic equations were obtained in term of Mittag-Leer function using Laplace transform.

**Keywords:** Generalized extended incomplete Hypergeometric Function, Fractional kinetic equation, Laplace transforms, Mittag-Leer function, Fractional calculus.

**Mathematics Subject Classification (2010):** 26A33, 33B15, 33B20, 33C20, 44A10, 33E20.

## Global Stability Analysis of SITRS Model of Influenza

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**Abstract:** Numerous people all over the world are suffering from influenza every year. It is an acute respiratory infectious disease which is caused by influenza virus. The purpose of this paper is to study the spread of disease when individuals have tendency to become susceptible again after recovery. A SITRS deterministic model is proposed and analyzed. In this paper basic reproduction number  $R_0$  is obtained, local stability of disease free equilibrium and endemic equilibrium is studied and discussed global stability of disease free equilibrium. It is observed that disease free equilibrium is locally and globally stable when  $R_0 < 1$  and endemic equilibrium is stable when  $R_0 > 1$ . Numerical simulations are performed using MATLAB to check the effect of movement of individuals from recovery class to susceptible class and results are shown graphically.

## Coupled fixed-point theorem using E.A property in complex valued rectangular (generalized) metric space.

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**Abstract:** In this paper coupled fixed point is obtain for four mapping using E.A property in complex valued rectangular (generalized) metric space.

**Keywords:** Complex- valued metric space, coupled fixed point, E.A property.

## Parametric excitation of high-frequency surface Plasma waves in Bismuth-Metal Interface

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**Abstract:** The problem concerning the excitation of high-frequency surface Plasma waves (SPW) propagating across an external magnetic field at a plasma-metal interface is considered. A homogeneous electric pump field is applied in the direction transverse with respect to the plasma-metal interface. Two high-frequencies SPW from different frequency ranges of existence and propagating in different directions are shown to be excited in this pump field. The instability threshold pump-field values and increments are obtained for different parameters of the considered waveguide structure. The results associated with saturation of the nonlinear instability due to self-interaction effects of the excited SPW are given as well. The results are appropriate for both gaseous and semiconductor plasmas. A surface plasma wave (SPW) over bismuth-Metal interface has a signature of mass anisotropy of free electrons. For SPW propagation along the trigonal axis there is no birefringence. The damping rate of waves at low temperatures is low. The surface plasma wave may be excited by an electron beam of current 100 mA propagating parallel to the interface in its close proximity.

## Artificial Neural Network Modeling for Estimation of Carbon Monoxide Concentration

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**Abstract:** The lack of environmental data is a common feature for many developing countries. Accurate estimation technique is highly required to overcome with this problem and the artificial neural network (ANN) is regarded as cost effective and better suited technique for estimation as compare traditional statistical techniques. In this paper an attempt is made to estimate concentration of CO gas based on historical data using artificial neural network (ANN). Eleven years (1996-2006), night time (22.00-06.00 Hrs.) CO emission data from ITO square of Delhi has been employed for modelling and simulation study. The results of ANN studies predicted CO concentrations with great accuracy and closer-to-reality which can be helpful to alleviate the excessive CO accumulations.

**Keywords:** Concentration, Artificial Neural Network (ANN), Real time analysis, Modelling.

## Intelligent Phishing Detection Classification Using Hybrid Approach

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**Abstract:** The so-called phishing attacks refers to an attacks in which a legitimate website is mimicked, in order to steal sensitive statistics from end-users. Phishing attacks are one of the significant threats to individuals and corporations on the Internet today. In recent years, this problem has been actively researched by academia and industry. There are two main approaches to try to provide an effective phishing solution: The first is to identify phishing attacks by comparing the similarities between phishing and the target site. The second method is to observe the underlying characteristics of the attack. This paper proposes a phishing technique based on web page uniform resource locator (URL) authentication. The proposed solution is able to distinguish legitimate web pages from fake web pages by verifying the Uniform Resource Locator (URL) of the suspicious web page. Check URLs against specific features to verify phishing pages. Prevention of detected attacks is reported. The performance of the proposed solution was evaluated using the Phistank and Yahoo Directory datasets. The obtained results suggest that the detection mechanism is deployed and can detect various types of phishing attacks while maintaining a low rate of false alarms.

**Keywords:** Phishing, malicious URL, KNN, machine learning, cybersecurity.

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## Review on mathematical modelling of an Internal Combustion Engine

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**Abstract:** In this article, we are focussed and discussed on different types of mathematical modelling and its application used in internal combustion engine. A mathematical model usually describes a system by a set of variables and a set of equations that establish relationships between the variables such as combustion, performance and emission parameters. By the use of mathematical modelling different parameter of internal combustion engine can be correlate and analyse the effect of one parameter to another. After developing a mathematical model different types of fuel blend can be easily analyse the effect on combust, performance and emission at different loads within the experimental domain. Author's analysed and found from previous published paper related to mathematical modeling and experimental output predicted should be closer to developed mathematical model.

## Kinetic Model for Performance Prediction of Anaerobic Digester

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**Abstract:** Anaerobic Digestion (AD) is a biological process that happens naturally when bacteria breaks down organic matter in environments in the absence of oxygen. Anaerobic digestion (AD) is a microbial decomposition of organic matter into methane, carbon dioxide, inorganic nutrients and compost in oxygen depleted environment and presence of the hydrogen gas. Bacterial growth is a complex process involving numerous anabolic (synthesis of cell constituents and metabolites) and catabolic (breakdown of cell constituents and metabolites) reactions. Ultimately, these biosynthetic reactions result in cell division. Several distinct growth phases can be observed within a growth curve lag phase, the exponential or log phase, the stationary phase, the death phase. During exponential growth the rate of increase of cells in the culture is proportional to the number of cells present at any particular time. One can mathematically describes cell growth during the exponential phase. Equation has been developed from a series of experiments performed. The results of these experiments shows that at low substrate concentrations, growth rate becomes a function of the substrate concentration. Thus, designed Equation to describe the relationship between the specific growth rate and the substrate concentration. The most important determinants of good living conditions for anaerobic bacteria and therefore efficient gas production. Acetogenic (acid forming bacteria) and methanogenic are naturally present in cow dung. However, their number is quite small. Acid forming bacteria proliferate fast and increase their number, while methanogenic bacteria develop very slowly. Therefore, for the initial reaction, small amount of sludge of another digester is generally used as seeding or inoculum. This sludge contains high concentration of acetogenic and methanogenic bacteria which could enhance the process of anaerobic digestion of organic materials. Some study has shown that the seeding materials can be mixed with the input slurry up to the ratio of 30 to 50 percent. If inoculum is increased further, less volume of gas is obtained due to reduced inputs fed to the digester. Anaerobic digestion occurs best within a pH range of 6.8 to 8.0.

## Emotion Detection based on Images and Captions on Social Media

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**Abstract:** Nowadays, Internet has grow to be an crucial element in every person's lifestyles. Social networking has regularly grow to be a recurring for people to submit their photos, opinions and remarks. People percentage their emotions on line in a completely casual language. Thus, it is very tough mission to research actual sentiment hidden inside the text of natural language. Emotion detection is the sphere of study that analyses people views and feelings. Human emotion can be expressed through numerous approach which include speech, facial expressions, gestures and textual facts. This paper proposes the gadget which makes use of present emotion detection thru facial features using deep mastering and supports it with the evaluation of textual information received thru captions of pics on social networking websites to ensure greater accurate outcomes. There is no characteristic on social networking sites to kind feelings of photos which motivate us to classes posts based on emotions. Emotion detection from each captions and photos collectively is efficient due to the fact most effective text isn't always enough to apprehend the feelings of customers. This hybrid approach offers promising results in both the class of feelings as well as in acting emotion detection.

**Keywords:** Emotion detection, Convolution Neural Networks, Social Networks, Deep Learning, Sentiment Analysis

## Content Based Facial Emotion Recognition Model using Machine Learning Algorithm

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**Abstract:** Emotion reputation or sentiment analysis is recognized as a critical studies topic in pc vision community. The challenges include identity of face, popularity of accurate emotion, suitable database and so forth. We have proposed and implemented a fashionable Convolution Neural community (CNN) building framework for emotion popularity. The model is formalized by means of developing a coincident gadget which fulfills the duties of face detection and emotion classification the usage of our proposed CNN structure. The version is verified using the FER-2013 dataset. In the proposed paintings, we talk the applicability of the proposed CNN model. This model lays a valuable evaluation of the effect of changing the network size, pooling, and dropout. For a given model, the very last accuracy at the validation facts is round 63%.

**Keywords:** Convolutional neural network (CNN), Facial expression recognition, Deep neural networks.

## Role of SODAR in the Climate Observing and Predicting System

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**Abstract:** Climate Change is our time's defining problem and we are at a defining moment. The effects of climate change are global in scope and unprecedented in scale, from changing weather patterns that threaten the human life and livelihood due to the rising risk of hydro meteorological disasters like flood, hurricanes, cyclones, drought etc. Without dramatic intervention today, it will be harder and more expensive to adapt to these hydro-meteorological effects in the future. Many methods have been created and are being developed for curbing the catastrophic effect caused due to hydro-meteorological disasters. Remote sensing was one of those techniques that had a huge effect on disaster management. This technology has been widely used in recent decades to explain the extent of the impacts of earthquakes, tsunamis, hurricanes, floods, wildfires etc. Remote sensing techniques have proved important effectiveness in quantifying post-disaster harm after major disaster through high resolution optical imaging and active sensors. Before these disasters happen and create a dreadful situation (humanly in terms of economy and socially), however, it is necessary to estimate and predict them. The present study focused to develop environmental models that enable prior prediction of these disasters via estimation of extreme climate change before it could cause detrimental effects. The research deploys Sound Detection and Ranging (SODAR) for collection of data in relation to wind speed and direction, atmospheric boundary layer for specific locations in India that are hit by hydro-meteorological catastrophe for evaluating the role of SODAR and environmental modelling in prediction of climatic trends, thereby avoiding the disaster hit consequences. The study also addresses the wider applications and advantages of using SODAR than other remote sensors and the models which uses wind speed and direction for the prediction of climate changes and thus helping in pre preparedness before the disaster. Therefore, there is an apparent connection between climate change and rising climate-related risks, generally suggesting the need to assert about the need for its predication through environmental modelling. This project will take the help of environmental modelling to ascertain about the upcoming climate change which will enable an estimation of climatic havoc leading to pre-precautionary measures before these disasters affect the people.

## Security Concerns, Matters and Methods for Wireless Sensor Network

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**Abstract:** A Mobile ad hoc networks (MANETs), a class of flexible and self-autonomous wireless networks that can be rapidly deployed and reconfigured without infrastructure support or centralized management, are highly promising to provide communication support [1]. The mobile nodes can move from one location to another. The mobile nodes are formed as a network without help of central management [1, 2, 18]. The Nodes in networks make use of an equivalent random access channel, cooperating in an especially friendly manner to contributing themselves in multihop forwarding. With the worldwide use of wireless sensor networks in different field and for various applications such as health care, military, ecological, and earth sensing, surveillance system monitoring. By reason the restrictions/ limitations of sensor nodes in terms of energy, storage and computational capacity, the use of insecure wireless communication channels concerns have ascended in these applications. To countermeasure the limitation various techniques and algorithm has been developed by the researchers. In this paper, we present the security issues, challenges occur and different techniques to overcome these security issues with their merits and demerits.

**Keywords:** Wireless sensor network, Sensor node, Security, Health care, Energy

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## Mathematical Modeling of Heat Exchange in the Under Ground Pipe of an Earth Air Heat Exchanger System

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**Abstract:** The tropical countries like India where heating and cooling of air is mostly required during particular season in a year. Conventional heating and cooling systems consume a great amount of energy reaching up to the level of almost one-third of the total energy consumption. As the current energy requirements are mostly fulfilled by the fossil fuel based energy generation systems, this extensive consumption of the energy contributes to green house emissions and affecting the environment adversely. A promising technology of heating and cooling of air by the earth air heat exchanger system has been becoming important in the present scenario of emphasis on reducing energy demand on space heating and cooling. This renewable and passive system of heating and cooling reduces the energy demand and thus protect the environment also. The design of the earth air heat exchanger system involves various parameters such as the thermo-physical properties of the soil, thermal and flow characteristics of the air in the pipe, material, orientation and dimensions of pipes buried in the earth and the heat exchange for the optimum performance. This paper presents the mathematical modeling of the heat exchange in the underground pipe. The mathematical model will provide the necessary input data for the design of an efficient earth air heat exchanger system. Thus the space heating and cooling can be more effectively done with the saving of energy and protecting the environment.

## Extreme Values Analysis for Finding Outliers Detection Using Machine Learning to Detect Predicted Data Points

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**Abstract:** An outlier is usually measured as an observation which is extensively found distant from the other well thought-out observations. In the era of modern machine learning analysis of n-dimensional datasets, data quality is essential for economists to guarantee robust results. Many machine learning algorithms are sensitive to the range and distribution of attribute values in the input data. Outliers in input data can skew and mislead the training process of machine learning algorithms resulting in longer training times, less accurate models and ultimately poorer results. Even before predictive models are prepared on training data, outliers can result in misleading representations and in turn misleading interpretations of collected data. Traditional techniques for outlier detection tend to exclude the tails of distributions and ignore the data generation processes of specific datasets. Various methods for detecting different kinds of outliers in high-dimensional data sets from two different perspectives, i.e. detecting the outlying aspects of a data object and detecting outlying data objects of a data set. N-dimensional data can be seen as part of the variety challenge of machine learning.

**Keywords:** Outlier detection, Machine Learning, High-Dimensional Data, Intrinsic Dimension (ID), k-Nearest Neighbour (k-NN)

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## Review of Artificial Neural Network and Its Applications

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**Abstract:** In this paper, we are elaborating Artificial Neural Network or ANN, its areas of applications. An Artificial Neural Network (ANN) is an information processing paradigm that is inspired by the way biological nervous systems, such as the brain, process information. In our brain, there are billions of cells called neurons, which processes information in the form of electric signals. ANN works on this concept. ANN provides a very exciting alternatives and other application which can play important role in today's computer science field. This paper gives overview of Artificial Neural Network of ANN. It also explains the application and advantages of ANN.

**Keywords :** Artificial neural network, information, process, electric signal, biological nervous system.

## Role of AI in Designing Smart Homes

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**Abstract:** Smart Homes have become firmly established as an active research area with potential for huge social and economic benefits. The concept of a Smart Home refers to the enrichment of a living environment with technology in order to offer improved habitual support to its inhabitants and therefore an improved quality of life for them. In this research paper we purpose how advances from the device and technological side have not necessarily been matched with a similar level of development in processing of the information recorded within the living environment from an algorithmic or 'intelligent' perspective. We surmise how traditional areas in Artificial Intelligence can bridge this gap and improve the experience for the user within a Smart Home. Smart Homes offer many benefits to its inhabitants and people with special needs. ANN (Artificial neural Network) technology appear to have potential, especially in the automated monitoring and control of smart home devices and the relevant space as well as the well being of inhabitants. With the rapid advances in technology , especially in wireless sensors and sensor networks, it is expected that it is not far when many of the dreams of the smart homes will be realized.

## Application of Intuitionistic Fuzzy Soft Matrix Theory in Decision Making in Real Life Problem

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**Abstract:** Soft set theory is a newly mathematical tool to deal with uncertain problems. It has a rich potential for application in solving practical problems in economics, social science, medical science etc. The concept of fuzzy soft sets extended fuzzy soft set to Intuitionistic fuzzy soft sets .In this paper we proposed intuitionistic fuzzy soft matrices and defined different types of intuitionistic fuzzy soft matrices and some operators. Finally a practical example that explains the best solution is analysed and demonstrate the application of the proposed decision making method.

**Keywords:** Soft sets, Fuzzy soft matrix (FSM), Fuzzy soft set (FSS), Intuitionistic fuzzy soft matrix (IFSM), Addition of IFSM, Complement of IFSM , Subtraction of intuitionistic fuzzy soft matrix.

## Generalized the Result on Common Fixed Point Theorem in Complex Valued b- Metric Space

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**Abstract:** In this paper we generalized a common fixed point theorem for four self-mappings satisfying rational contraction has been proved in complex valued b-metric space. Then, examples are provided to verify the effectiveness and usability of our main results. Finally, we validate our results by proving both the existence and the uniqueness of a common solution of the system of Urysohn integral equations and the existence of a unique solution for linear equations system.

**Keywords:** complex valued b-metric space, common fixed point, compatible mapping, weakly compatible mapping, integral equations, linear system.

**AMS Subject Classification No. (2010):** 47H10; 54H25

## **Big Data Analytics and High Performance Computing: Issues, Challenges and Paradigms**

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**Abstract:** Data has grown with the advent of technology, capture and store data and then analyze it. Big data is a primary concern with the management of computational models that require improvement. Big data and then later the rise of big data analytics which changed the whole perspective of data and data handling. Satisfied growing analytical needs for Big Data with extremely high performance computing models. As a result, a lot of research in this area has been seen in recent years, several paradigms for Big Data Analytics emerge. Simultaneously, the spread of Big Data Analytics in various domains, concerns about the effectiveness of the new analytical paradigm are also being seen. This paper highlights the major analytical models and concerns and challenges in High Performances Computing.

**Keywords:** Big Data, High performance computing, Computational Model

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## **Assortment of Data on Life table with Role of control of Internal Parasite in calf**

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**Abstract:** The assortment of information on life-table at various stages gives a significant undertaking for control of Internal Parasite in calf at various ecological conditions. Accordingly, in present examinations, age and stage explicit life table of were utilized at different stages.

**Keywords:** Life table, age explicit life and stage explicit life.

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## **Review Analysis of IOT based Solar Energy System**

**Anand Singh<sup>1</sup> and Manish Khemariya<sup>2</sup>**

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**Abstract:** A smart solar photovoltaic system is an advent of innovation coherence of information and communications knowledge with power systems control engineering via the internet. This paper designs and demonstrates a smart solar photovoltaic off grid system that self-healing, ecological and consumer friendly, but also with the ability to put up other renewable sources of energy generation seamlessly, creating healthy spirited energy industry and optimizing energy assets efficiency. This work also discuss the modeling of an competent dynamic smart solar photovoltaic power system by exploring the most power point tracking efficiency, optimization of the smart solar photovoltaic array through modeling and simulation to get better the quality of design for the solar photovoltaic module. Using the Internet of Things Technology for supervise solar photovoltaic power generation can greatly enhance the performance, monitoring and maintenance of the plant. The discussion in this project work is based on implementation of new cost effective methodology based on IOT to remotely monitor a solar photovoltaic plant for performance evaluation. This will facilitate preventive upholding, fault uncovering, historical study of the plant in totaling to real time monitoring.

**Keyword:** Solar, IOT, Power System, Optimization

## Glaucoma diagnosis using discrete wavelet transforms and Histogram features from fundus images

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**Abstract:** Glaucoma is one of the main eye diseases; it causes progressive deterioration of optic nerve fibres due to increased fluid pressure. The existing methods of glaucoma diagnosis are time consuming, expensive and require practiced clinicians to understand the eye problems. Hence fast, cheap and more accurate glaucoma diagnosis methods are needed. This paper presents an innovative idea for diagnosis of glaucoma using third level two dimensional discrete wavelet transform (2D DWT) and histogram features from fundus images. The 2D DWT is used to decompose the glaucoma and healthy images and histogram features are extracted from 2D DWT decomposed sub band images. The least square support vector machine (LS-SVM) is used as a classifier which classifies the glaucoma and healthy images using the extracted features.

**Keywords:** Glaucoma; 2DWT; LS-SVM.

## Some fixed point theorems for generalized Kannan type mappings in b-metric spaces

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**Abstract:** In this paper, we prove some fixed point theorems in b-metric spaces using subadditive altering distance function. Some of these results generalize many existing fixed point theorems for Kannan type mappings. The results are justified with suitable examples.

## Strong convergence of a general algorithm for nonexpansive mappings in Banach spaces

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**Abstract:** In this work, we consider a general algorithm for a countable family of non expansive mappings in Banach spaces. We proved that the proposed algorithm converges strongly to a common fixed point of a countable family of non expansive mappings which solves uniquely the corresponding variational inequality. It is worth pointing out that our proofs contain some new techniques. Our results improve and extend the corresponding ones announced by many others.

## Speech Recognition Application without Internet Connection

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**Abstract:** Artificial Intelligence, in all its forms is trying to make life simpler for humans, by utilizing the thinking power of man in creating machines which can think and do work for man. It is an area of computer science which focuses on developing intelligent, decision making machines which work and react like humans. There are millions of applications of Artificial Intelligence, one of them being: Speech Recognition. It is an area which enables translation of man-spoken words into machine readable format. Consequently, the machine understands the language, processes the words and responds depending upon the decision made by it. In this digital era, everyone knows how to use Google Assistant. Siri and Cortana have made everything easy for us. But still, these speech recognition softwares cannot work without proper internet connectivity. The research paper is entitled to demonstrate a solution to make use of artificial intelligence without internet. The main idea is to use integrated circuits as a medium to store the data required for processing of decisions. Also, computer's cache can be used to store frequently asked questions so as to deliver the solutions at a faster rate. This would make use of artificial intelligence in setting up of smart alarm clocks, in handling of event management, redirect users while travelling through frequent routes without using GPS system. This strategy would help make the speech recognition software a standalone application, and would provide reliability and faster response time as well.

**Keywords:** Artificial Intelligence, Speech Recognition, Response Time, Reliability

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## AI based chatbot with the help of Image processing for Medical Assistance

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**Abstract:** The aim of this paper is to present the idea of a chatbot which would give medical assistance to the patient at their home. It would also make use of image sensing to process image given by user and detect the disease. It would also be having a feature for emergency service. The chatbot would be user friendly and would communicate with user in natural language. The chatbot will be providing immediate home remedies which the patient could use at home to get quick and effective results.

**Keywords:** Chatbot, Artificial Intelligence, Image Processing, Dialog Flow

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## A.I based Chat Bots for Providing Health Related Information

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**Abstract:** Chat bots in health care have the potential to provide patients with access to immediate medical information. Health Care chat bots could help patients better manage their own health, improve access and timelines to care. This can be done by using a conversational chatbot which will ask for various symptoms of a disease and will try to find out the type of disease along with it's home remedy using machine learning. It will also provide the details of the nearest hospital in case of an emergency.

**Keywords:** Chatbots, Machine learning, Dialogflow, Human-computer interaction.

## A Novel Technique to Early Detection and Avoidance of Congestion in MANET

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**Abstract:** MANETs have different features that make congestion management more difficult. This paper examines a similar approach to congestion solving situations and minimizing loss of packets in wireless networks. The method of using the concept of trust aware with Queue status for bandwidth aware routing is introduced. We used NS2 simulator and we have demonstrated our approach improves system performance and reduces the number of packets deposited on the network, so improving system performance.

**Keywords:** MANET's, Congestion control, Packet loss, Congestion controlling techniques.

## A Security Issues and Approaches in Cloud Computing

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**Abstract:** This paper discusses the data security in computing of cloud and also focuses on the study of information in the cloud and all aspects that are related to concerning security. It also discusses the probable fear of data security in the cloud environment and their solutions adopted by an assortment of service providers to defend security of data. Research paper will depart into details of defense for data rules with approaches used to ensure maximum fortification of data by decreasing risks as well as threats. Data availability in the cloud is advantageous for numerous applications. For the more perspective, research focus on confidentiality of data perpetuation which becomes more complex with flexible data sharing among a vibrant user group. It requires the concealment of outsourced data and a competent sharing of decryption keys between different certified users. For this reason a variety of methods are offered some of them focus on the use of attribute based cryptography ABC with AES.

**Keywords:** Data Security, Cryptography, Public key, Data Protection, Privacy, Risks and threats

## Common Fixed Point Theorem for Multivalued Generalized Fuzzy Mapping in b-metric space

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**Abstract:** In this paper, we are proving  $\alpha$ -fuzzy fixed point and common  $\alpha$ -fuzzy fixed point theorems for Multi-valued fuzzy mapping in complete b-metric space. Our result extends and generalizes the result of A. Shahzad with new rational expression.

**Keywords:** Multi-valued Mapping, b-metric space, fixed point, Common fixed point.

## Optimal solution method for Transportation problems of multiple variables

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**Abstract:** Transportation problem is considered a vitally important aspect that has been studied in a wide range of operation including research domain. As such it has been used in simulation of several real life problems. The transportation problem is a special class of model. It deals with the situation in which a commodity from several sources is shipped to different destinations with the main objective to minimize the total shipping cost .optimizing transportation problem of variable has remarkably been significant to various disciplines .It this paper , multiple variable will be optimized to reduce from-transportation cost using multiple method which will include. Northwest corners method, least cost method, Vogel method and mode method. This will mainly aim at finding the best and cheapest route on how supply will be used to satisfy demand at specific points,

**Keyword:** Optimization techniques, transportation problem, northwest corner, least cost, Vogel, model.

## Reliability of System with Two Repair Facilities

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**Abstract:** The aim of this paper is to present a reliability analysis of two unit cold standby system with repair facilities. The system consists of two units with each one with operable or failed state. At any time, one unit is operating while other is in cold standby. The failure has been divided into two parts major and minor. Minor failure requires minor repair facility and major repair requires major repair facility. Thus there are two repair facilities available. System has perfect switching for units .The system completely fails on the failure of both the units. The failure and repair times follow exponential and general time distribution. Partial Differential Equations and Laplace Transforms of various state probabilities have been obtained. Reliability of the system has been derived in the form state probabilities.

**Keywords:** cold standby system, major and minor repair facilities.

## Modelling of the Risk of Cancellation of Policies using Fuzzy Logic Approach

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**Abstract:** The preventive avoidance of cancellation is a key problem facing insurance companies. A conversation with the client held prior to latter's decision to cancel a contract increases the likelihood of contract continuity. So companies are in need of reliable expert system that can help them to evaluate the risk of cancellation of the policies in future. With the help of fuzzy system it is possible to identify clients who may potentially cancel and take timely measure to safeguard the portfolio. Here a model is presented, which is designed by using fuzzy mathematics and expert system to provide indicative results on the risk of cancellation of the policies in future.

**Keywords:** Fuzzy logic, Insurance, Risk classification, Inference system, MATLAB, Index of vagueness.

## Availability Evaluation of 1-Unit System with 2-Warm Standbys

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**Abstract:** This paper extracts the availability of a warm standby system with reboot delay and switching failures. The system is studied under the assumption that the time-to-failure and the time to repair of the primary and standby units are exponentially and generally distributed, respectively. There is a possibility of failures during the switching from standby state to primary state. Reboot delay happens in this switching procedure of a standby unit to primary unit. The reboot time is assumed to be exponentially distributed. It is assumed that there is a significant probability of a switching failure. Primary and warm standby units can be considered to be repairable. Using the supplementary variable technique we develop the explicit expressions for the steady state availability.

## Investigation about Stock Market Timing using Fuzzy Inference System

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**Abstract:** To determine the buy and sell time is one of the most important issue for investors in the stock market. Stock investment has become an important investment activity and internet makes it easier exchange stock information and to make stock transaction. Trading in the stock market is full of uncertainly so there is vagueness in the market. Predicting the market is very difficult since it depends on several unknown factors. A person cannot observe that what is going to be happening and therefore investors often lose their money due to unclear investment objective. In this work a fuzzy approach to stock market timing is investigated. The proposed fuzzy model helps in identifying the stock market which is very bullish, bullish, neutral or very bearish, bearish. The four input factor are fuzzified to get a output using fuzzy logic, the stock market which is either very bullish, bullish, very bearish, bearish or neutral continues to some extent. For fuzzifying these input data, trapezoidal membership function is used, and center of gravity method is used for defuzzification of fuzzy output. The results found suggest that fuzzy modeling for this purpose is very promising.

**Keywords:** Stock market, fuzzy logic, timing, trapezoidal membership function.

## Fuzzy Logic Concatenation in Biometric Identification Systems

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**Abstract:** Security of information is one of the most important factors of information technology and communication. So systems need strong procedures to protect data and resources access from unauthorized users. There are number of ways to prove authentication and authorization. But the biometric authentication beat all other techniques. Biometric-based authentication systems represent a valid alternative to conventional approaches. As Multimodal biometric identification system is more powerful, more accurate, less noisy data than the Single/Unimodel biometric system. This paper introduce three biometric techniques which are face recognition, fingerprint recognition, and iris recognition (i.e. Multi Biometric System) & aims at concatenating three biometric features namely face, fingerprint and iris to minimize False Accept Rate(FAR) and False Reject Rate(FRR). And shows using these biometrics has good result with high accuracy using fuzzy logic at decision level. In greater detail, fuzzy logic based approach at decision level is used for concatenation. Fuzzy logic is used for the effect of each biometric result combination. The proposed multimodel system achieves interesting results with several commonly used databases.

**Keywords:** Biometric, Multibiometric (face, fingerprint, iris), fuzzy logic.

## Reliability of Three Unit System with Two Type of Repair

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**Abstract:** This paper represents the reliability of a redundant system, which consists of three units with each one operable or failed. The failure can further divided into minor or major. Minor failure can be repaired by minor repair, but a major failure required a major repair. So two repair facilities are considered. The system completely fails on the failure of all units. Three similar units are in the system where one unit works as main and others in cold standby. An imperfect switch is used to on standby unit which takes sometime in switching. Failure rate and repair rate and repair rate are constant. Failure rate and repair rate follow exponential distribution. Differential equation and Laplace transformation are used. Hence reliability is obtained by the sum of the probabilities of all operable states.



## A New Common Fixed Point Theorem for Two Pairs of Mappings Satisfying Implicit Contraction Condition in Triangular Intuitionistic Fuzzy Metric Spaces

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**Abstract:** Our goal of this paper is to prove a new general common fixed point theorem for two pair of mappings under a different set of conditions using the idea of weakly compatible mappings satisfying a general class of contractions defined by an implicit relation in the frame work of triangular intuitionistic fuzzy metric space, which unify, extend and generalize most of the existing relevant common fixed point theorems from the literature. Some related results and illustrative an example to highlight the realized improvements is also furnished.

**Keywords:** Triangular intuitionistic fuzzy metric space; common fixed point; implicit relation; weakly compatible mappings; contractions.

## A Survey on Development of Association Rule Mining Model for Gender Classification Over Fingerprint Database

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**Abstract:** Each person's fingerprint structure is unique and is developed for biometric authentication system than others because fingerprints have advantages such as: feasible, differ from each other (distinct) permanent, accurate, reliable and acceptable all over the world for security and person identity. Fingerprints are considered as legal proof of evidence in courts of law all over the world. Fingerprint recognition for Gender classification method done through various techniques like Support Vector Machines (SVM), Neural Network(NN), Fuzzy- C Means (FCM). Comparatively a small number of machine vision techniques have been suggested for gender recognition and classification so identifying the gender from fingerprints is an important step in forensic anthropology to shorten the list of suspect search. Very few researchers have worked on gender classification using fingerprints and have gained competitive results. This paper presents Gender classification using association rule mining and classification approach. It is also proposed to combines the elaborate study of various methods and strategies with their comparative measures and to forecast results. This will help the researcher to undertake a comprehensive review and to carry out further research in association rule mining model for gender classification over fingerprint.

**Keywords:** Support Vector Machines , Neural Network, Fuzzy- C Means , Gender classification

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## Different explicit rules of Combinatorics in ancient India

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**Abstract:** The topic 'Combinatorics' deals with counting problems, which are usually associated with selection of some objects from a given collection and their arrangements in a certain situation. The principles and methods of solving different combinatorial problems were well-known to the scholars of ancient India since the Vedic period. But no chronological account of contributions of Indian scholars in the field has been made available so far. In this paper author's mentioned some work of Combinatorics by ancient mathematicians, astronomers, ancient scientist and medical scribe. Author also highlighted various mathematical formulae and different explicit rule given by the ancient Indian mathematician time to time.

## Common Fixed Point Theorems in *Ab*-Metric Space

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**Abstract:** In this paper, I prove some Common Fixed Point Theorems satisfying new type of rational inequality in the  $n$ -dimensions *Ab*-Metric Spaces. In this paper, I modify new contractive conditions and give an application to verify the obtained results.

**Keywords:** common fixed point; *Ab*-Metric space; contractive mapping;

**AMS Subject Classification (2010):** Primary 47H10, Secondary 54H25

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## Influence of Wind on Urban Atmospheric Boundary Layer characteristics at the Capital Region Delhi

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**Abstract:** Remote sensing techniques play a significant role in understanding the dispersion behaviour of air pollutants with the study of Atmospheric Boundary Layer (ABL) height and characteristics. The vertical structure of the ABL plays an important role in meteorological and environmental prospect as it impacts the pollutant concentrations near surface and wind velocity. Acoustic Sounder (SODAR) technology employs the use of echograms to study the specific ABL parameters which includes the depth of ABL and its structure. Complex phenomenon associated with Atmospheric Boundary Layer can be better understood with the help of SODAR echograms and it can be better utilized for understanding the entire complex phenomenon happening in lower layer of atmosphere i.e., lower part of troposphere. The present study incorporates the SODAR echograms data for the analysis of the correlation between the parameters influencing the climate and the ABL height. The research also considers the variable structures produced by the SODAR during the month of January 2020. SODAR echograms represent different structures considering the atmospheric fluctuation due to the turbulence. This turbulence is mainly influenced by the wind gradient and wind shear. The sensors installed at the apex of the Acoustic & Vibration Metrology building, CSIR-National Physical Laboratory, New Delhi is taken into account for establishing the correlations between the variables.

**Keywords:** SODAR, Wind, Atmospheric Boundary Layer, Turbulence

## Characteristics Ventilation Coefficient over Delhi during summer

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**Abstract:** The diurnal and seasonal variation of ventilation coefficient studied using a Remote sensing technique SODAR (Sound Detection and ranging); it gives real-time continuous ABL (Atmospheric Boundary Layer) height data and attached metrological sensors give metrological parameters data such as wind speed/direction, relative humidity and temperature. The diurnal variability is a dominant feature of the ABL, which plays an important role in the exchanges of heat, momentum, moisture, and chemical constituents between the surface and free atmosphere. The ventilation coefficient is calculated using ABL height and average wind speed. The ventilation coefficient is an atmospheric condition that indicates the air quality and pollution potential. This study is for the period of summer (April to June) 2019 over National capital Delhi and its outskirts. The height of the ABL during the different stages of its diurnal evolution, namely, the Stable Inversion layer, convective boundary layer (CBL), and Nocturnal boundary layer (NBL), are discussed and the effect of convection and wind speed on the ventilation coefficient is also analyzed. In this study, the correlation between the wind speed, temperature and relative humidity with the ventilation coefficient is determined. Diurnal and seasonal variation of ventilation coefficient gives knowledge about the day to day weather phenomena for air quality management. The result shows that the Temperature and wind speed are influencing positively to the ventilation coefficient during the summer seasons and convective boundary layer height grows and falls during the day time depending on the increase and decrease of temperature.

## A study of queuing model with the analysis of payment mode and waiting time in supermarket

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**Abstract:** This paper deals with digital payments and cash payments in supermarkets. Initially we take two counters for comparison of digital and cash payments. The first counter for digital payments and the second for cash payments, and calculate billing times from both counters. Our aim is to reduce the customers waiting time by increasing the number of servers according to the conditions, both digital and cash payments. The analysis of various parameters of the queuing system, calculate utilization factor, service rate, arrival rate, calculate idle bill payment counter, customer satisfaction rates, and waiting time. After analyzing the parameters of the queuing system model, it is observed that digital payments save time.

## Diagnosis of ocular diseases by processing OCT images

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**Abstract:** Optical Coherence Tomography (OCT) images is a current active area in medical image analysis to assist ophthalmologist in the early diagnosis of ocular diseases such as blindness due to diabetes. Machine Learning and Deep Learning algorithms are used to predict the disease occurrence using image dataset. The proposed work is integration of collection of OCT image dataset(online and offline), feature extraction and preprocessing of dataset, implementation of image processing and linear prediction model using python for data science. Feature-based HOG-LSVM is applied for the features like inner limiting membrane, Bruch's Membrane, retinal pigmented epithelium, geographic atrophy. The results will be demonstrated for the performance measures precision, recall, accuracy, AUC, average correlation coefficient, Cohen's kappa ( $\kappa$ ),and distance-based disagreement (DbD) factors.

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## **A Theoretical study on Buyers Preference in Purchasing the Attires of Universal Brands**

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### **ABSTRACT:**

Apparel, being a more brand-driven category than, food & groceries, has already seen many international brand apparel retail outlets enter India over the past 15 years despite the restrictions in the FDI policy in retail sector. A lot of international brand Apparel retailers are most likely to look at India, as global markets have stabilized and the Indian economy has proved to be better than most other countries. This study was conducted to find out the factors that determine the shopper's inclinations for international apparel brand. The purpose is also to identify the predictors for internal brand apparels among consumers. From the study it was found that consumers are brand conscious now a days. To look more stylish they prefer branded apparels and branded apparels also depict the status of a person. Due to more durability, variety and quality and people prefer branded apparels. The study found out that price and media influence are strongest predictor for the consumer preference followed by quality and Land of original and style has less prediction towards the consumer preference. Overall, the survey shows that shoppers have positive attitude towards international apparel brands.

### **INTRODUCTION**

Globalization is vital sensation that is gaining attention worldwide, and lead the world to become a one combined market, an international market. In the era of pre-liberalization, consumers of India were acknowledged to have high preference towards foreign brands and imported goods. Though, after the decade of liberalization, Indian market, is highly served by the brands, which have their origin from the foreign countries. With the increased in popularity of international brands, market become a part of attractiveness and high competition. "Tastes and preferences of the consumers are the main base of fashion, to develop the brand popularity".

India has developed as third attractive market for apparel industry throughout the world. India is the nation which have different cultures and customs, and for each culture and customs they have

different dressing style. It has variation of dressing from “salwar-kameez to sari and from lungi to dhoti”. Indian market is increasing day by day through the branded garments. According to the past survey by various researcher, it has been noted that, in last ten years India is source of attraction for American and European brands because of high demands of apparel in India. And due to the preference over the brands by customers it becomes necessary of the companies to develop brand management so that they can gain competitive advantage worldwide. Brand management gain importance due to continuous change in the international market at global level, and due to the competition among the various international firms. Proper management of brands makes a clear differentiation among the products and give a proper information about the loyalty and preferences of consumers, which ultimately lead to increase the market share of the organization.

## **Brands**

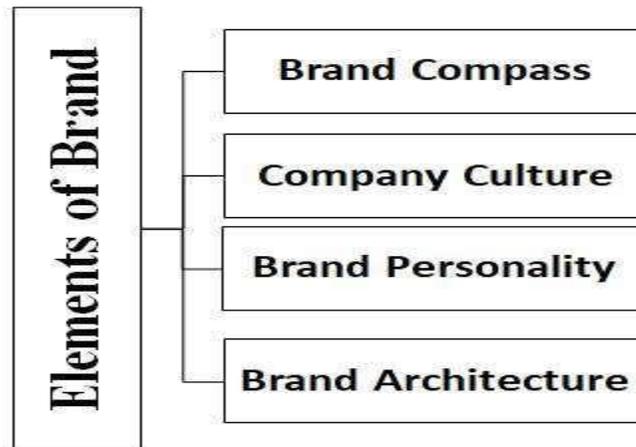
Brands is not a new concept to marketing. Earlier the concept of brand, firstly used by “Egyptian Brick-makers” who use symbols and signs on the bricks to make their product identical (Farquhar et. Al., 1990).

Branding is practice of marketing, which created by company as a “name, design or symbol” that is used by the consumer to identify the product and make the product different from the other products and services. Branding is vital for company because it makes a memorable impact on consumer’s mind as well as it allow consumers and clients to know what to be expect from the company. Brand should be a word, symbol or sign which represent a picture of your company.

Marty Neumeier defined brands as “*a brand is person’s gut feeling about a product, services or organization*”.

Fried lien defined Brand as “*Brand is the sum total of how someone perceives a particular organization*”.

## Element of Brands



- **Brand Compass:-**Brand Compass refers to abstract of the supreme fundamental facts about your brand. Brand compass leads to the directions, why branded is headed. Brand compass is outcome which company get through the work done in the stage of brand strategy plus in the stage of research and positioning. It contains five parts “purpose, vision, mission, values and strategic objectives”.
- **Company Culture:** - Company culture is inner self of motives, purpose and stimulus that drives brand of your company. If company have strong culture, it will create core value to brand, which defines how your product is engaged with the world by the name of your brand.
- **Brand Personality:** - Brand personality involves the individualist’s traits of brands. Brand personality of product is the reason that reveals the rational and loyal customers and build a cordial relationship between the customer and company.
- **Brand Architecture:** - Brand architecture is a combination of “name, color, symbol and visual language” that make brand identifiable. Brand architectures are highly purposeful and creative, founded by researchers through customers experiences. “Brand architecture systems are commonly categorized as either monolithic, endorsed, or pluralistic”. Monolithic brand architectures’ includes a single major brand and various sub brands. Endorsed and pluralistic includes parent brands which have different-different relationship with other divisions.

## Preference towards the Branded Apparels in India

In today's trend of fashion, people are switching on branded apparels form the non-branded ones. Brands are getting awareness throughout the world. There are various factors that are crating demand of branded apparel like "increase in the income of consumer, increase in literacy level among consumers, globalization, increase in purchasing power and consumer consciousness towards fashion".

Promotion and media is the main reason behind the increasing brand awareness among youth. This is the new era in which people are more aware about the brand and want to buy apparels which are related to reputed brands. People are becoming more brand conscious and it is new fashion trend which is gaining more attention now a days. People consider brand value as quality, price and style. Youths are preferring branded clothes due to the comfort level of clothing stuff and they also believes that branded clothes are recognized as a symbol of status.

International brands of apparels also capturing the attraction of people of India. Market of India is attracting various niche foreign retailers. Many International brands of apparels has been set up their stores and shops in India by using the franchisee route. Many International Brands of apparels are available in India which are as follows:-

➤ Lacoste	➤ Crocodile
➤ Benneton	➤ Reebok
➤ Dockers	➤ Lee
➤ Levi Strauss	➤ Zara
➤ Versace	➤ Mother Care
➤ DKNY	➤ Debenhams
➤ Wrangler	➤ Nike
➤ Mango	➤ Esprit
➤ Marks and Spencer	➤ Tommy Hilfiger
➤ Peter England	➤ Arrow

## Consumer Buying Preference

The most difficult issue for the manufactures of clothing is to identify the consumer's needs. Identification of need is not valuable until it is not transformed in to product and service. Before developing any product and service specially related to garments it is required to understand the full make up mind of consumers, it is known as the consumer behaviour.

Sproule's& Kendall (1980), defined consumer decision making as "a mental orientation characterizing a consumer's approach to making choices". They identify eight dimension, on which decision of consumer has depend whether to buy or not to buy apparels of particulars brands. These dimension are ass follows:-

- Quality Conscious
- Brand Trustworthiness
- Style Conscious
- Price Conscious
- Product Conscious
- Spontaneous and Careless Tendencies
- Jumbled by over varieties
- Amusing and pleasure-seeking orientation

## LITERATURE REVIEW

Stanforth (2009), states that shopper perceptions about the international brand fashion apparel are based on various factors, like "perceptual leadership and perceive role model in the society, matching attire status to employment and workplace ambience, socialization with peers and people they like, self-esteem and fun, and respectful treatment in the society (Stanforth, 2009).

Janson and Power (2010), found that fashion and latest design offers by global brands of apparels are the main actors which help in creating the good brand image and provides various myths that clear the consumers orientation to buy fashion apparels of global brands.

Tee, Gharleghi& Chan (2013), conducted a study, main purpose of this research to identify the factors which predict the preferences of buyer for choosing the foreign fashion brands. Result of study revealed that origin of a country, is a factor that play a vital role in making the buying

choice to buy branded clothes, which are followed by other factors like lifestyle, media influence and quality of the product.

Pandian, Varathani&Keerthivassan (2012), Conducted a study to know the most preferred international brands opted by Indian. Study reveals that “John player, Peter England and Raymond” are top most favorite brand which are preferred by the consumers of India, who are more brand conscious. It was found in the study that shopper decision about the brands mostly the man shoppers, has influenced by choice of color, design & style, price series, celebrity endorsers and stability.

Laskar& Abbas (2014), tried to find out the source of awareness among consumers about the brands of apparels and to know the level of awareness of brands among the buyers. It is found that the main source of awareness is advertisement and attentive mind of buyers towards the trend and market increases the level of awareness. International brands of clothing industry need to be invest huge amount of money on advertising to capture the attention of consumers.

## **OBJECTIVES OF THE STUDY**

1. To identify shopper inclinations in buying apparels of international brands.
2. To find out the elements that influences the purchasing choice of shoppers for the apparels of international brands.
3. To check whether Brand image affects the purchase intention of shoppers.

## **DISCUSSION/ ANALYSIS**

- It is found in the study that the majority of people go for the brands occasionally not always. People like to buy the branded apparels, it shows the likelihood of respondents towards the branded apparels and indicates that people are becoming brand conscious.
- Majority of shoppers have a medium level of priority towards the international branded apparels.
- Shoppers give importance to international brands of apparel, when the brands make them feel good it influences their buying decision.

- According to the respondents, the topmost factor that influences their preference is price after that media influence affect their decision. Media influences include advertisement, promotion and celebrity endorsement. Media influence and festival offers to carry equally according to the respondents. Whereas after the media and festival offer the next factor that affect the buying decision is the loyalty of the brand follows by the festival offers and quality of customer service. It shows that price is on the top most important factor for the shopper which influences their decision to go for the apparels of an international brand.
- It is found that attractiveness of logo is not so much important for the shoppers while taking the buying decision regarding the apparels.
- Majority of people among the respondents are agreeing the international brands are fashion focused which motives the shoppers to buy the apparels of the international brand.
- Consumers are agreed on the fact that variation in fashion in style provided by international brands in apparels and consider an important element of global brands covered by the apparel industry.
- Majority of people among the respondents are neutral on this element, that the international brands provide more comfortable apparels.
- It is found in the study that international brands of apparels have high impact on the mind of shopper, they wants to buy the apparels of international brands.

## RECOMMENDATIONS

- Consumers are becoming brand conscious. They prefer to buy the apparels on the origin of brand image and distinctiveness of the brands. So apparels manufacturer of the international brand can increase their profits and attract more consumers by providing the uniqueness in their apparels.
- Buyers get more influenced by price and loyalty factors, so companies may increase their sale by offering the apparels at low cost, this will also create loyalty among the consumers. Price can be reduced by reducing the tax prices so that consumers can afford easily the apparels of international brands.

- International brands of apparels can focus more media influence and promotional activities, it will lead to gain fame as well as attract more consumers.

## CONCLUSION

Consumer buying inclination has gained significant attention from the researchers. But, while reviewing the literature of shoppers' inclination towards the international brands of apparel, few studies have been found. The present study was conducted to identify the factor that affects the inclinations of customers while going for the apparels of international brands. Preference of consumers can be changed by the cultural effects also. Shoppers prefer international brands because they think that it relates to prestige and consider it as a symbol of status. From the analysis, it is found that store image, quality of product and customer services also reveals the inclination of shoppers. Study indicates that consumers are becoming more brand conscious and their decision was affected by the services given by the international marketers of apparels like style, location, store attribute, brand name, fashion and quality of stuff. The manufactures of the International brand must focus on all these factors to gain profit and to attract more consumers. If consumers have a high preference towards the international brands of apparels then, there will be higher the chances to go for the international brands.

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# Design and Analysis of IOT based pollution control system

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## ABSTRACT:

Air pollution affects our day to day activities and quality of life. It poses a threat to the ecosystem and the quality of life on the planet. The dire need to monitor air quality is very glaring, owing to increased industrial activities over the past years. People need to know the extent to which their activities affect air quality. This project proposes an air pollution monitoring system. The system was developed using the Arduino microcontroller. The air pollution monitoring system was designed to monitor and analyse air quality in real-time and log data to a remote server, keeping the data updated over the internet. Air quality measurements were taken based on the Parts per Million (PPM) metrics and analysed using Microsoft Excel. The air quality measurements taken by the designed system was accurate. The result was displayed on the designed hardware's display interface and could be accessed via the cloud on any smart mobile device.

**Keywords:** Internet of Things, Pollution, Air, Parts per Million, Quality and Metrics.

## INTRODUCTION:

Air is one of the essential elements of man's surroundings. The earth's atmosphere is full of air which contains gases such as Nitrogen, Oxygen, Carbon Monoxide and traces of some rare elements. Humans need an atmosphere of air that is free from contaminants. This is very crucial for human life and health. Any change in the natural composition of air may cause grave harm to life forms on earth. Air pollution is the presence of one or more contaminants in the atmosphere such as gases in a quantity that can harm humans, animals and plant. Air pollutants are measured in Parts per Million (ppm) or ug/m<sup>3</sup>. Primary pollutants are released directly into the atmosphere. Secondary pollutants are produced when the primary pollutant reacts with other atmospheric chemicals. Air quality affects public health. The effect of air pollution ranges from difficulty in breathing, coughing, aggravation of asthma and emphysema. Polluted air can also impair visibility. Air pollution is accountable for the death of 7 million persons worldwide each year or one in eight premature deaths yearly. Almost 570,000 children under the age of five die every year from respiratory infection linked to indoor/outdoor pollution and second-hand smoke. Children exposed to air pollution have an elevated risk of developing chronic respiratory problems such as asthma. In the monitoring of air pollution, several researchers worldwide have developed models to monitor many of the pollution gases such as Sulphur Dioxide (SO<sub>2</sub>), Carbon Monoxide (CO), Carbon Dioxide (CO<sub>2</sub>), Nitrogen Oxides (NO) etc. This paper focuses on the design and implementation of a smart air pollutant monitoring system. It discusses how the level of pollutants in the air can be monitored using a gas sensor, Arduino microcontroller and a Wi-Fi module. The main objective of this paper is to design a smart air pollution monitoring system that can monitor, analyse and log data about air quality to a remote server and keep the data up to date over the internet.

## RELATED WORKS:

A wireless distributed mobile air pollution monitoring nodes system using General Packet Radio Service (GPRS) and IOT sensors was reported in. Advancements in wireless communication and sensor technology is rapidly changing air pollution monitoring paradigm. Internet of things (IoT) also allows the creation of smart environments in which objects interact and cooperate with each other.

The lot of improvements have been made to existing air pollution monitoring systems. For example, proposed a system for monitoring air quality at home. The system transmits combination of address and data centric protocols. The system monitors the indoor air quality of a home and displays the sensor reading on a screen. The researchers in employed an Unmanned Aerial Vehicle (UAV) based system to monitor the air pollution in areas with poor accessibility. The system was equipped with a Pixhawk autopilot for UAV control and a Raspberry Pi for sensing and collating air pollution data. An adaptive algorithm was used to analyse the gathered pollution data. A participatory sensor system for monitoring air

pollution in Sydney was proposed by scientists in. In the proposed system, sensors were mounted on vehicles and a mobile application was used to upload data to a centralized repository. The system gave information to the user about their private vulnerability to pollution in the air. Recursive Converging Quartiles (RCQ) algorithm was utilized in to improve the efficiency of wireless air pollution monitoring system. Recursive Converging Quartiles (RCQ) algorithm aggregates and eliminates data duplicates by removing invalid readings. This saves energy. The system consisted of sensor nodes and wireless communication links to a server. The sensor nodes collated data automatically and passed it on through the network to the server. The sensor nodes automatically forwarded data measured to the server the moment they received instruction from the system to do so. The k-means clustering algorithm for analysing air pollution was proposed by the authors in. A comparative study was made between the proposed k-means algorithm and the probabilistic fuzzy c-means (PFCM) clustering algorithm in terms of exactness and process period.

The authors submitted that the proposed K-means clustering algorithm yielded exact values within a fewer process period in comparison to other existing techniques. The authors in proposed a model that showed the concentration of air pollutants in real-time. An optimal Wireless Sensor Network (WSN) was proposed in for monitoring the level of contaminants in the air. The system was enhanced by utilizing a flow concept that gave a combined formulation of coverage and connectivity. The probabilistic sensors taken into constraints to be formulated to ensure that the network remained conservative. A sensor-based system to monitor the air pollution in employed the use of Internet of Things (IoT) to enable data about air pollutants to be monitored online. When the pollutants' level in a locality exceeded the standard air quality index, the sensor-based system shared the information via SMS with the public. An ambient real-time air quality monitoring system that consisted of numerous distributed monitoring stations that were connected wirelessly to a backend server using machine-to-machine communication was explained in. The backend server assembled real-time data from the stations and reproduced them as information that can be delivered to users through web portals and mobile applications. However, cooperative, distributed, and energy-efficient communication protocols are required. Geographical search on social networks was used by the researchers in to gauge the level of pollutants in the air. The assumptions made were evaluated on three continents of the planet. A minimum increment in the number of air pollution related posts meant a rise in air pollution in that environment. Measured data was acquired online while processing and statistical analysis was performed offline. The use of Supervisory Control and Data Acquisition (SCADA) for air pollution monitoring was proposed in. It enabled the acquisition and statistical processing of measured data in real time. The smart SCADA made results available to users instantly. An air pollution and noise monitoring system that was IoT based was proposed by . Raspberry Pi was used to detect the noise and the level of air pollution in the environment. IoT based on metamorphic changes with a sensing device was proposed by . The system consisted of a Raspberry PI module and sensors connected to a computer system to monitor the fluctuation of two or three parameters of Carbon Monoxide (CO) and other gases from the normal level. The results showed that real-time air pollution

the parameters considered are not sufficient to give an accurate prediction of air pollution over a long time. The researchers in also designed an IoT based air pollution monitoring system over a web server that triggered an alarm whenever the air quality drops below the threshold. The model was able to show the air quality in parts per million on a Liquid Crystal Display (LCD) screen as well as on a webpage to achieve real-time monitoring. In, an IoT based air pollution technique using Single Board Computers (SBC) which integrates IoT with wireless sensor network (WSN). Processing complexity was reduced with the use of SBC and this made the alerting process smart and in real-time. Results showed that the proposed system offered a low-cost implementation that was very flexible and scalable. However, the model does not have a wide coverage area. Arduino microcontroller based on IoT technology to monitor air pollution was used in. The MQ135 gas sensor was used to sense different type of dangerous gases and the Arduino microcontroller controls the entire process. Software technologies like image processing and machine learning were used in to monitor some parameters and big data techniques was used to analyse sensor values for the prediction of future values. The system was very stable and effective. However, there was a need to make the system auto communicative to reduce processing time. The system can also be automated for real-time monitoring which will help to increase industrial output. A real-time air pollution monitoring system in employed IoT based on a large number of sensors. The obtained data was analyzed using neural network. The system achieved a better monitoring accuracy due to its use of a large number of sensors. The use of IoT devices enabled the air pollution monitoring system to be smart and scalable.

## METHODOLOGY

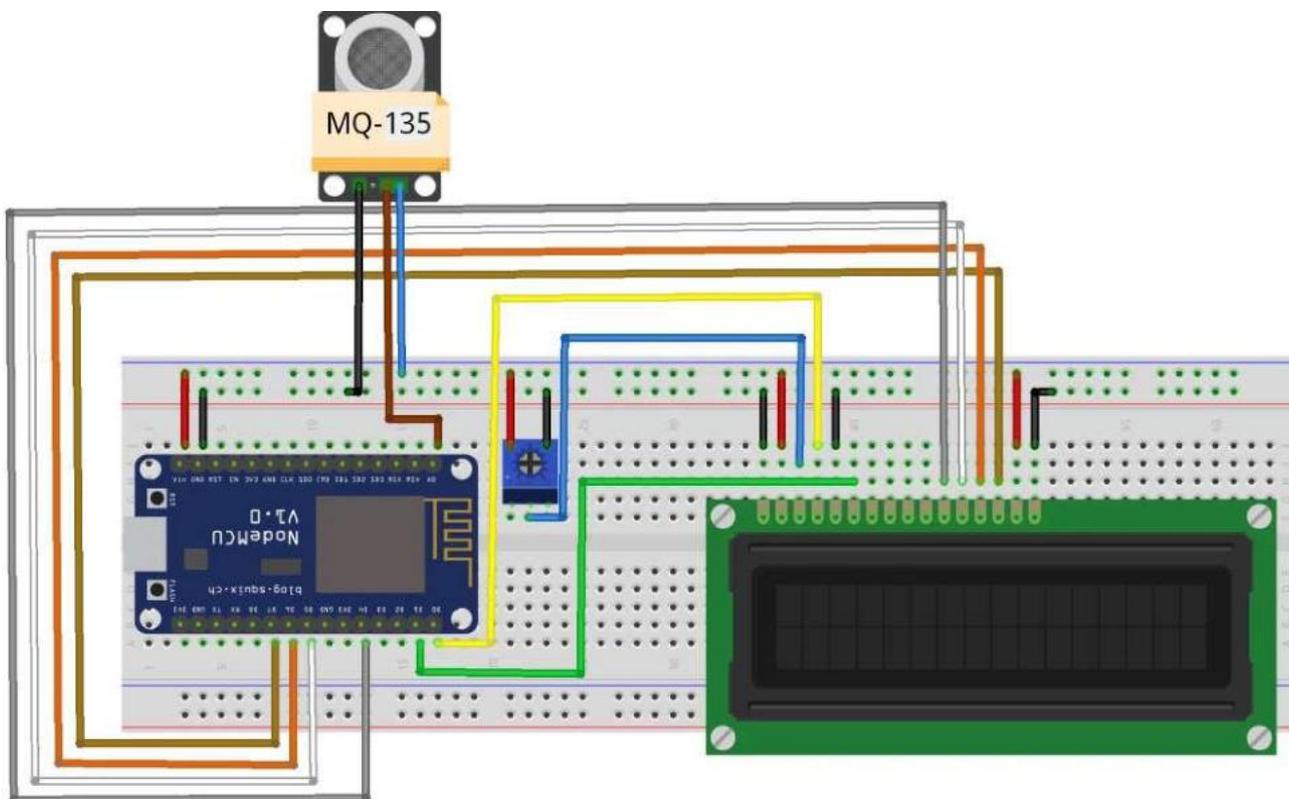
The model was designed using an Arduino Uno microcontroller, Wi-Fi module 8266, MQ135 Gas Sensor and a 16 by 2 liquid crystal display (LCD) Screen. Figure 1 shows the proposed system overview and the functional block diagram is depicted in figure 2. The proposed flow chart is presented in figure 3.

The system overview procedure was classified into Five (5) layers as shown in figure 1. The first layer was the environmental parameters which are obtained by measurement. The second layer was the study of the characteristics and features of the sensors. The third layer was the decision making, sensing, measuring, fixing of the threshold value, periodicity of sensitivity, timing and space. The fourth layer was the sensor data acquisition. The fifth layer was the ambient intelligence environment. The sensor collected data when operated by the microcontroller and forwarded it

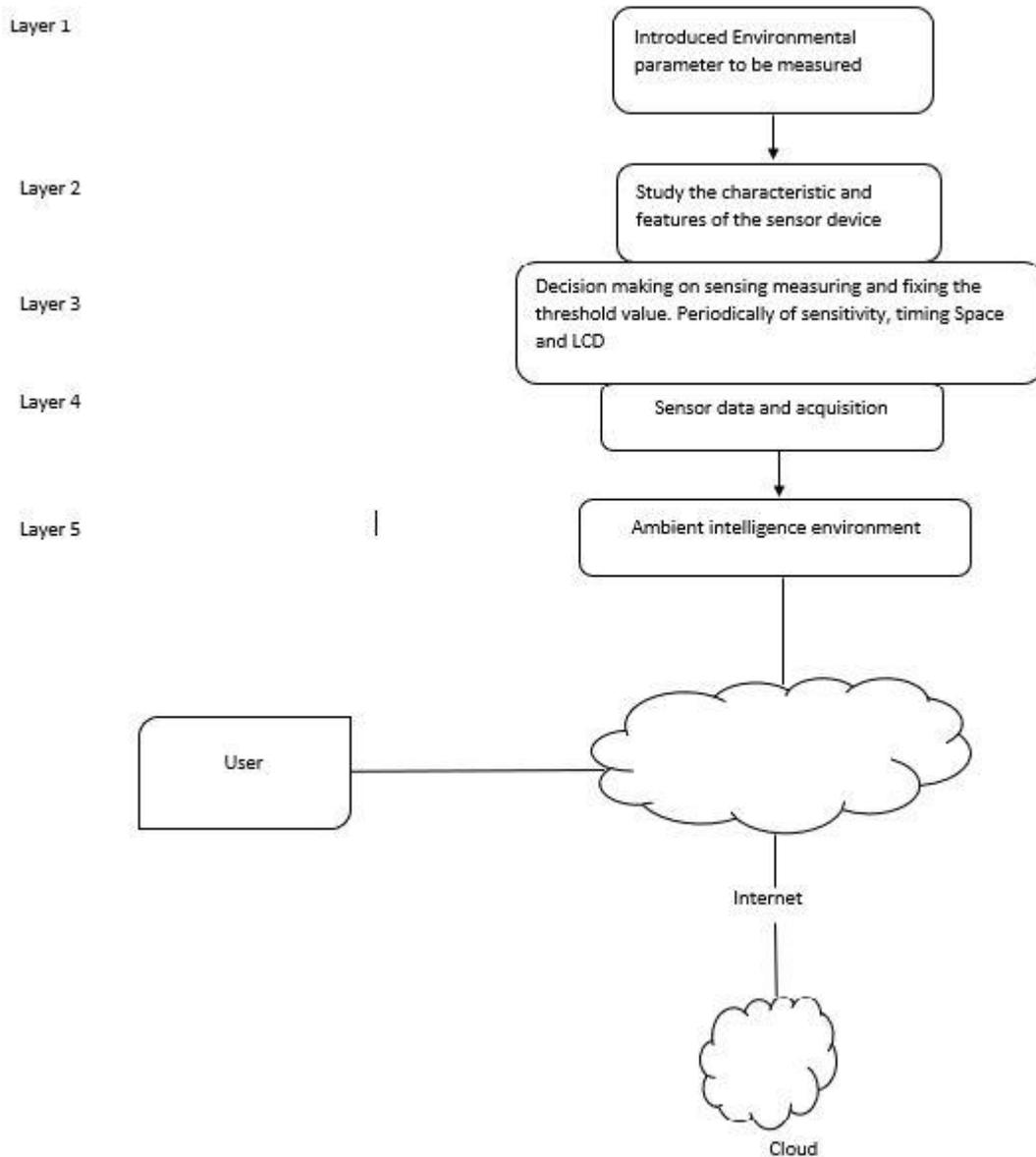
over the internet for analysis via the Wi-Fi module. Users were able to monitor measured parameters on their smartphones. The design specification of the proposed system is described in Table 1.

**Table 1** The Design Specification

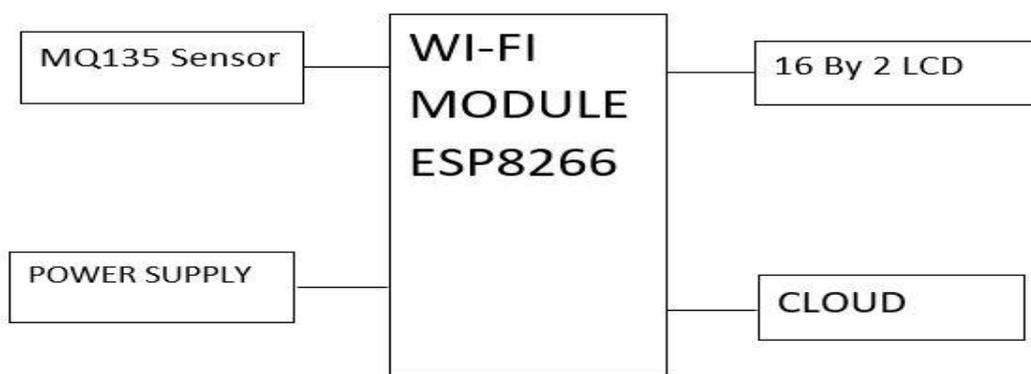
S/N	Component Required	Quantity
1	Arduino Uno	1
2	MQ 135 Sensor	1
3	16 by 2 LCD Screen	1
4	ESP 8266 Wi-Fi Module	1
5	Bread Board	1
6	10K Potentiometer	1
7	1k ohm Resistor	1
8	220 Ohm Resistor	3
9	Connecting Wires	Any Amount



**Figure (i)** Overview of the Projected System



**Figure 1** Overview of the Proposed System



**Figure 2** Block Diagram of the Proposed Air Pollution Measuring System

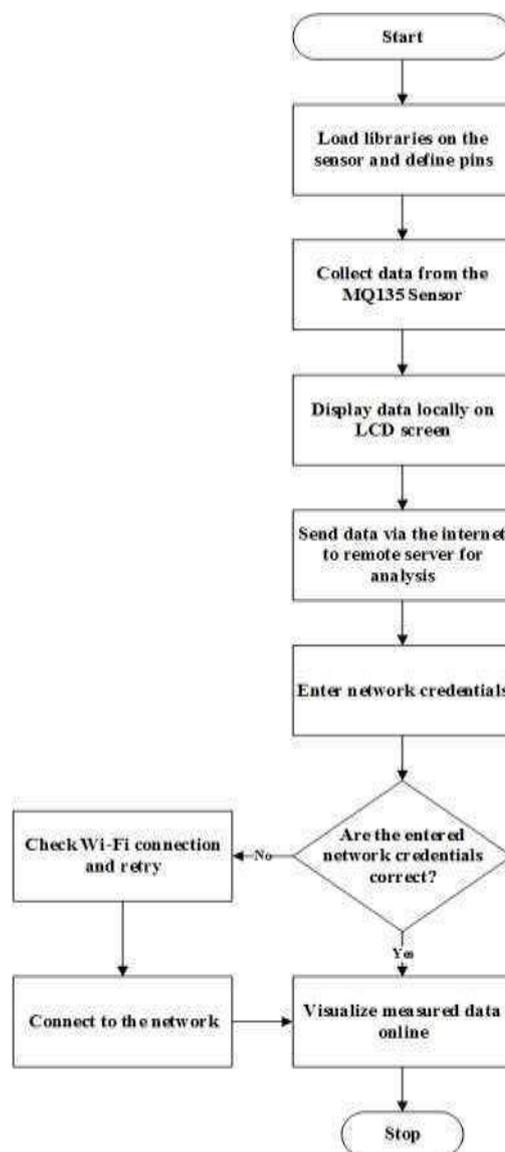


Figure 3 Flow chart of the proposed system

**Mathematical Analysis of Proposed Model**

The level concentration of pollutants in the air is measured in parts per million (ppm) or percentage. Conversion factors include the following:

- 1 ppm = 1.145 mg/m<sup>3</sup>
- 1 mg/m<sup>3</sup> = 0.873 ppm
- 1% = 1/100
- 1 ppm = 1/1000000
- 1 ppm = 0.0001%

Table 2 shows PPM to percentage conversion.

Table 2 PPM to Percentage conversion

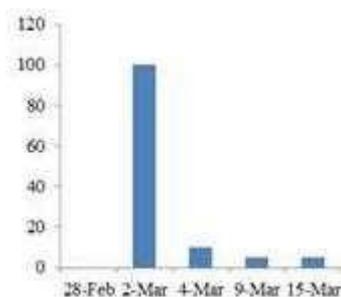
Parts per Million (ppm)	Percent (%)
0	0
5	0.005
50	0.005
500	0.05
1000	0.1

### Working Principle of Proposed Model

As described by Figure 3, the library in the Arduino was loaded and a message was sent to the LCD. Air quality data was collected using the MQ135 sensor. The calibrated sensor made the analog output voltage proportional to the concentration of polluting gases in Parts per Million (ppm). The data is first displayed on the LCD screen and then sent to the Wi-Fi module. The Wi-Fi module transfers the measured data value to the server via internet. The Wi-Fi module is configured to transfer measured data an application on a remote server called “Thing speak”. The online application provides global access to measured data via any device that has internet connection capabilities. Data collected from the sensor was converted into a string and used to update the information sent to the remote server.

### RESULTS AND DISCUSSION

The online application used to analyze air quality data got from sensors in this proposed system was “Thing-speak”. Thing-speak is an open source internet of things application programming interface used to store and retrieve data from interconnected things using the hypertext protocol over the internet or via a local area network. It also provides access to a broad range of embedded devices and web services. This enables the creation of sensor logging applications that can be updated regularly. Figures 5-10 show the results of various pollutants that were obtained.



**Figure 5** Air Quality on Selected Days with an Aerosol as Sample Pollutant

Figure 5 shows that there was a minimal level of pollutant before the sensor started reading the sample aerosol. However, when the sensor detected the aerosol, the air quality dropped rapidly from 0 to 100 ppm. After several readings on different days, it can be seen that there was significant reduction of the sample aerosol level in the air by the 15th of March.



**Figure 6** Air Quality on Selected Days with Dust as Sample Pollutant

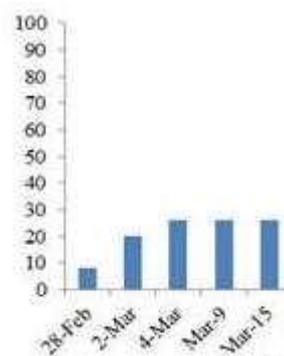
Figure 6 shows that the dust level in the environment was at the minimum on the 28<sup>th</sup> of February but increased gradually with each passing day. On some particular days, there was a

gradual and on other days there were no changes in the quality of the air. The level of the dust measured in the air is dependent on a lot of factors that are beyond the scope of this work.



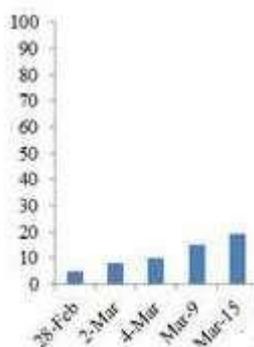
**Figure 7** Air Quality on Selected Days with a Gas as Sample Pollutant

The results from Figure 7 show the air quality level was significantly low in comparison to the previous pollutants used. It can be seen the air quality level dropped rapidly after only a few days of taking measurements. This is so because gases are high level air pollutants.



**Figure 8** Air Quality on Selected Days with Smoke as Sample Pollutant

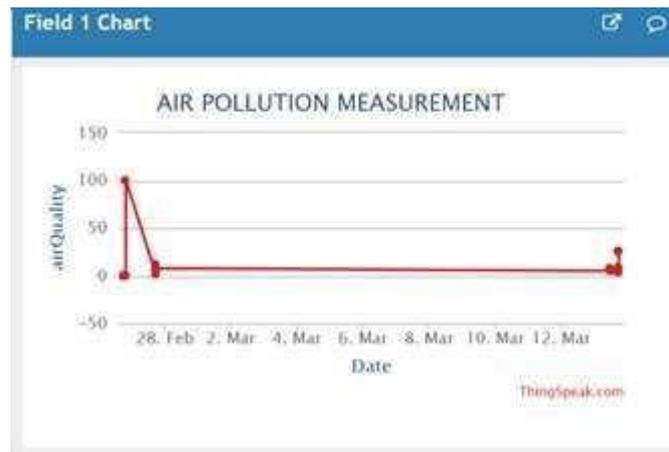
Figure 8 shows that the air quality decreased gradually from 8 ppm to about 70 ppm depending on the level of concentration smoke in the air.



**Figure 9** Air Quality on Selected Days with Biogas as Sample Pollutant

“Thing-speak” was configured to receive data from a remote system. The data was analyzed and published in the form of a scatter line graphs or bar charts on a channel. The channel corresponds to the air quality level as shown in Figure 10. The channel receives update every

time from the remote sensor via the internet and represents the data received as a scatter line graph online.



**Figure 10** Air quality measurement as seen online

The visual representation of data on “thing-speak” corresponded with the measured air quality. The rate at which data displayed on “Thing-speak” changes was dependent on the network traffic and speed of internet connection. The status of the air quality can be accessed at any time, with automatic updates occurring at defined time intervals.

## CONCLUSION

This research proposed a smart air pollution monitoring system that constantly keeps track of air quality in an area and displays the air quality measured on an LCD screen. It also sends data measured to the “Thing speak” platform. The system helps to create awareness of the quality of air that one breathes daily. This monitoring device can deliver real-time measurements of air quality.

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## A GAUGE FOR DETERMINING THE LEVEL OF A LIQUID WITH MULTIMODE DISPLAY AND SIGNALLING

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### ABSTRACT:

A fuel gauge is disclosed herein characterized in having multiple modes for determining the quantity of fuel in a fuel tank. This gauge is characterized in having purely mechanical as well as electronic modes of visualization. A buoyant member is included for floating on the top surface of fuel in the fuel tank. The buoyant member is connected to a drive link having an arm the length of which is selected suitable to the depth of the fuel tank. The drive link is pivoted on to base of the main housing, which is below the tank's top surface yet therein ensuring that the resistive element remains above level of the fuel held inside the fuel tank. Motion of the drive link is converted into a mechanical reading via a wiper and scale combination, and in parallel, to an electronic reading via potential free output to an external display based on a special resistor design.

**Keywords:** A flange ; A housing and a top cover, a drive link connected to rotating member through pivot, A buoyant member, Mechanical visual indicative output, Resistive output, Potential – free output.

### Desired Goal:

To provide a Mechanical visual level Indication/ dial gauge which does not require an external power or any other instrument.

### The solution according to this Product:

Providing a fuel measuring device with multimode/multifunction gadget, having a mechanism which ensures that the fuel level sensor element, the resistive element, is placed in such a way that the liquid/fuel does not come in contact with the resistive element under normal usage, hence the reliability is ensured. It is also provided with multiple potential free contacts to give predefined level signals and it also has a simple mechanical visual indication.

### The product as sought to be covered:

**A fuel gauge with multiple modes for determining the level of fuel in a fuel tank, comprising –**

- a. a flange for being received on top surface of the fuel tank;

- b. a housing including a base and a top cover being mounted, via clamping means, on the flange in a manner allowing at least a substantial portion of said housing to be positioned outside the fuel tank so as to remain out of contact with fuel held in the tank;

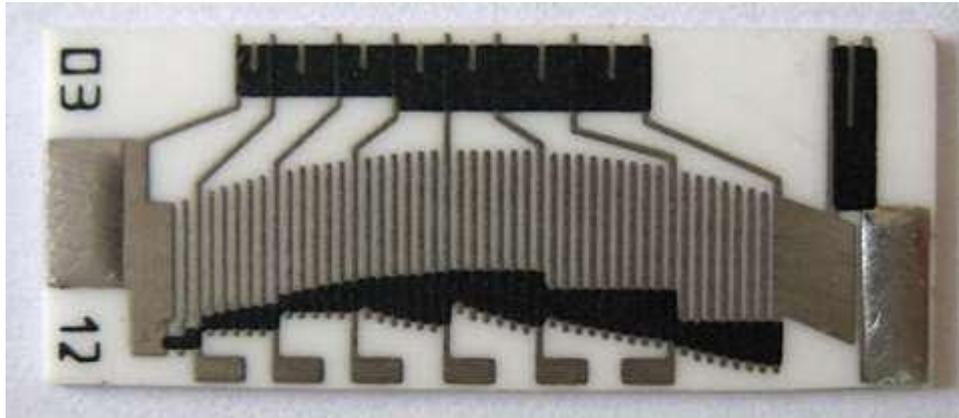


FIGURE 1. RESISTIVE COIL

- c. a member associated, rotatable via pivot, with base of the housing for receiving one end of a drive link leaving other end of said drive link free to extend inside the fuel tank in a manner freely pivot-able with the rotatable member;
- d. a buoyant member connected to the free end of said drive link therein allowing the buoyant member to freely float on surface of the fuel held inside the fuel tank and consequently displace the drive link through an angular motion as a function of change in residual level of fuel in the fuel tank;
- e. a first modality, to visually determine as to the residual level of fuel in the fuel tank, said modality being a mechanical assembly including-
- i. a wiper connected at one of its ends to the rotatable member to thereby allow an extended tapered tip of the wiper as a pointer at its other end, to translate in a corresponding measure to the displacement of the drive link.
  - ii. a visual scale placed on top of the housing and juxtaposed within path of translation of the pointer of the wiper to thereby visually determine the residual level of fuel in the fuel tank.
- f. a second modality, to determine as to the residual level of fuel in the fuel tank, said modality being an electronic assembly including-
- i. a wiper connected at one of its ends to the rotatable member to thereby translate along the resistance element in a corresponding measure to the displacement of the drive link to serve as a rheostat and thereby provide a linear resistive output;
  - ii. a terminal for conveying output from the resistive coil and the wiper, to any common art device capable of using said signal for determining the residual level of fuel in the fuel tank.

- g. a third modality, to determine as to the residual level of fuel in the fuel tank, said modality being an electronic assembly including-
- i. a set of magnets affixed onto the rotatable member to there by allow their radial translation in a corresponding measure to displacement of the drive link ;
  - ii. a set of Normally Open type magnetically actuated reed switches anchored on base of the housing to thereby allow generation of a switching.
  - iii. signal in response to magnetic field generated when the set of magnets are set in motion;
  - iv. a terminal for conveying output from the resistive coil and the signal generated by the reed switches and thereby act as a potential-free signal feed to any common art device capable of using said signal for indicating, as to the residual level of fuel in the fuel tank.

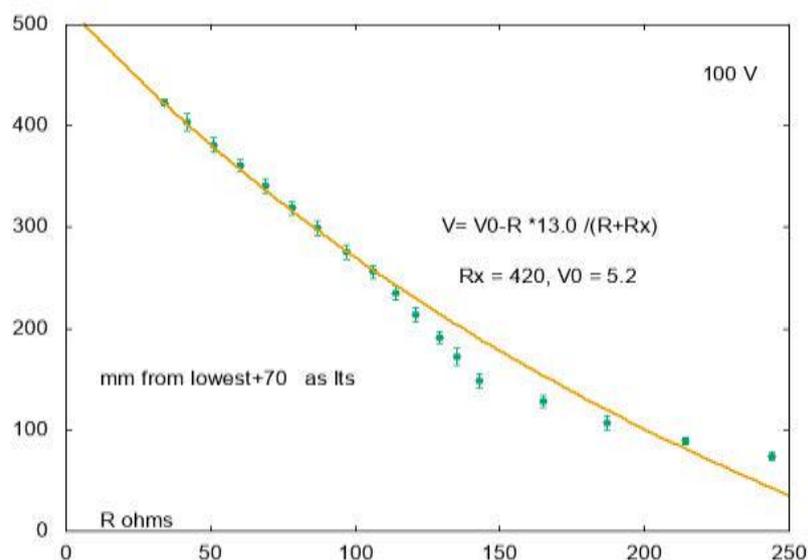


Figure 2. Resistance output graph

1. A fuel gauge with multiple modes for determining the level of fuel in a fuel tank, comprising -
  - a. a flange for being received on top surface of the fuel tank;
  - b. a housing including a base and a top cover being mounted, via clamping means, on the flange in a manner allowing at least a substantial portion of said housing to be positioned outside the fuel tank so as to remain out of contact with fuel held in the tank;
 

a member associated, rotatably via pivot, with base of the housing for receiving one end of a drive link leaving other end of said drive link free to extend inside the fuel tank in a manner freely pivot-able with the rotatable member.
  - c. a buoyant member connected to the free end of said drive link therein allowing the buoyant member to freely float on surface of the fuel held inside the fuel tank and consequently displace the drive link through an angular motion as a function of change in residual level of fuel in the fuel tank;
  - d. a first modality, to visually determine as to the residual level of fuel in the fuel tank, said modality being a mechanical assembly including-

- i. a wiper connected at one of its ends to the rotatable member to thereby allow an extended tapered tip of the wiper as a pointer at its other end, to translate in a corresponding measure, to the displacement of the drive link ; and
  - ii. a visual scale placed on top of the housing and juxtaposed within path of translation of the pointer of the wiper to thereby visually determine the residual level of fuel in the fuel tank.
- e. a second modality, to determine as to the residual level of fuel in the fuel tank, said modality being an electronic assembly including-
- i. a wiper connected at one of its ends to the rotatable member to thereby translate along the resistance element in a corresponding measure to the displacement of the drive link to serve as a rheostat and thereby provide a linear resistive output

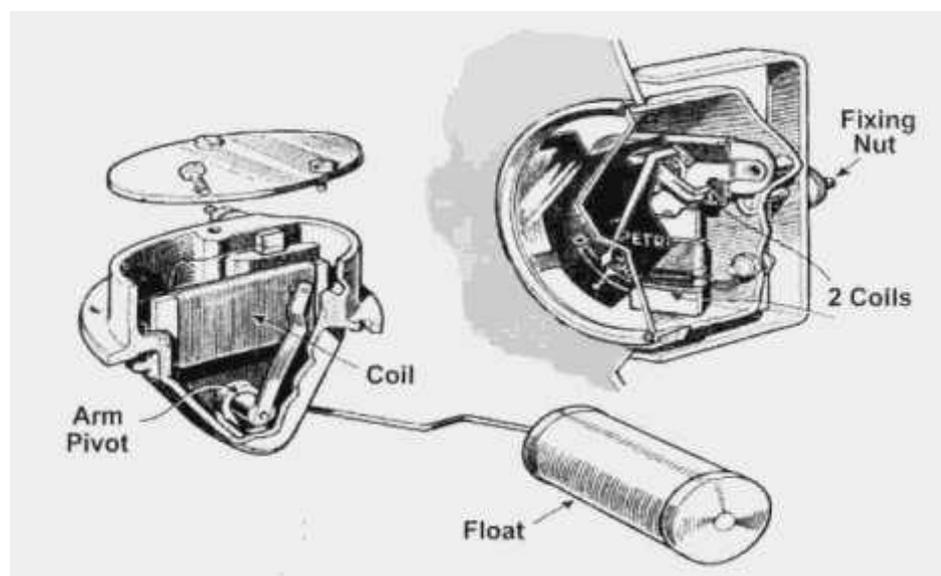


Figure 3. Internal Processing of a coil

- ii. a terminal for conveying output from the resistive coil and the wiper, to any common art device capable of using said signal for determining the residual level of fuel in the fuel tank.
- f. a third modality, to determine as to the residual level of fuel in the fuel tank, said modality being an electronic assembly including-
- i. a set of magnets affixed onto the rotatable member to thereby allow their radial translation in a corresponding measure to displacement of the drive link ;
  - ii. a set of Normally Open type magnetically actuated reed switches and anchored on base of the housing to thereby allow generation of a switching signal in response to magnetic field generated when the set of magnets are set in motion; and
  - iii. a terminal for conveying output from the resistive coil and the signal generated by the reed switches and thereby act as a potential-free signal feed to any common art device capable of using said signal for indicating, as to the residual level of fuel in the fuel tank.

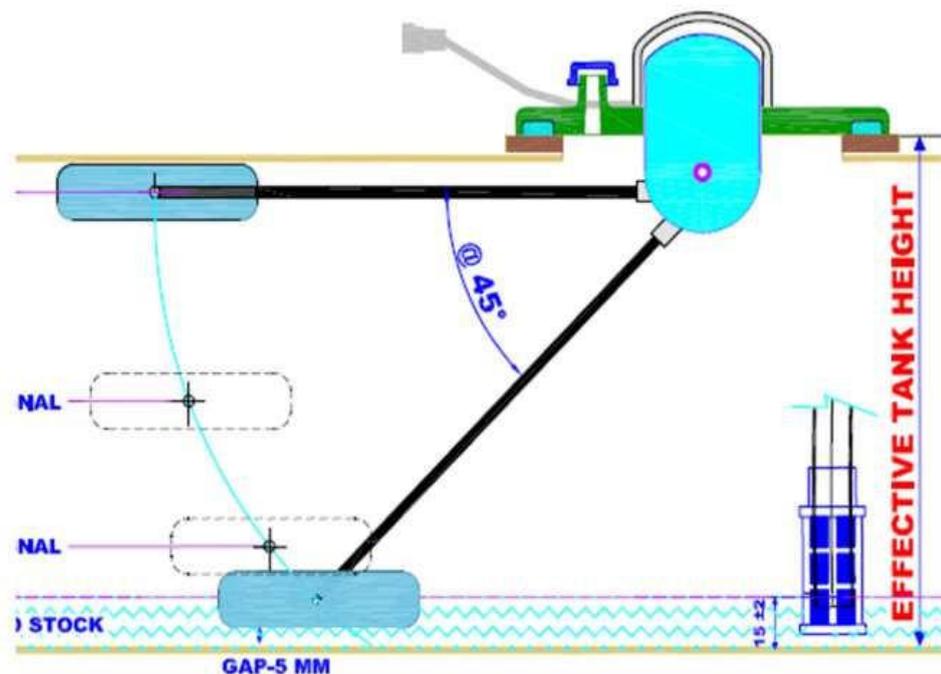


Figure 4. Proposed system

2. The fuel gauge with multiple modes for determining the level of fuel in a fuel tank wherein length of the drive link is proportioned as per depth of the fuel tank.
3. The fuel gauge with multiple modes for determining the level of fuel in a fuel tank as, where in geometry of flange is chosen as one conforming to that of the flange on the fuel tank on which said flange is to be received.
4. The fuel gauge with multiple modes for determining the level of fuel in a fuel tank as, wherein positions of the reed switches within base of the housing are permanently anchored using potting material chosen between polyurethane and epoxy resin to thereby protect said reed switches from environmental disturbances and handling impacts.
5. The fuel gauge with multiple modes for determining the level of fuel in a fuel tank as claimed in claim 1, wherein the base and the top of the housing has a notch parallel to the scale to serve as a guide for translation of the wiper.
6. The fuel gauge with multiple modes for determining the level of fuel in a fuel 10 tank as claimed in claim 1, wherein the housing is made from common art materials chosen among engineering plastics, sheet metal constructs, or metal casts.
7. The fuel gauge with multiple modes for determining the level of fuel in a fuel tank as claimed in claim 1, wherein the set of magnets translate radially along with rotation of the rotatable member in a plane above the reed switches.
8. The fuel gauge with, multiple modes for determining the level of fuel in a fuel tank as, further including a transparent protective cap for protecting the visual scale and path of translation of the tapered tip of the wiper arranged along said visual scale.
9. The fuel gauge with multiple modes for determining the level of fuel in a fuel tank as claimed in claim 1, wherein the base and top cover of the housing (26) are screwed together using screws.

**Type: Product + Method**

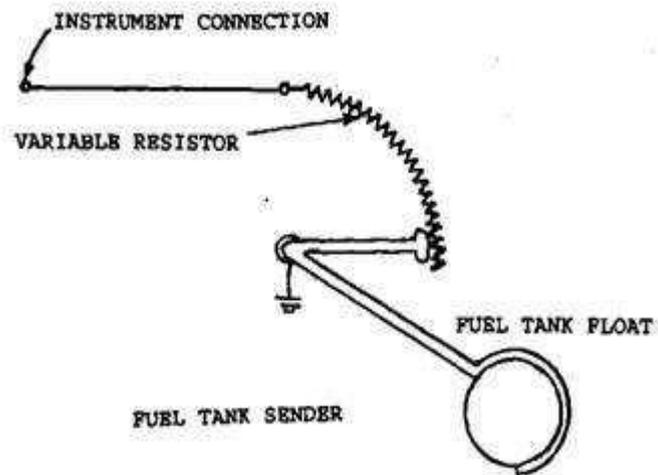
A fuel gauge with multiple modes for determining the level of fuel in a fuel tank,

- ✓ A flange ;
- ✓ A housing and a top cover;
- ✓ A drive link connected to rotating member through pivot ;
- ✓ A buoyant member ;
- ✓ Mechanical visual indicative output;
- ✓ Resistive output
- ✓ Potential – free output

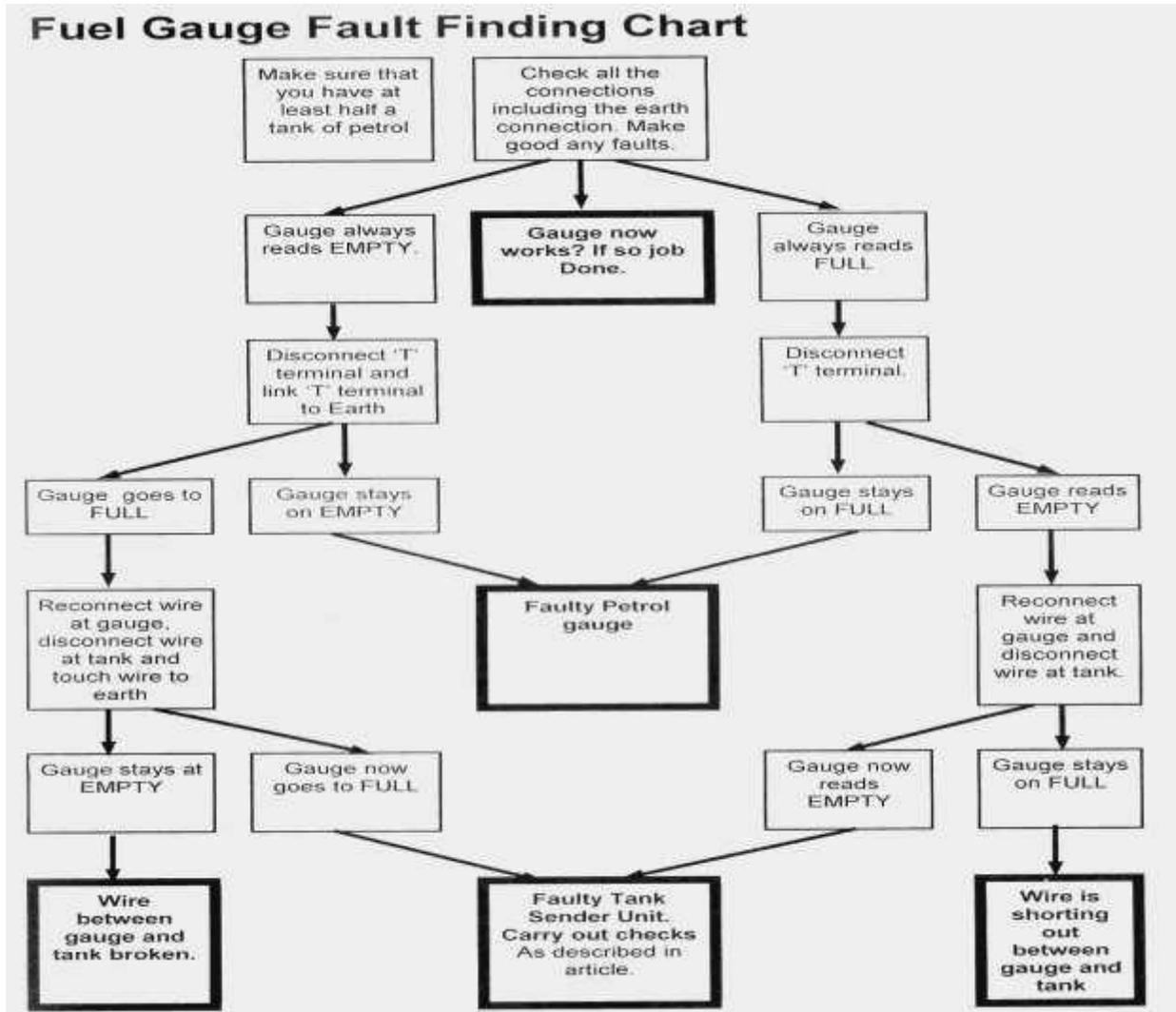
**The impugned patent describes a fuel gauge for determining the level of fuel in a fuel tank comprising:**

- A. A flange which is placed at the top of the fuel tank.
- B. A housing and a top cover placed in such a way that substantial portion remains outside the fuel tank to prevent damage from the contact of the fuel.
- C. A drive link where one end of drive link is free to extend inside the fuel tank and other end is connected to rotating member connected through the pivot joint .
- D. A buoyant member connected to the free end of said drive link which allows the buoyant to freely float on surface of the fuel held inside the fuel tank and displace the drive link through an angular motion and thus shows the change in residual level of fuel in the fuel tank;
- E. A wiper connected to the rotating member act as a pointer to translate the displacement of drive link on a visual scale to determine the visual level of residual fuel within the fuel tank;
- F. A wiper connected to the rotating member translates the displacement of drive link to the resistive coil to provide the resistive output.
- G. A set of magnets placed on rotating member are set in to motion due to displacement of drive link which radially translates signal to open type magnetically actuated reed switched which gets activated due to generated magnetic field and provides a switching signal to provide the potential- free signal output to terminal indicating the change in residual level of fuel in the fuel tank.

Figure 5. Working process of Resistance with float



**FUEL GAUGE FULT FINDING CHRT:-**



to provide resistive output; two sets of magnets are placed on to the rotating member are set in to motion due displacement of the drive link to allow their radial translation which activates the open type magnetically actuated reed switches which in response to magnetic field generated by the set of magnets gives a switching signal to provide a potential- free signal output.

**FEATURES ASPECT:-****FEATURES 1:**

Drive link

**Dependent Claim**

Length is adjusted as per depth of the tank

**FEATURES 2:**

Flange

**Dependent FEATURES**

Geometry preferred which fits to the fuel tank on which it is placed

**FEATURES 3:**

Reed switches

**Dependent FEATURES**

fixed within base of housing using Polyurethane or epoxy resin

**FEATURES 4,5 AND 6:**

Housing

**Dependent FEATURES**

has a notch parallel to the scale for translation of the wiper is made of engineering plastics, sheet metal constructs, or metal casts base and top cover screwed together using screws

**FEATURES 7:**

Set of magnets

**Dependent FEATURES**

radially translates over the reed switches

**FEATURES 8:**

Protective cap

**Dependent FEATURES**

protects translation path of wiper and of visual scale

**CONCLUSION:**

The Products describes about a fuel level gauge useful in determining the level of residual fuel in a fuel tank and providing with combination outputs for monitoring the level of residual fuel in said fuel tank. The main feature of the propose is to provide a dial gauge for visualization of residual fuel level in tank without any external power supply. Further, sensing device has multimode output modes where dial gauge to provide mechanical visual output where signals are provided by the rotating member connected to the wiper where extended tapered tip of the wiper act as a pointer to translate the displacement of the drive link; the displacement of the drive link signals are transferred to the resistive element by the rotating member which is connected to the wiper.

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## An Overview of DRF in the treatment of Multiple Sclerosis (AbstractView.aspx?PID=2020-13-6-82)

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# An Overview of DRF in the treatment of Multiple Sclerosis

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## ABSTRACT:

Diroximel fumarate (DRF) is an oral disease-modifying agent indicated for the treatment of relapsing-remitting multiple sclerosis (RRMS), which is taken twice a day. In EVOLVE-MS-1, Phase 3, a two-year safety study evaluating DRF in patients with RRMS, it is shown that the occurrence of flushing and gastrointestinal treatment-emergent adverse events is comparatively low. This results in a low rate of discontinuation due to treatment-emergent adverse events as compared to dimethyl fumarate (DMF). Monomethyl fumarate (MMF) is a common active metabolite of DMF and DRF. This active metabolite is responsible for the mechanism of actions of the drugs since it crossed the blood-brain barrier. Methanol is the primary metabolite of DMF metabolism but a minor metabolite of DRF metabolism, which results in a lower risk of gastrointestinal symptoms. Both DMF and DRF show similar T<sub>max</sub> and C<sub>max</sub>, which indicate similarity in the efficacy of both the drugs. Therefore, DRF has a similar safety and efficacy profile but better tolerability of treatment-emergent adverse events when compared to DMF. This article provides an updated overview of the pharmacological, therapeutic efficacy, and tolerability of DRF.

**KEYWORDS:** Sclerosis, Diroximel Fumarate, Monomethyl Fumarate, Gastrointestinal, Relapsing-Remitting Multiple Sclerosis.

## INTRODUCTION:

Multiple sclerosis (MS) is a demyelinating condition in which the myelin coating for nerve cells in the brain and spinal cord is impaired. It is categorized under the auto-immune disease. The pathogenic process involves the movement of self-reactive T cells across the blood-brain barrier to the central nervous system, causing damage to myelin, oligodendrocytes and nerve fibers and thus begin the immune cells recruitment.<sup>1</sup> This hinders the communication between the central nervous system and the rest of the body.<sup>2</sup>

It is pathologically described by inflammation, demyelination, and axonal and neuronal misfortune. Clinically it is characterized by intermittent backslides or movement, or both.<sup>3</sup> In individuals with MS, the natural equilibrium between pro-inflammatory and anti-inflammatory cells in the immune system is disturbed, which results in the inflammation of both CNS and PNS.

This inflammatory procedure causes injuries (overwhelmingly in the cerebellum, cerebrum stem, spinal rope, optic nerves and white matter of mind ventricles) that results in the occurrence of signs and symptoms of MS, including weak/hardened muscles, appendage deadness/shivering, balance issues, unsettling visual influences, and cognitive dysfunction.<sup>4</sup> The lesional inflammatory condition likewise adds to MS pathogenesis through the age of pro inflammatory cytokines and oxygen and nitrogen free radicals, building up a cycle of inflammation and oxidative pressure.<sup>5</sup>

Relapsing-Remitting MS (RRMS) is more frequently seen comparing to other MS forms. Approximately 85% of patients with MS are initially diagnosed with RRMS. In RRMS, attacks usually occur when symptoms are flared up which is called as relapse and followed by remission which is the period of recovery when few symptoms appear.<sup>3</sup>

Several disease modifying-therapies are used for the management of MS commonly via the parenteral route, for example, Interferon-beta and glatiramer acetate (GA) which are administered via injection while, natalizumab and mitoxantone administered via infusion.<sup>6</sup> Fortunately, some oral medications are recently developed which promote patient convenience and enhance therapeutic compliance. The oral drugs for the management of MS include fingolimod, teriflunomide, and dimethyl fumarate (DMF).<sup>7</sup> These medications are effective in slowing the progression of the disease by restoring the balance of immune cells.

Diroximel fumarate (DRF) is a novel oral fumarate with a distinct chemical structure approved in the U.S. which is in development to treat patients with RRMS, to include clinically isolated syndrome, relapsing-remitting disease and active secondary progressive disease.<sup>8</sup> DRF and DMF release similar active metabolite which is monomethyl fumarate (MMF).<sup>9</sup> The difference relies on the onset time in which DRF has a shorter time of onset in comparison to DMF because DRF undergoes esterase cleavage in the gut before reaching systemic circulation in the blood.<sup>10</sup> Unlike DMF, which is associated

with gastrointestinal side effects including nausea, diarrhea, vomiting, and upper abdominal pain, DRF has improved gastrointestinal tolerability because of production of less irritation and reactivity toward off-target receptors in the GIT.<sup>11-13</sup> GI adverse reactions are a common cause of discontinuation of DMF treatment.<sup>12</sup>

Apart from MMF, both DMF and DRF produce different metabolites. DMF is metabolized to MMF and methanol which is toxic while DRF is metabolized to MMF and inert 2-hydroxyethyl succinimide (HES).<sup>14</sup> Two primary metabolites, MMF and HES, and two minor metabolites, RDC-8439, and methanol are formed in the first step of DRF metabolism.<sup>14</sup> This is contrary to DMF, where MMF and methanol are produced as the primary metabolites by the first step of metabolism.<sup>14</sup> DRF and DMF produce bioequivalent systemic exposure to MMF at therapeutic doses, which is assumed to improve efficacy in MS patients.<sup>15</sup> Based on its chemical structure and associated metabolites, DRF is predicted to produce an effectiveness and safety profile comparable with DMF's experience but with an increased tolerability profile for GI.<sup>15</sup>

#### PHARMACODYNAMICS:

The neurological signs of RRMS, are reduced by diroximel fumarate with less digestive impact than its bioequivalent analog, dimethyl fumarate.<sup>13</sup> It must be remembered that angioedema, hepatotoxicity, anaphylaxis, flushing, lymphopeny, and progressive multifocal leukoencephalopathy (PML) may be induced by the administration of DRF.<sup>16</sup> DRF should be immediately discontinued when PML, anaphylaxis or angioedema is suspected. Liver function and total bilirubin should be checked before and during therapy with diroximel fumarate. A complete blood count (CBC) should be collected before beginning DRF, after the first six months of treatment, and at corresponding periods of 6 to 12 months after that time.<sup>16</sup> Stop the DRF therapy if the lymphocyte count is calculated to be less than  $0.5 \times 10^9$  /L for more than six months.<sup>16</sup> It is to be noted that, DRF does not prolong the QTc duration to any clinically relevant degree at a dosage two times the maximum recommended dose.<sup>16</sup> It is suggested that DRF does not increase the risk of experiencing ventricular arrhythmias even in high doses.

It is evident that the pharmacodynamics of DRF and MMF are similar with higher gastrointestinal tolerability in patients undergoing DRF therapy.

#### PHARMACOKINETICS:

Upon administration, diroximel fumarate, like its bioequivalent drug, dimethyl fumarate, is quickly absorbed in the gastrointestinal tract.<sup>17</sup> According to the EVOLVE-MS-1 Study, following oral administration, the median T<sub>max</sub> of monomethyl fumarate (MMF) varies from 2.5-3 hours, while the mean C<sub>max</sub> is of 2.11 mg/L.<sup>16</sup> A similar mean of T<sub>max</sub> and C<sub>max</sub> is also observed in the bioequivalent drug, dimethyl fumarate, given to healthy volunteers.<sup>17</sup> DRF metabolite's average steady-state concentration was reported at 8.32 mg.hr/L following twice-daily administration in MS patients.<sup>16</sup> Food tends to significantly reduce MMF, the active metabolite of C<sub>max</sub> DRF, when compared to fasted administration.<sup>16,17</sup>

The apparent volume of distribution of DRF varies from 72L to 83L.<sup>16</sup> The active metabolite of DRF, MMF, crosses the blood-brain barrier which is responsible for its effect.<sup>18</sup> While the plasma protein binding of MMF ranges from 27-45%.<sup>16</sup>

Esterases metabolize both DRF and DMF in the liver.<sup>17</sup> Throughout the gastrointestinal tract, skin, and plasma, these enzymes are found in high quantities. DRF's esterase metabolism releases the active metabolite, MMF, prior to moving into the systemic circulation.<sup>10</sup> Moreover, together with small amounts of methanol, the main inactive metabolite, 2-hydroxyethyl succinimide (HES), and another inactive metabolite, RDC-8439, are formed during the metabolism.<sup>16,19</sup> Following the esterase metabolism, the tricarboxylic acid (TCA) cycle further metabolizes MMF, which produces major metabolites including fumaric acid, citric acid, and glucose.<sup>16,17</sup> It is important to remember that methanol is the main metabolite of DMF metabolism, but a minor metabolite of DRF metabolism, that results in a lower risk of gastrointestinal symptoms.<sup>19</sup> Elimination of MMF, which is a major metabolite of both DMF and DRF, occurs through expired air as carbon dioxide. Negligible levels, lower than 0.3 percent of the absorbed dosage, are calculated in urine.<sup>16</sup> The 2-hydroxyethyl succinimide (HES), an inactive metabolite of DRF, which constitutes 58-63% of the ingested dose, is excreted in urine.<sup>16</sup> The half-life of MMF is estimated to be 1 hour. Monomethyl fumarate shows a mean apparent total plasma clearance of 1.54 mg/L following oral administration.<sup>17</sup>

#### GASTROINTESTINAL TOLERABILITY:

DRF was comparable in effectiveness to DMF but has a different chemical structure that may cause less gastrointestinal (GI) discomfort, as shown in the EVOLVE-MS-2 trial.<sup>19</sup> EVOLVE-MS-2 was a 5-week study comparing the gastrointestinal tolerability of DRF (462 mg twice daily) to DMF (240 mg twice daily).<sup>19</sup> The study hit its primary endpoint by demonstrating a statistically significantly lower number of gastrointestinal symptoms in patients taking DRF as compared to those who take DMF. The symptom intensity score of 2 or higher was observed with DRF on the Individual Gastrointestinal Symptom and Impact Scale (IGISIS) compared with DMF ( $P = 0.003$ ).<sup>19</sup> Both DMF and DRF show gastrointestinal symptoms including



than 700 calories and 30g fat.<sup>16</sup>

### POTENTIAL DRUG INTERACTION:

DRF is contraindicated for individuals currently receiving DMF, which is also metabolized to MMF. This increases the risk of toxicity for which it should be avoided.<sup>16</sup> DRF may be started the day after DMF is discontinued.<sup>16</sup>

### CONCLUSION:

DRF is an innovative oral fumarate in the treatment of RRMS patients with its distinct chemical structure. DRF and DMF produce similar pharmacologically active metabolites, MMF, which cause identical mechanisms of action of both the drugs. Consequently, efficacy and safety profiles are predicted to be identical for DRF and DMF. DRF has the potential to produce a better gastrointestinal tolerability profile when compared to DMF due to less production of methanol and decreases the reactivity with off-target receptors, which are the results of its distinct chemical structure. Therefore, DRF has a promising safety and efficacy profile and seems to be a well-tolerated alternative for the treatment of RRMS.

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## **Role of Branched Chain Amino Acids supplementation on quality of life in liver cirrhosis patients**

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### **ABSTRACT:**

Due to nutrition distortions and energy metabolism, protein energy malnutrition (PEM) is triggered in liver cirrhosis (LC). Since PEM is directly related to the prognosis of LC, it has been postulated that supplementation of Branched Chain Amino Acids (BCAAs) which comprised of the amino acids valine, leucine and isoleucine is helpful in LC. Decreased BCAAs and increased Aromatic Amino Acids (AAAs) are typical abnormalities in the blood of individuals with liver cirrhosis, which play a function in the pathogenesis of hepatic encephalopathy and muscle loss. As the concentration of AAAs increased, it was hypothesized that the influx of AAAs into the brain increased, resulting in an imbalance of the neurotransmitter synthesis, particularly serotonin and noradrenaline. It may cause an aggregation of 'false' neurotransmitters such as octopamine, which may in effect be responsible for Hepatic Encephalopathy associative cognitive impairment. HE is a reversible disordered brain function condition that arises in people with progressive liver failure. BCAAs treatment significantly raises the BCAAs/AAAs ratio and reduces the grade of hepatic encephalopathy. Since the nutritional treatment focused on the administration of BCAAs, it resulted in an improvement in the clinical condition, which also led to an improvement in quality of live (QOL).

**KEYWORDS:** Branched Chain Amino Acids, Liver Cirrhosis, Hepatic Encephalopathy, Protein Energy Malnutrition, Aromatic Amino Acids.

### **INTRODUCTION:**

The liver performs a key function in the metabolism of the components of food like protein, fat and other nutrients for which any chronic liver disease results in different kinds of metabolic disorders<sup>1,2</sup>. The stage of protein-energy malnutrition (PEM) is triggered in chronic liver disease due to the disturbance in the nutrition and energy metabolism<sup>3,4</sup>. PEM is directly related to the prognosis of liver cirrhosis (LC) cases, independent of liver function<sup>5-7</sup>. Nutritional status has been documented to affect survival in patients with decompensated cirrhosis<sup>6, 8-10</sup>. Some studies reported a decline in mortality among these enteral feeding patients<sup>11, 12</sup>.

However, some criticism has been made of the hypothesis that the nutritional status is used as a survival factor or as a therapeutic strategy<sup>13,14</sup>. It has been reported that PEM occurs in 20% of patients with well compensated cirrhosis and in more than 60% of patients with severe liver disease<sup>15</sup>. In patients with cirrhosis, malnutrition of proteins, as manifested for instance in reduced skeletal muscle mass and hypoalbuminemia, may occur despite apparent adequate food intake<sup>6,7,16</sup>. Long-term BCAAs supplementation has been reported to raise or sustain nutritional status when used as a therapy for protein deficiency and to enhance the longevity of patients with decompensated cirrhosis<sup>17,18</sup>. These results, however, were not confirmed in more extensive studies, partly due to the lack of a BCAAs preparation suitable for long-term administration.

also regulates various nutrient metabolism pathways<sup>19-22</sup>. BCAAs were suggested to be linked to the hepatic encephalopathy (HE) developed by alteration in ammonia and energy metabolism. BCAAs are first catabolized by  $\alpha$ -ketoglutarate into glutamate and branched-chain ketoacids (BCKAs) via BCAAs aminotransferase (BCAT), mainly in skeletal muscles<sup>23-25</sup>. Patients with advanced cirrhosis experience a drop in branched-chain amino acid plasma concentration (BCAAs) and a rise in aromatic amino acids (AAAs) distinctively. Many clinical trials have shown that supplementation of BCAAs enriched oral mixture and BCAAs granules of dietary therapy may enhance not only hepatic encephalopathy (HE) but also PEM in LC patients<sup>13, 16, 26, 27</sup>.

### **Pathophysiology of Liver Cirrhosis and Hepatic Encephalopathy**

Liver cirrhosis results from the abnormal propagation of healing response increase fibro genesis characterized by connective tissue production and accumulation<sup>28</sup>. Cirrhosis is an advance stage of liver fibrosis that comes with hepatic vasculature distortion which cause distortion in the exchange between hepatic sinusoids and the adjacent hepatocytes due to the shunting of the portal and arterial blood supply directly into the central veins<sup>28</sup>. In liver cirrhosis, sinusoidal capillarization occurs in which the space of Disse is obstructed with scar tissues along with loss of endothelial fenestrations<sup>29</sup>. Sinusoidal capillarization and endothelial defenestration are the main factors of hepatic dysfunction in hepatic cirrhosis.

Hepatic encephalopathy (HE) is a reversible disordered brain function condition that arises in people with progressive liver failure. Mechanisms in liver failure which induce brain dysfunction are still unknown although some theories have been speculated regarding the influx of AAAs into the brain.

### **Decreased concentration of BCAAs in liver cirrhosis (LC)**

Decreased BCAAs, valine (Val), leucine (Leu), isoleucine (Ile) and increased AAAs, phenylalanine (Phe), tyrosine (Tyr) and tryptophan (Trp) are typical abnormalities in the blood of individuals with liver cirrhosis, which play a function in the pathogenesis of hepatic encephalopathy and muscle loss<sup>30, 31</sup>. Changes in the level of amino acid in liver disease patients are influenced by a variety of causes, such as dietary condition, age, associated illness, and the form and level of occurrence of injury. The changes in the concentration of BCAAs and AAAs results in the decrease of BCAAs/AAAs molar ratio which is also known as Fischer ratio. As the concentration of AAAs increased, it was hypothesized that the influx of AAAs into the brain increased, resulting in an imbalance of the

neurotransmitter synthesis, particularly serotonin and noradrenaline. It may cause an aggregation of 'false' neurotransmitters such as octopamine, which may in effect be responsible for HE-associative cognitive impairment<sup>32, 33</sup>.

The metabolisms of BCAAs and AAAs differs in such a way that BCAAs are metabolised in the peripheral tissues such as muscles, adipose tissue and brain while AAAs are metabolised in the liver. There are several mechanisms that explained the decrease of BCAAs concentration in LC patients. In LC patients with elevated blood ammonia concentrations under which the urea cycle is disrupted, ammonia detoxification can be intensified in the muscle and BCAAs may be used primarily for detoxification<sup>34-37</sup>. In LC patients, due to the disruption of insulin metabolism in the liver and the formation of portal-systemic shunt, insulin concentrations in plasma are elevated. Since insulin is responsible for the controls of BCAAs in the muscles, rise in insulin concentration leads to the increased in BCAAs uptakes which eventually decrease the BCAAs levels in the plasma<sup>38, 39</sup>.

### **Effects of Zinc and Amino Acids to Oral BCAAs Supplementation on HE**

Zinc is an ornithine transcarbamylase (OTC) coenzyme, a main enzyme in the liver urea cycle<sup>40</sup>. Because cirrhotic patients are low in zinc, OTC function is decreased, contributing to elevated amounts of ammonia in the blood via the down-regulation of the urea cycle<sup>41, 42</sup>. Oral zinc supplementation improved hepatic OTC development in cirrhotic rats, contributing to a reduction in blood ammonia concentrations<sup>43, 44</sup>. In cirrhotic cases, relative to BCAAs supplementation alone, BCAAs in conjunction with zinc administration substantially reduced blood ammonia rates and improved HE<sup>45, 46</sup>.

Recently the additive effects of other amino acids on supplementation to oral BCAAs have been investigated. The addition of L-ornithine L-aspartate (LOLA) to the BCAAs supplementation has been shown to improve HE<sup>47</sup>. It also has been shown that adding L-acetylcarnitine to BCAAs supplementation significantly improves HE and reduces ammonia levels in the blood<sup>48</sup>.

### **Effects of BCAAs on Albumin level**

Malnutrition of proteins and energy is common in patients suffering from liver cirrhosis. It also provides an important predictor for patients' survival<sup>6, 49, 50</sup>. BCAAs has a protein-free effect and increases the concentration of serum albumin. BCAAs supplementation has been suggested as an intervention for candidates for liver transplantation<sup>51</sup>. Patients with chronic liver disease may have low levels of serum albumin due to either protein

deficiency or impaired liver function<sup>52</sup>. L-leucine promotes in vitro albumin synthesis by activating a transcription factor, the mammalian target of rapamycin (mTOR)<sup>53,54</sup>. Subsequently, BCAAs increases hepatocyte synthesis and albumin secretion rates in patient with liver cirrhosis. This suggests that BCAAs could increase oncotic pressures by improving the levels of blood albumin and thus decrease peripheral edema.

### Role of BCAAs in HE and MHE

Different pathological conditions such as dehydration, spontaneous bacterial peritonitis and non-compliance of medication can cause HE. Additionally, one of the pathogenesis of HE in cirrhotic patients involved a drop in serum BCAAs levels. Even though the established treatment for HE is lactulose or antibiotics, supplementation with BCAAs appears to further improve HE in cirrhotic patients. A research found that the BCAAs treatment significantly raises the BCAAs/AAAs ratio and reduces the grade of hepatic encephalopathy<sup>55</sup>. In addition, Horst et al performed a randomized trial comparing dietary protein with an oral BCAAs supplement and observed substantial changes in the grade of mental state, flapping tremors, and portal-systemic encephalopathy index<sup>56</sup>. Hence, it can be postulated that oral BCAAs administration may have beneficial effects on HE.

Minimal HE (MHE), known as subclinical or latent HE, is the mildest form in the clinical spectrum of HE<sup>57, 58</sup>. Kato et al have shown that energy and protein intake nutritional consultations improve MHE, and the severity of MHE is negatively associated with BCAAs serum levels<sup>59</sup>. BCAAs supplementation is therefore considered to be a therapeutic agent for MHE.

### Quality of life (QoL) evaluation through BCAAs

Patients with liver cirrhosis are prone to PEM which significantly contribute to various conditions such as painful muscle spasms induced by muscle atrophy, muscle weakness<sup>60</sup>. Moreover liver cirrhosis patients are also susceptible to edema and ascites, hepatic encephalopathy and gastroesophagealvarix. All of these conditions would therefore lead to a reduction in quality of life (QOL). In the case of liver cirrhosis, disease development was shown to be an significant factor in evaluations of QOL. Suzuki et al. have used SF-36 to prove that QOLs for the patients with liver cirrhosis were not only lower than the healthy, but also lower than those suffering from peptic ulcerations and diabetes<sup>61</sup>. Moreover, they reported that the use of branched chain amino acids may have the potential to improve QOL in patients with liver cirrhosis<sup>61</sup>. Large-scale clinical trials in Japan also indicate that BCAAs improves nutrition in patients with cirrhosis of the liver, raising levels of BTR and serum albumin leading to improved survival rates and QOL increase<sup>62</sup>.

Since the nutritional treatment focused on the administration of BCAAs, it resulted in an improvement in the clinical condition, which also led to an improvement in QOL.

### CONCLUSION:

Many studies have shown that BCAAs is responsible in the management of LC. HE is one of the LC complication which occurred due to decrease in the Fischer ratio (BCAAs/AAAs molar ratio). High AAAs level cause increase influx into the blood brain barrier and in turn resulting in imbalance in the synthesis of neurotransmitter which responsible for the symptoms of HE. Therefore, administration of BCAAs stabilise the Fischer ratio and reduce the symptoms of HE. Addition of oral zinc supplement and L-ornithine L-aspartate (LOLA) have been shown to improve HE. Therefore, increase in quality of life is seen in LC with BCAAs supplement.

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# Increased serum interleukin-9 and interleukin-1 $\beta$ are associated with depression in type 2 diabetes patients

Interleucina-9 e interleucina-1 $\beta$  séricas aumentadas estão associadas à depressão em pacientes com diabetes tipo 2

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## ABSTRACT

**Background:** Co-morbid diabetes and depression are prevalent chronic conditions negatively affecting quality of life (QoL). Inflammation has been considered as an integral mechanism in patients with both diabetes and depression. **Objective:** The aim of the present study was to investigate depression and its association with interleukins (IL)-1 $\beta$  and IL-9 in type 2 diabetic patients (T2DM) and controls. The QoL in diabetic patient was also assessed. **Methods:** Eighty subjects were included, distributed among three groups: Group 1 - Healthy controls; Group 2 - T2DM patients without depression; Group 3 - T2DM patients with depression. Depression and QoL were assessed using Patient Health Questionnaire (PHQ-9) and The Audit of Diabetes-Dependent QoL (ADDQoL), respectively. IL-1 $\beta$  and IL-9 were measured in serum samples of all the patients using ELISA kit. **Results:** The PHQ score in the Group 3 was significantly higher as compared to Group 1. The ADDQoL scores in the Group 3 were significantly higher as compared to Group 2. Levels of IL-9 and IL-1 $\beta$  were elevated in Group 3, as compared to the other groups. **Conclusion:** This study showed positive association between depression and IL-1 $\beta$ , IL-9 in T2DM patients. Additionally, the diabetic patients have poorer quality of life, which is further worsened by the presence of depression. Thus, routine assessment for the presence of depression is suggested in T2DM patients.

**Keywords:** Cytokines; Depression; Patient Health Questionnaire.

## RESUMO

**Introdução:** O diabetes e a depressão comórbidas são condições crônicas prevalentes que afetam negativamente a qualidade de vida (QdV). A inflamação tem sido considerada como um mecanismo integral em pacientes com diabetes e depressão. **Objetivo:** Investigar a depressão e sua associação com interleucinas (IL)-1 $\beta$  e IL-9 em pacientes diabéticos tipo 2 (DM2) e controles. A QdV em diabéticos também foi avaliada. **Métodos:** Foram incluídos 80 indivíduos, divididos em três grupos: Grupo 1 - controles saudáveis; Grupo 2 - pacientes com DM2 sem depressão; Grupo 3 - pacientes com DM2 com depressão. A depressão e a QdV foram avaliadas usando o Questionário de Saúde do Paciente (*Patient Health Questionnaire* — PHQ-9) e a auditoria de QdV dependente de diabetes (*Audit of Diabetes-Dependent Quality of Life* — ADDQoL), respectivamente. IL-1 $\beta$  e IL-9 foram medidas em amostras de soro de todos os pacientes utilizando kit de ELISA. **Resultados:** O escore do PHQ no grupo 3 foi significativamente maior em comparação ao grupo 1. Os escores de ADDQoL no grupo 3 foram significativamente maiores em comparação ao grupo 2. Os níveis de IL-9 e IL-1 $\beta$  foram elevados no grupo 3, como em comparação com os outros grupos. **Conclusão:** Este estudo mostrou associação positiva entre depressão e IL-1 $\beta$ , IL-9 em pacientes com DM2. Além disso, os pacientes diabéticos têm pior QdV, o que é ainda piorado pela presença de depressão. Assim, a avaliação rotineira da presença de depressão é sugerida em pacientes com DM2.

**Palavras-chave:** Citocinas; Depressão; Questionário de Saúde do Paciente.

*Diabetes Mellitus* (DM) is a complex and heterogeneous chronic metabolic disease affecting 425 million people worldwide. It is estimated that the number of diabetic patients would increase to 700 million by 2045<sup>1</sup>. Type 2 DM (T2DM), also called non-insulin-dependent or adult-onset diabetes, accounts for approximately 90% of all diabetes cases<sup>2</sup> and is

the seventh leading cause of death worldwide<sup>3</sup>. Depression is a common mental health disorder affecting more than 300 million people around the globe<sup>4</sup>. Various studies indicate that depression is more prevalent in adults with diabetes as compared to the general population<sup>5</sup>. The prevalence of depression among individuals living with diabetes has

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been estimated between 9 and 35%. A study reported a 43% increase in the risk of developing depression over six years for participants with baseline diabetes and a 102% risk for diabetes among those with depression at baseline<sup>6</sup>. The occurrence of clinically significant depression in patients with diabetes has been reported to be associated with biochemical changes either directly due to illness or hypoglycemic drug treatment<sup>7</sup>. Depression in diabetic patients has been found to be associated with insulin resistance, deranged circadian rhythms, and hypothalamic-pituitary-adrenal (HPA) axis<sup>8</sup>. Depression has also been linked with diabetes via biological and behavioral pathways such as neurohormonal pathways, alterations in glucose transport, and increased immunoinflammatory activation<sup>9</sup>. The co-occurrence of depression and T2DM is associated with increased morbidity, mortality, and health care costs, as well as decreased QoL and productivity<sup>10</sup>. Depression, when accompanied by macrovascular and microvascular complications, further worsen the QoL of the patient<sup>11</sup>.

Inflammation has been ascertained as an integral mechanism in patients with both diabetes and depression. Certain clinical studies have reported that raised serum markers of inflammation, particularly IL-6, are associated with the onset of T2DM<sup>12</sup>. Different cohort studies indicate the involvement of activated innate immunity in patients with T2DM<sup>11</sup>. Depression has been found to be associated with impaired immune system and increased susceptibility to various diseases. An increase in plasma cytokines and acute phase protein concentration has been reported in the blood of depressed patients. Cytokines affect multiple CNS functions that are dysregulated during depression. Moreover, external administration of IL into the CNS has been found to induce immune function and produce stress-like effect on behavior<sup>13</sup>. Studies have highlighted higher levels of IL-1 $\beta$  and IL-6 in patients with T2DM and depression<sup>14</sup>. IL-9, which is a Th2-related cytokine, has been reported to be over-expressed in the *post mortem* brains of depressed people<sup>15</sup>. It is a pleiotropic cytokine whose elevated levels have been linked to allergic lung inflammation<sup>16</sup>.

Despite the above probable mechanisms observed in depressive patients, it is not yet clear whether inflammation is associated with depression in diabetic patients. Thus, the aim of the present study was to investigate the depression in diabetic patients and its association with interleukins. We also assessed QoL in diabetic patient.

## METHODS

### Study site, duration, design, and population

This study was conducted in Hakeem Abdul Hameed Centenary Hospital, Jamia Hamdard, New Delhi, from March 2018 to May 2018 after approval was obtained from Ethics

committee. This case control study was conducted to investigate the association between depression and diabetes. The study focused on diabetic patients who attended diabetic clinic in the HAHC Hospital (Figure 1). Healthy human subjects, aged  $\geq 18$  years and  $\leq 65$  years, and able to give informed consent were included as controls. Patients diagnosed with T2DM, aged  $\geq 18$  years and  $\leq 65$  years, and ability to give informed consent were included as cases.

Cases with T1DM, severe psychiatric disorders (e.g.; alcohol abuse, severe depression, schizophrenia, bipolar disorder), already on psychotropic drug, severe complications of diabetes (i.e., amputation, blindness, renal insufficiency, and dialysis), liver disease, renal disease, primary hyperparathyroidism, cancer, HIV, obesity, congestive heart failure, myocardial infarction or coronary artery bypass surgery, or percutaneous coronary intervention within the previous 6 months, cardiac arrhythmias, and inability or unwillingness to give written informed consent were excluded.

### Ethical considerations

This study was conducted in accordance with the guidelines of Declaration of Helsinki. Ethical approvals were obtained from the Ethics Committee of Hamdard Institute of Medical Sciences and Research (HIMSR), and the Institutional Ethics Committee of the School of Pharmaceutical Education and Research (SPER). Written informed consent was voluntarily obtained from all participants before their in the study.

### Sampling method & sample size

The estimated sample size for this study was 80 participants. The calculation of the sample size was conducted on the assumptions that confidence level (95%), margin of error not more than (5%), and prevalence of depression among diabetes patients of (50%). The value of 95% confidence interval (95%CI) from the normal distribution is 1.96 and for practical reasons we rounded it to be 2. Participants were recruited in diabetic clinic in the HAHC Hospital. All type-2 diabetic patients visiting the diabetes clinic fulfilling the inclusion criteria and willing to participate were included in the study.

### Data collection

#### Questionnaires

The data was collected by “face-to-face” interview using two standardized questionnaires: Patient Health Questionnaire-9 (PHQ 9) and The Audit of Diabetes-Dependent QoL (ADDQoL).

#### Assessment of depression

The PHQ-9 questionnaire was used for assessing depression among diabetic with depression and control patients. The PHQ-9 offers a categorical algorithm for the

diagnosis of depressive disorder. Major depression is diagnosed if five or more of the nine depressive symptoms criteria were present for at least “more than half the days” in the previous two weeks (suicidal thoughts count if present at all) and one of the symptoms is depressed mood or anhedonia. In addition, the sum score [0-27] were used for screening purposes and for measuring depression severity. The cut-off point that is most widely used to indicate a positive case for depressive disorder is the sum score of 10 or higher<sup>17</sup>.

### Assessment of quality of life

The ADDQoL questionnaire was used for assessing QoL in cases. The ADDQoL is a 19-item questionnaire that measures the impact of diabetes on specific aspects of life and the importance of these aspects of life for QoL. Being an “individualized” measure, it is not assumed that all items are applicable to everyone: five items, including working life, have a preliminary ‘Yes/No’ option<sup>18</sup>.

### Assessment of interleukins

Blood samples were collected on the day of their assessment of depression. The blood samples were processed, the samples were centrifuged, and the serum was stored at -80°C. Biomarkers of subclinical inflammation were measured in serum samples by using ELISA technique (Krishgen Biosystems Private Ltd., Mumbai, India).

### Statistical analyses

Data were analyzed using IBM SPSS software (version 22.0) (IBM Corp., Armonk, NY, USA). Analyses were based on 80 individuals with controls and T2DM with a complete core data set comprising age, sex, body mass index (BMI), and duration of diabetes. Data are presented as SD or percentage (%) for continuous or categorical variables. Difference between controls and cases were tested using Student’s t-test (two sided) and Fisher’s exact test. Unadjusted correlations between biomarkers of subclinical inflammation and/or depression scores were estimated using unpaired t-test or nonparametric test (two sided) correlation and corresponding p-value. The  $p < 0.05$  was considered statistically.

## RESULTS

### Baseline data

Eighty subjects were included in the study, distributed among three groups:

- Group 1: controls (healthy individuals).
- Group 2: T2DM patients without depression.
- Group 3: T2DM patients with depression.

The mean±SD age of Group 1, Group 2, and Group 3 was 45.0±8.1, 47.9±7.8, and 46.7±6.1 years, respectively.

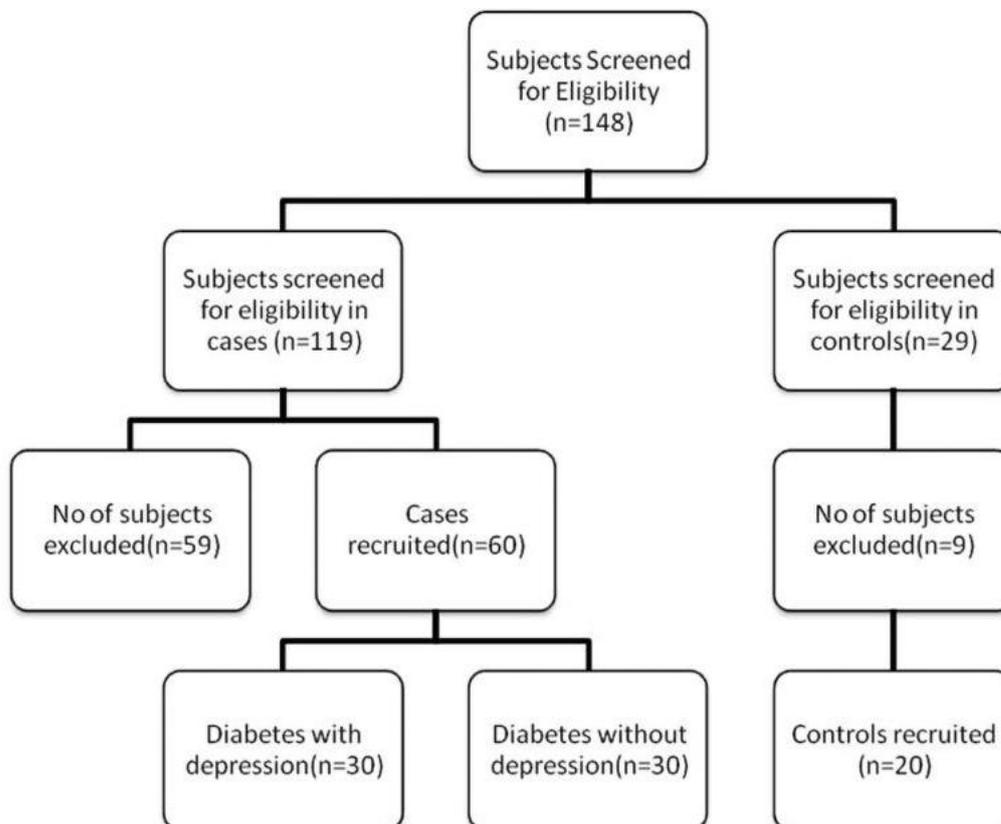


Figure 1. Study flow chart.

Group 2 and Group 3 had a known T2DM of mean duration 5.3±4.4 and 6.0±3.9 years, p=0.49.

There was no significant difference in mean age, gender distribution, RBS (random blood sugar), FPG (fasting plasma glucose), HbA1c, time spent on exercise between the three groups. The socio-demographic characteristics of study participants are shown in Table 1.

### Assessment of depression

The PHQ-9 scores in Group 1 and Group 3 were 1.3±3.3 and 11.9±1.9 respectively (p<0.001). It was observed that the PHQ scores in the Group 3 were higher as compared to Group 1. There was a significant difference between both the groups. The PHQ-9 scores in Group 1 and Group 2 were 1.4±3.3 and 1.5±2.0 respectively (p=0.88).

### Assessment of QoL by ADDQoL

The ADDQoL scores in Group 2 and Group 3 were 2.3±0.5 and 2.6±0.7 (p=0.04). There was a clear difference in the QoL scores for the Group 3 when compared with the Group 2. Between these two groups, Group 3 was significantly higher score compared to Group 2 (Figure 2).

### Assessment of IL-1β in cases and controls

Levels of IL-1β were found to be significantly higher in Group 3 or Group 2 as compared to Group 1. Additionally, Group 3 had significantly higher IL-1β concentration as compared to Group 2 (Figure 3).

### Assessment of IL-9 in cases and controls

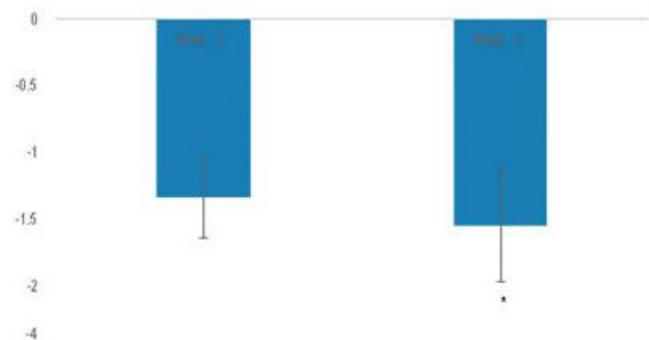
Levels of IL-9 were found to be significantly higher in Groups 2 or 3 as compared to Group 1. Additionally, Group 3 had significantly higher IL-9 concentration as compared to Group 2 (Figure 3).

### Correlation between IL-9, IL-1β, and PHQ

A positive association was found between IL-9 and PHQ-9 (r=0.6191 and p=0.003), IL-1β and PHQ-9 (r=0.7783 and p=0.0001) in Group 3 (Figure 4).

### Correlation between IL-9, IL-β, and ADDQoL

An inverse association was found between ADDQoL and IL-9 (r=-0.5737 and p=0.0009), ADDQoL and IL-1β (r=-0.5501 and p=0.0016) in Group 2 (Figure 5).



Group 2: T2DM patients without depression; Group 3: T2DM patients with depression. \*p<0.05.

Figure 2. ADDQoL scores in Groups 2 and 3.

Table 1. Baseline characteristic of patients.

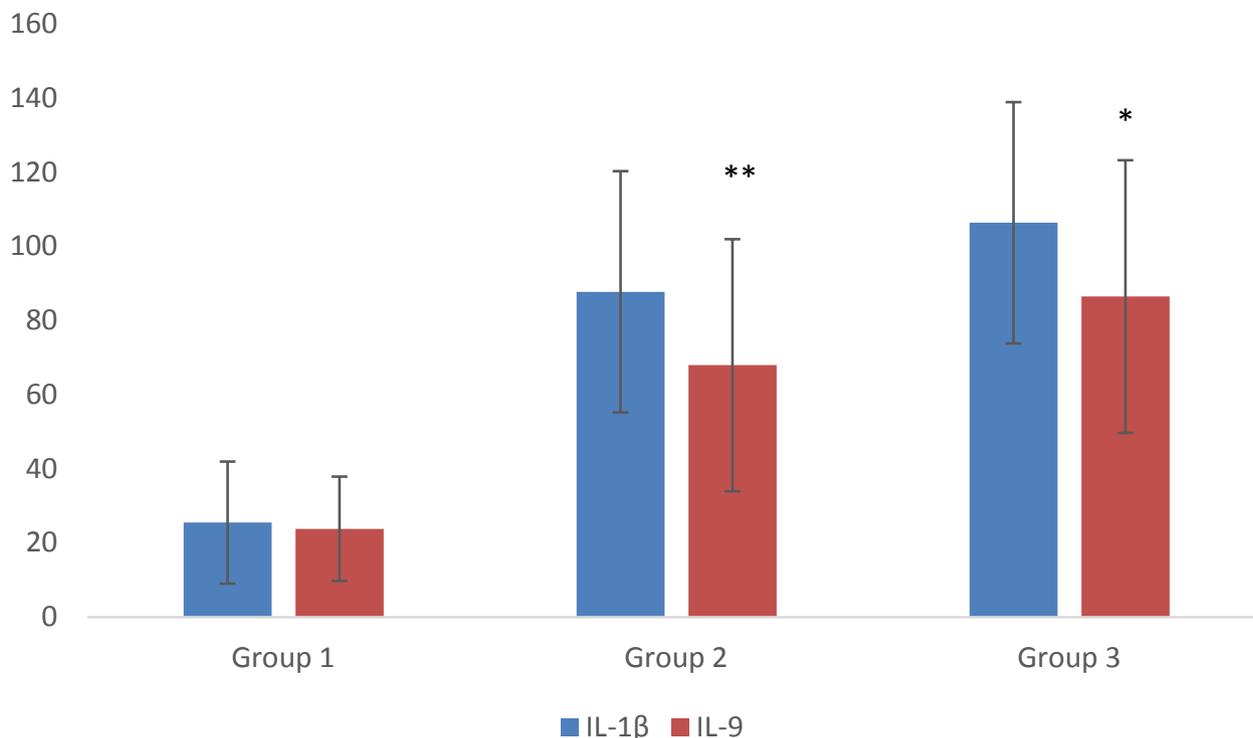
Characteristic	Group 1 (n=20)	Group 2 (n=30)	p-value	Group 1 (n=20)	Group 3 (n=30)	p-value	Group 2 (n=30)	Group 3 (n=30)	p-value
Age	45.0±8.1	47.9±7.8	0.18	45.0±8.1	46.7±6.1	0.58	47.9±7.5	46.7±6.1	0.31
Sex									
Female	6 (12%)	13 (26%)	0.38	6 (12%)	11 (22%)	0.76	13 (22%)	11 (18%)	0.79
Male	14 (28%)	17 (34%)		14 (28%)	19 (38%)		17 (28%)	19 (32%)	
BMI	24.3±2.5	24.8±3.8	0.99	24.3±2.5	25.0±3.5	0.43	24.8±3.8	25.0±3.5	0.82
Employment									
Working	13 (26%)	21 (42%)	0.76	13 (26%)	19 (38%)	1	21 (35%)	19 (32%)	0.78
Non-working	7 (14%)	9 (18%)		7 (14%)	11 (22%)		9 (15%)	11 (18%)	
Exercise	0.4±0.4	0.4±0.4	0.95	0.4±0.4	0.4±0.4	0.95	0.4±0.4	0.38±0.39	0.99
Diet									
Vegetarian	6 (12%)	6 (12%)	0.57	6 (12%)	8 (16%)	1	6 (10%)	8 (13%)	0.76
Non-veg	14 (28%)	24 (48%)		14 (28%)	22 (44%)		24 (40%)	22 (37%)	
Sun exposure	1.3±0.5	1.4±1.0	0.79	1.3±0.5	1.2±0.9	0.38	1.4±1.0	1.2±0.9	0.56
RBS							244.8±70.3	265.4±89.1	0.32
FPG							165.8±60.6	180.0±64.1	0.38
HbA1c duration of DM							8.4±1.7 5.3±4.4	8.6±2.3 5.1±4.1	0.61 0.83

Group 1: controls healthy individual; Group 2: T2DM patients without depression; Group 3: T2DM patients with depression; BMI: body mass index; RBS: random blood sugar; FPG: fasting plasma glucose; HbA1c: glycated hemoglobin; T2DM: type 2 Diabetes Mellitus.

## DISCUSSION

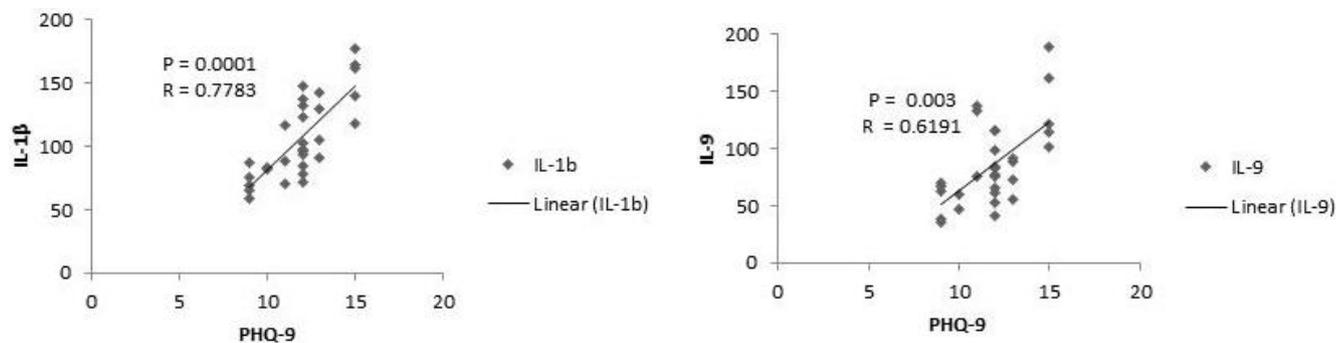
The current study was performed to assess the association of depression with IL-1 $\beta$  and IL-9 in T2DM. The increased

susceptibility to depression in individuals with T2DM is yet to be clearly understood. Depression is linked with physiological changes in the neuroendocrine system. The hidden cause of depression is thought to be related to changes in the



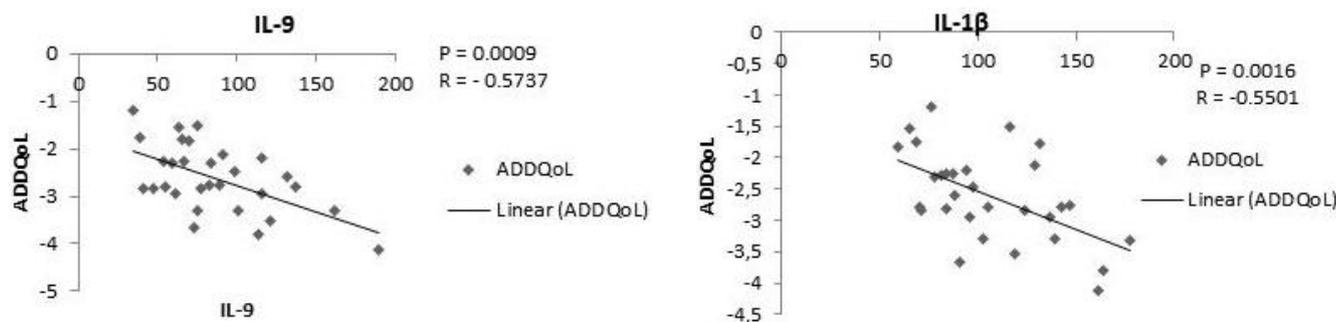
Group 1: Controls (healthy individuals); Group 2: T2DM patients without depression; Group 3: T2DM patients with depression; \* $p < 0.05$ ; \*\* $p < 0.001$ .

Figure 3. Levels of IL-1 $\beta$  and IL-9 in the three groups.



Group 3: T2DM patients with depression.

Figure 4. Correlation between PHQ-9 scores with IL-9 and IL-1 $\beta$  in Group 3.



Group 2: T2DM patients without depression.

Figure 5. Correlation between ADDQoL scores with IL-9 and IL-1 $\beta$  in Group 2.

neurotransmitters in the brain such as serotonin (5-HT), dopamine (DA), and norepinephrine (NE), which are monoamine neurotransmitters that affect mood and behavior. Counter-regulatory hormones such as catecholamine, glucocorticoids, growth hormone, and glucagon are believed to be activated during psychological stress. The activation of the counter regulatory hormones interferes in the natural action of insulin, leading to insulin being unable to lower glucose and instead elevating blood glucose. The increase in glucose level creates a major challenge in maintaining metabolic control. Poor glycemic control and functional impairment due to increasing diabetes complication may cause or worsen depression<sup>19</sup>.

The results of our study showed that serum IL-1 $\beta$  levels in T2DM patients were significantly higher than controls. Additionally, T2DM patients with depression had significantly higher serum IL-1 $\beta$  levels than patients without depression. These findings are in agreement with several other clinical studies. A prospective population-based study showed a higher production capacity of the pro-inflammatory cytokine IL-1 $\beta$  preceding a greater increase of depressive symptoms<sup>20</sup>. Another prospective study showed increased levels of IL-1 $\beta$  in T2DM as compared to the control subjects<sup>21</sup>. A previous clinical trial showed association between biomarkers (IL-1RA and IL-18) of subclinical inflammation and depressive symptoms in patients with T1DM and T2DM<sup>12</sup>. A study showed higher levels of IL-1 $\beta$  and IL-6 in patients with T2DM and depression<sup>14</sup>. Similar cross-sectional study in newly diagnosed T2DM patients demonstrated that higher depressive symptom scores were associated with higher concentration of IL-1 $\beta$  and other inflammatory biomarker. The increases in concentration of the inflammatory markers were seen in the study suggesting the role of inflammation in the pathogenesis of depression<sup>11</sup>.

The present study found significantly higher serum IL-9 levels in T2DM patients as compared to healthy controls. Moreover, patients with depression had significantly higher levels of serum IL-9 as compared to those without depression. IL-9 is a pleiotropic cytokine with anti-inflammatory effects. IL-9 has been associated with asthma, atherosclerosis, Hodgkin's disease, and cancer in humans<sup>22</sup>. However, to the best of our knowledge, there are only few studies available assessing IL-9 in the context of depression or anxiety symptoms. A

previous clinical study has observed that IL-9 cytokine correlated positively with prenatal depressive and overall anxiety symptoms<sup>16</sup>. Another study conducted on *post-mortem* brain tissues samples showed that IL-9 was over-expressed in the brains of depressed people<sup>15</sup>. Additionally, animal study conducted on mice has demonstrated IL-9 to be commonly reported cytokine in depressive like behaviors that were associated with local distinct neuroinflammation<sup>23</sup>.

Depression is one of the most neglected symptoms in diabetic patients and is directly linked with lowering the QoL<sup>24</sup>. The present study demonstrated significantly poorer QOL in diabetics with depression as compared to those without depression. Our finding is in line with previous literature. Cross-sectional studies have demonstrated a poor QoL in diabetic patients with depression as compared to patients without depression<sup>25</sup>. A similar case-control study showed lower QOL in diabetics with depression as compared to patients without depression<sup>26</sup>. Moreover, several cross-sectional studies have also demonstrated lower scores of QOL in diabetics<sup>27</sup>.

Our study has several limitations that need to be mentioned. Some of the data, such as duration of T2DM, exercise, BMI and age were self-reported or were obtained from the patients' medical records. This could have led to recall bias. As this was a case-control study, no causal relationship can be inferred. Lastly, the sample size was small which might not represent all diabetic patients.

In conclusion, this study showed positive association between depression and IL-1 $\beta$ , IL-9 in T2DM patients. Additionally, diabetic patients have poorer quality of life, which is further worsened by the presence of depression. The strength of the relationship between lifetime experience of depression and diabetes risk suggest that intervention designed to lessen the burden of diabetes should focus on depression that occurs at any time moment over a person's lifespan instead only that which is found immediately at the time of diabetes diagnosis or treatment.

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## A Survey on Awareness of Probiotics Knowledge and its Consumption among Student Population in a University Campus

*Sonam Bhatia, Sabreena Shafi Shiekh*

### Abstract

Probiotics are important pharmaceutical substitutes required for maintenance of gut health. In the present context, as the drug resistance for infectious pathogens is increasing, at alarming rate hence, it has become a dire need to boost up the immunity level so as to fight against infections. Therefore, the knowledge regarding use of probiotics has relevance among each of us. With this motive, a knowledge based survey was conducted among students residing in university campus and few other higher degree professionals to gather data regarding awareness on probiotics. The respondents of the study were majorly students; hence, an analysis was done among student subcategory only. A questionnaire-based survey was framed, which had variety of questions comprising general familiarity about the term "probiotic" and its different available products, technical know-how, their sources, use, effectiveness, etc. The data analysis was carried out using Microsoft Excel and SPSS software. The study shows that students from life science and paramedical courses are extremely familiar of the term probiotics (~40 to 50 %). Rest of the respondents, have learnt it from sources like newspaper or TV, however they did not know technical specifications necessary when purchasing these products. However, most of the respondents are quite familiar with Yakult product among various marketed probiotics products. Further, more interestingly students knew that food and supplements are the sources for probiotics but still there is a lack of proper understanding regarding concept of probiotics and its use in pharmaceuticals.

Full Text:

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## Refbacs

- There are currently no rebfacs.

Protocol

# Awareness and Opinions of Research Professionals on India's New Drug and Clinical Trials Regulations: Protocol for a Cross-Sectional Web-Based Survey Study

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## Abstract

**Background:** Although several studies have been conducted and several articles have been published on India's new clinical trial regulations, very few have examined the views of investigators and ethics board members regarding modifications to the previous regulations. Overall, they have neglected to find out the opinions of other relevant professionals, such as research assistants, coordinators, associates, and managers. To our knowledge, no study has yet investigated the awareness and opinions of Indian research professionals on the new 2019 regulations.

**Objective:** This study aims to describe the awareness and opinions of Indian research professionals on the new drug and clinical trial regulations.

**Methods:** In this cross-sectional, Web-based study, we will conduct an open survey for various Indian research professionals. These professionals will be selected randomly using multiple sources. The survey questionnaires, which have already been validated, were developed using the form function in Google docs. A Web link was generated for participants to take the survey. Descriptive statistics will be shown as means and standard deviations for constant variables, whereas certain variables will instead be shown as numbers and percentages.

**Results:** The survey was opened in July 2019. Enrollment has already started and will be completed in three months. The results calculations are expected to begin in October 2019.

**Conclusions:** The results of the survey are expected to represent the views of research professionals on the new regulations that will support the development of clinical research and the pharmaceutical industry in India. These regulations are expected to help advance clinical trials, help with the approval of new drugs, and enhance ethical norms in the country.

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**KEYWORDS**

online survey; professionals; clinical trial; rules

## Introduction

### Background

In India, the clinical trials industry has exemplified rapid growth in the last few years, driven by economic globalization, and is thus one of the most promising economic sectors in the country [1]. This rapid growth of clinical trials may be attributed to the outsourcing of clinical trials to India by various multinational pharmaceutical organizations [2]. Furthermore, the availability of infrastructure, such as comprehensive treatment, a broad spectrum of prevalent disorders, ethnic variation, English-speaking health care specialists, and medical and information technology, provides proper conditions for conducting clinical trials in the country [2]. However, reports of irregularities in the administration of clinical trials has overshadowed the flourishing of the industry [2,3]. These ethical violations in the industry have exposed loopholes in the regulatory system, which has led to it struggling to oversee clinical trials effectively [4,5].

Due to this, the loopholes of the regulatory system were amended in 2016 by Indian authorities to strengthen the regulatory mechanisms for reviewing clinical trials. These amendments were issued based on a high level of scrutiny, significant media attention [6], the involvement of non-governmental organizations [3], hearings in the Supreme Court, and the recommendations of an expert committee [7]. Details of these three back-to-back amendments and their associated challenges have been summarized elsewhere [8-11]. Furthermore, two pilot studies have detailed the knowledge of investigators and members of ethics boards regarding the impact of these regulations [12,13].

Recently, new regulations were issued in 2019 [14], which involved amending the 2016 regulations [8] to bring further changes in the clinical research sector. These rules have focused on clarifying the terms of clinical trials of new drugs and phase IV trials, and of clarifying post-trial access to new drugs, clinical trial approval validity, equality, compensation, and monitoring, which have all been described elsewhere [15]. To our knowledge, no study has thus far described research professionals' awareness and opinions regarding these new rules and regulations.

### Objectives

The purpose of this survey is to describe the awareness and opinions of research professionals on the new drug and clinical trials regulations.

### Hypothesis

We hypothesize that most Indian research professionals will be aware of, will welcome new changes to, and will agree that these new changes will speed up clinical trials, new drug approval, and improve ethical standards for clinical trials in the country. Also, they will aid with the expansion of clinical research and the pharmaceutical industry in India.

## Methods

### Overview

The methodology used in this survey is based on previous studies [16-18], and on the Checklist for Reporting Results of Internet E-Surveys (CHERRIES) [19].

### Ethics

The Institutional ethics committee was notified about the intended survey and excused from the review. This study does not require the informed consent of participants because this is an observational survey involving no risk or minimal risk to participants [20].

### Design

A cross-sectional, online survey design will be adopted to collect the data. No data which directly identifies any of the participants will be collected, but data that indirectly identifies participants, such as demographic information (eg, age, gender), will be collected. Mean, or range will be used to represent age, and counts/percentages will be used to show gender. We will select participants from different sources, including databases (eg, Clinical Trial Registry India, Indian Society Clinical Research, and the Central Drugs Standard Control Organization), personal networks, hospitals, institutions, and LinkedIn.

### Participant Eligibility Criteria

Those who are eligible to take part in this survey include research professionals. For this study, a research professional is defined as research investigators, members of ethics committees, assistants, coordinators, associates, and managers who have engaged in clinical trials in India. The number of target participants for this survey will be 80-100. Participants will be chosen randomly to avoid any selection bias.

### Data Collection

Validated questionnaires were selected from previous studies [12,13] and obtained from the respective authors or journals with their approval for use in the present project. Each questionnaire was developed using the form function in Google docs, which is a widely used and free survey tool [21]. A link was generated to enable participants to take the survey online [22]. The Google form feature of a limit of one respondent per email (respondents will be required to sign into Google) was enabled to prevent multiple entries from the same people. The "required to answer" feature was also enabled for each question, except for the following question: "If you are a member of the ethics committee, what is your role?"

The survey was announced on LinkedIn [23]. An email or message with a website link was sent to participants on LinkedIn to request that they complete the online, self-administered questionnaire. Participants' participation in this survey is entirely voluntary and anonymous. Therefore, it does not require participants to provide a name or any other identifying information, except for age and gender. Email reminders will be sent to all the participants to ensure the maximum possible number of responses. Respondents will be able to review and change their answers before clicking on the submit button at

the end of the form. All the responses will be accessible by only the study investigator.

### Outcome

The outcome of this will be an enhanced understanding of research professionals' awareness and opinions of the new clinical trials rules that came into effect in 2019.

### Statistical Analysis

Descriptive statistics will be estimated for continuous variables, whereas counts and percentages will be shown for categorical parameters. These data will be utilized to describe the awareness and opinions of the participants. *Post hoc* tests, such as the independent one-tailed *t* test and chi-square test, will be employed to test the significance of continuous and dichotomized parameters, respectively. Missing data will be explored in future studies, as appropriate. Results will be presented through graphs or tables. An analysis will be carried out utilizing SAS version 9.2 for Windows (SAS Corporation Inc, North Carolina, USA).

## Results

The enrollment of Indian research professionals will begin from multiple sources in July 2019 and is expected to end in November 2019. The results evaluations are expected to start in October 2019. The survey questionnaires being used in this project were previously validated by other studies [12,24], and approval was obtained for their reuse. The demographic characters of the respondents, such as age, gender, and region in India, will be presented in a table. The awareness and opinions of the respondents will be summarized in tables and illustrated as a pie chart.

## Discussion

### Primary Findings

This study, using a Web-based, online, open survey, aims to investigate the awareness and opinions of Indian research professionals who have engaged in clinical trials regarding the new rules put into place in 2019. It is crucial to understand the awareness and opinions of Indian research professionals, as they act as communicators and are a bridge between sponsors

and patients. Therefore, understanding the awareness levels and opinions of these research professionals is crucial to determine whether clinical trials are being conducted per the new rules. Furthermore, considering the new directives, these professionals play a crucial role in addressing and reporting unethical clinical trials on vulnerable populations in India.

This open survey will be conducted online, so it will not be necessary to meet participants at any point physically. The survey will need about 10 minutes to complete. Participants will be able to take the survey on their mobile devices or their computers. Participation in this survey will be voluntary and anonymous, which is expected to boost the response rate.

The findings will expand the current knowledge base regarding the awareness and opinions of various Indian research professionals on the new clinical trial regulations, and allow for comparison to the findings of previous studies. Some professionals may have a higher level of awareness of the regulation now or may even have changed their perspectives regarding the recent amendments to Schedule Y of the Drug and Cosmetic Act.

### Limitations

Nonetheless, this survey has some limitations. First, the survey will be taken by only a specific sample within the population. Therefore, the results cannot be generalizable to the whole population of India. Second, self-administered questionnaires may introduce some level of social desirability bias. Finally, the surveys are limited by their cross-sectional design, which allows us to determine the association but not causality.

### Conclusion

At present, there is a significant lack of clarity on the awareness levels and opinions of various clinical research professionals in India regarding the new rules. Findings from this study will fill a glaring gap in the literature by providing a knowledge base regarding views of the new rules. The findings may improve the ethical and quality standards of clinical trials, which will further benefit the expansion of the clinical research and pharmaceutical industry in India by speeding up clinical trials, the approval of new drugs, and protecting patients, especially vulnerable ones.

### Conflicts of Interest

None declared.

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## Abbreviations

**CHERRIES:** Checklist for Reporting Results of Internet E-Surveys

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Articles

**The association of quality of life between anxiety and depression in patients with chronic rheumatic heart disease**

*Sabreena Shafi Sheikh*<sup>1</sup>, *Saurabh Dahiya*<sup>1\*</sup>, *Anwar Hussain Ansari*<sup>2</sup>, *Mudigubba Manoj Kumar*<sup>3</sup>

**Abstract**

**Objective:** The main objective of the study was to measure the association of quality of life between anxiety and depression in patients with chronic rheumatic heart disease.

**Methodology:** Psychometric assessment (anxiety and depression) of the subjects was measured using HADS. Clinical data were collected from the Department of Cardiology OPD of Safdarjung Hospital, New Delhi. A total of 500 RHD patients and 100 healthy controls were included in the study based on inclusion and exclusion criteria. Data analysis was performed with Chi square test and ANOVA using IBM SPSS version 22.

**Findings:** Almost 80% of the subjects were suffering from moderate RHD, and 20% were suffering from Severe RHD. Most cases of RHD were suffering from moderate anxiety and depression levels. Among all the variables of SF-36 questionnaire, only pain was only variable associated with anxiety. None of the SF-36 variables was associated with depression in patients with RHD.

**Conclusion:** It was seen that high levels of anxiety and depression levels are present in patients with RHD. It was also observed that the high anxiety levels in the RHD patients can also be a major cause of depression in patients. The factors related to the disease like physical pain, social functioning, and general health causes high anxiety and depression in the patients when the disease prevails over a long time.

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**Keywords:**

Rheumatic Heart Disease; RHD; Depression; Anxiety; HADS (Hospital Anxiety and Depression Scale); Stress.

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**1. Introduction**

Rheumatic Heart Disease (RHD) is a condition that is initiated by the rheumatic fever and results in damaged heart valves of the affected individual. Rheumatic fever is generally caused by group A streptococcal bacterial infection (Marijon et al., 2012).

According to a recent report, there were 15.6 million of existing cases of RHD and each year 233,000 number of deaths caused by RHD and 282,000 new RHD cases were reported globally (Watkins et al., 2017). The epidemiological data presented by the author revealed that the disease

is more prevalent in developing countries due to lack of prevention strategies and poor medical facilities. Today, RHD is almost absent in developed regions such as Europe and North America, but it is still present in parts of Africa, the Middle East, Central, and South Asia, and South Pacific (Carapetis et al., 2016; Pilgrim et al., 2012).

In India, RHD burden is causing an enormous amount of money to be spent on its cure prevention and treatment (Ramakrishnan et al., 2012). Nearly, 20%-25% of the global RHD burden is caused by India. RHD can also be impacted by the psychological aspects over a prolonged time of prognosis. These psychological morbidities negatively impact the neural functioning of the patients causing the low quality of life (Alvarenga & Caldeira, 2009). Results from World Mental Health Survey conducted in 17 countries showed that the specific anxiety disorders (generalized anxiety disorder, panic/agoraphobia, social phobia and post-traumatic stress disorder or PTSD) were generally less prevalent than major depression. Among persons with heart disease, the prevalence of generalized anxiety disorder (GAD) ranged from circa 0.3% in Lebanon to about 5% in Ukraine, US and France (Ormel et al., 2007). Similar data are not available in India.

Various tools such as Hospital Anxiety and Depression Scale (HADS) and Quality of Life (QoL) are used to measure the anxiety and depression in the patients of RHD. HADS is a tool to identify and quantify anxiety and depression (Christoph, 1997). QoL and cognitive functions in RHD patients is reduced in all patients, and it can be assessed by using the Short Form 36 (SF-36) health survey (Idorn, 2013). In India, data regarding QoL associated with anxiety and depression in patients with RHD is scarce. Hence, this study was aimed to measure QoL associated with anxiety and depression in patients with chronic RHD.

## **2. Methods**

Patients with RHD aged >18 years and both sex with at least one year of the duration of the disease were included in the study as case. For control group subjects with age >18 years, both male and female and without RHD were included. The patients were excluded if they were participating in other studies, suffering from other co-morbidities, and refused to participate in the study. Informed consent was obtained from both case and control.

### **2.1 Methodology**

All the data was collected at the Department of Cardiology, Safdarjung Hospital, New Delhi during the period of February 2017 to June 2018. Subject HADS and SF-36 questionnaire were taken from the subjects for both case and control.

Subjects were studied for the RHD based on history, physical examination, and echo cardiogram.

#### Hospital Anxiety and Depression Scale (HADS)

The HADS is a self-reporting scale used to measure anxiety and depression in a general medical population of patients. It is simple and easy to use. The questionnaire comprises of seven questions for anxiety and seven questions for depression, and takes 2–5min to complete. Variables used for HADS consists of physical functioning, role limitations due to physical health, role limitations due to emotional problems, energy, emotional well-being, social functioning, pain, general health, and health change (Stern, 2014).

#### Short form 36 (SF 36)

The 36-Item Short Form Health Survey questionnaire (SF-36) is a very popular instrument for evaluating Health-Related Quality of Life. The SF-36 measures eight scales: physical functioning (PF), role physical (RP), bodily pain (BP), general health (GH), vitality (VT), social functioning (SF), role emotional (RE), and mental health (MH). Component analyses showed that there are two distinct concepts measured by the SF-36: a physical dimension, represented by the Physical Component Summary (PCS), and a mental dimension, represented by the Mental Component Summary (MCS). All scales do contribute in different proportions to the scoring of both PCS and MCS measures (Saris-Baglama RN et al., 2010).

## **2.2 Safety measures**

Vital signs and electrocardiogram of the subjects were evaluated as a safety measure. Vital signs included health issues and other physiological issues, including heart rate and its activities.

## **2.3 Ethical considerations**

The study was ethically approved from the Institutional Ethics Committee of Safdarjung Hospital, New Delhi to conduct the research. The data containing the names and disease history of all the patients involved in this study were kept highly confidential. All the clinical data and personnel files of the patients are only accessible to the study personnel to maintain the confidentiality and authenticity of the research. Informed consents were taken before the participation of the subjects.

## **2.4 Statistical analysis**

Data were presented as frequency, percentage, mean, and standard deviation wherever applicable. Chi square test was used to compare Analysis of variance (ANOVA) was used to compare anxiety and depression categories across demographic and SF-36 domain. P value

<0.05 was considered significant. All the statistical analyses were performed by using IBM SPSS version 22.0 software.

### 3. Results

Five hundred patients with RHD after they followed inclusion criteria were included in the study. General characteristics of the patients have been shown in table 1. The patients' age ranged from 18 years to 75 years with a mean age of 35.77 years. 95.8% of the patients aged between 21 to 60 years. Mean duration of treatment of RHD for the patients was  $5.3 \pm 2.2$  years. We observed that the majority of the patients (52.4%) were receiving the treatment between 5 to 8 years.

**Table 1.** General characteristics (n=500)

	n (%)
<b>Age (Years)</b>	
<20	18 (3.6%)
21-60	479 (95.8%)
>60	3 (0.6%)
<b>Sex</b>	
Male	271 (54.2%)
Female	229 (45.8%)
<b>Duration of treatment (Years)</b>	
<5	199 (39.8%)
5-8	262 (52.4%)
>8	39 (7.8%)

#### 3.1 Anxiety and depression

Table 2 and Fig 1 show anxiety and depression in the patients and healthy controls. We observed that 87% of the patients had borderline to abnormal anxiety and 78.6% of patients had borderline to abnormal depression. Borderline to abnormal anxiety and depression was observed in 80% and 97% healthy controls respectively.

**Table 2.** Distribution according to anxiety score among cases and controls

Anxiety	Group	
	Cases	Controls
Normal	61	20
	12.2%	20.0%
Border Line	217	64
	43.4%	64.0%
Abnormal	222	16
	44.4%	16.0%
Total	500	100
	100.0%	100.0%

### 3.2 Association of sex with age, treatment of disease, anxiety, and depression

Table 3 shows the association of sex with age, treatment of disease, anxiety, and depression. We observed that age ( $P=0.228$ ), treatment duration of disease ( $P=0.475$ ), anxiety ( $P=0.879$ ) and depression ( $P=0.215$ ) were comparable between male and female groups.

**Table 3.** Association of sex with age, treatment of disease, anxiety and depression

	Male, n(%)	Female, n(%)	Total, n(%)	P Value
<b>Age Group (Years)</b>				
< 30	79 (29.2)	82 (35.8)	161 (32.2)	0.228
30-40	96 (35.4)	85 (37.1)	181 (36.2)	
40-50	83 (30.6)	51 (22.3)	134 (26.8)	
50-60	12 (4.4)	9 (3.9)	21 (4.2)	
> 60	1 (0.4)	2 (0.9)	3 (0.6)	
<b>Duration of Treatment</b>				
< 5 years	152 (56.1)	130 (56.8)	282 (56.4)	0.475
> 5 years	119 (43.9)	99 (43.2)	218 (43.6)	
<b>Anxiety</b>				
Normal	33 (12.2)	28 (12.2)	61 (12.1)	0.879
Border Line	115 (42.4)	102 (44.5)	217 (43.4)	
Abnormal	123 (45.4)	99 (43.2)	222 (44.4)	
<b>Depression</b>				
Normal	56 (20.7)	51 (22.3)	107 (21.4)	0.215
Border Line	122 (45.0)	116 (50.7)	238 (47.6)	
Abnormal	93 (43.3)	62 (27.1)	155 (31.0)	

### 3.3 Association of Quality of life with anxiety and depression

The patients were also analyzed by the SF-36 questionnaire. It comprises of 36 items in 8 domains: Physical functioning, Role-physical functioning, bodily pain, general health, vitality, social functioning, role emotional functioning, and mental health.

The SF-36 generates a total score for each domain. The score is transformed into a value on a scale ranging from 0 to 100, where better health status is designated through a higher score value.

We observed that only pain variable was found to be a risk factor for anxiety (table 4), while none of the variables was associated with depression (table 5).

**Table 4.** Association of Quality of life with anxiety

		<b>n</b>	<b>Mean</b>	<b>Std. Deviation</b>	<b>F-test</b>
Age	Normal	61	35.72	9.694	0.987
	Border Line	21	35.15	9.259	p-value=0.374
		7			
	Abnormal	22	36.39	9.197	
	Total	50	35.77	9.285	
		0			
Gender	Normal	61	1.46	.502	0.128
	Border Line	21	1.47	.500	p-value=0.880
		7			
	Abnormal	22	1.45	.498	
	Total	50	1.46	.499	
		0			
Physical functioning	Normal	61	60.98	21.695	4.002
	Border Line	21	54.10	24.234	p-value=0.019
		7			
	Abnormal	22	51.91	20.148	
	Total	50	53.97	22.327	
		0			
Role limitations due to physical health	Normal	61	49.34	25.224	2.077
	Border Line	21	47.32	23.420	p-value=0.126
		7			
	Abnormal	22	43.54	24.309	
	Total	50	45.89	24.093	
		0			
Role limitations due to emotional problems	Normal	61	47.52	28.564	
	Border Line	21	46.87	29.449	1.299
		7			p-value=0.274
	Abnormal	22	43.00	25.902	
	Total	50	45.23	27.833	
		0			
Energy/fatigue	Normal	61	46.72	10.120	0.242
	Border Line	21	45.94	9.411	p-value=0.785
		7			
	Abnormal	22	45.83	8.050	
	Total	50	45.99	8.912	
		0			
Emotional well-being	Normal	61	48.16	9.709	2.102
	Border Line	21	50.67	9.935	p-value=0.123
		7			
	Abnormal	22	49.19	9.729	
	Total	50	49.71	9.839	
		0			

Social functioning	Normal	61	55.10	14.229	2.717 p-value=0.067
	Border Line	21	51.39	13.284	
	Abnormal	22	50.53	13.652	
	Total	50	51.46	13.612	
Pain	Normal	61	54.07	20.036	5.856 p-value= <b>0.003*</b>
	Border Line	21	51.20	18.011	
	Abnormal	22	46.36	18.910	
	Total	50	49.40	18.847	
General health	Normal	61	46.64	9.024	0.335 p-value=0.716
	Border Line	21	47.48	7.677	
	Abnormal	22	47.48	6.856	
	Total	50	47.38	7.496	
Health change	Normal	61	51.07	23.964	0.876 p-value=0.417
	Border Line	21	55.12	21.956	
	Abnormal	22	53.13	23.778	
	Total	50	53.74	23.021	

**Table 5.** Association of Quality of life with depression

		n	Mean	Std. Deviation	F-test
Age	Normal	10	34.82	9.868	0.810 p-value=0.445
	Border Line	23	35.86	9.023	
	Abnormal	15	36.29	9.281	
	Total	50	35.77	9.285	
Gender	Normal	10	1.48	.502	1.540 p-value=0.215
	Border Line	23	1.49	.501	
	Abnormal	15	1.40	.491	
	Total	50	1.46	.499	
Physical functioning	Normal	10	56.87	24.711	1.152 p-value=0.317
	Border Line	23	53.26	21.812	

		8			
	Abnormal	15	53.06	21.338	
		5			
	Total	50	53.97	22.327	
		0			
Role limitations due to physical health	Normal	10	43.60	25.410	0.722
		7			p-value=0.486
	Border Line	23	46.97	23.034	
		8			
	Abnormal	15	45.81	24.788	
		5			
	Total	50	45.89	24.093	
		0			
Role limitations due to emotional problems	Normal	10	43.75	31.006	2.329
		7			p-value=0.098
	Border Line	23	47.97	26.355	
		8			
	Abnormal	15	42.05	27.499	
		5			
	Total	50	45.23	27.833	
		0			
Energy/fatigue	Normal	10	45.84	9.700	0.620
		7			p-value=0.538
	Border Line	23	46.43	8.957	
		8			
	Abnormal	15	45.42	8.276	
		5			
	Total	50	45.99	8.912	
		0			
Emotional well-being	Normal	10	49.82	9.859	0.042
		7			p-value=0.958
	Border Line	23	49.78	10.240	
		8			
	Abnormal	15	49.52	9.237	
		5			
	Total	50	49.71	9.839	
		0			
Social functioning	Normal	10	51.90	14.289	0.308
		7			p-value=0.735
	Border Line	23	50.96	13.362	
		8			
	Abnormal	15	51.93	13.575	
		5			
	Total	50	51.46	13.612	
		0			
Pain	Normal	10	53.22	19.475	2.951
		7			p-value=0.053
	Border Line	23	48.74	19.072	
		8			
	Abnormal	15	47.77	17.795	
		5			
	Total	50	49.40	18.847	
		0			

General health	Normal	10	47.48	8.561	0.489 p-value=0.614
		7			
	Border Line	23	47.05	7.193	
		8			
Health change	Abnormal	15	47.81	7.187	0.172 p-value=0.842
		5			
	Total	50	47.38	7.496	
		0			
Health change	Normal	10	53.04	21.476	0.172 p-value=0.842
		7			
	Border Line	23	54.37	23.380	
		8			
	Abnormal	15	53.26	23.608	
		5			
	Total	50	53.74	23.021	
		0			

#### 4. Discussion

There is various availability of questionnaires which have been developed and validated to evaluate quality of life, data of QoL assessment in patients with RHD is scarce. RHD is a major burden in developing countries like India where it is one of the most common causes of cardiovascular morbidity and mortality in young people (Marijon et al., 2012).

Patients diagnosed with the disease experience severe difficulties due to complications caused by this disease such as atrial fibrillation (Diker et al., 1996), stroke, (Wolf, Abbott, & Kannel, 1991) and consequently often have problems in maintaining normal daily activities.

The present study demonstrated that quality of life in terms of pain and physical functioning was associated with anxiety while depression was not associated with quality of life in the patients with RHD. Patients with chronic RHD had been shown to have intellectual decline (Khalil, Mansour, & Attaia, 1998).

It has been reported that the patients with heart failure experience various physical and emotional symptoms such as dyspnea, fatigue, edema, sleeping difficulties, depression, and chest pain (Zambroski et al., 2005). These symptoms limit patients' daily physical activities and result in poor QOL (Rector, Anand, & Cohn, 2006). Bodily pain is one of the major manifestations of rheumatic fever that lead to sleeping difficulties in patients. Although heart diseases cause a significant impact on physical health from the medical point of view (Guyatt, 1993), most studies on quality of life also reported low scores in the psycho social aspects (DeMaso et al., 2004; Ruo et al., 2003). Adolescents with severe heart disease reported a higher level of anxiety and depression as compared to the age-matched healthy controls (Cohen et al., 2007).

Study on QoL in adults with congenital heart diseases showed that inoperable conditions had a trend towards a poorer quality of life (Varni, Limbers, & Burwinkle, 2007). Lane et al. (2002)

showed that arthritis and RHD negatively affected several sides in QoL, such as the work, and home activities compared to individuals without chronic disease. Regarding cognitive problems, it was observed that individuals with rheumatic fever may exhibit profound reversible cognitive problems, such as poor attention and concentration (Carapetis, 2008).

In our study, QoL was not associated with depression. However, a study suggested that depressed patients with cardiac heart failure (CHF) scored significantly worse than non-depressed patients on all components of Kansas City Cardiomyopathy Questionnaire measuring quality of life. Depressed CHF patients may perceive their quality of life to be lower and to underestimate their functional status.

Depression is less investigated in association with quality of life in cardiac disease (Gottlieb SS et al., 2004). Severity of anxiety has also suggested in the patients with osteoporosis and chronic breathing disorders (Kunik et al., 2005; Martino et al., 2018).

The findings also conclude an association between physical functioning, role physical functioning, bodily pain, general health, vitality, social functioning, role emotional functioning and mental health with anxiety and depression among the RHD patients. Therefore, anxiety and depression may be considered as a co-morbid effect of RHD, especially in economically backward patients. This implies that the patients generally belonging to the middle class or low-income families with RHD are impacted by anxiety and depression. Anxiety and depression in patients with Chronic RHD are therefore inter-related.

The current study had a few limitations as well. We used the English version of the SF36 questionnaire, and more than 90percent of our patients could not understand it and were unable to answer, so we had to take direct interviews afterward.

The data collected was from the patients of north region only, so we didn't know if the different region and environment will have the same effect.

## **5. Conclusion**

RHD is associated with a lower quality of life in patients. Anxiety and depressions in patients with RHD are associated with external and internal conditions. External conditions include work life, personal life, financial issues, and others, while the internal issues include co-morbid health condition and prolonged diseases. Anxiety and depression in patients with Chronic Rheumatic heart disease are inter-related with the quality of life.

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## An Eco-Conscious Awakening - A Socio-Eco-critical Elucidation of Select Indian Poets

Rashmi Maniar & Priya Raghav

### Abstract

In the last few decades, Indian English poets have penned down many a verse pertaining to popular subjects such as social activism, environment, eco-consciousness etc., with censorious compassion and candor. India is home to a rich cultural tradition of deifying each and every element of nature. This oriental view was negated by the occidental view of man's supremacy over nature. The advent and further rise of Christianity created an anthropocentric view of nature which further led to the earth's natural resources being pilfered, pillaged and raided. Not one to be left behind, Indians too, explored, excavated and experimented with its natural resources. This act helped in awakening the consciousness of nature lovers like Dilip Chitre and Vihang Naik to pick up their pens and voice their concerns against impending ecocide of man. They used poetic techniques and expression in such a manner so as to create awareness amongst the readers about the actual endangerment of community life. Both Chitre and Naik's approach in this direction, lies in the usage of satire heavily layered with cynicism, in their verse. The readers readily empathize and sympathize with the poet's pain of denuding nature. Thus, they project human responsibility towards caring for and protecting the environment. This paper is an endeavour to showcase the perceptions of these two poets on how they resist and raise the green movement to a level where it awakens eco-consciousness in the society through their poems "The Felling of the Banyan Tree" and "The Banyan City".

**Keywords:** Eco-criticism, Nature, Human, Anthropocentrism, Eco-consciousness

**Introduction:**

I didn't heed, I don't heed and I won't heed....  
The painful cry of the fish in the oil filled ocean  
The angry outbursts of nature when trees are cut  
The trembling of the ground when mines are dug  
The sudden silence of the chirp of the sparrow killed midflight  
The towering, irate waves resounding sworn vengeance  
The cloudy black sky, hurt, due to the loss of her beauty  
I didn't heed, I don't heed and I won't heed....  
But today,  
You, Corona, dumb than the dumbest of creatures  
Have brought me to my knees....  
'Me', the cleverest of all the clever creatures  
I don't know where to run, to hide, to save myself and my loved ones  
I don't know how to stop your roller coaster ride  
Oh! Corona, please stop  
You, oh tiny one! Have humbled the giant!  
I promise to heed, to love, to care, to have compassion  
I promise to leave the Earth 'safe', for my children  
For, it's our only HOME that we know of.

Today, when this tiny bug has heeled the world and brought it to a standstill, it becomes imperative for all of us to retrospect. In this forced period of cooling our heels and slowing down, let's all recollect our past deeds, act by act, scene by scene, that has helped in inching forward towards doomsday. Something which began with foraging for food went on with ruthlessly violating Mother Nature for our greed. These deeds or rather misdeeds have brought us to the brink of disaster. Our anthropocentric attitude of dominating nature has thus led to a new theory of reading nature writing in the last decade of the nineteenth century, known as Eco-criticism.

## Origin of Eco-criticism

Eco-criticism is a comparatively new literary field which emerged in 1990, it traces its origin to environmental degradation by human activities and investigates, interprets man's relation with the nature as presented in literature. It is an interdisciplinary study of interconnections between nature and culture; it examines relation between writers, texts and the ecosphere. The word 'ecology' has been derived from the Greek root 'oikos', means 'house' and 'logos' means 'study of', so 'ecology' is the study of the house/home or relationship between organisms and the environment. Thus, Eco-criticism is the criticism of 'house' or the environment, as represented in literature. In the mid-eighties, scholars began to embark on collaborative projects in the field of environmental literary studies; also, several annual literary conferences started adding sessions on nature writing or environmental literature to their program. At the annual meeting of the Western Literature Association, a new Association for Study of Literature and Environment (ASLE) was formed in 1992, with the mission: "to promote the exchange of ideas and information pertaining to literature that considers the relationship between human beings and the natural world" and to encourage "new nature writing, traditional and innovative scholarly approaches to environmental literature, and interdisciplinary environmental research." This then, is the origin of eco-criticism.

The credit of coining the term 'Eco-criticism' goes to William Rueckert, while, it was Cheryl Glotfelty who worked towards introducing this movement to most literary critics. Glotfelty's persistent efforts to include Eco-criticism in the family of literary studies finally bore fruit at the Western Literature Association meeting in 1989 (Dorbrin & Weisser, 2002, p. 569) The term 'eco-criticism' was coined by William Rueckert in 1978, in his essay "Literature and Ecology: An Experiment in Ecocriticism" where he says that eco-criticism entails "application of ecology and ecological concepts to the study of literature" (Glotfelty and Fromm xx). He calls upon each individual to become conscientious planet stewards and engage in creative and cooperative activities to shoulder the responsibility of the entire

biosphere, but, a question arises how? The answer lies in turning to the poets and then to ecologists so as to formulate ecological poetics which will help in promoting an ecological vision. An ecological vision will help merge all political, social economic and technological boundaries and thus radicalize them. Rueckert says, 'Poems are energy pathways that sustain life...properly understood, poems can be studied as models for energy flow, community building and ecosystem ... Poems are green plants among us...green plants are nature's poets'.

Thus, turning to these nature's poets who in turn have inspired many a poet to turn to verse in glorifying and deifying nature, this paper tries to eco-critically elucidate the poems of two Indian poets who are bilingual i.e. they write in their mother-tongue and in English. Through their poetry, Dilip Chitre and Vihang A. Naik endeavor to portray the coexisting relationship between man and nature and their attitudes and reactions to each other. Their perceptions and perspectives are similar to the point that both of them lay emphasis on the preservation of environmentalism and try to impart or inculcate values amongst the readers to respect and revere nature.

### **Social Ecology**

Social ecology is a theory associated with Murray Bookchin. Early in the 1960s, even before Rachel Carson's 'Silent Spring' was published, Bookchin's book, "Our Synthetic Environment" was published on the theme of humanity's collision course with the natural world and the effects of urbanization on human life. In his book, "The Ecology of Freedom"<sup>1</sup> he maintains a connection between ecological and social issues, he argues that social domination between humans is the principal cause for human domination and further destruction of nature. Bookchin's social ecology proposes "ethical principles for replacing a society's propensity for hierarchy and domination with that of democracy and freedom".<sup>[2]</sup> A critique of prevailing socio-political and anti-ecological attitudes, social ecology presents a reconstructive, ecological, communitarian and ethical approach to society. In this paper I shall

attempt to uncover the ecological consciousness reflected in the poems of Vihang A. Naik and Dilip Chitre.

### **'Nature' in Dilip Chitre's poetry**

There is a whole tree within a seed  
And a seed at the end of each tree  
That is how it is between you and me  
One contains the Other.

"Says Tuka" (Penguin Classic) – translated by Dilip Chitre from Saint Tukaram's bhakti poetry.

This abhang is the most appropriate description of the multi faceted Dilip Purshottam Chitre. He was an acclaimed poet, painter, fiction writer, translator etc., whose reputation overshadowed his demise in 2009. He wore all the hats with equipoise, doing justice to each field. He was a prolific poet in Marathi and English who started placing his thoughts into verse at a young age of fourteen. For him, poetry was like a survival kit in the dangerous journey through life. He embarked upon his literary career with his work in a Marathi magazine. Arun Kolatkar, Ramesh Samarth and Chitre created a magazine entirely devoted to poetry.

His Marathi collections are: Kavita (1960), Kavitenantarchya Kavita (1978), Ekoon Kavita that was published in three successive volumes. He has also published poems in English as: Ambulance Ride (1972), Travelling in a Cage (1980), The Mountain (1998), No Moon Monday On The River Karha (2000), Postclimactic Love Poem (2005), and As Is, Where Is (2007). His poetry consists of simple words used sparsely to create beautiful imagery which fills the mind of the readers with pictures. His awards speak of a distinguished and esteemed career.

His poems contain the angst of urbanization, ill effects of technological development, progress in science, deforestation etc., For him society is a 'wretched hill' / '*bhunda tekkad*'. In his Marathi book entitled *Satthottari Marathi Kavita Va Kavi* (1997), R. G. Jadhav, the well known Marathi critic, makes a comment on the symbol of the 'wretched hill' used for society by Dilip Chitre and provides an elaborate assessment of Chitre's Marathi poems in the context of ecological enlightenment of the post 1960s. B. S. Magade, in his Research Paper entitled "Dilip Chitre's Poetry: Through a Green Lens" (2009), has examined Chitre's English poetry in terms of an ecocritical perspective. His deep feeling for nature and ecological concern is evident in his poem "The Felling of the Banyan tree."

### **Eco-criticism and "The Felling of the Banyan Tree"**

"The Felling of the Banyan Tree", is an autobiographical poem where Dilip Chitre has used the banyan tree as a metaphor for a major upheaval in his life. The poet's father decides to uproot the poet from his surroundings, in Baroda, and migrate to the industrial city of Mumbai. The poem expresses feelings of alienation and isolation of man due to his estrangement from nature (or his surroundings).

Eco-critically viewing the poem, the poet symbolizes his father as the exploiter with an anthropocentric attitude of manipulating nature. The poem is composed in three stanzas. While the first stanza describes the relationship between Nature and the Feminine Vs Masculine world, the second stanza portrays the attack on Nature; the third stanza describes the consequences of deforestation on the animals and birds. It talks about the narrator's house situated on a hill surrounded by houses which have been vacated by the tenants and subsequently destroyed, on his father's behest. What remains now, is the narrator's house and many trees atop the hill. The father decides to cut all the trees, including the huge banyan tree which is nearly two hundred years old. The poet's father signifies the masculine attitude of dominance, destruction and moving forward towards modernism as compared to the grandmother's feminine traits of conservation, religious, nurturing and strong belief

in our ancient values and traditions. She raises her voice against the assault on nature due to modernization. This conforms to the poet's eco-feministic view that while man is the guardian of culture, woman is the guardian of nature. Just as humans dominate nature, men dominate women as is seen in the poem, the poet's father did not heed the grandmother's advice. Vandana Shiva has very succinctly opined, "Indian women have been at the forefront of ecological struggles to conserve forests, land and water. They have challenged the western concept of nature as an object of exploitation and have protected her as Prakriti, the living force that supports life."

In the first two lines, the poet has used the word "house" instead of "home", to imply the temporary nature of human stay on earth. The conflict between the older generation represented by the grandmother and the new generation represented by the father is clearly evident in the poem. The grandmother maintains sanctity of nature, she vehemently opposes the callous chopping of trees as it is a 'crime' yet, the father adamantly 'massacred' them 'one by one'. The poet's usage of words like 'demolished', 'massacred' vividly paints a scene of destruction in the reader's psyche. All types of trees were cut down 'but the huge banyan tree stood like a problem' whose roots lay deep in the soil. Our ancient, deep rooted values of respecting nature is metaphorically shown as a problem by the poet, in the father's blind rush towards urbanization. Right from the Vedic period, we have a rich history of deifying, glorifying, worshipping and caring for each and every element of nature. The deep rootedness of the banyan tree is compared to the poet's attachment to his house or grandmother's attachment to nature which is inversely proportional to the father's attachment to the land. The father's greed for his cruel technological assault on nature overpowers his grandmother's need to preserve nature. The poet displays a socio-ecological perspective of the grandmother's helplessness in saving her sacred trees from the father's act of chopping them away, may be for economic gain.

The poet describes the banyan tree using many numbers (fifty feet, thirty feet....) to explain the height and width of the gigantic tree. To paint a true picture of its magnificence, the poet says that it took many days and a number of men to cut the tree. The tree was an ecological haven for the insects and birds that began to leave in despair when men attacked innocent nature with their axes and reduced it to a "huge heap". This scene haunts the poet in his dreams even after shifting to Bombay, a land of technology, where trees are found only in the subconscious mind.

### **'Nature' in Naik's poetry**

According to Wordsworth poetry is "spontaneous overflow of powerful feelings: it takes its origin from emotion recollected in tranquility. ...". For Vihang A. Naik, poetry is a "fusion of thought and feeling". Poetry is an excellent way to express one's inner most feelings in the form of verse. His poetry is a fine amalgamation of his view of life and keen observation and deep study of the relationship between man and nature. Taking an eco-sociological perspective, his poetry deals with the effects of urbanization on nature and how it helps man find his true identity in a techno cultural society. Thus, his poetry is a dialogue between man's external self and inward soul in a modern society. When a poet uses his pen to take the readers on a fascinating exploration of human consciousness through the rich experience of the trials and tribulations, success and failures that he himself has faced, he surely strikes a deep chord with his readers and the verse remains in their hearts and minds for eternity. Vihang A. Naik is one such poet who has achieved this remarkable feat and is held in high esteem for his poetic excellence. At times, he uses his poetry as a medium to portray a realistic outlook of society and its norms through multiple perceptions. His expertise lies in sparsely using simple words to expose elementary feelings of the human mind and paint a satirical picture of society. A distinct pursuit of spiritual and physical freedom combined with an intense desire for creation is the central theme of his poetry.

Vihang Naik is a well known post modernist poet devoted to Indian literature. His poetry depicts the unjustified misuse and abuse of our natural resources due to the growing industrialization. His four collection of poetry includes 'Poetry Manifesto: new and selected poems' (2010), 'Making a Poem' (2004), 'City Times and other poems' (1993). His Gujarati collections of poems are entitled as 'Jeevangeet' published in the year 2001. His poems are his mouthpiece to shake the natural consciousness of human beings to get up and work towards the preservation of natural resources because their activities have brought our ecosystem to a verge of near destruction. In 1998, he was awarded the Michael Madhusudan award for poetry. In this context, the present paper attempts to offer a critical evaluation of Vihang A. Naik's "A Banyan City" from his poetry collections. The main focus is upon the poet's perception and appeal to humans to go back to nature and appreciate all that it offers.

### **Eco-criticism and "The Banyan City"**

We, humans, are the most intelligent and an integral link of the ecological cycle and thus it is our moral responsibility to care for the environment. But, for centuries we have been repaying the generosity of Mother Nature by destroying her natural beauty, by replacing her beautiful forests full of flora and fauna with concrete jungles. We have become sworn enemies of the environment in general and humanity in particular. Our quest for more and more modern comforts, our insatiable thirst for knowledge, our hunger to lead an everlastingly happy life has led to the direct or indirect destruction of elements of Nature. Vihang Naik's poetry is a true representation of this destruction and stresses on the importance of natural conservation. The poem, "The Banyan City" thus speaks on themes of urbanization, death and rebirth. The poet uses a simple, sober and restrained tone and takes his readers into confidence to create a bond with them. Naik uses an extended metaphor and parallel imagery to compare a city with an old banyan tree. Brevity of words is the poet's trademark and he uses it to create vivid images which create a turmoil in

the minds of the readers regarding the 'hacking' of the tree and the after effects of modernization.

The poem begins with the seemingly innocuous statement that it is difficult to uproot a banyan tree, these lines are followed by sudden violence with "chop or hack" in the fourth line. The poem is composed so as to bring about the suddenness of the action; the usage of enjambment vividly portrays the speed of the act needed to uproot the banyan tree. The lines that follow slacken the speed of the poem and take the readers back about a hundred years in time. The tree metaphorically relates to the history of the poet's native city. The tree as well as the city have become old and lost their splendor. The visual image created by the alliteration "withered/wrinkled/weather-beaten" shows effect of time and the elements of nature on both.

The ill-effects of urbanization are enunciated when a river (probably next to the banyan tree) turns into a gutter, the open spaces are filled with 'humming' vehicles due to which the personified city 'mumble'. The city is bursting at its seams; it groans and grumbles at the atrocities against her. This is the cost of man's greed for comfort and luxury under the guise of modernization, which nature has paid. Fertile, green, light-breathing lungs of rural land have been converted into sterile, brown, heavy breathing modern cities. The poet forcefully shakes the consciousness of the reader, 'the city dweller' by addressing him directly with the pronoun "you". The word 'traffic' relates to the vehicular volume in the city as well as the immense noise traffic in the world. In the seventh stanza the poem is placed in a specific location at the National Highway in the city of Vadodara. It is here that Naik describes how the banyan tree from the first stanza has disappeared, "you can no longer ... crossroad."

The death of the tree metaphorically implies to the end of the city itself. The poem ends on an optimistic note that over a period of time, the roots will come alive again

and so will the city. As an eco-socialist Naik, portrays the collective experience of hordes of humans who suffer due to converting green fields into sterile cities.

## **Conclusion**

After illustrating the poems in the light of eco-criticism, lastly, I would like to briefly compare them. Both, Dilip Chitre and Vihang Naik are products of modern age. It is natural that they have witnessed denudation of forests, technological development, urbanization, progress in science and its effects on both-Nature and human beings. Their perceptions and perspectives are similar in the beginning, yet, difference is seen in the way they observe the future. Both the poets wax eloquently on the grandeur of nature and emphasize on its conservation and preservation, at the same time, their main focus is on simple way of living. They gently coax and cajole the reader to shift their focus from marginalized Nature to nudging it towards the center of their lifestyle.

Eco-feminism views the connection between women and their natural ecosphere. Chitre as an eco-feminist raises his voice on the oppression of both women and Nature under a dominant patriarchal society. Chitre's grandmother strongly resists denudation of land in the name of modernization but his father goes ahead with his plan of exploitation and uproots the centuries old Banyan tree. Whenever women act against ecological destruction there is an equal and opposite reaction of patriarchal oppression to silence them. Woman's adherence to her ancient culture, her environmental ethics proves her loyalty to future generations and to life on planet Earth. Naturally, man's chauvinist attitude forces him to subdue and suppress these feminist ideals in the same manner that the father acted against the grandmother's wishes. Chitre's poem begins with a call to raise the eco-consciousness of the society and lend their voice for ethical environmentalism. He tries to show the way in which human being adapts and integrates according to the demands of his race and exploits Nature. On the other hand, Naik is more likely an eco-socialist, ready to

start environmental justice movements, for, his poems portray collective experience, ignoring individual suffering, by criticizing anthropocentric attitude of humans.

Both the poems portray not only the romantic and pastoral outlook towards nature but also the deterioration of nature. Chitre ends the poem on a pessimistic note of moving away from Baroda to Bombay- a concrete jungle, where trees are found 'only' in dreams. A tone of abject desolation and hopelessness marks the end of the poet's hopes and aspirations for a revival of eco-consciousness in the human psyche. On the other hand, Naik ends on a very hope filling, optimistic note which gives a message of rebirth- rebirth of a city, rebirth of human consciousness, rebirth of eco-consciousness!!!

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# ROLE OF SOCIAL NETWORKING SITES IN TEACHING AND LEARNING: AN INNOVATIVE APPRAISAL

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## **Abstract**

*Web based Social Networking Sites have increased in recent years. Several books and articles have been written from the past twenty years on the area of the subject using Social Networking Sites (SNSs) in different fields of study. On the other hand, in the area of experimental and applied linguistics, in common, and particularly in second language teaching (SLT), the value of SNSs seems to have been an untouched area of investigation. In this paper, an effort is being made to develop our understanding on the subject of the execution and implementation of latest technologies such as Social Networking Sites (SNSs) and second language teaching (SLT). This understanding will provide a room for investigation on the issues, which has been generally ignored in the field of English Language Teaching (ELT). The issue possibly might signify a considerable challenge not only for emerging and developing cities including Jammu and Kashmir, but for other state's around the Country. To put it in a different way, using Social Networking Sites could provide a vital importance in enhancing second language teaching programs of both emerged and emerging countries.*

**Keywords:** *Innovative technology, Second language teaching (SLT), Social networking sites (SNSs)*

## **Introduction**

Recently, there has been an escalating interest in the application of innovative technology to deal with the challenges in second language teaching and learning. Pollock (2007) believed that in order to be successful teachers and educators, they need to incorporate different learning tools keeping in mind the effective teaching methods that are

already in use. Another straightforward explanation of the term by Boyd and Ellison (2008), Social Networking Sites are defined as

Web-based services that allow individuals to (1) construct a public or semipublic profile within a bounded system, (2) articulate a list of other users with whom they share a connection, and (3) view and traverse their list of connections and those made by others within the system. The nature and nomenclature of these connections may vary from site to site. (p. 211)

Science and technology are continuously advancing. Online tutoring and technology incorporated education are now vital. The educator's should acquire some of the qualities while training his/her students. The educator's individuality, approach, skillfully handling teaching materials, capability in answering students' questions and aptitude to teach by means of techniques instills attention among students. However, there remains a relative dearth of research regarding the instructors' experiences of using social media in their teaching. Furthermore, little detailed attention seems to have been paid to the role of Social Networking Sites (henceforward SNSs) in second language teacher education programs in metropolitan states, including the state of Jammu and Kashmir. To encounter with this situation to fill in and to account for, in this research paper, an effort is being made for the usage of Social Networking Sites in Second Language Teaching (SLT). It's no secret that most of students & teachers have smart Mobile Phones and are using social networking sites for educational purpose. In context to that, there are applications that suggest social media in an educational context. By the variety of social media platforms efforts are being made to support the learning and development by which the quality of teaching will be increased abruptly. The study tells that making social networking sites (SNSs) as a part of conventional teaching, will attract students and can motivate them in E- learning process.

## **SOCIAL NETWORKING SITES (SNSs) AND TEACHING**

It has been verified and experimented that in the field of psychology and linguistics the practice of the stored information or the human mind vocabulary is resolved by the psychosomatic state of the receiver. This idea was also supported by the Aristotle's Greek philosophy which emphasizes on the theory of knowledge that some form of entertainment should be used while delivering the lessons. So as far as I am concerned I think that these Social Networking sites (SNSs) will be helpful in generating a revolution in the field of education, provided we should have the ability to meet the requirements of Science and Knowledge. In general, the Social Networking sites (SNSs) focuses on building online resource for the common interest of the communities and provides them with the tools that help them to do so. Social Networking sites (SNSs) led to attract people towards E-Learning and the researchers

carrying out the study examined this phenomenon and clarified the reason behind the attraction towards the innovative mode of learning in classrooms. Now we can observe from the previous studies that the social networking sites will play a main role in developing and improving education both at the level of the teachers or students.

### **Implementation of Innovative Uses of (SNSs) in Teacher Education**

Generally speaking, “social media are technologies that smooth the progress of social interface, make possible relationship, and enable thoughtfulness across stakeholders. These technologies include media (text, photo, audio, video), blogs, wiki, networking platforms (including Whatsapp, Facebook), and other virtual worlds” (Bryer & Zavatarro, 2011). The diversification in the field of technology has become much more important and open to innovation on the part of educationalist (i.e., practitioners in training and teaching) (Kukulka-hulme & Pettit, 2009). In this regard, some of the important Social Networking technologies are given below for educators and stakeholders.

1. Blogging with the help of Mobile.
2. Mobile Messaging (instant-messaging).
3. Wikis (modifiable collaborative web pages).
4. Video conferencing (Simulated Face-Face communication).
5. Podcasting (Web based Broadcast)
6. Vodcasting (video podcast over web broadcast)
7. Electronic teaching sites.
8. Virtual classroom & staffroom.
9. Virtual Blackboard or Projector.
10. Multimedia consulting organizations.
11. Lecture on demand (LoD)
12. Online testing system.

### **Objectives Obtained from the above innovative platforms**

In the field of education, social-networking sites offer a student the opportunity to connect with other students, educators, administrators, alumni, both within and outside his current institution. Scholars praise social-networking tools for their capability to attract, motivate and engage students in meaningful communicative

practice, content exchange, and collaboration (N.Mills, 2011). Some of the objectives obtained from these platforms are as under.

1. Vocabulary is enriched in both educators and learners.
2. Students' computational skill can be improved.
3. Reading skill Improvement.
4. Speaking skill Improvement.
5. Listening skill Improvement.
6. Accent & pronunciation Improvement.
7. Development of appropriate use of selective lexis.

### **Conclusion**

The aim of this research paper was to focus on the necessity of latest applications of Social Networking Sites in teaching at various levels. This paper also focuses on the issues in respect of the utility of Social Networking Sites (SNSs) in teacher education and English language teaching, Social Networking Sites (SNSs) for the development of professional teaching, the value of modern innovative uses of (SNSs) in teacher education (e.g., podcasting, vodcasting, blogs, messaging, etc.), skills and methodological concerns are also touched in this paper.

In view of the previous discussions in this paper, it is not difficult to understand the importance of innovative technologies in education and English Language Teaching. On the other hand, one might be on the finding's that with the utilization of the innovative technologies in programs like second language teacher education and learning is a challenging factor for teachers & educators. Kukulska Hulme (2008) are of the view that,

the main obstacle in the implementation and integration of innovative technologies in teaching and learning programs pertains to "lack of personal experience of mobile learning on the part of those involved in teaching" (p. 9) and also the people who are responsible for the "preparation of distance learning materials and resources, and more generally, those who devise programs, courses, and methods of supporting learners" (p. 9).

In this regard many teachers, educators and syllabus designers are bound to consider the application, integration and implementation of latest innovative technologies in various teaching programs in order to regulate the teachers' line of work and occupations. In short, using latest and modern methodologies in the classroom will provide learners the congenial and positive way of learning language meaningfully. Students will be able to understand the significance of learning second language without any panic and this will help them to endow with the influence of self-confidence and accomplishment. Thus this remains very exciting and promising area of academic research justifying the scope of further assessment and investigation. In view of the facts and discussions, further vital investigations are requisite to carry on the opinions made in this paper revealing and opening up some new opportunities of research.

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**TRAINING AND DEVELOPMENT AND ITS IMPACT EMPLOYEE AND ORGANIZATIONAL PERFORMANCE: A REVIEW**

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There is no question that multinational organisations are aiming to attain excellence and outpower others in the same field. To achieve this, organisations must successfully acquire and use their human resources. Organizations must be more conscious of their human resources in a practical way. Training has a positive influence on employee work results. Training is a driving force that strengthen the workers' competence in their work and improve their capacity to achieve positive performance. Training is often seen as a valuable way for grappling with technical innovation-fostered changes; business competitiveness, corporate structure and, most significantly, employee success play a vital part. This paper analyses the relation amid the effect of training on employee efficiency and performance.

**Keywords:** Training, Development, Employee, Performance, Human Resource

**Introduction**

Organizations are experiencing intensified competitiveness due to globalisation, technical developments, political and economic conditions (Evans, Pucik & Barsoux 2002) so that they can train their workers to brace themselves to respond and develop their efficiency to the above rise. The recent proof of awareness development in the business environment over the last decade can not be overlooked. It is significant this development was brought on not only by technical changes or variations of output variables, but also growing attempts to enhance organisation's human capital.

Human resources in this era of globalisation have been a strategic weapon for sustainable competitive advantages. The distinction between a successful business versus a good organisation is human resources. The human resource is the foundation of any company, it is also the organisation's primary capital. The distinction between financial resources and a successful business is human capital. Training and development was an essential task for the administration of HRM and efficient utilisation of human resources. An investment in an organisation's human resources, both immediate and long-term profits, is successful training and development.

Training is a crucial factor in enhancing efficiency and can strengthen human and organisational abilities. Training is critical to open up the future prospects for growth and advancement and gain a competitive advantage. Training systems allow staff to understand more about modern technologies and acquire robust competencies and expertise such that recently designed technological equipment can perform the tasks and fundamentals. Training encourages capability upgrades and contributes to enhanced engagement, wellbeing and sense of membership, which directly strengthens the competitiveness of company.

Therefore, the obligation for enhancing employee efficiency of any company is definitely one of the key measures that most organisations ought to do. Training and development is definitely one of the main steps. As is clear, workers are a vital resource, the commitment of employees in order to sustain productive efficiency must be optimised. This also allows managers to have sufficient personnel who are physically and socially qualified and willing to establish their professional careers in divisions or managerial roles (Afshan, Sobia, Kamran & Nasir 2012, 646)

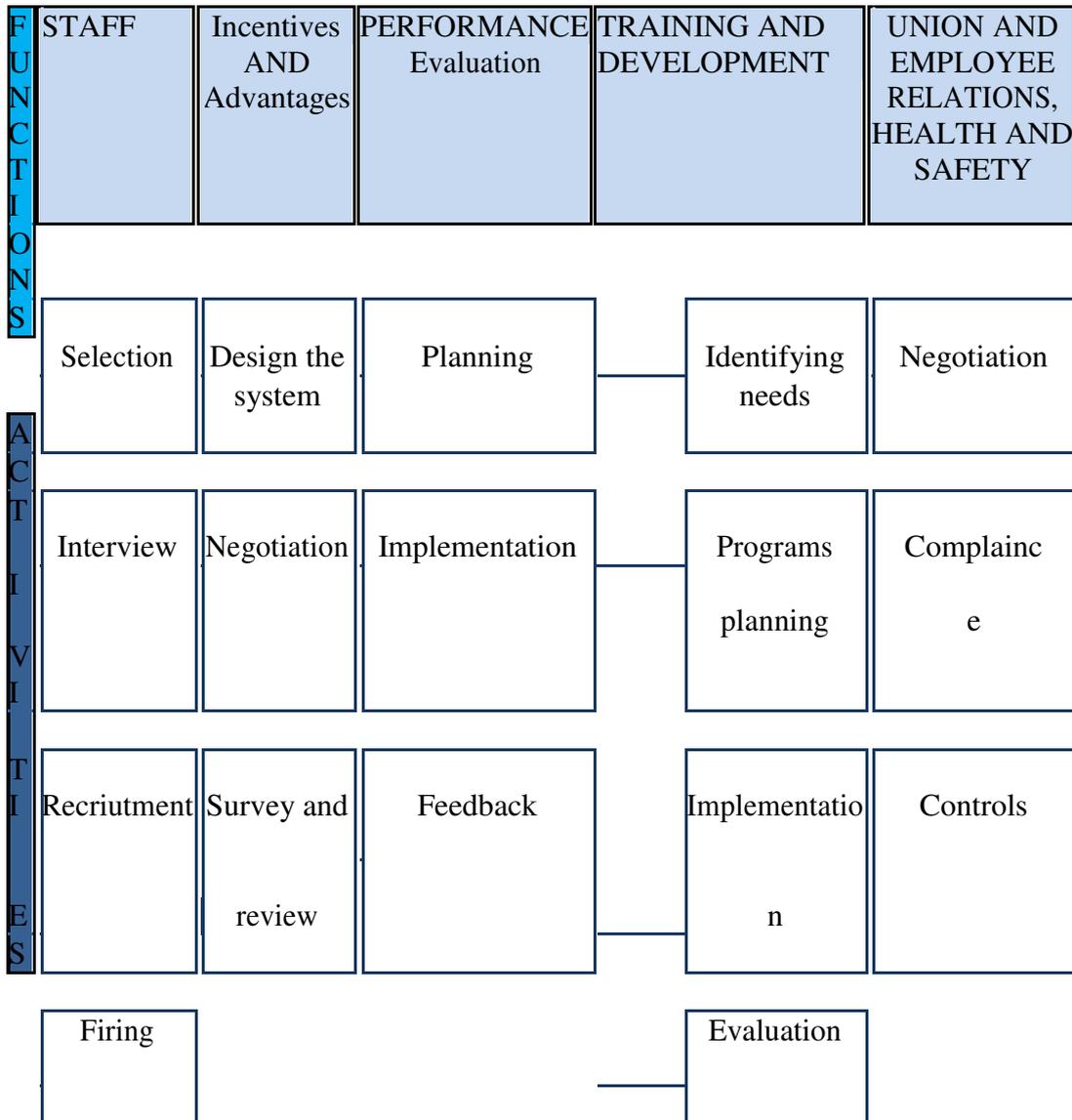
Training has the main function in enhancing workers' abilities to carry out existing and potential activities. Training allows you to alter things such as technologies and competitiveness. Training is, beyond a doubt, essential for an organisation in many things. Training is historically described as the mechanism by which persons adjust their abilities, expertise, attitudes and/or actions.

**Objective**

This study is intended to know the impact of training on employee performance on their jobs.

**Human Resource Management**

The management of human resources includes maintaining the human resources required by a company and ensuring that human resources are gained and retained in order to support the vision, policy and priorities of the organisation. In other terms, the emphasis of HRM is on the securing, management and use of an productive workforce, which companies demand for their short and long-term business survival. HRM main roles Briscoe (1995) are staff, training and development, performance evaluation, incentives and advantages and essentially the health and safety and employee relations.



**Training and Development**

Several variables included in these studies include: quality / quantity of jobs, preparation / organisation, effort / engagement, collaboration / co-operation and contact about the gaps in the employee output prior to and after training (Paat and Rumokoy, 2015). The findings of their analysis demonstrated the substantial gap in employee efficiency before and after training in quality / quantity

of jobs, plan / organisation, initiative / commitment, coordination and communication. One of the valuable systems for enhancing employee efficiency is the training programme. Management could also increase the quality of the training and expand the diversity of the training programme content and module (Paat & Rumokoy, 2015).

Falola 's (2014 ) explored the efficacy of training and development in Nigerian banking in terms of employee success and company competitive advantage. Descriptive study approaches were used by two hundred and twenty three accurate questionnaire, conducted using basic random sampling techniques by selected banks in the State of Lagos in the South-West of Nigeria. The collected data was evaluated in order to represent the raw data substantially using descriptive statistics. The findings revealed that there is a clear correlation between education and growth, success and competitive gain for employees. The results reveal that the tested dependent variable and independent construction have a close relationship.

Adeniji et al (2012) In the surveys of librarians in such Institutions, researchers showed that the quality or lack of a training programme depended strongly on the form of education offered by workers and the training they gained.

The effect of training on employee efficiency was evaluated in Bin Atan et al , ( 2015). The study was performed in a small and medium-sized (SME) Malaysian business. The research looked at the preparation element which had an effect on the success of company employees. The functional field of the organisation chosen for the research has also been analysed and involves preparation and staff success in the successful human resources management practises. A questionnaire was used to engage openly in the study by 85 workers of the respective development units of the company. Study results found that an essential association existed between productive training and the job performance of workers.

By an applied study model integrating the main factors which have been demonstrated in current literature with training transitions and also by evaluating the connexion between the transition of training and organisational results, the medium to long-term consequences of training programmes for companies were examined by Diamantidis and Chatzoglou (2014). The research involved the nature of preparation, self-sustainability and working conditions of trainees. Applying the Structural Equation Simulation method to data from 126 workers who have worked in a variety of Greek organisations, the test is accurate. The findings show the greatest influence on post-training work success and self-efficacy and after-training actions of trainees while the training curriculum is planned.

Al-Awawdeh (2011) carried out an analysis aiming primarily at statistically examining the connection between training policy and employee efficiency. The aim of this research was to evaluate the possible impact of staff performance found in the theoretical part of the study. Single regression method; SPSS were used to assess individual modules; training framework; training system, training and obstructions. Out of 651 staff members from the Al-Bayt University, a sample of 120 were selected. The findings revealed statistically significant impacts on output of all independent variables; the influence on morality was statistically significant. The transaction results of the two independent output variables were also positive. The research exposed the need for scientific approaches that will assess employees' training needs and that training systems are structured to concentrate on the practise and function to overcome challenges in the workplace. The Study guidelines included designing educational programmes in the face of global trends to give trainees training opportunities to deal with shifts in the environment which includes retraining from time to time.

### **Benefits of training**

Training strives primarily to develop awareness, expertise and behaviours in relation to job assignments and to enhance them. It is one of the most powerful motivators that can help both people and organisations on a temporary and long-term basis. With preparation, there are so many advantages. The following was summarised by Cole (2002):

1) Strong morals – trusted and inspired workers earned training;

- 2) Reduced manufacturing costs – training reduces the risks of efficient, more cost-effective usage of products and facilities in order to minimise and prevent waste;
- e3) Lesser turnover – preparation offers a feeling of protection at the office, minimising labour sales and avoiding absenteeism.
- 4) Change Management – preparation promotes change management by the staff awareness and interest in the change phase and also offers the knowledge and skills required for adjusting to different situations;
- 5) To include visibility, improved transparency and expanded compensation and advancement opportunities;
- 6) Support to maximise employee quality and availability.

### **Training and development methods**

Nadler (1984) stated that all practises relating to human resource growth are intended to enhance the individual's work efficiency, trainee new talents for new employment and new roles in the future and generally increase individuals and organisations in order to accomplish the present and future goals of the organisation. There are two ways in which organisations may opt to prepare and improve their staff's skills. This is on-the-job preparation given to corporate workers when doing their daily jobs at the same workplaces and off-work training allows employees to get away from their normal work atmosphere. Examples of work-related formation involve career rotations and transitions, coaching and/or mentoring, but are not constrained. Off-the-job preparation scenarios, on the other hand, include workshops, role playing, among several others, as detailed below.

Armstrong (1995) suggests that training on the job can be a teaching or coaching on the desk or at the table by more qualified persons or instructors. Various companies, for example, are encouraged to use various teaching strategies, (1) according to the policy, the objectives and the appropriate resources of the institution, (2) based on the requirements defined at the time and (3) according to the target population to be trained which may include, inter alia, particular staff, associations, teams, divisions or the whole organisation.

### **Effect of training on performance**

There are a lot of factors that influence organisation's success and development in the modern world. In view of present study, training for workers plays an important role in maximising efficiency and competitiveness in the growth of organisations. This ensures the companies are well positioned to compete and remain at the top. This also suggests that there is a substantial gap between the companies that train their workers and others that do not. Existing research indicates that there are clear impacts on job success in training and growth. In specific, several researchers have analysed employee efficiency (Purcell, Kinnie & Hutchinson 2003; Harrison 2000), while others have generalised to a general viewpoint on corporate performance (Swart et al. 2005). Both of these are associated in the way that the success of workers relies on organisational performance when employee performance affects overall organisational performance. Wright & Geroy (2001) states that the capabilities of workers change with successful training systems. In this sense. Therefore, it not only boosts employee's average efficiency in order to fulfil their existing roles successfully, it also raises workers' expertise and abilities, and thereby leads to greater corporate efficiencies.

Interesting results have been made on this partnership in the field of previous studies on training and employee performance. Training has shown a positive effect on success by improving awareness, talents, skills, abilities, maturity and actions for the employee and the business (Appiah, 2010; Harrison, 2000). (Appiano, 2014). Furthermore, other research by Swart et al. (2005) for example, analyse training to overcome ability deficiencies and competence gaps in order to enhance employee performance. The bridging of the performance gap is a relevant training technique for the acquisition of special abilities and skills of the workers and enhancement of their performance, according to Schwart et al., (2005). He expanded the idea further and claimed that creation allows organisations to understand that their employees do not perform well and therefore thus their expertise, abilities and

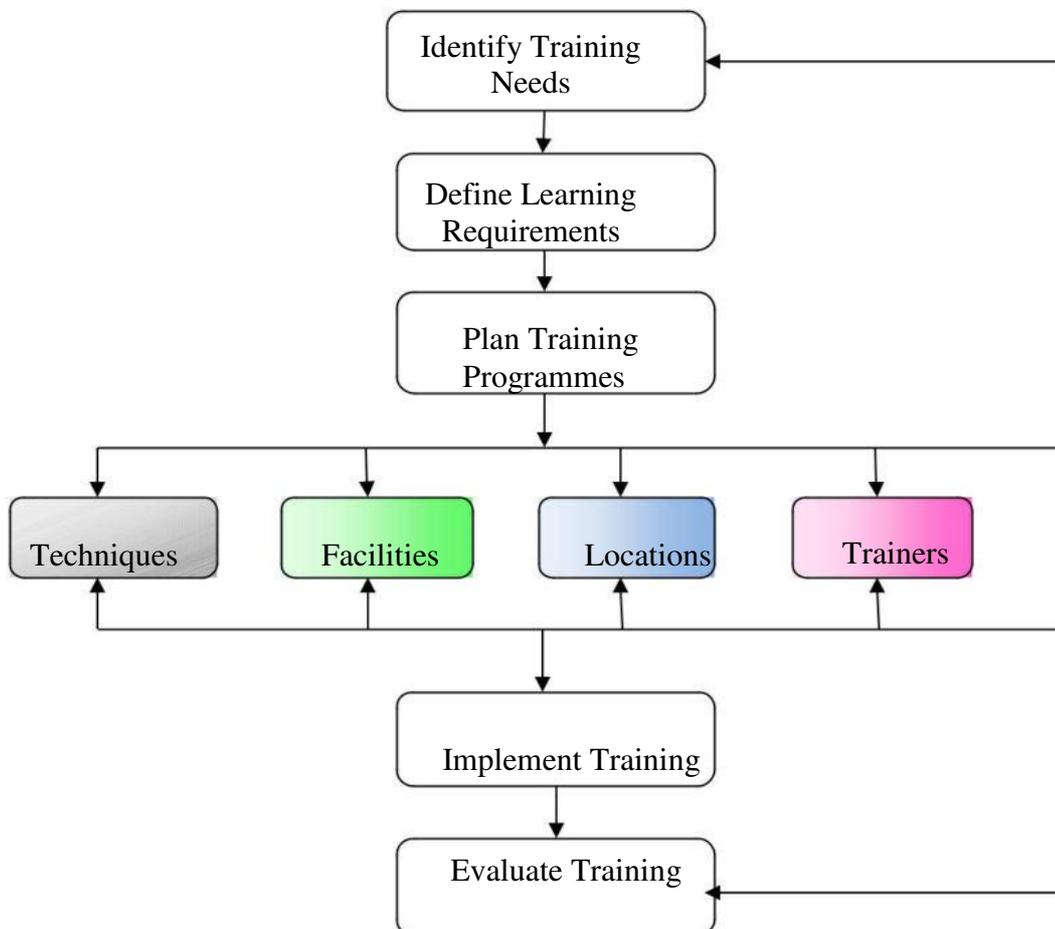
behaviours ought to be tailored to the firm's needs. It is often the case when workers have any information regarding multiple jobs. However this is not enough and workers need to respond regularly to new work performance criteria. In other terms, companies require quality preparation and staff engagement policies, and thus should not have to wait for qualifications and failures to arise.

The capabilities of workers change through successful training programmes, according to Wright & Geroy (2001). It not only boosts employees' cumulative efficiency to successfully fulfil the current work, but also enhances employees' expertise, abilities and mindset, thereby leading to higher organisation. Via training, employee skills are built and empowered to execute the role successfully and accomplish firm targets competitively. In addition, concerns of frustration, absentness and attrition may be significantly minimised where workers are so well trained that their success and expertise can be guided toward their innate strengths (Pigors & Myers 1989).

When training is scheduled, much of the gains from training will quickly be accomplished. So the company, trainers and trainees are trained well in advance for training. The proposed training is intentional action in order to obtain the requisite education to enhance jobs efficiency, according to Kenney & Reid (1986). The following phases are scheduled for training under Kenney and Reid:

- Identifying and defining needs for training
- Defines the training needed to recognise the expertise and abilities and the behaviours that need to be improved. Defining the training goals
- Planning training programmes, utilising the best blend of training methods and sites, to satisfy needs and goals. Choose who delivers the instruction
- Assess training.
- Amendment and expansion of training as needed.

Planned Training Process (Source: Armstrong Michael (1995).



### Conclusion

Training and development and its effect on results were outlined in the current study. In addition, the study indicates that organisational performance is substantially influenced by training provided to employees. A company's success depends on its dedication to workers, which in turn depends on its training and growth strategy for human resources. The analysis of the relationship between employees' training and success is relevant because the current market patterns need greater productivity, accuracy and efficiency in a lower period and expense and can only be accomplished by planning, improving and introducing excellent training programmes for employees. In order to acquire information about their employment, further educational programmes in the company allows workers to receive promotions between their colleagues. Given that training affects employee commitment and efficiency, it is essential that training is improved and implemented in order to meet organisational objectives.

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# Women Entrepreneurs in India - Emerging Issues And Challenges

**Dr. Richa Khugshal**

**ABSTRACT** - Women need to struggle a lot to have equal rights and place like men have in Indian society. Regardless of all the social barriers, women have struggled with man effectively and improved their educational status, living conditions, made necessitate changes in their life style, managed to survive in the competitive environment with their hard work, attentiveness, determination, and perseverance. The present research endeavors to recognize the factors that motivate women to become an entrepreneur, assess the several problems and challenges faced by women entrepreneurs and highlight the various government schemes to promote women entrepreneurs. This study is descriptive in nature and secondary data is accumulated from published articles, books, thesis, websites, newspapers, journals, etc. on women entrepreneurs. This research showed that increased family support, education and qualification, success of friends and relatives, better future of their children, family occupation, need of extra income, government procedures and policies, liberty to take own decision, new challenges and opportunities for self accomplishment are some factors that motivate women to become an entrepreneur; women face various problems and challenges like family dispute, scarcity of finance, marketing problems, deficiency of entrepreneurial training, scarcity of raw materials, low risk taking ability, hard competition, inadequate managerial ability, absence of entrepreneurial aptitude, high cost of production, patriarchal society, legal formalities, travelling to become an entrepreneur; and government has various schemes like Swalamban (NORAD), Rashtriya Mahila Kosh, Support to Training and Employment Programme for women (STEP), Women Component Plan (WCP), Technology Development and Utilization Programme for Women (TDUPW), Women Enterprise Development Scheme(WEDS), Self Employed Women's Association (SEWA), The Stand up India scheme etc. to promote women entrepreneur in India.

**KEYWORDS:** Entrepreneurship, Women, Business, Government Schemes.

## I. INTRODUCTION

According to Indian government "women enterprise is an enterprise which is managed, controlled and owned by women, that means women are having minimum 51 per cent of the capital/ share and at least 51 per cent women are working in an enterprise". Educated women are not willing to limit their lives within the boundaries their house. They also want equal respect from their spouses. Though, Indian society has been a male dominated, so Indian women need to go a long way to attain equal rights and equal position in the society. In Indian culture, women are assumed as weaker than men and they are asked to execute the decisions taken by the men in their family. But now Indian society has been changed in terms of enhanced educational status of women, better living standards and life style. Women struggled and competed with men and successfully stood up with men and performed well. Women are self-confident, persuasive, enthusiastic, willing to take risk, and capable enough to manage to survive and excel in their work. Women with their ability to learn quickly, solving problem, willingness to take risk, to motivate people, and to know how to win are the strengths of the women

entrepreneurs in Indian. Women stand high in the society and are applauded for their accomplishments in their respective fields.

## II. WOMEN ENTREPRENEUR

Women entrepreneurs are those women who think about business enterprise, take initiative, organize and combine the all necessary factors of production, and by undertaking the risks run a business enterprise.

**Kamal Singh** has defined woman entrepreneur as "a creative, innovative and confident woman competent of attaining self-financial freedom independently or in partnership, creates employment opportunities for others people also by starting, establishing and running the business enterprise by keeping pace with her personal and social life."

**Indian Government (GOI2006)** has defined women entrepreneur as "an enterprise hold, owned and controlled by a women with a minimum monetary interest of 51 per cent of the capital and also providing employment opportunities to at least 51 per cent to the women."

## STATUS OF WOMEN ENTREPRENEURS IN INDIA

India is a country where there is a rich cultural heritage. But now social scenario in India is changing. Time has gone when women were not permitted to venture out of their homes, now women have enhanced their education standards and also participate in social, financial and political activities with equal zeal and enthusiasm like men. Traditionally, Indian women like Brahmi, Gargi, Laxmi Bai, Damyanti & Razia Sultana were strong and considerable decision makers. But, today the role and status of women has been drastically changed all over the world. In all over the world women are breaking their traditional and stereotypic roles.

Progressively with time, women entrepreneurs are being measured as essential for the economic development of the nation. Women help in generating employment opportunities and economic growth. Entrepreneurship facilitates women to become economically independent and also to develop and improve their social status in the society.

World Bank report showed that women entrepreneurs usually tend to recruit women. Perhaps because women entrepreneurs have started these enterprises. A considerable quantity of women entrepreneurs are micro-domestic based enterprises increasing their family income in India.

Ministry of Statistics and Programme in sixth economic census released that women comprise about 14% of the total entrepreneur base that means about 8.05 million out of the total 58.5 million entrepreneurs in India.

## NEED TO STUDY WOMEN ENTREPRENEURSHIP

In today's period of social change and advancement, it is significant to study about women entrepreneurship and also about how to promote and boosted women entrepreneurship. In many countries it has been observed that where there is gender impartiality and women play important roles in an organization, there is social development, greater wealth, and development of moral organizations. Women entrepreneurs are generally the owners of micro, small and medium enterprises that mean women play important role in the development of MSME. Thus, role of women as an entrepreneur and in modern organization is of great academic interest.

## III. LITERATURE REVIEW

**Terjesen, S., Elam, A. and Brush, C.G. (2011) De Bruin, Brush, Welter, 2006; Bullough, Moore, and Kalafatoglu, 2017<sup>[1]</sup>** in their study showed that women entrepreneurs play a vital role in generating new opportunities and also contribute towards the social and economic growth of their societies.

**Ramasetu (2015)<sup>[2]</sup>** in his study, focused on the issues and difficulties faced by urban working women in India and

found that women go through with physical and psychological pressure, poor work-life balance, inequitable management in the work place, stressed life and work place discrimination.

**Chanchan (2013)<sup>[3]</sup>** in his study, recognized and examined the pull and push factors related to the growth of women entrepreneurs and showed that irrespective of the education level and the income, the economic restrictions are the key reasons for women starting up entrepreneurship.

**Tuschano (2013)<sup>[4]</sup>** in his research, showed that women mainly belonging to lower or middle income group were found in the micro businesses in the unorganized sector. Women entrepreneurs faced immeasurable problems as these businesses run under condition of intense scarcity of all resources and also outside the range of social security. The amount of low investment limit their businesses to remain small sized. Thus, it enforced them to utilize traditional tools and economical raw material. Professionalism, lack of skills and low production level in business also affect their income but there was a immense chance of development in some businesses.

**Umamaheswari (2011)<sup>[5]</sup>** considered the development and the factors affecting the development of women enterprises in her research and showed that the factors such as nature of the organization, age of the enterprise, location of the organization, supply of labor, and professional management have control on the growth of women enterprises. Also other variable such as technically qualified entrepreneurs, past experience and the special skills of the entrepreneurs also have influence on the growth women enterprises.

**Mehta and Mehta (2011)<sup>[6]</sup>** in their research found that the major challenges and problems faced by women are work background and educational in rural area in business. The research indicated that various State Small Industries Development Corporations, NGOs and the nationalized banks are conducting several development programmes for women entrepreneurs.

**Thangaraju (2011)<sup>[7]</sup>** in his study considered the factors of entrepreneurial motivation, growth and problems faced by women entrepreneurs. The study found that the key problem was inavailability of money but reimbursement of it. The reimbursement is hard due to low paying ability, which is influenced by poor education and skills, and some issues related to marketing, viz., poor mobility, partial towards women and social group they belong and bad infrastructural facilities. Therefore, women need to be educated, skilled and trained to become successful entrepreneurs.

**Kulkarni (2010)<sup>[8]</sup>** in his study showed that the difficulties that women entrepreneurs faced micro issues related was financial problem caused by lack of money and modern technology. The second limitation that women entrepreneurs faced macro issues related was competition.

Women entrepreneurs need to be emotionally stronger to survive in the male dominated society. The third limitation that women entrepreneurs faced macro issues related to external environment was the geographic problems concerned with channels of distribution, distance, communication mode, etc.

**Ghosh and Cheruvalath (2007)<sup>[9]</sup>** in their study they discussed about various challenges faced by women entrepreneurs such as low education and socio-cultural constraints. The research also given some proposal to improve women entrepreneurship such as inculcating an entrepreneurial attitude, accurate training, understanding their entrepreneurial inspiration, attribution augmenting, and removal of discriminating social duties essential to them.

**Setty (2004)<sup>[10]</sup>** in his research focused on challenges and potential of women to become entrepreneurs. Women have been the economic associate of men in numerous fields when they become entrepreneurship, but men seem to rule the entrepreneurial world. Woman are equally endowed with the managerial abilities and psychological qualities that required in successful entrepreneurship. At times, the opportunities and environment are the same for both women and men. But the entrepreneurial activities in traditional societies have been restricted to men.

#### OBJECTIVES OF THE STUDY

1. To recognize the factors that inspires women to become an entrepreneur.
2. To study the several problems and challenges faced by women entrepreneurs.
3. To know about the various government schemes to promote women entrepreneurs.

#### IV. RESEARCH METHODOLOGY

Research methodology used in present study is as follows:-

**Research design:** Descriptive research was used in the present study.

**Research area:** Research area in present study was India.

**Data collection:** This study was based on secondary data. Secondary data was collected from published books, articles, thesis, websites, newspapers, magazines, public records, journals, and annual reports on women entrepreneurs. For the present study data about the women entrepreneurs in India was collected.

#### V. ANALYSIS

##### Objective 1

**1. To recognize the factors that inspires women to become an entrepreneur.**

In India, women entry into business is traced out as an expansion of their day to day primarily kitchen activities such as 3P's, Pappad and Pickle. But with the enhanced education and span of time women started shifting from 3P's to modern 3E's i.e., Energy, Engineering and Electronics. Skill, knowledge, compliance and adaptability in business are the key factors for women to emerge into business. Women entrepreneurs take such challenging role to congregate their personal needs and to become economically independent. Inbuilt quality of entrepreneurial and a strong aspiration to do something in their life make women capable to contribute values to both family as well as social life. Media makes women to know about their own personality, rights and the work conditions. Numerous women start a business because of some hurtful incidents such as divorce, the health of a family member, unfairness due to pregnancy, or economic reasons. But today a new flair pool of women entrepreneurs is forming, because many women leaving the corporate world and planning their own future. Women are booming as interior decorators, designers, publishers, exporters, garment manufacturers and still trying to search new opportunities for economic contribution.

There are various factors which inspire women to become entrepreneurs such as innovative thinking, new challenges and opportunities for self accomplishment, employment generation, freedom to take own decision, desire to become independent, favorable government policies and procedures, family occupation, requirement of additional income, better future of children, success stories of friends and relatives, role model to others, supportive family, education and qualification, self identity and social status.

##### Objectives 2

**To study the several problems and challenges faced by women entrepreneurs.**

In India, women faced several problems to get ahead in business in their life. Women entrepreneurs face various problems to develop their own enterprise. Women faced problems at various stages starting from their initial commencement of business and also in running their business. The major problems faced by women entrepreneurs in India are as follows:

**Shortage of Finance:** Women entrepreneurs endure from insufficient economic resources and working capital. Women have a very less assets and bank balance and family members show least interest in investing money in the business run by women because of lack of confidence in the ability of the women to run business successfully. It also very complicated to take loan and support from banks and manage the working capital for the women.

**Marketing problems:** Women entrepreneurs always face difficulties in marketing their products because they depend upon the middlemen for advertising their products who ask

for the high profit. The middlemen usually take advantage of the women entrepreneurs. It's very difficult for women entrepreneurs to capture the market and to make their products popular because of tough competition from male entrepreneurs.

**Shortage of raw materials:** Women entrepreneurs also find it difficult to acquire the essential raw materials and other inputs required for production because of high prices of raw materials.

**Stiff competition:** Male entrepreneurs and organized industries pose strict competition for women entrepreneurs.

**Limited managerial ability:** Women entrepreneurs may not be specialist in all functions of the business venture and they shall not be able to dedicate enough time for all kinds of activities of enterprise.

**High cost of production:** The development of women entrepreneurs is also restricted by the high cost of production. To reduce the cost of production it is required to increase competence and expand productive capacity. Reduction of cost of production is required to make their survival possible for longer tenure. Women entrepreneurs also face the problems of human resources, legal formalities, infrastructure, lack of family support, overload of work, etc.

**Absence of Entrepreneurial Aptitude:** The another problems of women is the lack of entrepreneurial aptitude such as innovation, risk bearing etc.

**Low risk taking ability:** Women entrepreneurs usually plan for a protected life so they have a problem of low risk taking ability as comparison to male entrepreneurs.

**Family Conflicts:** In India, women are also supposed to take care of the children and other family members. Married women entrepreneurs have to balance their household activities and business activities. Women spend long hours in business and thus they find it hard to fulfill the requirements of their family members and also sometimes become unable to do the domestic work, to have time for children's education, personal hobbies, and this lead to family conflicts.

**Patriarchal Society:** In India, women do not get equal treatment because of male-dominated society and men ego also places barriers in women progress.

**Lack of entrepreneurial training:** Many women usually do not have proper technical and professional training to start a new business enterprise.

**Legal Formalities:** Women entrepreneurs find it very hard to comply with several legal formalities to obtain license etc.

**Travelling:** Women entrepreneurs cannot travel from one location to another freely in comparison to men.

### Objective 3

**To know about the various government schemes to promote women entrepreneurs.**

Development of women has been a policy objective of the government since independence. Following are the government schemes to promote women entrepreneur.

#### **Trade Related Entrepreneurship Assistance and Development Scheme for women (TREAD)**

This scheme is for women involved in non-farm activities. The main components of this scheme are as follows:

- Grant by government to 30% of the total project expenditure to the NGOs for encouraging trade associated activities among women. The remaining 70% of the project expenditure is financed by the primary agency as loan for operating activities as laid down by the project.
- Government grants up to Rs 1 lakh per programme to the many training institutions and NGOs for organizing training programmes for the women who willing to start up their own business.
- The government also grants need based grants up to Rs 5 lakhs to national entrepreneurship development institutions and any other institution for conducting research, field surveys, and evaluation studies and hence making a blueprint for training modules.

#### **Credit Guarantee Fund Scheme**

Government grant loan up to 25 lakhs without third party guarantees to small scale industries. It is run by Credit Guarantee Fund Trust for Small Industries (CGTSI). This scheme covers up to 80% of the credit to enterprises run by women which embrace maximum guarantee limit of Rs 20 lakhs.

#### **Support for Entrepreneurial and Managerial Development**

Micro, Small and Medium Enterprises conducts entrepreneurship development programmes and charge fees for enrolling in such programmes. To promote more entrepreneurs from women, SC/ST, physically challenged groups, it is emphasized that such programmes will not ask for any fees instead these programmes will give stipend of Rs 500 per capita per month. 50,000 entrepreneurs will get trained in diverse industries like Fashion, IT, Agro, Catering, Pharmaceutical, Food Processing, etc. 20% of the programmes will be organized only for women.

#### **Exhibitions for women under promotional package for Micro and Small Enterprises approved by CCEA under marketing support**

To promote women entrepreneurs to take participation in International Exhibitions some provisions are implemented which are as follows-

- Free space in exhibitions is provided to women.
- Reimbursement of air fare of economy class for one women representative.
- Reimbursement of shipping cost up to 15000.

**Swalamban(NORAD)** This scheme is to offer training for skill development to women to facilitate them to get employment or self-employment. The focus of this scheme is the needy and poor women from backward and weaker section of the society. The Haryana State Women Development Corporation (WDC) is the nodal organization for execution of this scheme through voluntary organisation of the state.

**Rashtriya Mahila Kosh** A cluster is a assembly of venture producing similar products/services. In a cluster there can be 20 or more venture. This Cluster Development Program aims to improve technology, competitiveness, manufacturing practices, market the products competently, create employment, etc. The clusters encompasses women enterprises and they are assigned up to 90% support to organize diagnostic study, workshops and seminars, forming association, capacity building through training programmes, market development, etc.

#### **Support to Training and Employment Programme for women(STEP)**

Ministry of women and Child Development manages STEP scheme of training of women to develop their skill, to enhance employability and helps them to become entrepreneurs /self-employed. This scheme is for 16 years and above age group women.

#### **Swa Shakti project and Swamsiddha scheme**

This scheme grants financial aid to capacitate rural poor women through microfinance from international agencies.

#### **The Ministry of Small Scale Industries**

The ministry develops productivity, competitiveness, and capacity building of small women ventures in India.

#### **Women Component Plan (WCP)**

This plan gives prioritizing economic resources for schemes/programmes for women, mainly those which give power to women.

#### **Technology Development and Utilization Programme for Women (TDUPW)**

This programme encourages awareness regarding the new technology, acceptance of new technology by women, training programmes for women regarding technology issues, encourages technological upgradation of tiny, small and medium enterprises run by women entrepreneurs, also conducts demonstration programmes on design, technical procedures and growth of products for the benefit of women.

**Schemes of Consortium of Women Entrepreneurs of India (CWEI)** CWEI supports in attaining E-commerce (Electronic Commerce) through its global information transformation system and web portal. E-commerce is the online buying and selling of services and products.

#### **The Federation of Indian Women Entrepreneurs (FIWE)**

This federation is to conduct training programme in domestic marketing, export marketing and management, quality control, management of enterprises, procedures and systems, laws and regulations for running a small and medium scale enterprises in order to sustain their growth.

#### **Scheme of Assistance to Women Co-operatives (SAWP)**

This scheme commence several functional, structural, and institutional measures to empower women, development of their access to inputs and technology, capacity building, and other farming resources.

#### **Women Enterprise Development Scheme(WEDS)**

This scheme provides economic assistance to women for any feasible economic creating activities in liberal terms and conditions.

#### **Self Employed Women's Association (SEWA)**

SEWA is a trade union registered in 1972 and supports poor and self-employed women workers. SEWA supports women in establishing their own economic organization and capacity building. SEWA connects women workers to development programs, so that they can attain full employment and self-reliance.

#### **The Stand up India scheme**

This scheme helps the SC/ST and women entrepreneurs economically so that women have a equal chance to set up their own enterprises. This scheme helps by giving loans from Rs 10 lakh to Rs 1 crore to the weaker section of the population. The Start-Up India scheme was launched in January 2016 by Prime Minister Narendra Modi to assist new entrepreneurs to start up their own enterprise.

**The Ministry of Small Scale Industries** The Ministry enhances competitiveness, productivity and capacity building of small women ventures and their collectives in India.

## **VI. FINDINGS**

1. Increased education and qualification, support of family members, success stories of friends and relatives, better future of children, need for additional income, family occupation, government policies and procedures, freedom to take own decision and be independent, new challenges and opportunities for self fulfillment are some factors that inspire women to become an entrepreneur.

2. Women face several problems and challenges like scarcity of finance, marketing problems, scarcity of raw materials, hard competition, inadequate managerial ability, high production cost, lack of entrepreneurial aptitude, inability to risk, family disputes, inadequate entrepreneurial training, legal formalities, travelling to become an entrepreneur.
3. Government has various schemes like Trade Related Entrepreneurship Assistance and Development Scheme for women (TREAD), Credit Guarantee Fund Scheme, Support For Entrepreneurial and Managerial Development, Swalamban (NORAD), Technology Development and Utilization Programme for Women (TDUPW), Rashtriya Mahila Kosh, Support to Training and Employment Programme for women (STEP), Ministry of Small Scale Industries, Women Component Plan (WCP), Women Enterprise Development Scheme(WEDS), Self Employed Women's Association (SEWA), The Stand up India scheme to promote women entrepreneur in India.

## VII. CONCLUSION

Women have increased their education and qualification and they are motivated to become an entrepreneur. Today women have equal passion and enthusiasm like men. Enhanced education and qualification, supportive family, success stories of friends and relatives, better future of children, requirement of additional income, family occupation, government policies and procedures, freedom to take decisions, desire to become independent, new challenges and opportunities for self accomplishment are some factors that inspire women to become an entrepreneur. But to become an entrepreneur women face several problems and challenges like scarcity of finance, marketing problems, scarcity of raw materials, hard competition, inadequate managerial ability, high production cost, lack of entrepreneurial aptitude, inability to risk, family disputes, inadequate entrepreneurial training, legal formalities, travelling. Progressively with time, women entrepreneurs are being considered as crucial for the economic development of the country. Women contribute towards the employment creation and economic growth. In India, government has come up with several schemes to promote and support the women entrepreneur like Women's Association (SEWA), The Stand up India, Trade Related Entrepreneurship Assistance and Development Scheme for women (TREAD), Credit Guarantee Fund Scheme, Support For Entrepreneurial and Managerial Development, Swalamban (NORAD), Technology Development and Utilization Programme for Women (TDUPW), Rashtriya Mahila Kosh, Support to Training and Employment Programme for women (STEP), Ministry of Small Scale Industries, Women Component Plan (WCP), Women Enterprise Development Scheme(WEDS), Self Employed. These schemes facilitates women to become

financially independent and also to improve their social status in the society.

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# SUCCESSION PLANNING AND ITS EMERGING ISSUES IN TODAY'S DYNAMIC ENVIRONMENT: AN EMPIRICAL STUDY

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**ABSTRACT**DOI URL: <https://doi.org/10.36713/epra3093>

Succession planning plays a crucial role in today's competitive environment. Escalation pool of talent has major contribution in organizational growth. Thus, identification and development of talent is a necessity for overall development of every organization. The aim of this study is to help organizations to know the importance of succession planning and various challenges of succession planning. This research is tried to cover many aspects of succession planning like organizational survival, strategic planning, prepares future leader, a necessary process in today's organization, challenges, and organizations performance. This present study showed that succession planning helps organization to survive for longer span of time; it has positive impact on organizational performance; it has positive relationship with strategic planning; it is a necessary process for organizations to motivate and create competent and stable workforce; organizations face many challenges in implementing succession planning, so organizations must be capable enough to make effective succession plan; and it also assists organizations in identifying and preparing future leaders.

**KEYWORDS:** Succession Planning, Organizational Survival, Strategic Planning, Future Leaders, Challenges, Organizations Performance.

## 1. INTRODUCTION

In the today's competitive and dynamic environment, the corporate human capital has become a precious source for gaining competitive advantage over other firms. Firms are becoming increasingly dependent on their human resource capabilities. This identified the need for succession planning as it identifies key roles and mapping out ways to ensure the organization has the right people with the right skills, capabilities, and experiences, in the right place at the right time.

## 2. Definition of Succession Planning

Succession Planning is defined as the process of identifying and creating leaders for future who will take the place of the previous employees when they leave the organization for some reasons like promotion, retirement, resignation, retrenchment, transfer, or death.

Succession planning is a modern and popular technique used by many companies that concentrates on recognizing the talented employee in the organization, who will be possible successors for the key positions.

## 3. How Succession Planning Works

Succession planning appraises each leader's skills and knowledge, recognizes potential replacements both within and outside the organization, and trains and prepares recognized employees to take senior positions in the case of internal replacements. Succession planning is not a one-shot event; but should be reevaluated and updated each year in the organization. Moreover organization might need to build both an emergency succession plan in order to replace key leader unexpectedly, and a long-term succession plan to anticipate changes in leadership.

In large organizations, the board of directors oversees the succession planning. Succession planning also has impact not just on owners and employees, but also shareholders of organization. For small organization, the succession planning means to provide training to the next generation talent to take over the business.

## 4. Need for Succession Planning

Succession planning is a part of the human resource planning that recognizes employees may or may not work with the organization in the future. Succession plan is made to

investigate the vacancies which may take place when an employee leaves the organization, the business areas which may get affected, and the skills, knowledge and job requirements of the existing incumbent. Therefore, succession planning is required to determine how and where viable employees can fill the vacant positions in the organization.

### 5. Benefits of Succession Planning

The numerous significances of succession planning for both employers and employees are as follows:

- Employees are more satisfied as they know that there is an opportunity for advancement in an organization.
- Reinforcement of career development among employees as organization is planning for future opportunities.
- Supervisors will mentor employees to enhance skill, knowledge and expertise.
- Positions can be filled internally when opportunities arise.
- Leadership and employees are able to share organization's values and vision.
- With Baby Boomer business owners and leadership retiring in huge numbers, a new generation of leaders will be needed.

### 6. LITERATURE REVIEW

**Department of management and administrative services, 2010** said that succession planning is a process that confirms that required number of employees is employed in the organization, and also that employees trained to be placed in key positions in the organization. The exercise of succession planning is to make sure that the key positions, which have been left by the related employees, are filled by using effective succession planning. Succession planning is not just a promotion of employees, but also includes experimenting, training, coaching, evaluation, communication, and accomplishment of the organization's goal.

**Paul, E. Ricci, 2006** argue that succession planning is not a short-term process, but a yearly permanent one beginning from the employer of employees, since the future managers of an organization are among the employees employed today.

**Collins (2009)** defines succession planning as "a process that provides flawless leadership conversion across the organization".

**M. Dami Baldwin (2005)**, found that succession planning plays a key role in the companies' strategic planning. Succession planning is not only the concern of CEOs but also for all the key positions. The succession planning process requires a long term strategy of the organization including the key areas that necessitate continuity and development of the key people that the organization wants to develop.

**Jeff Weekley (2005)** states that the HR professionals prepare the succession plan with a permission of CEO. A few techniques should be followed by organization to put the succession plan in the process. CEO must be a keen supporter and an energetic participant, the line management must involved in the process with HR and play a supportive role, gaps between the current skill employees possess and the future skill requirements are to be identified, succession planning ought to be consistent with other programs.

**Charan, et al. (2001)** said that it is crucial for organizations to provide training to successors before the vacancies are generated.

**Tropiano, M., 2004** said that succession planning is a systematic, strategic and premeditated attempt to develop competencies in potential employees through anticipated learning experiences such as educational training and targeted rotations in order to fill senior positions without discrimination.

**Schoonover, 2011** Succession planning refers to a purposeful and systematic effort to make sure leadership stability in senior positions, to develop intellectual and knowledge capital within the potential employees for the future, to encourage individual advancement, to ensure the stability of key employees, to retain and to enhance performance of the organization.

**Conger (2004), Kesler (2002), Leibman (1996), Rothwell (2005)** have defined the key factors of succession planning and management system including ten elements i.e. organizational commitment with communication of expectations, process of transparency, process evaluation, identification of organizational needs, recognition of key positions, enhancement of knowledge, skill, and ability, accountability, appraisal of talents, development of individual growth policy, individual feedback, and integrity of process throughout the organization. An effective succession planning and management process is well integrated, continuous, and systematic, lined up with strategic planning, and matches available talent with the projected talent requirement for the future.

**Neefe, 2009** has defined succession planning as determined by the philosophy that the leadership can be learned by potential employees and current employees can be recognized and developed to fill future leadership openings, and also allow the smooth conversion and ensures business continuity.

### 7.OBJECTIVES OF THE STUDY

- i. To know the role of succession planning in preparing future leaders.
- ii. To examine the importance of succession planning as a process in an organization.
- iii. To analyze the impact of succession planning on organizational performance.
- iv. To know the relationship of succession planning with strategic planning.
- v. To assess the role of succession planning in organizational survival.
- vi. To study the various challenges organizations face with respect to succession planning.

### 8. RESEARCH METHODOLOGY

This research is based on secondary data. The secondary data was collected through various books, magazines, research journals and other relevant sources.

### 9. SUCCESSION PLANNING AND ITS EMERGING ISSUES

**Objective 1:-** To know the role of succession planning in preparing future leaders.

#### 9.1 Succession Planning: Prepares Future Leader

In today dynamic global economy, organizations face many troubles such as rapidly changing customer demands, public pressure from activist groups, and technological distraction. The average time period of CEO for publicly traded companies is only five years. New generation is keen for career opportunities advancement to enter the workforce, so organizations to build a strong pipeline of future leaders ought to focus on long term strategies. Succession planning

facilitates organizations to identify high-potential and capable candidates and prepare them to take responsibilities of senior positions as per the availability. With the increased competition for talent bound, establishing a succession planning process has become very crucial. Further, succession planning accelerates the organizations performance. Succession planning is a transformational stage through which management explores the future leaders.

Therefore, Succession planning enables organizations in filling the senior positions with talented candidates to assure that every leadership level has plenty of talented performers to draw from, for both present and future need.

**Objective 2:-** To examine the importance of succession planning as a process in an organization.

### **9.2 Succession Planning: A Necessary Process in Today's Organization**

Succession planning helps organizations to reduce employee turnover rate, to retain talented employees, and to have stable workforce. Organizations implement a structured succession planning that make a distinction between the significance of establishing ownership of the succession plan and align the internal culture with external branding. Thus it includes identifying, assessing and developing high potential employees in the organization. Once high potential employees are identified and selected, they'll go through the development program which includes a job rotation program, a formal mentoring/coaching program, after that 360 appraisal is done to get their feedback and also receive an appropriate reward for their performance.

In today's rapid changing environment, organizations face major uncertainty and unpredictability, which sometimes further cause instability in the business operations. Thus in this unstable environment, organizations require to depend on their employees. Therefore, organizations ought to make strategies to encourage their employees and get connected with their employees in order to build competitive advantage and achieve high profitability. For this purpose organizations need to emphasize on methods like succession planning which promote their employees' skills, knowledge, capabilities, talents, and to tackle problems which may arise in future.

Therefore, organizations to prosper and survive in the challenge environment require reviewing the succession planning and management requires reacting, promoting or shedding staff. While succession planning and management both are the process and the system like any other human resource activities, so become necessary to be implemented properly in business organizations.

**Objective 3:-** To analyze the impact of succession planning on organizational performance.

### **9.3 Succession Planning: Its' Impact on Organizational Performance**

Succession planning is a significant way of identifying talented employees who can take senior positions in an organization. A management succession plan helps in preparing employees to replace senior executives. Succession planning identifies in advance the gaps between what employees should to know and what they know currently i.e. competency gaps. Thus, a succession plan assesses the strengths and weaknesses within an organization and accordingly provides training to employees to impart knowledge, skills and abilities they may require to fill future vacancies that mean succession planning identifies the weak areas of employees and accordingly conducts training program to enhance the employees'

performance. Effective and efficient succession planning activities have a positive and significant impact on organizations performance not only by ensuring that key positions will remain occupied with competent employees, but also saves money of external recruitment, selection and training, which may be significantly more expensive than promoting from within the organization.

Therefore, there is positive and significant impact of succession planning on organizational performance.

**Objective 4:-** To know the relationship of succession planning with strategic planning.

### **9.4 Succession Planning: Its Relationship with Strategic Planning.**

Strategic planning is an important element of succession planning. Succession plan helps organizations to lessen the gap in its active ties when its employees are promoted, resigned, transferred, retired, or terminated and improves the strategic planning of the organization. Succession plan is a continuous and systematic process that consist assessment of organizational talents, recognition of the existing skills, identification of the future requirement for the skills, identification of skill gap, implementing required training programs using on-the-job and off-the job training methods, plans for the development, job rotation plans, effectively and efficiently. Thus a formalized and determined strategic planning is required to be developed for the successful implementation of succession planning. Concerned senior directors encourage their employees to actively participate in strategic planning. Therefore, it can be concluded that there is a significant and positive co-relation between succession planning and strategic planning as these two types of planning interact with each other.

**Objective 5:-** To assess the role of succession planning in organizational survival.

### **9.5 Succession Planning: Its Role in Organizational Survival**

Organizational survival is implanted organizational objectives that necessitate the investment of the energy and resources. The objective of organizational survival emphasizes all other objective of the organization. Emphasizes on this objective ultimately contributes towards the satisfaction and implementation of other organizational objectives. Moreover to assess some of the internal variables that drain from the organization the effort that ought to be directed to the accomplishing the company' objectives with execution of succession planning; such as high turnover rate; internal conflict, nepotism, career development, talent retention, supervisor' support, etc. The key independent variables of succession planning concept of the human resource planning such as talent retention, career development, nepotism, and organizational conflict play a crucial role to improve the organizational survival. All variables intended for this study that influence succession planning and human resource planning concerning organizational survival is illustrated in the figure below:



The talent retention (independent variable) act as a mediator variable in concept of succession planning that further contributes towards the organization survival to a great extent.

**Objective 6:-** To study the various challenges organizations face with respect to succession planning.

#### 9.6. Succession Planning: Its Challenges

Succession planning is one of the important processes that cannot be ignored in today's competitive environment. Amplification of this process has direct and positive impact on organization as it helps in nourishing employees. There are numerous challenges that organizations face in today's dynamic environment in succession planning. Some of the challenges that organization face while conducting succession planning are size of the organization that determines the ability to provide opportunities for advancement; issues with the financial resources; the nature of funding may be an issue as more organizations rely on project funding as opposed to core funding; looking at temporary staff; senior managers who stay in their positions for too long or have expectation rights that are unrealistic; management that no longer has the skills needed for the top job; the requirements of the company's executive leadership have changed; the company's leader is no longer making a meaningful and productive contribution to the company; failing to strategically include promising employees in the succession plan, rather than including those who are disinterested, unmotivated, or lack the capacity to advance; inadequate training and development will mean employees who are not ready for a promotion; the succession plan doesn't promote people regularly, resulting in potential successors leaving the organization for other opportunities; and poor communication, which creates confusion and unrest within the company with staff speculation about the true details of the succession plan.

#### FINDINGS

- i. Succession planning helps companies to ensure leadership continuity in key positions, retain and develop intellectual and knowledge capital within key employees for the future, encourage individual advancement, ensure the workforce stability.
- ii. Succession planning helps organization to promote their employees' knowledge, skills, talents, and capabilities to motivate and connect their employees in order to create competitive advantage, achieving higher profitability, reduce workforce attrition and prepare for an aging workforce.
- iii. There is positive impact of succession planning on organizational performance as succession planning helps organization in identifying and providing training to employees to help them to move up in an organization. Further this would help the organization to improve its performance.
- iv. A formalized and concentrated process for strategic planning should be developed for the implementation of succession planning.
- v. Organizational survival is a primary goal of every organization and the variables of succession planning concept of the human resource planning namely; talent retention, career development, organizational conflict and nepotism play a crucial role to enhance the organizational survival/growth.
- vi. Organizations face many challenges in implementing succession planning such as the organization size that verify the ability of organization to provide opportunities for advancement; financial issues like employees contentment regarding adequate salaries and benefits; looking for temporary staff; senior managers stay for longer tenure in their positions; skills for the top level jobs no longer required; the

need for executive leadership have changed; leaders are not making productive contribution to the company; unable to include talented employees in the succession plan; improper training and development program to prepare employees for promotion; the succession planning is not done on regular basis that results in employee attrition; and improper flow of communication which creates confusion and unrest within the company.

## CONCLUSION

In today's dynamic world where competition is high, organization's future plans may change for some reasons such as retirements, transfer, promotions, sickness, death, or resignation. Succession planning is considered as an appropriate plan to cope up with such kind of changes, as organizations must have key employees for replacement plan. This research has found that succession planning has positive impact on organizational performance; it helps in organizational survival for longer tenure; its helps in identifying and preparing future leaders, it has positive relationship with strategic planning, it is also a necessary process to motivate and create competent and stable workforce; and organizations face many challenges in implementing succession planning, so organizations must be capable enough to make effective succession plan. So, succession planning is not just an exercise, but an extremely important process that can be converted into organization development. Hence the organizations must be capable enough to prepare and implement effective succession planning.

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**A study of student's perception regarding E-learning during Lockdown.****Submitted By:****Dr Rachna Kalsan****Assistant Professor****Lingayas Vidyapeeth****Faridabad****8295472725****drrachnakalsan@gmail.com****Abstract:**

Corona virus pandemic era interrupt many things in the world. Where the GDP fall down, the education sector also faces several problems. Due to the lockdown all the colleges, universities, schools, institutes are interrupted. Due to these students faces many problems. This lockdown creates a major cause in student's learning. Due to this several health issues occurred among students. To limit/ minimize the loss of studies, Ministry of Human Resource Development & Regulators, Directorate of Higher Education in States motivated to educational institutions to shift to online modes of education. Due to this online teaching mode starts for higher education to reduce the loss of student's study. Online mode is a new challenge for both the students and teachers. This paper helps in knowing the current situation of online learning of students. For this study primary data was collected from 150 college students. The data was collected from Haryana rural areas with questionnaire method (in Google form) and mailed to students. This paper focus on the student's hurdles faced during lockdown basically in rural areas.

**Keywords:****Lockdown, MIHRD, Corona virus.****Introduction:**

The covid-19 pandemic era comes with several challenges for the whole world. The covid-19 spoils the whole world economy. All sectors were seriously harmed. In all sectors the education sector is also one of the major sectors faced various challenges. Education sector is also plays a very important role in Country's economy. In India both state and central government authorities faces various challenges and do preventive

measures to solve this problem. This pandemic situation disturbed the education sector, which effects the students future.

COVID-19 is an infectious disease caused by a newly discovered corona virus. Formerly, this disease was referred to as '2019 novel corona virus' or '2019 ncov'. COVID-19 was first identified in Wuhan, China in December 2019. This lockdown situation develops various health issues in students and teachers life.

E-learning tools are playing a crucial role during this pandemic, it aims to help instructors, schools, and universities facilitate student learning during periods of universities and schools' closure. Besides, most of these systems are free which can help ensure continuous learning during this Corona virus pandemic. The success of any information system depends on the usage of the system by users.

E-Learning is just like a web based training means to install a software through which both teachers and students communicate with each other. Everything change with the changing technology. Now the new tools of teaching and learning changes with the technology.

The deadly and infectious disease Corona Virus also known as Covid-19 has deeply affected the global economy. This tragedy has also shaken up the education sector, and this fear is likely to resonate across the education sector globally. The Covid-19 pandemic outbreak forced many schools and colleges to remain closed temporarily. Several areas are affected worldwide and there is a fear of losing this whole ongoing semester or even more in the coming future. Various schools, colleges, and universities have discontinued in-person teaching. As per the assessment of the researchers, it is uncertain to get back to normal teaching anytime soon. As social distancing is preeminent at this stage, this will have negative effects on learning opportunities. Educational units are struggling to find options to deal with this challenging situation. These circumstances make us realize that scenario planning is an urgent need for academic institutions. This is a situation that demands humanity and unity. There is an urgent need to protect and save our students, faculty, academic staff, communities, societies, and the nation as a whole.

E-learning tools are playing a crucial role during this pandemic, it aims to help instructors, schools, and universities facilitate student learning during periods of universities and schools' closure. Besides, most of these systems are free which can help ensure continuous learning during this Corona virus pandemic.

### **Literature Review:**

1. Dr Amita (2020) in his study analyse that faculty made appreciable efforts to compensate the loss of syllabus. According to them various online learning tools were used to deal with students. With the help of online teaching 60 to 80 percent syllabus were completed. The data is collected from 882 students of various higher education institutions through the questionnaire method.
2. Radha and her research coordinators conduct a research in 2020. According to them E-learning mode become the future trend of leaning. The study conducted on 175 students across the world using stratified sampling method. The findings are based on primary data of different students. According to them most of the students were interested in online learning but within their comfort. This mode become more effective and popular during the lockdown situation.
3. Accorging to Suraksha and their co-researchers findings in 2020 analyse that most of the respondents were suffered from disturbance during lockdown. The disturbance are in the form of internet connectivity problem, electricity problem, data packs facilities etc. Due to these hurdles online teaching mode makes difficult to understand the concepts. The data is collected from 13 different nursing colleges of Nepal. The primary data was collected with distributed the questionnaire to all the respondents through mail. This is a descriptive cross-sectional online survey on students. Both teachers and students faced the problem of internet connectivity, and others. If we have to reduce or minimize theses hurdles than it makes the online teaching and learning process more effective and efficient method.
4. According to the study motivation is most important element while using online classes. When the students are not motivated then they don't prefer to use this mode. According to their survey teachers use various strategies to motivate the students.
5. Raheem in his study concluded that learning and teaching from home with the help of online tools is a very efficient step to teach the students. It is beneficial for both the teachers as well as students. In today's life technology become the most

important part of our life. For E-Learning various applications like Zoom, Google meet, Google classroom, Youtube etc were used to help the teachers. So finally during the pandemic era E-Learning through various applications become the most effective tool. It is interesting to share something new.

6. M Samir, said that many educational institutions faced various obstacles during online classes. But the latest technology can help in overcome these problems with the help of different E- Learning platform like Zoom, Google Meet, Youtube, Google Classroom etc. Now these technologies were used in the universities to deliver lectures. This study is done in Egypt. Due to him E- Learning is a easy and effective way to motivate students for learning.
7. Mohammadi, in his study has showed the role of e-learning and its application in language learning process and compared it with traditional form of language learning. It also has provided advantages and disadvantages of e-learning in language learning. The researcher when referred to the above related studies was able to bring out this maiden thought into his research done on the role of e-learning in COVID19 crisis and to show the important of it in different fields. The present paper is going to show the role of e-learning in COVID -19 crisis.
8. Amidst this deadly virus spread such online platforms are needed where (a) video conferencing with at least 40 to 50 students is possible, (b) discussions with students can be done to keep classes organic, (c) internet connections are good, (d) lectures are accessible in mobile phones also and not just laptops, (e) possibility of watching already recorded lectures, and (f) instant feedback from students can be achieved and assignments can be taken in the study.
9. Kapasia in his study analyse the impact of lockdown on students both (graduate & undergraduate). This survey is basically conducted in West Bengal through questionnaire method. The survey conducted on 232 students. According to them 70% learners were involved in the online learning process. But during online classes students faced many obstacles like depression, poor internet connectivity, anxiety, unfavorable study environment at home etc. She suggests targeted interventions to create a positive space for study among students from the vulnerable section of society. Strategies are urgently needed to build a resilient education system in the state that will ensure to develop the skill for employability and the productivity of the young minds.
10. Pravat in his study highlights on major impacts of Covid-19 on HEIs in India. Some measures taken by HEIs and educational authorities of India to provide seamless educational services during the crisis are discussed. Due to Covid-19 pandemic, many new modes of learning, new perspectives, new trends are emerged and the same may continue as we go ahead to a new tomorrow. So,

some of the post Covid-19 trends which may allow imagining new ways of teaching learning of higher education in India are outlined. Some fruitful suggestions are also pointed to carry out educational activities during the pandemic situation

**Objectives:**

1. To know the status of e- learning during lockdown.
2. To study students behavior regarding e-learning.
3. To gather suggestions to make online teaching more effective.

**Research Methodology:****Population:**

All the college students of faridabad are the population of this study.

**Sample:**

This study is conducted on the Faridabad students. The study was done on college going students of different colleges of Faridabad. It mainly focuses on the private sector colleges students.

**Sample Size:**

In the study the sample of 150 students was taken to reach at the conclusion.

**Data Collection:**

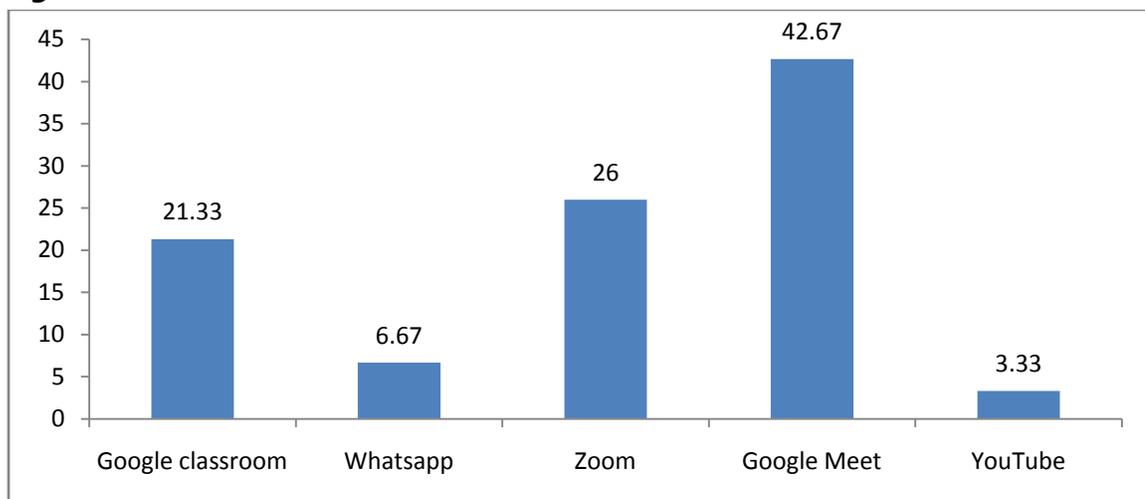
Primary as well as secondary both the sources of data were used in collecting the data. The primary data was collected through questionnaire method. The questionnaire was mailed to the respondents and collects the necessary information from them.

**Findings:**

1. Students preference on different types of application tools used for e-learning:

Table 1:

Classification	Respondents	Percentage
Google classroom	32	21.33
Whatsapp	10	6.67
Zoom	39	26
Google Meet	64	42.67
YouTube	5	3.33
Total	150	100

**Figure 1:**

2. Types of Device used for e-learning:

Table 2:

Classification	Respondents	Percentage
Laptop	42	28
Mobile	84	56
Desktop	24	16
Total	150	100

Figure 2:

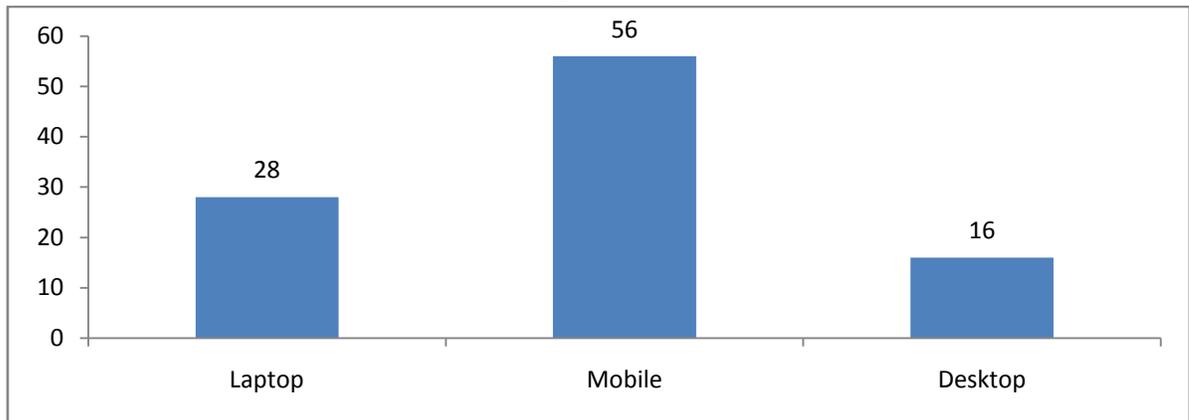
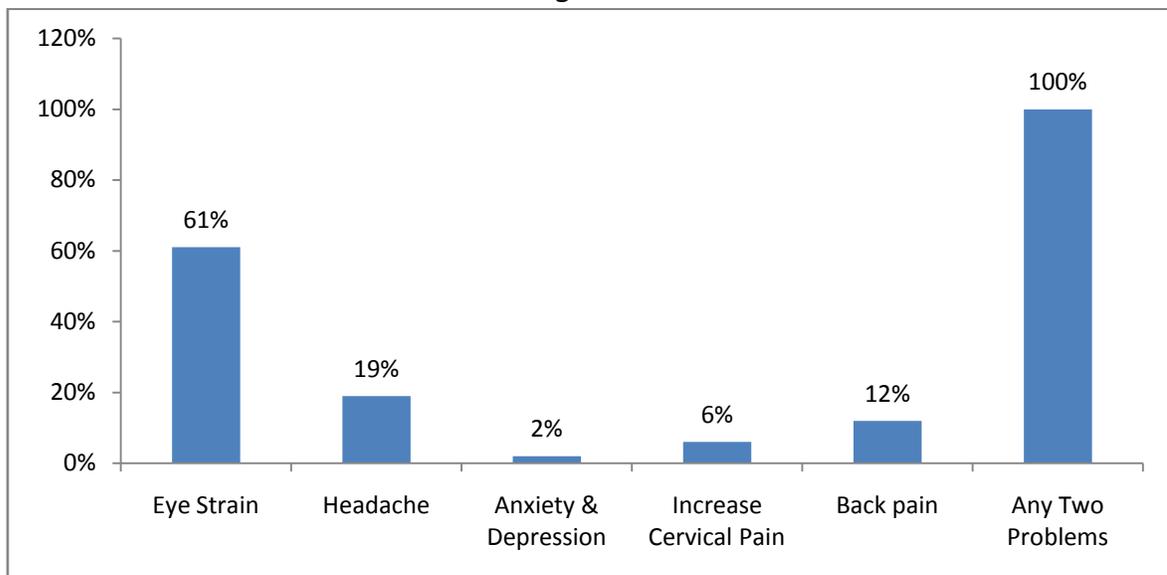


Table: 3

Students faced various health problems:

S.no	Health Problems	No. of Students	%
1	Eye Strain	92	61%
2	Headache	28	19%
3	Anxiety & Depression	3	2%
4	Increase Cervical Pain	9	6%
5	Back pain	18	12%
	Total	150	

Figure: 3

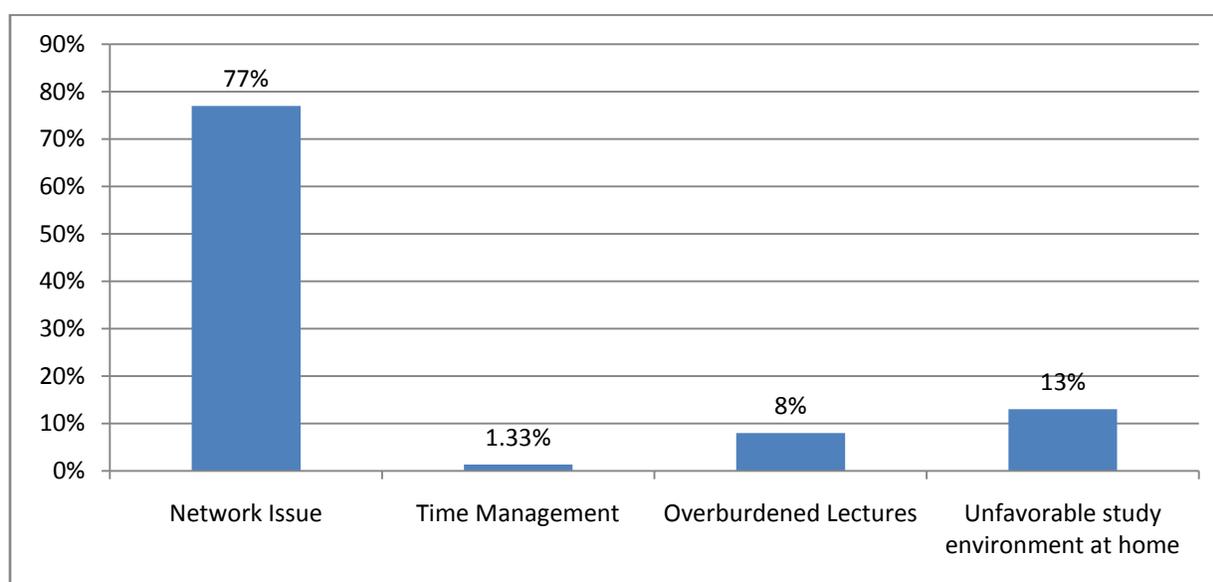


4. Different Problems faced by students during online classes:

Table: 4

S.no	Classification	No. of Students	%
1	Network Issue	116	77%
2	Time Management	2	1.33%
3	Overburdened Lectures	12	8%
4	Unfavorable study environment at home	20	13%
	Total	150	

Figure: 4



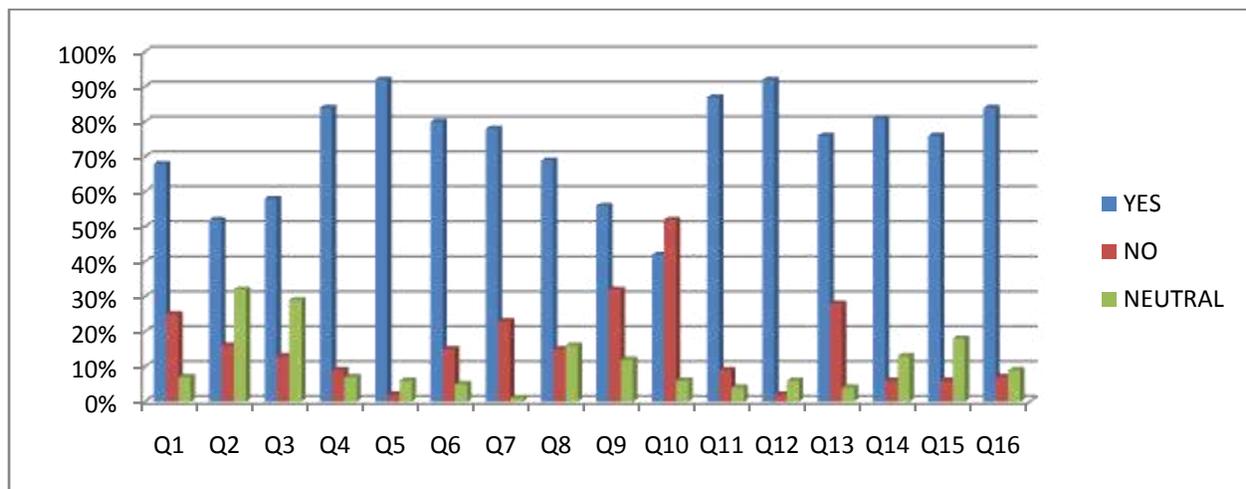
## 5. Attitude of students towards E-Learning:

Table: 5

Sno	Statement	Yes	No	Neutral
1	I enjoy taking online classes from home.	68%	25%	7%
2	Online classes are better than the offline classes.	52%	16%	32%
3	It can easily clarify the doubts and quarries.	58%	13%	29%
4	Online classes are suitable for Theoretical subjects.	84%	9%	7%
5	It can create health issues.	92%	2%	6%
6	Are you interested in e-learning?	80%	15%	5%
7	Does e-learning improve your study skill?	78%	23%	1%
8	Are you satisfied with Google Form mock test?	69%	15%	16%
9	Does e-learning make your quarantine time a useful one?	56%	32%	12%

10	Do you believe that improving knowledge through e-learning is better than traditional learning?	42%	52%	6%
11	Do you think Face to face learning is important for practical teaching?	87%	9%	4%
12	Did you face any issues during e-learning?	92%	2%	6%
13	Are you positive towards e-learning?	76%	28%	4%
14	Does e-learning make your knowledge wider?	81%	6%	13%
15	Do you think web-based teaching is important for a student?	76%	6%	18%
16	Can e-learning bring a social change in India?	84%	7%	9%

Figure: 5



**Conclusion:**

This pandemic era is very difficult for all human being. Due to this various sectors face obstacles and try to overcome the barriers. For students also this time is very difficult where they study from home using various applications and device to learn something new. This time period taught something new to students. They learn time management, give time to their parents, help in each and every activity. These all things are not done when they went to colleges. This covid-19 has positive and negative effects both. It can make students more efficient. More than 70% of students believe that online classes are effective to learn but there are several obstacles arise during E-Learning. If these

obstacles will remove then it makes learning more effective. But it can create health problems among students. Those who have cervical problem before lockdown, it may increase and also back pain increases due to over sitting for online classes. Eye problem also rises due to over usage of phones, laptops, Desktops and sit in front of camaras for a long time. Ministry of Education can control on make rules and guidelines for online classes for school students. According to their guidelines the time limit of each lecture is fixed of 30-40 minutes and 9 -12 pm is fixed to take classes. But for college students no guidelines were made. They take 6-7 lectures per day. Internet connectivity problem, electricity problem are the various obstacles during online classes. For remove these obstacles if we work on these things, then we make online classes more effective and attractive for the students.

The measures to be taken to remove the obstacles during E-Learning are:

1. Fix the time limit of online classes with limited Hours.
2. Fix the limit of no. of lectures per day with 3-4 lectures per day.
3. If the companies minimize the data rate, so that each and every student easily afford the network connection.
4. Make presentation more attractive for students.

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### Questions to be asked from respondents:

1. Students preference on types of application tools used for E-Learning:
  - A. Google Classroom
  - B. Zoom
  - C. Google Meet
  - D. Youtube
2. Which type of device will be prefer by students during online classes:
  - A. Laptop
  - B. Mobile
  - C. Desktop
3. Are you suffering with any health problems due to online classes:
  - A. Eye strain
  - B. Headache
  - C. Anxiety & Depression
  - D. Increase Cervical Pain

- E. Back Pain
4. Which type of problem faced by students during online classes:
- A. Network Issues
  - B. Time Management
  - C. Overburdened Lectures
  - D. Unfavorable study environment at home

Sno	Statement	Yes	No	Neutral
1	I enjoy taking online classes from home.	Yes	No	Neutral
2	Online classes are better than the offline classes.	Yes	No	Neutral
3	It can easily clarify the doubts and quarries.	Yes	No	Neutral
4	Online classes are suitable for Theoretical subjects.	Yes	No	Neutral
5	It can create health issues.	Yes	No	Neutral
6	Are you interested in e-learning?	Yes	No	Neutral
7	Does e-learning improve your study skill?	Yes	No	Neutral
8	Are you satisfied with Google Form mock test?	Yes	No	Neutral
9	Does e-learning make your quarantine time a useful one?	Yes	No	Neutral
10	Do you believe that improving knowledge through e-learning is better than traditional learning?	Yes	No	Neutral
11	Do you think Face to face learning is important for practical teaching?	Yes	No	Neutral
12	Did you face any issues during e-learning?	Yes	No	Neutral
13	Are you positive towards e-learning?	Yes	No	Neutral
14	Does e-learning make your knowledge wider?	Yes	No	Neutral
15	Do you think web-based teaching is important for a student?	Yes	No	Neutral
16	Can e-learning bring a social change in India?	Yes	No	Neutral

# Impact of Digital Banking in India: Trends & Challenges

**Dr. Rachna Kalsan**

**Abstract -** For the growth of any country's economy various sectors play a very important role. In the Indian economic growth banking sector is the most important aspects. Banking sector become the backbone of Indian economy. Any changes regarding technology or other aspects directly impact the growth of the economy. With the change in technology various changes occur in banking sector. Now more of customers are educated. They don't want to stand in queue for various activities like: Make payments, Deposit Cheque, Open bank accounts, Deposit Cheque and many more. With the change in time now digital banking introduced and it proves a star for the banking sector. Today's era accept this digital banking concept very easily and in a short time period it become more demanded mode of transaction in the market. In this paper we analyse the concept of digital banking. How it effects the human life. The research is based on secondary data. The concept of digital banking in banking industry brings numerous opportunities. But with every benefits some risk also introduced. And this digital banking also come with some risk.

**Key words:** Financial Inclusion, Digital Finance, Financial Products, Financial Services, Innovative Financial Technology.

## I. INTRODUCTION

Now banks are part of human life. Now Indian govt. do efforts to make cashless economy. In this process digital banking play a important role. In the present era we found ourselves in a wonderland, where the milkman accepts wallet payment without a fuss, a men buys a geometry set worth rs 100 using a credit card and the vegetable vendor uses QR code based "scan and pay" utility. The new innovative digital technologies and fantastic thoughts have given birth to whole new business and social dimensions. Digital banking provides solutions to bankers for their short term and long term business and technological requirements.

Digital Banking is the new paradigm in India which offers multiple benefits to the banking sector. It helps in increasing the productivity and profitability of banking sectors. It is a technological Updation in the growing era. This is mainly introduced to improve 4C's namely: Cost, Convenience, Control and Customer satisfaction. The framework/ structure of digital banking is the result of the collaborated efforts of the group comprising IDRBT research team, bankers, IT professionals and consultancy experts. The term digital is refers to the storage of data in the form of digital signals. It can make the banking function easy. ATM (Automatic Teller Machine) is an electronic telecommunication device. It is the best example of digital banking system. Digital banking makes the transaction very simple & easy. SMS banking is the example. Now every customer is free and do their as per their convenience. Digital banking is part of the broader context for the move

to online banking, where banking services are delivered over the internet.

### Defination's:

1. "Digital Banking- a new concept in the era of electronic banking, which aims to enrich standard online and mobile banking services by integrating digital technologies, for example strategic analytics tools, social media interactions, innovative payment solutions, mobile technology and a focus on user experience".
2. "Digital Banking is the application of technology to ensure seamless end to end (STP in the 'old' jargon) processing of banking transactions/ operations; initiated by the client, ensuring maximum utility to the client in terms of availability, usefulness and cost; to the bank in terms of reduced operating cost, zero errors and enhanced services".

## II. EVALUATION OF DIGITAL BANKING IN INDIA

The traditional system of banking in India has been the branch banking. The (MICR) Magnetic Ink Character Recognition based cheque processing was introduced during the period 1986- 88. The late 80's marked the emergence of computerisation of bank's with the introduction of LPM's (Ledger Posting Machines). The new economic policy gave motivation to introduce digital banking process in India in 90's. The year of 1991- 92 proves a successful year because of its rapid growth in the market. The major turning point was private and foreign

banks came to Indian banking sector due to this New Economic Policy. It has born a high competitive market. And due to this the trend of digitalization arises. Now every bank wants to use digital banking services, so that they can give better services to their customers.

The challenges for banks are now facilitate demands that connect vendors with money through channels determined by the customers. This is a dynamic shape which is the base of customer satisfaction. It can be maintained by customer relationship management (CRM) software. This is an important aspect in digital banking. It can directly communicate with the customers. And it can be base to connect both customers and bank management.

### III. REVIEW OF LITERATURE

1. Arunangshu in his paper focus on digitalization on rural banking system in India. Digital banking system have enormous potential to change the landscape of financial inclusion. They found that with the features of low cost, ease of use of digital banking can accelerate the integration of unbanked economy to the maintenance.
2. Rajeshwari in his research paper found that digital banking increase the expectations of customers from banks. With the help of secondary data they analyse that digital banking become the milestone in Indian banking system. It enhance the growth and progress of Indian banking. It found that due to digital banking the operating cost of banks has been reduced rapidly. Lower operating cost means more profits for the banks. According to him digital banking has a power change the banking structure.
3. Aarti Sharma, in his research paper concluded that digital banking will proves a milestone in the Indian economy. The study is analytical in nature and based secondary data. According to him digital banking impact on Indian economy. With the change in the technology of banking system, the economy also faces the changes. It can provide better services to their customers. Due to their rapid growth it is acceptable in the market. Now by analysing the benefits of digital banking everyone in the market demanded this for the overall growth and success.
4. Kiran Jindal conducted a research and analyse that with the promotion of digital banking it is also necessary to enhance awareness and preference of cutomers for banking products. It basically emphasis on HDFC banking products. The paper is based on empirical study. They can use primary data for the study. With the use of questionnaire they collect the data they analyse that age factor is most effective factors which effects the digital banking system. The customers over the age of 35 doesn't accept the change and still they are dependent upon public sector banks other than privet sector banks. Customers are not much aware with the new technology. So it is very important for the success of digital banking is to promote awareness among customers. For analysing the data researcher use SPSS software.
5. Ruby in his paper studied the problems and prospects of E- Banking. It also focus on the pros and cons of digital banking which effects the customers perceptions. They also focus on the risk involved while introducing digitalisation in the market. The secondary data was used for the research paper. They concluded that E- Banking offered a high level of convenience for managing finance for the customer in the digital market. They also analysed the risk means financial security, personal privacy towards the customers
6. Vishal conducted a study and concluded that customers always want safety and security during cash transactions. This paper makes more emphasis on the perception and opinion of urban mobile banking users. He focuses on practices, challenges and security issues related mobile banking in India. He uses quota sampling method. The data is collected from the primary source of data. The sample size is 100 respondents divided into two catagories: 50 users and 50 non- users of mobile banking. The sample is taken from Ghaziabad city. It was analysed that knowledge regarding use of mobile phone was the most important issue in mobile banking due to availability of various handsets models supporting different types of technology in the market.
7. Chandrawati identify the drivers of digital banking transformation for Indian banking system. E- Technology has become a tool that facilitates banks' organizational structures, business strategies, customer services and related functions. Using exploratory research, the study concluded that digitalization changed the face of branch banking and mobile was being increasingly used as a primary channel of banking. Moreover, integration with social media components as their online channels was also a major driver for digital banking transformation
8. Sahu and Kumar studied the important factors responsible for successful implementation of digital payment (e-Payment) system in India. Conducting a qualitative study with extensive literature review and using interview and expert opinion, 13 success factors namely Anonymity, Bank Involvement, Drawer, Infrastructure, Mobility, Parties, Popularity, Range of Payment, Risk, Security, Transfer limit, Transfer mode, and Transfer time were responsible for successful implementation of digital payment at Allahabad city.
9. Ankit and Singh conducted a study to analyses the impact of technology acceptance model (TAM) in the context of internet banking adoption in India under security and privacy threat. Keeping the TAM proposed by Davis as a theoretical basis, the paper

revealed that perceived risk had a negative impact on behavioural intention of internet banking adoption and trust had a negative impact on perceived risk. A well-designed web site was also found to be helpful in facilitating easier use and also minimizing perceived risk concerns regarding internet banking usage.

10. Geetha conducted a study on 200 respondents of metropolitan city in India. The researcher has laid down various parameters which has direct impact on the adoption of E- Banking facilities. They specified the parameters like innovativeness, familiarity, awareness, security and trust among the various customers. These factors effects the customers perception regarding digital banking.
11. Utpala conducted a study to evaluate the current status of E- Banking in the market. From the primary source of data she analyse the respondents reviews about E-banking. It will cover the Indian respondents as well as the non- residence respondents of India. They analyse the hurdles faced by the customers during online banking. They found that 60% of the urban population using digital banking. So for banks it should be important to focus on rural population by creating awareness programmes and training session. It should help in promoting digital banking in India.
12. Hoehle note that the utilization of digital banking channels has grown substantially. It focus on the customer related issue. They analyzed that if banks can use this digital banking system it can improve the financial performance of banks. Customers are looking for value and demanding more mobile banking services.

#### IV. RESEARCH METHODOLOGY

##### Objectives of the Study:

1. To know the role of Digital Banking among Adults life.
2. To identify the services provided by Indian banks to promote digital banking.
3. To know the Pros & Cons of Digital Banking.
4. To understand the challenges of digital banking.

##### Data Collection Methods:

The data should be collected with a secondary source. Various research papers, bank data, banking structure should be analysed for this paper.

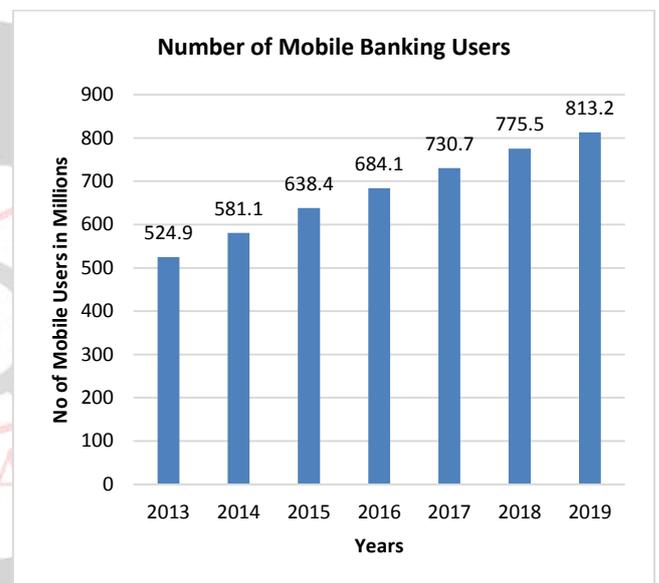
#### V. RESULTS

**Objective 1:** To know the role of Digital Banking among Adults life.

Now the time has been changed. With the change in technology human life also changes. In the past people go to banks and do their works by their own. But now all are educated and adopts new technologies for their growth. Now no one is like to go to banks because of shortage of

time. All are busy in their jobs. I'm sure any one of them not wants to stand in queue for depositing money or to withdrawal of money. Everyone wants comfort and peace in their life. In the past this system of queue is applied. Now smart banking starts. And this smart banking is come in our way of life. It is a part of our life. Now every transaction is done through mobile banking. Now paying bills with mobile banking become very easy.

Years	No. Of Mobile Users in Millions
2013	524.9
2014	581.1
2015	638.4
2016	684.1
2017	730.7
2018	775.5
2019	813.2



**Number of adult Indians with bank accounts rises to 80%**

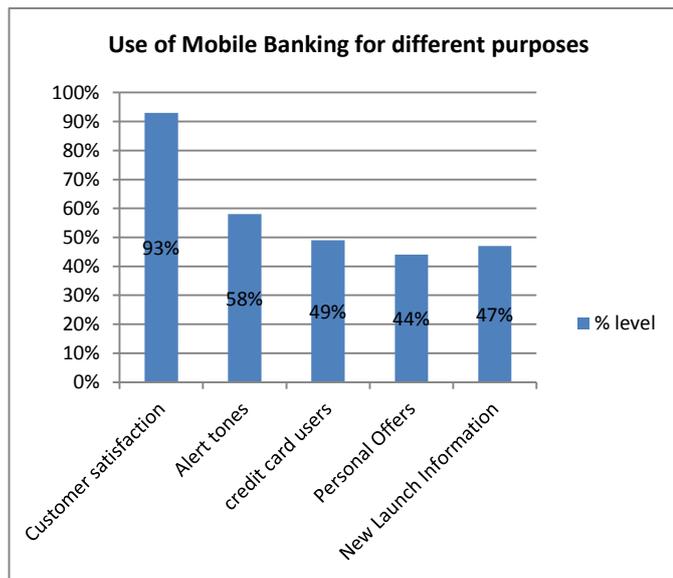
##### No. of Adults using Mobile Phone Banking

Years	% of people
2018	69%
2017	62%
2016	51%
2015	49%

Globally, 69% of adults (3.8 billion adults) now using mobile banking. The Modi Government put more efforts to increase the use of digitalization in banking. India's Jan-Dhan Yojana scheme, developed by the government to increase account ownership, brought an additional 310 million Indians into the formal banking system by March 2018, many of whom might not yet have had an opportunity to use their new account.

In India the contribution of adults has been increased by doubled since 2011 with 80%.

During 2017-18, the number of transactions carried out through credit cards and debit cards was 1.4 billion and 3.3 billion, respectively. Prepaid payment instruments (PPIs) recorded a volume of about 3.5 billion transactions, valued at Rs 1,416 billion. Indians prefer a digital-first approach to banking, and will not hesitate to protest poor service, finds a survey by Avaya. 51% of Indians use online banking channels. 26% of Indian customers prefer to access services via their bank’s website, and the same number would prefer to use a mobile app rather than talk to a human agent.



**Benefits of Digital Banking for Student’s:**

1. No need to carry cash (plastic notes).
2. Avoid long queues.
3. Highly secured system.
4. No worry of loss and theft of money.
5. Easily availability of money.
6. One card- multiple uses.
7. Reduce operational expenses.

**Digital banking Users according to Age Group:**

Age Group	% of Users
Below 18	33.3
18- 29	78.6
30- 49	67.5
50- 59	33.3
60 and Above	-

**Objective 2:** To identify the services provided by Indian banks to promote digital banking.

S.no.	Services:
1	Tablet banking.
2	Mobile check deposit.
3	Tax alerts.
4	E-Statements.
5	
6	

7	Online Bill pay.
8	Deposit Account opening.
9	Account statement.
10	Cheque book Issue.
11	Fund Transfer facility.
	SMS Banking.
	Request status enquiry.

**Objective 3:** To know the Pros & Cons of Digital Banking.

(Pros) Advantages of Digital Banking:	(Cons) Disadvantages of Digital Banking:
1. Customer Satisfaction.	1. Increase Cyber attacks.
2. Cost Reduction.	2. Afraid of Privacy & Security.
3. Paper less Work.	3. Increased in unemployment.
4. Face Competition.	4. Increase training and development cost.
5. Reduce Human Error.	5. It is not useful for uneducated Peoples.
6. Easy Accounts Handling.	6. Digital knowledge is must.
7. Cash less Transactions.	7. Customer’s perception changed.
8. Increased Productivity.	8. Low internet speed.
9. Increased employees Performance.	9. Transactional Charges.
10. Time Saving.	10. Habitual causes.
11. Eliminate area gap.	

**Objective 4:** To understand the challenges of digital banking.

1. **Security/ Privacy:** This is the most important challenge in digital banking. Every person has a doubt regarding privacy and security of digital banking. They don’t believe on digitalisation. They only prefer to do cash transactions. Most of the customers were not changed their perception regarding banking. They think that with the growth of technology some problems also occur. Customers don’t want to take any chance with their money which they have earn in their life with full of efforts and hard work. With digitalisation, antivirus also come which destroy your life.
2. **Knowledge of Digitalisation:** Many people don’t understand the concept of digitalisation. This system wants Updation time to time to improve its accuracy. This digitalisation work only when the customers are educated and have knowledge regarding this. This is the challenge that it wants to cover more & more customers. For this knowledge is most important.
3. **Internal Barriers:** Banking industry also has departments like other industry. With the change in technology effects the departments of the organisation. Like customers & bank employees are the most important part of banking system. As customer knowledge regarding digital transaction is important as such employee’s knowledge regarding digitalisation is also matters. If employees don’t know this then how

they can influence the customers. So banking system can give training to their employees so that they can update themselves with the change in technology. It can increase the performance & productivity of employees.

4. **Non financial Institutions:** Like Govt. banks, several other institutions like Google, face book, paytm etc. offers similar services like banks provided to their customers. These non financial institutions provide a platform to the customers to send their money directly to someone's bank account. These institutions were not bounded with any rules and regulations. But financial institutions were bounded with some rules. This is the most challenging concept for financial institutions.
5. **Digital banking system:** Now a days the demand for digitalisation grow on a high speed. But most of the banks have no guts to adopt this technique quickly. For this best and skilled management will be required so that their policies & strategies will give benefits to the organisation. Some wants a readymade system and some wants to build a system and then implement it. It takes a lot of time to take a decision which is beneficial for the organisation. This makes a challenge for the organisation to adopt which system because each decision has with some cools & fires.

## VI. CONCLUSION

Digital banking captures a large market share. Now a days with technical advancement there is a change in the banking sector. Now every customer accept the digital banking for their comfort. But with benefits of this advancement some errors also occurs. So there are some technical issues which effects customers perception. According to the study the active users of digital banking are 562 millions in India. Digital banking is converting the brick and mortar banks into more greater and efficient places to operate. Digital banking makes easier all the transaction for the customers. They can easily pay their bills, convenient places, transfer money from one place to another and easily check the bank details. Growth of digital banking in India can help in various issues like: Growth of capital market, Growth of insurance sector, Growth of venture capital market.

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## **A study on the Buying behaviour of females in Delhi NCR (Impulsive Vs Rational buying)**

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**Lingayas Vidyapeeth**

**Faridabad**

### **Abstract**

Impulsive buying is the spontaneous purchase or a purchase without any pre planned idea of buying that specific product. It is observed that impulsive buying is mostly related to females as females are majorly inclined towards impulsive behaviour when compared to males. It is a sudden and immediate purchase decision. This study aims at searching the factors which influences the buyers (particularly females) to go for impulse buying. It also try to find out whether any price factor is involved in the impulsive buying. The study extends to find out the post purchase behaviour of females after buying impulsively. This study is based on the secondary sources of data. This is mainly descriptive in nature. Secondary sources mainly includes past research papers, articles, journals etc. According to past studies the ambience, convenience and shelf positioning have a significant impact on the Impulsive buying behaviour of consumers.

**Key words:-** Impulsive buying behaviour, post purchase behaviour, females, price of products

### **1. Introduction**

In today's scenario as pool of options is available for the consumers, they generally opt for the impulsive buying. "Impulsive buying" is basically a spontaneous purchase without any intention to buy a particular product. The person who goes for this type of purchases referred as impulse buyer. Mostly females used to shop for products impulsively without any pre purchase intention. This paper focuses on the female purchase intension.

#### **1.1 Indian consumer buying behaviour**

Buying behaviour is basically the decision making process and the acts involved in customers buying and using products. Buying behaviour of consumers may vary from person to person. The buying behaviour has become a great necessity for the marketers to understand as success of an organisation majorly depends on the consumers purchase behaviour. Initially Indian consumers were price sensitive, they always go for the economical product with the best quality, even a small change in price of products will induce the consumers to switch from one brand to another. Now the mind-sets of consumer have changed, they mostly now prefer the

best combination of quality, quantity and price. As the drastic change in socio-economic pattern of Indians are witnessing the new markets and they are going to get exposure of the new varieties. The Indian consumer profile has been changed and developed in terms of employment, income, advertising, education, media exposure etc. Now consumers have become aware about the pros. and cons. of each and every product. Nowadays consumer buying preferences change rapidly towards high end technology products.

## 1.2 Consumers buying process

### The Consumer Buying Process

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The study of consumer buying process is important to analyse as it gives the idea about how the customer purchases the products. In the buying process consumers follow various steps and at every step they analyse everything. A rational consumer can follow all these steps while he/she decides to go for the purchases. Firstly the consumer finds out his need of the product or recognises the problem. Then after problem recognition the consumer go for the information search. In information search the consumer searches the information from each and every available source, and then he/she compiles the information. After searching of information the next step is evaluation of alternatives i.e. to compare the entire available alternative and evaluate these alternatives on the basis of price, quality etc. After evaluation of alternatives purchase decision should be made and when the consumer decides about the purchase, he/she can finally go for the purchases. Purchases is not the final step of the

decision making process after purchases, the consumer can go for post-purchase evaluation. In post purchase evaluation the customer evaluates the after sales services, on the basis of which the customer evaluate the marketer. If the customer is not satisfied with the services of the marketer, he/she may also return the product. If post purchase stage is not taken seriously, the loyalty of the customer may be lost.

### **1.3 Female buying behaviour**

As India is a diverse country the choices of people will also differ based on their culture, caste and creed. The buying pattern may also differ as we travel from one region to another. Also there is a difference between the buying pattern of males and buying pattern of females. Females frequently visit at the shop for buying one thing or the other. As compared to males females are more indulged into impulsive buying. Females attach emotions with their product and that's why they impulsively buy product. Sometimes the influence of the seller, sometimes the packaging of the product also persuades the buyer (especially females) to go for purchases. Window dressing plays a crucial role in enhancing the shopping experience of buyers. It is also observed that women seek variety of products and from the hundreds of available brands she chooses one or two.

### **1.4 Factors affecting the buying behaviour**

With the new entrants in the market and a variety of options the consumers keep on changing their preferences from time to time. There are various factors which influence or attract them to buy. These factors include marketing campaigns, income of the buyer, buyer's personal preferences, group influence etc. Many a times just because that particular product is advertised by their favourite star or the person to whom they admire induce them to purchase.

## **2. REVIEW OF LITERATURE**

**Rajput, Kesharwani and Khanna(2012)** - This paper examine the buying behaviour of females and analyse the key factors in branded clothing which influence them to buy branded clothes. It is included in the study that price, income level of consumers are the main factors in their buying process. Also the author specifies that females have a wide knowledge in the branded products and the shopping behaviour of females is occasional.

**Ekeng, Lifu and Asinya(2012)** – This study highlights the demographic characteristics in buying behaviour. It focuses on the purchase behaviour of people according to their demographic condition and how impulsive buying is directly related to their demographic characteristics. This paper collected data through filling of questionnaires. The study reveals that though education was insignificant factor but it was the one which indulge the consumers to go for impulse buying.

**Badgaiyan and Verma(2015)** – This study is tried to find out the impact of situational factors on the impulsive buying behaviour. They categorise the variables into two classes (i) personal variables (ii) in-store variables. The study is based on the primary data collection. Their study concluded that gender does not impact impulsive buying behaviour while age has a negative relation with impulsive buying.

**Liao, Shen and Chu(2009)** – The study investigate the marketing effectiveness in attracting the customers to go for the impulsive buying. Also focuses on how the sales strategy induces consumers to adopt impulsive buying. They concluded from their study that a price discount promotion and also a premium price promotion of a product encourage them for impulsive buying.

**Ghani and Jan(2011)** – This study is based on examining the demographic factors with impulse buying tendency of consumers in developing countries. This study concludes that age plays the major factor in impulsive buying whereas gender and income plays secondary role. Also the demographic variables have an indirect effect on impulsive buying behaviour.

**Amir et. ,al.(2014)** – This study focuses on the relation and effect of factors that may influence the impulsive buying behaviour of females in apparel industry. This study mainly tries to find out the factors which trigger the female to adopt impulsive purchases. This report is based on primary data collection. The results show that the impulsive buying of Pakistani women mainly increases because of social desirability.

**Gangai and Agrawal(2016)** – This study tries to establish the link between personality traits of an individual and impulsive buying. They highlight that many marketing organisation focuses on their personality traits and depending on them they make their strategy. In this study two objectives were set (i) to examine the effect of personality traits on impulsive buying (ii) to identify the role of gender and their personality traits on impulsive buying.

**Akram et. ,al.(2016)** – This study explores the relation between store atmosphere and impulse buying behaviour. It also analyses whether the demographic variables like education, gender, age affect the relationship between store atmosphere and impulsive buying.

## OBJECTIVES

1. To study the impulsive buying behaviour of females.
2. To find out the post purchase behaviour of females after impulsive buying.

## RESEARCH METHODOLOGY

This study is based on the secondary data. It is basically descriptive in nature. The data have been collected from various sources like research papers, journals, government reports, newspaper articles etc.

## ANALYSIS/FINDINGS/DISCUSSIONS

It was analyzed on the basis of past study that most of the females prefer for impulsive buying. Females go with their intuition and purchases what they actually want to buy. In impulsive buying females does not consider cost factor. After impulsive buying the females are mostly satisfied. Studies show that females are more frequent buyers as compared to males. Also from the past observations it can be concluded that shopping act as a stress buster for mostly consumers (especially females).Female buying pattern is less rational than male buying pattern. On the basis of prior researches, it was found in the study that frequent advertisement of product is the main source of making the buying decision. Producer should invest on the advertisement so that they can attract more and more customer.

## CONCLUSION

The purpose of the research was to understand the buying behavior of females. The results of this study clearly indicate that there is difference between the buying pattern of males and females. Females do have impulsive behavior in case of certain things but not necessarily always. It has been observed that female shop according to their moods and most of the time they thought of buying something and bought another thing. After buying things impulsively mostly females were satisfied but it has been observed that most of the times they do feel the thing is of no use to them. This study is based on secondary data and the information collected is on the basis of the research papers studies. This study reveals the purchase and post purchase behavior of the people with special focus on the females.

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## A Theoretical study on Buyers Preference in Purchasing the Attires of Universal Brands

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### ABSTRACT:

Apparel, being a more brand-driven category than, food & groceries, has already seen many international brand apparel retail outlets enter India over the past 15 years despite the restrictions in the FDI policy in retail sector. A lot of international brand Apparel retailers are most likely to look at India, as global markets have stabilized and the Indian economy has proved to be better than most other countries. This study was conducted to find out the factors that determine the shopper's inclinations for international apparel brand. The purpose is also to identify the predictors for internal brand apparels among consumers. From the study it was found that consumers are brand conscious now a days. To look more stylish they prefer branded apparels and branded apparels also depict the status of a person. Due to more durability, variety and quality and people prefer branded apparels. The study found out that price and media influence are strongest predictor for the consumer preference followed by quality and Land of original and style has less prediction towards the consumer preference. Overall, the survey shows that shoppers have positive attitude towards international apparel brands.

### INTRODUCTION

Globalization is vital sensation that is gaining attention worldwide, and lead the world to become a one combined market, an international market. In the era of pre-liberalization, consumers of India were acknowledged to have high preference towards foreign brands and imported goods. Though, after the decade of liberalization, Indian market, is highly served by the brands, which have their origin from the foreign countries. With the increased in popularity of international brands, market become a part of attractiveness and high competition. "Tastes and preferences of the consumers are the main base of fashion, to develop the brand popularity".

India has developed as third attractive market for apparel industry throughout the world. India is the nation which have different cultures and customs, and for each culture and customs they have

different dressing style. It has variation of dressing from “salwar-kameez to sari and from lungi to dhoti”. Indian market is increasing day by day through the branded garments. According to the past survey by various researcher, it has been noted that, in last ten years India is source of attraction for American and European brands because of high demands of apparel in India. And due to the preference over the brands by customers it becomes necessary of the companies to develop brand management so that they can gain competitive advantage worldwide. Brand management gain importance due to continuous change in the international market at global level, and due to the competition among the various international firms. Proper management of brands makes a clear differentiation among the products and give a proper information about the loyalty and preferences of consumers, which ultimately lead to increase the market share of the organization.

## **Brands**

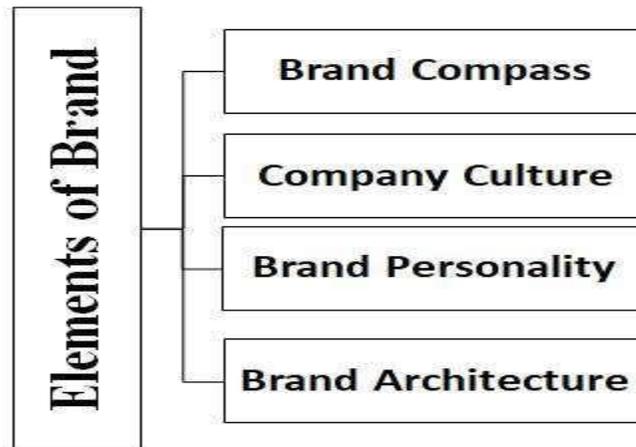
Brands is not a new concept to marketing. Earlier the concept of brand, firstly used by “Egyptian Brick-makers” who use symbols and signs on the bricks to make their product identical (Farquhar et. Al., 1990).

Branding is practice of marketing, which created by company as a “name, design or symbol” that is used by the consumer to identify the product and make the product different from the other products and services. Branding is vital for company because it makes a memorable impact on consumer’s mind as well as it allow consumers and clients to know what to be expect from the company. Brand should be a word, symbol or sign which represent a picture of your company.

Marty Neumeier defined brands as “*a brand is person’s gut feeling about a product, services or organization*”.

Fried lien defined Brand as “*Brand is the sum total of how someone perceives a particular organization*”.

## Element of Brands



- **Brand Compass:-**Brand Compass refers to abstract of the supreme fundamental facts about your brand. Brand compass leads to the directions, why branded is headed. Brand compass is outcome which company get through the work done in the stage of brand strategy plus in the stage of research and positioning. It contains five parts “purpose, vision, mission, values and strategic objectives”.
- **Company Culture:** - Company culture is inner self of motives, purpose and stimulus that drives brand of your company. If company have strong culture, it will create core value to brand, which defines how your product is engaged with the world by the name of your brand.
- **Brand Personality:** - Brand personality involves the individualist’s traits of brands. Brand personality of product is the reason that reveals the rational and loyal customers and build a cordial relationship between the customer and company.
- **Brand Architecture:** - Brand architecture is a combination of “name, color, symbol and visual language” that make brand identifiable. Brand architectures are highly purposeful and creative, founded by researchers through customers experiences. “Brand architecture systems are commonly categorized as either monolithic, endorsed, or pluralistic”. Monolithic brand architectures’ includes a single major brand and various sub brands. Endorsed and pluralistic includes parent brands which have different-different relationship with other divisions.

## Preference towards the Branded Apparels in India

In today's trend of fashion, people are switching on branded apparels form the non-branded ones. Brands are getting awareness throughout the world. There are various factors that are crating demand of branded apparel like "increase in the income of consumer, increase in literacy level among consumers, globalization, increase in purchasing power and consumer consciousness towards fashion".

Promotion and media is the main reason behind the increasing brand awareness among youth. This is the new era in which people are more aware about the brand and want to buy apparels which are related to reputed brands. People are becoming more brand conscious and it is new fashion trend which is gaining more attention now a days. People consider brand value as quality, price and style. Youths are preferring branded clothes due to the comfort level of clothing stuff and they also believes that branded clothes are recognized as a symbol of status.

International brands of apparels also capturing the attraction of people of India. Market of India is attracting various niche foreign retailers. Many International brands of apparels has been set up their stores and shops in India by using the franchisee route. Many International Brands of apparels are available in India which are as follows:-

➤ Lacoste	➤ Crocodile
➤ Benneton	➤ Reebok
➤ Dockers	➤ Lee
➤ Levi Strauss	➤ Zara
➤ Versace	➤ Mother Care
➤ DKNY	➤ Debenhams
➤ Wrangler	➤ Nike
➤ Mango	➤ Esprit
➤ Marks and Spencer	➤ Tommy Hilfiger
➤ Peter England	➤ Arrow

## Consumer Buying Preference

The most difficult issue for the manufactures of clothing is to identify the consumer's needs. Identification of need is not valuable until it is not transformed in to product and service. Before developing any product and service specially related to garments it is required to understand the full make up mind of consumers, it is known as the consumer behaviour.

Sproule's& Kendall (1980), defined consumer decision making as "a mental orientation characterizing a consumer's approach to making choices". They identify eight dimension, on which decision of consumer has depend whether to buy or not to buy apparels of particulars brands. These dimension are ass follows:-

- Quality Conscious
- Brand Trustworthiness
- Style Conscious
- Price Conscious
- Product Conscious
- Spontaneous and Careless Tendencies
- Jumbled by over varieties
- Amusing and pleasure-seeking orientation

## LITERATURE REVIEW

Stanforth (2009), states that shopper perceptions about the international brand fashion apparel are based on various factors, like "perceptual leadership and perceive role model in the society, matching attire status to employment and workplace ambience, socialization with peers and people they like, self-esteem and fun, and respectful treatment in the society (Stanforth, 2009).

Janson and Power (2010), found that fashion and latest design offers by global brands of apparels are the main actors which help in creating the good brand image and provides various myths that clear the consumers orientation to buy fashion apparels of global brands.

Tee, Gharleghi& Chan (2013), conducted a study, main purpose of this research to identify the factors which predict the preferences of buyer for choosing the foreign fashion brands. Result of study revealed that origin of a country, is a factor that play a vital role in making the buying

choice to buy branded clothes, which are followed by other factors like lifestyle, media influence and quality of the product.

Pandian, Varathani&Keerthivassan (2012), Conducted a study to know the most preferred international brands opted by Indian. Study reveals that “John player, Peter England and Raymond” are top most favorite brand which are preferred by the consumers of India, who are more brand conscious. It was found in the study that shopper decision about the brands mostly the man shoppers, has influenced by choice of color, design & style, price series, celebrity endorsers and stability.

Laskar& Abbas (2014), tried to find out the source of awareness among consumers about the brands of apparels and to know the level of awareness of brands among the buyers. It is found that the main source of awareness is advertisement and attentive mind of buyers towards the trend and market increases the level of awareness. International brands of clothing industry need to be invest huge amount of money on advertising to capture the attention of consumers.

## **OBJECTIVES OF THE STUDY**

1. To identify shopper inclinations in buying apparels of international brands.
2. To find out the elements that influences the purchasing choice of shoppers for the apparels of international brands.
3. To check whether Brand image affects the purchase intention of shoppers.

## **DISCUSSION/ ANALYSIS**

- It is found in the study that the majority of people go for the brands occasionally not always. People like to buy the branded apparels, it shows the likelihood of respondents towards the branded apparels and indicates that people are becoming brand conscious.
- Majority of shoppers have a medium level of priority towards the international branded apparels.
- Shoppers give importance to international brands of apparel, when the brands make them feel good it influences their buying decision.

- According to the respondents, the topmost factor that influences their preference is price after that media influence affect their decision. Media influences include advertisement, promotion and celebrity endorsement. Media influence and festival offers to carry equally according to the respondents. Whereas after the media and festival offer the next factor that affect the buying decision is the loyalty of the brand follows by the festival offers and quality of customer service. It shows that price is on the top most important factor for the shopper which influences their decision to go for the apparels of an international brand.
- It is found that attractiveness of logo is not so much important for the shoppers while taking the buying decision regarding the apparels.
- Majority of people among the respondents are agreeing the international brands are fashion focused which motives the shoppers to buy the apparels of the international brand.
- Consumers are agreed on the fact that variation in fashion in style provided by international brands in apparels and consider an important element of global brands covered by the apparel industry.
- Majority of people among the respondents are neutral on this element, that the international brands provide more comfortable apparels.
- It is found in the study that international brands of apparels have high impact on the mind of shopper, they wants to buy the apparels of international brands.

## RECOMMENDATIONS

- Consumers are becoming brand conscious. They prefer to buy the apparels on the origin of brand image and distinctiveness of the brands. So apparels manufacturer of the international brand can increase their profits and attract more consumers by providing the uniqueness in their apparels.
- Buyers get more influenced by price and loyalty factors, so companies may increase their sale by offering the apparels at low cost, this will also create loyalty among the consumers. Price can be reduced by reducing the tax prices so that consumers can afford easily the apparels of international brands.

- International brands of apparels can focus more media influence and promotional activities, it will lead to gain fame as well as attract more consumers.

## CONCLUSION

Consumer buying inclination has gained significant attention from the researchers. But, while reviewing the literature of shoppers' inclination towards the international brands of apparel, few studies have been found. The present study was conducted to identify the factor that affects the inclinations of customers while going for the apparels of international brands. Preference of consumers can be changed by the cultural effects also. Shoppers prefer international brands because they think that it relates to prestige and consider it as a symbol of status. From the analysis, it is found that store image, quality of product and customer services also reveals the inclination of shoppers. Study indicates that consumers are becoming more brand conscious and their decision was affected by the services given by the international marketers of apparels like style, location, store attribute, brand name, fashion and quality of stuff. The manufactures of the International brand must focus on all these factors to gain profit and to attract more consumers. If consumers have a high preference towards the international brands of apparels then, there will be higher the chances to go for the international brands.

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# "Transformational Leadership and Employee Empowerment: An Empirical Study of the Attitudes of the Employees of Indian Automobile Sector"

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## **Abstract:**

The concepts of transformational leadership (TL) and employee empowerment (EE) occupy a prominent place in business world. Past researches signify a positive relationship between these two concepts, as has been studied by various researchers in various sectors. But the current study is only focusing upon relationship between TL&EE in the automobile sector. The population for the study covers middle level employees of automobile sector in Delhi-NCR region. Data were collected from 500 sampled respondents with the help of administering pre-developed structured questionnaires on transformational leadership (MLQ-5X) and employee empowerment (Psychological Empowerment). Non- Parametric tests like one sample sign test, chi-square test and Kruskal-Wallis tests and parametric test like Z test and t-test were applied for analysis. The findings indicate that all the dimensions of TL and all the dimensions of EE are vital and also prominent. However, the prominence in the case of technical cadre of employees occupies first rank while the management-cadre of employees has third rank, out of the three categories of cross sections. As such the scores differ significantly. There is very positive & significant relationship between EE and TL and EE is the effective function of TL..

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## I. INTRODUCTION

Leaders are visionary, altruistic and have influencing power, who help organization in developing high performance of teams and thereby lead to develop learning organizations and improves job satisfaction playing very vital role in improving an organizations performance. Today's organizations are facing changing environment and, therefore, organizations require transform themselves as per the changing environment. Transformation of organizations is not possible without employee involvement. Employees are vital source for the organizations and if the employees are empowered, organizations can survive in the corporate world and improve their

existence. Employee empowerment is the main issue which is gaining attention due to increasing competition and, therefore, growth of organizations largely depends on how organizations treat their employees. The studies related to leadership indicate that TL has relation with the employee job performance and also their satisfaction (Bass & Avolio, 1993; Özaralli, 2015). Since past few decades, competition is globally increasing due to advancement in technology and socio-economic changes; it influences the organizations to change their structure from centralized to decentralized nature. Organization structure could be changed by the dominated role of leadership, which modifies the management practices complementary to the

aim of employee empowerment (Conger & Kanungo, 1998; Forrester, 2000, Dewettinck & Ameijde, 2011).

Past researchers indicate that leadership and employee empowerment has positive relationship (Dust *et al.*, 2014; Ismail *et al.*, 2011; Judge & Piccolo, 2004). This paper mainly concentrates on the relationship of TL& EE in automobile sector for middle level employees. Every organization has its own leadership style and employee empowerment strategies. In the past, various areas of corporate world have covered in the research of transformational leadership and employee empowerment. This study, mainly focuses on automobile manufacturing sector, which is the most growing sector in Indian economy. Automobile sector is facing challenges due to complex changing environment as also due to the requirements of customers and society. To deal with the issue of continuous technical up-gradation in production process and requirement of customers, it is the need of manufacturing sector to build transformational leadership and empowered employees. For this purpose, the attitudes of the employees have been studied in connection with TL& EE.

## II. REVIEW OF LITERATURE

### Transformational Leadership (TL)

It has been defined by Downton (1973), as "when one or more person engages with others in a way that leaders and followers raise one another to a higher level of motivation and morality". Burns (1978) defined TL as "the truly transformational leader who is seeking the greater good for the greatest number and is concerned about doing what is right and honest and is likely to avoid stretching the truth or going beyond the evidence, because he/she wants to set an example to followers about the value of valid and accurate communication in maintaining the mutual trust of the leader and his or her follower". Because of its nature to motivate and relate TL is gaining attention (Gardner *et al.*, 2005).

Transformational leaders inspire followers to work in a team for long hours and achieve

performance beyond the expectations (Bass, 1985). Podsakoff *et al.*, (1982) states that contingent rewards affect the performance of subordinates. Contingent rewards motivate the followers which lead to job satisfaction. Transformational leaders raise the morale of the followers, build up awareness among employees, provide them guidance to work according to their own method and encourage participative management (Yukl, 2009). Avolio & Bass (1995), classified transformational leadership in four dimensions as explained below:

- **Idealized influence:** Leaders influence their followers, create culture and value between the followers. Transformational leaders inspire and motivate the employees to build confidence among them as also contribute in building trust and creating an environment of loyalty. They perform their role as ideal to their followers (Avolio, 1999; Bass & Avolio, 1992; Goh, 2002).
- **Inspirational Motivation:** Leaders play a role of motivator who encourages the followers to perform according to the organization's norms. They clearly communicate objectives and vision to the employees and provide guidance to them, so that they can achieve targets within the time frame (Bass & Avolio, 1992; Sarv & Santra, 2001). Transformational leader increases the quality of work and inspires the followers towards positive thinking (Avolio & Bass, 1988).
- **Individualized Consideration:** Transformational leaders treat followers individually. They do not focus on the present needs of the followers but try to exploit their needs and develop potential among the followers to achieve those needs. They give preference to one to one relationship. Leaders establish a connection line between the needs of employees and mission of organization (Bass, 1985). Here, leaders act as coach and mentor to their

followers (Bass & Avolio, 1992; Skosik, 1997).

- Intellectual Stimulation: Innovative leadership and leadership for innovation is again an important aspect of leadership encouraging employees to be innovative, creative and problem solver. They offer challenging work to the followers and encourage them to work according to norms, values and traditions. They also influence the followers to perform a task with new ideas and techniques (Bass, 1990). Transformational leader connects the ideas with value.

#### Employee Empowerment (EE)

Empowerment term came into existence in 1981. It was introduced by Julian Rappaport. "It is a state of mind as well as result of position, policies, and practices, Block (1987). As managers, we become powerful as we nurture the power of those below us. One way we nurture those below us is by becoming a role model for how we want them to function". According to Clutterbuck & Kernaghan (1994), "empowerment is, in essence, the transfer of power within organizations from top management to middle management and so on, all the way to the front line employees". The term empowerment focuses on enhanced participation of employees in organizational processes and decision making (Mitra & Sinha, 2005).

Empowerment has the positive relationship with commitment and increases the job accountability among the employees (Sarkar, 2009). Kauffman (2010), states that empowerment is a continuous process of encouraging employees to generate new ideas, make plan and strategy for actions and take initiatives which ultimately aids organization. The primary aim of employee empowerment is redefining the power between employee and management, which increases the employee authority, commitment and responsibility (Handy, 1993; Spreitzer, 1996; Greasley et al., 2008, Sahoo et al., 2010). To be the highly effective

empowerment, an organization must adopt practices which increase the "power, knowledge, information and rewards" and share it with the employees on lower and organizational level (Bowen & Lawler, 1995). The employee empowerment has been classified into the following eight dimensions:

- Meaning: It is "the value of the task goal or purpose, judged in relation to the individuals intrinsic caring about a given task" (Thomas & Velthouse, 1990, p.672). Meaning acts as engine to the empowerment; it inspires and encourages employees to work effectively and actively (Spreitzer, Kizilos & Nason, 1997; Spreitzer, 1995).
- Competence: It is "the degree to which person can perform task activities skillfully when he or she tries" (Thomas & Velthouse, 1990, p. 672). Competence stands for self-efficacy and personal mastery.
- Self-determination: It is related to freedom of employees to take decisions related to their own job. It deals with choice of performing the task according to employees (Deci, Connell & Ryan, 1989. Locus of control is important in self-determination. Individual behaviour and attitude are to recognize as self-determination.
- Impact: It is the extent to which one can create a difference through their behavior which leads to accomplishing the task in a purposeful manner as also producing intended effects in one's work environment (Thomas & Velthouse, 1990, p.672). It is influenced by the personality characteristics and locus of control. Impact is to deal with how much employee activities have impact on department and on organization.
- Clarity to expectations: Organizations need to communicate the vision and mission to the employees. Supervisors should clearly communicate the job expectation to the employees; and also the organization expectations from them and employees

having authority to job (Fishmen& Keys, 1997).

- Value and rewarding: Employees are rewarded and praised for their efforts. Organization should value their employees who take participation in the management activities. It increases the empowerment and helps organizations in achieving the targets more easily.
- Access to resources: Supervisor should have clear idea about the resources available to the employees. Task is incomplete with improper resources, so the supervision should ensure that employees have proper and adequate resources to perform their jobs and activities.
- Voice: Voice deals with the encouragement from the supervisors to the employees for future growth. Supervisors should encourage decisions-making from the employees as it creates responsibility among employees which raises the employee-empowerment. Employee involvement and participation culture supported by the organization provide authority to employees to perform their job

#### Theoretical Framework between TL& EE

Employee empowerment has positive relation with transformational leadership as also with organizational commitment Ismail et al., (2011). Past researches investigate the relationship between TL & EE based on varied samples and industries. Özaralli (2003) & Meyerson & Kline (2008), assures that if a leader implements transformational leadership style properly it will lead to the increase in the empowerment of the followers and have the impact on functions of the organization. LMX (Leader-Member Exchange) is positively related with the creativity of employees (Scott & Bruce, 1994; Tierney et al., 1999). Ahearne et al., (2005), exhibits various aspects of empowering leadership which includes “enhancing meaningfulness of work, fostering participation in decision-making

expressing confidence in high performance, and providing autonomy from bureaucratic constraints”. Empowerment is affected by forthrightness (Appelbaum et al., 2015), innovation and creativity (Behroozi et al., 2012), and organization assistance (Huanget al., 2005).

Erkutlu & Chafra (2015), states that servant leadership has an influence on the innovation behavior of employees mediated by the empowerment. Empowerment plays an intermediary role between TL and the performance of the employees (Judge & Piccolo, 2004). Transformational leadership style raises the empowerment which has a positive impact on organizational commitment. Dust et al., (2014), states that there is positive influence of psychological empowerment on the relationship between employee task performance and TL. Lang & Chang (2015), study assures that transformational leadership improves the perception of the employees about empowerment, and it directly affects the team effectiveness in a positive manner. Gill et al., (2011), said that employee retention depends upon the degree of freedom to do the job; empowering employees and exhibiting transformational leadership help reduce the turnover and increase employee retention and performance. The theoretical relationship propounded by the past researchers denotes that Employee Empowerment is the function of Transformational leadership. This implies that EE and TL are highly positively related. For, the effective TL improves EE and thereby results into higher levels of employee performance.

In this backdrop, the researchers are curious to study empirically the relationship between EE and TL in the automobile industry. For this purpose, the attitudes/perceptions of the employees have been studied with 5-point Likert scale

#### Hypotheses

On the basis of the survey of literature, the researchers could develop the following broader hypotheses:

1. All the dimensions and parameters of EE and TL are very prominent and vital.
2. All the dimensions and parameters of EE and TL do not differ substantially in general as also in terms of cross sections of the employees.
3. There is positive relationship between EE and TL for all the employees.

### Objectives

In the context of the hypotheses mentioned, the objectives of the study are as under:

1. To calculate the average scores of the aspects/parameters of EE and TL and to pinpoint their prominence. In other words, whether their prominence is different or is equally prominent for all the employees as also for the cross sections of the employees.
2. To measure the average nature and degree of co-relationship between TL and EE for all the employees as a whole

### Research Methodology

The title of the problem is “Transformational Leadership and Employee Empowerment: An Empirical Study of the Attitudes of the Employees of Indian Automobile Sector”. The nature of the study is sample based on descriptive research. The population covers employees working at middle level in automobile sector of Delhi-NCR region.

Primary data are collected from the sampled middle-level managers of automobile sector in Delhi NCR by administering a well and a pre-tested structured questionnaire on 5-point Likert scale. The instruments of transformational leadership developed by Bass (1985), namely MLQ-5X contains 20 items and employee empowerment instrument developed by Spritzer (1995) and Fishmen & Keys, (1997), it contains 23 items

divided in eight dimensions. The size of the sample is 500 middle-level employees. The sample size was determined on the basis of the following formula:

$$n = Z^2 * \sigma^2 / e^2,$$

Where the researchers have accepted the error term 0.058 and the S.D of the population ( $\sigma$ ) as the proxy figure is 0.66.

$$n = (1.96)^2 \times (0.66)^2 / (.058)^2$$

$$n = 496$$

By rounding the figure, the sample size is of 500 employees (the cross sections of 256, 41 and 203 employees of management cadre, non-management cadre and technical cadre). The sampled middle-level managers have been identified by using a stratified random sampling technique so that sample represents the whole population.

To check the significance and to test the hypotheses, Non- Parametric tests like one sample sign test, chi-square test and Kruskal-Wallis tests and parametric test like Z test and t-test were applied at 5% level of significance. For studying the relationship between EE and TL, Karl Pearson’s Correlation Coefficient and Linear Regression Analysis are used. Moreover, the average scores of all the aspects/parameters in the form of percentage of total spectrum represents as follows

Criteria Percentag e	Remarks
Up to 60	Normal
>60 <75	Highly Satisfactor y
>75	Vital or prominent

### Result & Discussion

The data collected for this study relate to 500 middle-level employees which have been processes as depicted in Table 1.

Measurement of the overall aspects of Transformational Leadership

**Table: 1**

Average Score of Attitude Measurement on a 5-point scale for the aspects and Dimensions/Parameters of Transformational Leadership of the Sampled Respondents

Dimension	Aspects of Transformational leadership Pertaining to each Dimension	Aspects Average Score & Average Score of the Dimension	
Idealized Influence	Instills pride in me for being associated with him/her	(20) 3.518	3.936 (86)
	Acts in way that builds my respect	(17) 3.862	
	Talks about their most important values and beliefs	(16) 3.896	
	Specifies the importance of having a strong sense of purpose	(2) 4.114	
	Emphasizes the importance of having a collective sense of Mission	(3) 4.072	
	Goes beyond self-interest for the good of the group	(18) 3.856	
	Considers the moral and ethical consequences of decisions	(9) 4.034	
	Displays a sense of power and confidence	(1) 4.136	
Inspirational Motivation	Talks optimistically about the future	(14) 3.934	3.9855 (42.5)
	Talks enthusiastically about what needs to be accomplished	(6) 4.046	
	Articulates a compelling vision of the future	(15) 3.92	
	Expresses confidence that goals will be achieved	(7.5) 4.042	
Individualized Consideration	Spends time teaching and coaching	(7.5) 4.042	4.041 (26.5)
	Helps me to develop my strengths	(5) 4.048	
	Considers me as having different needs, abilities, and aspirations form others.	(4) 4.062	
	Treats me as an individual rather than just a member of a group	(10) 4.012	
Intellectual Stimulation	Suggests new ways of looking at how to complete assignments	(13) 3.962	3.8755 (55)
	Gets me to look at problems from many different angles	(11) 4.006	
	Seeks differing perspectives when solving problems	(12) 3.998	
	Re-examines critical assumptions to question whether they are appropriate	(19) 3.536	
Total average		3.9548	3.9595

Source: Authors(Based on MLQ Multifactor Leadership Questionnaire, Bass, B., & Avolio, B., 1995)

(Note: figures in brackets denote rank values among all the scores in descending order covering all the 20 statements and total of ranks for all the statements covered in each of the parameters).

The table contains the average scores of attitude measurement on 5 point scale for the aspects and

dimensions of the transformational leadership of 500 samples.

As per the table, the overall average score of all the aspects and dimensions of transformational leadership comes to 3.954 which indicates, in term of percentage, 79% of the total spectrum and as per

the criteria pointed out earlier, it has the vital importance of all the aspects of transformational leadership. Moreover, the average scores of all the dimensions in term of percentage came to Idealized Influence 77%, Inspirational Motivation 80%, Individualized Consideration 81% and Intellectual stimulation 77% of the total spectrum and this indicates the vital importance of all the dimensions of transformation leadership.

In order to examine the significance of the overall average score, the researcher has adopted one-sample sign test as follows

Null Hypothesis  $H_0: \mu = 3.9548$ , Alternate Hypothesis  $H_a \neq 3.9548$ ,

Total Number of Signs ( $n$ ) = 20, 13 plus sign and 7 minus sign,

Number of less frequent signs ( $s$ ) = 7

The critical value for the two-tailed test at 5% level of significance ( $k$ )

$K = (n-1)/2 - 0.98 \sqrt{n}$ ,  $= 19/2 - 0.98 \sqrt{20}$ ,  $= 9.5 - 4.38 = 5.12$

Since  $S(7) > K(5.12)$ , Null hypothesis is accepted

Hence, the average score of the dimensions is not different and whatever difference comes, it is just because of sampling fluctuations. To authentic this result, another test of hypothesis testing, chi-square test was applied.

Null Hypothesis ( $H_0$ ): the observed average scores are equal to the overall theoretical scores

Alternate Hypothesis ( $H_a$ ): the observed average scores are different from the overall theoretical scores.

If the calculated value of chi-square is less than the table value of chi-square ( $X^2_C = \sum (O-E)^2/E$ , when  $X^2_C \leq X^2_t$ ), then null hypothesis is accepted. Since, the calculated value of chi-square 0.1313 is less than the table value of chi-square at 5% level of significance for 19 degrees of freedom 30.144, the null hypothesis is accepted. It indicates that all the average scores of transformational leadership aspects individually are not significantly different from the theoretical value of all the aspects taken together. Though, the percentage values of the parameters denote that these parameters are all very vital, as their value exceeds 75% of the total spectrum of the scale. These percentage values are apparently not equal. But as per the Kruskal Wallies Test (H-test) at 5% level of significance, these values do not differ significantly; as the calculated value of  $H_c$  is 0.08 while  $X_t$  at 5% level of significance for 3 degrees of freedom is 7.8%. Hence, they are all equally prominent and vital. The mean scores of aspects of TL for the cross sections of employees (management, Non-Management and Technical) are shown in Table 2. The score values in percentage of 5-point spectrum indicate vital prominence. But, as per Kruskal-Wallis Test, the score values show substantial differences. This is obvious from the fact that calculated H-statistics is 15.49 which is far more than chi square value of 5.991 for 2 degrees of freedom at 5% level of significance. Hence, first rank goes to technical employees while the last to managerial cadre employees

**Table: 2**  
Average Scores of Attitudes Measurement on a 5-point Scale for the Aspects of Transformational Leadership of Sampled Respondents

Aspects of Transformational leadership Pertaining to each Dimension	Mean Scores of Cross Sections			Overall Mean Score
	Management	Non-Management	Technical	
1. Instills pride in me for being associated with him/her	3.425 (59)	3.609 (57.5)	3.615 (56)	3.549
2. Acts in a way that builds my respect	3.832 (47)	3.804 (51)	3.911 (41)	3.849
3. Talks about their most important values and beliefs	3.832 (47)	3.756 (53)	4.004 (26)	3.864
4. Specifies the importance of having a strong sense of purpose	4.015 (25)	3.975 (32)	4.266 (2)	4.085
5. Emphasizes the importance of having a collective sense of mission	3.941 (40)	4.073 (15)	4.236 (3.5)	4.083
6. Goes beyond self-interest for the good of the group	3.695 (55)	4.024 (22)	4.024 (22)	3.914
7. Considers the moral and ethical consequences of decisions	3.882 (45)	3.975 (32)	4.236 (3.5)	4.031
8. Displays a sense of power and confidence	4.031 (21)	4.048 (18)	4.285 (1)	4.121
9. Talks optimistically about the future	3.816 (50)	3.951 (36)	4.078 (13)	3.948
10. Talks enthusiastically about what needs to be accomplished	4 (27.5)	3.78 (52)	4.157 (9)	3.979
11. Articulates a compelling vision of the future	3.832 (47)	3.902 (43.5)	4.034 (20)	3.922
12. Expresses confidence that goals will be achieved	3.945 (38.5)	4.17 (8)	4.137 (10)	4.084
13. Spends time in teaching and coaching	3.91 (42)	4 (27.5)	4.216 (5)	4.042
14. Helps me to develop my strengths	4.023 (24)	4.073 (15)	4.073 (15)	4.056
15. Considers me as having different needs, abilities, and aspirations form others.	3.949 (37)	4.195 (6)	4.177 (7)	4.107
16. Treats me as an individual rather than just a member of a group	3.976 (29.5)	3.829 (49)	4.093 (12)	3.966
17. Suggests new ways of looking at how to complete assignments	3.957 (35)	3.975 (32)	3.965 (34)	3.965
18. Gets me to look at problems from many different angles	3.945 (38.5)	4.097 (11)	4.064 (17)	4.035
19. Seeks differing perspectives when solving problems	3.976 (29.5)	3.902 (43.5)	4.044 (19)	3.974
20. Re-examines critical assumptions to question whether they are appropriate	3.394 (60)	3.609 (57.5)	3.699 (54)	3.567
Overall Mean Score	3.869	3.937	4.066	3.957

Source: Authors(Based on MLQ Multifactor Leadership Questionnaire, Bass, B., & Avolio, B., 1995).

Measurement of Overall Aspects of Employee Empowerment:-For quantifying the overall aspects of employee empowerment of the sampled 500 respondents, the collected data of various dimensions of employee empowerment on 5-point Likert scale and their equivalent average scores have been shown in table 3

**Table: 3**

Average Score of Attitude Measurement on the 5-point Scale for the Aspects and Parameters of Employee Empowerment for the Sampled Respondents

Dimensions	Aspects of Employee Empowerment Pertaining to each Dimension	Average Score for Aspects & Dimensions	
Meaning	The work I do is very important to me	3.794	3.967
	The work I do is meaningful to me	4.094	
	My job activities are personally meaningful to me	4.014	
Competence	I am self-assured about my capabilities to perform my work Activities	4.158	4.160
	I have mastered the skills necessary for my job	4.142	
	I am confident about my ability to do my job	4.182	
Self-determination	I have significant autonomy in determining how I do my job	4.018	4.02
	I have considerable opportunity for independence and freedom in how I do my job	3.98	
	I can decide on my own how to go about doing my work	4.062	
Impact	My impact on what happens in my department is large	4.094	4.021
	I have a great deal of control over what happens in my Department	3.982	
	I have significant influence over what happens in my department	3.988	
Clarity of expectations	I feel certain about how much authority I have	3.99	4.030
	My supervisors communicates clear expectations about my job performance	4.072	
	The company clearly communicates its vision and direction to Me	4.03	
Valuing and rewarding	In this organization, people are encouraged to learn from their mistakes	3.736	3.921
	In this organization, people are rewarded for taking personal responsibility to meet customer and customer needs	4.106	
Access to resources	My supervisors ensures that adequate resources are available to achieve objectives	3.996	3.996
Voice	My supervisor encourages decisions to be made at the lowest appropriate level in the organization	4.172	4.083
	This organization supports employee involvement in decision-making	4.104	
	This organization provides me with the authority to effectively do my job	4.024	
	Meaningful opportunities to participate in decision-making at work are given to me	4	
	I am given the responsibility for managing and prioritizing the competing requests of others	4.118	
Total Average		4.037	4.025

Source: Authors(Based on Employee Empowerment Instrument developed by Spritzer, 1995 and Fishmen & Keys, 1997).

As per table 3, the overall average score of all the aspects and parameters of employee empowerment comes to 4.037 which shows in term of percentage 81% of total spectrum and as per the criteria pointed out earlier; it has the vital importance of the aspects of employee empowerment. Moreover, the average scores of the parameters of employee empowerment in term of percentage are as, meaning 79%, competence 83%, self-determination 80%, impact 80%, clarity of expectations 81%, valuing and rewarding 78%, access to resources 80%, voice 82%. All these parameters possess vital prominence.

To find out the significance of all the aspects of employee empowerment, one sample sign and chi-square test were applied.

Null Hypothesis  $H_0: \mu = 4.037$ , Alternate Hypothesis  $H_a \neq 4.037$ ,

Total Number of Signs ( $n$ ) = 23: 11 plus sign and 13 minus sign

Number of less frequent signs ( $s$ ) = 11

The critical value for the two-tailed test at 5% level of significance ( $k$ )

$$K = (n-1)/2 - 0.98 \sqrt{n}, = 22/2 - 0.98 \sqrt{23}, = 11 - 4.699 = 6.33$$

Since  $S(11) > K(6.33)$ , Null hypothesis is accepted. It indicates that all the aspects of employee empowerment are equally important. To authentic/ cross-examine the result, another hypothesis testing through chi-square was applied.

Null Hypothesis ( $H_0$ ): the observed average scores are equal to the overall average scores

Alternate Hypothesis ( $H_a$ ): the observed average scores are different from the overall theoretical scores.

If the calculated value of chi-square is less than the table value of chi-square ( $X^2_C = \sum (O-E)^2/E$ , when  $X^2_C \leq X^2_t$ ), Null hypothesis is accepted.

$X^2_C = 0.06286 < X^2_t$  at 5% level of significance for 22 degrees of freedom = 33.924

Hence, the null hypothesis is accepted. It indicates that all the average scores of the aspects are not different from the expected value of the aspects of employee empowerment. It means, all the eight parameters of employee empowerment, i.e., meaning, competence, self-determination, impact, clarity of expectations, valuing and rewarding, access to resources, voice are equally important for the aspects of employee empowerment.

The mean scores of all the aspects of EE for the cross sections of employees are shown in Table 4. The score values in percentage of 5-point spectrum indicate vital prominence. But, as per Kruskal-Wallis Test ( $H$ ), the score values show substantial differences. This is obvious from the fact that the calculated H-statistic is 22.9 which is far more than Chi-square value of 5.99 for 2 degrees of freedom at 5% level of significance. Hence, first rank goes to technical employees while the last to management employees

**Table: 4**

Mean Score Values of all the 23 Statements (Row-Wise) and Cross Sections of Respondents (Column-Wise) on a 5-Point Scale for Employee Empowerment.

Aspects of Learning Employee Empowerment Pertaining to each Dimension	Mean Scores of Cross Sections			Overall Mean Score
	Management	Non-Management	Technical	
The work I do is very important to me	3.683 (68)	3.902 (59.5)	3.911 (57)	3.832
The work I do is meaningful to me	4.05 (32)	4.024 (40)	4.162 (13)	4.078
My job activities are personally meaningful to me	3.957 (50)	3.878 (62)	4.113 (23)	3.982
I am self-assured about my capabilities to perform my work activities	4.078 (30)	4.121 (21)	4.266 (6)	4.155
I have mastered the skills necessary for my job	4 (43.5)	4.292 (3)	4.29 (4)	4.194
I am confident about my ability to do my job	4.082 (29)	4.317 (2)	4.28 (5)	4.226
I have significant autonomy in determining how I do my job	3.976 (45)	3.951 (51.5)	4.083 (27)	4.003
I have considerable opportunity for independence and freedom in how I do my job	3.898 (61)	3.975 (47.5)	4.083 (27)	3.985
I can decide on my own how to go about doing my work	3.933 (54.5)	4.195 (10)	4.197 (9)	4.108
My impact on what happens in my department is large	4.046 (34)	4.121 (21)	4.147 (15)	4.104
I have a great deal of control over what happens in my Department	3.843 (65)	4.121 (21)	4.128 (18.5)	4.030
I have significant influence over what happens in my department	3.91 (58)	4 (43.5)	4.083 (27)	3.997
I feel certain about how much authority I have	3.875 (63)	3.975 (47.5)	4.137 (16.5)	3.995
My supervisors communicates clear expectations about my job performance	4.035 (37.5)	4.024 (40)	4.128 (18.5)	4.062
The company clearly communicates its vision and direction to me	4.019 (42)	4.048 (33)	4.039 (36)	4.035
In this organization, people are encouraged to learn from their mistakes	3.66 (69)	3.804 (67)	3.817 (66)	3.760
In this organization, people are rewarded for taking personal responsibility to meet customer and customer needs	4.105 (24)	3.951 (51.5)	4.137 (16.5)	4.064
My supervisors ensures that adequate resources are available to achieve objectives	3.933 (54.5)	3.902 (59.5)	4.093 (25)	3.976
My supervisor encourages decisions to be made at the lowest appropriate level in the organization	4.042 (35)	4.17 (12)	4.334 (1)	4.182
This organization supports employee involvement in decision-making	4.035 (37.5)	3.975 (47.5)	4.216 (8)	4.075

Source: Authors(Based on Employee Empowerment Instrument developed by Spritzer, 1995 and Fishmen & Keys,1997).

(Note: Figures in brackets denote rank values among all the scores of cross sections in descending order) Relationship between Transformational Leadership and Employee Empowerment studied through Karl Pearson's Coefficient of Correlation as per the following results.As such the Coefficient of Correlation between EE and TL is +0.757.

TL EE

TL	Pearson Correlation	1	.757**
	Sig. (2-tailed)		.000
	Sum of Squares and Cross-products	104.755	77.948
	Covariance	.210	.156

The Coefficient of Correlation was calculated between transformational leadership and employee empowerment on the basis of their paired average scores of 500 sampled respondents. As per the results, the calculated value of correlation coefficient between them is  $r = 0.757$ . To test the significance of the results and to test the hypothesis z test was applied with the following null and alternate hypothesis

H0: There is no relationship between transformational leadership and employee empowerment.

Ha: There is a significant positive relationship between transformational leadership and employee empowerment.

$$Z = r \sqrt{n-1} / \sqrt{1-r^2} \quad S.E = 1-r^2 / \sqrt{n}$$

The calculated value of Z 39.736 is much greater than the table value of Z at 5% level of significance 1.96. Hence the null hypothesis is rejected while the alternate hypothesis is accepted. This implies that the transformational leadership and employee empowerment have significant positive co-relationship. In order to study the functional relationship between EE and TL, the Linear Ordinary Regression model was used as under

$$EE = f(TL)$$

Where EE is the dependent variable and TL is the independent variable. For this purpose, the average scores of all the statements in EE as also in TL for all the 500 respondents were regressed with the latter variables. The Linear Regression equation developed on the basis of the analysis was as given below:

$$((EE)^{\wedge}) = \beta_0 + \beta_1(TL), ((EE)^{\wedge}) = 1.11 + 0.743(TL)$$

$(EE - 4.04) = .757(.449) / (.458) \times (TL - 3.95)$ , where  $((EE)^{\wedge})$  is expected average score of employee empowerment and  $(TL) =$  Average score of the Transformational Leadership,  $\beta_0 =$  Intercept,  $\beta_1 =$  Shape of the Regression line (Regression

coefficient).

$$H_0: \beta_1 = 0 \text{ and } H_a: \beta_1 \neq 0$$

Since  $\beta_1$  is positive and its value is significant because t-statistic calculated is  $\beta_1 / \text{Standard Error of Estimate of EE}$  which is  $= 0.74 / 0.37$  which is equal to 2. It is more than the table value of t-statistic for very large degrees of freedom at 5% level of significance (1.96). Hence, there is significant cause and effect relationship between TL and EE average scores.

### Major Findings and Conclusion

1. The average scores of all the aspects of TL as also for the parameters are equally prominent. They are not different from one another.
2. The average score value for TL is 3.95 which comes to 79% of the total spectrum of 5-point scale.
3. All the score values of TL for managerial, non-managerial and technical cadre of employees are prominent and vital but their values differ. Technical cadre employees had the highest score value while managerial cadre recorded the lowest value.
4. The average scores of all the aspects of EE as also for the parameters are equally prominent. They are not different from one another.
5. The average score value for EE is 4.02 which comes to 81% of the total spectrum of 5-point scale.
6. All the average score values of EE for managerial, non-managerial and technical cadre of employees are prominent and vital but their corresponding values differ substantially. Technical cadre employees recorded the highest average score while managerial cadre the lowest average scores.
7. There is significant positive relationship between TL and EE scores of the respondents, as the r is 0.757. Moreover, EE is the effective function of the TL and with the enhancement of average score value of

the TL, the average score value of EE enhances.

The findings support first and third hypotheses, hypothesis stood rejected; for the cross sections of the employees record subsequently different average scores for TL and EE. The results revealed that all the aspects as studied under the four dimensions of transformational leadership and all the aspects as studied under eight dimensions of employee empowerment are equally important. In terms of percentage, the level of agreement for the aspects of transformational leadership is 79% and for employee empowerment it is 81%, which are significantly vital. The results indicate that the dimensions of transformational leadership, namely, idealized influence, inspirational motivation, individualized consideration and intellectual stimulation are equally important, and the dimensions of employee empowerment like meaning, competence, self-determination, impact, clarity of expectation, value and rewarding, access to resources and voice are also equally important. These dimensions are an inbuilt part of transformational leadership and employee empowerment. The results of the study indicate that transformational leadership and employee empowerment are having significant positive relationship. Moreover, the EE is the effective function of the TL. Since the research focused on automobile sector and conducted the study on only middle level employees, the future researches can be conducted in various sectors for different levels of management. There is also a potential scope in the automobile sector itself to focus the study for other category of employees. On the whole, this empirical study also supports the results of the earlier researches in this area

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## Synthesis of Silver Nanoparticles by *Phyllanthus emblica* Plant Extract and their Antibacterial Activity

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### Abstract

The silver nanoparticle was successfully synthesized by using the help of *Phyllanthus emblica* plant extract as a reducing agent and aqueous silver nitrate as the precursor. Moreover, physical and chemical methods are widely used for the synthesis of nanoparticles, but these methods have expensive and not ecofriendly. This study highlights the green, rapid, facile, cost-effective, and ecofriendly synthesis and synthesized nanoparticles also investigate their antibacterial activity. Synthesized silver nanoparticles are analyzed by different techniques of modes like XRD, UV-Visible spectroscopy, TEM, FTIR, and photoluminescence (PL). The prepared AgNPs show characteristic absorption peak in UV-Visible spectroscopy due to SPR (surface plasmonic resonance) band between 400 to 450 nm wavelength, which was confirmed by TEM (transmission electron microscopy) image. X-ray diffraction (XRD) results showed the crystalline nature of AgNPs as well as the size of nanoparticles calculated with the help of TEM (20-25 nm) and XRD (25 nm). ATR spectroscopy identified the functional groups that are involved in the reduction of silver ion to AgNPs and the PL spectrum indicates higher emission in the green region and low emission peak in the UV region. Antibacterial activity of AgNPs analyzed against with the help of *E. Coli* bacteria and the result shows that a higher concentration of AgNPs is increasing as well as a zone of inhibition increased. This method is environmentally friendly, of low cost,



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and less expensive method for the fabrication of AgNPs in abundance which can be further helpful for biosensor devices as well as for other applications such as pollutant degradation, pharmaceutical, and hydrogen production, etc therefore can promote the application of green technology for the production of AgNPs.

### Introduction

The specific characteristics features of metal nanoparticles participate in the field of energy, optics along with biomedicine as well as disaster management with other health care issues.<sup>1</sup> Among the various nanoparticles like Ag, Au, Pt, and Pd, etc. are their broad range of applications like antibacterial agent, photocatalyst in a photocatalytic reaction as well as a biosensor technology. Generally, researches are prepared of silver nanoparticles by a number of the process such as chemical reduction,<sup>2</sup> electrochemical reduction and photochemical reduction<sup>3</sup> but such type of convention method requires more amount of chemicals as well as a large amount of energy for nanomaterial synthesis process so such type of synthesized products are more hazardous for the environment.<sup>4</sup> Different types physical and chemical methods apply for preparation of silver nanoparticles for various shape and size of nanoparticles, and such type of technique are involved in UV irradiation<sup>5,6</sup> microwave irradiation<sup>7,8</sup> chemical reduction<sup>9-11</sup> photochemical method<sup>12,13</sup>

electron irradiation<sup>14,15</sup> and sonoelectrochemical method.<sup>16</sup> However extremely all previous methods in engaging more than one step as well as advanced energy, low conversions, the trouble of purification, and required critical chemicals. All chemical synthesis methods of nanomaterial show the poisonous chemicals, but the synthesis of nanomaterial by the green method can be removed from this issue, so it requires developing a green synthesis method for nanomaterial synthesis. A wide range of metal NPs such as Ag,<sup>17-18</sup> Au,<sup>19-23</sup> ZnO,<sup>24</sup> TiO<sub>2</sub>,<sup>25</sup> CuO,<sup>26</sup> In<sub>2</sub>O<sub>3</sub>,<sup>27</sup> etc, have been synthesized using the help of herbal plant extracts. Various, plants have been used for the synthesis of metal nanoparticles including medicinal plants. Ag has long been reputed for its goods inhibitory effect on many bacterial strains and catalytic activity. So, normally used in industrial and medical products so, in this research work, we have synthesized AgNPs with the help of *Phyllanthus emblica* plant extract for the conversion of silver ion to silver nanoparticles by silver nitrate solution.



**Fig. 1: *Phyllanthus emblica* fruit**

Present investigation focused on the effects of the different optical parameters on the silver nanoparticles and investigates of the antibacterial

effect of the synthesized AgNPs. *Phyllanthus emblica* is a common plant, which is more amount of exceedingly in a nearby part of Indian subcontinents

as shown in figure 1. Some organic phytochemicals compounds are present in plant extract so *Phyllanthus emblica* fruit extract can be used in the synthesis of another different type of nanoparticles like Au, Ag, Pd, Pt, ZnO, and TiO<sub>2</sub>, etc. Present phytochemicals in plant extract such as terpenoids and flavanones which act as stabilizing and reducing agents for the nanoparticle synthesis process. Synthesized AgNPs show the no harmful effects on the human body as well as environmental health, natural antibacterial activity in the direction of pathogens like as viruses, fungi and bacteria etc.

### Experimental

#### *Phyllanthus Emblica* Extract

Sigma-Aldrich grade AgNO<sub>3</sub> (99%) solutions was prepared by distilled water and all glassware was purified by distilled water and dry and glassware was autoclaved before the experiment. Extraction of plant fruit and ready the aqueous plant extract<sup>28</sup> by the dry fruit. Firstly washed carefully by distilled water to make free from dust particles and dried 24 h on room temperature. After that 2 gm dry fruit was soaked in 50 mL of pure distilled water for 24 h. Then synthesized plant extract was filtered and stored for nanoparticle synthesis.

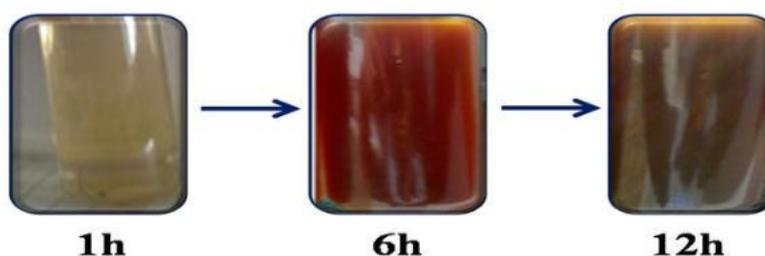
#### Nanoparticle Synthesis

Synthesis of AgNPs by green synthesis process.<sup>29</sup> *Phyllanthus emblica* fruit extract (0.5% (w/v)) was

mixed drop by drop in aqueous 0.001 M AgNO<sub>3</sub> solution and kept in boiling tube at around 25°C temperature till 12 h aging. Then the solution of a mixture of silver nitrate turns brown with increasing time interval; its optical property shows the confirmation of AgNPs. Synthesized silver nanoparticles are established without any chemical reagent and their stability for a long time due to antimicrobial properties of this plant extract and now synthesized silver nanoparticles was separated by centrifugation technique at 5000 rpm for 20 minutes. For the further settlement of particles, the supernatant material was transferred to a beaker and frequent centrifugation process was carried out to clean AgNPs. The obtained nanoparticle pellet was dry in an oven and stored for further study.

### Results and Discussion

Synthesis of AgNPs was noted by optical observation with reaction time, initially a silver salt solution is mixed to *Phyllanthus emblica* plant extract, it observed a color change from light yellow to brown color within 12 h of incubation as shown figure 2, after that the color of the solution not be changed and stable therefore observed change of color is strong indication formation of nanoparticles and the stability of color shown that means it's have been completely done the conversion of silver ions to silver nanoparticle due to SPR.<sup>30-33</sup>



**Fig. 2: *Phyllanthus emblica* fruit extract after the addition of silver salt shows the coloration due to the synthesis of silver nanoparticles**

It's indicated these plants extract reducing agents such as terpenoids and flavanones are responsible for the reduction of Ag<sup>+</sup> to AgNPs. It is suggested, the time duration is an important role during the nanoparticle synthesis process, and present analysis indicates that's 12 h time duration is more

appropriate for the complete synthesis of silver nanoparticles.

#### UV-Visible Analysis

Synthesized AgNPs were characterized and confirmed by respective UV-visible absorption

band at appearing around 400-450 nm at 12 h shown in figure 3, due to the strong surface plasmon resonance. This wavelength corresponds to the AgNPs and a previous study revealed that the SPR value for the AgNPs was in the

range 400- 450 nm.<sup>34-36</sup> After 12 h of reaction time UV-visible absorption band did not change peak position and highly stable which means 12 h reaction period is more reliable for synthesis and stability of silver nanoparticles.

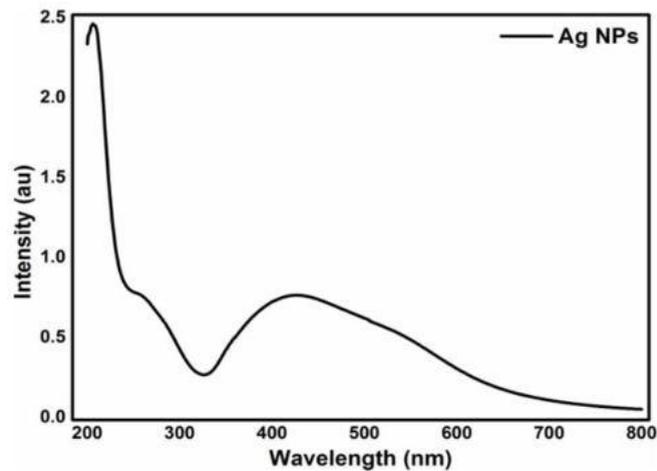


Fig. 3: UV-Visible spectrum of synthesized silver nanoparticles

Surface plasmon resonance (SPR) is the excitation of free electrons within the conduction band. Hence the broad absorbance was observed. This broad absorbance, indicating the amount of synthesized AgNPs. The broad spectra could be generated due to some reasons (1) organic elements that

are produced by plant extract (2) homogeneity,<sup>37-38</sup> and extra-fine nature of AgNPs.<sup>39</sup> (3) Moreover many other factors such as the size and shape of nanoparticles.<sup>40</sup> The TEM image from this study confirms the spherical shape of synthesized silver nanoparticles.

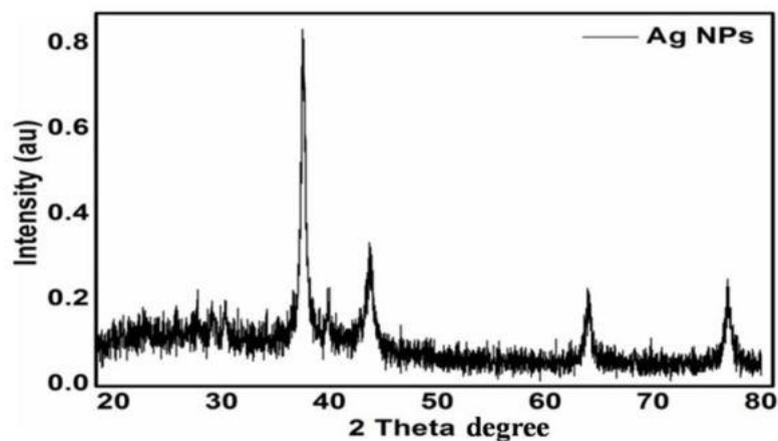


Fig. 4: X-ray diffraction patterns of synthesized silver nanoparticles

### XRD Analysis

Figure. 4 shows the XRD patterns of synthesized AgNPs by *Phyllanthus emblica* extract. Some intense characteristic diffraction peaks at  $2\theta$  angles of 38.4, 44.5, 64.8, 77.6 are observed, which crystallographic planes of (111), (200), (220), and (311). According to the TEM, synthesized AgNPs are evidently showed the most AgNPs were highly dispersed in spherical shapes. Synthesized silver nanoparticle directly corresponds with JCPDS 00-004-0783. No, any other peaks were obtained, only cubic shape AgNPs appeared. Usually, XRD peaks width directly related

to the crystallite size of nanomaterial. Which are useful in the debye scherrer equation for the analysis of average particle size.<sup>41</sup> That means Diffraction peak  $D = (k\lambda)/(\beta \cos \theta)$ , here  $\lambda$  wavelength of  $\text{CuK}\alpha$ ,  $D$  is the crystalline size of the sample powder,  $\beta$  is the full width at half maxima,  $\theta$  is the bragg diffraction angle and the  $K$  is the constant. The highest peak (111) was picked to determine the crystalline size of nanomaterial. According to this equation, the average size of AgNPs is found 25 nm and mostly spherical. That's the result that was found consistent with the TEM analysis.

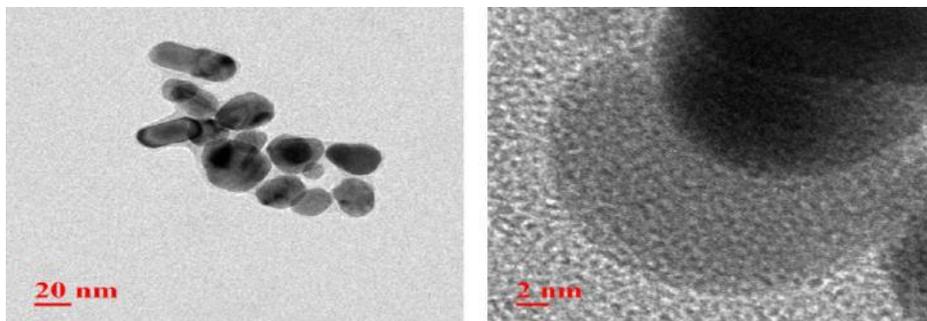


Fig. 5: (A) TEM image of synthesized Ag nanoparticles  
(B) HRTEM image of spherical shape Ag nanoparticles

### TEM Analysis

Synthesized silver nanoparticles shape and size are calculated by with the help of HRTEM image shows in figure 5. Aliquots silver nanoparticle solutions were placed on a copper grid and dry under

ambient conditions than after the HRTEM image was recorded. These results shows the particles are still in the range of nm scale with a spherical shape. These spherical shape synthesized AgNPs with a size range of 20-25 nm.

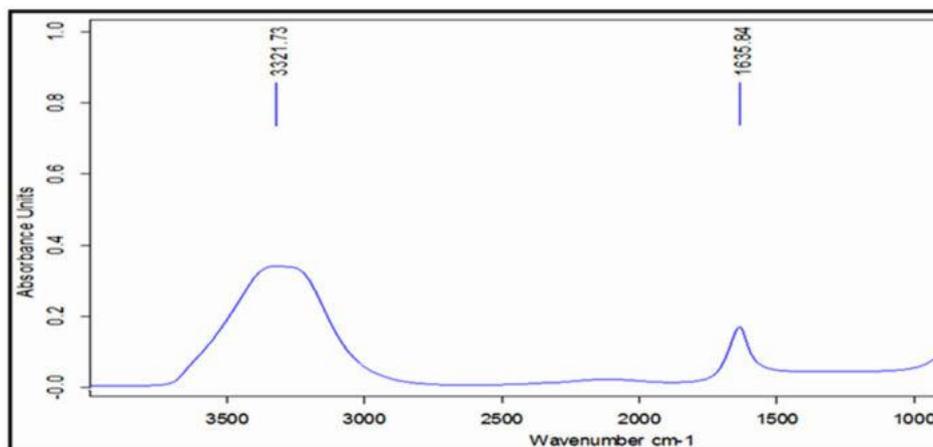


Fig. 6: ATR spectrum of synthesized silver nanoparticles after 12 h

### ATR Analysis

ATR measurement was used for identifying the responsible biomolecules for capping and stabilizing agent in AgNPs. Two types of infrared bands are observed at a position of  $3321\text{cm}^{-1}$  and  $1635\text{cm}^{-1}$  figure 6. Present intense peak around at  $3321\text{cm}^{-1}$  responsible for OH stretching of alcoholic and phenolic groups<sup>42</sup> and another intense peak around at  $1635\text{cm}^{-1}$  appear from the C=O stretching mode of amine group these groups are found in proteins<sup>43</sup>

and these groups of proteins as a capping and stabilizing agent for synthesized AgNPs, which are responsible for increasing the stability of the synthesized nanoparticles.<sup>44</sup> It is observed the structures of proteins were not affected by the silver ions before and after binding with AgNPs.<sup>45</sup> Previous studies by<sup>46-48</sup> have also identified the plant extracts in the samples and proposed that these alcoholic and phenolic groups could serve as organic reducing as well as capping agents.

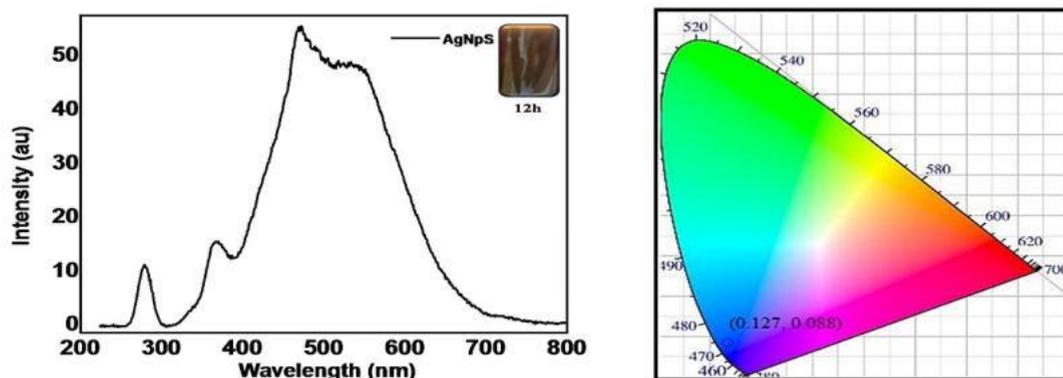


Fig. 7: (A) Photoluminescence (PL) emission spectra of synthesized AgNPs under the excitation radiation of  $\lambda_{\text{ex}} = 289\text{ nm}$ . (B) Chromaticity coordinate plotted on CIE-1931 diagram

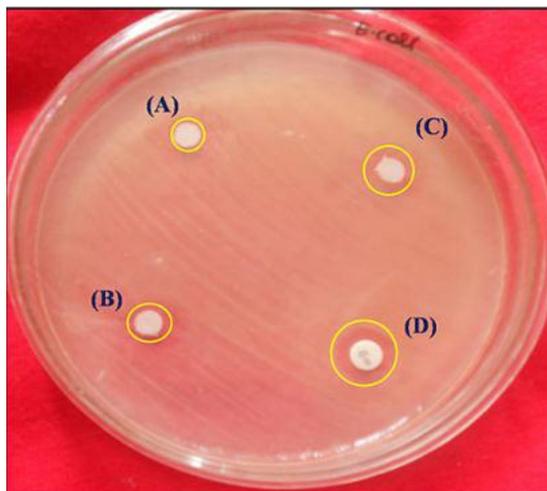
### Photoluminescence Analysis

Figure. 7 represents the photoluminescence spectra of the synthesized silver nanoparticles by *Phyllanthus emblica* plant extract that are studied through emission spectroscopy. This is one of the technical methods for observation of the optical properties of synthesized AgNPs. Synthesized AgNPs are mixed in distilled water then emission spectra are obtained within a range from 200 to 800 and for the wavelength of excitation at 289 nm. It exhibits the emission peaks around 400 to 600 nm which belong to the green-yellow region. The intensity of emission peak continues increased up to 469 nm, then after it's gradually decreased up to 650 nm. The luminescence spectrum of AgNPs is generated by the excitation of an electron from occupied d bands into states above the Fermi levels its responsible for luminescence spectra of AgNPs<sup>49</sup> and broad peak in green-yellow emission is produced by radial recombination of photoexcited holes with

the electrons in oxygen vacancies and indicates that AgNPs have a good crystal structure.

### Antibacterial Activities

Antibacterial activity of synthesized silver nanoparticles analysed against *E.Coli* bacterial samples, shown in figure.8. During this process in which synthesized silver nanoparticles are used in different concentrations (2, 4, 8, and 10mg) are further agar dishes containing colony. The dishes are visible every concentration with a bacterial colony and experimentally observed after 24 h incubating time at  $37^{\circ}\text{C}$ . The zone of approval is experiential maximum at 10 mg of AgNPs. The antibacterial activity results show due to modifying bacteria cell permeability as well as enzyme degradation by synthesized AgNPs. The resultant zone of inhibition increased as well as increases the concentration of AgNPs.



**Fig. 8: The inhibition zones of AgNPs against *E.coli***

### Conclusions

We have reported a reasonable, eco-friendly, and easy approach for the synthesis of AgNPs. *Phyllanthus emblica* plant extracts which act as a reducing, stabilizing, and capping agent for nanoparticle synthesis. This is a simple, green efficient method for the synthesis of silver nanoparticles at room temperature without using any harmful reducing and capping agent. The green synthesized silver nanoparticles were collected of spherical shape which was highly stable and crystalline. These AgNPs were characterized carefully by XRD, TEM, FTIR, PL, and UV-visible spectroscopy. The UV-visible spectra showed a characteristic range of 410-425 nm for nanoparticle. XRD results showed the crystalline nature of AgNPs, and size with the help of TEM (20-25 nm) and XRD (25 nm). ATR analysis found numerous phytochemicals and functional groups these groups are responsible for stabilizing and creation nanoparticle. Antibacterial activity of AgNPs analyzed against *E.Coli* bacteria and the result shows that a higher concentration of AgNPs is increasing as well as the zone of inhibition increased. This synthesizes process is cheaper,

a single step, and faster as compared to chemical and biological methods as well as eco friendly, of low cost, and simple therefore can promote the application of the green method for silver nanoparticle synthesis.

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### Conflict of interest

There is no conflict of interests regarding the publication of this article.

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# A review on high-throughput synthesis, deposition of thin films and properties of polyaniline



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## ABSTRACT

Polyaniline (PANI) has attracted a special attention from researchers, scientists and chemists in fields of nanotechnology. It is widely known for its easy synthesis process, high environmental stability and can be easily doped by different acids/ dyes and other dopants. This review deals with the synthesis of PANI by several methods in which oxidative polymerization is the main focused as well as deposition of thin films via chemical & physical methods has been discussed. Several properties of PANI thin films such as magnetic, electrical, redox, antioxidant, anticorrosion, along with its sensing properties to various analytes, etc. are discussed at the end of the review.

## 1. Introduction

Electrically conducting polymers (ECPs) are class of conjugated polymers which are vibrantly used in various opto electronics and medical devices now days. Among all electrically CPs, polyaniline (PANI) has been extensively studied due to its outstanding redox properties, variable oxidation states and wide applications. PANI was first known in 1835 as aniline black and it is a term that has been used for those products which were obtained by oxidation of aniline. In 1840, Fritzsche studied the oxidative products of aniline and later on. Letheby's work resulted in discovery of the final product from oxidation of aniline at Pt electrode in aqueous H<sub>2</sub>SO<sub>4</sub> solution [1]. Subsequent researchers have been achieved the same results with similar observations during the oxidation of aqueous HCl solutions of aniline. For these results, in 1907 Bucherer proposed a phenazine type structure for the synthesis of polymer which was complex for understanding. Therefore, a linear arrangement of the quinone-imine linked on para-position has been proposed for the product obtained by the chemical oxidation of aniline [2]. The base of the linear structure was the poly-leucoemeraldine form which converted into another form such poly-pyrnigraniline & polyemeraldine base shown in graphical abstract.

In 2000, three scientists namely A.J.Heeger, A.G. McDiarmid, and H. Shirakawa were awarded Nobel Prize in the chemistry for their study on intrinsically conducting polymers and obtained the world's appreciation owing to the unique characteristics, properties and technological applications of these polymers. During the past two decades, these

polymers and their composites are the subject of intensive research and development in the academic world and also in the chemical and electronic-based industrial organizations. The use of these composites as new materials has opened an entirely new domain of polymeric applications in industrial and consumer products.

The polymers are the key components of the new fascinating research area owing to their simple preparation and the diversity of their properties. Even though conventional insulating polymers are used in the past 50 years, it did not meet the latest requirements which led to the development of different conducting materials such as conducting polymer composites, conducting fibers and conducting films. The polymers are comprehensively used in the manufacture of insulators and dielectric materials in electrical based industrial organizations due to their insulating and low conducting properties. Nevertheless, some polymers are synthesized with a remarkable ability to conduct electricity. The organic polymers that possess the magnetic, optical and electric properties of a metal are called an intrinsically conducting polymer, and such polymers are the electroactive polymers which possess the properties mentioned above while retaining their structural characteristics. It is a class of polymer with conjugated double bonds in their backbones, and it demonstrates good electrical conductivity without the use of conductive additives. It becomes highly conductive only in its doped state. The conductivity of the polymers is converted into the metallic state from its insulating state through the doping process. Both N-type (electron-donating) and P-type (electron-accepting) dopants are utilized to induce an insulator to metal transition

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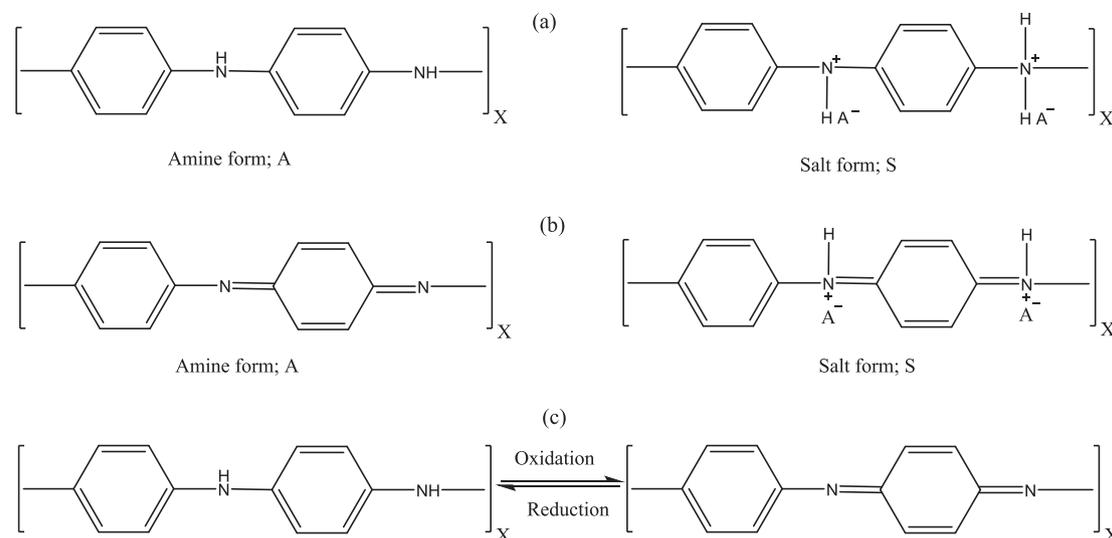
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**Scheme 1.** Chemical structures of PANI and their conversion.

in electronic polymers [3,4]. It was demonstrated that charges are either added or removed chemically or electrochemically from the polymer chain by introducing acidic or basic solutions during the polymerization or post-processing of the polymer. During this process, the negative (electron) or positive (holes) ions formed are then free to move throughout the polymer chain creating the current.

## 2. Constitution and nomenclature

Since the preparation of polyaniline, there was a lot of confusion regarding its constitution, and later it has been proposed that polyaniline may be described as that it is formed by combination of aniline as repeating units.

PANI is found in one of the five idealized oxidation states during polymerization of aniline monomer: (a) Leucoemeraldine (white/clear), (b) Protoemeraldine, (c) Emeraldine (Salt-green/Base-blue), (d) Nigraniline, and (e) Pernigraniline (Blue/Violet). PANI exists in two different forms: (i) completely reduced form which contains only benzenoid rings (Scheme 1a) and (ii) completely oxidized form containing benzenoid and quinonoid ring as repeating unit (Scheme 1b). In both cases, nitrogen atoms present in the repeating unit may be protonated, and it depends on the pH of the solution. The base and protonated form of PANI has been called an amine (A), and salt (S) forms respectively proto-emeraldine, and nigraniline are the intermediate form of PANI. In older nomenclature PANI was known by their oxidation state but presently 'poly' is used as a prefix to the older names. For example, the older term, 'emeraldine,' is now replaced by 'poly-emeraldine.' The completely reduced form of PANI converted into completely oxidized form by removing one electron and proton, as illustrated in Scheme 1c. The polyleucoemeraldine form is obtained from polypernigraniline by reducing it to polyemeraldine form and finally back to polyleucoemeraldine form with an alkaline solution. During oxidation of the polyleucoemeraldine base, the oxidant removes the unbound electron from the amine nitrogen center, and a proton is liberated.

The lone pair electron is resonated with a neutral position due to which imine group is formed. Polyleucoemeraldine is then oxidized into polyemeraldine form and then into polypernigraniline form. The oxidation of the polypernigraniline state results in the degradation of polymer and polyleucoemeraldine is easily oxidized in air. The polyemeraldine base estimates the most stable form of PANI, and hence polyemeraldine form of PANI is most widely used because the polyemeraldine salt form of PANI is electrically conducting. Polyleucoemeraldine and polypernigraniline are the poor conductors

even when doped with an acid.

PANI is known for its simplicity of unique, environmental stability and simple to dope by protonic acids [5]. PANI can be characterized by 1,4-coupling of aniline monomer units. PANI may be present in various oxidation states and it can be characterized by FTIR benzenoid to quinonoid ratios. Polyleucoemeraldine (PANI-LE) base form of PANI is totally reduced form whereas polypernigraniline (PANI-PE) base is completely oxidized form. Similarly, the polyemeraldine base (PANI-EB) is half oxidized and half reduced form of PANI (Scheme 2). These structures of polyaniline give information about synthetic representations of the various oxidation state of PANI [6].

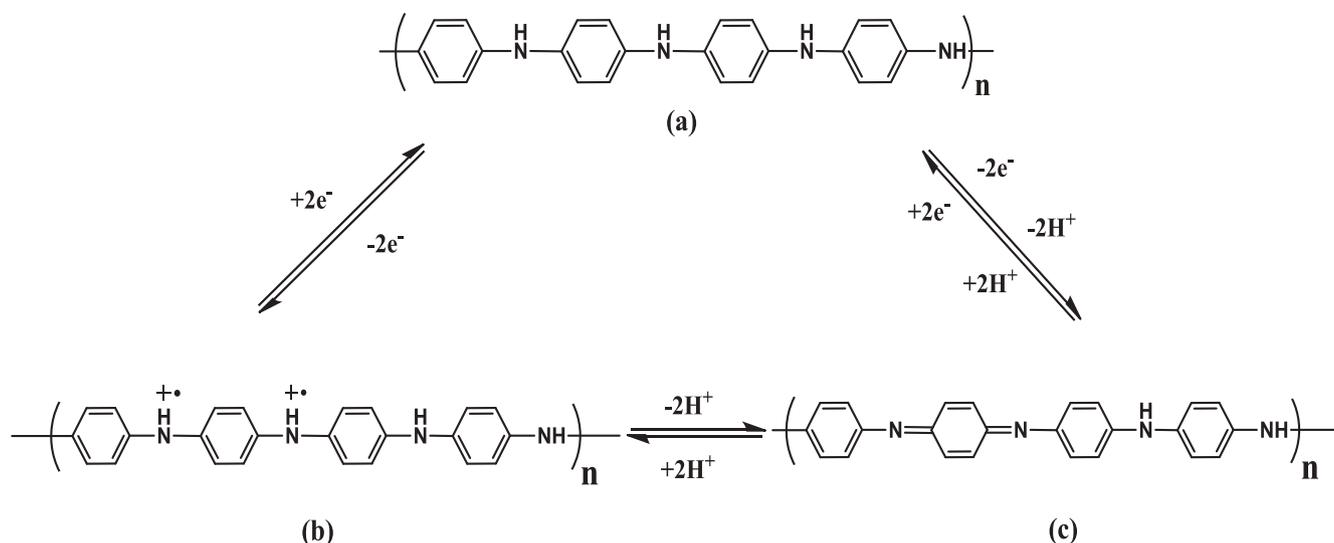
Nonetheless, a protector blue polyemeraldine base might direct on the off chance that it is doped with protonic acids and end up green protonated ES. PANI-EB varies considerably from PANI-LE and PANI-PE, its conductivity has been obtained from  $-10^{-10}$  S/cm up to  $10^0$  S/cm after doping with different acids. PANI has potential applications in various fields such as organic electronics and biomedical fields due to its extraordinary properties. It has a number of utilizations, for example, sensor [7–10], electromagnetic shielding [11], biosensor [12], memory device [13], and natural or polymer light-transmitting diodes [14]. Other than all the potential applications detailed above, PANI can likewise be utilized for erosion insurance for mild steel. PANI microtubes/nanofibers and PANI-multi walled carbon nanotubes, nanocomposites might be utilized as microwave safeguards and electromagnetic shielding materials [15]. Besides this, review deals with the synthesis of PANI thin films by different methods and thin film deposition on substrates.

## 3. Synthesis of PANI

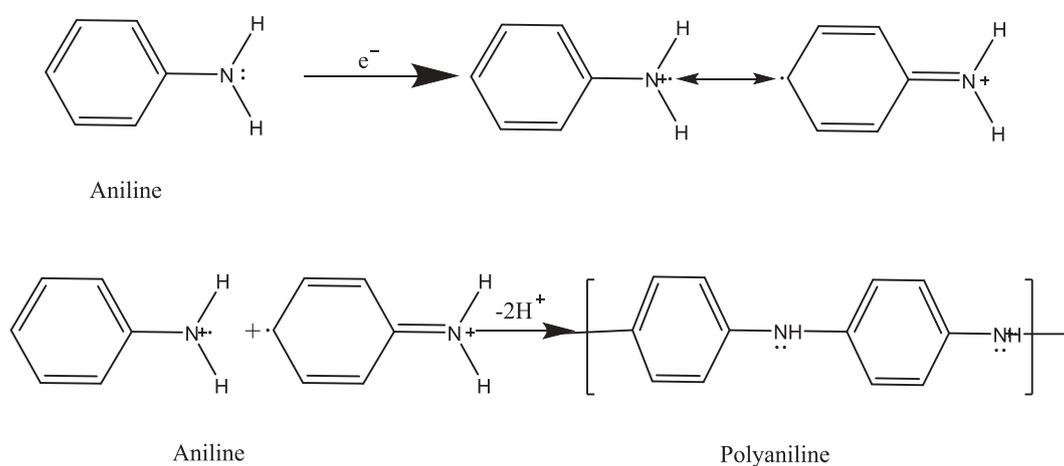
In the literature, several reports on polyaniline have been observed which deals with advanced oxidative polymerization method of polyaniline synthesis. In this method, doping and polymerization occur at the same time, and a chemical or electrochemical process may complete it. The major difference between these methods is the chemical method gives higher yield as compared to the electrochemical method [16].

### 3.1. Chemical synthesis (Oxidative polymerization)

Synthesis of PANI can take place by chemical oxidation polymerization method by using HCl and H<sub>2</sub>SO<sub>4</sub> as dopant and ammonium persulfate as an oxidant in aqueous media. Here, the oxidant removes a proton from aniline monomer without forming a strong co-ordination bond either with the substrate/intermediate or with the final product



**Scheme 2.** Different oxidation states of PANI and their conversion in each other (a) polyleucoemeraldine Base (b) polyemeraldine salt (c) polyemeraldine base.



**Scheme 3.** Homo-polymerization of PANI.

(Scheme 3). The progress of the polymer chain can proceed by a redox reaction between the growing chain and an aniline unit. PANI has been synthesized by oxidation of aniline either with an electrochemical or a chemical oxidant.

The chemical synthesis of PANI mainly requires three reactants: aniline as a monomer, an oxidant and an acidic medium. The more common acids used in PANI synthesis are HCl & H<sub>2</sub>SO<sub>4</sub>, while as an oxidant ((NH<sub>4</sub>)<sub>2</sub>S<sub>2</sub>O<sub>8</sub>) ammonium persulfate, hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>), potassium iodate (KIO<sub>3</sub>), cerium sulfate (Ce(SO<sub>4</sub>)<sub>2</sub>), potassium dichromate (K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>), potassium ferricyanide (K<sub>3</sub>(Fe(CN)<sub>6</sub>) and sodium vanadate (NaVO<sub>3</sub>) are frequently used. Most common mechanism used for synthesis of PANI is oxidative polymerization method in which aniline reacts in the presence of acidic medium by using acid as dopant and polymerization is initiated by dropwise addition of ammonium persulfate (APS) which is used as an oxidizing agent at different temperature under constant stirring at least for 2 h. After fulfillment of the polymerization mechanism (2 h), the blue color solution has been observed which is separated by filtration. The pure PANI can be obtained by washing the above solution 3–4 times with double distilled water after that alcohol and acetone until the filtrate becomes colorless which ensures that unreacted substances are completely removed. This product will be dark green and known as polyemeraldine salt form of PANI which is unstable due to the presence of counterions. Therefore, this precipitate was allowed to equilibrate with an appropriate amount of NH<sub>4</sub>OH overnight, during this polyemeraldine salt form convert into

PANI – EB form which is environmentally stable at room temperature [17,18].

The camphorsulfonic acid (CSA) doped PANI thin films were prepared on glass slides by using the chemical oxidative polymerization method and spin coating [19]. The sticking efficiency of the film to glass plate was excellent due to an organic solvent and organic dopant while FTIR studies reveal the presence of dopants and change in the molecular environment of the film with a high CSA dopant ratio (1:8). The pristine films were found to be amorphous nature and indicated to change into the crystalline structure with increasing CSA doping ratio while SEM represents the change in smooth morphology to rough root-like morphology of the PANI films.

### 3.2. Electrochemical synthesis

The electrochemical synthesis of PANI focus on the electrochemistry and electrochemical process, therefore, it is an electro-organic process as compared to organic synthesis. Electrochemistry plays a vital role in the synthesis of conducting polymers (CPs) because, in most of the applications, it is essential to synthesize polymers in the form of a thin film with a well-defined structure which has a large surface area [20,21]. When CPs are synthesized by the chemical method, then they cannot proceed easily whereas processing becomes easy in the electrochemical process because in these thin films will be adhered to electrode surface which makes it useful in the study of optical and

electrical properties. The electrochemical synthesis process has very much similarity with the electrodeposition method of metals which CPs deposited on the surface of the electrode. An electrochemical method such as galvanostatic, potentiostatic and potentiodynamic has been used for the synthesis of PANI.

Electrochemical synthesis process has several advantages on chemical process listed below;

- It is a simple and cost-effective technique. Therefore, the electro-deposition of CP on the oxidizable conducting glass is extremely economical.
- By change, the nature of solution doping of polymer can proceed with the desired ion.
- In electrochemical method, the catalyst is not required as a chemical method.
- CPs which was deposited on the electrode surface will be homogeneous and pure.
- This synthesis process completed in a single compartment cell that contained an electrolyte, electrode and power supply.

### 3.2.1. Mechanism of PANI polymerization

The synthesis mechanism of polymerization proceeds by step by step. The first step is known as an oxidation step in which aniline converts in aniline radical cation by removal of one electron from nitrogen lone pair (Scheme 4).

This step can be accelerated by using it as a catalyst during synthesis. The cation radical of aniline may be represented by three resonating structure, Scheme 5.

Among these three resonance forms, second is more reactive because of the substituent inductive effect and absence of steric hindrance. The next step in scheme 6, the reaction takes place in between radical cation and second resonating form of aniline radical cation in head to the tail manner and dimer will be formed [22].

In the next step, the dimer is oxidized by the removal of electron and converted into a new radical cation, as shown in Scheme 7.

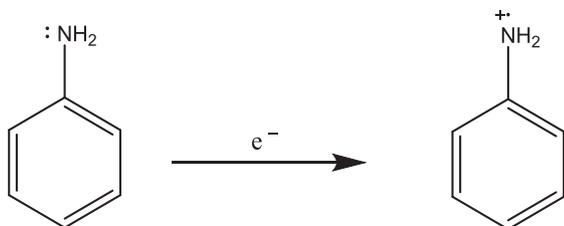
This radical cation further reacts with the radical cation monomer or with radical cation dimer to form, respectively, a trimer or a tetramer, and polymer shown in Scheme 8.

### 3.3. PANI doping

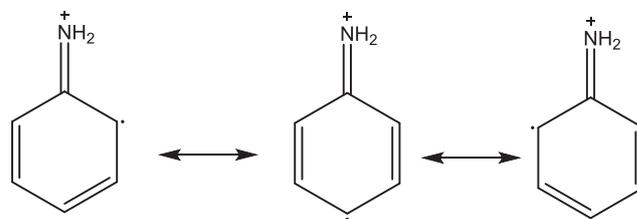
The term “doping” is employed here for showing similarity with semiconductors like Si or Ge in which P or B atoms are introduced. Doping in CPs introduced the insertion of  $e^-$  acceptor (oxidation) or  $e^-$  donor (reduction) molecule, therefore, polymers are considered as p-type and n-type respectively. PANI is a different conducting polymer because its mechanism of conductance induced either by the protonation of the polyemeraldine base or by oxidation of polyleucoemeraldine. In this process, PANI converts into polyemeraldine salt form which is highly conducting in nature shown in Scheme 9.

### 3.4. Oxidative doping

The oxidative doping of PANI can take place by using  $Cl_2$  or  $I_2$  in  $CCl_4$  solution,  $SnCl_4$  or  $FeCl_3$  organic solutions and with  $O_2$  or  $H_2O_2$  in



Scheme 4. Formation of aniline radical cation.



Scheme 5. Resonating form of aniline radical cation.

aqueous acidic solution. Oxidative doping of PANI by using chlorine molecule has been given in Scheme 10, where chlorine was considered as dopant as well as the oxidant. Although chemical doping is a well-organized process, the control of the doping level  $\delta$  is challenging to process.

Above said problem can be overcome by electrochemical doping in which the doping level has been determined by the applied voltage in between the CP and counter Electrode [23]. The electrochemical doping of polyleucoemeraldine base can be written as Scheme 11, where the counter-ions are inserted in the polymer backbone.

### 3.5. Acidic doping

In acidic doping, treatment of polyemeraldine base occurs via HCl,  $H_2SO_4$  acids which induce the protonation on the imine sites and give the polyemeraldine salt, through a mechanism illustrated in Scheme 12. A drawback associated with hydrochloride polyemeraldine salt form because it is poorly soluble in common solvents and its conductivity also altered with temperature and moisture. Therefore, to improve solubility and temperature stability polyacrylic acid [24] or another polymeric acid has been used as a dopant on the place of hydrochloride [25].

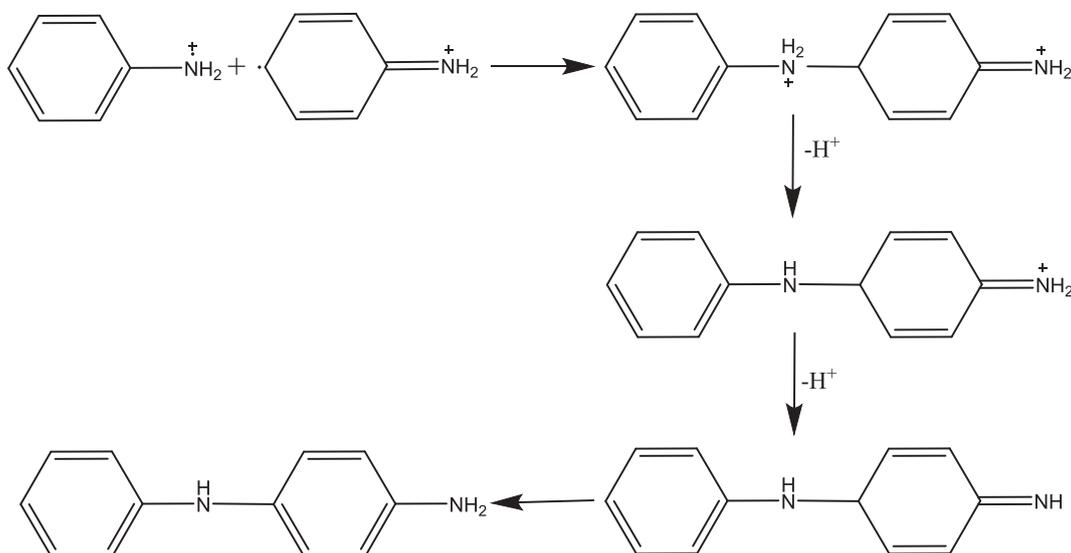
## 4. Synthesis of PANI thin films by various methods

Most regular union of PANI (PANI) has been accounted for as synthetic oxidative polymerization (Scheme 13) of aniline can take place in the presence of acidic medium by using acid as dopant and polymerization is initiated by dropwise addition of ammonium persulphate (APS) which is used as an oxidizing agent at different temperature under constant stirring at least for 2 h. After fulfillment of the polymerization mechanism (2 h), the blue color solution has been observed which is separated by filtration. The pure PANI can be obtained by washing the above solution 3–4 times with double distilled water along with alcohol and  $(CH_3)_2CO$  until the filtrate becomes colorless which ensures that unreacted substances are completely removed.

This product will be dark green in color and known as polyemeraldine salt form of PANI which is unstable due to the presence of counter ions. Therefore, this precipitate was allowed to equilibrate with an appropriate amount of  $NH_4OH$  overnight, during this polyemeraldine salt form convert into PANI – EB form which is environmentally stable at room temperature [26].

### 4.1. Cost-effective oxidative polymerization

Different PANI thin films can be prepared by doping with inorganic acids, afterwards deposition on glass substrate via various techniques which are cost-effective. [27,28]. The pre-cleaned glass substrate was embedded vertically in the blended reactants for the proclamation of PANI film for one hour [29]. The thickness of the deposited thin film was 220 nm [30]. These PANI thin films are investigated by different methods.



Scheme 6. Formation of the dimer.

#### 4.2. Surface-initiatelectro-polymerization

The PANI thin films were deposited on Au electrode by surface-initiated electrochemical polymerization method. This process is initiated by the formation of a monolayer of 4-aminothiophenol (ATP) or a substitution on 4-nitrobenzenediazoniumsalt (NBDS) by reduction of aromatic  $\text{NO}_2$  functional group to aniline monolayer. By this process chain bonding will take place on surface and well organized PANI structure has been obtained. This PANI thin film shows a peak that differentiates redox transition in between reduced and oxidized form due to shifting towards negative potential [31].

#### 4.3. Atmospheric pressure plasma polymerization technique

Plasma-polymerized aniline (PANI) nanofibers and nanoparticles have been synthesized by iPC-APPJ device. In this plasma polymerization process, iPC-APPJ device works with a single bundle of three glass tubes to increase the plasma jets in fragmentation regions. A plastic tube and substrate of polytetrafluoroethylene (PTFE) bottom cap fixed at the end of jet for getting plasma cloud with high density. Consequently, the iPC-APPJ including a bottom cap can extend farther downstream and can produce the broad and intense glow plasma in the fragmentation regions [32].

#### 4.4. mSILAR (microwave-assisted successive ionic layer adsorption and reaction)

Zinc oxide nano-polycrystalline thin films have been set up by down to earth mSILAR framework. ZnO/PANI organized by *in situ* polymerization technique and thin films were made using turn covering. The ZnO thin films were set up by mSILAR, by which the ZnO thin film was first secured on a glass substrate by then again diving it in a sodium

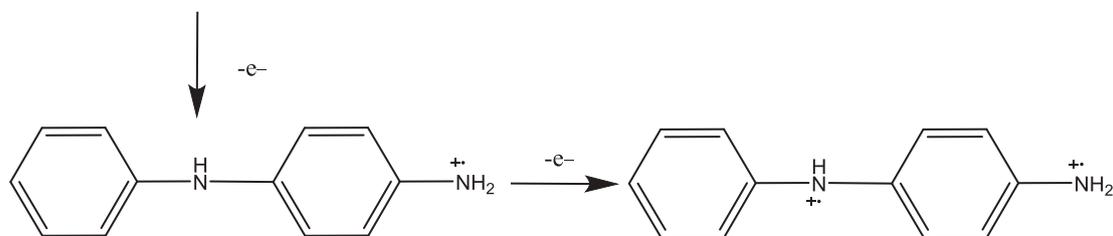
zincate shower at room temperature and in warmed water at 90–95 °C using prompt micro-controlled dip-coating unit. Aluminum doping was done by adding anhydrous aluminum chloride [ $\text{AlCl}_3$ ] to the sodium zincate shower [33]. The doping centralizations of the extensive number of blends were kept up at 3 and 5 wt%. The plain much-cleaned substrates were immersed in the creation shower for 10 s sought after by submersion in high temp water for a proportionate range, and the strategy was reiterated. These models were tempered at 450 °C in the air using a heat annealing chamber [34].

#### 4.5. PANI-TiO<sub>2</sub> composite thin films

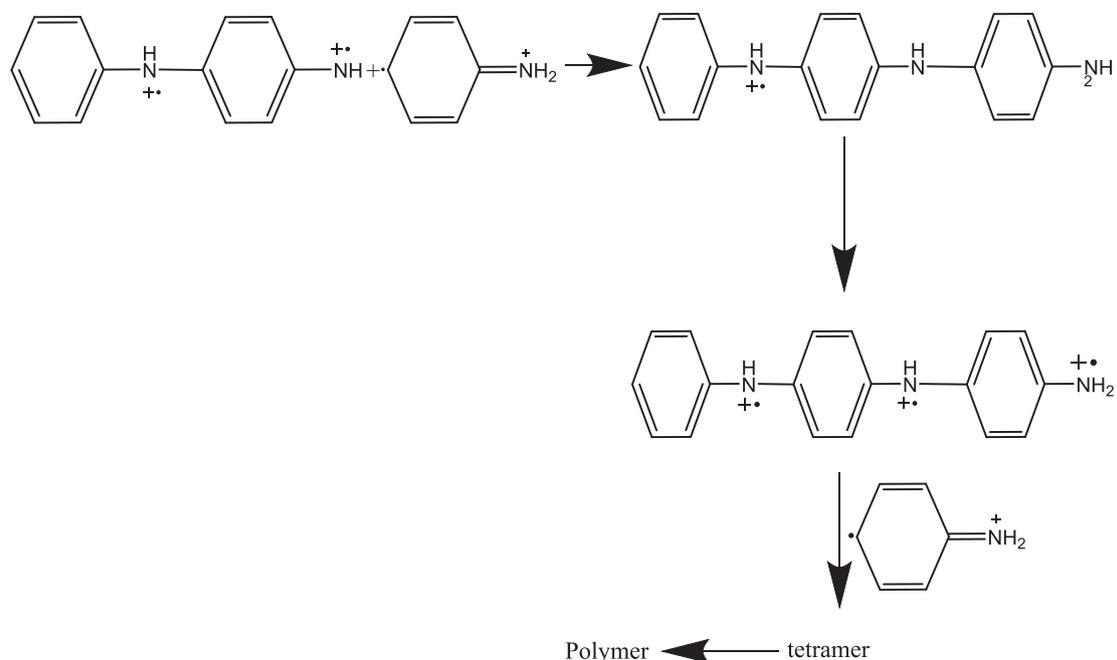
PANI-TiO<sub>2</sub> composite thin films have been synthesized by using aniline,  $\text{TiCl}_3$  and APS solutions. Initially, a sol of TiO<sub>2</sub> has been prepared by a solution of  $\text{TiCl}_3$  which was aged for five days. The very first-day solution was visible violet in color, as days pass color of the solution become whitish. On the fifth day, whitish sol has been formed which is converted into TiO<sub>2</sub> at six days. This TiO<sub>2</sub> sol was treated with a 1:1 ratio solution of aniline (0.1 M) &  $\text{H}_2\text{SO}_4$  (1 M), stainless steel substrates were vertically immersed in the reaction vessel and APS (0.1 M) add as an oxidant. During the polymerization process, the color of the solution becomes blue to dark blue and finally green. Precipitation was started to settle down in the bottom after 30 min and 0.03  $\text{mg cm}^{-2}$  thickness observed on a steel substrate. For an increase, the thickness of the films the same procedure has been repeated [35].

#### 4.6. Perchlorate ( $\text{LiClO}_4$ ) doped PANI thin films

PANI (PANI) is joined through compound course subject to manufactured oxidative polymerization and starting there *in-situ* doped with HCl and unmistakable weight dimension of  $\text{LiClO}_4$ . Thin films of PANI and its particular doped variety are put away on plain soda glass and



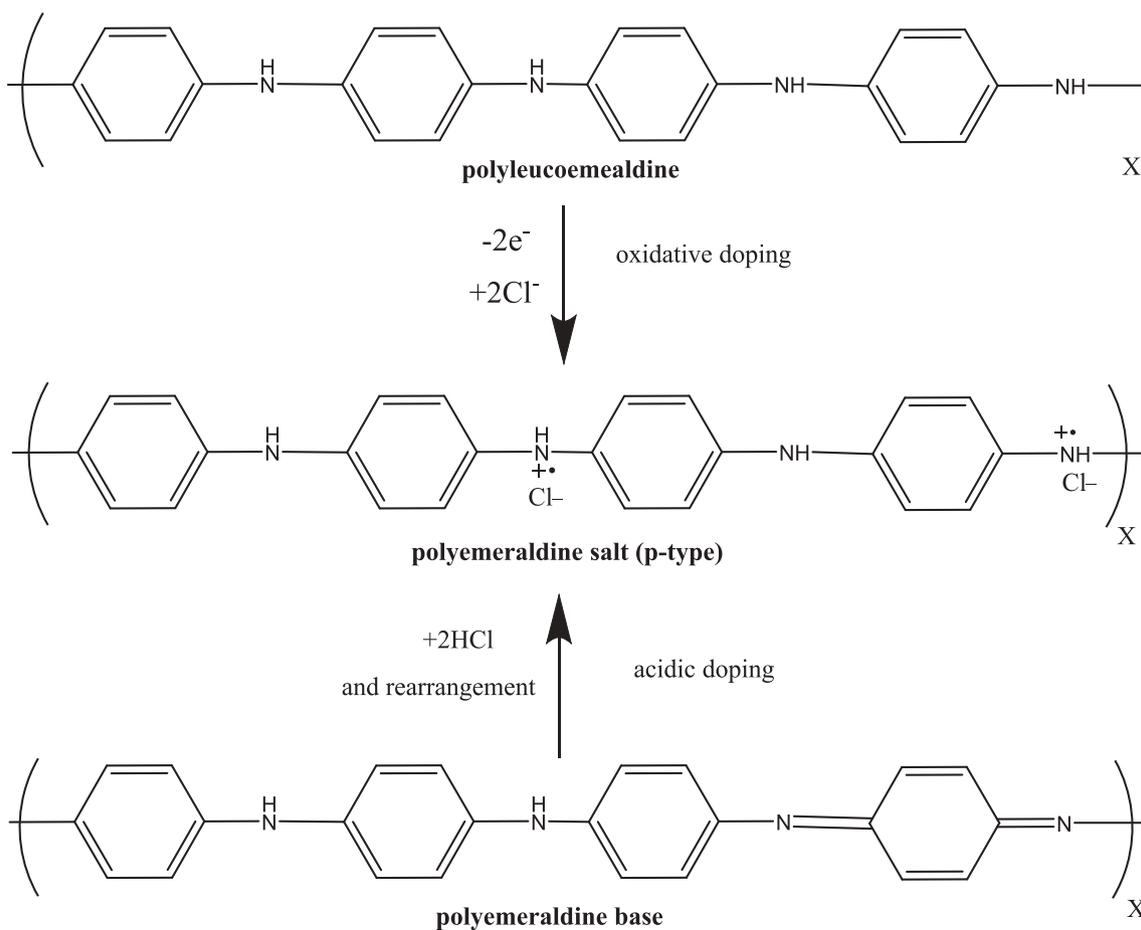
Scheme 7. Formation of the radical cation dimer.



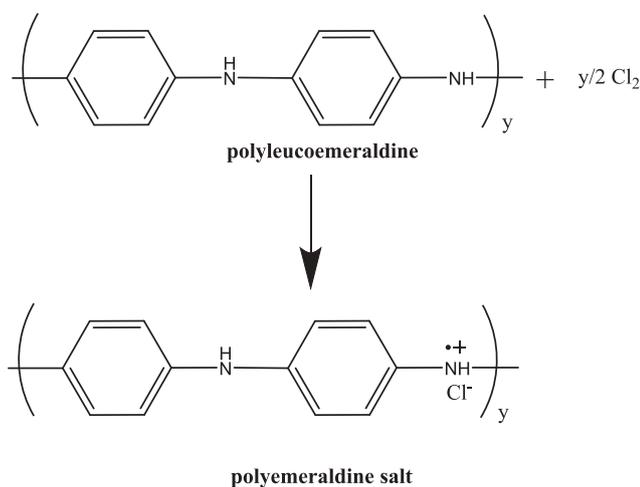
Scheme 8. Mechanism of polymer synthesis.

ITO driving glass with compound shower proclamation technique. The PANI base is organized by methods for chemic course filtered and dried. PANI thusly got was crumbled in N-methyl pyrrolidinone (NMP) dissolvable at 3% wt. Extent concerning the dissolvable. The soda plain

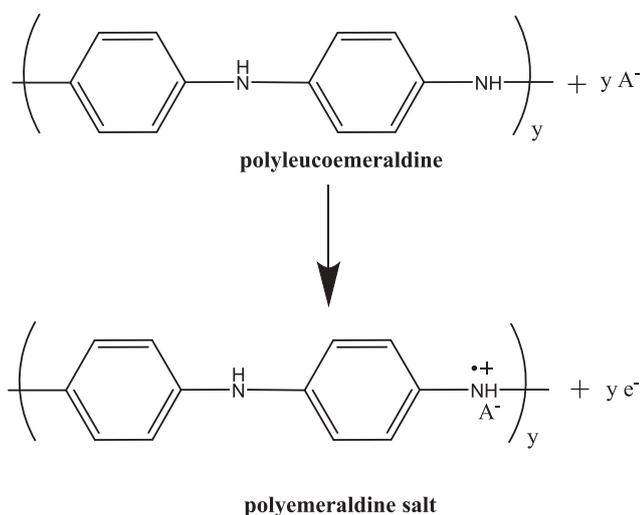
glass and ITO glass slide are immersed in the response for 72 h, and PANI disengaged covering in this manner obtained are washed, cleaned and dried. The doping course of action of  $\text{LiClO}_4$  was made by dissolving it in DMC (dimethyl carbonate) by weight rate extent 1%, 2% and



Scheme 9. Doping mechanisms in PANI.



Scheme 10. Oxidative doping by chlorine.



Scheme 11. Electrochemical doping of polyleucoemeraldine.

5% independently. PANI base unattached films were submerged in the individual course of action of Li salt for 48 h. The doped films were dried in a vacuum grill for 6 h [36].

#### 4.7. Synthesis of HCl-doped PANI thin films

PANI-HCl has been set up by oxidative polymerization at three different temperatures which are 4 °C, 13 °C and 31 °C with 1 M & 2 M concentrations of HCl as the dopant. PANI-HCl has synthesized by chemical oxidative polymerization process by using aniline, HCl as dopant and APS as an oxidant. APS is added by dropwise addition and complete polymerization will take place in 15 min and PANI-HCl thin film has been formed. The same procedure has been repeated on 4 °C, 13 °C and 31 °C with 1 M & 2 M concentrations of HCl. Synthesized thin films have been washed with deionized water, acetone and dried at room temperature [37].

#### 4.8. V<sub>2</sub>O<sub>5</sub>/PANI thin films

V<sub>2</sub>O<sub>5</sub>/PANI in the presence of xerogel V<sub>2</sub>O<sub>5</sub> has been used for the detection of NH<sub>3</sub> gas. During oxidative polymerization, process gel reacts with aniline monomer and hybrid material is has been formed. In the detection of ammonia gas can be taken place without any interference of another gas by V<sub>2</sub>O<sub>5</sub>/PANI thin films. Aniline & V<sub>2</sub>O<sub>5</sub> gels show acid-base & redox reaction during polymerization which is an

example of an intercalation reaction. By the reaction of aniline (4.0 mL of 0.2 mol/L) and 30 mL V<sub>2</sub>O<sub>5</sub> gel under constant stirring for two days V<sub>2</sub>O<sub>5</sub>/PANI has been formed by intercalation reaction. The green color product has been obtained which is spread on a glass substrate followed by water evaporation at room temperature; obtained thin film was rinsed with deionized water and dried [38].

### 5. Deposition of PANI thin films

Deposition of PANI thin films can be taken place by the chemical and physical method:

#### 5.1. Chemical methods

The covering of various materials with leading electroactive polymers (CEP), i.e., PANI, their subordinates, given by methods for compound polymerization, is quickly explored. Herein, we will discuss the chemical deposition methods of PANI such as bulk oxidative chemical polymerization, surface-located polymerization, chemical vapor deposition, Langmuir–Blodgett technique, layer by layer self-assembly technique, Spin coating, Drop coating, Nanopatterning, Inkjet printing, Screen printing, Line patterning and Nucleation and growth process.

##### 5.1.1. Bulk chemical polymerization

The strategy of the manufactured oxidative polymerization is regularly trailed by a change in ion during polymerization. Initially, the solution was colorless which turned into blue & dark blue which indicates that dimer & oligomers of PANI are formed. The chemical polymerization process possesses autocatalytic character means a rapid coloration and polymerization proceeds after a definite induction period. The rate of the process depends upon many factors, like oxidant nature, and reactant concentration [39]. Most of the CEP formed by the chemical polymerization process, spontaneously a part of the CEP can deposit as a thin film on various substrates of the reaction medium.

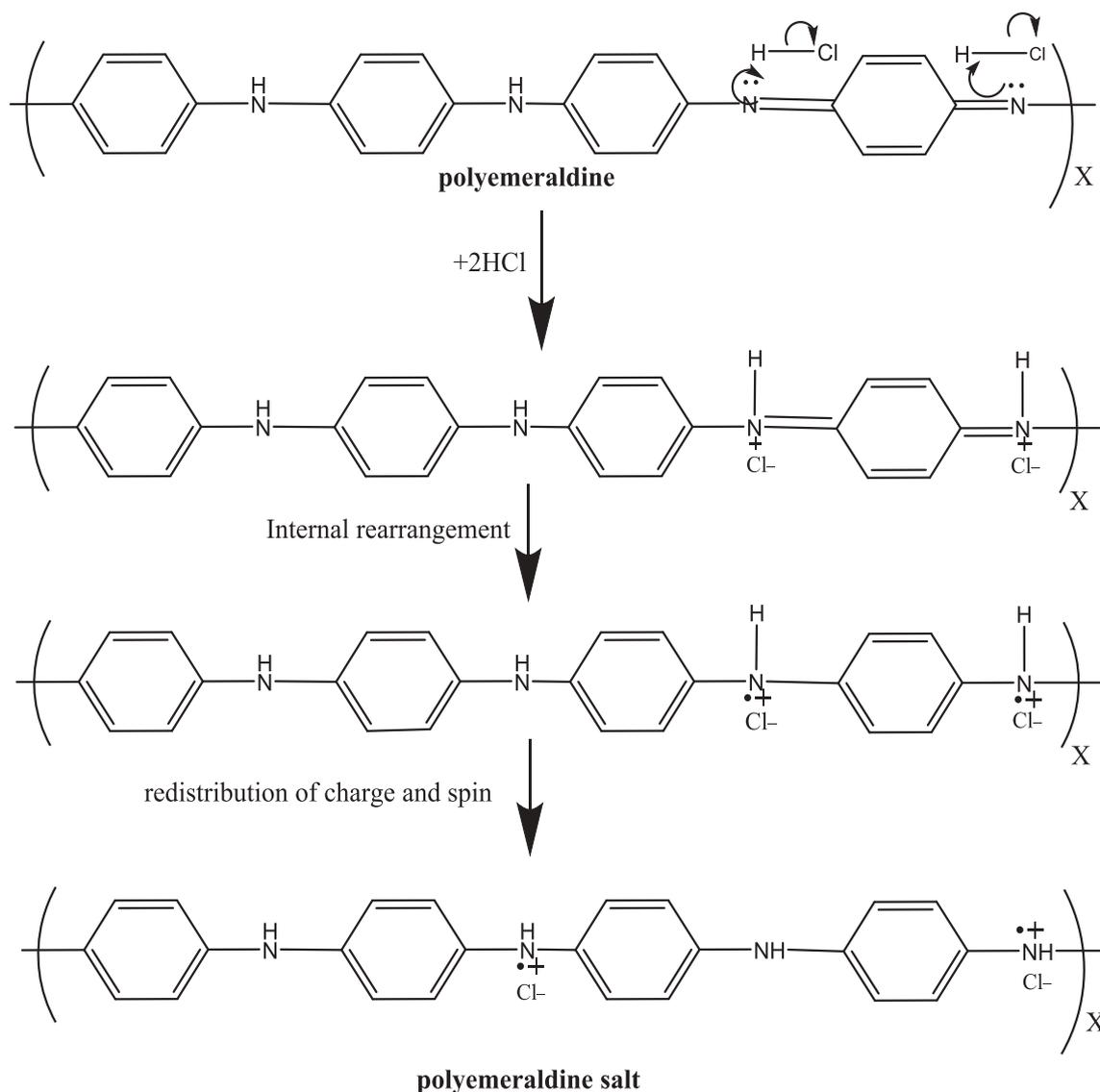
Various CEPs shows different redox states. Therefore conductivity is as per their form have existed. Likewise, we can say that by removing one electron from the structure with doping of anion then half oxidized polaronic form will be obtained. Similarly, by removal of the second e<sup>-</sup> the oxidized bipolaronic form will be produced. Therefore, it has been found that PANI-EB form shows the highest conductance as compared to PANI-LE and PANI-PB. PANI-LE and PANI-PB do not have any conductance power.

##### 5.1.2. Surface polymerization

Metallization of printed circuit boards (PCBs) shows the most important practical use in the deposition of CEP by chemical polymerization on the surface of nonconductor substrates from the 1990s. In this procedure, the printed circuit board's surface is reacted with basic KMnO<sub>4</sub>, and MnO<sub>2</sub> is spread on selective plastic parts of PCBs. After that, a thin layer of PANI is deposited onto the PCB followed by reaction of it with an acidic solution of PANI, where the polymerization of PANI initiated by MnO<sub>2</sub>. And finally, the Cu metal layer is deposited by electrodeposition on PANI-deposited PCB. Therefore, from the last few years, this technique gains so much attention, and various materials have been involved in this process [40].

##### 5.1.3. Chemical vapor deposition (iCVD&oCVD)

Initiated chemical vapor deposition (iCVD) and oxidative chemical vapor deposition (oCVD) methods are able to deposition of thin films on bulk, micro and nanoscale materials. In the deposition of polymer in the vapor phase, many effects like solution and wetting has been observed which has to be avoid must. In iCVD, the deposition rate has been increased by using a hot filament of CVD and for maintenance of chemical nature of polymers a thermally labile initiator used in the feed stream. In oCVD, by direct use of oxidant and monomer into the reactor electrically conducting and the infusible film have been formed. In iCVD,



Scheme 12. Mechanism of acidic doping.

polymeric monomer and initiator molecule has been introduced into the vacuum chamber. Therefore many free radical homopolymers, random copolymers, and alternating copolymers has been created in iCVD method. Ultrahydrophobic, hydrophilic, chemically resistant, antimicrobial, biopassive and peptide-functionalize polymer surfaces have all been characterized by iCVD. For oCVD, by using monomers and volatile oxidants step-growth polymerization of polymers occurs [41]. Thin, adherent coatings of CPs show various properties, such as work function have been demonstrated by oCVD [42]. This Strategy developed a covalent link between underlying substrate and films [43]. The enhanced adhesion is required for many practical applications and also enables high-resolution patterning of the CVD polymer layers [44].

#### 5.1.4. Langmuir–Blodgett technique

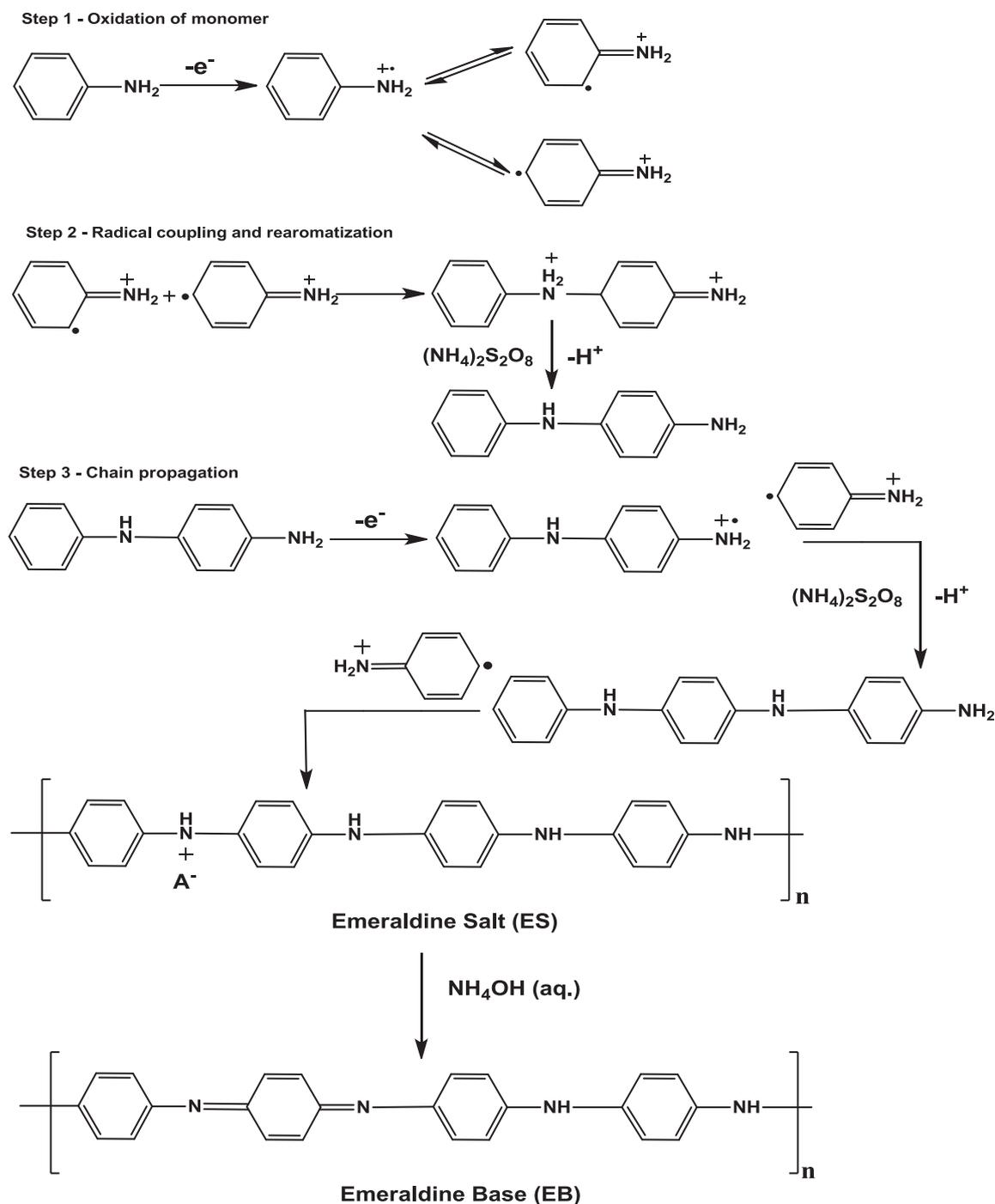
By this technique, PANI–CSA composite thin film has been prepared. In this process, PANI–CSA solution (800 mL.) has been expanded over the substance by syringe.  $\text{CHCl}_3$  is highly evaporating in nature so it will evaporate first and monolayer films are left undisturbed a period of 20 min for complete get rid of the solvent particles. Therefore the gaseous phase of the film has been obtained. PANI–CSA and CdS incorporated thin films are prepared by the same method, by isotherm check process we can compare the change found in both thin films during the deposition process.

#### • LB film deposition

CdS incorporated PANI–CSA thin films are deposited on a glass substrate at room temperature, on  $12 \text{ mN m}^{-1}$  surface pressure &  $20 \text{ mm min}^{-1}$  compression speed. After several performances, increase compression speed for getting stability in multilayer deposition. Next deposition followed by after 30 min of elapsing and substrate kept undisturbed for drying. LB films of 25 layers, 21 layers, 19 layers, 15 layers, 9 layers and 3 layers are deposited on a glass substrate [45].

#### 5.1.5. Layer by layer (LbL) self-assembly technique

By this technique, PANI thin film deposition takes place on a glass substrate by LbL self-assembly formation. In this technique first glass substrate will be cleaned by RCA –1 Silicon Wafer Cleaning method [46]. In this process, 325 mL of distilled water take in a beaker and add 65 mL of ammonium hydroxide then heat it on  $70\text{--}75^\circ\text{C}$  temperature. After that add 65 of hydrogen peroxide followed by stop heating. Then add silicon wafer in this solution for 15 min., when the reaction is finished then transfer the wafer into a container in which overflowing of distilled water is present. After several washes, we will remove the wafer from flowing water so as a result it has been obtained that the water surface only has an organic substrate that will be deposited on the wafer surface. After cleaning the surface of the glass substrate, the



$\text{A}^-$  = Counter ion

**Scheme 13.** Oxidative polymerization of aniline to PANI.

glass substrate will be immersed into the PANI solution by adding some natural rubbers particles for absorption. After deposition of first layers surface will be washed by deionized water and dried in  $\text{N}_2$  gas atmosphere and the next layer will be deposited by the same procedure. By this method, 10 layers can be deposited on a glass substrate [47].

#### 5.1.6. Spin coating

Spin coating is a method that is extensively used for depositing layers of organic semiconductors on any suitable substrate. A quantity of a polymer solution is first placed on the semiconductor wafer that

rotated at the desired speed while the solution flows radially outwards, reducing the fluid layer thickness. The evaporation of the solvent results in a uniformity of this film. The initial stage involves delivering a quantity of solution to the surface of the substrate. The substrate surface may be pretreated with an adhesion promoter to improve the wetting [48].

#### 5.1.7. Drop coating

In the drop coating method, the sample is dissolved into any suitable solvent and may be stirred with a magnetic stirrer for better mixing.

Then the solution is filtered, the insoluble material which remain on the filter paper is discarded. The resulting solution is used to cast a thin film. A clean suitable substrate is placed on a leveled surface and the solution is put on the substrate drop wise. The coated substrate is dried in a vacuum and the films appear visually dry. To have a thicker film, a second layer of the solution is casted overlaying the first layer the same in a way. After 4–5 h, the glass is taken out from the oven and submerged in distil water and then the film can be peeled off from the substrate and ready for use [49].

#### 5.1.8. Nanopatterning

The planar microelectronics components are patterned using photolithography where a surface is covered first with a light-sensitive photoresistor and then exposed to ultraviolet light through a mask. Either the exposed photoresist (positive resist) or the unexposed regions (negative resist) can be washed away subsequently to leave a positive or negative image of the mask on the surface [48].

#### 5.1.9. Inkjet printing

The inkjet printing technique is mainly used for the fabrication of film of an organic semiconductor. It is very simple, compatible with different substrates, feasible of non-contact and non-mask patterning can be processed in the low temperature range. Herein the inkjet printer of computer printing with simple modification can be used to pattern solution processible polymers or nanoparticles inks on various substrates including glass, semiconductor materials, overhead transparencies and even paper.

#### 5.1.10. Screen printing

This is a very simple and environmental friendly printing process and used to manufacture conductive inter-connections between the electronic components on the circuit boards. Herein, a squeegee blade across a screen mesh moves and pushes ink through a screen mesh and patterned by means of a stencil to produce open areas that result in the pattern of a conductive material on the circuit board. This method is suitable for high viscosity materials including conductive ink, dielectric pastes, UV durable materials and various adhesives [50].

#### 5.1.11. Line patterning

Line patterning is the simplest and cheapest printing method introduced by MacDiarmid and co-workers [51]. It includes (i) the design of a negative image of required pattern using computer design software, (ii) deposition of conductive polymer on the substrate, and (iii) removing the printed mask by sonicating the substrate in toluene. This method can be used for the fabrication of resistors, R.C. filters, FETs and R.F. identification tags, etc.

#### 5.1.12. Nucleation and growth process

Generally, the atoms/molecules can deposit on certain sites in the initial stage leading to assemblages of atoms/molecules is known nuclei or clusters. These nuclei may increase laterally to form a monolayer over a small area and later on also thickness with the fresh arrival of more atoms or molecules. The increase in the sizes of these nuclei is also accompanied by fresh deposition of atoms/molecules at newer sites of the uncovered portions of the substrate surface. These new nuclei/clusters along with the earlier ones will increase laterally as well as in height with the arrival of fresh atoms/molecules. The gaps in between

these nuclei will decrease gradually eventually a continuous film will be fashioned at a certain average film thickness. The theory involves film formation often over a foreign substrate surface which plays an important role in nucleation. This is known as heterogeneous nucleation. If the substrate is of the same materials as the vapor atoms then the nucleation process is called homogeneous. In the case of nucleation and cluster formations from the vapor phase, the surface of the substrate should be smooth, void and defect-free. The general process of additions, adsorption, desorption, migrations, etc. of atoms is called the nucleation. The formation of a film and its growth from the vapor phase or there wise involve phase transitions, adsorption, desorption, nucleation, cluster formation, etc. In order to explain the nucleation and cluster formation, several theories may be applied [52].

### 5.2. Physical methods

The present area oversees the synthesis and characterization of PANI thin films using room temperature electrodeposition systems. Assorted preparative parameters, for instance, kind of dopant, deposition potential, the union of monomer and declaration period were progressed to get uniform and well teach PANI thin films and depicted by different methods. The strategy of electrodeposition incorporates a mix of thin films from deteriorated species by changing their oxidation states over electricity. The terminal position has diverse focal points over others dealing with techniques used for the announcement of thin films [53].

It is a cost-effective method for the preparation of thin films.

1. The deposition should be possible in a picked specific region and the thickness of the store can be controlled entirely by checking the exhausted charge.
2. It is an incredibly beneficial procedure for making thin multilayered materials.
3. Deposition can be finished at a low temperature.
4. Deposition on complex shapes is possible.
5. The deposition process can be controlled even more absolutely and easily.

Different sorts of morphologies and compositions can be gained for different polymers, mixes and blends (Table 1)

#### 5.2.1. Galvanostatic mode

Fig. 1 shows potential versus time transient of affirmation of PANI film at unflattering current thickness. The possibility of the plot chooses the nucleation and improvement of PANI. At first, the potential was raised out of the blue to +0.92 V due to the institution of the space charge region. At B, oxidation of aniline on substrate happened and over way BC, a perpetual improvement of PANI viewed. The films put away under predictable current conditions are thin and less supporter to the treated steel substrate. Along these lines, this method was finished to prepare PANI films. At B, oxidation of aniline on substrate happened and over way BC, an interminable improvement of PANI viewed. The thin films spared under reliable current conditions are thin and less teach to the treated steel substrate. Subsequently, this strategy was suspended to prepare PANI films.

**Table 1**  
Modes of electrodeposition.

Mode of Electrodeposition	Difference
Galvanostatic	Deposition by applying a constant current between counter electrodes and working electrodes
Potentiodynamic	Electrode potential is varied using a stable the reference electrode and the current flow is measured between the working and counter electrode.
Potentiostatic	Deposition by applying a constant potential between working and counter electrodes.

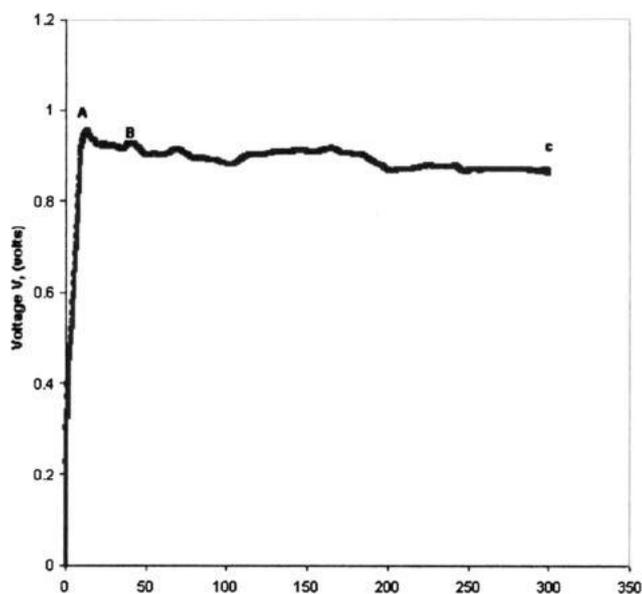


Fig. 1. Galvanostatic deposition of polyaniline film.

### 5.2.2. Potentiostatic mode

The hidden decreasing in current is seen due to the adsorption of the molecule at the electrode surface. Constant rising in current after initial decay suggests parallel nucleation of PANI close by the autocatalytic improvement of PANI. The possibility of the current-time transient in the potentiostat deposition is a result of the use of  $H_2SO_4$  as an electrolyte. For our circumstance light blue due to  $H_2SO_4$  electrolyte used at the assembly of monomer solution (0.45 M aniline), the current transient seeks after nature as showed up in Fig. 2. The electro-oxidation of aniline at constant potential produces a powder that adheres poorly to the electrode hence not employed to deposit PANI films in further work.

### 5.2.3. Potentiodynamic mode

Fig. 3 shows cyclic voltammograms (CV) plots of PANI deposition by potentiodynamic strategy at a broadness rate 50 mV/s in the potential domain  $-0.2$  V to  $+0.8$  V/SCE. The peaks at A ( $+0.45$  V/SCE) analyzes to oxidation of aniline and inside the potential region part AB (upto  $+0.8$  V/SCE) PANI advancement occurs. Right, when the cycle was come to at potential regard  $-0.2$  V/SCE PANI was in the completely reduced state, i.e., Leucoemeraldine (LE) state. The color of the film was light yellow. With positive potential at about  $+0.45$  V/SCE (first oxidation top at A), the reduced state was not entirely oxidized

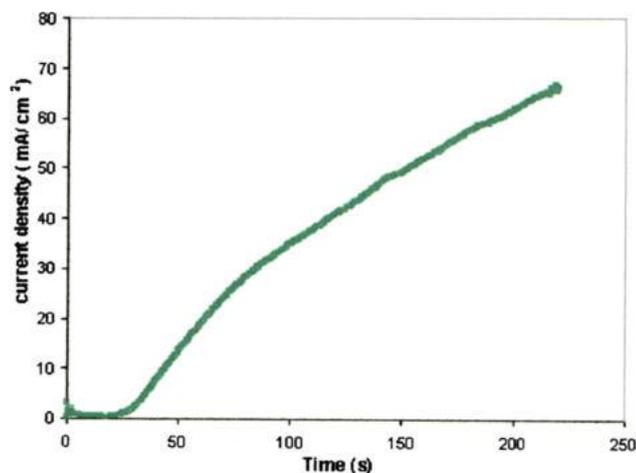


Fig. 2. Potentiostatic deposition of PANI film.

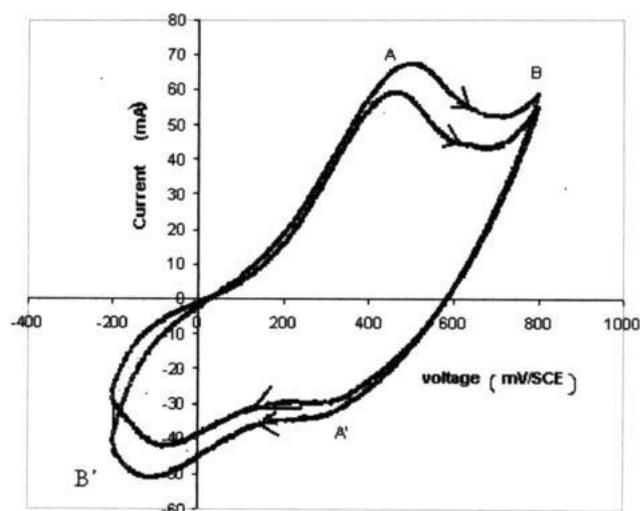


Fig. 3. Potentiodynamic deposition of polyaniline film.

which realized a state to Emeraldine (EM). The color of the film turns emeraldine green. Above capacity of  $+0.8$  V/SCE (point B), EM went to complete oxidation to make polypemigraniline. The film color change in some degree blue-violet. These oxidation states and the way A-B are electrochemically reversible. In the procedure used to store PANI, the cathode was checked for ten cycles between  $-0.2$  to  $+0.8$  V/SCE at breadth rate 50 mV/s. During  $-0.2$  to  $+0.45$ , V/SCE oxidation of aniline did not occur. The oxidation and advancement of PANI happened over the potential region  $+0.45$  to  $+0.8$  V/SCE.

Notwithstanding the way that the PANI films were spared by three distinctive courses, for further examination and production of hetero-junctions, PANI films were spared potentiodynamically. The thin films spared potentiodynamically are adherent, even thicker and co-ordinating.

### 5.2.4. Thermal evaporation

The thermal evaporation method is widely applied for the deposition of metals, alloys and several compounds that involves the evaporation or sublimation of the material in vacuum by thermal energy and allowing the vapor-stream of material to condense on a substrate and consequently to form a continuous and adherent film of desired thickness. The quality and properties of the film will depend on the evaporation rate, the temperature of the substrate, ambient pressure, etc. The uniformity of the film also depends on several factors including inter alia the geometry of the evaporant source and its distance from the substrate [52].

Thermal evaporation is done by in a variety of ways e.g. resistive heating where the material is heated by resistive filament generally made of refractory metals such as W, Mo, Ta and Nb with or without ceramic coatings. Others are flash-evaporation, arc-evaporation, exploding wire technique, laser evaporation, RF heating, and electron-beam evaporation. To overcome the drawbacks upon resistive method, an efficient source of heating by electron bombardment of the material may be used which is capable of evaporating any materials with rates ranging from fractions of an angstrom to microns per second. In the process, thermal decomposition and structural changes of some chemical compounds may occur because of the intense heat or energetic electron bombardment [54].

### 5.2.5. Sputtering method

The ejection of atoms from the surface of the target material by bombardment with energetic particles is known as sputtering. If the ejection is due to the positive ion bombardment then it is referred to as cathodic sputtering. The ejected or sputtered atoms can be condensed on a substrate to form a thin film. If the ions are supplied by glow

discharge phenomena owing to an applied electric field between two electrodes in a low-pressure gas then it is called glow discharge sputtering. The factors affecting the operation of the glow discharge technique are gas, pressure, deposit distribution, current and voltage values of the systems, and size of the cathode. The deposition/evaporation rate remains constant with the time that provided the current density and voltage do not vary and can be attainable by regulated power supply using an automatic pressure controller. The sputtering technique can be categorized as reactive sputtering, rf-sputtering, triode-sputtering, ion-plating, magnetron sputtering and ion beam sputtering [55].

## 6. Properties of conducting polymers

The nano-sized inorganic particles and their unique properties are introduced into conducting polymers for the formation of new desired properties. It is apparent from the literature review that PANI is successfully utilized for the preparation of nanocomposites. Mostly, inorganic metal oxides nanoparticles are incorporated into conducting polymers to achieve desired properties. Recently, interest is shown on PANI inorganic nanocomposite due to their interesting various physical properties and potential applications. Maeda & Armes carried out a series of pioneering works in colloidal conducting polymer nanocomposites [56]. They incorporated  $\text{SiO}_2$ ,  $\text{SnO}_2$ , etc., into PANI to achieve stable colloidal dispersions. Some of the stable dispersions [57], stable PANI- $\text{SiO}_2$  dispersions [58] and films [59] were studied for biomedical applications. Nano-dimensional manganese (IV) oxide was incorporated into PANI to produce water-dispersible nanocomposites [60].  $\text{WO}_3$  [61] and Prussian blue [62] were synthesized for their electrochromic properties. Some researchers prepared the nanocomposites by incorporating the  $\text{Cu}_2\text{O}$  nanoparticles into PANI to enhance electronic, electrical, optical and mechanical properties [63]. Kondawar et al. [64] prepared the nanocomposites by the incorporation of ZnO into the PANI matrix, and they found the increased electrical conductivity of ZnO in the nanocomposites. This group also found that the change in the conductivity of the nanocomposites is indicating a change in the doping state of the polymer [65]. Nowadays, several researchers have reported the nanocomposites of metal oxide/polymer nanocomposite and the incorporation, embedded or intercalation of metal oxide into polymers which increased the optical absorption, thermal stability, corrosion resistance and conductivity of metal oxide [66]. Some pioneering work to prepare the  $\text{Cu}_2\text{O}$ /PANI composite is done by explaining the possible proposed photocatalytic mechanism for the improvement of the photocatalytic activity in which photocatalysts effect with enhanced photocatalytic activity and stability of its composite. So, PANI associated with various properties such as magnetic properties, electrical and dielectric properties, redox properties, antioxidant properties, anticorrosion properties, charge-discharge properties, capacitive properties, sensing properties etc.

### 6.1. Magnetic properties

The PANI has attracted much attention because of its magnetic behavior as it exhibits high spin density [67]. The magnetic properties of CPs have been intensely studied because these properties give information about unpaired spins and charge-carrying species [68]. The paramagnetic nature of the conducting PANI upon HCl doping changes its electrical and magnetic properties which are closely related to each other. Lu et al. [69], PANI- $\text{Fe}_3\text{O}_4$  composite nanotubes have been synthesized by ultrasonic irradiation technique and studied their magnetic properties, and as a result, it has been observed that PANI- $\text{Fe}_3\text{O}_4$  composite nanotubes showed a super paramagnetic behavior. Similarly, of PANI- $\text{Fe}_3\text{O}_4$  composites nanorods prepared via a self-assembly technique and their magnetic properties have also been studied. By comparing to both methods, it has been observed that the samples synthesized through the ultrasonic irradiation technique promote the distribution of  $\text{Fe}_3\text{O}_4$  particles. The magnetic properties of 1D-CPs – Ni,

Co, Fe nanocomposites have also been studied [70]. A remarkable ferroelectric response in PANI nanotubes has been observed due to the polarization caused by intermolecular H-bonding in methanol and PANI chain. Djurado et al. [71] studied that an independent film of the PANI protonated with a di-(2-butoxyethoxy-ethyl) ester of 4-sulfophthalic acid did not show magnetized behavior at zero magnetic fields. The magnetic behavior of PANI in the presence of chloranil has also been studied during the electro-oxidation [72]. The spin susceptibility of PANIs shown that this term employed from paramagnetic centers which were present in charge carriers which mainly present in implant metal-like domains as well as in amorphous polymer backbone. In this electron spin interacts with samples and shows antiferromagnetic behavior as paramagnetic susceptibility [73].

Huang et al. [74] prepared the HCl, PTS and CSA doped  $\text{SrPr}_{0.2}\text{Fe}_{11.8}\text{O}_{19}$ /PANI composite films and HCl-PANI film employing a sol-gel method and in-situ oxidative polymerization. They observed that the magnetic properties of these composite films have no much difference. The electromagnetic losses of the four kinds of films in series from strong to weak are HCl-PANI film,  $\text{SrPr}_{0.2}\text{Fe}_{11.8}\text{O}_{19}$ /(HCl-PANI) composite film,  $\text{SrPr}_{0.2}\text{Fe}_{11.8}\text{O}_{19}$  film,  $\text{SrPr}_{0.2}\text{Fe}_{11.8}\text{O}_{19}$ /(CSA-PANI) composite films. They concluded that the acid doped PANI materials had a great impact on the electromagnetic loss of the composite films and improved the electromagnetic properties of the composite films.

### 6.2. Electrical and dielectric properties

In a variety of polymers, PANI is especially attractive owing to both its thermal and environmentally stable properties. The origin of the metallic phase and its dimensionality of the natural form of PANI are still unknown [75]. The first electrically conducting doped organic polymer as polyacetylene was reported in the year 1977 [76]. The pristine polymers are converted into a metallic regime through the doping process. The electrical conductivities of polymers are increased with increasing the doping level while the conductivity of PANI is increased in many orders in magnitude with the doping. The electrical properties of the polymers and its nanocomposites are understood based on the explanation of various models devised by the scientists. Several reports are focused on the nature of the carriers in the highly doped metallic state. Even though there is a high concentration of conduction electron at the Fermi level in the highly doped state, the carriers are spatially localized, and hence they do not participate in transport except through hopping. Since conduction is carried out through localized electrons where the electrons jump across an energy barrier from one site to the other site. If two molecules are separated by a potential barrier, a carrier can move from one side to the other by tunneling either through the barrier or over the barrier. The process of movement of carriers from one side to another over, the barrier is known as hopping in which the structural disorder is the prime source of localization in the polymers. In a polymer system, the charge transport is an important phenomenon which obtained from the relationship between AC conductivity and the temperature of the polymer. Generally conducting polymers is either polycrystalline or amorphous and has a substantial amount of disorder. The presence of partial crystallinity and impurities produces disorder in a polymer. The conduction also depends on the number of defects present on the polymer. The charge transport takes place between localized sites through phonon-assisted hopping due to localized charge carriers instead of band conduction. Activation energy is required for each hop and hopping occurs near the Fermi energy which dominates at low temperature. The hopping obtained near the maximum density of states dominates at high temperatures. Generally, an electron or hole hops to a more remote site than the nearest neighboring one, to reduce the energy required for the hop. The crystallinity and disordered system of polymers are studied through X-ray spectroscopy. Also, the fibrillar nature of many of the conducting polymers may lead to localization by reducing the effective dimensionality of the electrons delocalized in a

bundle of polymer chains [77]. In a perfect crystal with periodic potentials, electron wave functions form delocalized Bloch waves [78]. The impurities and lattice defects in the disordered systems are introduced through backward scattering. Anderson 1958 studied this phenomenon regarding a localization effect and the disorder-induced metal-insulator transition. It is well known that the electronic structure of the system strongly depends on the degree of disorder. The energy fluctuation in the random potentials broadens the bandwidth and creates smooth band-tails while the original band gap between the conduction and the valence bands of a semiconductor may be closed owing to these band tails. In the year 1979, Mott discussed the ramifications, and the finite density of states  $N_{EF}$  produced at the Fermi level ( $E_F$ ) between the mobility edges. In the second half of the forties, it was observed that the transistor effect of semiconducting materials like Ge-doped semiconductor had broken the behavior mechanism at low temperature and Hung and Gliessman found the type above of behavior in the general conduction mechanism. In the year 1956, the new conduction process was suggested by Mott (1979) in which the charge carriers conducted the electric current from an occupied site to an empty site by thermally activated tunneling. Many numbers of transport theories were developed as per the model of Miller and Agraahans in the year 1960, even though the theories were most widely accepted, it possesses few discrepancies. To overcome, a more sophisticated treatment (called as percolation theory) has been suggested, and it is still most reliable as well as considered for the evaluation of electric coefficient as conductivity and thermal electric power of non-crystalline semiconductors.

It is well known for a one-dimensional metallic chain that the localization of charge carriers arises for even weak disorders because of the quantum interference of static backscattering [79]. In contrast, strong disorder (the mean free path is comparable with the Fermi wavelength) is required for localization in three-dimensional systems. The localization effects in the in-homogeneously disordered (partially crystalline) conducting polymers may originate from the one-dimensional localization in the disordered regions. In the case of conducting polymers as fillers, the degree of cross-linking between the polymeric chains also affects the electrical properties in these composites [80]. Generally, the percolation theory is used to explain the behavior of electrical conductivity and dielectric properties of conducting polymer composites, but it could not explain very low values of the percolation threshold observed in many of the composite systems of conducting polymers. In the year 1998, Wessling proposed a non-equilibrium theory for the composites of conducting polymers. This theory accounting for the interfacial interactions between conducting polymers and host matrix could also explain the observations of the low percolation threshold.

The conducting polymers are appreciable candidates for electronic and electromagnetic applications. Among these, PANI is having a high level of conductivity and permittivity (Piou et al. 2004), and the dielectric properties are tuned easily by blending with inorganic nanoparticles. Though, when they are taken in the form of the nanocomposite, their electrical, as well as dielectric properties, are altered from those of basic materials. Some groups are reported on the electrical conductivity and dielectric properties of composites of a variety of conducting polymers [81]. It is observed that the conductivity of these systems depends on several factors such as the concentration of conducting fillers, their shape, size, orientation and interfacial interaction between filler molecules and host matrix [82]. The nano-dimensional shape of the filler particles governs the ability of conductive network formation which results in a large increase in the conductivity. Also, encapsulation particles/matrix interactions and physical properties of the matrix influence the agglomeration of the encapsulation phase which, in turn, affects the dielectric properties of the nanocomposites. In the case of conducting polymers, the degree of cross-linking between the polymeric chains also affects the electrical properties in the composites. Although the percolation theory is generally used to explain the

behavior of electrical conductivity and dielectric properties of conducting polymer composites [80], it does not explain very low values of the percolation threshold observed in many of the composite systems of conducting polymers. Wessling proposed a non equilibrium theory for the composites of conducting polymers which explained the observations of low percolation threshold while accounting for the interfacial interactions between conducting polymers and host matrix.

The incorporation of PMMA enhanced the optical and mechanical properties of PANI thin film where films showed higher transmittance, adhesion, and lower refractive index and intrinsic stress [83]. PANI/PMMA composite thin films grown by vacuum evaporation was in the form of short-chain oligomers. The optical band gap was found to be increased with increasing concentration of PMMA which confirmed the formation of the homogenized composite. The optical transmittance of the pristine films increased from 70% to 85% with increasing PMMA concentration while the refractive index decreased from 1.822 to 1.571. The adhesion was increased from  $6.86 \times 10^4$  to  $12.26 \times 10^4$  N/m<sup>2</sup> and stress reduced from  $16.98 \times 10^8$  to  $10.50 \times 10^8$  N/m<sup>2</sup> owing to PMMA. The improved optical and mechanical properties make them more applicable in optics and optoelectronics. The camphorsulfonic acid (CSA)-doped PANI thin films are P-type semiconductors with high conductivity for PANI film of PANI:CSA weight ratio (1:8) [19].

### 6.3. Redox properties

The PANI shows different forms in which these forms are converted into each other reversibly by acceptance or removal of an electron. The reduction of the polyemeraldine form and polyleucoemeraldine base form has been shifted by increasing the scan rate in the positive direction [84]. Gospodinova et al. [85], has been studied that the HCOO<sup>-</sup> like highly hydrated anions promote the propagation of PANI reduction in organized thin films when it is deep in an aqueous acidic medium. Electrochemical activity of a PANI film has been prepared by casting PANI from N-methylpyrrolidone solution (PANI-NMP), and another film has been developed by dissolving the PANI in a combined solution of dichloroacetic acids and dodecyl benzene sulfonic (PANI-DBSA-DCA), and comparative study of both have been done with HCl/NaCl aqueous solution used as an electrolyte. As result, it has been observed that PANI DBSA- DCA and PANI-NMP films have been active up to pH < 5 and at pH < 2 respectively, whereas weight of PANI DBSA-DCA has been increased by reduction due to movement of Na<sup>+</sup> and weight of PANI-NMP film, has been increased by oxidation due to the movement of Cl<sup>-</sup>. PANI has been used as redox-active nanojunctions [86]. The scanning electrochemical microscopy method has been used for preparation of nanojunctions which showed conductance in range of 10<sup>-7</sup> and 10<sup>-8</sup> S, appeared current to be controlled when it is for less than 10 oligoaniline strands because the less number of strands will also be able to connection of two electrodes, and the junctions will be highly stable in nature.

### 6.4. Antioxidant properties

A modified 2,2-azino-bis(3-ethylbenzothiazoline-6-sulfonic acid) diammonium salt (ABTS) has been synthesized for the determination of the antioxidant property of PANI powder [87]. The reduced forms PANI show the highest radical scavenging property as compared to their partially oxidized form. It has also been observed that the radical (DPPH<sup>•+</sup>) scavenging property of the PANIs has not been dependent on surface area and the conductivity of PANI, but it subject to the various oxidation state of PANI. As a result, it has been observed that the antioxidant property has been increased with decreasing in the level of PANI oxidation. PANI exhibited a fast decrease of free-radical scavenging property when it is treated with above 200 °C temperature. Therefore it has been concluding that processing temperatures of PANI should be < 200 °C to attain higher antioxidant t property [88].

### 6.5. Anticorrosion properties

Although PANI has been studied as an important material for the formation of corrosion control coatings, it has been reported first in the 1980s, PANI has promising benefits in the protection of corrosion. PANI has been used for efficient protection of corrosion in stainless steel as well as proton exchange membrane fuel cells. In further studies, it was found that polyaniline sulfate coatings were more adequate than polyaniline  $\text{PO}_4^{-3}$  coatings for the prevention of stainless steel from the corrosion [89]. Similarly, polyaniline sulfamate coatings provided anodic prevention to the stainless steel substrate. The importance of polyaniline molybdate and PANI tungstate for the protection of steel from corrosion has also been demonstrated [90]. The potential-time curves which have been obtained by the electrochemical galvanostatic polymerization of aniline on low carbon steel in an aqueous solution of  $(\text{COOH})_2$  showed two distinct stages:

The electrochemical polymerization of aniline, the formation of polycrystalline Fe oxalate attachment and solubility of the surface of carbon steel. Electro-synthesized PANI coatings have also been used for the protection of Ni-coated mild steel from corrosion [91]. Polarization curves exhibit a little enhancement in the potential of corrosion for PANI-covered Al alloy (6061-T6) as compared with bare metal, it has been observed that no sufficient protection was obtained by PANI coating [92].

On the other hand, a reduction in Al harm because of the galvanic corrosion in aluminum-copper/PANI galvanic couples in environment of sea has been observed by Vera et al. 2010, it has been found due to the existence of PANI in the aluminum-copper system which is due to a decrease in the oxygen reduction reaction (ORR) rate. Electrochemical impedance spectroscopy (EIS) shows that the coating inhibition of Al alloys (AA 7075, AA 2024) covered with PANI which was synthesized in  $(\text{COOH})_2$  solution, and it shows resistance to more than  $10^6 \Omega \text{ cm}^2$  whereas the alloys coated with epoxy resin only then resistance value will be less than  $10^4 \Omega \text{ cm}^2$  [93]. It has been found that the resistance ability of PANI film on aluminum alloy (AA 7075) against corrosion has been enhanced from 70 to 90% by post-treatment in a solution of Ce salt. Distinguish in three different types of PANI/metal interfaces can be done by Kelvin Probe which was based on the daily exposure of PANI-covered metal to wet  $\text{N}_2$ , wet & dry air [94].

### 6.6. Charge-discharge properties

$\text{LiPF}_6$  doped PANI electro-sprayed onto aluminum foil by using the electrospinning technique and also has been used as cathode material for Li batteries at room temperature [95]. In this property, cells delivered high discharge capacity and approached towards the highest theoretical capacity, and this theoretical capacity will be decreased to 61% after completion of 50 cycles. Similarly, PANI polysulfide has also been used as a cathode material in high energy Li/S batteries [96]. In recent years, a lot of attention has been gained by rechargeable batteries which were based on PANI composite materials.

### 6.7. Capacitive properties

Supercapacitor devices and electrodes which have been formed by using PANI create a boundary between inorganic materials-based batteries and carbon-based supercapacitors (double-layer capacitors) and form units of intermediate energy. PANI has capacitive properties because in the bulk of PANI a fast redox reaction will take place which gives the capacitive response and shows superior specific energies than the double-layer capacitors. During the study of the capacitive property, it has been observed that PANI more conducting in nature and has a higher power capability than inorganic battery materials. However, the life of supercapacitors which is based on pure PANIs, is weak as compared to double-layer capacitors because of materials of PANI swell and contract during charging and discharging. Therefore, it has been

observed that sufficient progress has been found in the preparation of composites of PANI material, e.g., PANI/carbon nanotubes, PANI/graphene, etc., with excellent capacitive properties [97].

Kim et al. [98] synthesized the PANI thin films on flexible ITO/PET (indium tin oxide/polyethylene terephthalate) substrates employing the drop-casting method with varying the amount of PANI from 0.04 to 0.16 g. The morphology study shows a porous vermicular shape while the electrochemical supercapacitor properties were examined in a 0.5-M  $\text{LiClO}_4 + \text{PC}$  electrolyte. The PANI films with 0.08 g of PANI show higher current density and considerably higher specific capacitance and capacity retention vis-à-vis to compare with other PANI films. They concluded that the drop-casted 0.08 g PANI thin films could be used as a supercapacitor electrode to improve energy density, power, and stability. The effect of the amount of PANI also exhibited its excellent properties for supercapacitor applications.

### 6.8. Sensing properties

The conducting thin films of photo-responsive PANI have been synthesized for sensor applications [99]. An easy and adequate method for the measurement of ultra-trace amount of Hg and  $\text{CH}_3\text{-Hg}$  in fish tissues and water has been invented, by using a micro-column which was filled with PANI. The glassy carbon electrode was formed with the help of PANI coating has been utilized for the detection of  $\text{Pb}^{2+}$  and  $\text{Cd}^{2+}$  in  $\text{CH}_3\text{COO}^-$  buffer solutions by using square wave anodic stripping voltammetry [100]. PANI Langmuir-Blodgett film-modified glassy carbon electrode has been utilized for the determination of  $\text{Ag}^+$  ions in the voltammetric sensor for the determination of  $\text{Ag}^+$  ions [101].

PANI thin films can be used in sensors just because of its high surface area, and fast response time. These are used in the detection of many gases such as ammonia, LPG, CO, etc. In the gas detection process, PANI thin films are inserted vertically in the gas chamber, and observed changes are measured. It has been seen that absorbance on thin-film increases when gas is purged in the chamber, and it indicates the reaction between gaseous molecules and PANIs. An easy and low-cost Potentio-dynamic electrodeposition method has been employed by Mello et al. [102] to produce quality PANI thin films. They found that the electrodeposited PANI films have high sensitivity, linearity, and stability, and films could be a promising contender for commercial pH and biosensors.

Kumar and Yadav [103] have fabricated PANI thin films using spin coater and investigated with the exposure of humidity sensor. The minimum crystallite size of PANI was found to be 5 nm, and films have more porous, stable and sensitive and may be employed as a humidity sensor. Liu et al. [104] prepared PANI-TiO<sub>2</sub>-Au thin films by in-situ self-assembly method and findings demonstrated a higher response, better reversibility and faster response/recovery rates than those of PANI-TiO<sub>2</sub> based one which also possessed good repeatability, stability, selectivity and low detectable concentration (1 ppm) to  $\text{NH}_3$ . They also proposed a sensing mechanism model to enhance the sensing properties. They found that the prepared ternary film sensor could be an effective strategy for the development of room-temperature operation ammonia sensors with improved performance. Recently, this group also investigated the effect of CeO<sub>2</sub> nanoparticles on the performance of PANI based  $\text{NH}_3$ -sensing performances at room temperature [105]. The sensor showed an improved response, reduced recovery time, perfect response-concentration linearity, good reproducibility, splendid selectivity, remarkable long-term stability, ultra-low detectable concentration, and outstanding flexibility.

Khanikar and Singh [106] developed an intrinsic optical fiber pH sensor coated with PANI-polyvinyl alcohol (PVA) composite layer. The sensor was fabricated by substituting the polymer cladding of multi-mode fiber with pH-sensitive PANI-PVA layer and results demonstrated high sensitivity of 2.79  $\mu\text{W/pH}$  for 2–9 pH range. They also studied the impact of environmental temperature and ionic strength on the sensor

performance. Their investigation also revealed that the proposed sensor has excellent long term stability and durability. Santos et al. [107] fabricated PANI intercalated into the vanadium pentoxide ( $V_2O_5$ ) matrix and studied the behavior for an ammonia sensor.  $V_2O_5$ /PANI exhibited a sensorial response to different concentrations of ammonia gas which indicated that this hybrid material could be used in ammonia amperometric gas sensors for animal confinement buildings.

## 7. Conclusion

Several non-conventional polymerization methods have been used for the synthesis of PANI and extensively used by different dopant and oxidant. PANI has potential applications in various fields because of the special properties. Oxidative polymerization is the most common method for the synthesis of PANI thin films. Similarly, PANI thin films are synthesized by surface-initiated electro-polymerization, Langmuir–Blodgett technique, atmospheric pressure plasma polymerization technique, mSILAR, etc. ZnO, TiO<sub>2</sub>, V<sub>2</sub>O<sub>5</sub>, LiClO<sub>4</sub> & HCl doped PANI thin films also been studied in this review. Synthesized PANI thin films can be deposited on various substrates by chemical and physical methods. Chemical method is classified into three types: bulk oxidative chemical polymerization, surface-located polymerization and chemical vapor deposition. Likewise, the physical method basically deals with the mode of electrodeposition. These novel synthetic approaches allowed the PANI for showing different physicochemical properties and also allowed for better control over electrical conductivity, environmental stability, thermal stability, etc. Due to this nature of PANI it shows various properties like magnetic properties, electrical and dielectric properties, charge-discharge properties, redox properties, antioxidant properties, and anticorrosion properties, capacitive properties, sensing properties, etc. These properties of PANI make it useful in different fields for various applications. It has been found that the polyaniline sulfate coatings were more adequate than polyaniline PO<sub>4</sub><sup>-3</sup> coatings for the prevention of stainless steel from the corrosion. The drop-casted PANI thin films can be used as a supercapacitor electrode to improve energy density, power, and stability. PANI based NH<sub>3</sub>-sensors showed an improved response, reduced recovery time, perfect response-concentration linearity, good reproducibility, splendid selectivity, remarkable long-term stability, ultra-low detectable concentration, and outstanding flexibility.

## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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## Appendix A

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## Appendix B. Supplementary material

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.eurpolymj.2020.109485>.

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# Postural Analysis Through RULA, REBA And QEC Of Vendors Selling Edible Items At Railway Stations And In The Trains

Iqbal Ahmed Khan, Rupak Kumar Deb

**Abstract:** An ergonomic study is conducted on postural analysis of the vendors selling edible items at various railway stations and in trains in Northern India. It has been observed that they attain a definite posture infinite number of times to perform a particular task for whole life. It depends upon the number of passengers whom they interact for selling edible products in the trains and at the railway stations. It has been observed that about 20-25 vendors are working at one railway station and +7000 railway stations in Indian railway network therefore at national level these are large in numbers. The RULA and REBA analysis are performed on the eight different vendors who were selling various types of eatable products at the railway stations and in the trains. The results of RULA analysis score is 100% score (7-high risk) was obtained for each vendor which indicates that there is a very high risk and further investigation is required on their working postures and implement change soon. On the other hand REBA analysis showed that 50% score (5- has medium risk, further investigate and change soon and remaining 50% score (8-9), pointed out that these postures have high risk, further investigate and implement change. The average of REBA score of all 8 vendors is 6.75 which showed that the working postures have high risk, further investigate and implement change soon. Further, QEC analysis also revealed that there is a high risk as per the assessment scores. Almost every vendor's shoulder score lies (31-40) which means high risk, also back score, wrist score and neck score showed high risk in QEC assessment scores. On the basis of results and succeeding discussions conclusions has been drawn.

**Index Terms:** WMSDs .RULA .REBA . QEC.

## I. INTRODUCTION

India has the largest train network in Asia. Daily 7000 trains including Gatimaan, Shatabdi, Super-Fast, Rajdhani, Duranti, Mails, Express, Passenger trains and special trains are plying at different routes. Train journey is considered to be safest, comfortable and economic journey and approximately one crore passengers used this facility on regular basis throughout the India. At the time of journey their eatable needs are different throughout the day. To cater passengers eatable needs vendors carry various eatable things/products such as tea, coffee, soup, cold drinks, water bottles, milk bottles, samosas, bread pakodas, chips, and other edible products. Further through observations it is

noticed that working postures of vendors during selling of items is awkward. Few vendors (Figure 1 & 2) holding the bucket of weight of 18-20 kg (water bottles, milk bottles, cold drinks etc.) at their forearm and moved in different Boggies of trains and at railway stations. Some vendors (Figure 3) carry breadpakodas, samosas etc. in the tray on their head. Also some vendors keep containers weight at their shoulder (right/left) (Figure 4, 5, 6 and 7). Apart for this few vendors (Figure 8) had the weight of the tray support through belt on his neck. Also tea/coffee vendors carry container on their either shoulder or hand. Besides this all the vendors shift the load when they feel tired to other part of the body. Through observations it is also noticed that they usually carry eatable/liquid items in different containers like Bucket, tub (square/round), tray etc. Also they carry load at their head, shoulder (right/left), on hands and sometimes through belt on the neck and give support by stomach and hands to the tray.

The activities of vendors are repetitive in nature which enhances the work related musculoskeletal disorders (WMSDs)/ RSI (repeated strain injury)/ CTD (cumulative trauma disorder).The vendors work is repetition in nature and have not sufficient time for body tissues to recover themselves to overcome the strain which is producing during working on body tissues might be effect discomfort, pain and prolonged working subsequently results of disability to them. Further, no doubt repetitive nature of work is the major and important parameter for WMSDs but apart from this other factors such as working conditions, environment factors, individual capabilities and habits play a significant role in WMSDs in human beings.

The literature re-examine showed that a lot of researches were conducted in the past e.g Alireza Choobineh et.al. [1] found that there was very high score of RULA (action level 3 & 4). This score could be minimized by designing ergonomic workplace to the workers of an Iranian communication company. Another study conducted by Yasser Labbafinejad et.al. [2] found a relationship between Low Back Pain (LBP) and education of workers in RULA scores. Also they found relationship between neck pain, age, gender, and working posture (mostly sitting/standing or alternating between the two). LBP, neck pain, awkward posture increased abstentism in the workers of the company. Further, J Nieves Serratos-Pereza et. al. [3] performed the investigation and ergonomic assessment in camshaft production operations.

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# Postural Analysis Through RULA, REBA And QEC Of Vendors Selling Edible Items At Railway Stations And In The Trains

The tasks performed by the workers are; i) managing the camshaft components i.e loading and unloading to and from the lathe machine, ii) camshaft mechanism visual inspection and test of fulfilment to the required parameters, iii) alteration of the machinery iv) setting the complete components in the containers. The REBA results showed that the 3 operations are at a very high risk, 14 classify as high risk, 14 were found as medium risk and 4 operations classified as small risk level. The body parts such as trunk, neck, arm and wrist were found at risk for WMSDs.

Keeping this in mind the present study is conducted to explore the health risk assessment of the vendors through their working postures, when they are selling edible items at platforms and in the trains. Their postures are recorded in videos and at a standstill taking photographs and these images are used for postural examination. The postural analysis tools Rapid Upper Limb Assessment (RULA), Rapid Entire Body Assessment (REBA), and Quick Exposure Check (QEC) are used to evaluate the risk assessment concerned in the functioning postures of the vendors.

## II. METHODOLOGY

The vendors working at railway stations and in the trains the following procedure is followed for postural analysis;

1. Filming (Video and still photography) the vendors' posture by Sony Camera
2. Take print of each vendors posture and measure the different angles of body parts as stated in RULA and REBA employee Assessment Worksheet (Table 1 and 2). Eventually, calculate the grand score of REBA and find out the associated risk through the Table 4.

3. The evaluation of this vendors' posture is to be carried out as per the procedure given in the RULA and REBA employee Assessment Worksheet. The outcome of the evaluation is **score** of RULA and REBA.
4. On the basis of these **scores** of RULA and REBA, determine the associated risk of posture of the vendor. This risk can be found in Table 3 & 4.
5. The similar analysis is to be carried for all the vendors' postures. The procedure of analysis for RULA, REBA and QEC is adopted from Iqbal Ahmed Khan and B.P Agarwal [4].

Further, The Rapid Upper Limb Assessment (RULA) employee assessment worksheet (Table 1) is used which was developed by McAtamney and Corlett [5] to compute the musculoskeletal risk caused by inactive tasks where upper body difficulty were high and work related upper extremity disorders are reported. The upper arm, lower arm, wrists, neck, trunk, legs postures are to be evaluated as procedure mentioned in Table 1. Finally, calculate the grand score of RULA and find out the associated risk through the Table 3. Similarly REBA (Rapid Entire Body Assessment) employee assessment worksheet (Table 2) is used, which was developed by Hignett.S. and Mc Atamney.L. [6] to give postural investigation of the worker for entire body activities i.e static and dynamic activities and give a REBA score.. The procedure of evaluation of posture is given in REBA employee assessment worksheet is to be followed for trunk, neck, and legs, upper and lower arms and wrists.

**Table 1: RULA Employee Assessment Worksheet**

**A. Arm and Wrist Analysis**

**Step 1: Locate Upper Arm Position:** +1, +2, +3, +4. Step 1a: Adjust... If shoulder is raised: +1. If upper arm is abducted: +1. If arm is supported or person is leaning: -1. Upper Arm Score.

**Step 2: Locate Lower Arm Position:** +1, +2. Step 2a: Adjust... If either arm is working across midline or out to side of body: Add +1. Lower Arm Score.

**Step 3: Locate Wrist Position:** +1, +2, +3, +4. Step 3a: Adjust... If wrist is bent from midline: Add +1. Wrist Twist Score.

**Step 4: Wrist Twist:** +1, +2. Wrist Score.

**Step 5: Look-up Posture Score in Table A:** Using values from steps 1-4 above, locate score in Table A.

**Step 6: Add Muscle Use Score:** If posture mainly static (i.e. held-10 minutes), Or if action repeated occurs 4x per minute: +1. If load < 4.4 lbs. (intermittent): +0. If load 4.4 to 22 lbs. (intermittent): +1. If load 4.4 to 22 lbs. (static or repeated): +2. If more than 22 lbs. or repeated or shocks: +3.

**Step 7: Add Force/Load Score:** +0, +1, +2, +3. Force / Load Score.

**Step 8: Find Row in Table C:** Add values from steps 5-7 to obtain Wrist and Arm Score. Find row in Table C.

**Table A: Wrist Score**

Upper Arm	Lower Arm	Wrist Twist	Wrist Twist	Wrist Twist	Wrist Twist
		1	2	3	4
1	1	1	2	2	2
1	2	2	2	2	3
1	3	2	3	3	3
1	4	2	3	3	3
2	1	2	3	3	3
2	2	3	3	3	3
2	3	3	3	3	4
2	4	3	4	4	4
3	1	3	4	4	4
3	2	4	4	4	4
3	3	4	4	4	5
3	4	4	4	4	5
4	1	4	4	4	5
4	2	4	4	4	5
4	3	4	4	5	5
4	4	4	4	5	5
5	1	5	5	5	6
5	2	5	5	5	6
5	3	5	5	6	6
5	4	5	5	6	6
6	1	6	6	6	7
6	2	6	6	6	7
6	3	6	6	7	7
6	4	6	6	7	7

**Table B: Neck, Trunk, Leg Score**

Neck	Trunk	Legs	Legs	Legs	Legs	Legs	Legs
Score	1	2	3	4	5	6	7
1	1	2	2	2	2	2	2
2	2	2	3	3	3	3	3
3	3	3	3	4	4	4	4
4	4	3	4	4	5	5	5
5	5	4	4	5	5	6	6
6	6	5	5	5	6	6	6
7	7	6	6	6	6	7	7
8	8	7	7	7	7	7	7

**Table C: Neck, Trunk, Leg Score**

Wrist / Arm Score	1	2	3	4	5	6	7
1	1	2	3	4	5	5	5
2	2	2	3	4	5	5	5
3	3	3	3	4	5	6	6
4	4	3	3	4	5	6	6
5	4	4	4	5	6	7	7
6	4	4	5	6	7	7	7
7	5	5	6	7	7	7	7
8	5	5	6	7	7	7	7

**Scoring: (Final score from Table C)**  
 1-2 = acceptable posture  
 3-4 = further investigation, change may be needed  
 5-6 = further investigation, change soon  
 7 = investigate and implement change

**B. Neck, Trunk and Leg Analysis**

**Step 9: Locate Neck Position:** +1, +2, +3, +4. Step 9a: Adjust... If neck is twisted: +1. If neck is side bending: +1. Neck Score.

**Step 10: Locate Trunk Position:** +1, +2, +3, +4. Step 10a: Adjust... If trunk is twisted: +1. If trunk is side bending: +1. Trunk Score.

**Step 11: Legs:** If legs and feet are supported: +1. If not: +2. Leg Score.

**Step 12: Look-up Posture Score in Table B:** Using values from steps 9-11 above, locate score in Table B.

**Step 13: Add Muscle Use Score:** If posture mainly static (i.e. held-10 minutes), Or if action repeated occurs 4x per minute: +1. If load < 4.4 lbs. (intermittent): +0. If load 4.4 to 22 lbs. (intermittent): +1. If load 4.4 to 22 lbs. (static or repeated): +2. If more than 22 lbs. or repeated or shocks: +3.

**Step 14: Add Force/Load Score:** +0, +1, +2, +3. Force / Load Score.

**Step 15: Find Column in Table C:** Add values from steps 12-14 to obtain Neck, Trunk and Leg Score. Find Column in Table C.

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Table 2: REBA Employee Assessment Worksheet

**A. Neck, Trunk and Leg Analysis**

**Step 1: Locate Neck Position**  
 Diagrams showing neck positions with scores: +1 (twisted), +2 (side bending).  
 Step 1a: Adjust...  
 If neck is twisted: +1  
 If neck is side bending: +1

**Table A: Neck**

	Neck		
Table A	1	2	3
Neck Score	1	2	3
Trunk Posture Score	1	2	3
Leg Score	1	2	3

**Step 2: Locate Trunk Position**  
 Diagrams showing trunk positions with scores: +2 (twisted), +3 (side bending), +4 (bent).  
 Step 2a: Adjust...  
 If trunk is twisted: +1  
 If trunk is side bending: +1

**Table B: Lower Arm**

	Lower Arm	
Table B	1	2
Wrist	1	2
Upper Arm	1	2
Score	1	2

**Step 3: Legs**  
 Diagrams showing leg positions with scores: +1 (bent), +2 (twisted), +3 (bent), +4 (twisted).  
 Adjust: +1, +2, +3, +4

**Table C: Score A and Score B**

	Score A												Score B											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Score A	1	1	1	2	3	3	4	5	6	7	7	7	1	1	2	3	4	5	6	7	7	7	7	7
Score B	2	1	2	2	3	4	4	5	6	6	7	8	1	1	2	3	4	5	6	7	7	7	7	7
Score C	3	2	3	3	4	5	5	6	7	7	8	9	2	2	3	4	5	6	7	8	8	8	8	8
Score D	4	3	4	4	5	6	6	7	8	8	9	10	3	3	4	5	6	7	8	9	9	9	9	9
Score E	5	4	5	5	6	7	7	8	9	9	10	11	4	4	5	6	7	8	9	10	10	10	10	10
Score F	6	5	6	6	7	8	8	9	10	10	11	12	5	5	6	7	8	9	10	11	11	11	11	11
Score G	7	6	7	7	8	9	9	10	11	11	12	13	6	6	7	8	9	10	11	12	12	12	12	12
Score H	8	7	8	8	9	10	10	11	12	12	13	14	7	7	8	9	10	11	12	13	13	13	13	13
Score I	9	8	9	9	10	11	11	12	13	13	14	15	8	8	9	10	11	12	13	14	14	14	14	14
Score J	10	9	10	10	11	12	12	13	14	14	15	16	9	9	10	11	12	13	14	15	15	15	15	15
Score K	11	10	11	11	12	13	13	14	15	15	16	17	10	10	11	12	13	14	15	16	16	16	16	16
Score L	12	11	12	12	13	14	14	15	16	16	17	18	11	11	12	13	14	15	16	17	17	17	17	17
Score M	13	12	13	13	14	15	15	16	17	17	18	19	12	12	13	14	15	16	17	18	18	18	18	18

**Step 4: Look-up Posture Score in Table A**  
 Using values from steps 1-3 above, locate score in Table A

**Step 5: Add Force/Load Score**  
 If load < 11 lbs.: +0  
 If load = 11 to 22 lbs.: +1  
 If load > 22 lbs.: +2  
 Adjust: if shock or rapid build up of force: add +1

**Step 6: Score A, Find Row in Table C**  
 Add values from steps 4 & 5 to obtain Score A, find row in Table C

**Scoring**  
 1 = Negligible Risk  
 2-3 = Low Risk, Change may be needed  
 4-7 = Medium Risk, Further Investigation, Change Soon  
 8-10 = High Risk, Investigate and Implement Change  
 11+ = Very High Risk, Implement Change

**B. Arm and Wrist Analysis**

**Step 7: Locate Upper Arm Position**  
 Diagrams showing upper arm positions with scores: +1 (abducted), +2 (flexed), +3 (extended), +4 (rotated).  
 Step 7a: Adjust...  
 If shoulder is abducted: +1  
 If upper arm is abducted: +1  
 If arm is supported or person is leaning: -1

**Step 8: Locate Lower Arm Position**  
 Diagrams showing lower arm positions with scores: +1 (flexed), +2 (extended).

**Step 9: Locate Wrist Position**  
 Diagrams showing wrist positions with scores: +1 (flexed), +2 (extended).

**Step 10: Look-up Posture Score in Table B**  
 Using values from steps 7-9 above, locate score in Table B

**Step 11: Add Coupling Score**  
 Well fitting handle and mid range power grip: good: +0  
 Acceptable but not ideal hand held or coupling acceptable with another body part: fair: +1  
 Hand held not acceptable but possible: poor: +2  
 No handles, awkward, unstable with any body part, unacceptable: +3

**Step 12: Score B, Find Column in Table C**  
 Add values from steps 10 & 11 to obtain Score B, find column in Table C and match with Score A in row from step 6 to obtain Table C Score.

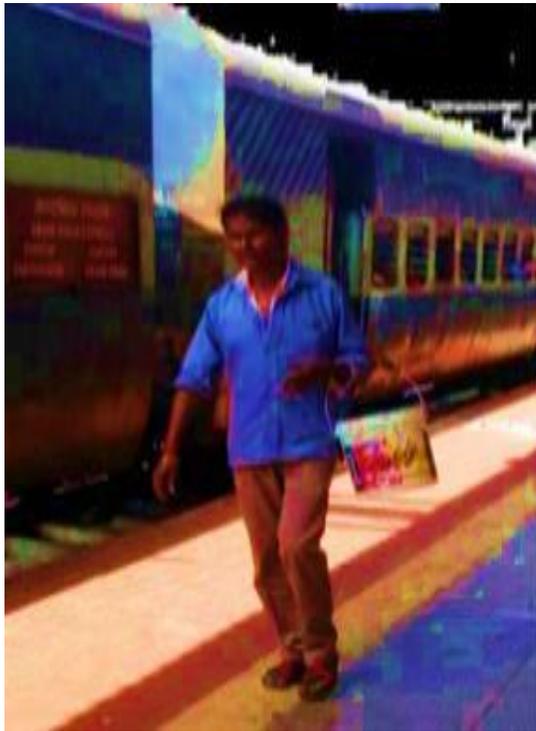
**Step 13: Activity Score**  
 +1 1 or more body parts are held for longer than 1 minute (static)  
 +1 Repeated small range actions (more than 4x per minute)  
 +1 Action causes rapid large range changes in postures or unstable base

Score	Intensity of MSD Hazard
1-2	Insignificant Risk, No Action Required
3-4	Low Risk, Change may be needed
5-6	Medium Risk, Further Investigation, Change Soon
6+	Very High Risk, Implement Change Now

Score	Intensity of MSD Hazard
1	Insignificant Risk, No Action Required
2-3	Low Risk, Change may be needed
4-7	Medium Risk, Further Investigation, Change Soon
8-10	High Risk, Investigate and Implement Change
11+	Very High Risk, Implement Change Now



# Postural Analysis Through RULA, REBA And QEC Of Vendors Selling Edible Items At Railway Stations And In The Trains



**Figure 1: Vendor holding bucket at forearm selling water bottles at a railway platform**



**Figure 2: Vendor holding bucket at forearm selling water and milk bottles at a railway platform**



**Figure 3: Vendor Selling breadpakoda at head at railway station**



**Figure 4: Vendor Selling breadpakodaat his shoulder a at railway station**

**Postural Analysis Through RULA, REBA And QEC Of Vendors Selling Edible Items At Railway Stations And In The Trains**



**Figure5: Vendor Selling Kachaouriat his shoulder a at railway station**



**Figure 6: Vendor Selling cold drinks at his shoulder a at railway station**



**Figure 7: Vendor selling tea in a container at his shoulder a at railway station**



**Figure 8: Vendor selling samosas with neck and stomach support in a container a at railway station**

# Postural Analysis Through RULA, REBA And QEC Of Vendors Selling Edible Items At Railway Stations And In The Trains

## III. RESULTS

**A. For Arm and Wrist Analysis:** Vendor's upper arm and wrist position (figure 1 and figure 2) are measured in angles. And the corresponding scores are obtained from Table 1.

**Step 1:** Position of Upper Arm

Upper Arm Angle ( $26^0$ ) Score = 2

**Step 2:** Position of Lower arm

Lower Arm Angle ( $46^0$ ) Score = 2

**Step 3:** Position of Wrist

Wrist Angle ( $10^0$ ) Score = 2

**Step 4:** Wrist Twist

Wrist Twist Score = 1

**Step 5:** Look up posture score in Table A; which exits in Table 1

Using values, from steps 1 to 4 above, position score in Table A, score = 4

**Step 6:** Add muscle score: It is repetitive, so score =1

**Step 7:** Add Force/Load Score: load > 4.4 lbs, so score =2

Add values from step 5 to 7  $4+ 1+ 2 = 7$

**Step 8:** Find Row in Table C which exits in Table 1

According to Table 1 (RULA Employee Assessment Worksheet), Steps 1-15 are given below;

**B. Neck, Trunk and Leg Analysis:**

**Step 9:** Neck Position

Neck Angle ( $24^0$ ) Score = 3

**Step 10:** Trunk Position

Trunk Angle ( $0^0$ ) Score = 1

**Step 11:** Legs Position

Leg Angle ( $0^0$ ), Leg score =2, Now find these scores of neck, trunk and leg in Table B of Table 1.

**Step 12:** Look up posture in Table B of Table 1, Score = 4

**Step 13:** Add muscle score: It is repetitive, score = 1

**Step 14:** Add Force/Load Score: load > 4.4 lbs, to 2.2 lbs score =2

**Step 15:** Find Column in Table C of Table 1

In Table C of Table 1, position the step 8 (score = 7) in row and step 15 (score =7) in column and obtained score 7. This "7" is the RULA score. Further RULA score =7, is used to see the information in Table 3. The information obtained from Table 3 is, very high risk, implement change now. The similar process is repeated for eight vendors. The results of eight vendors are presented in Table 5.

**Table.5: RULA Scores for different Vendors**

S.No.	Type of Vendors	RULA Score	Interpretation
Tea/ Coffee (Figure 7)			
1	Vendor 1	7	very high risk, implement change now
Samosas/Breadpakodas/ Kachodi (Figure 3, 4, 5 and 8)			
1	Vendor 2	7	very high risk, implement change now
2	Vendor 3	7	very high risk, implement change now
3	Vendor 4	7	very high risk, implement change now
4	Vendor 5	7	very high risk, implement change now
Cold Drinks/Water and Milk Bottles(Figure 1,2 and 6)			
1	Vendor 6	7	very high risk, implement change now
2	Vendor 7	7	very high risk, implement change now
3	Vendor 8	7	very high risk, implement change now

## IV. REBA INVESTIGATION

According to Table 2 (REBA Employee Assessment Worksheet), steps 1-13 are given below;

**Neck, Trunk and leg Analysis:** For neck, trunk and leg positions (figure1) are measured in angles. And the subsequent scores are obtained from Table 2;

**A. Neck, Trunk and leg Analysis**

**Step 1:** Position of Neck:

Angle ( $24^0$ ) Neck Score = 3

**Step 2:** Position of Trunk:

Angle ( $0^0$ ) Trunk Score = 1

**Step 3:** Legs position

Angle ( $0^0$ ), Leg Score = 2

**Step 4:** Look-up posture Score in Table: A of Table 2.

Using values from steps 1-3, Table: A of Table 2, **Score = 3**

**Step 5:** Load Score: Load > 22 lbs., score = 2

**Step 6:** Find row in Table C of Table 2. Score = 3 + 2 = 5

**B. Arm and Wrist Analysis:**

**Step 7:** Position of Upper Arm

Upper Arm ( $26^0$ ) Upper Arm Score = 2

**Step 8:** Position of Lower Arm

Lower Arm ( $46^0$ ) Lower Arm Score = 1

**Step 9:** Position of Wrist:

Wrist Angle ( $10^0$ ) Wrist Score = 2

**Step 10:** Look up posture score in Table B of Table 2.

Score = 2

**Step 11:** Add coupling Score: Score = 2

**Step 12:** Find Column in Table C of Table 2. Add values From

Step 10 to 11: Score = 2 + 2= 4

**Step 13:** Activity Score, Score = 1

REBA Score = Score in Table C of Table 2 + Activity Score.

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**REBA Score = 4 + 1= 5**

This REBA (score = 8) is seen in Table 4. The information obtained is, **Medium risk, further**

**investigation, change soon.** The similar process is repeated for eight vendors. The results of eight vendors are presented in Table 6.

**Table.6: REBA Scores for different Vendors**

S.No.	Type of Vendors	Figure No.	REBA Score	Interpretation
1	Vendor 1 Tea/Coffee	1	5	Intermediate risk, further investigate, modify soon
1	Vendor 2 Samosas/Breadpakodas/ Kachodi	2	8	High risk, investigate and implement change
2	Vendor 3	3	8	High risk, investigate and implement change
3	Vendor 4	4	5	Intermediate risk, further investigate, modify soon
4	Vendor 5	5	8	High risk, investigate and implement change
1	Vendor 6 Cold Drinks/ Water/Milk Bottles	6	6	Intermediate risk, further investigate, modify soon
2	Vendor 7	7	5	Intermediate risk, further investigate, modify soon
3	Vendor 8	8	9	High risk, investigate and implement change

### V. QUICK EXPOSURE CHECK (QEC)

Through QEC spectator evaluation sheet calculator (website <http://www.qec.freiz.com>) give all answers and obtained the results as shown in Table 7 & 8. QEC was developed by [7], it has two sections. The first section is related to the risk factors in developing WMSDs, i.e. profound manual handling, Repetitive and dynamic actions, uncomfortable static postures that arise from poorly designed workstations, tools, equipment, working methods. The other factors are back, shoulder/arm, wrist/hand and neck.

The second section involves the worker. Their responses are an important part of the evaluation. Care should be

taken that they respond the questions based on their understanding of performing the task. There are eight questions in this section pertaining to:

1. Maximum weight handled (this can be subjective, but should be verified with measurements of weights and forces)
2. Time spent on task
3. Maximum force level exerted by one hand (this can be subjective, but should be verified with measurements of forces)
4. Visual demand of the task
5. Vehicle use
6. Vibrating tools
7. Work pace
8. Stress level

**Table 7: Risk Assessment of QEC for vendors**

Risk evaluation	Low	Moderate	High	Very High
Back	10-20	21-30	31-40	41-56
Shoulder/Arm	10-20	21-30	31-40	41-56
Wrist/Hand	10-20	21-30	31-40	41-56
Neck	2-6	7-10	11-14	15-18
Stable Base	1	4	9	
Vibration	1	4	9	-
Work Pace	1	4	9	-
Environment	1	4	9	16

**Table.8: QEC Scores for different Vendors**

S.No	Type of Vendor	Figure No.	SCORES OF							
			Back	Shoulder /Arm	Wrist/ Hand	Neck	Driving	Vibration	Pace	Work Stress
1	Vendor 1 Tea/Coffee	1	32	40	42	16	1	1	4	9
	Samosas/ Breadpakodas									

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1	Vendor 2	2	32	42	38	16	1	1	9	9
2	Vendor 3	3	36	46	42	14	1	1	9	9
3	Vendor 4	4	32	28	38	16	1	1	9	4
4	Vendor 5	5	32	46	42	16	1	1	4	9
Cold Drinks/ Water Bottles										
1	Vendor 6	6	36	42	38	14	1	1	9	16
2	Vendor 7	7	36	38	42	14	1	1	9	9
3	Vendor 8	8	36	46	42	16	1	1	9	16

### VI. DISCUSSIONS

RULA score = 7, is obtained which designates, very high risk, implement change now. From the observations it is also obvious that vendors' neck, upper arm, lower arm and trunk are in several time 's bents and twist to take explicit postures for performing a specific task. These precise uncomfortable postures of the vendors are repetitive infinite number of periods all over the day and produces job related musculoskeletal disorders in their upper extremity. The RULA results are matching with the past researchers such as D. N. Agrawal et.al. [8] observed that due to constant kneeling posture of the workforce got fatigued repeatedly and musculoskeletal nuisance were identified in them. A study of Chowdury M. L. Rahman [9] had found that most of the workers exposed to the upper extremity discomfort due to the awful working postures. Also, RULA revealed that no posture is risk free for all the workers working in ceramic industry. Therefore, various means and ways should be devised to obtain desired level of output from the workers.

Further, REBA analysis of the vendors showed that their working postures were either medium or at high risks so further investigate their working postures and modify soon. It is obvious from the photographs of the vendors that their functioning posture is awkward and could be injurious to them, if it continues for long duration. Further, over a period of time their age will also increases. Eventually working postures, ageing, work demand and their capability, needs extra efforts to complete the task successfully. Numerous studies were conducted in the past such as a study conducted

by Karthikeyan Mathesan et. al. [10] results of RULA and REBA were high (REBA 53.33% and RULA 85.71%) in manual feeding of workpieces by the operators during drilling operation has maximum risk for the operators. Therefore, the ergonomic aspects have to be considered for designing drilling workstation.

Farahnaz Abdollahzade et. al. [11] studied on room nurses and found a high score of REBA analysis which reflects urgent need to change the working postures of the nurses. Also they found in univariate analysis strong relationship between working posture and age, gender and regular daily exercise, work experience and number of shifts per month. QEC results (Table 7 and 8) also showed that back, shoulder/arm, wrist/hand, neck and work pace scores are high. These factors scores are high might be due to train

vendors carry food articles on their shoulders, arms and at head and also often bent their neck again and again to provide the food articles to the passengers by keeping bucket on the floor of the train or at railway stations due to weight of the bucket. Obviously when vendors repeated this posture in several times faces the pain in different body parts (at back, neck or shoulder etc.) which is the result of the working postures of the vendors. The QEC results are matching with the past researches such as Emre Ozgur Bulduk et. al. [12] QEC scores of 382 taxi drivers were establish very high risks for the shoulder/arm, wrist/hand and neck, whereas the scores for the back were found to be high for static use and moderate for moving. The results also showed that the work-related risk factors for WMSDs were connected with constrained postures, repetitive actions, vibration, work related stress. Essential ergonomic interventions are needed to reduce risk of exposures to WMSDs in taxi drivers.

### VII. CONCLUSIONS AND FUTURE SCOPE

The present working postures of vendors are not appropriate so redesign the postures of the vendors considering ergonomic principles to reduce the WMSDs. Also, when they induct in this profession they have to aware about the posture affects in their life.

In each bogie install a machine/fix a place from where passengers purchase edible items from the vendors.

Further, work should be done on their postures to verify the present work by other postural analysis tools to reduce the WMSDs.

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# Effect on Material Removal Rate and Surface Finish in ECM Process When Machining Stainless Steel-316 with Cu Electrode

Iqbal Ahmed Khan, Megha Rani, Rupak Kumar Deb, B R Bundel

**Abstract:** Electrochemical Machining process is one of the popular non-traditional machining processes which is used to machine materials such as super alloys, Ti-alloys, stainless steel etc. Its working principle is based upon Faraday law of electrolysis. The aim of the present work is to optimize the ECM process parameters with the combination of SS 316 (job material) and Copper electrode (tool material). To explore the effect of ECM process parameters such as electrolyte concentration, voltage and current, feed rate on MRR and surface finish (Ra) of the job, total 27 experiments were conducted as per experimental scheme. The results of these experiments revealed that increase in electrolyte concentration decrease the mrr and surface roughness initially increases then decreases. Further, increase in current increases mrr initially and then decreases, surface roughness also increases. It is also noticed that increase in Feed rate mrr decreases and then increases, also surface roughness decreases then increases. Through RSM analysis it is found that the optimum conditions for maximum MRR, and minimum Surface roughness (Ra) is electrolyte concentration 150gm/lit, Voltage 13.5 V & feed 0.8 mm/min. The findings are discussed in the light of previous researches and subsequently conclusions are drawn.

**Keywords:** Electrochemical machining (ECM), Material removal rate (MRR), Surface roughness (Ra), Electrolyte concentration

## I. INTRODUCTION

Electro-chemical Machining (ECM) is a nontraditional machining process which is used for machining materials which are difficult to machine by traditional machining processes such as alloy steel, Ti alloys, super alloys and stainless steel etc. Literature review revealed that many studies were conducted in the past by various researchers to evaluate the effect of ECM process parameters such as electrolyte concentration, current and voltage, surface finish, material removal rate (MRR), tool and workpiece gap current and voltage etc. for its optimization with different materials. ECM is a non-contact type machining process, and it gives exact replica of the tool, a cavity in the job material. In this machining process [1] and [2] a very high current is passed among the job (anode) and the tool (cathode) through a electrolyte and a cavity (as the shape of the tool) is obtained in the workpiece. EDM has been found to be a better for smaller batch sizes whereas ECM is more suitable for large scale production [3].

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One of the researchers, Neto J., et. al. [4] results showed that feed rate is the important factor which affects the material removal rate. In ECM process,  $\text{NaNO}_3$  showed the good results on surface roughness and overcut. Also it had been observed that material removal rate increases with increase in tool feed rate because of the decrease in machining time. Further, Sodium Chloride had better machining results on MRR than Sodium Nitrate as NaCl solution is a non-passivated electrolyte and has constant current efficiency. In another research, Milan Kumar Dasa, et.al. [5] ANOVA results revealed that the electrolyte concentration has the maximum influence on metal removal rate and surface roughness characteristics. Further, P. Rodriguez et. al. [6] observed that when current intensity is increases, it directly affects the material removal rate and as material removal rate is increases surface finish on the other hand decreases in the ECM process. Therefore there should be a balance in between material removal rate and the surface finish.

Also Kai Egashira et.al. [7] suggested that a semi-cylindrical tool electrode, long pulse width, high pulse frequency, high low-level voltage, and high electrolyte concentration were preferable for high-speed drilling without widening the lateral gap between the tool electrode and hole. Ming-Chang Jeng et al. [8] showed that the material removal rate & current efficiency increases with carbon content. Also the quenched microstructure and the tempered microstructure have a greater removal rate and current efficiency than those of annealed microstructures, work-piece machined at a working pressure of  $3\text{-}4 \text{ kg/cm}^2$  has the greatest removal rate and current efficiency, and the roughness of the machined surface of the annealed microstructure is greater than those of the quenched and tempered steels.

Another study of Joao Cirilo da Silva et.al. [9] concluded that resistance offered by electrolyte arrangement decreases stridently with increasing current densities, and at the same time the over-voltage of framework first increases and then achieves a saturation value with increasing current densities. In any job the primary requirement is surface finish of the job, a study was conducted by the Keeping this in mind the present experimental work is focused on "Optimization of ECM process parameters for maximum material removal rate (MRR), and minimum surface roughness (Ra) for the stainless steel (SS-316) as a job material and a Copper (Cu) electrode as a tool material.

**II. EXPERIMENTAL SET UP**

For experimental work these constituents are required;

- Work Piece (SS 316)
- ECM Machine
- Electrolyte

- Electrode
- Weighing Machine
- Surface Roughness Tester

The detail information all of the above mentioned components are given below.

**2.1 Specifications of SS 316:**

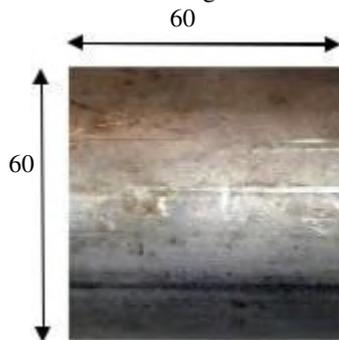
**Table 1: Composition Specification (%) for SS 316**

Grade	C	Si	P	S	Mn	Cr	Ni	N	Mo
Min.	-	-	-	-	-	16	10	-	2.0
SS 316									
Max.	0.08	0.75	0.045	0.030	2.0	18.0	14	0.10	3.0

**Table 2: Mechanical Properties of SS 316**

Grade	Tensile	Strength	Yield Strength 0.2%	Elongation %	Hardness	
	(MPa) Minimum	proof (MPa) Min	(in 50 mm) min.	Rockwell B (HR B) max	Brinell (HB) max	
SS 316		515	205	40	95	217

Four Stainless Steel (SS 316) workpieces are having dimensions of 60 mm x 60 mm x 5 mm, weighing 0.153 Kg each are used for machining. In SS 316 workpieces, 16 cavities are made as shown in Figure 7.



**Figure 1: Work Piece**

**2.2 ECM MACHINE**

ECM machine specifications are as follows;

Tool area – 259.8 mm<sup>2</sup> Cross head stroke - 150 mm, Job holder - 100 mm opening x 50 mm depth x 100 mm width. Tool feed motor - DC Servo type. AC Three phase power supply of - 415 V +/- 10%V, 50 Hz

The machining on SS 316 workpieces are to be carried out on ECM set up as shown in Figure 2. It mainly consists of electro-mechanical assembly, servo automated system for the tool vertical upward and downward motion, an electrolyte supply system, machining chamber with crystal clear window and, vice for holding the job.



**Figure 2: ECM set up Metatech Industries, Pune**



**Figure 3: ECM Control Panel**

### 2.3 ELECTROCHEMICAL MACHINE CONTROL PANEL

The Control panel (Figure 3) is used for adjustment of voltage (V), current (C), feed rate (F) and time (T) during machining of the SS jobs. The specifications of control panel are as follows;

- Electrical Output Rating: 0-300 Amperes. DC from 0-20 V.
- Efficiency: Better than 80% at partial & full load condition.
- Operation Modes - Manual/Automatic.

- Tool Feed - 0.2 to 2 mm / min.
- Supply - 415 V +/- 10%, 3 $\phi$  AC, 50 Hz.

### 2.4 ELECTROLYTE CIRCULATION SYSTEM

The pumping of electrolyte (Figure 4) is done from a tank through a pump. The used electrolyte returns to the tank. The hydroxide sludge produced will settle down at the base of the tank and further drained out. Also electrolyte supply is controlled by flow control valve. For experiments we have taken 100 gm, 125 gm and 150 gm of salt sample in 1000 ml of water at room temperature.



Figure 4: Electrolyte chamber



Figure 5: Circular cross section of the copper tool

### 2.6 ELECTRODE OR TOOL

For machining of SS 316 jobs, copper tool (Figure 5) is used having a length of 50 mm with diameter 21mm.



Figure 6: Digital weight balance ( Model: DJ 300S)

### 2.7 WEIGHING MACHINE

The material removal rate of each job has been found out by electronic weighing machine (figure 6). Initial weight and after machining of the SS jobs were measured by weighing machine by taking care of jobs i.e. all jobs must be free from water, chips etc. This weighing machine weight up to 300g with an accuracy of 0.001 g.

### 2.8 SURFACE ROUGHNESS TESTER

A moveable type surface roughness tester (Make: Taylor Hobson, Model: Surtronic,) as shown in figure 7, has been used for measurement of surface roughness (Ra) of the machined SS 316 jobs. The readings are taken at three points on the surface and take average value of it.

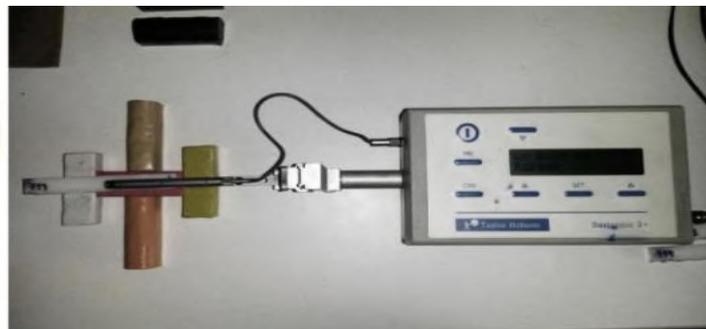


Figure 7: Surface Roughness Tester

### 2.9 PROCEDURE FOR THE EXPERIMENT

Following steps are involved in machining of workpiece and completion of experiment:

- Weigh the initial weight ( $W_{bm}$ ) of work piece.
- Place the job in ECM Machine
- Fix the Cu electrode in ECM tool holder
- Now Copper Tool is brought near to the SS 316 job and maintains a particular gap with the help of press buttons which are provided in the control panel.
- Fill the electrolyte solution in Tanks and run the pump
- Start the ECM machine through push button and set the process parameters like tool feed rate, voltage and electrolyte concentration.

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- g. The procedure is happening in the existence of an electrolyte flow, filling the gap between anode (job) and cathode (tool). Electrolyte flow is adjusted by flow control valve.
- h. After completion of ECM on a job (after 10 minutes) a beep sound is produced. And stop the Machine.
- i. After electrochemical machining on the SS 316 job note down the weight ( $W_{am}$ ) of the workpiece.
- j. Calculate MRR for the experiment.
- k. Calculate the SR with help of surface roughness tester
- l. Repeat all above steps **from a. to k.** for taking experimental values Output (i.e. MRR & SR) & varying Inputs (i.e. Electrolytic concentration, Voltage and Feed Rate) on the remaining 15 experiments

## 2.10 INPUT VARIABLES

**Table 3: Electrochemical Machining variables and their levels**

Machining Parameter	Unit	Level 1	Level 2	Level 3
Voltage (V)	Volt	10	13.5	17
Feed rate (F)	mm/min	0.4	0.6	0.8
Concentration (C)	gm/lit	100	125	150

## 2.11 RESPONSE SURFACE METHODOLOGY (RSM)

Response Surface Methodology (RSM) is used Central Composite Design (CCD) with three variables yield a total of 27 runs in seven blocks, where the cardinal points used are; 8 cube points, 6 axial points and 6 center points [Minitab16, 2011]. Electrolyte concentration, voltage and feed rate were the three experimental factors capable of influencing the process responses, namely, MRR, SR. Hence, these factors were considered for exploration.

To find out the effect of input variables on the output response, the Equation for output (y) is as follows;

$$Y = f(x_1, x_2) + e$$

The input variables  $x_1$  and  $x_2$  are independent variables and,  $y$  is the dependent variable. Also the experimental error term, denoted as  $e$ , which represents any measurement error

on the output variable. Let the output is a linear function of independent variables, then the approximating function is a first-order model. A first-order model with two independent variables is;  $y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \epsilon$

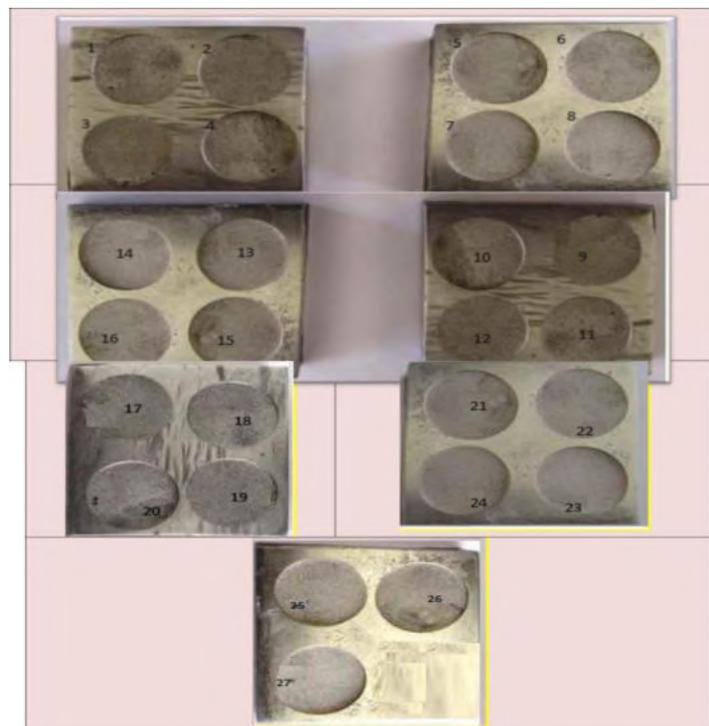
Further, if there is a curvature in the response surface, then a higher degree polynomial with two variables is called a second-order model;  $y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_{11} x_1^2 + \beta_{22} x_2^2 + \beta_{12} x_1 x_2 + \epsilon$

$X$   $n^2$  - square terms of parameters

$x_1 x_2$  - interaction terms of parameters  $\beta_0 \beta_1 \beta_2$  - unknown regression coefficients and  $\epsilon$  - Error

## III. RESULTS AND ANALYSIS

Figure 8, depicts the 27 number runs on SS 316 jobs after electrochemical machining.



**Figure 7: Work piece (SS 316) after machining**

After experimental work results are obtained, which are shown in Table 4

Table 4: Experimental outcomes for 27 runs

Std Order	Concentration ( gm/liter )	Voltage ( volts )	Feed ( mm/min)	MRR (mm <sup>3</sup> /min)	Ra (μm)
1	100	10	0.4	12.25	2.22
2	100	10	0.6	7.66	2.16
3	100	10	0.8	9.19	2.18
4	100	13.5	0.4	15.32*	2.37
5	100	13.5	0.6	8.65	1.70
6	100	13.5	0.8	8.99	2.04
7	100	17	0.4	9.23	2.52
8	100	17	0.6	7.19	2.24
9	100	17	0.8	7.87	3.64
10	125	10	0.4	9.58	2.21
11	125	10	0.6	7.27	1.42
12	125	10	0.8	8.42	1.82
13	125	13.5	0.4	14.87	2.64
14	125	13.5	0.6	7.45	2.44
15	125	13.5	0.8	13.56	3.24
16	125	17	0.4	9.58	2.86
17	125	17	0.6	5.58	2.46
18	125	17	0.8	7.58	2.66
19	150	10	0.4	6.90	2.20
20	150	10	0.6	6.60	1.20
21	150	10	0.8	7.50	1.34
22	150	13.5	0.4	14.42	2.91
23	150	13.5	0.6	6.85	0.94 <sup>#</sup>
24	150	13.5	0.8	10.64 <sup>@</sup>	1.93 <sup>@</sup>
25	150	17	0.4	6.20	2.72
26	150	17	0.6	5.96	2.22
27	150	17	0.8	6.08	3.22

#### IV. EXPERIMENTAL ANALYSIS

##### 4.1 Effect on Material Removal Rate

The machinability of ECM process depends on the electrolyte concentration, feed rate and voltage. The influence of various machining parameters on material removal rate (means) are revealed in figure 9 (a) (b) (c). The important and major finding is material removal rate is gradually decreases (Figure 9a) with increase in electrolyte concentration. This might be due to there is no increase in electrolyte flow as a consequence the material which is already removed cannot be dislocated taken away from the machining area. So eventually mrr is decreased with increase in the electrolyte concentration.

This finding is not in line with the past researches such as studies [10, 11] concluded that the increase in electrolyte concentration and its flow rate, increases mrr. This is occur because of when we increase in electrolyte flow rate, the reaction products (small chips) in between Inter-electrode gap (IEG) removes at faster rate with electrolyte concentration and also fresh electrolyte flow in between IEG, which increases the conductivity of the electrolyte.

Therefore in the future more work has to be done specifically in combination with SS316 and Cu as tool material.

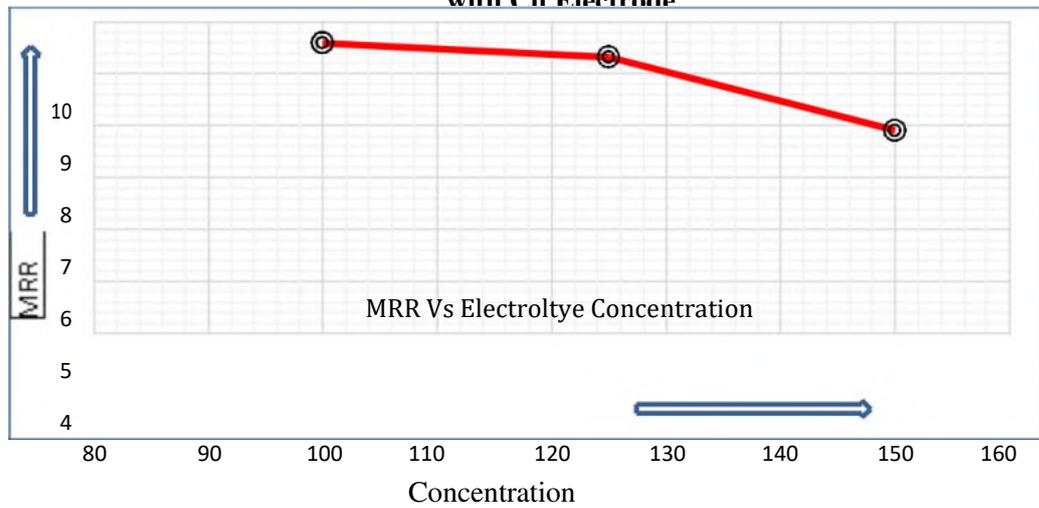


Figure 9 (a): Effect of Electrolytic Concentration on MRR (data means)

Further, Figure 8(b) showed that the material removal rate increases noticeably with increase in voltage in the range of 10 to 13.5 V and, then further decreases from 13.5 to 17 V. A similar study of Mukherjee et. al . [12]

observed that resistance of the electrolyte solution decreased rapidly with increase in current. Further, initially, the over-voltage of the system increases and attains a saturation value with increasing current densities.

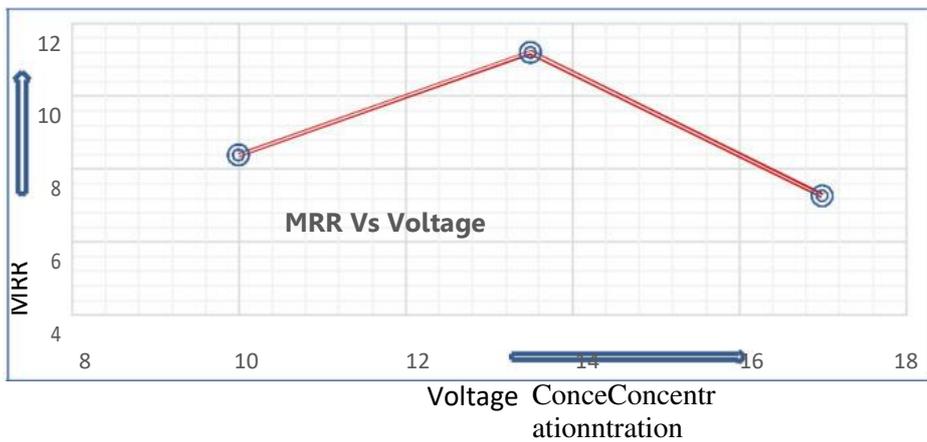


Figure 9 (b): Effect of Voltage on MRR (data means)

Also Figure 9 (c) revealed that the MRR decreases linearly with increases in feed rate in the range of 0.4 to

0.6, and then further increases considerably in the range of 0.6 to 0.8

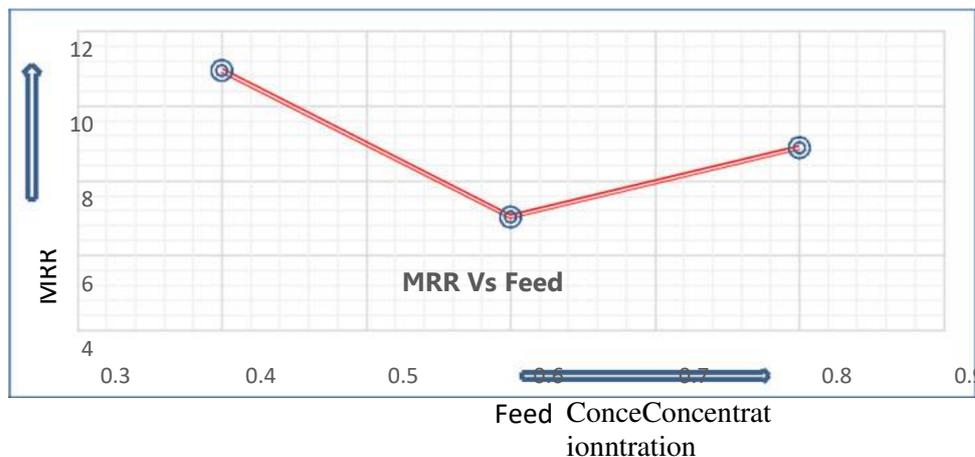
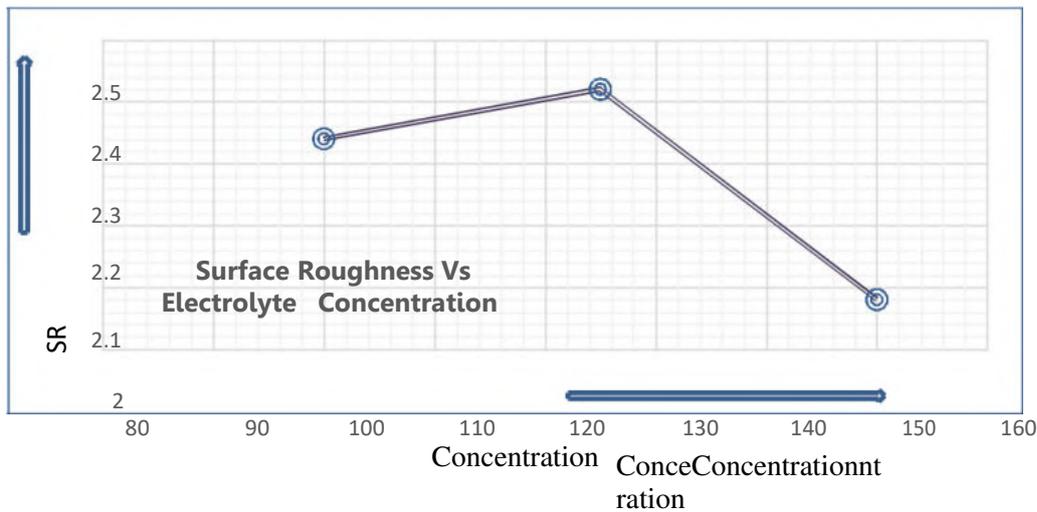


Figure 9 (c): Effect of Feed on MRR (data means)

#### 4.2 EFFECT ON SURFACE ROUGHNESS (Ra)

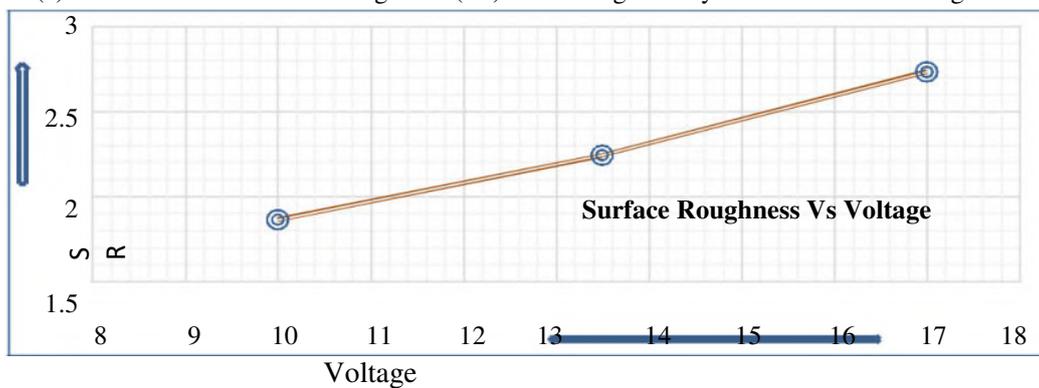
The influences of Surface Roughness (data means) Vs electrolyte concentration, surface roughness Vs voltage and surface roughness Vs feed are depicted in figure 10 (a) (b) (c). The figure 10 (a) showed that the Surface

Roughness, has slightly increased with increase in electrolyte concentration (NaCl) in the range of 100 to 125 gm and then decreased significantly in range of 125 to 150gm. This might be due to the higher electrolyte concentration; generations of machined products are more, which changes the property of electrolyte and leads to the higher surface roughness. [14].



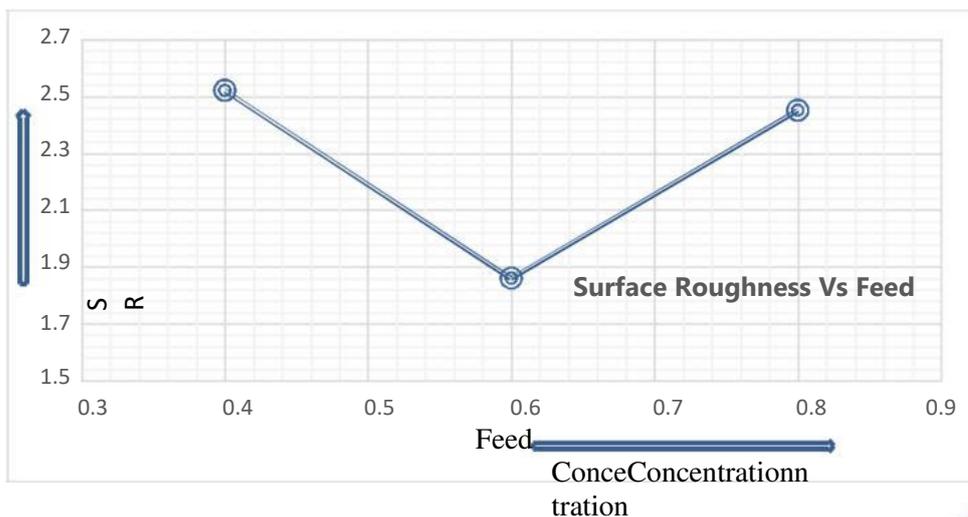
**Figure 10(a): Effect of Electrolytic Concentration on SR (data means)**

Further, Figure 9 (e) revealed that the surface roughness (Ra) increases gradually with increase in voltage.



**Figure 10 (b): Effect of Voltage on SR (data means)**

Also figure 10(c) depicted that the surface roughness (Ra) decreases with increase in feed rate in the range 0.4 to 0.6 and then increases in the range of 0.6 to 0.8.



**Figure 10 (c): Effect of Feed rate on Surface Roughness (data means)**

### 4.3 DETERMINATION OF OPTIMUM SOLUTION

By combining all the objectives, we obtained a multi-objective optimization relation,  $Min.(Z1) = W1 Z_{sr} / SR_{min} - W2 Z_{mrr} / MRR_{min}$

The optimum conditions for maximum MRR, and minimum Surface Roughness (Ra) is:

Electrolyte concentration 150gm/lit, Voltage 13.5 V & feed 0.8 mm/min

### V. CONCLUSIONS

The following conclusions have been drawn on the basis of results and discussions;

- 1) The optimum condition for **maximum material removal rate** is electrolyte concentration 100 gm/liter, voltage 13.5 volts and, feed rate 0.4 mm/rate.
- 2) The optimum condition for **minimum surface roughness** is electrolyte concentration 150 gm/liter, voltage 13.5 volts and feed is 0.6 mm/min.

The Feed rate, voltage, electrolyte concentration and its flow rate effects maximum material removal rate, and minimum surface roughness parameters.

- 3) The Feed rate, voltage, electrolyte concentration and its flow rate effects maximum material removal rate, and minimum surface roughness parameters.

The following conclusions have been drawn on the basis of results and discussions;

- 4) The optimum condition for maximum material removal rate is electrolyte concentration 100 gm/liter, voltage 13.5 volts and, feed rate 0.4 mm/rate.
- 5) The optimum condition for minimum surface roughness is electrolyte concentration 150 gm/liter, voltage 13.5 volts and feed 0.6 mm/min.

The Feed rate, voltage, electrolyte concentration and its flow rate effects maximum material removal rate, and minimum surface roughness parameters.

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## Original Article

## Fracture analysis and mechanical properties of three phased glass/epoxy laminates reinforced with multiwalled carbon nanotubes

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## ABSTRACT

Herein, we report the use of Multi Wall Carbon Nano Tubes (MWCNTs) as nano-compatibilizers based on their astonishing mechanical properties and ease of processing. To fabricate laminate samples, pure MWCNTs were homogeneously dispersed in the fiber-reinforced plastic (FRP) composite with 0, 0.5, 1 and 1.5 wt. % loading. The laminates were prepared with eight plies ( $4.0 \pm 0.1$  mm thickness) using the hand layup technique assisted by the compression moulding method. It was found that the tensile, compressive and inter-laminar shear strength (ILSS) increase by 103.81%, 139.78% and 36.06%, respectively corresponding to 1 wt. % loading of MWCNTs as compared to neat GFRP specimen. However, a rapid decrease in strength beyond 1 wt. % loading of MWCNTs has been noted. Interestingly, the maximum of the tensile strength was higher than that of the compressive strength, and the maximum of the tensile modulus was larger than that of the compressive modulus in the case of 1 wt. % loading of MWCNTs. It was observed that after a certain loading, the mechanical properties of such laminates can only reach the best value with an optimum loading of MWCNTs. In addition, the micromechanical failure modes and effect of MWCNTs loading on internal morphologies of the composites were also intensively explored with the help of Field Emission Scanning Electron Microscopic (FESEM) analysis.

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## 1. Introduction

In the past few decades, nanocomposites have become interesting for different applications, particularly to improve the mechanical properties of polymeric materials using nanoparticles (as nanofillers). These nanofillers may be graphene [1], chopped carbon fibers [2], nanoclay, CNTs and their derivatives [3]. Depending on the nature, these nanomaterials have capabilities to influence the mechanical, thermal and electrical properties of the produced nanocomposites. Several recent investigations have proved the applicability of CNTs based composites in many fields, especially for lightweight and high-performance structures in aerospace industry and as coating materials in the maritime and chemical industries [4]. The astonishing properties of CNTs in mechanical (axial Young modulus of 1–5 TPa [5], stiffness,

strength [6], flexibility [7], fracture toughness [8]) and physical (high thermal conductivity, electrical conductivity [3,9], semi-conducting behavior [10]) aspects, have been continuously studied and published. The large surface area of nanotubes can act as an interface and bridging agent for uniform load transfer, but an extreme agglomeration of CNTs is caused due to strong attractive forces between CNTs. Such aggregation always demises the properties of nanocomposites mainly in the case of polymer composites [11]. The specific surface area of the CNTs is dependent on the number of sidewalls and the diameter of the tubes themselves, therefore single-wall CNTs (SWCNTs) have the largest surface area as compared to the double-wall CNTs (DWCNTs) and multiwall CNTs (MWCNTs). Their dispersibility, however, is quite low and the load transfer is difficult as already discussed elsewhere [12].

In this line, we have used the MWCNTs because of their ease of bulk production, low cost per unit and high thermal, chemical stability. Such CNTs based nano-composites have been under intensive study using different matrix materials, including metals

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[13,14], ceramics [15,16], polymers [17] and so on. Moreover, CNTs are being used as a secondary reinforcement in FRP composites to enhance their properties beyond the natural limit, even though there are certain challenges for developing an efficient and considerably tough three-phase glass/epoxy/MWCNT nanocomposites. These challenges are (i) a standardized and homogeneous distribution of CNTs in the two-phase glass/epoxy composites, (ii) the proper interfacial bonding between the filler and the matrices which affect the uniform load transfer from the matrix to the reinforcement, and (iii) the tedious functionalization of CNTs. To minimize these three-shortcoming, numerous efforts have been made and each procedure has its own advantages and disadvantages [15,16]. Furthermore, three foremost mechanisms have been taken to explain the load transfer from the matrix to the filler and vice-versa, including: (i) mechanical interlocking, (ii) covalent and non-covalent bonding between the matrix and the CNTs, (iii) Van der Waals interaction between CNTs/glass and epoxy composites. In the case of MWCNTs, the first one is very problematic owing to the smooth surface of CNTs and the second one cannot be guaranteed due to the low friction and the only reason left is addressed for the load transfer [18]. To explore these issues, Liu *et al.* [19] studied the tensile modulus and the yield strength by dispersing 2 wt. % of MWCNTs in a nylon-6 matrix and found an increase in values around 214% and 162%, respectively. They proved that all three-mechanisms mentioned above are applicable for MWCNTs to explain the outstanding mechanical properties of MWCNT-Nylo-6 composites. Grimmer *et al.* [20] examined and found that the incorporation of small volume fractions of MWCNTs to the glass-fiber composites greatly diminishes the cyclic delamination crack propagation rates. Schadler *et al.* [18] studied the load transfer in MWCNT-epoxy composites and found that there is a large scatter in the compression modulus, they also reported exceptional trend in tensile modulus and the maximum value of compression modulus is larger than that of the tensile modulus. Allaoui *et al.* [21] considered the mechanical and electrical properties of MWCNT/epoxy composites and found that the Young's modulus is doubled, and the yield strength is quadrupled at 1 and 4 wt. % loading of MWCNTs, respectively.

In this work, we tried to modify the brittle nature of the bi-directionally woven glass fiber composite by adding MWCNTs as a secondary reinforcement and as a nano-compatible. The tensile, compressive and inter-laminar behaviors are investigated; the modulus of tension and compression forces are compared; the fracture analysis is explored; and the morphological properties are discussed considering different loadings of MWCNTs. Nevertheless, this paper proposed an optimum loading percentage to exploit the mechanical properties of the GFRP composites using MWCNTs, which is the novelty of the paper.

## 2. Synthesis and characterization

The arc-discharge method for the bulk production of high quality MWCNTs developed by Iijima *et al.* [22] is well known and herein, we have adopted the same procedure for the MWCNTs synthesis and their surface modification as reported by Singh *et al.* [23]. To confirm the functionalization of the as-prepared MWCNTs, Raman and FTIR spectroscopic techniques were used and important features are noted below.

Raman spectroscopy is one of the best methods to analyze carbon nanomaterials. Raman spectra of the as-prepared modified MWCNTs was recorded at an excitation wavelength of 532 nm [24,25]. The Raman spectrum of the modified MWCNTs is

presented in the Fig. 1(a), showing the characteristics of -COOH functionalized carbon nanotubes [24]. Modified MWCNTs show intense D and G bands at around 1348 and 1580  $\text{cm}^{-1}$ , respectively, which disclose the prominent structural disorder caused by the incorporation of oxygen functional moieties on the carbon skeleton of the nanotubes [24,25]. The presence of a broad 2D (2690  $\text{cm}^{-1}$ ) peak in the spectrum is also a signature of the edge disorder in the nanotubes due to the incorporation of the -COOH functional groups [24,25]. To evaluate the nature of the functional groups on MWCNTs, FTIR analysis was carried out and the spectrum is presented in Fig. 1(b) [26,27]. The as-prepared, modified MWCNTs show a clear absorption for -OH, C-O, and -C=O [26,27]. This confirms the successful incorporation of the -COOH groups on the surface of the carbon nanotubes which is in good consistency with the previous investigations [26,27].

## 3. Fabrication of MWCNTs based nanocomposites

Eight layered quasi-isotropic symmetrical GFRP laminates were prepared with different loadings of the pure samples, *i.e.* 0.5, 1 and 1.5 wt. % of MWCNTs. Mixing of the surface modified MWCNTs in epoxy resins (Bisphenol-A) was completed using a probe-ultrasonicator (Fig. 2(a)). This process is one of the most effective paths for the homogeneous dispersion of MWCNTs in polymer matrices as discussed elsewhere [11]. The ultrasonication may cause heat generation in the solution and consequently aggregation of the MWCNTs. Therefore to avoid this phenomenon, the beaker was fully covered in an ice blanket [11]. Once mixing of the MWCNTs and epoxy was completed, the hardener (K-6) was mixed in 10:1 (epoxy: hardener) ratio followed by 15 minutes continuous ultrasonication. Herein, the glass fiber used was bi-directionally [(0/90) and (+45/-45)] woven (600GSM) as provided by M.S Industries, Kolkata, India. The stacking sequence of the proposed design for the laminates is shown in Fig. 2(b), *i.e.* (0<sup>0</sup>/+90<sup>0</sup>), (+45<sup>o</sup>/-45<sup>o</sup>), (+45<sup>o</sup>/-45<sup>o</sup>), (0<sup>o</sup>/90<sup>o</sup>)/(0<sup>o</sup>/+90<sup>o</sup>), (+45<sup>o</sup>/-45<sup>o</sup>), (+45<sup>o</sup>/-45<sup>o</sup>), (0<sup>o</sup>/90<sup>o</sup>). To engineer the three-phased composite laminates, the first layer was placed over a flat glass surface and the resin solution was applied manually using a soft brush. The same procedure was also applied for all other layers as per proposed symmetrical design. To remove extra resins from the edges of the wet laminates, an iron roller was rolled after placing one layer over the other manually. Authors have adopted the hand layup technique for the preparation of wet laminates and curing of the laminates was carried out with the help of a press-molding machine under 40 KN pressure at room temperature for 24 hours (Fig. 2(c)).

## 4. Experimental testing method

### 4.1. Tensile test

The prepared laminates with different loadings of MWCNTs (total 20 samples, 5 for each wt. %) were cut out in the dimensions of 125 mm × 15 mm × 4 mm using a diamond cutter as per ASTM D3039 requirement. The aluminum tabs of dimensions 25 mm × 15 mm × 2 mm were properly cleaned with propyl alcohol and pasted over the sample laminates as shown in Fig. 3(a) to avoid alteration during the testing. Each specimen was then gripped in the prepared fixture of the Universal Testing Machine (UTM) which prevented any lateral movements and forces were measured using S-type load cells as shown in Fig. 3(c). Five such tests were conducted for each loading amount of MWCNTs at a strain rate of 0.5 mm/min.

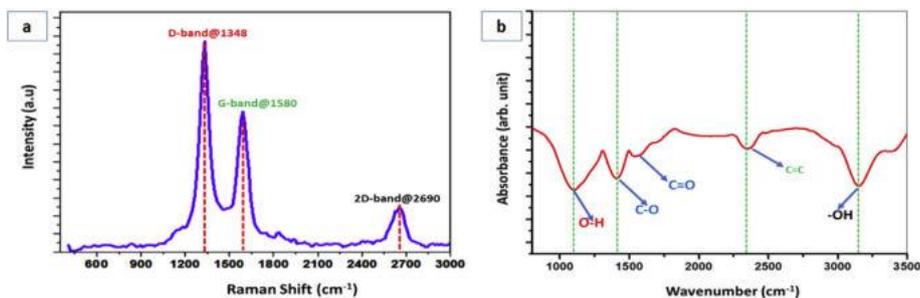


Fig. 1. (a) Raman spectra of surface modified MWCNTs and (b) FTIR of the as-synthesized and modified MWCNTs revealing the presence of the -COOH and -OH functional groups.

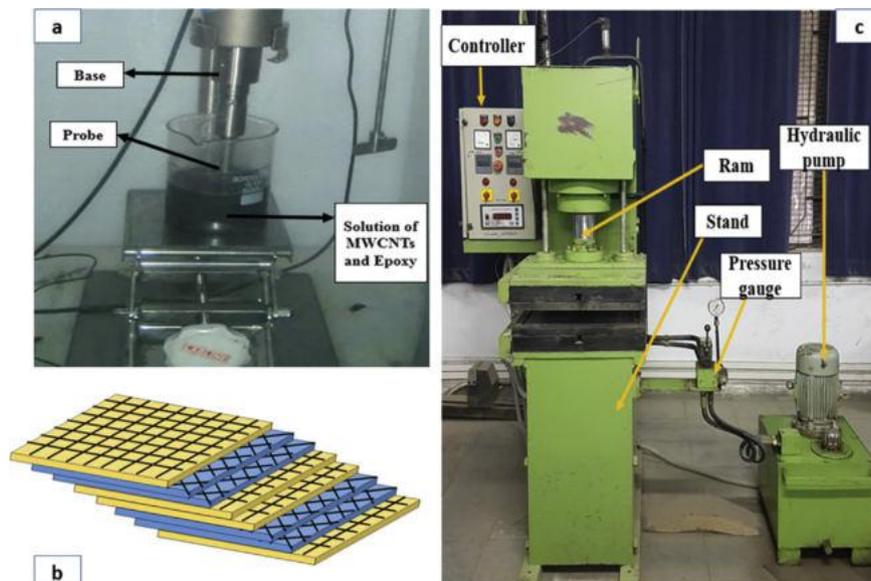


Fig. 2. (a) Set up of Probe Ultrasonication process; (b) Schematic representation of stacking sequence; (c) Set up of press molding machine.

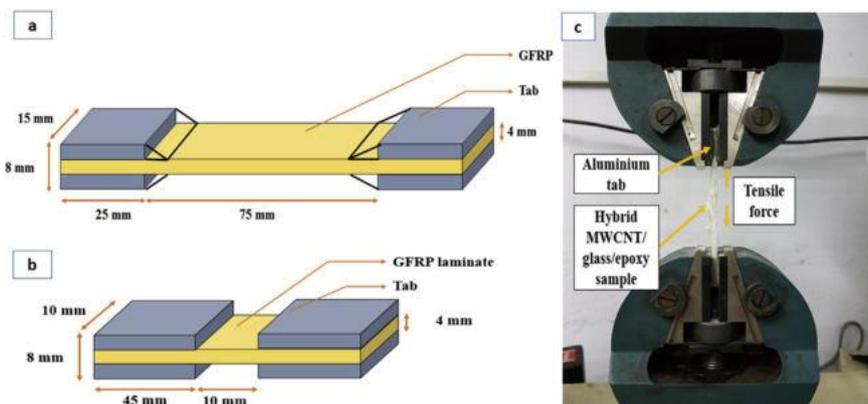


Fig. 3. (a) Specimen sample for the tensile test (ASTM D3039); (b) Specimen sample for compression test (ASTM D3410); and (c) Test fixture in UTM machine.

#### 4.2. Compression test

To investigate the compressive strength, seven different specimens (each wt. % of dimension 100 mm × 10 mm × 4 mm) were prepared as per ASTM D3410 requirement and a diamond cutter was used for the sample preparation. The properly cleaned aluminum tabs of dimensions of 45 mm × 10 mm × 2 mm were pasted over the specimen (with gauge length of 10 mm) as

shown in Fig. 3(b) to avoid alteration. This test was performed under the displacement control with a strain rate of 0.5 mm/min at room temperature. The load was measured using the S-type load cell attached to the specimen as discussed in the previous section. It is notable that the specimens used were short enough to prevent any buckling and clamping during the compression measurement. Further, any effects caused due to the stress concentration at the grips were considered insignificantly because

the repeated failures were witnessed at the gage section of all the loaded GFRPs.

#### 4.3. Inter-laminar shear strength (ILSS)

The inter-laminar shear strength tests were conducted based on the short beam shear strength test (SBS). For this test, seven specimens of dimensions 24 mm × 8 mm × 4 mm were prepared as per obligation of ASTM D2344, shown schematically in Fig. 4(a). The gage length of the specimen was 20 mm. The tests were performed at a strain rate of 0.5 mm/min as shown in Fig. 4(b). For the ILSS measurement, the gauge length of the specimens were kept very small to minimize the effect of bending during the failure of laminates under tension and compression. Thus, the main failure mechanism was dominated by the pure shear phenomenon.

The standard equation used for the calculation of inter-laminar shear strength is noted below:

$$F^* = 0.75 \times \frac{P}{b \times h} \quad (1)$$

where,

- $F^*$  = ILSS or Short-beam strength (ILSS) (MPa)
- $P$  = Max. load observed during test (N)
- $b$  = Specimen width (mm)
- $h$  = Specimen thickness (mm)

The cut specimens' samples are shown in Fig. 5(a)–(c) for the tensile, compressive and ILSS test, respectively.

The UTM (as shown in Figs. 3(c) and 4(b)) used for this work was fully computerized and the machine can be operated at loading rates varying from 0.01 to 10 mm/min. It had maximum load carrying capacity of 50 KN. Henceforth, using the UTM, the maximum values of load and stress for different samples under tension, compression and ILSS were noted and the maximum load carrying capacity was compared for the same wt.% samples in tension and compression for the systematic analysis. The maximum tensile and compressive modulus for different wt. % were also compared with neat samples.

## 5. Results and discussion

### 5.1. Tensile properties

Most of the important mechanical properties of materials, such as yield strength, elasticity, ultimate tensile strength and ductility can be obtained by the tensile analysis [21]. For the present investigation, five samples were tested and the obtained values are presented in Table 1 for better understanding. The graph shown in Fig. 6a represents the average values of the

tensile stress and it can be observed that the maximum stress values for the GFRP laminate composites are 122.70 MPa, 144.02 MPa, 250.08 MPa and 163.78 MPa for neat, 0.5, 1 and 1.5 wt. % of MWCNTs loading, respectively. The Young's modulus of elasticity ( $E_T$ ) was determined using the stress–strain data based on the tensile tests whose values were 2956.62, 3453.71, 6315.15 and 3937.02 MPa for the neat, 0.5, 1 and 1.5 wt. % of MWCNTs/glass/epoxy sample laminates, respectively and all are presented in Table 1 for the sake of simplicity. The maximum value for the modulus ( $E_{TMax}$ ) is 6315.15 MPa at 1 wt. % of MWCNTs loading and the average Young's modulus ( $E_{TAvg}$ ) for the tensile specimen laminates is found to be 4165.625 MPa. It can be observed that there is a continuous increase in the stress value as compared to neat GFRP specimen up to 1 wt. % MWCNTs incorporated laminates as shown in Fig. 6. This enhancement can be accounted to the delay in the crack generation and propagation owing to the nucleation and bridging effect of MWCNTs [18]. The role of MWCNTs to reinforce the mechanical properties is schematically presented in Fig. 7. Thus, the optimum loading of MWCNTs attributes a strong cross-linkage and enshrouding between the interfaces of resin which ultimately causes a delay in the crack propagation [11]. Moreover, with the increase in the loading percentage of MWCNTs, the tensile strength of the FRP laminate increased as fracture behavior shifted from brittle to ductile like hackle for the homogeneously dispersed MWCNTs [11]. Thus, the strong nanoparticle covalent bonding between the matrix–reinforcement interfaces is also responsible for the improved strength of the MWCNTs filled laminate specimens [18]. Further, from the tensile analysis, it can be observed that with the increase of MWCNTs loading, there is a fall in stress value by 34.5% from 1 wt. % to 1.5 wt. %. Such a drastic reduction in the value of stress may be attributed to the aggregation of MWCNTs (as shown in Fig. 9d), which takes place when MWCNTs loading increases beyond 1 wt. % [11]. In the present situation, the aggregation of MWCNTs is mainly due to the selective distribution and the high degree of entanglement of MWCNTs with matrices [11,18]. Therefore, the optimum stress value is 250.08 MPa at 1 wt. % MWCNTs incorporated GFRP and the average Young's modulus ( $E_{TAvg}$ ) for the tensile test specimen is 4165.625 MPa.

#### 5.1.1. Failure mechanism and fracture analysis

The failure mechanism is one of the most important aspects for the composites and polymeric materials [18]. There are so many reasons for the failure in the case of FRPs and similar materials. In this particular work, it is assumed that the failure originates from a region where there is the maximum stress concentration or an inherent defect is generated in the composite specimens during the testing as explained by Y. Iwahori *et al.*[28]. However, the homogeneous mixing of nanofillers in case of the three-phase composites is a serious concern and cannot be explained through the logic developed by Y. Iwahori *et al.*[28], because the mixing of nanofillers

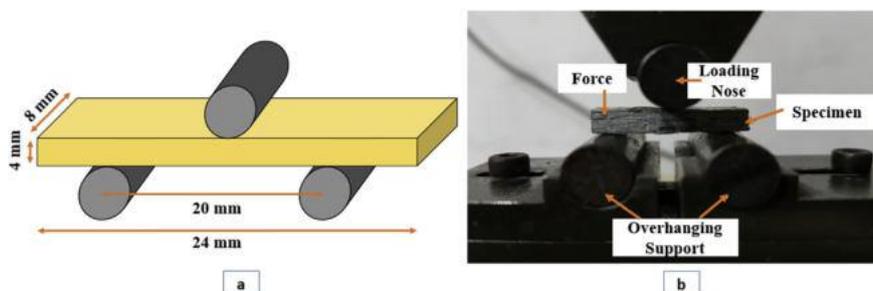


Fig. 4. (a) Specimen sample for SBS test (ASTM D2344) and (b) Specimen fixture setup for SBS test.

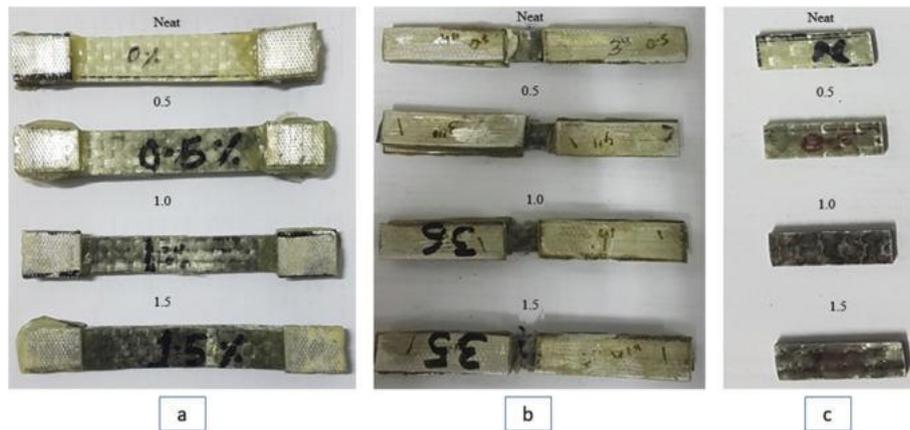


Fig. 5. Specimen test samples for (a) Tensile (b) Compressive and (c) SBS tests.

**Table 1**  
Statistics of the tensile tests performed for the hybrid MWCNT/glass/epoxy laminate samples.

Stress in MPa									
Specimen Number → MWCNT (wt.%), ↓	1	2	3	4	5	Average Tensile strength (MPa)	Standard deviation (SD)	Standard deviation (%)	Average Young's modulus ( $E_T$ ) (MPa)
0	120.57	118.96	125.45	124.23	124.29	122.70	2.782	2.27	2956.62
0.5	145.67	145.98	144.65	142.66	141.14	144.02	2.057	1.43	3453.71
1	247.63	245.97	251.67	253.53	251.16	250.08	3.102	1.24	6315.15
1.5	165.67	161.23	160.78	164.45	166.77	163.78	2.67	1.63	3937.02

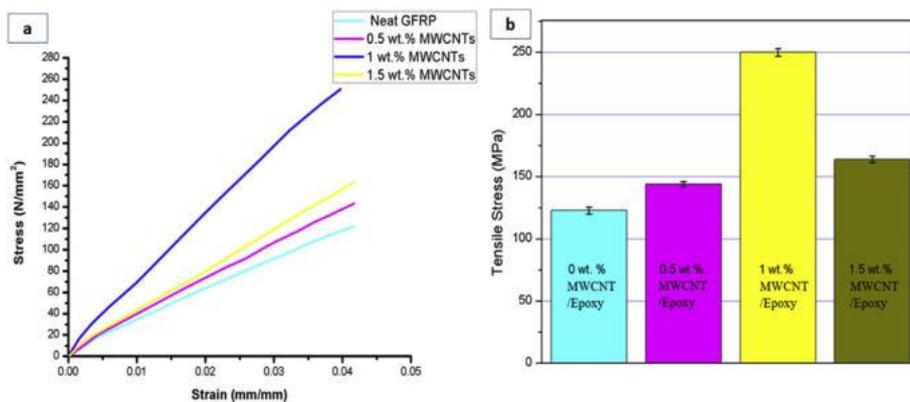


Fig. 6. (a) Stress vs. Strain graph for the tensile test of GFRP composite sample laminate and (b) Statistics of the tests performed according to ASTM D3039 with reference to Table 1.

into three-phase composites leads to the formation of clusters, cracks and voids owing to the non-uniform stress concentration (as shown in Fig. 9 (b)) which can also be the reason for the crack generation and propagation that ultimately leads to failure in the composites [28]. The mechanism explained in Fig. 8 shows the fracture and cracking of FRP composites during the tensile test which is an indication of adopted mechanism for the failure [11]. From the FESEM (Fig. 8 (d)) micrographs, it is clear that cracking at the interfaces of matrices occurs at the point of maximum stress, and then the crack propagates through the fibers and appears on the external surface of the specimen [11]. In other words, the debonding between the matrix and the nanofiber/glass is responsible for the fracture which leads to the pull-out phenomenon as shown in Fig. 8(a),(b). It is notable that the stress near the tip of the crack causes the matrix-fiber delamination before the actual bond breakdown and finally the crack reaches to the interface between

the two laminates of the composite. Fig. 7(a) and the FESEM image in Fig. 9(a) show the mechanism of delay in the crack propagation caused by the strong cross-linkage of MWCNTs between the two laminate composites [18].

## 5.2. Compression properties

The compressive strength is often used to state applicability of composite materials as it denotes the ability of a material to withstand load tending to reduce size. To further examine the mechanical properties of the fabricated composites, the compressive behavior was investigated as per ASTM D3410 and the stress vs. strain (Fig. 10(a)) curve of the same along with statistical data is presented in Table 2. The compressive results of the studied samples are in good agreement with the tensile properties as mentioned in previous section. The maximum compressive stress

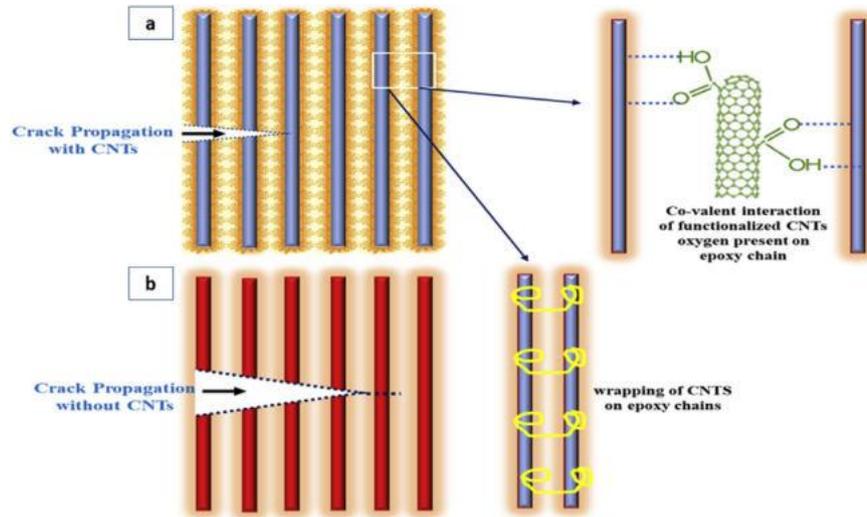


Fig. 7. Schematic diagram of (a) MWCNTs distributed between glass fiber layers which cause an increase in the tensile strength and (b) unmodified GFRP.

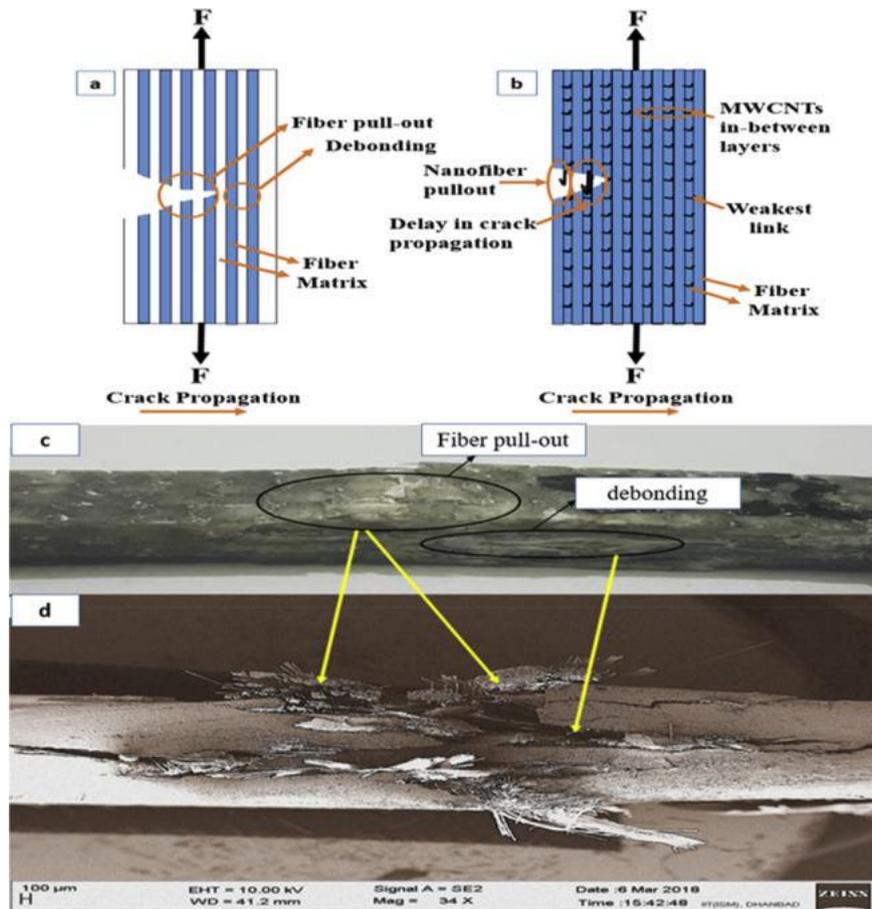


Fig. 8. (a) mechanism of tensile failure of neat GFRP specimen; (b) nanofiber pull-out and delay in crack propagation caused due to crosslinking of MWCNTs (c) image of the failure mechanism of specimen under tensile load; and (d) FESEM image of debonding followed by fiber pull-out.

( $\sigma_c$ ) values for the specimens are found to be 10.38, 13.44, 24.89 and 21.32 MPa for the neat, 0.5, 1 and 1.5 wt. % of MWCNTs loading in GFRP composites, respectively. Similarly, the compressive modulus ( $E_c$ ) of the studied specimens were obtained (1069.56, 1383.71, 4194.77 and 2195.31 MPa for the neat, 0.5, 1 and 1.5 wt. % of MWCNTs/epoxy, respectively) from the corresponding graphs and

the data is presented in Table 2 for detailed information. From the stress vs. strain graphs (Fig. 10(a)), MWCNTs loading up to 1 wt. % is accounted to the uniform load transfer from the matrix to the reinforcement which is further strengthened owing to the intrinsic properties of MWCNTs and their homogenous distribution at the interfaces of the composite. Due to the aggregation of MWCNTs at

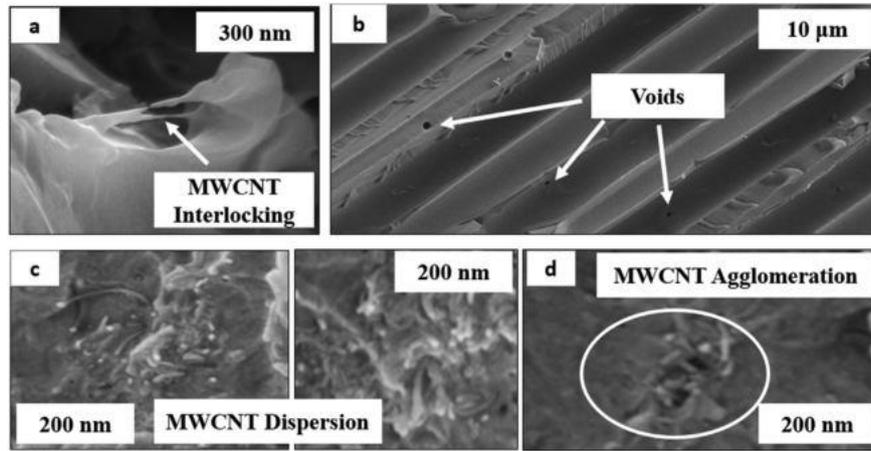


Fig. 9. FESEM images of (a) MWCNTs interlocking; (b) cured sample laminate at 1 wt.% MWCNTs loading containing voids; (c) MWCNTs dispersion; and (d) agglomeration at 1.5 wt.% MWCNTs in GFRP.

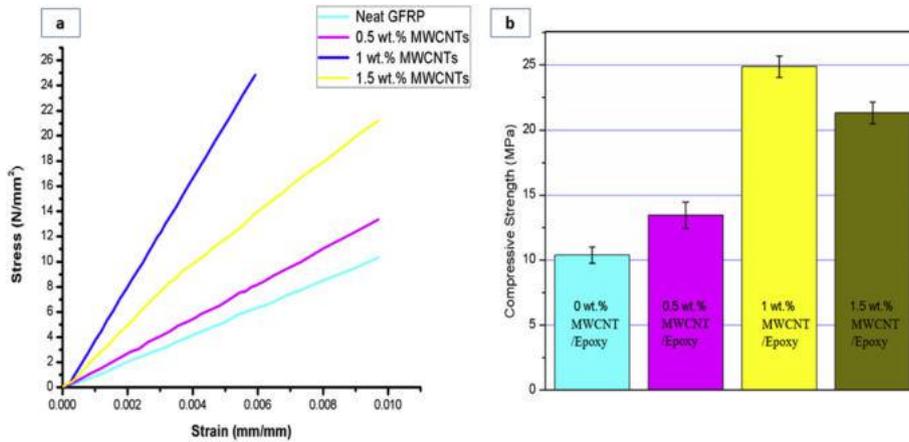


Fig. 10. (a) The Stress vs. Strain graphs for the compressive test of GFRP composite laminate samples (b) Statistics of the tests performed according to ASTM D3410 with reference to Table 2.

Table 2  
The statistics of compressive tests performed for hybrid MWCNT/glass/epoxy laminate samples.

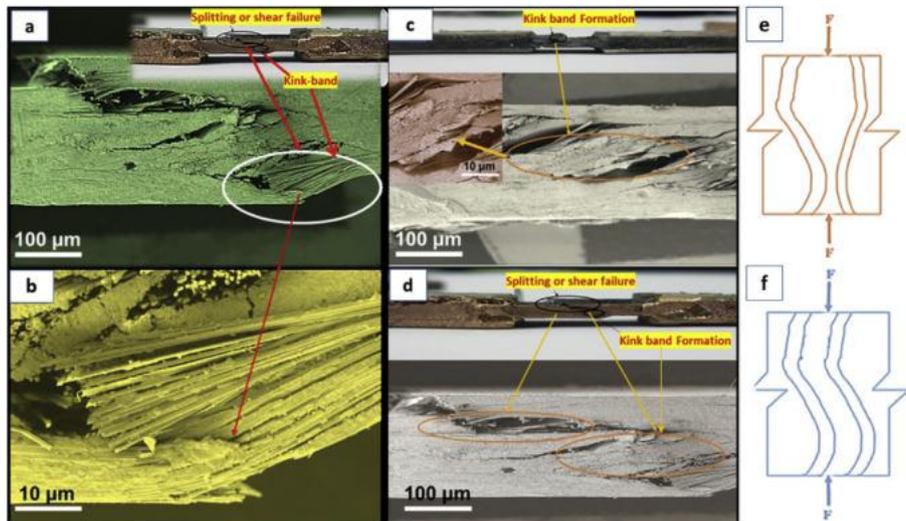
Stress in MPa											
Specimen Number → MWCNT (wt.%), ↓	1	2	3	4	5	6	7	Average Compressive strength (MPa)	Standard deviation (SD)	Standard deviation (%)	Average compression modulus ( $E_C$ ) (MPa)
0	10.56	10.65	9.87	11.23	10.02	10.88	9.43	10.38	0.626	6.03	1069.56
0.5	14.56	14.89	13.65	12.63	13.23	12.02	13.10	13.44	1.018	7.57	1383.71
1	24.23	25.17	25.36	23.67	25.87	25.61	24.32	24.89	0.820	3.29	4194.77
1.5	22.56	22.21	20.97	21.25	20.56	20.23	21.46	21.32	0.842	3.95	2195.31

higher loading, the cross-linkage (see Fig. 9(a)) at the interfaces get decreased and therefore abrupt drops in strength can be seen above 1 wt. % of loading of nanofillers (Fig. 9(d)). In summary, the maximum value of the compressive modulus ( $E_{Cmax}$ ) is found as 4194.77 MPa for the 1 wt. % of MWCNTs loading and the average value of the compressive modulus ( $E_{CAvg}$ ) for the specimen laminates is found as 2210.837 MPa.

5.2.1. Failure mechanism and fracture analysis

Composites and nanocomposites possess different phases with different elastic properties. Hence, there is a high possibility for the formation of microcracks across various regions of interfaces in the fabricated composites under the applied load [18]. A typical

fracture of fibers is shown in Fig. 11(a),(b) for the specimen under compressive loading. The compressive strength of the laminates is controlled by various mechanisms [29]. First, it is seen that most of the laminate in the test undergo micro-buckling. Buckling is the only area in the field of structural mechanics where failure is not related to the material strength. The collapsing of the material due to buckling does not deal with the yield of the material [30]. Generally, there are two types of micro-buckling modes of failure according to Rosen's model [31] (i): out of phase buckling of fibers or extension mode, (ii) in-phase buckling of fibers or shear mode as shown in Fig. 11(e),(f). Their analysis was based on the assumption of the 2D behavior of composites and on an idealistic approach, so the predicted results in their test were significantly higher than



**Fig. 11.** (a) FESEM image of fractured fibers and (b) cracking due to compressive loading; (c) FESEM image of the kink band formation in the test sample specimen; (d) FESEM image failure mechanism of compressive test specimen (Kink-band formation and Splitting); (e) Extension mode or out of phase buckling; (f) Shear mode or in-phase buckling.

experimentally observed ones. In their model, the authors predicted the value of the shear mode failure to be lower than that of the extension mode of failures which was also in agreement with the experimentally observed results. Further, the failure modes are highly dependent on the fiber volume fraction ( $V_f$ ). For  $V_f < 30\%$ , the extension mode is dominant as with application of the sudden load, the adjacent fibers tend to deform sinusoidally with the deformation patterns being  $180^\circ$  out of phase, whereas for  $V_f > 30\%$ , the fibers adjacent to each other deform transversely in phase indicating the shear mode failure [30]. In our experiment, since the prepared composite is high in fiber content with fiber volume fraction ( $V_f \sim 55\%$ ), therefore, in the coherence to the Rosen's model, it is feasible to assume the micro-buckling to be in-phase as shown in Fig. 11. Also, researchers like Tadjbaksh and Wang in their model took into consideration the inter-ply micro-buckling of the cross-ply laminates [32]. They modelled the laminate as a single ply inhomogeneous continuum. In this analysis, they observed an increase in resistance of buckling due to adjacent plies. Similarly, in the present study, most of the samples were resisting buckling owing to the use of cross-ply laminates [33].

Secondly, there is kinking, which is also perceived to be the most common failure mechanism. Kinking in FRPs can be said to be the consequence of the combination of plastic micro-buckling and the low strain rate subjected to the fibers. A typical kinking failure mechanism is shown in the Fig. 11c. These initiative mechanisms like kinking and micro-buckling at micro-structural level lead to the global instability of the composite materials [30]. Lee and Waas [33] in their investigation on the compressive strength of unidirectional GFRP laminates found that the kink-bands were formed at different fiber-volume fractions of the tested GFRP samples. Also, for higher fiber-volume fractions, it remained one of the major modes of failure. Similarly, in this study, it was observed that the kink bands were formed. But, as the fiber volume fraction of the prepared GFRP was high ( $V_f \sim 55\%$ ), no significant stress drop was observed during testing of the loaded GFRP laminates. Thus, it can be concluded that the chances of formation of kink-bands decreases at high fiber volume fractions of loaded bi-directionally woven GFRP laminates. A typical kink band formation is shown in Fig. 11(c) of the loaded GFRP samples.

Thirdly, we address the splitting or delamination as another failure mechanism for the rupture of the composites [33]. This kind

of failure modes is supposed to occur when a pre-existing flaw inside the specimen starts growing under compressive loading conditions. In multi-directional composites, where the fibers are continuous, cracks with an opening under compressive loading are easily liable to delamination in a macroscopic level and fiber-matrix debonding in a microscopic level. The micro-cracks that grow under compressive loading tend to form transverse cracks. These micro-cracks with a gradual increase in the compressive load grow and their domain of circumferential size increases, and they form interfacial de-bonds [33]. Debonding is the transition mechanism followed by the micro-cracking which eventually leads to transverse cracking [34]. Although, it is assumed that transverse crack originates from the defects or voids present in the matrices owing to improper layering and selective distribution of MWCNTs (see Fig. 9(b)). However, the consequence of the same may enhance the cracking and therefore the fiber-matrix interfacial weakening in the case of an uniaxial transverse loading [35]. Such crack initiation and propagation cannot afford applied loads and result in fracture via the kink band formation. A typical debonding or shear failure mechanism is shown in Fig. 12(a),(b) followed as by a transverse cracking in the compression test samples.

As described in previous sections, there are three major mechanisms of failure for the compressive laminate samples, but it is observed that no particular failure is alone responsible for the breakdown of the test samples. The failure is governed majorly by a combination of kink-band formation and splitting. But there can be other failure modes like splitting or shear failure alone. However, this is the rare case, *i.e.*, one among seven specimen samples. So, for high fiber volume fraction bi-directional GFRP samples we designate the failure mode by kink-band formation followed by splitting or shear failure as shown in Fig. 11(d).

### 5.3. Inter-laminar shear strength (ILSS) properties

The tests were performed for the short beam shear (SBS) strength and the observed strength values are summarized in Table 3. Also, the statistics of the obtained force values are presented in Fig. 13(b). The force vs. deflection graph for the test samples (see Fig. 13(a)) represents the average values of force for the samples put to test in the Hounsfield UTM.

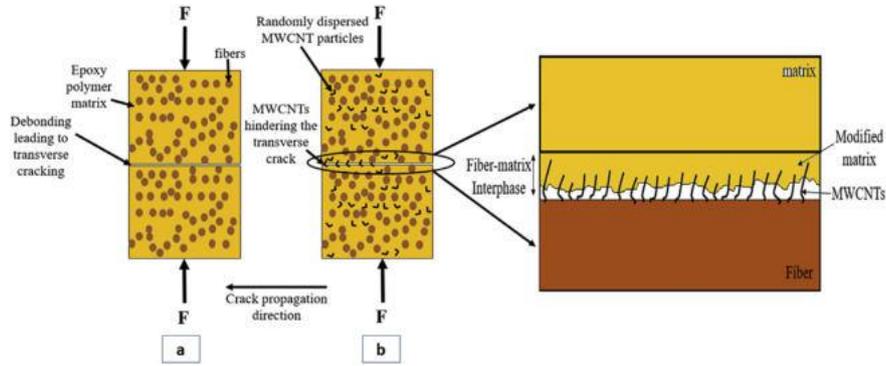


Fig. 12. (a) debonding mechanism leading to transverse crack and (b) hindrance to the transverse crack caused by loading MWCNTs.

**Table 3**  
The statistics of the SBS test performed for hybrid MWCNT/glass/epoxy laminate samples.

Specimen Number →	1	2	3	4	5	6	7	Average Force (N)	Standard deviation (SD)	Standard deviation (%)	Inter-laminar shear strength (ILSS) (MPa)
MWCNT (wt.%) ↓											
0	469.23	468.12	472.27	460.57	457.32	460.73	470.12	465.48	5.80	1.25	10.909
0.5	532.48	536.65	540.45	521.27	526.34	525.25	517.55	528.57	16.42	3.11	12.388
1	637.55	634.23	632.12	621.98	620.45	628.34	658.64	633.33	12.78	2.02	14.843
1.5	503.12	501.67	491.73	487.33	495.51	493.34	510.64	497.62	7.95	1.60	11.663

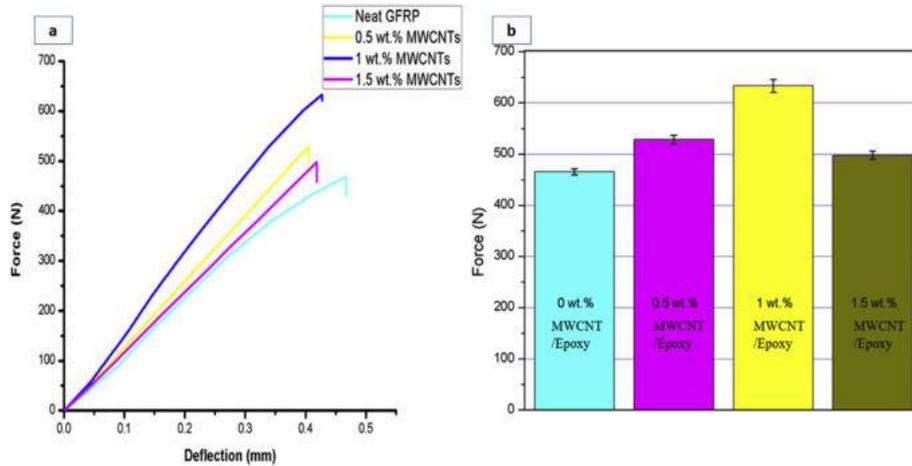
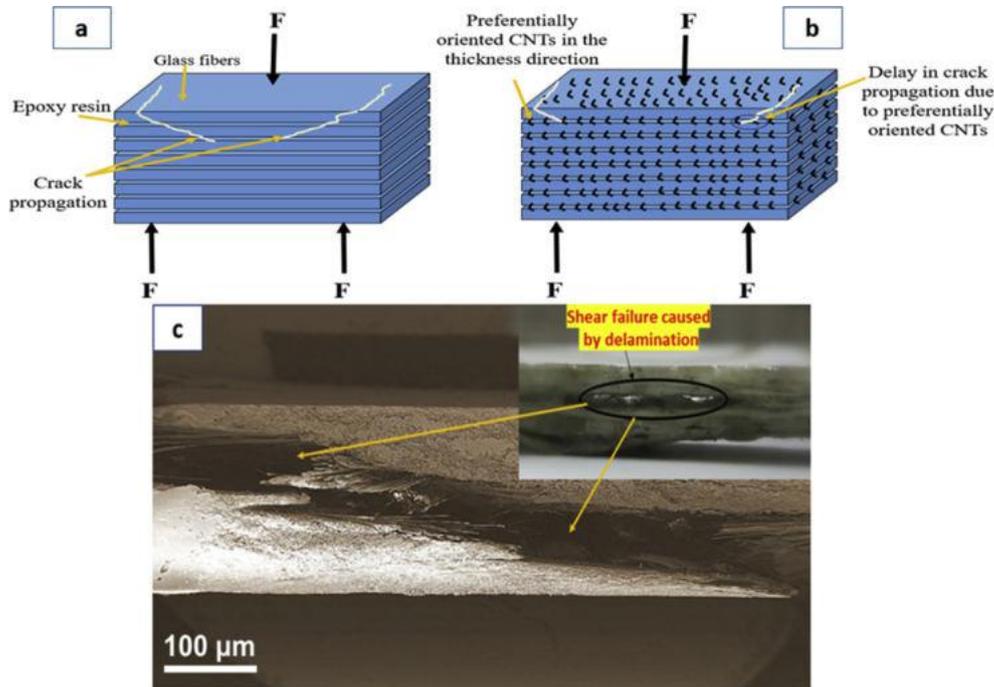


Fig. 13. (a) Force vs. displacement graph of GFRP laminate samples obtained from SBS test; and (b) statistics of the tests performed according to ASTM D2344 with reference to Table 3.

When the shear load in the transverse direction experienced by a composite laminate exceeds the inter-laminar shear strength (ILSS), a failure will occur between the fiber layers (which are the reinforcing materials in FRPs) and its was known as delamination failure [36]. In order to measure the ILSS, a pattern of the pure shear stress should be generated which will make the composite undergo an interlaminar shear failure. This failure will occur between the glass woven plies, which act as the reinforcing material. In the case of a load applied perpendicular to the fiber layers, an additional failure is possible and, therefore, an accurate ILSS estimation is not possible. In this testing, we used the SBS test, where the failure was caused by both the shear failure and the failure due to bending (caused by both tension and compression). The failure is not due to shear alone, so there can be anomaly in the results obtained [36]. To avoid the bending effects of failure, we reduced the gage length, so

that the moment is reduced which ultimately diminishes the failure due to the bending effects [36]. In this case, the gage length as per ASTM D2344 is 20 mm, so it can be assumed that the pure shear failure will dominate the bending failure at a greater scale, therefore, we can neglect the effects of bending.

From the graph of Fig. 13(a) and from the calculations using equation (1), the Inter-laminar Shear Strength values are 10.909 MPa, 12.388 MPa, 14.843 MPa and 11.663 MPa for MWCNT loading values of 0, 0.5, 1 and 1.5 wt. %, respectively, which are noted down in Table 3. The reason for the increase in ILSS of the fiber reinforced composites up to 1 wt. % can be addressed to the MWCNTs/epoxy suspension between the fiber layers, which create a strong cross-linking bond between the layers as shown in Figs. 9(a) and 14(b). Although, the CNTs in this case are not preferentially oriented, they are randomly dispersed, it is seen that



**Fig. 14.** (a) The crack propagation mechanism in th neat GFRP laminate; (b) Hinderance in the crack propagation due to MWCNTs aligned along the thickness direction; (c) FESEM image of failure mechanism of short beam shear strength (SBSS) test sample specimen (delamination).

some of the MWCNTs tend to orient along the thickness direction which transfers the load from the matrix to the MWCNTs. Fan *et al.* [36] used oxidized multi-wall nanotubes (OMWCNTs) with the vacuum assisted resin transfer molding method (VARTM) and the newly developed injection and double vacuum assisted resin transfer molding method (IDVARTM) to preferentially orient the MWCNTs along the thickness direction, which ultimately leads to increased ILSS due to the effective and uniform load transfer from the matrix to the CNTs.

The decrease in ILSS at 1.5 wt. % of MWCNTs loading from 14.843 to 11.663 MPa indicates that the CNTs after 1 wt. % loading tend to re-agglomerate (Fig. 9(d)). Thus, it can be assumed that the 1 wt.% loading is an optimum value of reinforcement, and beyond the 1 wt.% loading, owing to the saturation effect and the attractive Van der Waal forces among the nanoparticles, the agglomeration effect tends to dominate and results in major aggregation, indicating that the ILSS is decreased by 21.42% from 1 to 1.5 wt. % of MWCNTs loading.

### 5.3.1. Failure mechanisms and fracture analysis

The failure mechanism of the ILSS test samples for the SBS test is relatively easy. Since, the load is applied on an overhanging test sample with a very short gage length, the crack propagation takes somewhat close to the axial direction [37]. Since bending also exists in the failure mechanism, the crack propagation is not along the pure axial direction. Therefore, there are two mechanisms which can be accounted for the failure: (i) the shear failure and (ii) the bending failure. The shear failure is a result of the delamination caused due to the matrix cracking followed by breaking of the bond between the fiber and the matrix which eventually leads to the delamination. Since the matrix is considered to be the weakest material in the composite structure, so it is assumed that the crack initiation takes place from the defects or voids present in the matrix (Fig. 9b), and it is expected to be eventually present after the curing process [35]. This becomes the point of the maximum stress concentration, so a load up to its maximum bearing capability along the axial direction is considered the maximum ILSS. Further

application of the load after this point leads to the crack propagation from the defect which causes matrix breaking and the load is transferred from the matrix to the secondary reinforcement, *i.e.* the MWCNTs as shown in Fig. 14b. The matrix breaking and the crack propagation along the near axial direction leads to the delamination of the fiber and the matrix, which upon further spreading conquers a lot of circumferential area under its domain ultimately leading to the shear failure [37]. In this testing process, the most dominant failure mode is the inter-laminar shear failure. A typical failure mechanism of the SBSS test is shown in Fig. 14(c).

## 6. Conclusion

In summary, surface modified MWCNTs were synthesized and unvaryingly dispersed in the glass fiber-reinforced plastic composites with 0, 0.5, 1 and 1.5 wt. % loading. The mechanical properties of specimens were inspected mainly in the context of tensile, compressive and ILSS test. In the present study, it has been established that an optimum tensile stress value of 250.08 MPa was at 1 wt. % of MWCNTs loading along with Young's modulus ( $E_{Tmax}$ ) of 6315.15 MPa and the composites failed owing to the debonding followed by the fiber pullout. The optimum compressive stress for the composite in the case of 1 wt. % of MWCNTs loading was found of ~24.89 MPa corresponding to 4194.77 MPa compressive modulus. Interestingly, the maximum strength value for the tension was found greater than that for the compression which implies the role of the nanotubes as nano-compatible and as reinforcement on the properties of the fabricated composites. For the studied samples, the tensile modulus was greater than the compressive one indicating that there was less elastic deformation of the material under tension as compared to compression. Moreover, owing to the proper dispersion of MWCNTs in the fabricated composites, the increment in the tensile stress and compressive stress were 103.81% and 139.78%, respectively. Also, for the 1 wt.% of MWCNTs loading, the optimum ILSS was found to be 14.843 MPa with an increment of 36.06% as compared to the neat sample. Thus, the optimum MWCNTs loaded GFRP can be used in many structural

applications where a high stability against tension, compression and inter-laminar strength is needed at the same time.

## Conflicts of interest

Authors have no conflict of interest.

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## Worldwide spread of COVID-19

# Pandemic and risk factors among Co-morbid conditions especially Diabetes Mellitus in India

## (AbstractView.aspx?PID=2020-13-5-80)

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# Identification of Ellagitannins as Natural Inhibitors of Spike Proteins of COVID19 Virus: An *in silico*-based study for drug development

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## Summary

### BACKGROUND

Ellagitannins are the potential source of bioactives and found abundantly in consumable food items. S-protein is a type I fusion protein of COVID19 virus and used for initial attachment with human Angiotensin converting enzyme 2 (ACE2) receptor, which facilitates its entry into the host cell.

### MATERIALS AND METHODS

S-protein is validated target and hence, we screened food borne polyphenols and FDA approved Drugs against SARS-CoV-2 spike protein by the Autodock Vina 1.1.2. and Pymol for the molecular docking and simulation studies.

### RESULTS

The study showed that Sanguiin-H-6, Potentillin, Punicalagin, have excellent binding affinities for S-protein as compared to its natural N-acetyl glucosamine (NAG) ligand. Theaflavin-di-gallate and Theaflavin-mono-gallate also show comparably good binding affinities and similar binding conformations.

### DISCUSSION

SH6, Casuarictin, and Potentillin compounds have shown excellent binding on the hinge of S1 and S2 subunits of spike glycoprotein. As they show hydrogen bonding interaction with S2 unit by interacting with HR region and SD2 region, and on the other side they form hydrogen bonds with amino acid residues of NTD (which is present in S1 unit). The S1 unit is responsible for the virus attachment with its host ACE2 receptor, where potential ellagitannins were found to bind with NTD, and can modulate the binding of virus with host cell.



Similarly, in S2 subunit its binding in HR region leads to disruption of membrane fusion stage, hence, ellagitannins have capability to act as potential inhibitor of virus spike protein by inhibiting both cell surface attachment as well as membrane fusion. These three compounds also show good drug likeliness properties apart from solubility which can be overcome by drug delivery advancements.

#### CONCLUSION

Thus, from the result it is concluded that Sanguiin-H-6, Potentillin, Casuarictin which are ellagitannins may have ability to inhibit both attachment and membrane fusion of COVID19 virus to ACE2 receptor.

#### RECOMMENDATION

This study needs further *in vitro* and *in vivo* testing which will provide a clear path for the development of novel compounds of natural origin that would most likely prevent the receptor binding or internalization of the SARS-CoV-2 spike protein and therefore could be potential drugs for COVID-19 preventive therapy.

**Keywords:** COVID-19, Virtual Screening, Phytochemicals, Ellagitannins, Flavonoids, ADMET

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## Introduction

The corona virus outbreak has resulted in a socio-economic crisis all over the world as of 11<sup>th</sup> March, 2020 [1] when the Director General of the World Health Organization (WHO) declared COVID-19 disease to be a global pandemic. This upsurge initially started in late December 2019 as a pneumonia-associated infection, reported in Wuhan, Hubei Province of China [2].

Coronavirus is of the family of  $\beta$ -coronavirus (but SARS-related coronavirus (SARSr-CoV) strain WIV1) [3], which seem to have evolved from bats and possess a dreadful threat to human health. The clinical symptoms associated with the SARS-CoV-2 generally involves the upper respiratory tract infections with its mean reproduction number (R0) 3.28 [4] and onset of pneumonia symptoms within average of 4 days (ranging from 2 to 7) [5].

The novel coronavirus is a positive single-stranded RNA that consist of majorly four proteins namely, envelope (E), membrane (M),

the nucleocapsid (N), and spike (S) proteins (*see Figure 1- all tables and figures are presented at the end of this article*) [6]. These proteins function in different ways to keep the viral machinery active with E and M protein maintaining viral assembly, N protein playing role in RNA synthesis [7]. The critical glycoprotein S is a class I fusion protein found on the surface of COVID-19 virus, which majorly causes the virus' attachment to human Angiotensin converting enzyme 2 (ACE2) receptor. This is followed by its fusion with the host cells. The attachment is facilitated by the S1 subunit of S-protein via its receptor binding domain (RBD).

The RBD is projected upward as a hairpin, and provides a structural template for ligand to bind, followed by antiparallel  $\beta$ -sheets (N-terminal domain) NTD; both contributing to formation of S1 domain part. The S2 domain consists of a linker which connects RBD to heptad repeat (HR), a central helix (CH) and connector region (CR) (*Figure 2*). Two domains



are responsible for the inclusive behaviour of the virus, namely N-terminal (S1 containing RBDs) and C-terminal (S2 for fusion). Moreover, the S1 further consists of two subdomains N-terminal domain (NTD) and C-terminal domain (CTD), both functioning as RBDs.

In  $\beta$ -coronavirus (SARS-CoV), the receptor and virus fusion interaction takes place at C Terminal [8]. The S protein also consists of cleavage sites, fusion protein near to HR1 and a TM (transmembrane) span depicted in (Figure 3). It is reported that membrane fusion and internalization of the COVID19 virus is brought about by the S2 domain of spike protein. A huge dynamism is associated with this protein as it changes its conformation from pre-fusion to post fusion state after binding and internalization [9].

Belouzard *et al.* [10] depicted the mechanism of coronavirus entry mediated by spike protein with the two different conformation structures, namely, the metastable pre-fusion and the stable post fusion. When the spike protein S1 attaches the host membrane, its trimeric pre-fusion structure gets destabilized, resulting in loss of S1, and the transition of S2 subunit to stable post fusion conformation. The virus on entering into the cell releases its genome, followed by assembly and release of virions [11] from the infected cell through the process called exocytosis. The spike glycoprotein seems to exert a potential target for inhibition of infection and treatment.

Facing, the massive casualties of this pandemic, researchers all around the world are actively engaged in finding various strategies including new and repurposed drugs to treat the SARS-CoV-2 infection. Wei *et al.* [12] reported about Digitoxin, Bisindigotin, Polygoni Tinctorii Folium and Raltegravir having high binding affinities towards spike glycoprotein. In time of need high-throughput virtual screening is also employed, which identified KT185, KT203 GSK1838705A, BMS195614, and RS504393 as a potential binder of spike protein, thereby preventing spread of COVID19 by acting both

as a entry inhibitor to cell and anti-inflammatory agents [13].

Since, the age old times, people have believed that naturally occurring substances like phytochemicals have potential to fight against infectious pathogens. Most of the polyphenols are reported to have anti-viral [14] and anti-bacterial properties [15]. It is more inspiring to know that theaflavin derivatives (Flavon-3-ols), an active constituent of black tea is found to have proteolytic activity against main protease (3-CL-Protease) of SARS-CoV established through biological assays [16].

In a similar context, we recently performed virtual screening of Phenol Explorer database against main protease of SARS-CoV2 (COVID19 virus) and strikingly similar results indicating that Theaflavin-di-gallate and Theaflavin-mono-gallate have potential to bind actively in substrate binding pocket of main protease of COVID19 virus by a characteristic covalent bond [17, 18]. This, study motivated us to perform another investigation to explore the capability of polyphenols (majorly ellagitannins) against spike protein of COVID19 virus.

In this study, we performed *in silico* screening to ascertain the most potent natural food borne compound against spike glycoprotein of COVID19 virus which can inhibit virus attachment and internalization with host cell. We found that four Ellagitannins and two flavon-3-ols can bind to (NTD) of S1 and (HR) of S2 sub unit of spike protein, with a binding interaction more stable than that of N-acetyl glucosamine (NAG) and HCQ. These natural compounds have unique features of binding to both S1 and S2 subunit and most probably prevent COVID19 virus from binding to the ACE2 receptor or internalization during fusion [10, 19]. The ADMET analysis also suggested that these ellagitannins have potential to function as effective anti-SARS-CoV-2 agents with further testing and scientific modifications.



## Material and Methods

### *Data Set Preparation*

In-house database preparation of 69 ellagitannins (comprising of hydroxybenzoic acids and urolithin) derivatives and few other polyphenols was carried out by taking these compounds mainly from Phenol Explorer [20, 21] Version 3.6. The 2D structures of these compounds were exported from ZINC database [22] in SDF format and some of them (not available) were drawn manually by ChemDraw. The database was checked for redundancy and redundant molecules, in order to avoid any repetition. These structures were further refined in Chemdraw3D ultra by performing energy minimization using Molecular Mechanics 2 (MM2) force field method and saved in .mol2 format [23].

The energy minimized structures, were imported in AutoDock Vina 1.1.2 for ligand preparation [24]. Along with this, the SDF files of known 68 FDA approved anti-asthmatic drugs and A2 receptor agonist were also imported from the ZINC database for screening study.

### *Virtual Screening by Molecular Docking Approach*

Molecular docking is an essential tool in computer-based drug design and drug discovery, which helps to predict the small ligand conformation and orientation (docking pose) within the active sites of the target receptor protein [25-30]. This technique has been highly useful in virtual screening of large libraries of ligands against suitable target proteins to identify potential drug candidates based on scoring functions and intermolecular interactions. The following were taken in conducting this study:

#### *a. Protein Preparation*

The Cryo-EM structure of spike protein of COVID19 virus co-crystallized with its ligand N-Acetyl-D-Glucosamine (NAG) was reported

by Wrapp *et al.* in 2020 [31]. This protein with PDB ID: 6VSB was taken from (protein data bank) depository for virtual screening. The protein was prepared using the protein preparation wizard of Auto Dock Vina 1.1.2. This tool helps in adding hydrogens, Kollman charges, assigning AD4 type and repairing missing atoms.

#### *b. Ligand Preparation*

The 3D structural files of compounds of the in-house database along with FDA approved drugs [22] were subjected to energy minimization using MM2 by keeping a check on the connection error in the bonds. The torsions for the ligands were set by detecting the roots in AutoDock Vina 1.1.2 followed by setting aromaticity criteria of 7.5 [24].

#### *c. Ligand Docking*

First of all, the bound ligand (NAG) was extracted from spike protein and then re-docked to generate the same docking pose as found in its co-crystallized form (PDB: 6VSB) for validation of docking protocol.

The prepared sets of ellagitannins and related ligands were then docked against the spike protein using AutoDock Vina 1.1.2. based upon docking score and docked pose, the protocol validated for docking of multiple ligands.

#### *d. Visualization*

The results obtained from AutoDock Vina (1.1.2) were visualized using the academic version of Pymol software [32].

#### *e. Prediction of ADMET by In Silico Analysis*

ADMET profiling of top 3 scoring ellagitannins at pH 7 were determined using Swiss ADME, online web server (<http://www.swissadme.ch/index.php>) [33]. The important parameters allied with ADME properties such as Lipinski's rule of five, solubility of drug, pharmacokinetics properties, molar refractivity and drug likeliness were



deliberated. Regarding toxicity [34] analysis, Ames mutagenicity and carcinogenicity on rat and mouse models were considered. All calculated values are provided in Tables 5, 6 and 7, presented at the end of this article.

## Results

The docking scores of top 14 polyphenols on spike glycoprotein of COVID19 virus is shown in Table 1 and found to be much higher in comparison to NAG (bound ligand), a natural ligand of spike protein, having docking scores of  $-5.3$  kcal/mol. The two compounds Sanguiin-H6 (SH6) and Punicalagin (PC) found to have excellent docking scores of  $-9.8$  kcal/mol and  $-9.1$  kcal/mol, followed by theaflavin derivatives Theaflavin 3, 3'-O-digallate (TDG) and Theaflavin 3-O-gallate (TMG).

Out of 69 docked ellagitannins compounds, most of the compounds show binding affinities higher than that of NAG, however, we have listed top six compounds in Table 2 with their docking scores, which have been shown to be potential binders of spike glycoprotein of COVID19 virus in *in silico* drug-receptor interaction studies

This docking exercise shows that ellagitannin nucleus has more suitability to bind in the active site of spike protein as compared to Flavan-3-ol skeleton. Based on our previous reports [17, 18] TDG and TMG, were found to have excellent binding affinities towards Main Protease (Mpro) of COVID19 virus, and we were again surprised to notice that theaflavin derivatives (anti-asthmatic agents and are established bronchodilators) have potential to bind with spike glycoprotein too, based on obtained docking scores. Hence, in order to seek any relationship between anti-asthmatic and anti-COVID activity, we have also screened a number of anti-asthmatic drugs and A2-receptor agonist. Though, data from Table 3 have shown that anti-asthmatic drugs and A2-receptor agonist have poor binding affinities on Spike glycoprotein of COVID19 virus

## Molecular Interactions with Spike Protein

Similarly, the ligand interactions of SH6, Casuarictin, and Potentillin with spike glycoproteins were also studied and represented in Figure 5a, 5b and 5c and their interactions with amino acid residues are presented in Table 4.

## In-Silico ADMET Studies: Pharmacokinetic Prediction

We also carried out ADME studies of three active polyphenolic compounds, using Swiss ADME, [33] a free web tool to evaluate the pharmacokinetics and drug-likeness scores of medicinally important compounds. The *in silico* pharmacokinetic prediction and toxicity data of top three polyphenolic compounds are presented in Tables 5, 6 and 7.

The results show that these compounds violate the Lipinski rule of 5, because of their higher molecular weight  $>500$ . These natural compounds have low Gastro-intestinal (GI) absorption rate which leads to their low bioavailability and subsequent low plasma concentration. However, these challenges can be overcome by use of drug delivery vehicles or microencapsulation process [35, 36].

## Discussion

### Molecular Docking of Ligand NAG

The molecular docking was performed for the bound ligand N-acetyl glucosamine (NAG), this ligand is able to dock inside spike glycoprotein with the binding affinity value of  $-5.3$  kcal/mol. Figure 4, demonstrates the binding of NAG in S1 and S2 subunit with the spike glycoprotein. This inhibitor forms hydrogen bonds with key amino acid residues Asn 856, Cys743, Leu977, Arg1000, which are important for the interaction.



## ***Screening of Flavonoids Database (Ellagitannins and other Polyphenols) against Spike Glycoprotein***

In our earlier study on exploration of polyphenols against Mpro of COVID19 virus, we found that sanguin H6 (SH6), Theaflavin-di gallate (TDG), Theaflavin-mono-gallate (TMG) and punicalagin (PC) effectively bind to S1 subunit of substrate binding pocket of Mpro [17,18]. This, led us to perform their binding energy evaluation on spike glycoprotein (S-protein, where *in silico* docking results, again suggested the potentiality of these polyphenolic compounds to bind to spike glycoprotein in association with Mpro. Thus, these polyphenols can act both as entry inhibitors and stop the virus replication by inhibiting main protease.

The top scoring compounds SH6 and PC both bear ellagitannin nucleus, which inspired us to perform molecular docking of in house prepared ellagitannin database containing 69 compounds.

Sanguin-H-6 (hydroxybenzoic acid derivative) (SH6), is found to be the highest-scoring compound with the docking score of -9.8 kcal/mol, followed by Casuarictin and Potentillin (isomers) both at -9.4 kcal/mol followed by another hydroxybenzoic acid derivative i.e., Punicalagin with -9.1 kcal/mol binding affinity.

SH6, Casuarictin, and Potentillin compounds have shown excellent binding on the hinge of S1 and S2 subunits of spike glycoprotein. As they show hydrogen bonding interaction with S2 unit by interacting with HR region and SD2 region, and on the other side they form hydrogen bonds with amino acid residues of NTD (which is present in S1 unit).

The S1 unit is responsible for the virus attachment with its host ACE2 receptor, where potential ellagitannins were found to bind with

NTD, and can modulate the binding of virus with host cell.

Similarly, in S2 subunit its binding in HR region leads to disruption of membrane fusion stage, hence, ellagitannins have the capability to act as potential inhibitor of virus spike protein by inhibiting both cell surface attachment as well as membrane fusion. This docking exercise again proves the importance of Sanguin-H6 as compounds with potential anti-CoV activity as it shows excellent binding affinities with spike as well as Mpro of COVID19 virus.

In recent years' awareness about the use of natural products over the synthetic consumables has revived the scientists' attention to conduct research, which will support the concept of chemicals derived from a natural source [37] which are practically considered to be much safer. Nowadays phytochemicals or bioactive compounds mainly comprising of flavonoids derived from plant sources are being marketed as preventive medicines under the class of "nutraceuticals" [38-40]. The flourishing market of nutraceuticals products has created awareness among the consumer to use more natural ways to treat an ailment [41]. Therefore the knowledge of pharmacokinetics and drug-likeness properties of natural compounds is crucial as these compounds can be a future drug candidate/pharmaceutical adjuvant.

Since the drug development process involves absorption, distribution, metabolism and excretion, profiling it is very important to access the knowledge about drug targets, its sufficient concentration and the plasma concentration to bring about the effective concentration (EC). Thus, the Swiss ADME tools works on principle of molecular fingerprint over a particular structure to report details on pharmacokinetic data.

Apart from the solubility issue the three compounds SH6, Casuarictin, and Potentillin show good drug likeliness and fair pharmacokinetic profile with good data on synthesis accessibility.



## Conclusion

This *in-silico* investigation to identify a potent novel natural compound that can interfere in COVID19 virus attachment/internalization is decisively a seamless therapeutic option in the prevailing pandemic period. Bioinformatics based drug design studies have been effectively used by many for a fast and more or less accurate prediction of potential drugs or inhibitors against their targets.

In this study, we have virtually screened ellagitannins, polyphenols and FDA approved drugs (only anti-asthmatic and A2 agonist) to identify potent natural compounds that targets and binds to the spike protein of COVID19 virus. We have identified about 3 ellagitannins (Sanguin-H-6, Potentillin, Casuarictin) out of the whole pool capable of binding both S1 and S2 subunit of spike protein of COVID19 virus.

Our results suggest that all of these identified compounds, abundantly present in “berries”, have the potential to inhibit COVID19 virus attachment/internalization and should be explored further as preventive therapeutics for COVID-19.

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## Conflict of Interest

None to declare

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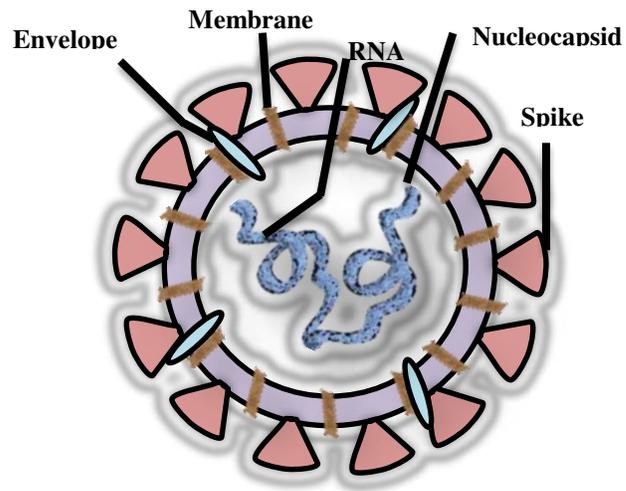


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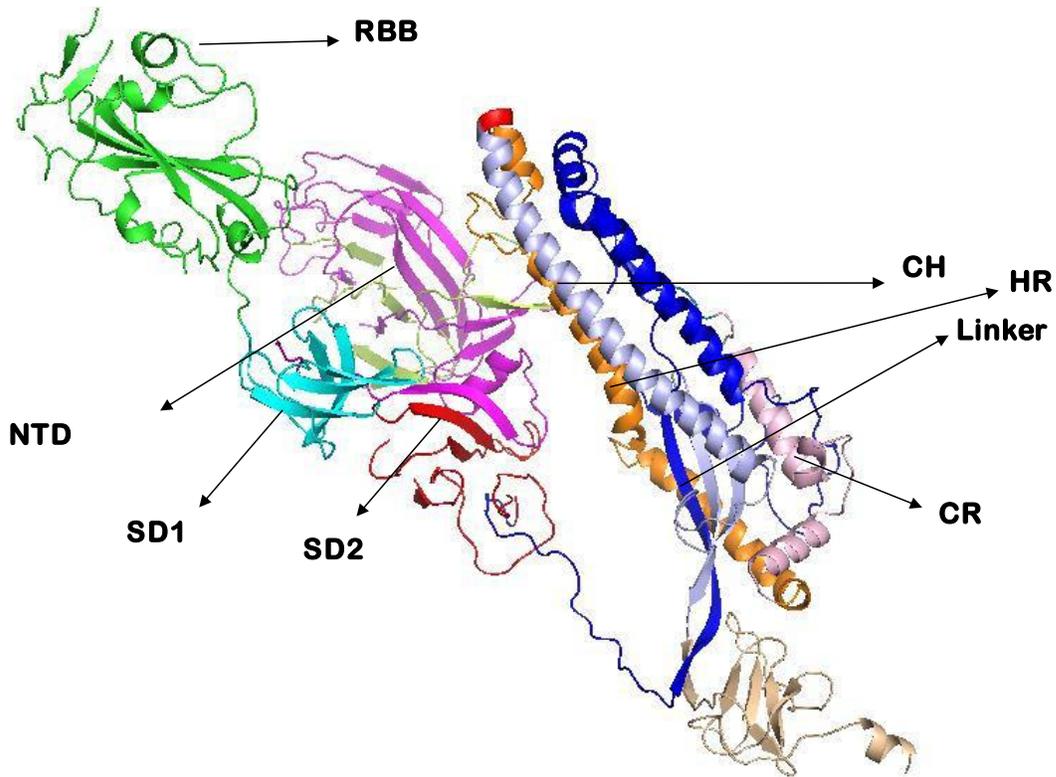


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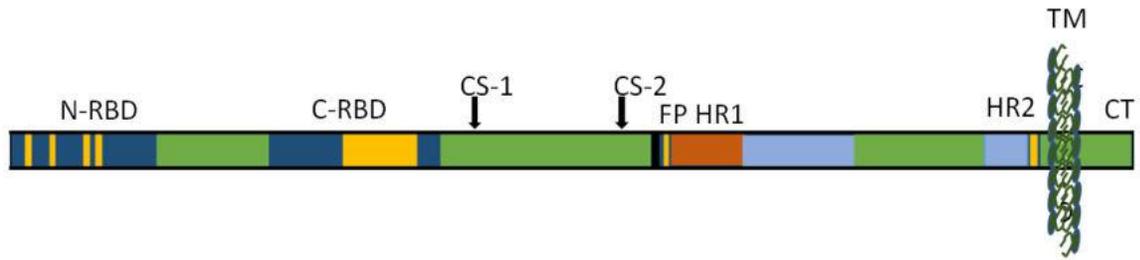
# Appendix



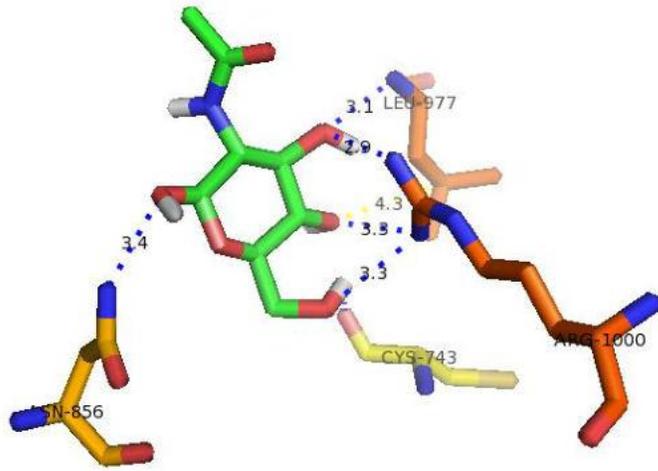
*Figure 1: Structural details of coronavirus*



**Figure 2:** *The 3D structure of spike protein is composed of multiple domains. RBD (residues 8–101) (shown in green); NTD (residues 102–184) (shown in magenta, have antiparallel  $\beta$ -sheets structure); SD1 (residues 201–303) (shown in cyan); SD2 (shown in red) These four domains form a part of S1 unit. However, S2 unit comprise of HR (shown in orange); CR (shown in light pink); CH (shown in violet); and a linker connecting S1 and S2 in blue.*

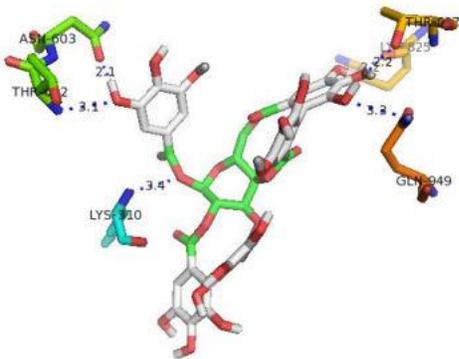
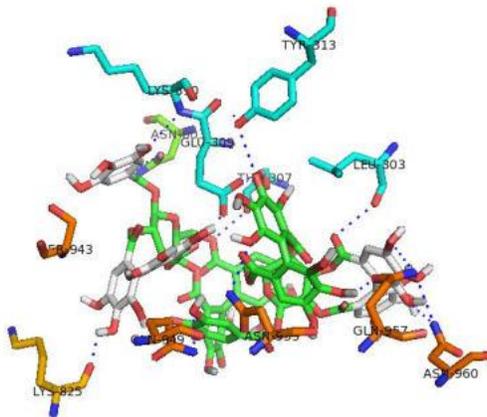


***Figure 3: Genome sequence of Spike Protein***

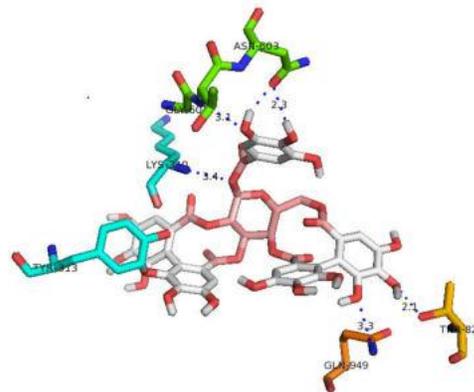


*Figure 4: Interactions of NAG with the residues of Spike glycoprotein*

5a



5b



5c

**Figure 5a:** Interaction of SH6 with the spike glycoprotein amino acid residues that forms hydrogen bonds. **5b:** Casuarictin forming hydrogen bonds with SARS-CoV-2 spike glycoprotein. **5c:** Potentillin interaction with spike glycoprotein.



**Table 1: Docking scores of top 14 polyphenols (screened as per our previous study on Main protease) [17, 18] on spike glycoprotein of COVID19 virus**

S.No.	Polyphenol Class	Polyphenol Sub-Class	Compound Name	Docking Score on Spike Protein (kcal/mol)
1	Flavonoids	Anthocyanins	Cyanidin 3-O-galactoside	-6.6
2	Flavonoids	Anthocyanins	Peonidin 3-O-rutinoside	-7.3
3	Flavonoids	Anthocyanins	Peonidin 3-O-(6"-p-coumaroyl-glucoside)	-6.7
4	Flavonoids	Anthocyanins	Peonidin 3-O-sophoroside	-6.2
5	Flavonoids	Anthocyanins	Peonidin 3-O-sambubioside	-6.8
6	Flavonoids	Anthocyanins	Isopeonidin 3-O-sambubioside	-6.8
7	Flavonoids	Flavanols	Theaflavin 3-O-gallate	-8.3
8	Flavonoids	Flavanols	Theaflavin 3,3'-O-digallate	-8.5
9	Flavonoids	Flavanols	Procyanidin dimer B5	-7.4
10	Flavonoids	Flavonols	Kaempferol 3-O-glucuronide	-7.5
11	Flavonoids	Flavonols	Kaempferol 3-O-(2"-rhamnosyl-6"-acetyl-galactoside) 7-O-rhamnoside	-6.3
12	Phenolic acids	Hydroxybenzoic acids	Protocatechuic acid 4-O-glucoside	-6.2
13	Phenolic acids	Hydroxybenzoic acids	Sanguiin H-6	-9.8
14	Phenolic acids	Hydroxybenzoic acids	Punicalagin	-9.1
15	--	--	NAG (bound ligand)	-5.3



**Table 2: Docking scores (in kcal/mol) of top 6 polyphenolic compounds against Spike glycoprotein of SARS-CoV-2 virus.**

S.No.	Compound Name	Docking Score on spike glycoprotein (kcal/mol)
	Sanguiin H-6	-9.8
	Punicalagin	-9.1
	Casuarictin*	-9.4
	Potentillin	-9.4
	Ellagitannin	-8.8
	Sanguiin h2	-8.7

\*isomer of potentillin

**Table 3: Molecular docking scores of top 2 scoring Anti-asthmatics and A2 agonist drugs against Spike glycoproteins of COVID19 virus (for more detail please see (Table S2 and S3, supporting information))**

S.No.	Compound Name	Docking score on Spike glycoprotein (kcal/mol)
<b>ANTI-ASTHMATICS</b>		
	Nepadutant	-8.2
	Revefenacin	-7.9
<b>A2 AGONIST</b>		
	Defibrotide Sodium	-8.2
	Rolofylline	-6.4



**Table 4: Molecular Interactions of high Docked Scoring Compounds with Spike Glycoprotein (6VSB)**

<b>S. No.</b>	<b>Compound Name</b>	<b>Hydrogen Bond</b>
1.	Sanguiin H-6	Tyr313, Leu303, Asn960, Gln957, Asn953, Gln949, Lys825, Ser943, Lys310, Glu309, Asn603
2.	Casuarictin	Asn603, Thr602, Lys310, Gln949, Thr827, Lys825
3.	Potentillin	Asn603, Gly60, Lys310, Try313, Gln949, Thr827



**Table 5: In Silico Pharmacokinetics Prediction (Lipinski parameters)**

<b>Compound Name</b>	<b>MW<sup>a</sup></b>	<b>n-rotb<sup>b</sup></b>	<b>n-ON<sup>c</sup></b>	<b>n-OH, NH<sup>d</sup></b>	<b>MR<sup>e</sup></b>	<b>TPSA<sup>f</sup></b>	<b>iLOG P<sup>g</sup></b>	<b>Lipinski #violations</b>	<b>Lead likeness #violations</b>	<b>Synthetic Accessibility</b>
Potentillin	936.65	3	26	15	212.26	444.18	1.62	3	1	7.35
Casuarictin	936.65	3	26	15	212.26	444.18	1.62	3	1	7.35
Sanguiin H-6	1871.27	12	52	29	423.8	877.36	2.33	3	3	10

<sup>a</sup>Molecular weight (MW), <sup>b</sup>Number of rotatable bonds (n-rotb), <sup>c</sup>Number of hydrogen bond acceptors (n-ON), <sup>d</sup>Number of hydrogen bond donors (n-OH,NH), <sup>e</sup>molar refractivity (MR), <sup>f</sup>Topological polar surface area (TPSA), <sup>g</sup>partition coefficient calculated between n-octanol and water by considering solvation energies (iLog P)



**Table 6: Swiss ADME Based Pharmacokinetics Prediction**

<b>Zinc ID</b>	<b>Ali Clas s</b>	<b>Silicos-IT class</b>	<b>GI absorp tion</b>	<b>BBB permeati on</b>	<b>Pgp substra te</b>	<b>CYP1A2 inhibitor</b>	<b>CYP2C19 inhibitor</b>	<b>Synthetic Accessibilit y</b>
Potenti llin	Insol ible	Soluble	Low	No	Yes	No	No	7.35
Casuar ictin	Insol ible	Soluble	Low	No	Yes	No	No	7.35
Sangui in H-6	Insol ible	Moderat ely soluble	Low	No	Yes	No	No	10



**Table 7: Toxicity Prediction for the Three Potential Polyphenolic Inhibitors of Spike Glycoprotein**

S. No.	ZINC ID	TA100_10RLI	TA100_NA	TA1535_10RLI	TA1535_NA	Ame s test	Carcino_Mouse	Carcin o_Rat	hERG_in hibition
1.	Sanguin H-6	negative	negative	negative	negative	non-mutagen	positive	Positive	ambiguous
2.	Casuarictin	negative	negative	negative	negative	non-mutagen	positive	positive	ambiguous
3.	Potentillin	negative	negative	negative	negative	non-mutagen	positive	positive	ambiguous

TA100\_10RLI/1535\_10\_RLI = TA100/TA1535 strain with metabolic activation by rat liver homogenate,

TA100\_NA/1535\_NA = TA100/1535 strain with no metabolic activation.

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# Vehicular Growth & Road Use Pattern Analysis for Traffic Planning of a Mid-Sized City using SPSS

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**Abstract-** Planning the traffic & transport facility for a mid-sized city or semi-urban city needs lots of traffic related components to be evaluated such as traffic volume, future vehicle demand, road use pattern, etc. This paper quantitatively examines the effect of traffic volume, vehicular growth and road use pattern in the movement of traffic. Traffic survey has been conducted to obtain the traffic volume and DTO vehicle record has been obtained to observe the vehicle data. DTO vehicle data has been used to analyze the future vehicle demand on the roads of the city as a part of the future traffic by applying MLR method for traffic forecasting using SPSS. The peak hour traffic volume data helps to identify the road use pattern during the morning & evening peak hours of a particular roads which helps to formulate a better traffic movement plan. An improved conclusion based on the quantitative methods is designed to solve the problems of existing traffic systems. The influence of some important parameters on the traffic analysis results was observed through a sensitivity analysis.

**Index Terms-** Traffic Volume, PCU, Mid-sized city, Road use pattern, Vehicle growth.

## 1. INTRODUCTION

[JEAN-PAUL RODRIGUE & Dr. BRAIN SLACK, 2013] Transport planning is most developed in the urban sphere, and it is there where most experience has been gathered. The predictions of future traffic flows produced by the four-stage sequence are then used to identify planning options. Study of traffic condition of Madhubani city have been done to enhance and provide a better traffic planning approach to improve the traffic problems of the city and reduce the traffic congestion, accidents, etc. For this purpose, the major traffic operated roads have been observed to calculate traffic volume. These roads have been surveyed to understand the traffic volume and road use pattern. The case study of Madhubani city have been used just for observing, analyzing and formulation a good traffic planning system for a mid-sized city. As Madhubani is a mid-sized city having no any traffic planning system, it had huge growth in traffic in last decade. It doesn't matter whether the city is small or large, where there is extreme traffic growth, there must need a traffic planning approach to maintain the proper traffic system of city. Lots of deficiencies are found in small cities regarding traffic. So, to overcome on the deficiencies of traffic, two of parameters in this paper have been analyzed. Traffic survey is very useful for understanding the traffic conditions. DTO vehicle record helps us to analyze or forecast the traffic of the city. The number of vehicles running on the roads of Madhubani have been obtained from the District Transport Office as shown in Table 3 and represented

in graphical form in Figure 3 to analyze the vehicle growth in past decades and to forecast the vehicle growth in the future decade. This will be considered a major factor for planning the traffic system of the city. The data are analyzed by SPSS. On the basics of results obtained, improvement methodologies and recommendations have been made.

## 2. STUDY AREA

Madhubani District is one of the thirty-eight districts of Bihar state, India. This semi-urban city has high traffic operations through-out the city area. There are lots of road connecting the different junctions, intersections, crossings, etc. shown in Figure 1.

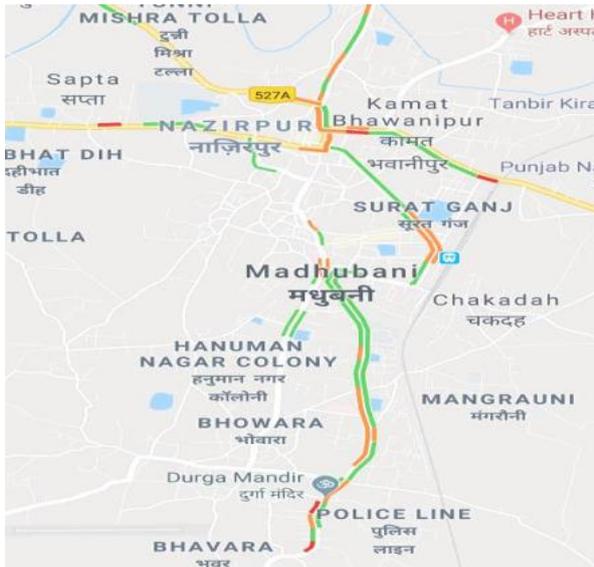


Fig.1. Study Area Traffic Route

The city has very less participation of public transport traffic for in/out through city to different destinations. Out of the total Madhubani population for 2011 census, 3.60 percent lives in semi-urban regions of district. In total 161,495 people lives in semi-urban areas of which males are 85,026 and females are 76,469. Though the Madhubani city is the key place for major marketing and employment of the district, there is always a huge traffic moving throughout the city. There are lots of road network on which the traffic condition is very serious, but there are certain roads with high traffic operations through-out the city. A study of the transport infrastructure for Madhubani is crucial for the understanding and analyzing micro level (within the different zones of the city – linkages between the different parts of city and the market).

### 3. METHODOLOGY

Traffic survey is the best method to collect the traffic data for the planning strategies. [HENSHER, 1982] If survey data is to be used to develop predictive models of travel and activity behavior, it therefore appears that longitudinal data, which can account for dynamic changes in behavior, is the preferred type of data to collect for further arguments to this effect. [JUSTO & TULADHAR, 1984] developed mathematical models to derive PCU values for vehicles on urban roads based on empirical data under mixed traffic flow. The PCU method have been adopted to convert the traffic survey data into a single unit for the uniformity of the traffic counts. DTO vehicle record also has been included for the data analysis. To analyze the Vehicular growth rate,

SPSS has been used to generate the equations of regression analysis. Traffic volume data is used to identify the road use pattern by analyzing the traffic volume data in SPSS for t-test.

### 4. DATA COLLECTION METHODOLOGY

#### 4.1. Traffic Volume Study

[Udit Batra, Mandar V Sarode, 2013] Traffic survey gives us the different analytical results such as traffic volume, road use pattern, future traffic growth, roadway capacity and Level of Service. After conducting traffic survey for the peak hour in morning & evening session on the roads identified (Thana Chowk Road) as the major traffic operations, traffic survey data summarized as shown in Table 1 & Table 2 for one of the roads among all the identified roads of major traffic operation. Figure 2 shows the variation of volume & PCU of different peak hour session wrt time on Thana Chowk Road. Likewise, traffic survey was conducted on all the roads and the data was used to analyze the various traffic related analysis.

Table.1. Motor Vehicle Volume for Thana Chowk Road in 1<sup>st</sup> Session

Time	09:00-09:15	09:15-09:30	09:30-09:45	09:45-10:00	10:00-10:15	10:15-10:30	10:30-10:45	10:45-11:00
Volume	116	124	130	151	139	119	118	113
PCU	96.1	95.8	86.9	109.1	89.7	86.9	101.7	93.7

Table.2. Motor Vehicle Volume for Thana Chowk Road in 2<sup>nd</sup> Session

Time	04:00-04:15	04:15-04:30	04:30-04:45	04:45-05:00	05:00-05:15	05:15-05:30	05:30-05:45	05:45-06:00
Volume	111	113	136	146	158	152	145	158
PCU	69.6	62.3	83.5	88.1	93.4	94.8	81	96.2

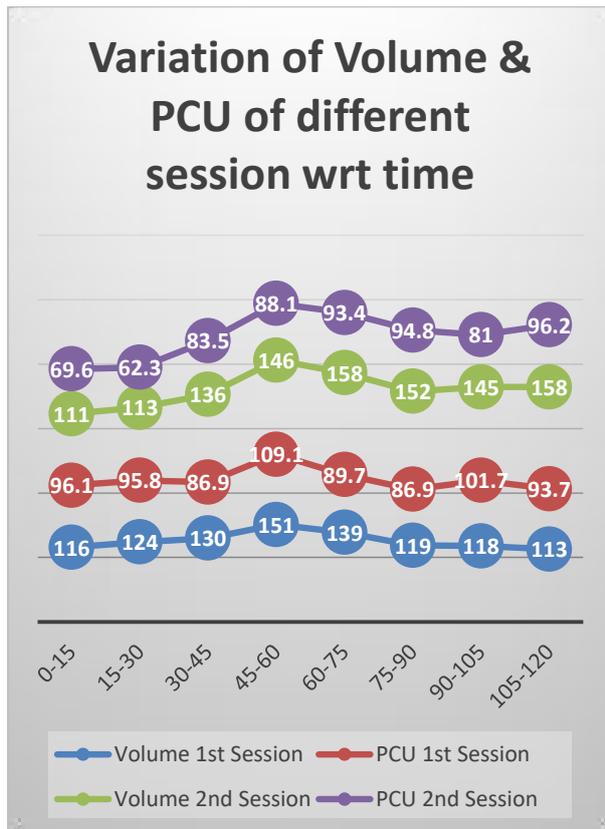


Fig.2. Variation of Volume & PCU of different session wrt time on Thana Chowk Road

4.2. DTO Vehicle Data

Table.3. DTO Vehicle Data Record

Year	Two Wheelers	Three Wheelers	Cars, Jeeps	Tractors	LMV	Bus/ Truck	Total
2011	4534	12	00	29	00	00	4575
2012	5988	23	11	37	09	00	6068
2013	7855	28	19	48	11	00	7961
2014	9767	37	26	52	15	00	9897
2015	11322	42	32	63	21	00	11480
2016	13100	51	41	71	26	00	13289
2017	14835	58	49	79	30	00	15051
Total	67401	251	178	379	112	001	68321

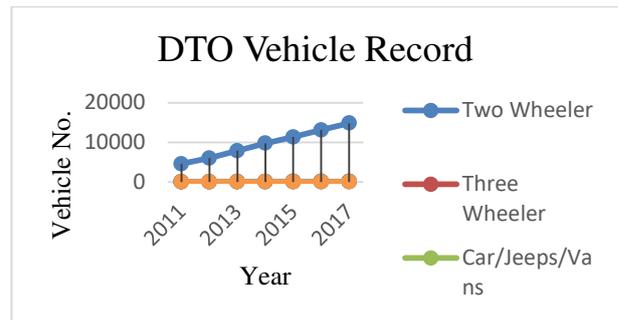


Fig.3. DTO Vehicle Record

5. DATA ANALYSIS & RESULT

5.1. Vehicular Growth Analysis

Vehicle growth rate signifies the growth of motor vehicle in the city. The maximum participation of the traffic movement in the city is the vehicle registered with the district transport authority. District transport authority have made available the data of the number of registered vehicles in the city. Refer Table.3. The significance of the analysis of motor vehicle registered data is to find the number of vehicles moving on the city road in the upcoming years. It will help in the estimation of the growth of the road network as per the vehicles moving on the road. Multiple regression analysis method best suit for this type of data analysis. MLR general expression:  $Y = a + bX$

$$b = (\sum XiYi - n\bar{X}\bar{Y}) / (\sum Xi^2 - n\bar{X}^2)$$

$$a = \bar{Y} - b\bar{X}$$

Mathematically, this formula can also be used for the data analysis, more ever, I had used SPSS for the analysis of the data. DTO Vehicle Data Record, the following regression analysis have been done and equations have been found for the different vehicle class shown in Table.4. Regression analysis of 2-wheeler vehicle is shown below. Likewise, regression analysis of all the category of vehicle have been done as given in Table.3.

Regression Analysis For 2-Wheeler:

Variables Entered/Removed<sup>a</sup>

Model	Variables Entered	Variables Removed	Method
1	VAR00002 <sup>b</sup>	.	Enter

a. Dependent Variable: VAR00001

b. All requested variables entered.

**Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.999	.999	.999	.06499

a. Predictors: (Constant), VAR00002

**ANOVA<sup>a</sup>**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	27.979	1	27.979	6623.391	.000 <sup>b</sup>
	Residual	.021	5	.004		
	Total	28.000	6			

a. Dependent Variable: VAR00001

b. Predictors: (Constant), VAR00002

**Coefficients<sup>a</sup>**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	8.456	.072		116.774	.000
	VAR00002	.001	.000	1.000	81.384	.000

a. Dependent Variable: VAR00001

**Model Summary and Parameter Estimates**

Dependent Variable: VAR00002

Equation	Model Summary					Parameter Estimates	
	R Square	F	df1	df2	Sig.	Constant	b1
1	.999	6623.391	1	5	.000	8.456	.001

Linear		6623.391	1	5	.000	-14668.000	1735.500

The independent variable is VAR00001.

Table.4. Regression equations for Vehicle growth rate

Sr.No.	Vehicle Class	Regression Equation
01	Two Wheelers	Y = -14668 + 1735.5 X
02	Three Wheelers	Y = -68.1 + 7.4 X
03	Cars, Jeeps, Vans	Y = -84.5 + 7.9 X
04	Tractors	Y = -62.3 + 8.3 X
05	LMV	Y = -51.4 + 4.8 X

After inserting the year (X) in the different equation shown in Table.4. for the specific vehicle class, we found the future number of vehicles estimated to be registered with district transport office and will be running on the roads of city as shown in Table.5.

Table.5. Future estimated vehicle record

Year	Two - Wheeler	Three - Wheeler	Cars, Jeeps, Vans	Tractors	LMV	Total	Growth Factor
2018	16571	65	58	87	35	16816	1.11726795
2019	18306	72	66	95	40	18579	1.10484062
2020	20042	80	73	104	45	20344	1.09499973
2021	21777	87	81	112	49	22106	1.08661030
2022	23513	95	89	120	54	23871	1.07984257
2023	25248	102	97	129	59	25635	1.07389719
2024	26984	105	105	137	64	27395	1.06865613
2025	28719	117	113	145	69	29163	1.06453732
2026	30455	124	121	153	73	30926	1.06045331
2027	32190	132	129	162	78	32691	1.05707172
Total	243805	979	932	1244	566	247526	Av.=1.098

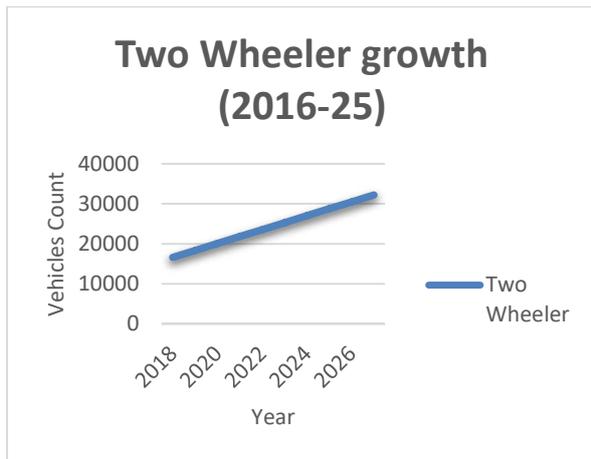


Fig.4. Two-Wheeler Growth (2016-25)

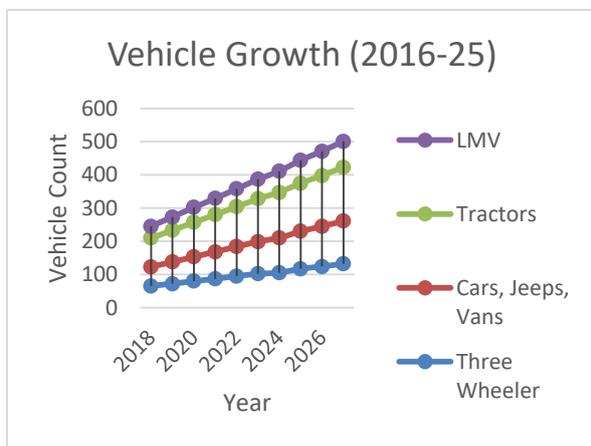


Fig.4. Vehicle Growth (2016-25)

It has been found that the average growth in the number of registered vehicles in the city will be 1.098. The Figure 3 & Figure 4 explains better the trends of future growth of vehicles.

**5.2. Road Use Pattern Analysis**

Road use pattern is the hypothetical analysis of the PCU generated on a particular stretch of road section during morning peak hour and evening peak hour. This study gives the analysis of the road use pattern with respect to the survey sessions. [Singh S. K., 2014] Road use pattern gives the analytical observation of the road section whether the pattern of road use by the motorist in morning peak hours is same of different with the evening peak hours. This method uses the researcher approach as the data is limited, Parametric test of two sample will be used as Paired t-test is perfect suit for the analysis of these types of data. At 5 % significance level, t-Critical should be 1.9146. We get t-stat valus 2.033. Now if t-stat will be greater than t-critical then the road use

pattern is different for the both sessions otherwise it will be same road use pattern in 1<sup>st</sup> session and 2<sup>nd</sup> session. The road use pattern of the different roads are shown in Table.6.

We have 8 number of samples so,

$$d.f. = (8+8-2) = 14.$$

For d.f. = 14 at 5 % significance level, the t-Critical is 1.9146.

**T-Test for Thana Chowk Road:**

**Paired Samples Statistics**

	Mean	N	Std. Deviation	Std. Error Mean
Paired Sample 1 PCU in 1st Session	94.9875	8	7.62092	2.69440
Paired Sample 2 PCU in 2nd Session	83.6125	8	12.28791	4.34443

**Paired Samples Correlations**

	N	Correlation	Sig.
Paired Sample 1 PCU in 1st Session & Paired Sample 2 PCU in 2nd Session	8	-.221	.600

**Paired Samples Test**

	Paired Differences					t-stat	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference			
				Lower	Upper		
Paired Sample 1 PCU in 1st Session - Paired Sample 2 PCU in 2nd Session	11.37500	15.82392	5.59460	-1.85413	24.60413	2.0337	.082

Table.6. Road Use Pattern Analysis

Sr.No.	Road Section	Significant/Not Significant	Type of Pattern
01	Thana Chowk	Not Significant	Different

	Road		
02	Neelam Chowk Road	Significant	Same
03	Bata Chowk Road	Significant	Same
04	Churi Bazaar Road	Significant	Same
05	Mahila College Road	Not Significant	Different
06	Railway Station Road	Not Significant	Different
07	Ganga Sagar Chowk Road	Significant	Same
08	Old Bus Stand Road	Significant	Same
09	Bara Bazaar Road	Significant	Same
10	Chavaccha Mor	Significant	Same

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## 6. CONCLUSION

It has been concluded that at peak hour the traffic volume is very much in morning session i.e. 402.7 PCU/hr and in evening session i.e., 372.5 PCU.hr which is slightly more than the normal capacity of smooth traffic operation which cause traffic congestion. By the continuous growth in vehicles at a rate of 1.098 per year, market area road has not been extended cause the major congestion. Traffic volume data is very helpful for identifying the road use pattern of traffic during both peak hours. The major roads have different road use pattern for example; Mahila college road & railway station road which means the road use demand varies from morning session to evening session. Traffic growth analysis is very important for the future planning of transport facilities. Road use pattern helps to identify the trends of usability of roads during different peak hours which helps in identifying the roads used for diversion of traffic during the congestion hours.

### Conflict of Interest

The author confirms that there is no conflict of interest to declare for this publication.

### Acknowledgments

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# TRAFFIC SIMULATION & INTEGRATION USING SUMO SIMULATOR

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## Abstract

Road network management is an important task for the development of any city. As no exact model of traffic flow exists due to its high complexity and chaotic Organisation, researchers mainly try to predict traffic using simulations. Simulation is a best practical method to plan for the proper road & traffic management. In this study, the road networks of Madhubani city has been integrated in SUMO. Open street map used for the map creation of the city road network. The various road networks and vehicles on the road as per traffic data have been taken as input and simulated in SUMO. Through this simulation, better traffic signal planning has also been discussed. It has been observed that the road & transport integration is not suitable at large scale as the city don't have multimodal transport facility.

**Keywords:** Simulation, Integration, SUMO, Traffic.

## I. INTRODUCTION

In order to decrease the travel time, reduce traffic congestion & to integrate the various traffic routes, Simulation of Urban Mobility (SUMO) traffic simulation tool is used to simulate the traffic studies. SUMO was developed by The German Aerospace Center as a traffic simulation tool and it is an open source, highly portable, microscopic road traffic simulation package. SUMO is licensed under the GPL. As the simulation is multi-modal, which means that not only are car movements within the city modelled, but also public transport systems on the street network, including alternative train networks, the atomic part of the simulation is a single human being.[Sanjiv K. Shukla & Anupam Agrawal, 2015] In the Indian context other vehicles are also used on the road such as Auto Rickshaws, Man pulled Rickshaws, Motorbike also some time roaming of domestic animals on the road. This is great a challenge to consider those parameters and model the computer traffic simulation and also in the real traffic management.

SUMO helps to prepare and perform the simulation of a traffic scenario along with traffic simulation [Krajzewicz D. et. al., 2012]. SUMO utilizes a variant of Gipps car model namely Krauss car model for the simulation in default which is based on safety conditions derived from braking distances of the individual vehicle. In Krauss model, between car drivers is described using the maximum safe velocity ( $V_{safe}$ ). The formula is given in equation as below:

$$v_{safe} = (v_{n+1}(t) + \{(g_n(t) - v_{n-1}(t)\tau) / ((v_n(t) + v_{n+1}(t)) / 2b) + \tau\})$$

Where:

$$g_n(t) = x_{n-1}(t) - x_n(t) - s$$

$$v_{des} = \min\{v_n(t) + a.\Delta t, v_{safe}, v_{max}\}$$

$$v_n(t + \Delta t) = \max[0, \text{rand}\{v_{des} - \epsilon a, v_{des}\}]$$

The position of the vehicle is denoted by index 'n' and predecessor vehicle has higher index. So, in the traffic, leading vehicle has the highest index. The maximum acceleration (a), deceleration (b), and jammed spacing (s) are assumed constant. The distance between two vehicles is denoted by  $g_n(t)$ , vehicle desired speed ( $v_{des}$ ) expresses how big the desire of drivers to accelerate their vehicle with a maximum speed, and the time step ( $\Delta t$ ) is assumed to be equal to the reaction time ( $\tau$ ). In the randomization step, each vehicle will be slowed down by random amount that is distributed between 0 and  $\epsilon a$ , where  $\epsilon$  is a value between 0 and 1.

Four step simulation model is used to proper run the simulation on SUMO as follows:

- I. In the first step, the network building is required in the XML format. It includes the road network, intersection or junction and traffic lights.
- II. In the second step, demand file is required to create. It includes the physical property of vehicles such as type of vehicle, acceleration, deceleration, the length of the vehicle and maximum speed.
- III. In the third steps, the computation of dynamic use assignment is required. Dynamic user assignment is a traffic assignment which the assumption of the OD-matrix and the link flows are to be time dependent. It also simulates updated route choice.
- IV. The last step is to run the simulation. The simulation can be run if the file contains the network, the information of routes that will be used in the simulation, the time period when the simulation will begin and end.

With all information, the simulation can be performed in order to get a base model that will be applied to the simulation scenario [Leksono C. Y. and Andriyana, T., 2012].

Additionally, NETCONVERT tool is used in this study for the generating road network from the XML file. NETCONVERT is a command line tool and it is developed in C++ language. It can import digital road networks from different sources and generates road networks that can be used by other tools including SUMO [66].

## II. METHODOLOGY

SUMO tool requires various data set such as road geometry of the city, traffic flow and turning movement, queue length of each section in a certain time period, travel time data which is used for calibration. Open Street Map website was utilized to obtain the road geometry data of Madhubani. The Open Street Map website provides facility to save street data on OSM file format. The .OSM file format is specific to Open Street Map. It is coded in XML and contains geographical data in a structured, ordered format. Open Street Map contains only the street structure for the Madhubani city. Therefore, the Google map was used to validate and for proper naming of the street. SUMO uses the road network structure file in the XML file format; hence,

NETCONVERT tool was utilized to convert OSM files into road network structure file format. Fig. 5.3 shows the road network structure which was extracted from open street map and converted as desired format. Traffic flow data were collected by observation of the study location by traffic survey. In these regards, the major entry and exit points were identified and data were collected during the peak traffic hours 9:00 AM to 11:00 AM and 04:00 PM to 06:00 PM. The overall traffic flow was estimated on based that. Similarly, queue length and travel time data were collected.

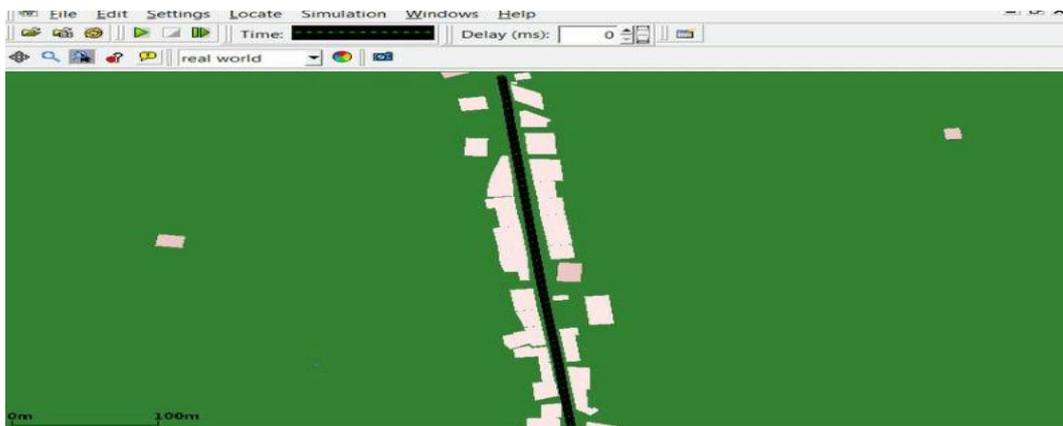


Fig.5.1. Road network development in SUMO for Station Road

The route data is also required for the simulation on SUMO which contains a basic property of the vehicles such as length, acceleration and deceleration, and maximum speed of the vehicle. In this regard standard properties of vehicles were considered.

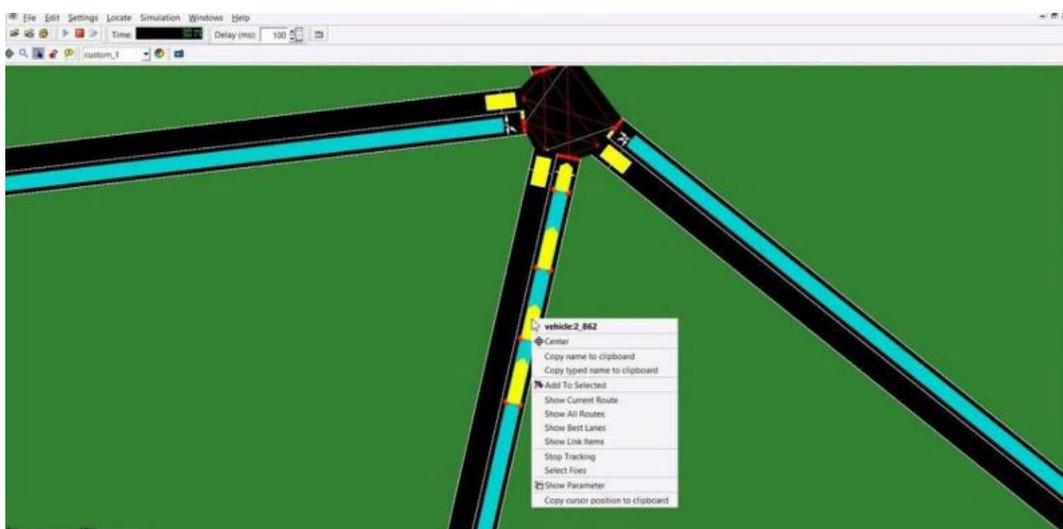


Fig.5.2. Road network development in SUMO for Thana Chowk Road

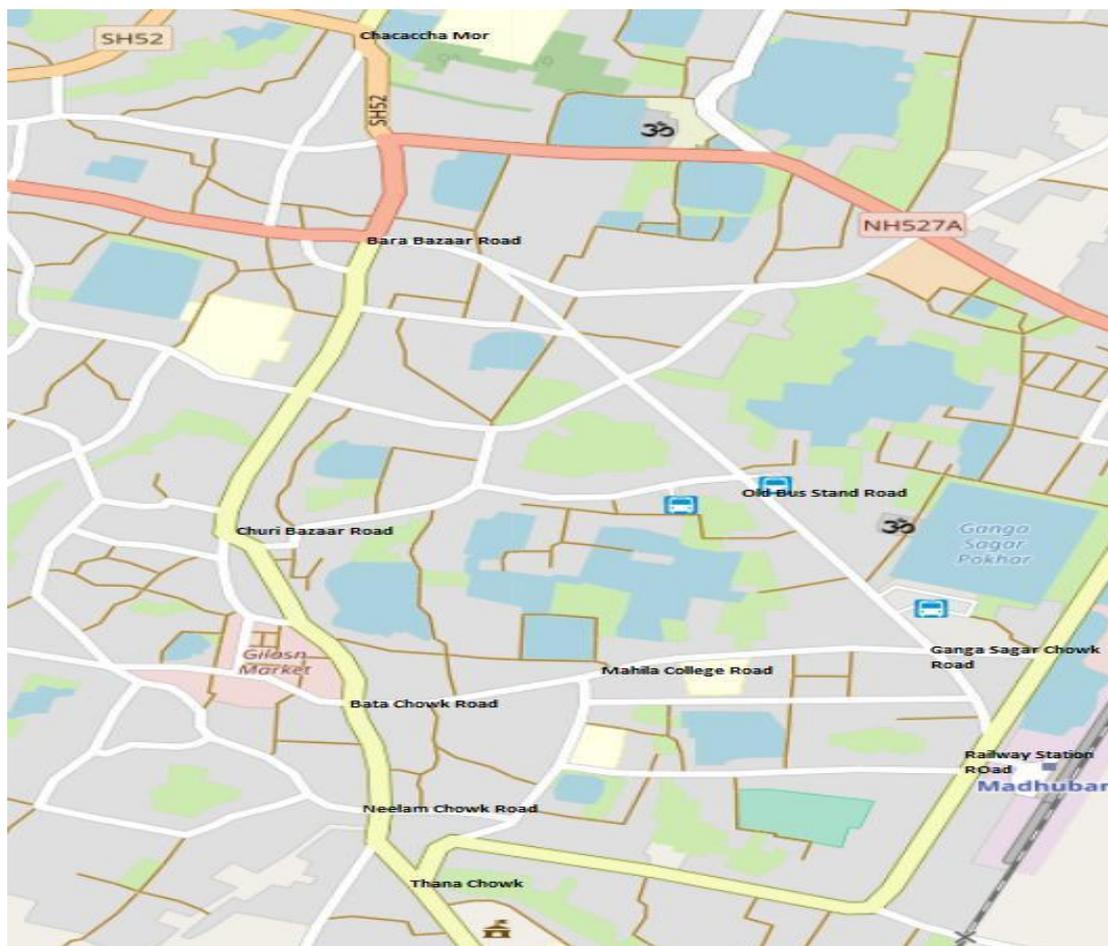
### III. EXPERIMENT

The simulation was performed in SUMO version 0.22.0 by considering the above-mentioned data set.

The experiment was performed as per the following step:

- i. In the first step network was built.

- ii. In the second step demand modeling was performed in this regard's vehicle characteristics were supplied.
- iii. In the last step configuration file was developed. It contains the network file and demand file.
- iv. This file was saved with extension of sumo.cfg. This configuration file was supplied to SUMO to observe the simulation result.
- v. Further, calibration process was performed to identify the possible better parameters. It can be several parameters which will adjust to find the optimal value in trail process. It can be used for the allowable minimum distance between two vehicles, maximum acceleration, road speed limit (sigma), and the drivers' reaction time (tau). The initial model before the adjustment parameter is taken from the [Maciejewski. M., 2010] research work for the calibration purpose and it is shown in the Table 5.1.



**Fig.5.3. Map of Road Network for Simulation**

**Table.5.1. Initial Model Before Adjustment**

V Type	Len (m)	Speed (m/s)	Min. gap (m)	Car Following	Max. Acc. (m/s <sup>2</sup> )	Sigma	Tau (s)
Car	5	27.78	2	Krauss	5.50	0.50	1
Bus	15	27.78	3		5.50	0.50	1
Truck	10	27.78	3		5.50	0.50	1

#### IV. RESULT & CONCLUSION

Following results for simulation & road network integration were observed & suggested through SUMO:

- i. Alternative scenario was developed and it was found traffic congestion reduced when some traffic diverts into Jaldhari Chowk (NH527A) Road high rather than Old Bus Stand Road for traffic approaching Bara Bazaar & Chavacchamor exit.
- ii. Similarly, we can divert route through Nidhi Chowk – Stadium Road – Maharaj Gunj Road – Gandhi Chowk – Rahika Road for the traffic which is meant to reach to the destination towards Rahika-Jaynagar road.
- iii. Traffic signals were designed for Ganga Sagar Road as shown in Fig.5.4.

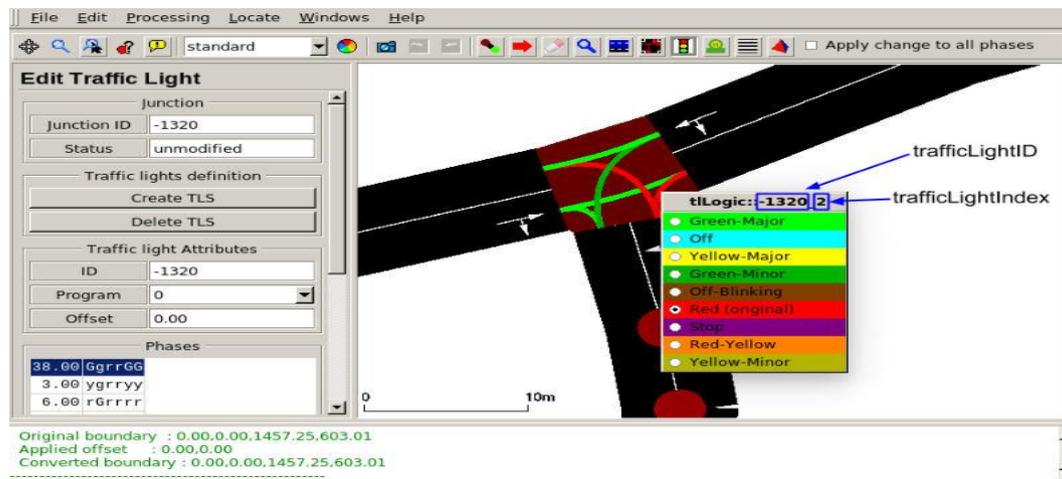


Fig.5.3. Traffic Signal Design for Ganga Sagar Road

- iv. In order to reduce traffic congestion in road network Thana Chowk-Neelam Chowk-Bata Chowk-Churi Bazaar-Thana Chowk, personal four-wheeler vehicle entry should be restricted and this road network should be integrated with the public transport preferably e-rikshaws or autos.
- v. Road network for airport connectivity also to be integrated through stadium road which may not disturb the traffic of the city area.
- vi. Multilevel traffic integration is not suggested and is also not feasible upto larger extent because, there is very less movement of multimodal transport throughout the city.

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# Corrosion assessment and control techniques for reinforced concrete structures: a review

Md Daniyal<sup>1</sup> · Sabih Akhtar<sup>1</sup>

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## Abstract

Steel corrosion is the main source of damage and early failure of reinforcement concrete structures that in turns create huge economical loss and creating environmental problems. In the past, several corrosion assessment techniques such as potential measurement, gravimetric weight loss measurement, electrical resistivity measurement, sensors and electrochemical methods for instance potentiodynamic polarization, linear polarization resistance, galvanostatic pulse, and electrochemical impedance have been developed to detect corrosion condition of steel in concrete. Though the potential measurement, resistivity measurement and sensors can only provide the qualitative information about the steel corrosion. The weight loss measurement is an efficient technique for corrosion rate measurement of steel, but it is destructive and requires long exposure times. The electrochemical techniques are non-destructive in nature and are used to determine corrosion rate of steel in laboratory as well as field studies. However each of these methods possesses certain advantages and limitations, therefore a combination of these techniques is recommended to use to obtain the corrosion condition of steel. As far as corrosion control techniques for steel reinforced concrete are concerned, several methods such as cathodic protection, electrochemical chloride extraction, surface treatments of the steel, surface treatment of concrete, utilization of mineral admixtures and chemical corrosion inhibitors have been developed in the past. Each of these methods offers some advantages and disadvantages. Thus, more researches are required to develop such methods of corrosion protection of steel that are economical, durable, environment-friendly and do not cause any adverse effect on the structural performance of concrete and steel.

**Keywords** Steel corrosion · Economical loss · Environmental problems · Corrosion assessment techniques · Corrosion control techniques

## 1 Introduction

Prior to the invention of cement, mortars were made by mixing water, sand and slaked lime [1]. John Smeaton discovered hydraulic lime mortars in 1754 [2]. A British mason named Joseph discovered the cement in 1824 and filed the first patent on Portland cement [3]. However, the objects prepared with the use of Portland cement were extremely brittle and incapable to tolerate shocks. Joseph Monier, a French gardener in 1867 made flowerpots with embedded iron nails and consequently observed a remarkable enhancement in the durability of his pots. Afterward, efficient scientific developments in concrete manufacture took place. In

1911, American Society for Testing and Materials (ASTM) formulated a detailed specification for the utilization of steel in concrete [4]. Subsequently, various developments ensued in designing the steel reinforcement bars in order to produce stronger and durable concrete structures. Consequently, the steel-reinforced concrete became the most widely used structural material in the world because of its economical, strength and durability properties. Steel-reinforced concrete structures were viewed as maintenance-free and unlimited service life until the mid-1970s. Conversely, since then, several durability related problems have emerged, such as alkali-silica reactions, sulphate attacks and corrosion of steel reinforcement. Among all durability related problems in steel-reinforced concrete structures, corrosion of steel reinforcement has been recognized as the main source of deterioration [5].

Generally, the corrosion affects our daily lives directly as well as indirectly. In direct, it shortens the useful service

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life of our goods. In indirect, the manufacturer and provider of goods and services incur costs of corrosion from the clients. In particular, the corrosion of reinforcing steel bar in concrete results the collapse of bridges, failure of a part of highways, damage to buildings, and parking structures, etc. consequently endangers public safety and requires considerable repair costs. For instance, the unexpected collapse of the Silver Bridge over the Ohio River at Point Pleasant due to corrosion fatigue in 1967 resulted in deaths of 46 people and cost millions of dollars [6]. Therefore, in order to estimate the cost of corrosion in the United States (US), a study entitled “Corrosion Costs and Preventive Strategies in the United States” was conducted with the help of Federal Highway Administration (FHWA) and National Association of Corrosion Engineers (NACE) International, from 1999 to 2001 by CC Technologies Laboratories. This investigation estimated the average direct cost of corrosion of \$8.3 billion per year for highway bridges alone and the total corrosion cost of US industries was estimated to \$276 billion annually, which is approximately equal to 3.1% of the US Gross Domestic Product (GDP) [7]. In 2014, a study entitled “International Measures of Prevention, Application, and Economic of Corrosion Technologies (IMPACT)” was initiated by NACE International and conducted by Det Norske Veritas (DNV), Germanischer Lloyd (GL), and American Productivity and Quality Center (APQC) and its industry and technology partners worldwide. From this study, the cost of corrosion at the global level is estimated to be \$2.5 trillion per year, which is about 3.4% of the global GDP in 2013 [8]. Hence, from the safety and economical perspective, the corrosion of steel reinforcement is very serious problem that can affect the sustainability of the steel-reinforced concrete structures directly. Numerous studies have been conducted worldwide in order to extend service life of steel reinforced concrete structures; regardless of this, several aspects are still not well known, and there is the requirement to incorporate present facts into practical field.

In this paper, an attempt has been made to review the studies pertaining to corrosion of steel reinforced concrete conducted by various investigators. The paper is organized in two major thematic sections. In the first section, an

overview of various corrosion monitoring techniques for steel reinforced concrete has been undertaken. The second section includes studies related to the different corrosion control methods for steel reinforced concrete.

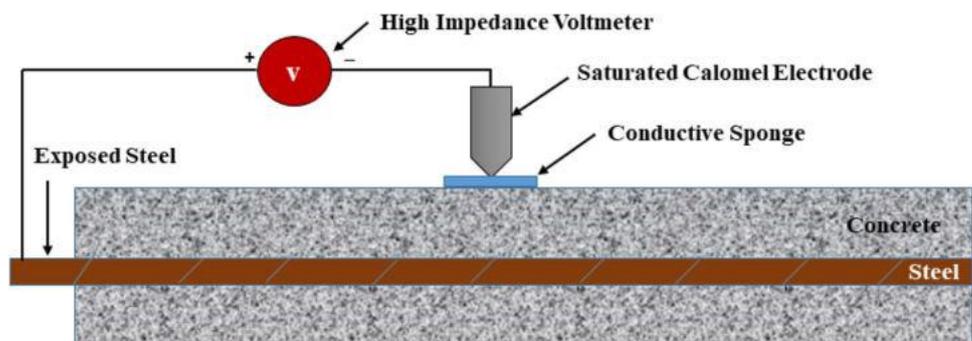
## 2 Corrosion assessment techniques

The maintenance and repair of steel reinforced concrete structures for their safety needs effective monitoring and inspection methods for evaluating the corrosion of steel reinforcement. These methods need to be able to identify any probable durability problems within structures before they become severe. Since the corrosion of steel reinforcement occurs through electrochemical reactions involving charge (electrons) transfer via concrete pore solution (electrolyte), electrochemical methods are appropriate to study the corrosion processes. In this section, some electrochemical and non-destructive techniques commonly used for monitoring the corrosion of steel in concrete structures have been discussed. Further, a destructive technique viz. the gravimetric weight loss method and corrosion monitoring using sensors have been reviewed.

### 2.1 Open circuit potential measurement

The basic principle involved in this method is the measurement of corrosion potential (also called half-cell potential or open circuit potential) of steel reinforcement with respect to a standard reference electrode (RE) such as copper/copper sulphate electrode (CSE), silver/silver chloride electrode (SSCE), standard hydrogen electrode (SHE) and Saturated Calomel Electrode (SCE). The reference electrode has a predetermined potential. For example, the SCE has a potential of + 242 mV vs. the SHE (assumed potential of 0.0 V) at room temperature. The schematic diagram for open circuit potential ( $E_{OC}$ ) measurement is shown in Fig. 1 [9]. In accordance with ASTM C 876, the probable corrosion conditions of steel reinforcement related with  $E_{OC}$  values is presented in Table 1 [10].

**Fig. 1** Illustration of  $E_{OC}$  measurement technique [9]



**Table 1** Corrosion risk of steel reinforcement associated with  $E_{OC}$  values [10]

$E_{OC}$ values				Corrosion risk
(mV vs. CSE)	(mV vs. SSCE)	(mV vs. SHE)	(mV vs. SCE)	
< - 500	< - 406	< - 184	< - 426	Severe
< - 350	< - 256	< - 34	< - 276	High
- 350 to - 200	- 106 to - 256	+ 116 to - 34	- 126 to - 276	Intermediate
> - 200	> - 106	> + 116	> - 126	Low

The open circuit potential ( $E_{OC}$ ) of a steel is a measure of its tendency to corrode. However, these  $E_{OC}$  values are not sufficient criterion, as they are affected by many factors, such as polarization by partial diffusion of  $O_2$ , porosity of concrete and the existence of resistive layers. Therefore, it is commonly believed that  $E_{OC}$  measurement must be complemented by other techniques [11]. This technique is very useful in identifying the anodic and cathodic locations in steel–concrete structures by drawing potential map. Numerous investigators have studied the effectiveness of this method and got advantageous outcomes [12–14]. However,  $E_{OC}$  values can provide information for degree of corrosion risk only and cannot specify the corrosion rate [15].

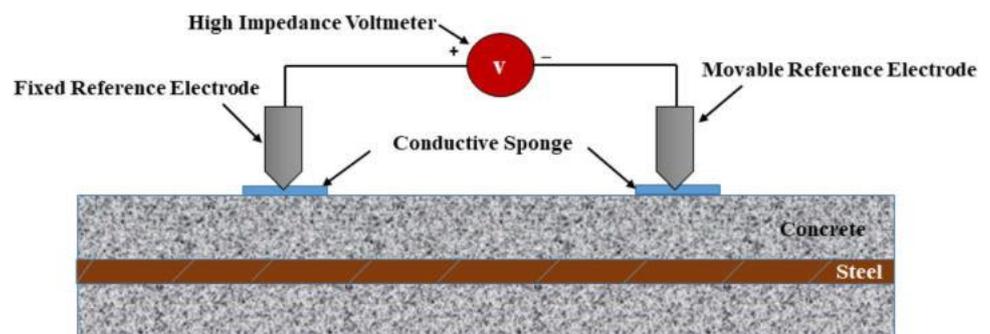
## 2.2 Surface potential measurement

This is another useful non-destructive method to identify the condition of steel embedded in concrete. In this method, two reference electrodes are used as shown in Fig. 2 [9]. One electrode is kept fixed (called fixed electrode), the other electrode (called movable electrode) is moved along the structure on the nodal points. When movable electrode is placed at the nodal points, the potential is measured against the fixed electrode by means of a high impedance voltmeter. A more positive potential value signifies anodic region where corrosion is possible. The higher the potential difference between anodic and cathodic zones higher is the possibility of corrosion. Therefore, surface potential measurement is used for detecting anodic and cathodic areas in steel–concrete structures and ultimately identifying the possibility of corrosion of steel in concrete [9].

Although potential measurement techniques (open circuit potential and surface potential measurements) have been used extensively, some of their limitations has described as follows:

- The measured potential difference between the reference electrode and the steel in concrete depends on the corrosion condition of the steel and on the type of reference electrode used [16].
- A simple comparison of the measured potential values with the ASTM recommendations on probability of steel rebar corrosion could not be useful. This is because of the fact that a more negative value of potential, which is usually considered to specify a greater possibility of corrosion, may not be valid always as several factors can change the potential values towards more negative or positive values [17].
- While performing the potential measurements, potential values should be interpreted according to the resistivity of the steel reinforced concrete system. Otherwise, the outcomes can be misrepresentative for the same degree of corrosion. Thus, one can get different potential readings at the surface of concrete, corresponding to different values of resistivity, and consequently have more than one probability for the same condition of corrosion [18].

On account of the above limitations, the use of potential measurements is considered as the first methodology for detection of corrosion, and thus requires to be complemented with other non-destructive methods for advance diagnosis.

**Fig. 2** Schematic diagram of surface potential measurement [9]

### 2.3 Potentiodynamic and cyclic polarization

The recent theory of electrochemical corrosion is based on electrode kinetics. The corroding system wherein a single anodic reaction and a single cathodic reaction take place on a single electrode surface, the relationship of the current as a function of potential can be written as Eq. (1). This equation is derived by the application of the mixed potential theory and Butler-Volmer equation [19–21]:

$$i = i_{\text{corr}} \left[ \exp \left\{ \frac{2.303(E - E_{\text{corr}})}{\beta_a} \right\} - \exp \left\{ \frac{-2.303(E - E_{\text{corr}})}{\beta_c} \right\} \right] \quad (1)$$

where,  $i$  = external current density ( $\text{A}/\text{cm}^2$ ),  $E$  = potential applied to polarize the corroding system (V),  $E_{\text{corr}}$  = corrosion potential (V),  $i_{\text{corr}}$  = corrosion current density ( $\text{A}/\text{cm}^2$ ),  $\beta_a$  = anodic Tafel constant (V/decade),  $\beta_c$  = cathodic Tafel constant (V/decade). However, when  $E$  is far away from  $E_{\text{corr}}$  then the Eq. (2) gives the Tafel equation [22]:

$$E = a \pm b \log |i| \quad (2)$$

where,  $a$  = a constant and  $b = \beta_a$  or  $\beta_c$

The Eq. (2) shows that the variation of the logarithm of the external current density with the potential is linear at high overpotential. The  $i_{\text{corr}}$  can be calculated by extrapolating the anodic and cathodic straight lines of  $E$  vs.  $\log |i|$  plot at the  $E_{\text{corr}}$ . Moreover, the  $E$  vs.  $\log |i|$  plot and various corrosion kinetic parameters can be determined easily by conducting potentiodynamic and cyclic polarization test using inbuilt software provided by the potentiostat manufacturer. A potentiostat is a specifically designed instrument that measures the potential/current characteristics of an electrochemical (electrode/solution) interface [23].

In order to perform the potentiodynamic or the cyclic polarization scan, three electrodes, electrolyte (testing solution) and a potentiostat are required. The electrodes include a working electrode (the test sample itself), a counter or auxiliary electrode (used to transport the current to the working electrode and to close the electrical circuit) and a reference electrode (used to measure the potential difference). In order to conduct the scan, these electrodes are to be immersed in the electrolyte and attached to the potentiostat [13, 14]. Moreover, the potentiostat is a device that is used to apply potential and record the induced current or vice versa. More explicitly, both controlled-current (Galvanostatic) and controlled-potential (Potentiostatic) polarization can be applied. The term ‘polarization’ means the perturbation of the potential of a sample in electrolyte from its open circuit potential ( $E_{\text{oc}}$ ). This can be done by two ways, i.e. when the polarization is accomplished galvanostatically, potential is measured and when it is achieved potentiostatically, current is measured. However, the potentiostatic method is much

more common than galvanostatic method. The response (i.e., resulting current) of the sample is measured as it is polarized. The response is used to develop a model of the sample’s corrosion behaviour [9].

The potentiodynamic polarization is used to study the corrosion behaviour and to calculate the different corrosion parameters such as corrosion current density ( $i_{\text{corr}}$ ) of a corroding system in a certain environments. In a usual potentiodynamic scan, the potential ( $E$ ) is swept over a fixed range by potentiostat and the induced current is recorded as a function of potential. The graphical output of a potentiodynamic scan is referred to as Tafel plot (named after Swiss chemist Julius Tafel), which is a plot of the potential ( $E$ ) versus the logarithm of the current density ( $\log |i|$ ). In order to perform several tests on one sample (i.e., non-destructive test) the scan range should be within the Tafel region. Applying excessive anodic potential will force the system to corrode (i.e. destructive testing) [1, 15].

The analysis of Tafel plots is performed by corrosion test software (such as Gamry Instruments, ACM Instruments etc.). The corrosion parameters (such as  $E_{\text{corr}}$ ,  $i_{\text{corr}}$ ,  $\beta_a$ , and  $\beta_c$ ) are determined by intersecting the open circuit potential ( $E_{\text{oc}}$ ) and the extrapolation of the linear portions of logarithmic current plot as shown in Fig. 3 [12, 16]. Knowing the corrosion current density ( $i_{\text{corr}}$ ) the corrosion rate (CR) can be calculated using Eq. (3) [28]. Though, this can also be estimated by corrosion test software provided by potentiostat manufacturer.

$$\text{CR} = \frac{i_{\text{corr}} \times K \times (\text{EW})}{d \times A} \quad (3)$$

where, EW (equivalent weight) = Theoretical mass of metal that will be lost from the sample after one Faraday of anodic charge has been passed ( $\text{EW} = \text{atomic weight}/\text{valence}$ ),  $i_{\text{corr}}$  = corrosion current density ( $\text{mA}/\text{cm}^2$ ),  $K$  = a constant that defines the units for the corrosion rate (for CR in mm/

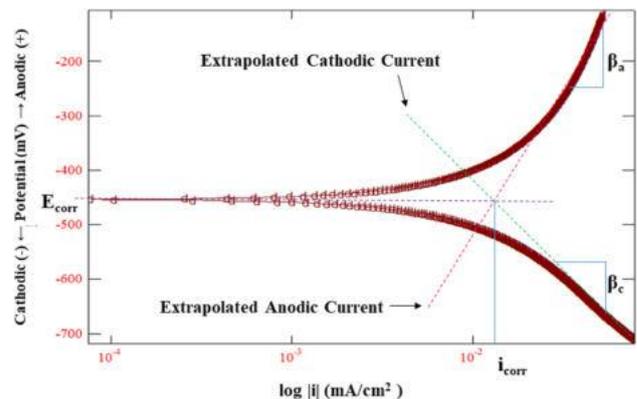


Fig. 3 Typical potentiodynamic polarization curve [12]

year (mmpy),  $K = 3272$ ; and CR in milli-inches/year (mpy),  $K = 1.288 \times 10^5$ ,  $d =$  density ( $\text{g}/\text{cm}^3$ ),  $A =$  specimen area ( $\text{cm}^2$ )

The cyclic polarization test is used primarily to study the pitting corrosion behaviour of metal in a certain environmental condition. Therefore, in this test, sufficiently high anodic potential is to be applied to ensure initiation of pitting corrosion. As soon as the scan is reached at anodic potential limit  $E_{\text{rev}}$  (reverse potential), the path of the scan is reversed on the way to the cathodic direction until the ultimate predetermined potential is reached. The potential at the scan plot in which the induced current sharply increases is called the pitting potential ( $E_{\text{pit}}$ ). The potential on the reverse scan where the loop closes is called the protection potential ( $E_{\text{prot}}$ ), below which no pitting corrosion is likely to take place. If the  $E_{\text{prot}}$  is more positive than the  $E_{\text{pit}}$ , then pitting will not occur. Though, pitting could occur if the  $E_{\text{prot}}$  is more negative than the  $E_{\text{pit}}$ . In general, the extent of the hysteresis loop indicates the degree of pitting tendency. The greater the loop size, the higher the pitting tendency and vice versa. Figure 4 shows a detailed cyclic polarization scan curve [29–31].

In this technique, the conductivity of the electrolyte (environment) plays very important role. The resistance of electrolyte lowers the potential between the reference electrode and working electrode and can cause errors in the readings. This aspect has significant effects on the interpretation, and should be compensated. Therefore, this factor should be considered while performing the potentiodynamic cyclic polarization measurement.

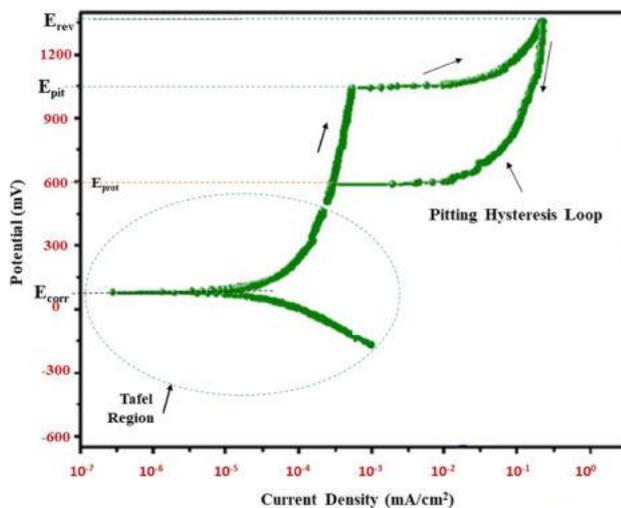


Fig. 4 Typical cyclic polarization curve [29]

## 2.4 Linear polarization resistance

The linear polarization resistance (LPR) technique can be applied in both field and lab measurements. It is a direct current (DC) technique, first introduced by Stern and Geary in 1957 [32–34]. In this technique, a small polarization perturbation (between 10 and 30 mV) is applied about  $E_{\text{OC}}$  of metal using a potentiostat and the resulting induced current is recorded. Although, the corrosion is an electrochemical process and does not comply with the Ohm's law (i.e. linear relationship between current and potential). However, it has been found that Ohm's law will be nearly true if polarization potential is very small [35]. Since in this method the applied potential is small, therefore the current response will be linear. A typical potential and current density (obtained by dividing the current response by known surface area of working electrode) plot is shown in Fig. 5 [25, 26].

The slope of the potential–current density plot near  $E_{\text{OC}}$  is defined as linear polarization resistance ( $R_p$ ) [38]. In case of steel reinforced concrete system, the  $R_p$  includes the concrete resistance ( $R_c$ ) and charge transfer resistance ( $R_{ct}$ ). Thus, linear polarization can be estimated as follows [28, 29]:

$$R_p = \frac{\Delta E}{\Delta i} = R_c + R_{ct} \quad (4)$$

The corrosion current density is then determined using the Stern–Geary formula:

$$i_{\text{corr}} = \frac{B}{R_p} \quad (5)$$

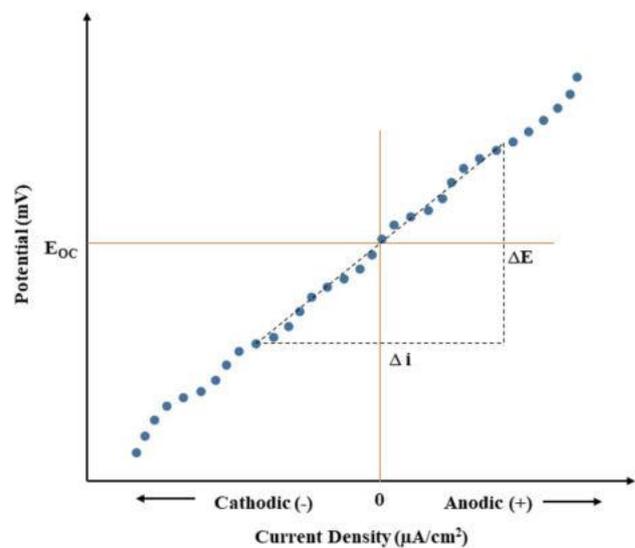


Fig. 5 Typical linear polarization plot [25]

where,  $i_{\text{corr}}$  is the corrosion current density ( $\mu\text{A}/\text{cm}^2$ ),  $R_p$  is the polarization resistance ( $\text{k}\Omega \text{ cm}^2$ ) and  $B$  can be calculated by the following relationship:

$$B = \frac{\beta_a \times \beta_c}{2.3(\beta_a + \beta_c)} \tag{6}$$

where,  $\beta_a$  and  $\beta_c$  are the anodic and cathodic Tafel constants in mV/decade, respectively.

The Tafel constants are usually obtained from Tafel plot (by polarizing the steel to  $\pm 250$  mV of the  $E_{\text{OC}}$ ). However, in the absence of necessary data on  $\beta_a$  and  $\beta_c$ ,  $B = 26$  mV (for actively corroding steel in concrete) and  $B = 52$  mV (for steel in passive situation) is used to compute the corrosion current density [41]. Moreover, the corrosion current density is inversely proportional to the linear polarization resistance. Hence, high polarization resistance value indicates low corrosion rate, and vice versa.

In order to carry out the linear polarization resistance investigation, similar to the potentiodynamic and cyclic polarization test, three electrodes are to be connected to a potentiostat. These are the working electrode (corroding metal), the auxiliary (counter) electrode and the reference electrode [35].

Several investigation has used a corrosion current density limit of 0.1–0.2  $\mu\text{A}/\text{cm}^2$  to distinguish between passive and active corrosion state of steel embedded in concrete [31, 32]. In addition, many study reported different limits (in terms of corrosion current density, linear polarization resistance and corrosion penetration rate) in order to separate the different degree of corrosion risk associated with steel reinforcement, as listed in Table 2 [1, 24].

Even with complexities, the LPR measurements method pose several complications in high resistivity media, for instance those encountered in huge steel reinforced concrete structures. Noteworthy amongst such complications has been described as follows, which may even render the in situ measurement extremely inaccurate.

- a. The resistance of concrete between the steel rebar (working electrode) and the reference electrode is very high. This offers a potential drop generally referred to as an

Ohmic drop and that must be either compensated externally or removed mathematically.

- b. The counter electrode being smaller compared to the sample, the distribution of the applied electrical signal for polarisation of the steel rebar is non-uniform throughout the cross-section of the sample.

### 2.5 Electrochemical impedance spectroscopy

This technique is also known as alternating current (AC) impedance spectroscopy, because in this method, an AC excitation potential with variable frequencies is applied to the specimen (working electrode) and the induced AC current response is measured. The AC excitation potential should be very low (usually between 5 and 20 mV) in order to retain in the linear zone and to perform non-destructive testing. In the linear zone, the AC current (induced) will have the different amplitude and identical frequency as the applied AC excitation potential, but with a phase difference. The impedance (that includes real and imaginary parts) is the ratio of AC potential to AC current, and can be calculated from the following relationships [33, 34]:

$$Z = \frac{E(t)}{I(t)} = \frac{E_0 \text{Cos}(\omega t)}{I_0 \text{Cos}(\omega t - \Phi)} = Z_0 \frac{\text{Cos}(\omega t)}{\text{Cos}(\omega t - \Phi)} \tag{7}$$

$$Z = Z_0 [\exp(j \cdot \Phi)] = Z_0 (\text{Cos}\Phi + j \cdot \text{Sin}\Phi) = Z' + jZ'' \tag{8}$$

where,  $Z$  = complex impedance,  $E(t)$  = potential at time  $t$ ,  $I(t)$  = current at time  $t$ ,  $E_0$  = potential amplitude,  $I_0$  = current amplitude,  $\omega$  = radial frequency,  $\Phi$  = phase difference between potential and current,  $Z_0$  = magnitude of complex impedance,  $j = \sqrt{-1}$

The real part ( $Z'$ ) and imaginary part ( $Z''$ ) of the impedance ( $Z$ ) represent resistive and capacitive/inductive terms respectively. The graph of  $Z'$  on the abscissa and  $Z''$  on the ordinate, measured at various frequencies (usually between 100 kHz and 10 mHz) is called as impedance spectrum or impedance graph or Nyquist plot. In order to determine various parameters (such as solution resistance, charge transfer resistance and double layer capacitance), the Nyquist plot has to be fitted and modelled with an equivalent electrical circuit that indicate the electrochemical processes at the specimen. Particularly in the steel reinforced concrete specimens, various equivalent circuits have been suggested due to complex nature of the steel–concrete interface. The simplest electrochemical equivalent circuit known as Randles circuit shown in Fig. 6 can be used for modelling the typical Nyquist plot shown in Fig. 7 [46–48].

The equivalent circuit comprises of a resistance  $R_c$  linked in series to a loop that contains a different resistance  $R_{ct}$  and a capacitance  $C_{dl}$  joined in parallel. The  $R_c$

**Table 2** Typical corrosion criteria of steel embedded in concrete [1, 24]

Corrosion condition	Polarization resistance ( $\text{k}\Omega \text{ cm}^2$ )	Current density ( $\mu\text{A}/\text{cm}^2$ )	Corrosion penetration rate ( $\mu\text{m}/\text{year}$ )
Very high	2.5–0.25	10–100	100–1000
High	25–2.5	1–10	10–100
Low/moderate	250–25	0.1–1	1–10
Passive	> 250	< 0.1	< 1

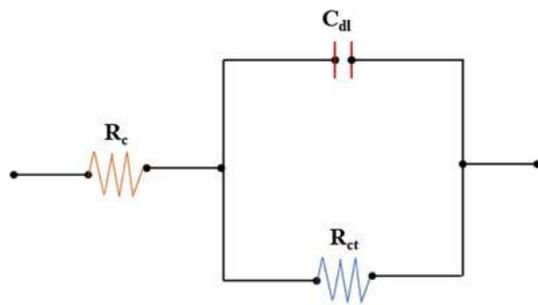


Fig. 6 Randles electrical equivalent circuit for steel reinforcement [46–48]

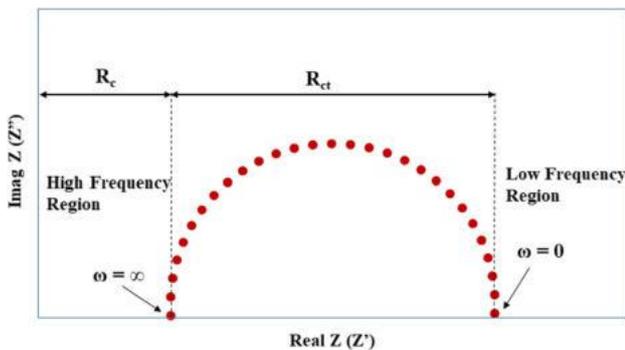


Fig. 7 Typical Nyquist plot for steel reinforcement [46–48]

indicates the concrete pore electrolyte resistance or concrete cover resistance. The  $R_{ct}$  is the charge transfer resistance at the surface of steel that represents the ease with which the charged ions can leave the steel surface and reach into the electrolyte (i.e. metal dissolution resistance). The  $C_{dl}$  is a double layer capacitor, which refers to the development of two layers on the steel/electrolyte interface. The first layer is formed due to the attraction of molecules towards the steel surface anions (free electrons). The second layer is formed due to the attraction of molecules towards cations in the pore solution. Moreover,  $R_{ct}$  and  $C_{dl}$  both resembles to the ionic resistance of the corrosion products film developed on the steel surface. These terms are illustrated in Fig. 8 [24, 38].

From the Randles equivalent circuit, the equivalent impedance ( $Z$ ) of the Nyquist plot is represented as follows [39]:

$$Z = R_c + \frac{R_{ct}}{1 + j\omega C_{dl} R_{ct}} \tag{9}$$

where,  $R_c$  = concrete resistance,  $R_{ct}$  = charge transfer resistance,  $j = \sqrt{-1}$ ,  $\omega = 2\pi f$ ,  $C_{dl}$  = double layer capacitance

When,  $\omega \rightarrow 0$  (i.e. at low frequency), the circuit turn into DC circuit and therefore

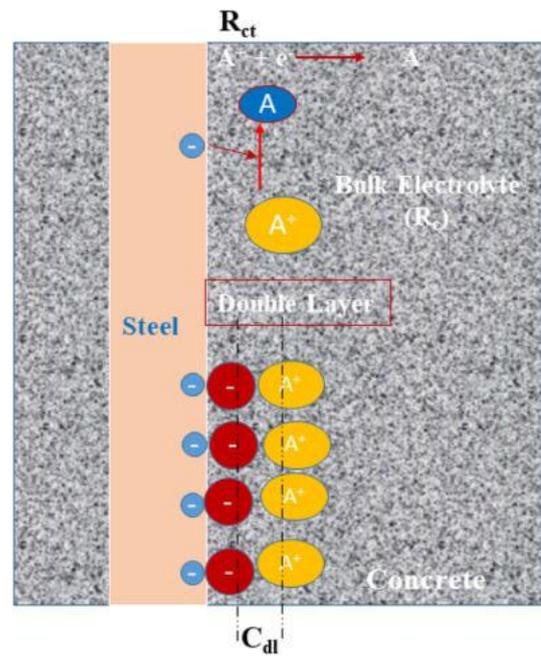


Fig. 8 Impedance components in steel concrete interface [38]

$$Z = R_c + R_{ct} = R_p$$

When,  $\omega \rightarrow \infty$  (i.e. at high frequency, AC circuit),  $Z = R_c$

The difference of DC and AC impedance gives the true polarization resistance as:

$$\text{True polarization resistance} = (R_c + R_{ct}) - R_c = R_{ct}$$

Accordingly, the diameter of the extrapolated semicircle in the Nyquist plot indicates the charge transfer resistance ( $R_{ct}$ ), which is equivalent to the true polarization resistance. Thus, if the diameter of the semicircle will be large, then polarization resistance will be high and corrosion rate will be low, and vice versa [45].

Owing to sophistication of the measurement, this method is more extensively used in laboratory investigations rather than in field. It needs more time to perform and its interpretation is also difficult. However, nowadays it used as a research tool to recognize the behaviour and mechanism of the concrete/steel interface and to reveal facts of the steel rebar corrosion kinetics [50].

## 2.6 Galvanostatic pulse

This is a rapid and non-destructive polarisation method. It was introduced in 1988 for field application [51]. In this technique, galvanostatically a short-time anodic current pulse (usually 10–100  $\mu A$  with pulse duration of 5–30 s) is applied between the steel reinforcement and auxiliary (counter) electrode placed on the surface of concrete. The reference electrode is commonly placed in the centre of the auxiliary electrode. The steel is polarised anodically and the

resulting electrochemical potential response of the steel is recorded using a reference electrode as a function of polarisation time. The characteristic electrochemical potential response of corroding steel is shown in Fig. 9 [52].

When the current pulse,  $I_{app}$ , is applied to the steel reinforcement, then the polarisation of the steel at time  $t$ ,  $E_t$ , can be written as follows [53–55]:

$$E_t = I_{app} \left[ R_p \left\{ 1 - e^{\left( \frac{-t}{R_p C_{dl}} \right)} \right\} + R_{tc} \right] \quad (10)$$

where,  $R_p$  = polarisation resistance,  $C_{dl}$  = double layer capacitance,  $R_c$  = concrete cover resistance,  $R_p$  and  $C_{dl}$  can be determined by transforming the Eq. (10) into linear form as [53, 54]:

$$\log(E_{max} - E_t) = \log(I_{app} \times R_p) - \left( \frac{t}{R_p C_{dl}} \right) \quad (11)$$

where,  $E_{max}$  = Final steady state potential

A typical plot of Eq. (11) is shown in Fig. 10 [53]. If the straight line passing through the data points is extrapolated to time ( $t$ )=0, then the intercept at ordinate will give  $\log(I_{app} \times R_p)$  and slope of the straight line will yield  $1/(R_p \times C_{dl})$ . The residual overpotential analogous to  $(I_{app} \times R_c)$  i.e. potential drop across the cover concrete. After finding the  $R_p$  by applying above technique, the corrosion current density ( $i_{corr}$ ) can be determined from Stern Geary formula (Eq. 5) [46].

### 2.7 Electrical resistivity measurement

The durability characteristics of concrete can be assessed by determining its electrical resistivity. Various investigations have given the correlation between electrical resistivity of concrete and corrosion of steel reinforcement [56–58].

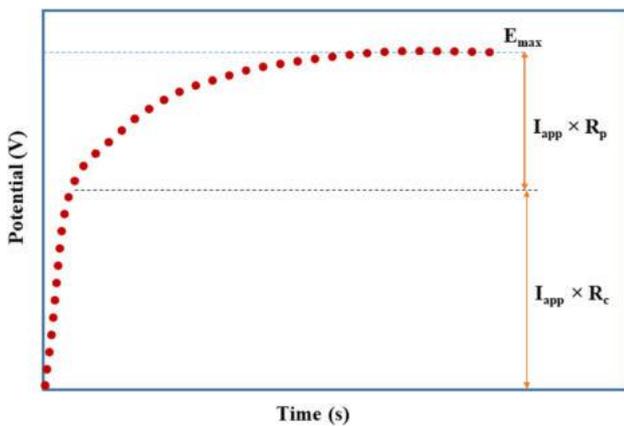


Fig. 9 Electrochemical potential response of corroding steel [52]

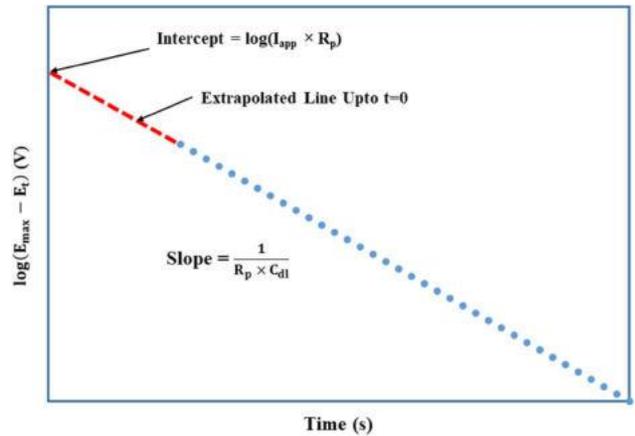


Fig. 10 A typical plot of Eq. (11) [53]

Several researchers have tried to made the relationship between the concrete resistivity and the different concrete properties such as water/cement ratio, cement content, coarse aggregate content, age, diffusion coefficient of chloride and porosity [59–61].

The electrical resistivity of concrete is commonly measured using four-probe technique. F. Wenner firstly introduced this technique in order to evaluate the soil resistivity [62]. After that, this method was widely applied for the concrete resistivity measurement in the lab as well as field. The Fig. 11 illustrates principle involved in the Wenner four-probe electrical resistivity measurement technique [63]. In this method, four equally spaced electrodes (probes) are used to measure the concrete resistivity. A small AC current ( $I$ ) is applied between the outermost probes whereas potential difference ( $V$ ) between the inner probes is recorded. Then, the surface resistivity of concrete is determined from the Eq. (12) [64].

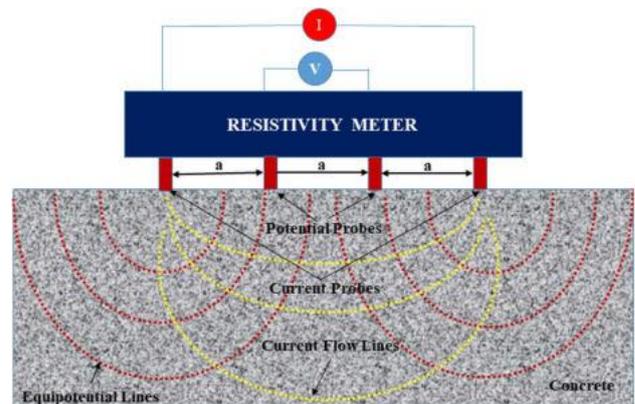


Fig. 11 Illustrations of the Wenner four-probe resistivity measurement [53]

$$\rho = ka \frac{V}{I} \quad (12)$$

where;  $a$  = distance between the probes,  $k$  = geometry factor =  $2\pi$  (for semi-infinite body such as concrete slabs)

However, the value of  $k$  is different for small cubic or cylindrical specimens used in laboratory testing condition. The AASTHO TP 95-11 Standard specified the typical value of 'a = 38 mm' and 'AC frequency = 13 Hz' in order to conduct the concrete surface electrical resistivity measurement [65].

Moreover, it is extensively recognized that resistivity of concrete can be easily determined, particularly in the field, compared to other corrosion parameters such as corrosion rate. Various investigators as presented in Table 3 have developed the correlation between the resistivity of concrete and steel reinforcement corrosion risk [65].

The variations in the results show that the concrete resistivity could not be used with full confidence as an indicator for corrosion activity in steel reinforcement and need more investigations. Furthermore, various factors that might affect the results of resistivity measurement of concrete include water/cement ratio, microstructural properties of concrete, aging, existence of steel reinforcement, geometrical constraints, surface contact of probes, spacing between probes, temperature, and moisture content [63].

## 2.8 Gravimetric weight loss measurement

This is the most commonly used destructive technique for estimating the corrosion rate of steel reinforcement [59, 60]. The detailed guideline for the preparation of test specimens and evaluation of corrosion rate by means of gravimetric weight loss measurement has been specified in ASTM G1-03 [73]. In order to carry out this test, firstly, the steel is to be immersed in the Clark solution (1L of HCl + 50 g of  $\text{SnCl}_2$  + 20 g of  $\text{Sb}_2\text{O}_3$ ) for 40 s, then, degreased with acetone, rinsed with distilled water and dried in air. Thereafter,

the initial weight of the steel is taken using an electronic weighing balance with 0.1 mg precision before embedding in concrete. After a specified period of exposure in the corrosive medium, the steel is taken out by splitting the concrete specimens. After that, the corroded steel is to be cleaned by the above procedure and finally, weighed again. The obtained weight loss value is to be used to estimate the corrosion rate (CR) by the following relationship [74]:

$$\text{CR} = \frac{K \times \Delta W}{A \times T \times \rho} \quad (13)$$

where,  $\Delta W$  = weight loss (g),  $A$  = exposed surface area ( $\text{cm}^2$ ),  $T$  = Time of exposure (hours),  $K$  = unit conversion constant =  $8.76 \times 10^4$  (for mm/year) = 534 (for mils/year),  $\rho$  = density ( $\text{g/cm}^3$ )

This is the most accurate and precise technique for determining the corrosion rate of steel reinforced concrete system because the testing is easy to replicate. This is comparatively simple method that reduces the tendency to lead methodical errors. The sensitivity of mass loss measurements is limited because mass can be measured easily only to about 0.1 mg, therefore this key issue must be considered while using this method. Further, this technique is destructive and generally performed after long exposure periods, consequently provide an average corrosion rate.

## 2.9 Corrosion monitoring using sensors

The latest advances in the field of smart materials and systems have escorted novel openings for structural health monitoring and non-destructive evaluation. Smart materials, for instance the fibre-optic materials and the piezoelectric-ceramic (PZT), have enabled online monitoring with greater resolution and quicker response as these materials have enormous competences of damage diagnosis. In recent times, sensors based on PZT and optical fibres have been studied for corrosion assessment in steel reinforced concrete structures [75–77].

Recently, an optical fibre sensor comprising of a fibre bragg grating sensor has been developed to identify steel rebar corrosion. A correlation between the weight loss rate of rebar (by gravimetric loss method) and reflected wavelength change from the grating was found through a series of accelerated corrosion tests. Through this relationship, it was noticed that the greater the wavelength shift, the larger the weight loss rate in the steel rebar [78]. Various analytical and experimental investigation have been carried out to detect rebar corrosion in steel reinforced concrete structures using fibre optic sensors [79–82]. Moreover, numerous proof-of-concept research to identify corrosion using PZT patches in metallic structures have been reported [77, 83]. However, these investigations were preliminary in nature and did not

**Table 3** Relationship between concrete resistivity and corrosion risk [65]

Corrosion risk in terms of concrete resistivity ( $\text{k}\Omega \text{ cm}$ )			References
High	Moderate	Low	
< 5	5–12	> 12	[56]
< 6.5	6.5–8.5	> 8.5	[57]
< 7	7–30	> 30–40	[58]
< 10	10–30	> 30	[66]
< 20	20–100	> 100	[67]
< 10	10–100	> 100–200	[68]
< 5	5–20	> 20	[69]
< 8	8–12	> 12	[70]

offer any solid means of rigorous qualification of corrosion damage after its detection. Hence, more investigations are required in this field.

## 2.10 Comparison of different techniques

Since potential measurement, resistivity measurement and sensors techniques do not provide the corrosion rate of the steel reinforcement, therefore the comparison of corrosion rate as obtained from electrochemical and weight loss measurement techniques can be made based on past studies.

Ismail et al. [49] evaluated the corrosion condition of steel rebar in high performance concrete using potentiodynamic polarization (PP), electrochemical impedance spectroscopy (EIS), linear polarization resistance (LPR) techniques, and observed that the corrosion rates obtained from the LPR were 5–20% less than those obtained using EIS but 10–30% more than those determined using PP. Nygaard et al. [84] investigated the corrosion rate of passive steel and active steel by means of galvanostatic pulse (GP) and LPR techniques. They found that both GP and LPR methods overestimated the actual corrosion rate for passive steel by factors of about 100 and 10 times, respectively. But these methods underestimated the corrosion rates by a factor of 2 (GP) and 10 (LPR) for steel rebars with localized corrosion. Aligizaki [85] assessed the corrosion rate of steel using LPR, PP and EIS and found well correlation between the  $I_{\text{corr}}$  values obtained from LPR and PP techniques. Sathyanarayanan et al. [86] measured the corrosion rate of steel rebar by GP and LPR techniques and concluded that the GP technique provides more reliable corrosion rates than LPR method, when compared with the gravimetric weight loss method results. Law et al. [87] also used gravimetric weight loss and LPR methods to measure the corrosion rates of steel at regular intervals during an exposure period of 1,085 days. They compared the corrosion rates obtained from both the techniques and concluded that the LPR technique overestimated the corrosion rate. Pradhan et al. [88] observed that the corrosion rates obtained from LPR technique were 10% higher than those from the EIS method, whereas agreed closely with that found from the gravimetric weight loss method.

There are numerous existing techniques for the detection, measurement and diagnosis of corrosion of steel rebar, however there is no consent regarding which technique evaluates the corrosion rate more precisely. Therefore a combination of evaluating methods is recommended to use in order to find the reliable information about the corrosion condition of steel embedded in concrete. The average corrosion rate as obtained from the different techniques may be used for further analysis.

## 3 Corrosion control techniques

The corrosion control methods for steel reinforced cementitious composite include cathodic protection, electrochemical chloride extraction, surface treatments of the steel reinforcement, surface treatment of concrete, utilization of mineral admixtures and chemical corrosion inhibitors. In the subsequent sections, these methods have been discussed comprehensively.

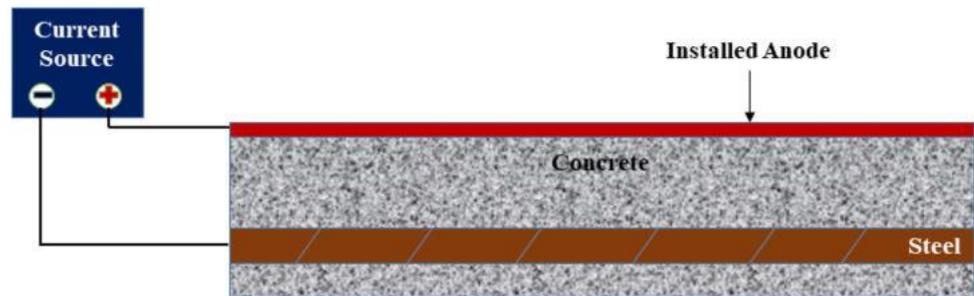
### 3.1 Cathodic protection

The first investigation on corrosion control of steel in a reinforced concrete bridge through cathodic protection was reported by Stratfull in 1957 [89], and the application of this technique began in 1972 in order to protect Sky Park bridge decks contaminated by de-icing salts in Placerville, California [90]. Thereafter, research has been carried out by various government and private industries for the development of cathodic protection systems in steel reinforced concrete structures. For example, on the basis of research investigations, Federal Highway Administration has identified that the cathodic protection is the only rehabilitation system that has proven to stop corrosion in chloride contaminated bridge decks irrespective of the chloride content in concrete [91].

The cathodic protection system can be established by two ways: galvanic (sacrificial) anode and impressed current systems. The galvanic anode system is based on the principles of dissimilar metal corrosion and the relative position of specific metals in the electro-chemical series. Hence, this system employs reactive metals as auxiliary anodes, which are connected to the steel that is to be protected. The difference in potentials between the reactive metal and the steel, as specified by their relative positions in the electro-chemical series, causes a positive current to flow in the electrolyte, from the reactive metal to the steel. Thus, the whole surface of the steel converted to negatively charge and becomes the cathode. The metals commonly used, as sacrificial anodes are aluminium, zinc and magnesium. No external power source and low maintenance is required in this system. Patch-repair and plug-type anodes are examples of galvanic anodes [92].

In contrast, an impressed current system requires a current source (generally less than 50 volts) and inert (zero or low dissolution) anode material, fixed either on the surface, or embedded within the concrete. To achieve an electrical circuit, the positive terminal is connected to anode material and the negative terminal is connected to steel (cathode) to be protected, the anode and cathode are separated by an electrolyte (concrete) as shown in Fig. 12. This

**Fig. 12** Impressed current cathodic protection system [93]



system works well until power supply is not interrupted. Therefore, this system consumes substantial electrical energy and also requires specialized services to design and verify the system's functioning [93].

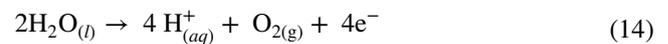
### 3.2 Electrochemical chloride extraction

The aim of the electrochemical chloride extraction (ECE) technique is to remove the chloride ions from the steel rebar and out of the concrete body. This method is similar to cathodic protection, but there are two main differences. First, the current density used for impressed current cathodic protection (ICCP) is much lower than that for ECE. Second, the external anode for ECE is temporary and installed for few weeks only (during the process) [94]. However, both protection techniques have been recognized to increase the service lifespan of the structures. However, ECE technique is more advantageous because of no long-term regular maintenance requirement.

In this technique, an electric field is applied between the steel reinforcement and an external anode metal fixed to the surface of the concrete body. The commonly used anodes are titanium-activated meshes, steel meshes, and mortar pastes prepared with graphite powder [95]. The positive terminal of current source is connected to anode, while negative terminal is connected to steel rebar embedded in concrete. When the electric current is applied, anions (such as  $\text{Cl}^-$ ) are attracted towards the external anode placed on the surface of the concrete, while cations (such as  $\text{Na}^+$ ,  $\text{K}^+$ ) are migrated towards steel reinforcement and thereby produced hydroxyl ions ( $\text{OH}^-$ )

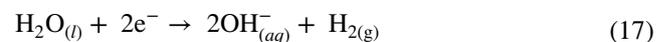
on the surface steel, as a result of cathodic reactions. The schematic diagram of the chloride extraction technique is shown in Fig. 13. The following reactions occur during electrochemical extraction treatment due to the development of electric potential difference between the external anode and the steel (cathode) [96].

At anode:

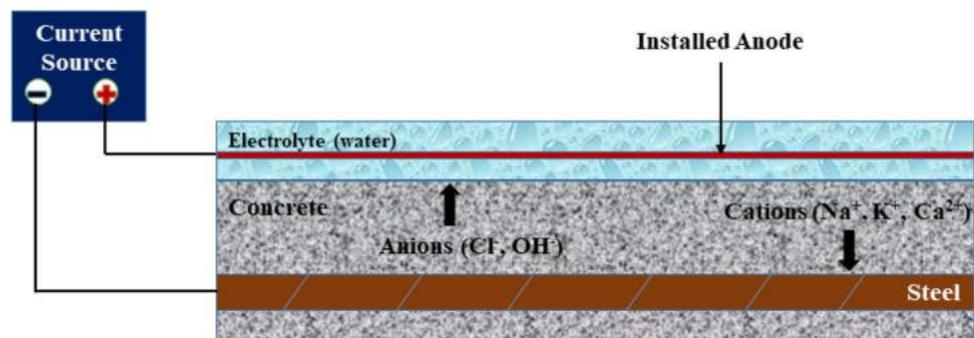


The pH of the electrolyte should be sufficiently high in order to suppress the reaction represented by Eq. (15). The highly alkaline electrolytes also neutralize the hydrogen ions produced by the reaction in Eq. (14) and protect the surface of concrete from acidification. Therefore, solution of calcium hydroxide, sodium hydroxide and treated water are commonly used as external electrolytes [97]. However, water is the most widely used owing to the deficiency of salts, thus  $\text{Cl}^-$  ions travel more easily in the concrete and are extracted effortlessly [98].

At cathod (steel):



**Fig. 13** Illustration of the chloride extraction technique [96]



The Eq. (17) shows the evolution of hydrogen gas at the level of steel reinforcement due to the low cathodic potential that is induced by the high current density. Also, it is believed that higher current densities can produce cracking in the concrete as a function of the chloride extraction velocity. Therefore, the current density has been taken between  $1 \text{ A/m}^2$  and  $5 \text{ A/m}^2$  in various studies [94]. Despite this, some authors determine that the current density should not be more than  $2 \text{ A/m}^2$  [99]. However, some of the studies focused on densities up to  $1 \text{ A/m}^2$  [100].

The period of application of this system varies from 6 to 10 weeks [101], in this period the chloride concentration is reduced below 0.4% of total chlorides, which is considered as critical value [102]. According to results of an investigation, the chloride content was found to be reduced by around 40% within 7 weeks of treatment and simultaneously, substantial quantities of alkali ions were detected nearby the steel [103]. The reduction percentage of chloride content can reach up to 70% [104]. The reduction of chloride ions content below the critical level and simultaneous increment of hydroxyl concentration on the surface of the steel reinforcement creates favourable environment for the steel repassivation [105].

### 3.3 Surface treatment of steel

The reinforcing bars commonly used are mild steel, mainly due to its significant low cost. Alternatively, stainless steel shows excellent mechanical and durability properties, but impractical for use in reinforced concrete because of its high cost [106]. The poor corrosion resistance of mild steel is a common cause of deterioration in reinforced concrete structure. Therefore, various treatments have been given to steel surface in order to increase the corrosion resistance. One such treatment is coating with epoxy, which acts as a barrier to aggressive corrosion agents, and thus significantly decrease the corrosion rate of steel rebar. But, the poor bonding between epoxy coated steel and concrete, and the damaged areas of epoxy coated steel rebar (at which pitting corrosion may occur) are the common problems with epoxy coating [107]. Another similar treatment is coating with zinc (*galvanization*), which improve the corrosion resistance of steel by acting as a sacrificial anode. It has been observed in many studies that the galvanized steel develops better bond to concrete than the epoxy coated steel, and also the tendency of the zinc coating to debond is very less as compared to epoxy coating [108]. Subsequently, techniques for surface treatment of steel that increases the corrosion resistance as well as bond strength have been developed. These techniques include inhibited cement slurry coating, surface oxidation and sand blasting.

The Central Electrochemical Research Institute (CECRI), Karaikudi, India, has developed inhibited cement slurry

coating for corrosion control in steel reinforcement. This coating system involves of four stages i.e. pickling, phosphating, two times application of inhibited cement slurry coating and sealing. This coating is an in situ process that is carried out after all bending and shaping operations are completed at the construction site. As this coating is applied at the site of working, the damage caused on account of transporting and lifting are significantly minimised. Moreover, in situ patch repairing is easy to execute in this coating system. Though, strict quality control measures are required to ensure the performance of this coating [109]. In an investigation, it was concluded that the inhibited cement slurry coating is economical and efficient to control the corrosion of steel reinforcement [110]. In an another study, it was observed that inhibited cement slurry coated steel show higher bond strength as compared to galvanized and epoxy coated steel [111].

Sand blasting technique involves the blasting of  $\text{Al}_2\text{O}_3$  particles (size about  $250 \mu\text{m}$ ) on the steel rebar under pressure of around 0.6 MPa. It is used for cleaning of the surface of the steel. The cleaning includes the removal of rust and/or contaminants from the surface of steel. This cleaning improves the corrosion resistance by making the surface of the steel more uniform in composition. Moreover, the cleaning increases the roughness of surface and thus improves the bond strength. However, the disadvantage of this method is that it is uneconomical and difficult to use in the construction site [112].

Water immersion method involves the immersion of the steel rebar under water at ambient temperature for 2 days. This treatment forms a black coating (oxide layer) on the steel surface, hence the surface of steel turns out to be more uniform in composition and thereby, enhancing the corrosion resistance. Furthermore, the oxide layer improves the bond between concrete and rebar, thus increasing the bond strength. The immersion periods less than or more than 2 days provide less beneficial effects on both corrosion resistance and bond strength. This method is found to be very simple and economical as compared to other methods [113].

### 3.4 Surface treatment of concrete

Since numerous hostile agents (e.g. chloride,  $\text{CO}_2$  etc.) ingress into the concrete through air or water and creates durability problems (e.g. carbonation, chloride attack and sulphate attack etc.), therefore, the permeation property of the surface concrete is considered as a main factor that impact the durability of entire concrete structure [114].

Concrete surface treatment has gained sufficient attention since 1980s, for example, American and German transportation agencies applied some hydrophobic agents on the surface concrete of bridges in order to prevent

chloride penetration. Also, a chemical named isobutyltrimetoxisilane (100% pure and hydrophobic agent) has been used on bridges in the United Kingdom in 1986 to protect from chloride attack [115]. However, many progresses has been occurred in terms of understanding the mechanism of already known surface treatment agents; and various new treatment agents has emerged in last two decades. Moreover, the surface treatment agents can be classified into two categories based on chemical composition i.e. organic and inorganic. Organic agents are widely used for surface treatment of concrete owing to their good barrier properties. But, there are some problems associated with organic treatments viz. poor fire resistance, crack and detach easily, inadequate service life, and after losing protecting effects their removal is difficult [116]. In contrast, the inorganic surface treatment agents are more stable and have better durability performance. The most commonly used inorganic surface treatment agent is sodium silicate. Also, it has been reported that lithium silicate, potassium silicate and fluosilicates can be used as inorganic surface treatment agents for concrete [117].

According to the functions of surface treatments, they were grouped into four types: surface coating, hydrophobic impregnation, pore blocking treatment and multifunctional surface treatments [118]. Surface coating forms a continuous layer and produce a physical barrier to prevent the ingress of the corrosive substances into cementitious substrate [119]. There are many types of surface coatings which have been used in the construction industry, for example, acrylic, chlorinated rubber, butadiene copolymer, polyethylene copolymer, epoxy resin, polyester resin, vinyl, polyurethane, coal tar and polymer modified cementitious coatings [120].

Hydrophobic impregnation works via penetrating concrete pores, expanding the contact angle. The surface turns out to be hydrophobic when the contact angle is greater than  $90^\circ$ . Thus, hydrophobic impregnation can prevent the ingress of water and water-born ions; but permits penetration of water vapour [113]. The most commonly used hydrophobic impregnation are silane, siloxane and a combination of these two chemicals. The molecular structures of silane (1.0 to 1.5  $\mu\text{m}$  diameter) and siloxane (1.5 to 7.5  $\mu\text{m}$  diameter) are extremely small; and therefore, efficiently penetrate into dense concrete substrate. Both silane and siloxane comprise an alkyl group and various alkoxy groups [121, 122]. The alkyl group can decrease the surface tension of the substrate, whereas the alkoxy group is related to the bonds between silane/siloxane and concrete. For example, the chemical reaction between silane and concrete substrate can be proceeded as: firstly, silane hydrolysis reacts with pore water, and silanol groups are formed due to hydrolysis alkoxy groups [123]. Then, the unstable silanol molecules lose water molecules and transformed into silicone resin. Subsequently, the silanol groups react with hydroxyl groups

in the cementitious substrate via hydrogen bonds. Lastly, the silicon resin bonds to cementitious substrate during drying, and creates water repellent pore surfaces. The alkalinity of the cementitious substrate serves as a catalyst in these reactions [124].

Pore blocking surface treatment agents have been used in construction industries for many years [125]. They are able to partially or completely block the existing capillary pores in concrete surface and thus increase impermeability of surface layer. Silicate and fluosilicate based pore blockers (e.g. calcium silicate, lithium silicate, sodium silicate, magnesium fluosilicate and sodium fluosilicate) have been demonstrated to be effective in blocking capillary pores in concrete surfaces. Sodium silicate is considered as one of the most common pore blocking agents [126].

Multifunctional surface treatments should have at least two functions, for example, ethyl silicate (or tetraethylorthosilicate), an alkoxy silane compound, which itself does not have binding property, and nevertheless it can produce silica gels and block the pores through hydrolysing process. Also, it can prevent the entry of corrosive substances because of its hydrophobic effect [127]. Similarly, Silane-clay nanocomposites are not only show a hydrophobic effect, but also improve the microstructure of concrete cover [128].

Surface treatment of concrete may be an effective and economical technique in order to enhance the quality of surface concrete and improve the durability of concrete structures. However, this technique of corrosion control suffers from the poor durability of the coating and the loss of corrosion protection in the parts where the coating is damaged.

### 3.5 Admixtures in concrete

Admixtures are solid or liquid substances that are added to the concrete mixture in order to enhance the properties of the resulting concrete. Admixtures that are primarily used for improving the corrosion resistance of steel reinforcement, commonly known as corrosion inhibitors. These include mainly organic and inorganic chemicals. However, admixtures that are mainly used for enhancing the structural performance of concrete are more attractive due to their multi-functionality (such as, improvement in workability, mechanical strengths, bond strength, impermeability, corrosion control, etc.). They are usually mineral particles, for example, fly ash, silica fume and slag.

Fly ash (FA) is a by-product of coal combustion and mainly composed of  $\text{SiO}_2$  and  $\text{CaO}$ . The recent advancement in concrete technology exhibits that the fly ash is the most common pozzolan and used worldwide as an essential component for making high-performance concrete. This is mainly because of pozzolanic reaction between fly ash and hydrated cement paste resulting a denser microstructure over a period of time. However, studies

have revealed that fly ash does not reduce the diffusion coefficient of concrete at early ages, but at the later ages, significantly lowers the diffusion coefficient as compared to control concrete [129]. Moreover, Class F fly ash (low CaO content) leads to a slightly lower diffusion coefficient than Class C fly ash (high CaO content) admixed concrete [130]. As far as steel reinforcement corrosion is concerned, it was observed that the corrosion resistance of steel in concrete is improved with the addition of fly ash as a replacement of Portland cement (PC) up to the 30% [131]. In another study, it was concluded that the incorporation of 15% fly ash as replacement of cement can produce quite durable concretes against corrosion [132]. Also, it was found that the chloride penetration resistance of concrete increases with increasing the fineness of fly ash [133]. In general, it is recognised that the addition of fly ash improves the corrosion resistance properties of steel reinforcement by reducing porosity and increasing the resistivity of cementitious composite [134]. Moreover, fly ash is typically used at replacement levels between 15% and 35% by weight of Portland cement so as to increase the mechanical strengths as well as the resistance to deterioration mechanisms (such as chloride attack, sulphate attack, carbonation etc.) of cementitious composites [135].

Silica fume (SF) is a by-product from silicon alloy production in electric arc furnaces. It is almost pure  $\text{SiO}_2$  and its particles size are approximately 100 times finer than cement grains. When added in cementitious composite, silica fume reacts quickly with hydrated cement due to small particle size and high surface area to volume ratio and consequently improving the microstructural and mechanical properties and decreasing the diffusion coefficient of cementitious composite at all ages with respect to plain cementitious composite [110, 111]. Though, it was observed that chloride diffusion coefficient of concrete in a marine environment reduces with lowering the water binder ratio and increasing silica fume content up to 10%. Also, the chloride diffusion coefficient is found to be high for early ages and drops over time [138]. The reduction in diffusivity leads to decrease the chloride threshold level required to initiate corrosion, and this may increase the service life of the exposed concrete structures by 15-fold in certain circumstances [139]. From the sensitivity analysis, it is calculated that with the addition of 10% silica fume in concrete, the chloride transport in terms of apparent diffusion coefficient is reduced by approximately 74% and corrosion-free life is increased by 270% as compared to OPC concrete [140]. Moreover, the incorporation of silica fume in appropriate quantity, significantly enhances the corrosion resistance properties of steel reinforced cementitious composite [115, 116]. Furthermore, the typical replacement levels of Portland cement with silica fume range from 3% to 10% in order to enhance the mechanical strengths and durability properties of concrete structures [134].

Ground granulated blast-furnace slag (GGBFS), commonly known as slag, is a by-product of steel production. It mainly contains  $\text{CaO}$ ,  $\text{SiO}_2$ ,  $\text{Al}_2\text{O}_3$  and  $\text{MgO}$  [143]. When slag is used as part of Portland cement in concrete, it reacts with both the hydrated cement (*pozzolanic reaction*) and the water (*latent hydraulic reaction*), and consequently refines the pore structure and enhances interfacial transition zone (ITZ) of concrete [144]. Also, the addition of slag, improves the consistency and workability of fresh concrete. The mechanical strengths and durability properties of concrete is found to be substantially improved with the incorporation of GGBFS [145]. The diffusion coefficient of GGBFS admixed cementitious composite is found to be significantly lower as compared to the plain cementitious composite, particularly at the later exposure ages. Therefore, when incorporated appropriate amount of GGBFS in concrete, the transportation of corrosive agents is greatly reduced and consequently improved the corrosion resistance of steel reinforcement, and thereby, increasing the predicted service life of concrete structures. From most of the investigational studies, it may be concluded that the use of 40% to 80% of GGBS as a replacement of Portland cement does not cause any negative impact on the performance of cementitious composite [120, 121].

Metakaolin (MK) is obtained by the calcination of clay mineral kaolinite ( $\text{Al}_2\text{Si}_2\text{O}_7$ ) at the temperature range of 500 °C to 800 °C. It is primarily composed of  $\text{SiO}_2$  and  $\text{Al}_2\text{O}_3$ . The size of 99.9% metakaolin particles is below 16  $\mu\text{m}$  and the average particle size is approximately 3  $\mu\text{m}$ . It is a pozzolanic material and commonly used in the manufacture of ceramics [148]. The small particle size, high surface area to volume ratio and pozzolanic property of metakaolin, make it possible to be befittingly used as partial replacement of cement up to 10% and fine aggregate up to 20% in concrete [149]. The studies revealed that when metakaolin is used in concrete, it reacts quickly due to small particle size and high surface area, and undergoes pozzolanic reaction, and consequently improves the microstructure of the hydrated cement paste [150]. This improvement leads to further enhancement in the mechanical and durability properties and reduction in the diffusion coefficient of concrete [151]. In particular, the corrosion resistance of steel reinforcement in aggressive environment is improved substantially with the inclusion of suitable amount of metakaolin. Besides, the appropriate replacement level of cement by metakaolin ranges from 5 to 10% [152].

Moreover, the use of binary blends (Portland cement plus one admixture, such as PC + SF, PC + SF, PC + GGBFS and so on.) and ternary blends (Portland cement plus two admixtures, such as PC + FA + SF, PC + MK + FA, PC + FA + GGBFS etc.) can significantly enhance the performance of cementitious composite exposed to corrosive environments. Research has revealed that the use of

admixtures can reduce the diffusion coefficient of concrete and consequently improve the corrosion resistance of steel reinforcement. However, it has been observed that ternary blends result in superior resistance to chloride ingress compared with binary blends at both early and later ages. This is because the ternary blends contain a slow-reacting admixture (e.g. fly ash or slag) and a fast-reacting admixture (e.g. silica fume or metakaolin) [153]. In addition, such replacement of cement will contribute to the reduction in CO<sub>2</sub> production (carbon footprint) and therefore encourage the use of such sustainable and green concrete. Furthermore, recently some new generation nano-admixtures (such as carbon nanotubes, SiO<sub>2</sub>, TiO<sub>2</sub>, Fe<sub>2</sub>O<sub>3</sub>, CuO, ZrO<sub>2</sub>, ZnO<sub>2</sub>, Al<sub>2</sub>O<sub>3</sub>, CaCO<sub>3</sub>, Cr<sub>2</sub>O<sub>3</sub>) emerges, which can be used to improve the microstructure and corrosion resistance properties of reinforced concrete [154].

### 3.6 Chemical corrosion inhibitors

International Organization for Standardization (ISO 8044:2015) defines corrosion inhibitor as a chemical substance that decreases the corrosion rate when present in the corrosion system at suitable concentration, without significantly changing the concentration of any other corrosion agent [155]. The National Association of Corrosion Engineers (NACE) defines corrosion inhibitors as substances that, when added to an environment, decrease or slow down the rate of attack of the metal [156]. ACI 116R-85 defines a corrosion inhibitor as a chemical compound, either liquid or powder, that effectively decreases or slows down reinforcement corrosion in hardened concrete if introduced, usually in very small concentrations, as an admixture [157]. Therefore, an ideal corrosion inhibitor for cementitious composite may be defined as a chemical compound, which, when incorporated in suitable quantities to cementitious composite, can control corrosion of embedded steel reinforcement and has no adverse effect on the fresh and hardened properties of cementitious composite [158]. These definitions exclude other corrosion control methods such as pore blockers, coatings etc., which modify the oxygen, water and chloride concentrations. Nevertheless, some chemical corrosion inhibitors may also act as pore blockers, which is a secondary property. The inhibitors may be the better than the other methods of protection owing to lower cost and easy to use.

The inhibitors could be classify in many ways: according to their application methods, according to their mechanism of protection, and their chemical nature [132, 133]. The main application methods for corrosion inhibitors are:

- (a) Added to fresh concrete as an admixture
- (b) Added to repair mortars
- (c) Used as a surface treatment on the steel reinforcement bars before concreting

- (d) Applied on the hardened concrete surface, as a penetrating corrosion inhibitor (also surface-applied corrosion inhibitor and migrating corrosion inhibitor).

According to the mechanisms of protection, corrosion inhibitors could be divide into three types:

- (a) Anodic inhibitors: These inhibitors passivate the metal by forming a film adsorbed or insoluble layer on anodic surfaces of the metal. They mainly act by affecting the anodic reaction and consequently reducing the corrosion rate by increasing the corrosion potential and decreasing the corrosion current density of the metal. Though, the sufficient concentration of anodic inhibitors must be used for covering the entire surface of metal. The inappropriate concentration of inhibitors affects the formation of film and leaves some exposed sites, and thus causes pitting corrosion. The commonly used anodic inhibitor are nitrites, nitrates, benzoates, chromates, molybdates, phosphates, hydroxides, silicates and carbonates.
- (b) Cathodic inhibitors: These inhibitors act by forming a barrier of insoluble precipitates over the metal surface and particularly affecting the cathodic reaction. Accordingly, reduced the corrosion rate by decreasing the corrosion potential as well as corrosion current density of metal. These inhibitors are usually less effective but more secure than anodic inhibitors. Examples of cathodic inhibitors are silicates, phosphates polyphosphates, tannins and ions of the zinc, nickel and magnesium that react with the hydroxyl (OH<sup>-</sup>) of the water forming the insoluble hydroxides as Zn(OH)<sub>2</sub>, Ni(OH)<sub>2</sub>, Mg(OH)<sub>2</sub>, which are deposited on the cathodic site of the metal surface, protecting it.
- (c) Mixed inhibitors: These inhibitors act on both anodic and cathodic sites by adsorption on overall surface of the metal. They reduce the corrosion rate by decreasing the corrosion current density without substantial changing the corrosion potential of metal. This type of inhibitor includes amines, amino alcohols, sulfonates, esters and compound with the hydrophobic group that have polar groups such as N, S and OH.

According to chemical functionality, the inhibitors can be classified as follows:

- (a) Inorganic Inhibitors: These inhibitors are generally crystalline salts such as nitrite salts, chromate salts, molybdate compounds, zinc salts, phosphates, silicate compounds etc. Usually, the anions of these salts are involved in decreasing the corrosion of metal. In general, these inhibitors have anodic or cathodic actions. However, when zinc salt is used, the zinc cation can

add some advantageous effect. These zinc-added salts are termed as mixed-charge inhibitors.

- (b) **Organic Inhibitors:** The inhibitors are characterized by high molecular weight structures, incorporating  $-\text{NH}_2$ ,  $-\text{SH}$ ,  $-\text{COOH}$ ,  $-\text{OH}$  or  $-\text{SO}_3\text{H}$  functional groups. In their concentrated forms, these are either liquids or wax like solids. Their active portions are generally large aliphatic or aromatic compounds with positively charged amine groups. These inhibitors are said to be chelating agents, which can form five or six-membered chelate rings. These rings are formed as a result of the bonding between two or more functional groups from the inhibitor and the cation metal, thus, completely cover the metal surface. However, occasionally, they act as cathodic, anodic or mixed inhibitors. Some examples are amines, mercaptobenzothiazole, aldehydes, sulphur-containing compounds, heterocyclic nitrogen compounds and acetylenic compounds.

As compared to the other corrosion control techniques, chemical corrosion inhibitors have some benefits such as economical and versatility. Application of inhibitors in concrete can aid to delay the corrosion initiation in the embedded steel exposed to aggressive environments. However, after the corrosion initiation, their efficiency was less significant. In general, the side effects of the inhibitors on fresh and hardened concrete were reported to be insignificant [161]. Very limited studies on the long-term performance of the inhibitors in real structures are available. Hence, more researches are needed to identify such inhibitors that are effective throughout the service life of structures and are non-hazardous.

## 4 Conclusions

From the critical review discussed concerning steel rebar corrosion monitoring and controlling techniques, following points can be noted

- (1) Potential measurements have been extensively used since 1970 to assess the corrosion risk of steel rebar in concrete. Though, potential values do not provide the corrosion rate of steel. In spite of the simple method for potential measurement on the surface of concrete, the potential mapping results need cautious interpretation. Also, the depth of concrete cover, concrete resistance, polarization effects and high resistivity of surface layer significantly influence the measured potential values.
- (2) The corrosion rate can be evaluated using electrochemical techniques such as potentiodynamic polarization, linear polarization resistance, galvanostatic pulse, electrochemical impedance spectroscopy, Tafel

extrapolation. These techniques can be used in small steel reinforced concrete specimens under laboratory environments as well as large scale field structures. However each method possesses certain advantages and limitations. Therefore a combination of evaluating methods is recommended to use in order to find maximum information about the corrosion condition of steel embedded in concrete.

- (3) The gravimetric weight loss measurements is an efficient technique for finding the corrosion rate of steel rebars, but it is destructive and is usually performed after long exposure times
- (4) Potential measurement, electrical resistivity measurement and sensors techniques do not provide the corrosion rate of the steel reinforcement, they only give qualitative information. However, corrosion monitoring using PZT and optical-fibre sensors is still a new area of research and needs to be explored. Although some of the researchers considered that there is a robust potential in emerging the sensors as a non-destructive method for corrosion assessment that can be possibly provide better assessment than the conventional methods.
- (5) The corrosion control methods for steel reinforced concrete include cathodic protection, electrochemical chloride extraction, surface treatments of the steel reinforcement, surface treatment of concrete, utilization of mineral admixtures and chemical corrosion inhibitors. Each method possesses certain advantages and disadvantages. Consequently, more researches are needed to develop such methods of corrosion protection of embedded steel that are economical, durable, environment-friendly and do not cause any adverse effect on the structural performance of concrete and steel.

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## Compliance with ethical standards

**Conflict of interest** The authors declare that they have no conflict of interest.

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# Influence of Ethanolamine and Nano-TiO<sub>2</sub> on the Fresh, Hardened, Microstructural and Corrosion Resistance Properties of Cementitious Composites

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## Abstract

The influence of 1%, 3% and 5% content of ethanolamine (EA) and nano-TiO<sub>2</sub> (NT) on the fresh, hardened, microstructural and corrosion resistance properties of cementitious composites under different exposure environments (tap water, saline water and acidic solution) had been investigated. The setting time test confirmed that the EA acts as a retarder while NT acts as an accelerator. The SEM and XRD results indicated that EA had an adverse effect on the microstructure, while NT improved the microstructure and increased the amounts of desirable hydration products. The compressive strengths of EA-admixed mortar under all the exposure mediums were found to be lower than control mortar, while NT had the opposite effects. The corrosion inhibition efficiency of 3% EA was found to be higher than the 5% content in all the three exposure environments, while the corrosion inhibition efficiency of NT was increasing with the increase in the dosage.

**Keywords** Ethanolamine · Nano-TiO<sub>2</sub> · Setting time · Compressive strength · Microstructure · Corrosion resistance

## 1 Introduction

Steel-reinforced concrete structures were considered as maintenance-free until the mid-1970s. However, since then various sustainability-related problems have arisen mainly due to acid, sulphate, carbon dioxide and chloride attacks [1]. However, acidic and sulphate attacks primarily degrade cementitious composites thru chemical reactions between cement hydration products and these aggressive agents [2–4]. In contrast, the carbon dioxide and chloride usually cause corrosion of steel rebars. The CO<sub>2</sub> reduces the pH of concrete by reacting with the hydrated cement and creates favourable environment for steel corrosion [5–7]. The Cl<sup>-</sup> ions pass through concrete pores and attack the steel rebars [8–10]. Among all the durability problems, steel corrosion has been

identified as the principal source of deterioration of steel-reinforced concrete structures.

In general, the penetration rate of aggressive agents in dense concrete is very low and thus maintained high alkalinity of the pore solution (pH between 12.5 and 14), and consequently rate of steel corrosion is considerably reduced in such concrete. But, the densification cannot be always related to high alkalinity content of concrete. The high pH of concrete pore solution is owing to the existence of Ca(OH)<sub>2</sub>, KOH and NaOH [11]. When the steel is exposed to such highly alkaline environment, steel reacts with dissolved oxygen and forms an oxide layer ( $\gamma$ -Fe<sub>2</sub>O<sub>3</sub>·H<sub>2</sub>O) on its surface. This layer is very thin (approximately 10 nm), passive, insoluble, dense and impenetrable and acts as a barrier to the oxidation reaction of iron. This layer is known as the engineer's dream coating due its self-formation and maintenance in the alkaline environment [12, 13]. In such condition, the steel usually has a very low risk of corrosion or at least shows a prolonged initiation period before corrosion. However, protection offered by this layer weakens in the presence of aggressive environments. For instance, pitting corrosion may occur at some areas on the surface of steel where the passive film has been damaged due to the presence of aggressive species (mainly chlorides). This is a localized form of corrosion by which cavities or holes are produced in the steel

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bars and consequently local failures occurred in the structural elements. Hence, the pitting is considered to be more hazardous than uniform corrosion damage. In general, the corrosion process generates voluminous corrosion products that causes cracks in concrete, spalling and delamination of concrete cover, and consequently corrosion rate of embedded steel increases critically [14, 15]. Therefore, the corrosion has been considered as one of the most common causes of deterioration of steel-reinforced concrete structures [16].

Numerous approaches have been made in the past to control the steel corrosion. For instance, electrochemical chloride extraction [17–19], cathodic protection [20–22], surface treatment of concrete [23–26], surface treatments of steel rebars [27–30], application of chemical corrosion inhibitors [31–36] and mineral admixtures [37–43]. In addition, recently, use of some nanomaterials as an admixture for cementitious composites has been explored by various researchers. Most of the investigators reported that the use of nanomaterials could increase the strength and durability properties of cementitious composites [44–51].

The corrosion of steel rebars is an electrochemical process. The oxidation reaction ( $\text{Fe} \rightarrow \text{Fe}^{+2} + 2e^-$ ) and reduction reaction ( $2\text{H}_2\text{O} + \text{O}_2 + 4e^- \rightarrow 4\text{OH}^-$ ) occur at anodic and cathodic zones, respectively, and steel itself acts as a conducting medium [52]. Therefore, electrochemical techniques have been developed to assess the corrosion condition of steel rebars. For instance, surface potential measurement [53], open circuit potential measurement [54, 55], linear polarization resistance measurement [56–58], Tafel potentiodynamic polarization measurement [59, 60], galvanostatic pulse transient [61–63] and electrochemical impedance spectroscopy [64–66]. However, Tafel potentiodynamic polarization technique offers many advantages in comparison with other electrochemical techniques: it is rapid and easy to carry out, it provides almost accurate electrochemical parameters (such as corrosion current, corrosion potential, corrosion rate, etc.), and it can be used to monitor the corrosion behaviour of a system uninterruptedly [59].

In the present investigation, an attempt has been made to use one of the recognized chemical corrosion inhibitor, i.e. ethanolamine and one nanomaterial, viz. nano-TiO<sub>2</sub>, primarily to compare their influence on the corrosion behaviour of the steel embedded in mortar exposed under different environments, i.e. tap water, saline water and sulphuric acid solution. Moreover, Tafel potentiodynamic polarization technique was used to monitor the corrosion condition of steel rebars. Besides, the corrosion inhibition efficiency of ethanolamine and nano-TiO<sub>2</sub> was estimated. In addition, the influence of ethanolamine and nano-TiO<sub>2</sub> on the fresh, hardened and microstructural properties of cementitious composites was studied. Therefore, a series of investigations such as setting time of the cement paste, compressive strength of mortar exposed under different environments, microstruc-

tural analysis and elemental compositions of mortar through SEM and EDX techniques and mineralogical analysis of cement paste through XRD technique were carried out.

## 2 Experimental Programme

### 2.1 Materials

In this study, 43-grade ordinary Portland cement (OPC), locally available fine aggregates of fineness modulus of 2.65, nano-TiO<sub>2</sub> (NT) with 30 nm of average particle size and ethanolamine (H<sub>2</sub>N–CH<sub>2</sub>–CH<sub>2</sub>–OH) were used. Mild steel rebar of 3 mm diameter was used as embedding reinforcement in the mortar. Tap water (pH of 7.11) was used as mixing water as well as exposure environment. However, saline water and acidic solution were exclusively used as exposure environments. Moreover, the saline water was made by adding 3.5% NaCl (laboratory grade) in distilled water. We have found pH value of 7.17 of this salt solution. In addition, the acidic solution was made by adding 1% H<sub>2</sub>SO<sub>4</sub> (laboratory grade) in distilled water. We have found pH value of 1.12 of this acidic solution.

The scanning electron microscope (SEM) and the energy-dispersive X-ray spectroscopy (EDX) techniques were used to determine the microstructural properties and elemental compositions of the OPC, nano-TiO<sub>2</sub> and mild steel. The X-ray diffractometer (XRD) technique was used to determine the mineralogical properties of the OPC, nano-TiO<sub>2</sub>. The SEM micrographs of OPC and nano-TiO<sub>2</sub> are shown in Fig. 1a, b, respectively. It can be seen that the OPC particles are irregular in shape and large in size, while NT particles are almost spherical in shape and very small in size. Also, it can be seen for nano-TiO<sub>2</sub>. The EDX spectrums of OPC and NT are shown in Fig. 2a, b, respectively. Figure 3a, b shows the SEM micrograph and EDX spectrum of steel, respectively. The XRD patterns of OPC and NT are shown in Fig. 4a, b, respectively. It can be seen that the XRD pattern of OPC is complex and hence difficult to recognize the polymorphs of OPC because of coexistence of polymorphs and overlapping of large peaks. However, the most prominent peaks in the XRD pattern are obviously those of tricalcium silicate (C<sub>3</sub>S), dicalcium silicate (C<sub>2</sub>S), tricalcium aluminate (C<sub>3</sub>A) and tetracalcium aluminoferrite (C<sub>4</sub>AF). The XRD pattern of nano-TiO<sub>2</sub> indicates its crystalline nature.

### 2.2 Mix Proportions

The details of the different mix proportions for each mortar cube specimen of size 70.6 × 70.6 × 70.6 mm are given in Table 1. The amount of ethanolamine (EA) and NT was added as 1%, 3% and 5% by weight of OPC. Moreover, both admixtures were mixed thoroughly in the water. Besides, NT

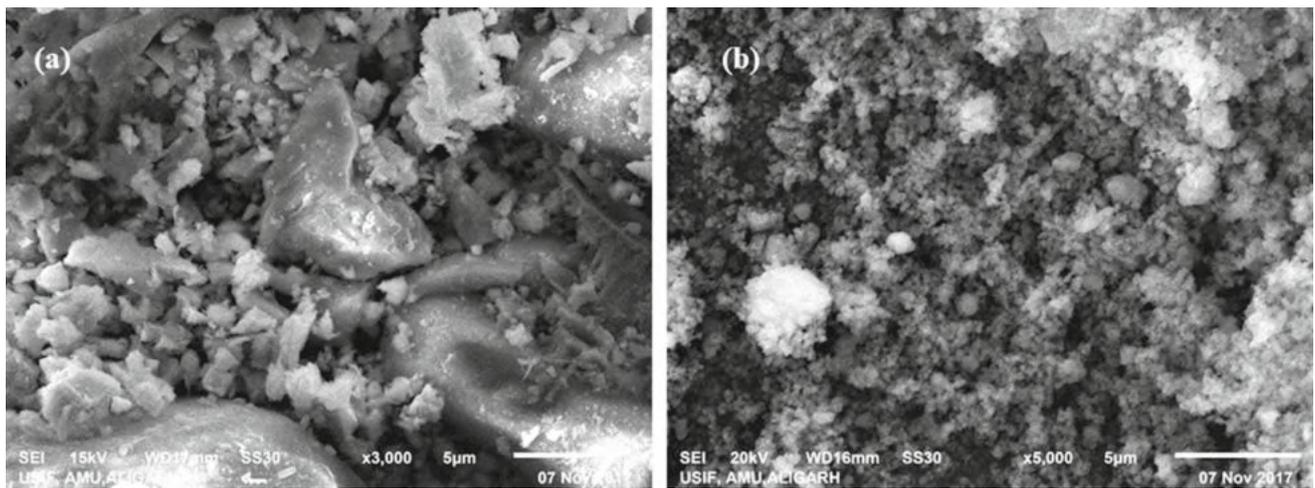


Fig. 1 SEM micrograph of a OPC and b nano-TiO<sub>2</sub>

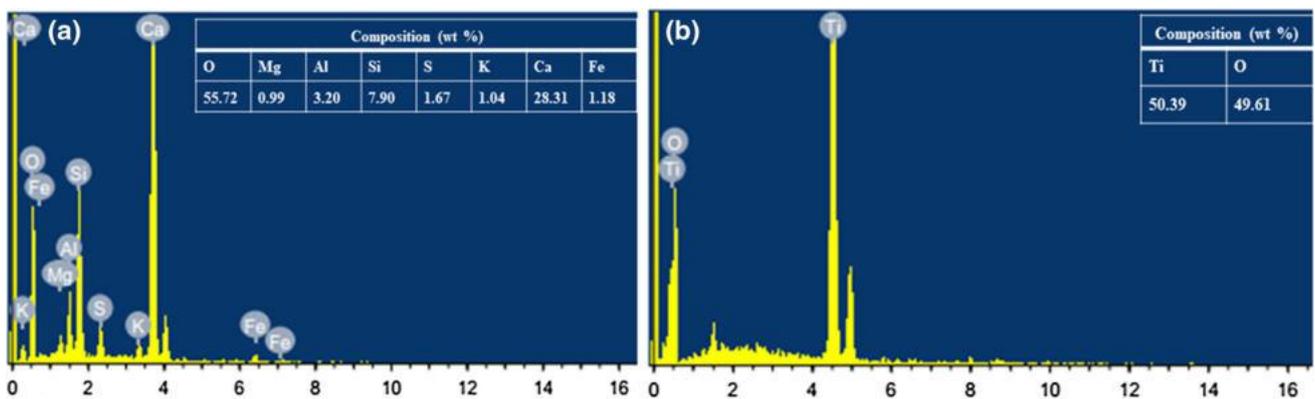


Fig. 2 EDX spectrum of a OPC and b nano-TiO<sub>2</sub>

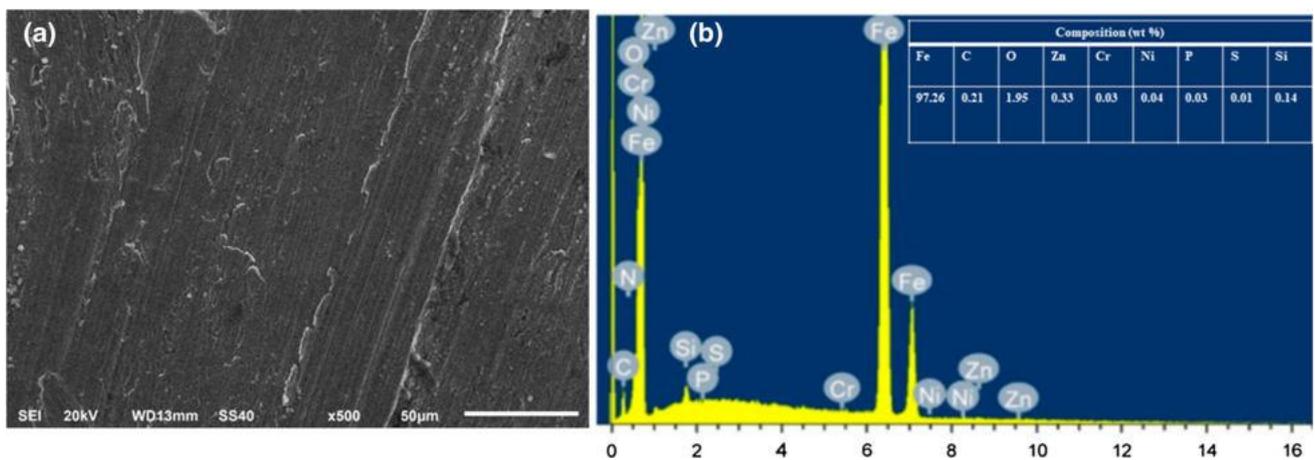
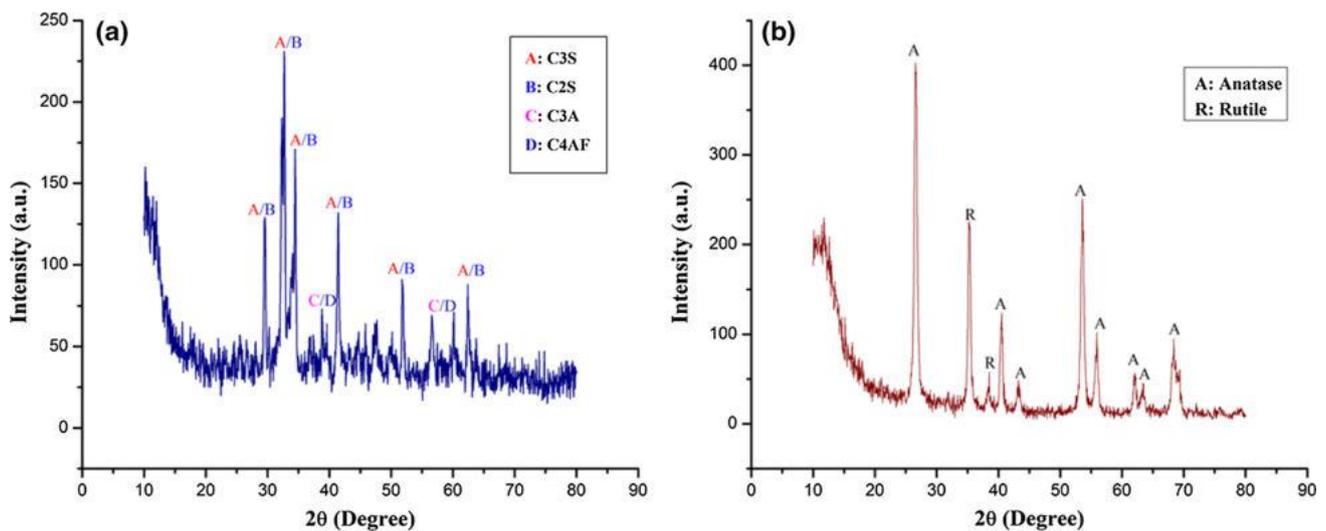


Fig. 3 a SEM micrograph and b EDX spectrum of steel

was properly dispersed in mixing water using magnetic stirrer. These mortar mix proportions were not only designed for compressive strength investigations but also used for SEM and corrosion studies. However, to perform XRD investiga-

tions, the OPC paste (P-X0), 5% EA-admixed paste (P-EA5) and 5% NT-admixed paste (P-NT5) were designed as given in Table 1. Further, the mixing water for these pastes were cal-



**Fig. 4** XRD configuration of **a** OPC and **b** nano-TiO<sub>2</sub>

**Table 1** Mix proportions of mortars and pastes

Type of composite	Specimen designation	Mixture components				
		OPC (g)	FA (g)	EA (ml)	NT (g)	Water (ml)
Mortars	Control (X0)	200	600	0	0	90
	EA1	200	600	2	0	88
	EA3	200	600	6	0	94
	EA5	200	600	10	0	80
	NT1	198	600	0	2	90
	NT3	194	600	0	6	90
	NT5	190	600	0	10	90
Pastes	Control (P-X0)	100	0	0	0	33
	P-EA5	100	0	5	0	31
	P-NT5	95	0	0	5	36

**Table 2** Water content for setting time

Specimen designation	P = Standard consistency (%)	Water content for setting time = 0.85P (%)
OPC	33	28.1
EA1	33	28.1
EA3	32	27.2
EA5	31	26.3
NT1	33	28.1
NT3	34	28.9
NT5	36	30.6

culated using their respective standard consistency as given in Table 2.

## 3 Specimen Specifications and Test Procedure

### 3.1 Setting Time

In order to study the influence of 1%, 3% and 5% of EA and NT on the setting time of OPC, the water content was determined by means of Vicat's apparatus in accordance with IS: 4031 (Part 4 & 5) as shown in Table 2 [67, 68]. Before blending the admixtures into OPC, they were mixed thoroughly in the mixing water.

#### 3.1.1 Compressive Strength

A total 12 mortar cube specimens of size 70.6 × 70.6 × 70.6 mm for each mix proportions were made to determine

the influence of 1%, 3% and 5% of EA and NT admixtures on compressive strength. The specimens were demoulded after 24 h of casting and then exposed to potable water for curing. After 28-day curing, 3 specimens of each mix were examined for compressive strength. And out of remaining 9 specimens, 3 specimens of each mix were submerged in tap water, 3 specimens of each mix were submerged in saline water and 3 specimens of each mix were submerged in acidic solution. These specimens were examined for compressive strength after 360 days of the exposure period. Moreover, the compressive strength test were carried out using compression testing machine (AIMIL Ltd., capacity = 1000 kN and least count = 1 kN) by applying uniform and steady load of about 310 kN/min.

### 3.1.2 Microstructural Analysis

The SEM and EDX analyses of X0, EA5 and NT5 mortar specimens were performed using JSM-6510LV (JEOL) microscope. Small fragments (about 10 mm diameter and 5 mm thickness) of the central portion of the mortar cube specimens were taken for SEM and EDX analyses. The surface of the fragments was prepared flat and regular in shape to avoid any deceptive outcomes. Further, the fragments were immersed in the pure alcohol for 72 h and then were dried at 80 °C for 8 h to stop the hydration reaction.

### 3.1.3 Mineralogical Analysis

The P-X0, P-EA5 and P-NT5 pastes of samples size 20 mm × 20 mm × 20 mm were made for mineralogical analysis. After 24 h of moulding, the samples were submerged in the potable water for curing. After 28 days of curing, the samples were submerged in pure alcohol for 72 h to stop the hydration reaction and then were dried at 50 °C for 4 h to dry and were then kept at room temperature for 72 h to cool. After that, the samples were ground to powder form to perform the XRD analysis by Bruker X-ray D8 Advance diffractometer with Cu-K $\alpha$  ( $\lambda = 1.54187 \text{ \AA}$ ) radiation at room temperature. In addition, the data were recorded with the scanning rate of 2°/min, step-length of 0.02° and  $2\theta$  range of 10°–80°.

## 3.2 Potentiodynamic Polarization Test

In order to determine the corrosion behaviour of steel bar embedded in mortar through Tafel potentiodynamic polarization method, 9 cylindrical specimens of 30 mm diameter and 42 mm height were made for each mix proportion. The 3-mm-diameter steel bar was centrally placed in the mould and was projected by 30 mm from the top of the mould. Besides, a uniform clear cover of 13.5 mm to the steel was provided from the sides as well as bottom of the specimen. Further, the projected portion of the steel was protected with insulating tape.

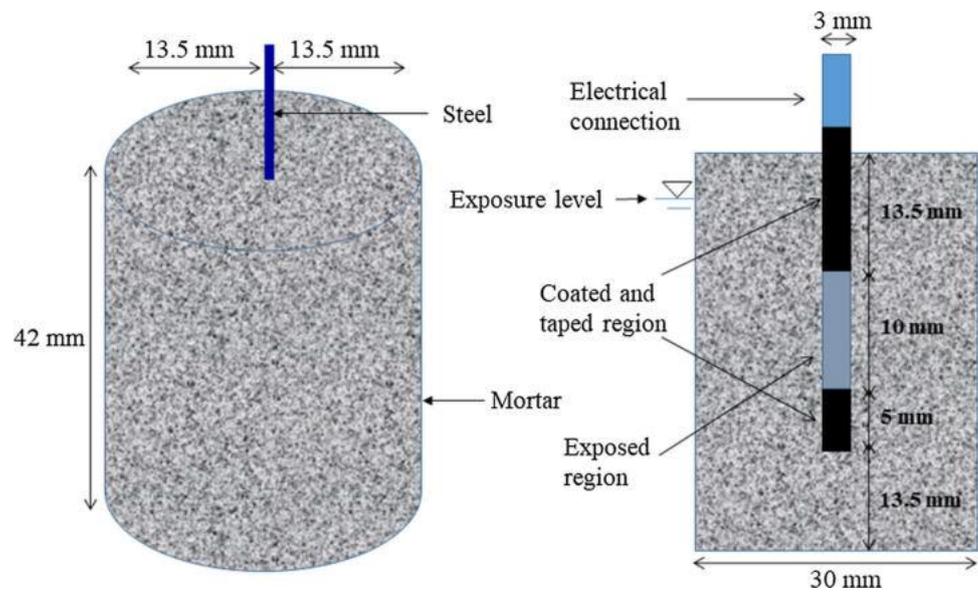
At the time of experiment, this tape was removed for connecting to electrochemical circuit. Moreover, the actual exposed surface area of the steel bar was considered as 1 cm<sup>2</sup> (about 10 mm length). The insulating tape followed by enamel and red oxide coating was applied on the remaining part of steel bar. Figure 5 shows the schematic diagram of the test specimen with details. After 24 h of casting of these specimens, they were demoulded and were cured in tap water for 28 days. Afterwards, 3 specimens of each mix were submerged in tap water, 3 specimens of each mix were submerged in saline water and 3 specimens of each mix were submerged in acidic solution. These test solutions were renewed in every two weeks. In addition, the specimens were monitored continuously with 15 days wetting and drying cycle to accelerate the corrosion process. The wet exposure environment was tap water, saline water and acidic solution; the dry exposure environment was room temperature or normal storage conditions, which means storage in a dry, clean, well ventilated area at room temperatures between 15° and 30 °C. Figure 6 shows the specimens under investigation. The potentiodynamic polarization test was performed after 360 days of exposure period.

The potentiodynamic polarization test was carried out using the Gill AC Potentiostat of Applied Corrosion Monitoring (ACM) instruments. Besides, the ACM instrument offers inbuilt programmes to assess the various corrosion kinetic parameters such as corrosion current density, corrosion potential, corrosion rate, etc. Moreover, the corrosion kinetic parameters were determined by means of the most commonly used three-electrode electrochemical cell assembly, in which the test specimen was acting as working electrode (WE), while platinum electrode (PE) and saturated calomel electrode (SCE) were acting as counter electrode (CE) and reference electrode (RE), respectively. Besides, a working sense (WS) electrode had been connected to WE to measure the potential within the cell between RE and WS electrodes. The test solutions (tap water, saline water and acidic solution) were used as an electrolyte of the electrochemical cell. Figure 7a, b shows the schematic diagram of the test set-up and Gill AC Potentiostat during test, respectively. The experiments were performed at the potential of  $\pm 300 \text{ mV}$  (vs. SCE) from the open circuit potential ( $E_{OC}$ ) with 60 mV/minute potential sweep rate.

The potentiodynamic polarization test produces a plot of the logarithm of the current density ( $\log|i|$ ) versus the potential ( $E$ ). This plot is also known as Tafel curve. The various corrosion kinetic parameters such as Tafel anodic slope ( $\beta_a$ ), Tafel cathodic slope ( $\beta_c$ ), corrosion current density ( $i_{corr}$ ) and corrosion potential ( $E_{corr}$ ) were estimated through intersecting the  $E_{OC}$  and the extrapolated linear parts of the logarithmic current plot as shown in Fig. 8. Besides, the corrosion rate (CR) and linear polarization resistance (LPR) were assessed by means of Gill AC-ACM instrument.



**Fig. 5** Schematic diagram of test specimen



**Fig. 6** Test specimens during dry cycle



Furthermore, the corrosion inhibition efficiency (IE) of EA and NT in percentage were calculated by the following relationship:

$$I.E(\%) = \left( \frac{CR_O - CR_W}{CR_O} \right) \times 100 \quad (1)$$

where  $CR_W$  and  $CR_O$  are the CR of the specimens with and without admixture, respectively.

## 4 Results and Discussion

### 4.1 Setting Time

Figure 9 shows the initial setting time (IST) and final setting time (FST) of different cement pastes. It can be seen that the addition EA led to increase the IST as well as FST of cement paste. The addition of 1%, 3% and 5% EA increased the IST by 4.7%, 8.1% and 13.9%, respectively, and increased the FST by 2.7%, 6.3% and 10.4%, respectively. Hence, it can be said that the EA acts as a retarder for the hydration



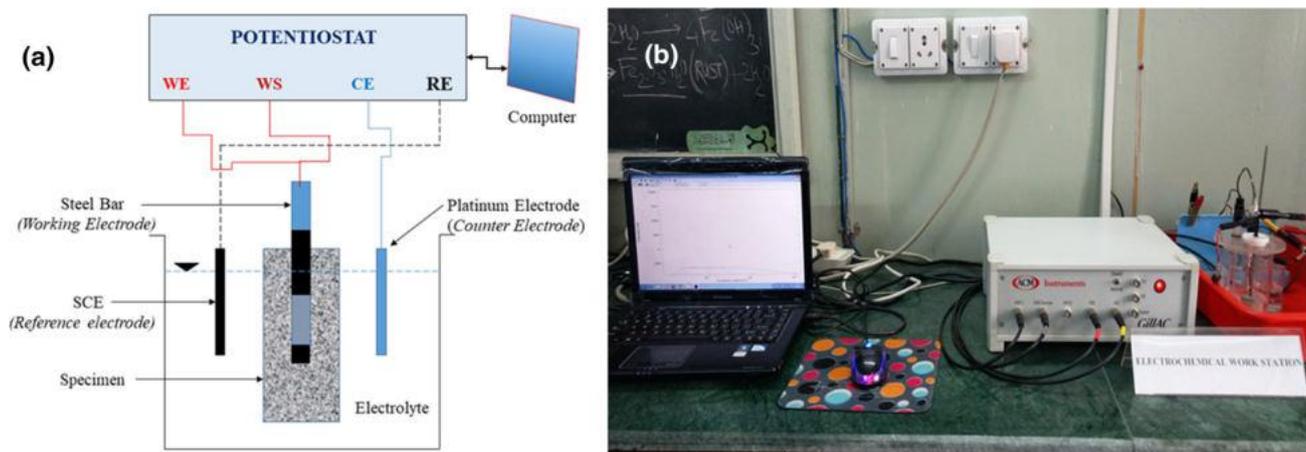


Fig. 7 a Test set-up, b Gill AC potentiostat

Fig. 8 Analysis of Tafel curve

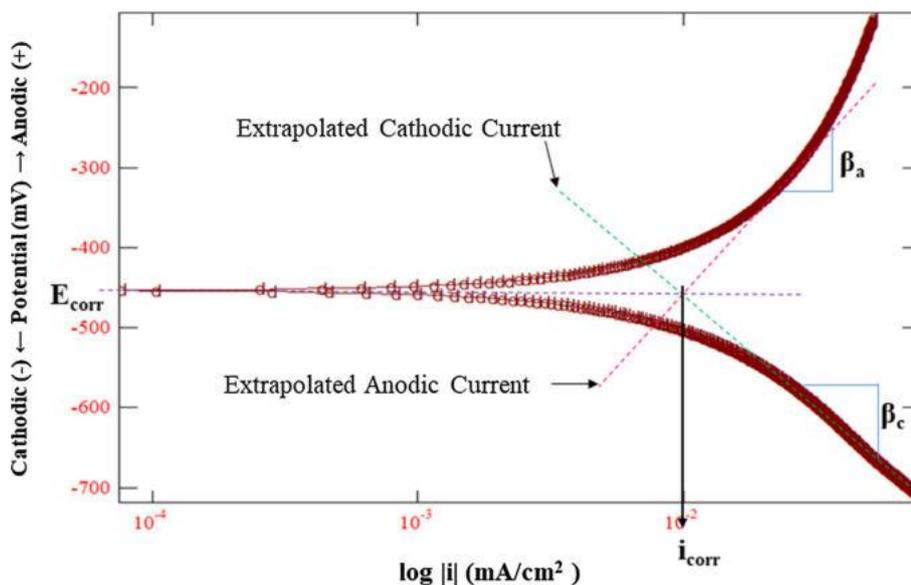
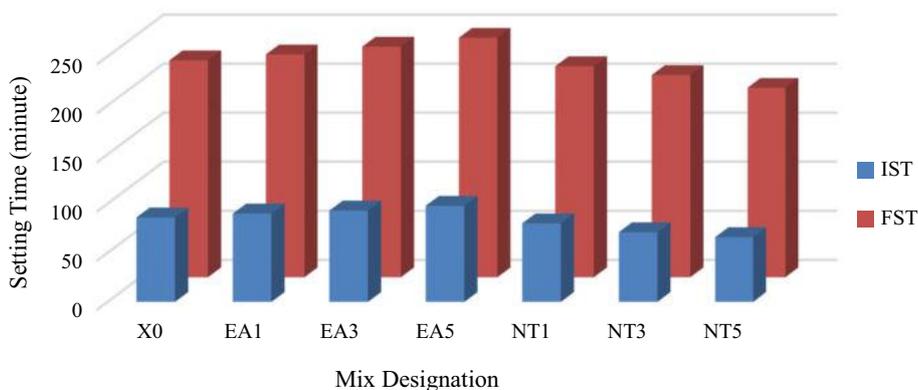


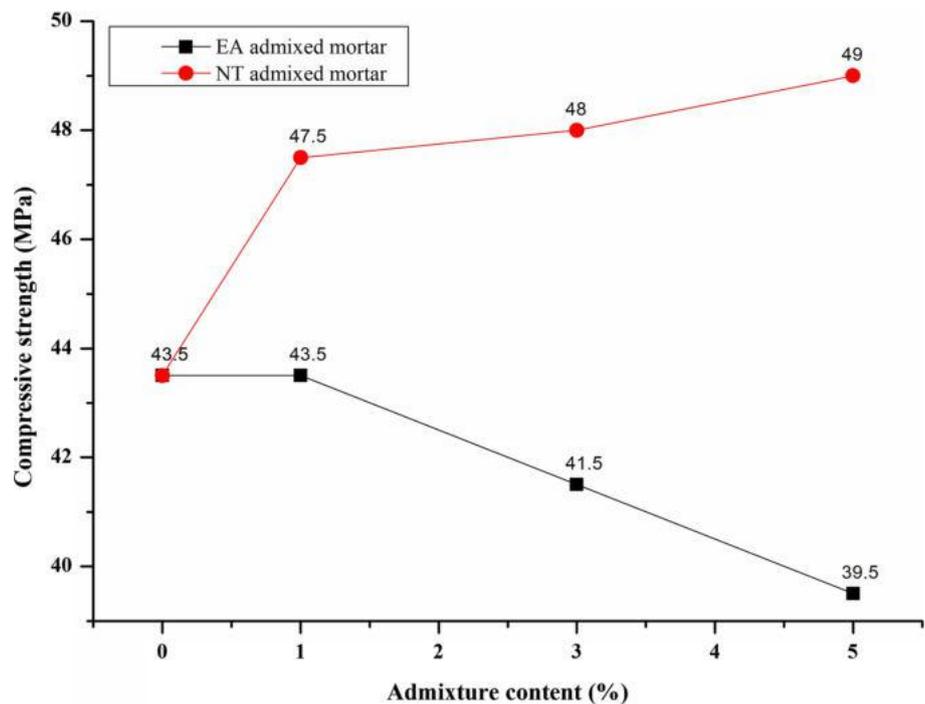
Fig. 9 Influence of EA and NT on IST and FST



process of cement paste. On the other hand, the IST and FST was decreasing with the increase in the percentage of NT. For 1%, 3% and 5% addition of NT, the decrement in IST was 6.8%, 17.4% and 23.3%, while in FST it was 3.6%, 6.8% and 12.7%, respectively. The acceleration effect may

be due to high specific surface area of NT which in turn increases the wettable surface area and water absorption. As a result, the rapid decrease in free water content may speed up the bridging process of gaps, leading to an increase in the viscosity and quick solidification.

**Fig. 10** Influence of EA and NT on 28 days compressive strength of mortar cured in potable water



## 4.2 Compressive Strength

The average compressive strength results (reported to the nearest 0.5 MPa) of 0%, 1%, 3% and 5% EA- and NT-admixed mortar after 28 days of potable water curing is shown in Fig. 10. It can be seen that the compressive strength decreases with increasing the content of EA. As compared to control mortar, the reductions in strength were found as 0.0%, 4.6% and 9.2% for EA content of 1%, 3% and 5%, respectively. These compressive strength reductions may be due to the adsorption of EA on the surface of cement particles that affect the hydration process [69].

The compressive strength was observed to increase with the increase in proportion of NT. When 1%, 3% and 5% NT was added, the corresponding strength improvement as compared to control mortar was found to be 9.2%, 10.3% and 12.6%. These improvements in strength may be because of the enhancement in homogeneity, density and microstructure of cement matrix in the presence of NT [70, 71].

Figure 11 shows the mortar cube specimens after 360 days exposure under tap water, saline water and acidic solution. On visual inspection, no obvious deteriorations were observed on the surface the specimens exposed under tap and saline water. In contrast, clear deteriorations on the surface of the specimens exposed under acidic solution were observed owing to the gypsum and ettringite formation in the presence of mineral sulphuric acid. However, it can be seen that NT-admixed specimens showed less signs of deterioration as compared to the other specimens. Hence, it can be said that

EA was not effective against mineral sulphuric acid attack. On the other hand, NT exhibited acid-resistant properties.

Table 3 shows the impacts of EA and NT on the compressive strength of mortar specimens after 360 days exposure under tap water, saline water and acidic solution. It can be seen that in all the three exposure mediums, EA-admixed specimens exhibited lower compressive strengths as compared to control specimens and the higher EA dosage, the lesser the strength. On the other hand, strengths were improved by the addition of NT and the higher NT amount, the greater the improvement.

The specimens exposed under tap water exhibited greater compressive strengths as compared to the corresponding specimens exposed under saline and acidic environments. In saline environment, the reduction in strength may be due to the consumption of calcium aluminate hydrate and the formation of calcium chloroaluminate hydrate. Besides this, it can be because of the development of stresses and microcracks due to salts crystallization in the pores [72]. In acidic environment, the loss in strength is due to the formation of gypsum in the presence of  $H_2SO_4$  and  $Ca(OH)_2$ . The gypsum forms ettringite on reacting with tricalcium aluminate (C3A). The higher volume of gypsum and ettringite causes inner stresses in mortar leading to the growth of cracks [73]. In addition, EA-admixed specimens showed higher strength loss as compared to control specimens. In contrast, NT-admixed mortar specimens showed considerably lower strength loss as compared to the control specimens. This may be because of the limiting the ingress of aggressive ions into the mortar by NT.

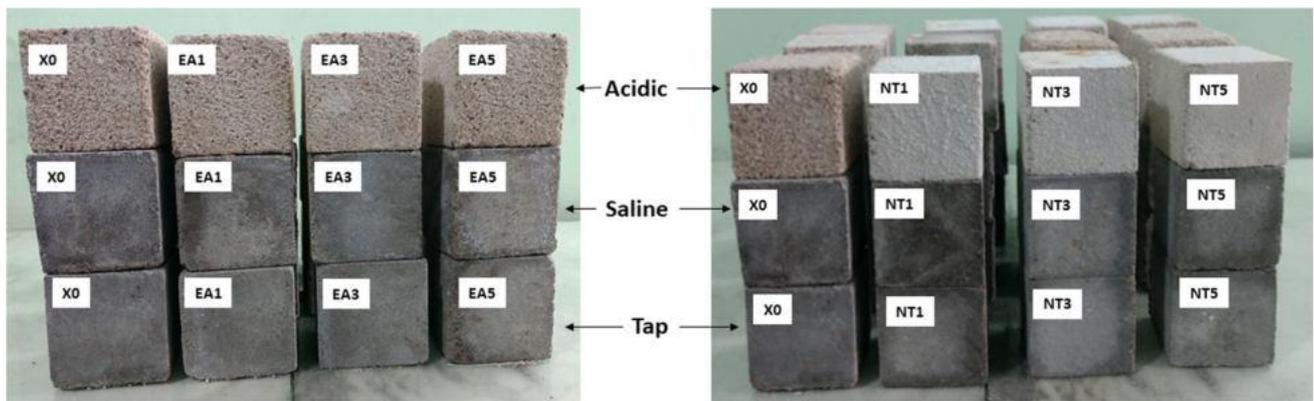


Fig. 11 Mortar cube specimens after 360 days of exposure under different environments

**Table 3** Compressive strength of specimens after 360 days exposure under tap water, saline water and acidic solution

Exposure medium	Mix designation	Compressive strength (MPa)	% Variations w.r.t. control specimen	% Variations w.r.t. the corresponding specimens exposed in tap water
Tap water	X0	47.5	–	–
	EA1	46.5	– 2.11	–
	EA3	45.0	– 5.26	–
	EA5	43.5	– 8.42	–
	NT1	52.5	10.53	–
	NT3	54.5	14.74	–
	NT5	55.0	15.79	–
Saline water	X0	39.5	–	– 16.84
	EA1	38.5	– 2.53	– 17.20
	EA3	37.0	– 6.34	– 17.77
	EA5	35.0	– 11.39	– 19.54
	NT1	47.0	18.99	– 10.48
	NT3	48.5	22.78	– 11.00
	NT5	49.5	25.32	– 10.00
Acidic solution	X0	34.5	–	– 27.37
	EA1	32.5	– 5.78	– 30.11
	EA3	30.0	– 13.04	– 33.33
	EA5	27.5	– 20.29	– 36.78
	NT1	40.5	17.39	– 22.86
	NT3	42.5	23.19	– 22.08
	NT5	43.5	26.09	– 20.91

### 4.3 Microstructural Analysis

Figure 12a–c shows the SEM micrographs of X0, EA5 and NT5 mortars, respectively. The images were taken at the magnification of 1000 and 10,000 times. Figure 13a–c shows the EDX spectrums of X0, EA5 and NT5 mortars, respectively. The SEM image of EA5 specimen exhibits more amount of needle-like crystals of calcium aluminate trisulphate hydrate (C-A-S-H) and pores compared to X0 specimen. This indicates that the high amounts of EA may adversely affect the

microstructural and mechanical properties of cementitious composites. Thus, the microstructural analysis results exhibited good agreement with the above-mentioned compressive strength test results. Besides, the presence of EA in the mortar is evident from EDX spectrum because its analysis results show the existence of additional carbon element. The SEM micrographs of NT5 show a special type of microstructure, comprising a voluminous quantity of calcium silicate hydrate (C-S-H gel) and a low amount of pores and C-A-S-H (Ettringite). Thus, it is clear that the addition of NT has improved

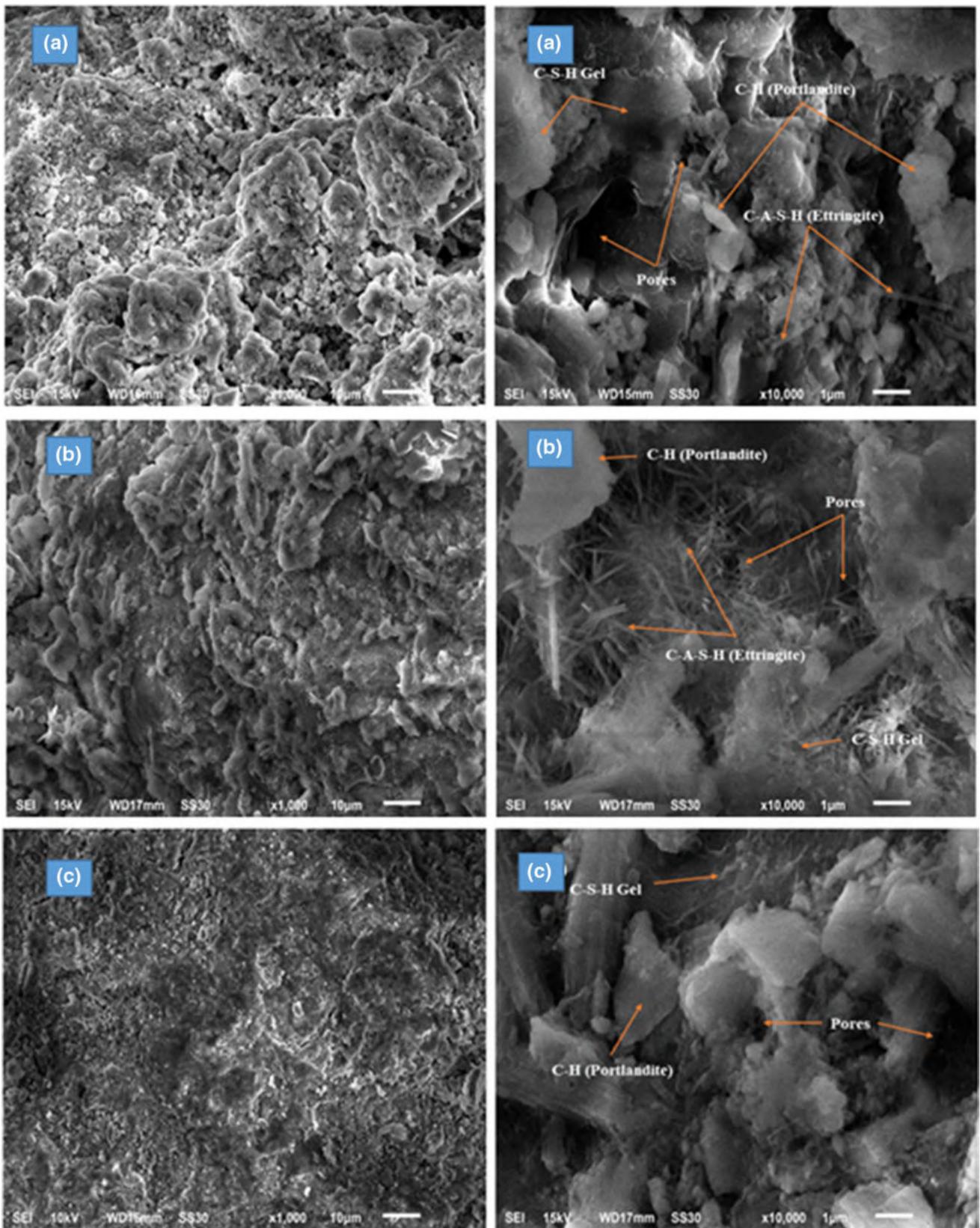


Fig. 12 SEM micrographs of a X0, b EA5 and c NT5 mortar

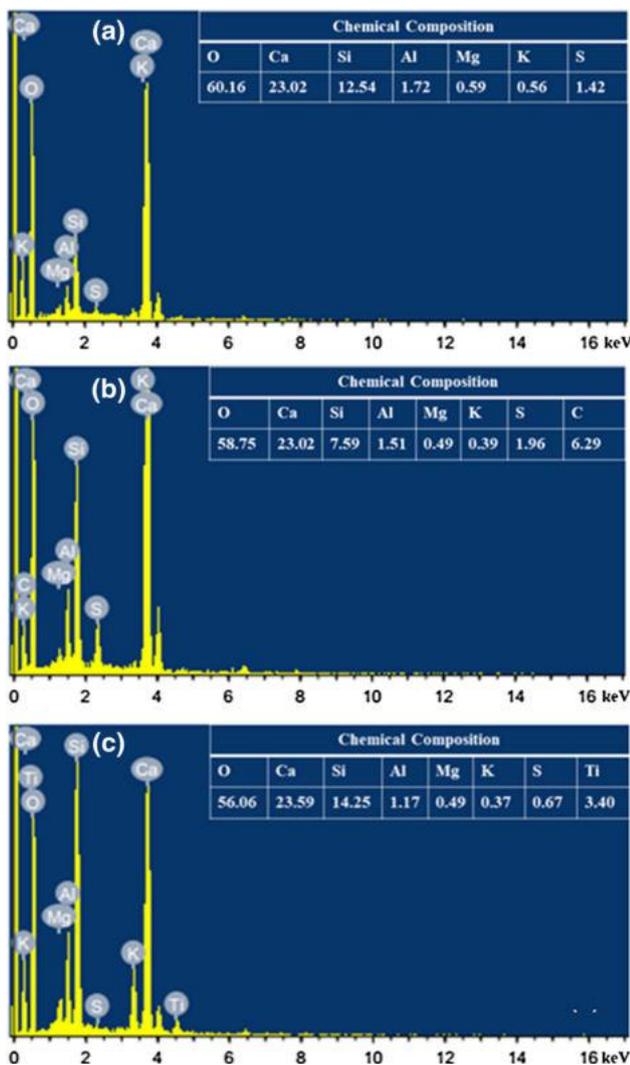


Fig. 13 EDX spectra of a X0, b EA5 and c NT5 mortar

the microstructural and mechanical properties of mortars. These characteristics might be because NT could increase particle-packing density, reduce the porosity and develop intact bonds. Moreover, the presence of NT in the mortar confirms through EDX spectrum.

#### 4.4 Mineralogical Analysis

Figure 14a–c shows the XRD patterns of P-X0, P-EA5 and P-NT5 pastes, respectively. The XRD configurations of cement paste can be explained with the help of hydration reactions. Since the total mole quantity of calcium is constant, calcium may be present in the hydration products either as calcium hydroxide (Portlandite) or as C–S–H gel or C–A–S–H (ettringite). Usually, the quantity of ettringite is considerably lower than the Portlandite and C–S–H gel. As such, a lower amount of C–S–H gel corresponds to a higher amount of Portlandite.

Generally, the quantitative analysis of C–S–H gel cannot be carried out by means of the XRD results, because C–S–H gel is poorly crystalline fibrous mass (amorphous in structure), which is not possibly reflected in XRD pattern. In addition, there is no direct technique to calculate the C–S–H gel concentration and hence the quantity of Portlandite can indirectly estimate the C–S–H gel concentration. Various investigators found that the quantity of Portlandite is inversely related to that of C–S–H concentration, and hence, the smaller peaks of Portlandite in XRD pattern indicate the higher quantity of C–S–H gel [74–76].

The XRD results signify the presence of C3S (1), C2S (2), Portlandite (3), and ettringite (4). Portlandite peaks have been considered as the main indicator of cement paste and can be used for the estimation of C–S–H gel quantity. The XRD pattern of P-EA5 specimen showed various overlapping and low-intensity peaks that indicates the presence of ettringite. Thus, the addition of a higher amount of EA may adversely affect the strength and durability characteristics of cementitious composites. On the other hand, the XRD pattern of P-NT5 exhibited considerably lower intensity peaks of Portlandite as compared to control specimen. This suggests that the NT consumes Portlandite crystals. Such consumption of Portlandite increases the desirable C–S–H gel quantity and enhances the microstructural and mechanical properties of cementitious composites.

#### 4.5 Potentiodynamic Polarization Test

Figures 15, 16 and 17 show the Tafel potentiodynamic polarization curves of all the specimens submerged in tap water, saline water and sulphuric acid solution, respectively. The corrosion kinetic parameters such as anodic constant ( $\beta_a$ ), cathodic constant ( $\beta_c$ ), corrosion current density ( $I_{corr}$ ), corrosion potential ( $E_{corr}$ ), linear polarization resistance (LPR) and corrosion rate (CR) of different specimens as found from their corresponding polarization curves are shown in Table 4. Also, the corrosion inhibition efficiencies (IE) of different percentages of EA and NT were estimated and presented in Table 4.

It can be seen that the presence of EA up to 3% produces a significant decrease in the corrosion rate of steel embedded in mortar specimens exposed to tap water. Further addition of EA up to 5% marginally reduces the corrosion rate of the embedded steel as compared to 3% dosage. Thus, the corrosion inhibition efficiency of EA increases with the increase in the dosage up to 3%, and decreases at 5% dosage. Similar trends of effectiveness of EA were observed in case of saline water and acidic solution exposure conditions. The effectiveness of EA in preventing corrosion is believed to be due to the formation of a film around the steel [36]. It was observed that the corrosion rates exhibited by the NT-admixed specimens were found to be lower than the control specimens exposed in

Fig. 14 XRD patterns of  
a P-X0, b P-EA5 and c P-NT5

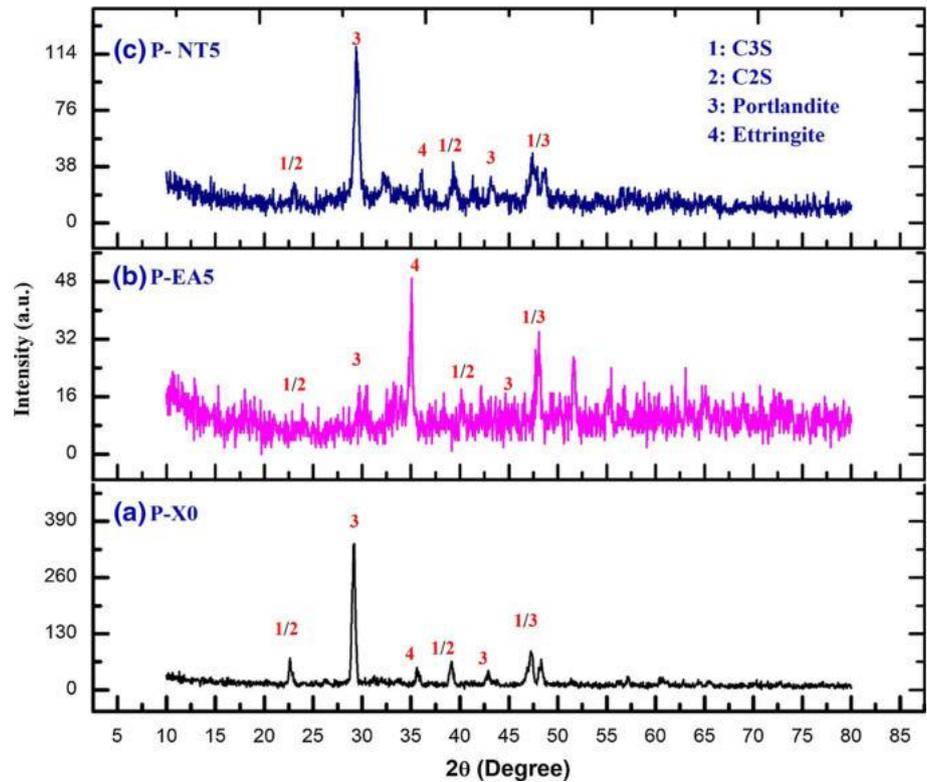
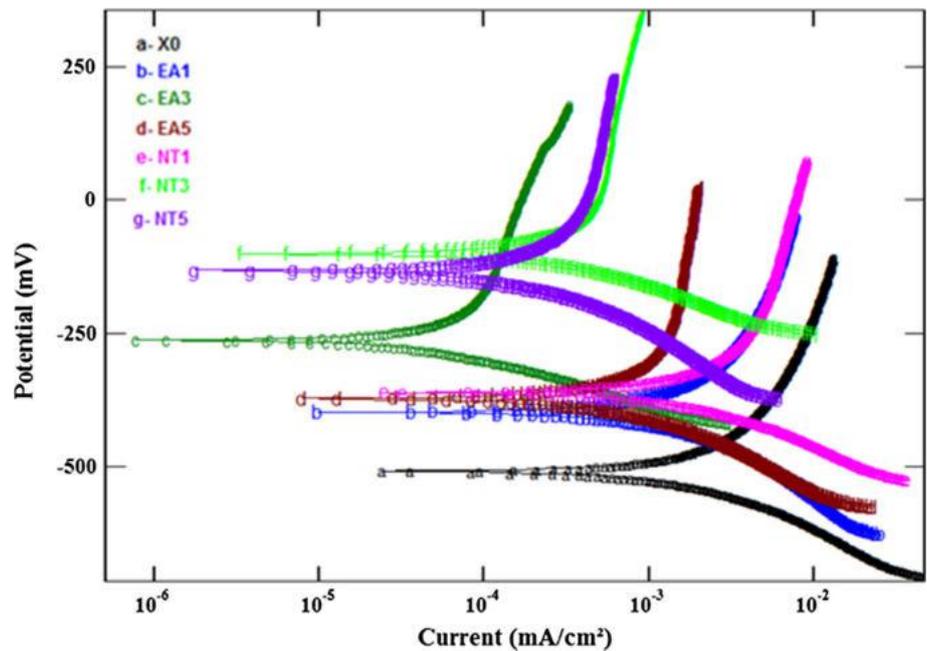


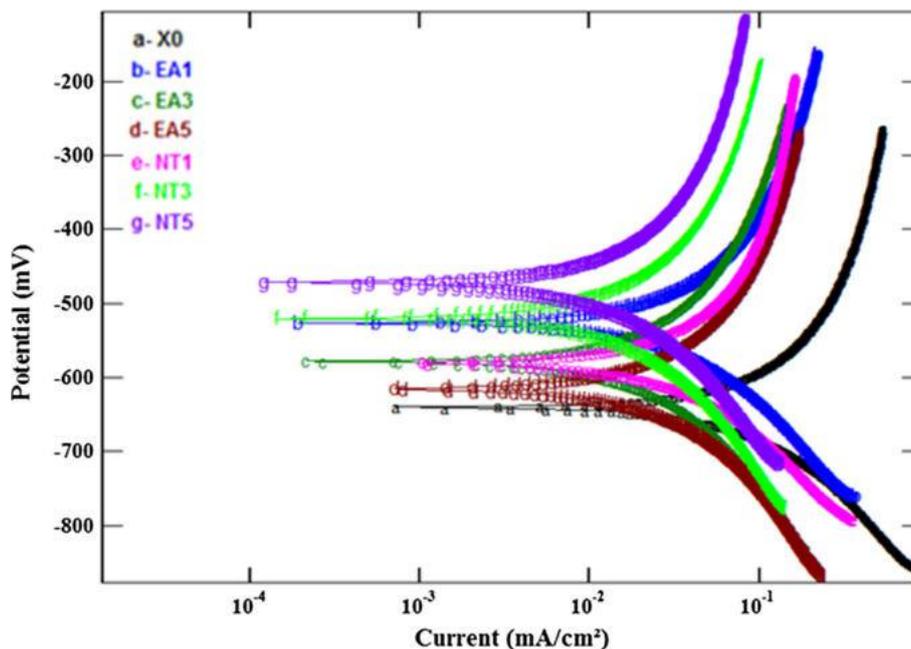
Fig. 15 Potentiodynamic polarization curves of all the specimens exposed under tap water



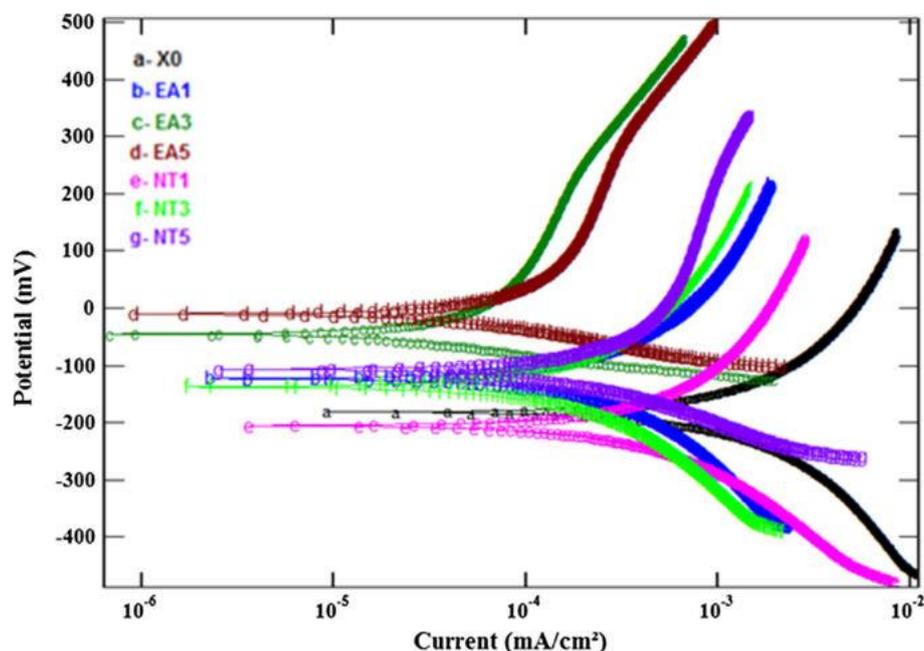
tap water. Hence, the corrosion inhibition efficiency increases with the increase in the amount of NT. Also, the specimens exposed in saline water and sulphuric acid solution exhibited similar effects. This suggests that the NT can fill up the voids and yields a compact mortar and consequently decreasing the ionic transport.

Furthermore, the corrosion resistance of all the specimens exposed in saline water was observed to be significantly lower than the corresponding specimens exposed in tap water. In contrast, the corrosion resistance of all the specimens exposed in sulphuric acid solution was found to be slightly higher than the corresponding specimens exposed in tap

**Fig. 16** Potentiodynamic polarization curves of all the specimens exposed under saline water



**Fig. 17** Potentiodynamic polarization curves of all the specimens exposed under acidic solution



water. This contradictory effect may be because of the development of gypsum and ettringite within the pores of mortar in the presence of sulphuric acid that decreases the ingress of aggressive agents.

### 5 Conclusions

The following conclusions have been drawn based on the obtained results:

1. The setting time results showed that ethanolamine (EA) acts as retarder. However, nano-TiO<sub>2</sub> (NT) acts as accelerator. The acceleration effect of NT may be due to its high specific surface which in turn increases the wettable surface area and water absorption leading to an increase in the viscosity and quick solidification.
2. The EA-admixed mortar specimens showed a slightly lower 28-day compressive strength as compared to control specimens. This reduction was more significant at the higher dosage of EA. This might be because the

**Table 4** Corrosion kinetic parameters of steel embedded in mortar and IE of EA and NT

Exposure medium	Specimen name	$\beta_a$ (mV/dec)	$-\beta_c$ (mV/dec)	LPR ( $\Omega \cdot \text{cm}^2$ )	$E_{\text{corr}}$ (mV)	$I_{\text{corr}}$ ( $\text{mA}/\text{cm}^2$ ) $\times 10^{-3}$	CR ( $\text{mm}/\text{year}$ ) $\times 10^{-3}$	IE (%)
Tap water	X0	440.87	183.14	20,061	- 508.20	2.804	32.502	-
	EA1	436.00	193.22	28,040	- 396.96	2.076	24.061	25.97
	EA3	578.34	109.26	734,930	- 263.87	0.054	0.630	98.06
	EA5	509.64	156.38	58,342	- 373.58	0.892	10.336	68.20
	NT1	497.03	127.62	27,810	- 364.58	1.588	18.400	43.38
	NT3	598.63	186.08	171,230	- 131.68	0.360	4.177	87.15
	NT5	625.8	104.07	191,750	- 99.636	0.202	2.345	92.78
Saline water	X0	321.66	146.69	515	- 640.24	84.983	984.956	-
	EA1	400.83	171.52	1279	- 527.91	40.831	473.232	51.95
	EA3	358.38	199.26	2024	- 578.23	27.501	318.738	67.64
	EA5	310.33	180.04	1611	- 617.48	30.734	356.205	63.84
	NT1	369.68	142.16	1475	- 580.17	30.257	350.681	64.4
	NT3	315.17	165.9	2733	- 520.95	17.287	200.353	79.7
	NT5	313.2	147.13	3179	- 470.84	13.687	158.635	83.9
Acidic solution	X0	432.88	312.11	34,028	- 180.84	2.317	26.856	-
	EA1	472.23	198.20	164,770	- 123.46	0.368	4.269	84.10
	EA3	456.47	53.11	1,105,300	- 47.32	0.019	0.217	99.19
	EA5	467.33	58.90	767,570	- 12.18	0.030	0.343	98.72
	NT1	418.71	221.36	85,355	- 202.97	0.738	8.549	60.49
	NT3	455.30	225.09	223,420	- 138.22	0.293	3.397	87.35
	NT5	532.48	142.31	249,650	- 105.56	0.196	2.267	91.56

addition of EA decreased the amount of desirable hydration products. A substantial improvement in the 28-day compressive strength of mortars was observed with the addition of NT. This was more noticeable when higher quantities of NT were added. This might be because the addition of NT increased the quantity of desirable hydration products and particle-packing density of mortar.

- The EA-admixed specimens showed considerably lower resistance against chloride and acid attack as compared to control specimens. However, the specimens containing NT showed significantly higher resistance against chloride and acid attack as compared to control specimens. This may be due to the pore-blocking ability of NT that inhibit the ingress of aggressive ions.
- The microstructural analysis confirmed that the EA-admixed specimen exhibited more amount of needle-like crystals and pores compared to control specimen. This indicates that the high volumes of EA may adversely affect the microstructural properties of cementitious composites. However, the SEM micrograph of nano-TiO<sub>2</sub>-admixed specimen showed a large quantity of C-S-H gel, and a low amount of pores and needle-like crystals. This might be because the addition of nano-TiO<sub>2</sub> increased particle-packing density of mortar.

- The XRD analysis of cement paste specimen containing EA showed many overlapping and lower intensity peaks that indicate the presence of Ettringite. Consequently, the addition of a higher amount of EA may adversely affect the strength and durability characteristics of cementitious composites. In contrast, the XRD analysis confirmed that the inclusion of NT leads to increase in the amount of C-S-H gel and thus may enhance the microstructural, strength and the durability properties of mortar.
- The potentiodynamic polarization studies showed that the EA is effective in reducing the corrosion rate of embedded steel. This may be due to the adsorption of EA on the surface of steel, thus preventing the reaction to occur between iron and aggressive ions. The corrosion rate exhibited by the NT-admixed specimens was found to be significantly lower than the control specimens. This may be due to pore blocking efficiency of NT that restrict the ingress of aggressive agents.

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## Compliance with Ethical Standards

**Conflict of interest** None.

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# Effect of ethanolamine and nano-TiO<sub>2</sub> on the properties of ferrocement composites under different exposure environments

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**Abstract.** The main aim of this study was to investigate the effect of 1%, 3% and 5% content of ethanolamine (EA) and nano-TiO<sub>2</sub> (NT) on the corrosion resistance properties of ferrocement composites exposed under tap water, saline water and sulphuric acidic solution environments. The corrosion behaviour composites were assessed through potentiodynamic polarization technique. Besides, the effect of EA and NT on the fresh, hardened, microstructural and mineralogical properties of cementitious composites were evaluated by conducting setting time, compressive strength, SEM, EDX and XRD studies. The corrosion resistance properties of ferrocement composites were found to be improved with the addition of both EA and NT. The corrosion inhibition efficiency of EA was observed to be increasing up to 3% but decreased at 5% dose, whereas it was increasing with increasing the content of NT in all the three exposure environments. The EA and NT were found to be acting as retarder and accelerator, respectively. The addition of EA led to decrease the 28-days compressive strength of mortar, however the addition of NT showed an opposite effects. Similar impacts on the 180-days compressive strengths mortars exposed under tap water, saline water and acidic solution were also observed. The SEM and XRD analyses revealed that EA caused adverse impacts on the microstructure and hydration products of OPC, though NT enhanced the microstructure and the quantities of desirable hydration products.

**Keywords.** Ethanolamine; nano-TiO<sub>2</sub>; corrosion resistance; setting time; compressive strength; microstructural properties.

## 1. Introduction

Until the mid-1970s, steel reinforced cement concrete structures were assumed to be maintenance-free for an indefinite period. On the contrary, subsequently several durability associated problems have been emerged mainly caused by aggressive agents such as chlorides, carbon dioxide, sulphates and acids [1]. Generally, the carbon dioxide and chlorides corrode the steel. Carbon dioxide creates an environment favourable to corrosion of steel by reacting with hydration products of cement and reducing the alkalinity of concrete [2–4]. Chlorides attack the steel reinforcement by passing through the pores of the concrete but usually do not attack the concrete integrity [5–7]. In contrast, acids and sulphates mainly degrade the integrity of concrete by reacting with the hydration products of cement [8–10].

Of all the problems related to the durability of reinforced concrete structures, the corrosion of the steel reinforcement

was recognized as the main cause of the deterioration. Usually, steel does not oxidize in dense concrete due to the high pH of pore solution containing NaOH, KOH and Ca(OH)<sub>2</sub> [11]. Under such environmental conditions, an oxide film ( $\gamma$ -Fe<sub>2</sub>O<sub>3</sub>·H<sub>2</sub>O) on the surface of steel is formed due to the reaction between steel and dissolved oxygen. This film is very thin (about 10 nm), passive, insoluble, dense and impenetrable. This passive film considerably decreases the corrosion of steel by acting as a barrier to the oxidation reaction. This film is recognized as the engineer's dream layer owing to its self-formation and maintenance in the presence of alkaline environment [12, 13]. Under such circumstances, generally there is low risk of corrosion of steel or corrosion initiation time is prolonged. Though, protection presented by this passive film declines in the presence of hostile agents. For example, when the passive layer gets damaged because of the presence of hostile species (primarily chlorides) then pitting corrosion may take place at some zones on the steel surface. This type of corrosion is limited to a small area and produces cavities or holes in the steel bars and thus, causes local failures in the

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structural components. Therefore, the pitting corrosion is known to be more dangerous than generalized form of corrosion. Generally, the corrosion of steel forms expansive corrosion products that create cracks in concrete and leads to spalling and delamination of cover concrete and eventually increases the rate of corrosion [14, 15]. As a result, steel corrosion is known as one of the most common causes of degradation of steel-reinforced cement concrete structures [16].

Various methods have been developed in the past to reduce the corrosion of steel reinforced cement concrete structures. Some of the techniques comprise addition of chemical corrosion inhibitors [17–22], use of mineral additives in concrete [23–29], surface treatment of concrete [30–33], surface treatment of steel [34–37], electrochemical chloride extraction [38–40] and cathodic protection [41–43]. Besides, several research articles recently reported the potential use of various nanoparticles as an additives for cementitious composites. Most of the studies have revealed that incorporating nanoparticles into cement-based composites can improve the strength and durability properties [44–51]. For example, the addition of 5% nano-TiO<sub>2</sub> into self-compacting mortar caused to enhanced the 28-days compressive strength by 13% and electrical resistivity by 257% and reduced the water absorption by 11% and the chloride permeability by 58% [47]. As far as fresh properties are concerned, it was found that the addition of nano-TiO<sub>2</sub> substantially reduced the workability and setting time of cementitious composites [52].

Since corrosion of iron is an electrochemical process, hence oxidation reaction occurs at anode ( $\text{Fe} \rightarrow \text{Fe}^{+2} + 2\text{e}^-$ ) and reduction reaction occurs at cathode ( $2\text{H}_2\text{O} + \text{O}_2 + 4\text{e}^- \rightarrow 4\text{OH}^-$ ). To keep electrical neutrality, the  $\text{Fe}^{+2}$  ions move through the pore water of concrete to the cathodic zones and combine with  $\text{OH}^-$  to produce iron hydroxides [53]. As a result, various electrochemical techniques such as Tafel potentiodynamic polarization measurement [54, 55], open circuit potential measurement [56, 57], linear polarization resistance measurement [58–60], surface potential measurement [61], galvanostatic pulse transient [62–64] and electrochemical impedance spectroscopy [65–67] have been developed to assess the corrosion behaviour of steel reinforced cementitious composites. As compared to other methods, Tafel potentiodynamic polarization technique is quick and easy to execute, provides a range of electrochemical parameters such as corrosion current, corrosion potential, linear polarization resistance, etc.

In this study, the effect of one of the renowned chemical admixtures, i.e., ethanolamine (EA) and a nanomaterial, i.e., nano-TiO<sub>2</sub> (NT), on the corrosion resistance behaviour of the ferrocement composite in different environments, namely tap water, saline water and acidic solution have been investigated. In addition, the corrosion state of ferrocement composites was assessed using Tafel potentiodynamic polarization technique. Besides, the effect of EA

and NT on the microstructural, fresh and hardened characteristics of cementitious composites were investigated. Hence, various experiments such as setting time, compressive strength, microstructural and mineralogical analysis were conducted.

## 2. Experimental procedure

### 2.1 Materials and their properties

In this investigation, ordinary Portland cement (OPC) of 43-grade and fine aggregates (FA) of fineness modulus (FM) of 2.65 was used [68]. NT with average particle size of 30 nm (as specified by supplier) was used. The EA ( $\text{H}_2\text{N}-\text{CH}_2-\text{CH}_2-\text{OH}$ ) was used as corrosion inhibitor. The ferrocement composites were made by embedding mild steel (MS) bar of 3 mm diameter into cement mortar. Tap water with pH of 7.11 was used as mixing water and exposure medium. On the other hand, saline water (3.5 % NaCl solution) with a pH of 7.27 and acidic water (1% H<sub>2</sub>SO<sub>4</sub> solution) with a pH of 1.12 were exclusively used as exposure environments.

The microstructural properties and elemental compositions of the OPC, NT and MS were determined by scanning electron microscope (SEM) and energy-dispersive X-ray spectroscopy (EDX) techniques, respectively. Mineralogical properties of the OPC, NT were characterized using X-ray diffractometer (XRD) technique. Figure 1a, b show SEM images of OPC and NT, respectively. It can be seen that OPC particles have rough surfaces and irregular shapes and sizes. This suggests that there are probabilities of infilling the spaces amongst OPC particles using some finer particles. Also, it can be seen that NT particles are very small in size and almost spherical in shape. Figure 2a, b show EDX spectrums of OPC and NT, respectively. The SEM image and EDX spectrum of MS are shown in figure 3a, b, respectively. Figure 4a, b show XRD configurations of OPC and NT, respectively. The XRD configuration of OPC is quite complex due to overlapping of large peaks and coexistence of polymorphs and thus, it is very difficult to identify the polymorphs of OPC. Though, the chief compounds of OPC i.e., dicalcium silicate (C<sub>2</sub>S), tricalcium silicate (C<sub>3</sub>S), tricalcium aluminate (C<sub>3</sub>A) and tetracalcium aluminoferrite (C<sub>4</sub>AF) can be seen in most prominent peaks of XRD configuration. The XRD configuration of NT specifies its crystalline structure.

### 2.2 Mixture proportions of mortars and pastes

Mixture proportions of the mortars and pastes are listed in table 1. For mortars, the ratio of binder (OPC + NT) to FA was taken as 1:3 and water/binder ratio was fixed to 0.45 for all mixtures. The dosage of both EA and NT was taken as 1%, 3% and 5% by weight of OPC. However, NT was

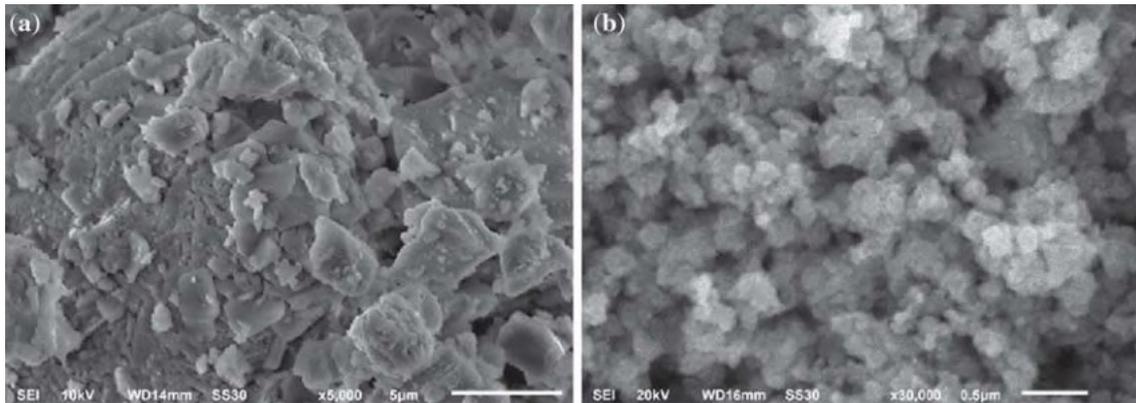


Figure 1. (a) SEM image of OPC and (b) SEM image of nano-TiO<sub>2</sub>.

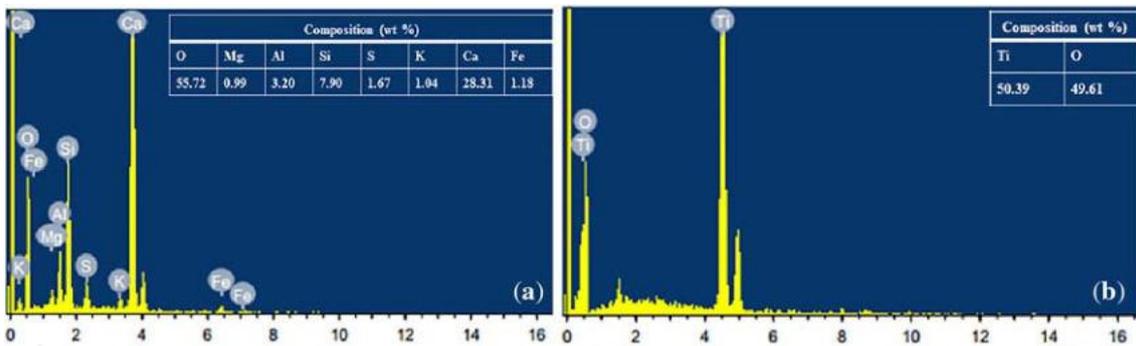


Figure 2. (a) EDX spectrum of OPC and (b) EDX spectrum of nano-TiO<sub>2</sub>.

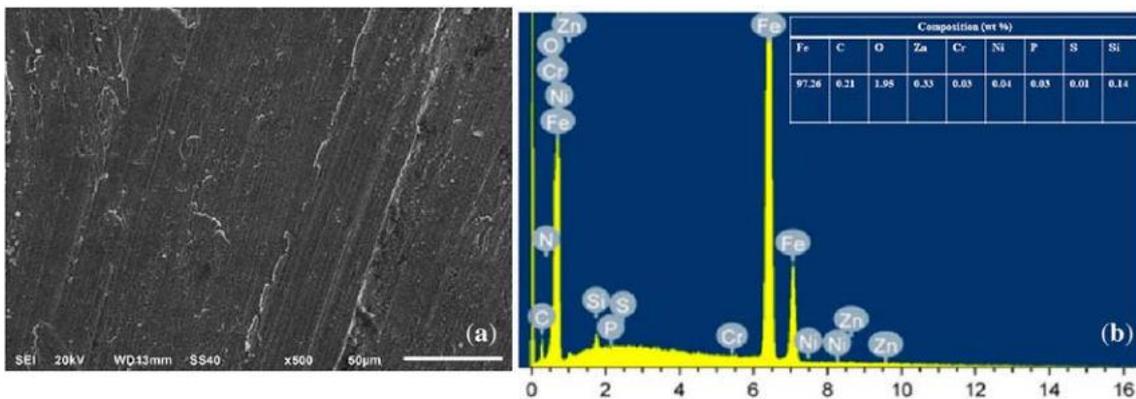
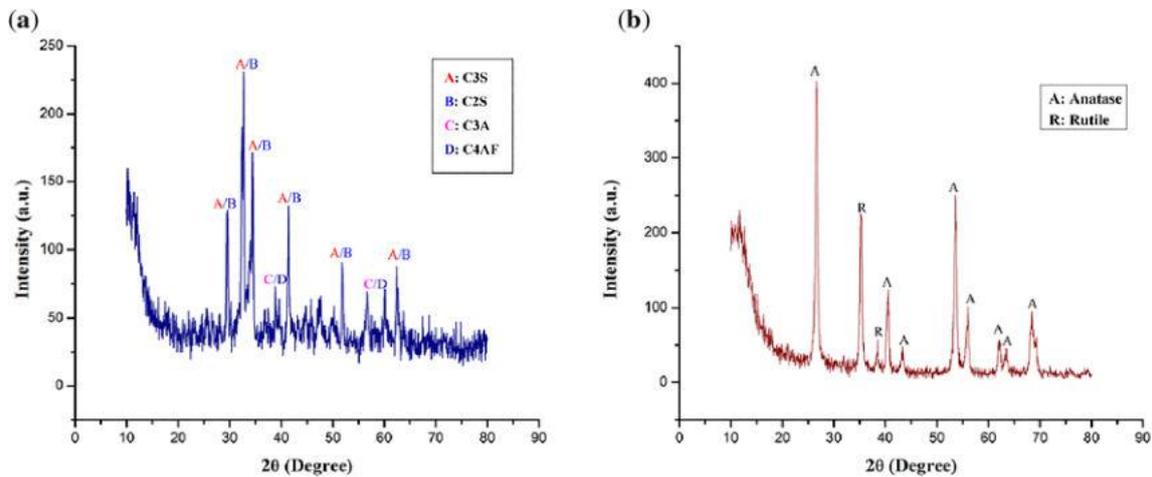


Figure 3. (a) SEM image of steel and (b) EDX spectrum of steel.

added as a replacement of the OPC. Both admixtures were mixed thoroughly in the water. In addition, NT admixed water was stirred by the magnetic stirrer for 10 minutes to get the proper dispersion. The mortar mix proportions were used for compressive strength, SEM and corrosion analysis. Moreover, the OPC paste (P-X0), 5% EA-admixed paste (P-EA5) and 5% NT-admixed paste (P-NT5) were exclusively used for XRD analysis.

### 2.3 Corrosion investigation

2.3a Preparation of ferrocement specimen: To evaluate the corrosion activities of ferrocement composites by Tafel potentiodynamic polarization method, 9 cylindrical specimens with centrally embedded MS bar of size 30 mm diameter and 42 mm height for each mixture were prepared. The MS bar was positioned in such a way that it projected

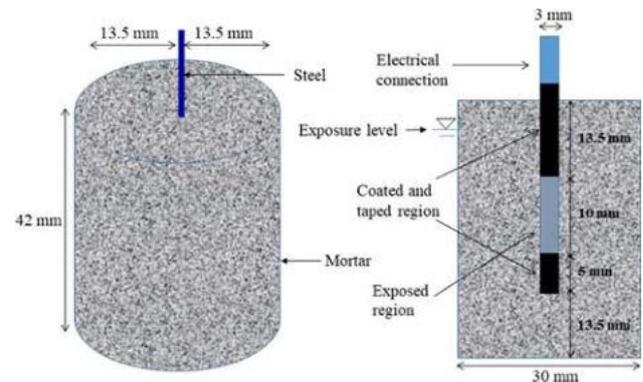


**Figure 4.** (a) XRD pattern of OPC and (b) XRD pattern of nano-TiO<sub>2</sub>.

**Table 1.** Mixture proportions of composites.

Composite	Designation	Mixture components (%)				
		OPC	FA	EA	NT	Water
Mortars	Control (X0)	100	300	0	0	45
	EA1	100	300	1	0	45
	EA3	100	300	3	0	45
	EA5	100	300	5	0	45
	NT1	99	300	0	1	45
	NT3	97	300	0	3	45
	NT5	95	300	0	5	45
Pastes	Control (P-X0)	100	0	0	0	33
	P-EA5	100	0	5	0	33
	P-NT5	95	0	0	5	33

from the top of the mould by 30 mm and also providing a uniform clear cover of 13.5 mm from the sides and bottom of the specimen. This projected part of the MS bar was wrapped with insulating tape. This tape has been detached for electrical connection at the time of testing. In addition, the actual exposed length of MS bar has been taken as 10 mm (surface area of about 1 cm<sup>2</sup>). On the remaining portion of MS bar, red oxide and enamel coating were applied and after that a protecting tape was wrapped. The schematic diagram of the test specimen with details is shown in figure 5. After 24 hours of casting, the specimens were cured in tap for 28 days. After that, 3 specimens of each mixture were exposed under tap water, 3 specimens of each mixture were exposed under saline water and 3 specimens of each mixture were exposed under acidic solution. These test solutions were renewed in every two weeks. In addition, the specimens were monitored continuously with bimonthly wetting and drying cycle in order to accelerate the corrosion process. The specimens under investigation are shown



**Figure 5.** Schematic illustration of test specimen.

in figure 6. Potentiodynamic polarization test was conducted after 180 days of exposure duration.

**2.3b Potentiodynamic polarization technique:** Potentiodynamic polarization measurements of the ferrocement specimens were carried out using Applied Corrosion Monitoring (ACM) instrument. The polarization measurements were made to assess the various corrosion kinetic parameters such as corrosion potential, corrosion current, etc. Investigations were carried out in a conventional three electrode cell assembly with ferrocement test specimen was used as working electrode (WE), a saturated calomel electrode (SCE) as standard reference electrode (RE), and a rectangular Pt foil as the counter electrode (CE). In addition, a working sense (WS) was connected to WE. The exposure mediums (test solutions) were used as an electrolyte of the cell. A schematic illustration of the test set-up and ACM instrument during test is shown in figure 7a, b, respectively. A time interval of 20 minutes was given for each test to achieve the steady state open circuit potential ( $E_{OC}$ ). The polarization was carried out from a cathodic



Figure 6. Test specimens during dry cycle.

potential of  $-300$  mV (vs SCE) to an anodic potential of  $+300$  mV (vs SCE) at a sweep rate of  $60$  mV/minute.

The polarization curve i.e., a plot of the potential ( $E$ ) vs. the logarithm of the current density ( $\log |i|$ ) is obtained from the potentiodynamic polarization test. From this curve, anodic Tafel slope ( $\beta_a$ ), cathodic Tafel slope ( $\beta_c$ ), corrosion potential ( $E_{corr}$ ) and corrosion current density ( $i_{corr}$ ) were calculated as shown in figure 8. Besides, corrosion rate (C.R) and linear polarization resistance (LPR) can be assessed.

In addition, the corrosion inhibition efficiency (I.E) in percentage can be calculated using the following In addition, the corrosion inhibition formula:

$$I.E (\%) = \left( \frac{CR_a - CR_p}{CR_a} \right) \times 100 \quad (1)$$

Where  $CR_a$  and  $CR_p$  are the C.R of the specimens in the absence and presence of admixtures, respectively.

#### 2.4 Setting time investigation

The effect of EA and NT on the initial setting time (IST) and final setting time (FST) of OPC was determined using Vicat’s apparatus in accordance with IS: 4031 (Part 5) [69].

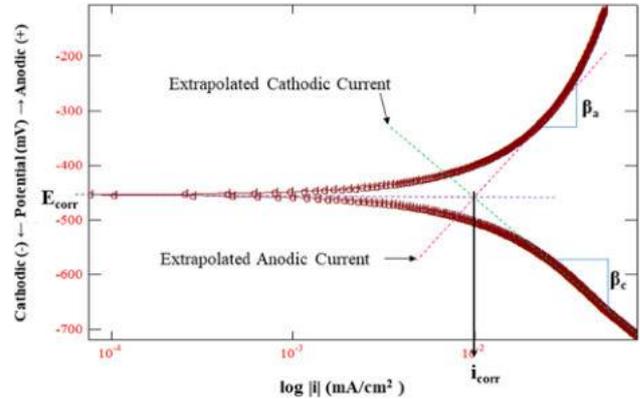


Figure 8. Exploration of Tafel curve.

The dosage of both EA and NT admixtures was taken as 1%, 3% and 5% by weight of OPC. Before mixing the admixtures into OPC, they were mixed thoroughly in the mixing tap water. In addition, NT was dispersed through magnetic stirrer.

#### 2.5 Compressive strength investigation

For each mixture, 12 mortar cubes of dimensions  $70.6$  mm  $\times$   $70.6$  mm  $\times$   $70.6$  mm [70] were made for determining the compressive strength. After 24 hour of casting, the specimens were detached from the mould and exposed to tap water curing for 28 days. After 28 days of curing, 3 specimens of each mixture were exposed under tap water, 3 specimens of each mixture were exposed under saline water and 3 specimens of each mixture were exposed under acidic solution. These specimens were tested for compressive strength after the exposure period of 180 days. The remaining 3 specimens of each mixture were tested for compressive strength using compression testing machine (AIMIL Ltd., capacity =  $1000$  kN and least count =  $1$  kN) by applying uniform and steady load until the failure.

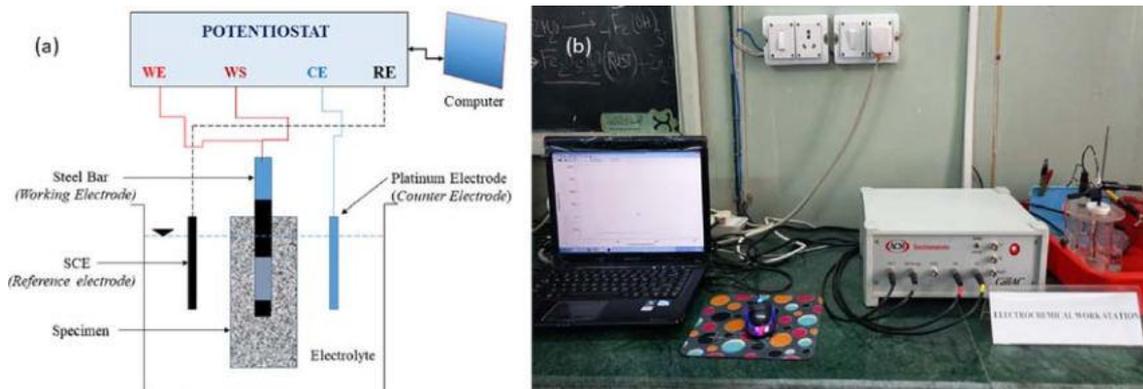


Figure 7. (a) Illustration of test arrangement. (b) Potentiodynamic polarization test using ACM instrument.

## 2.6 Microstructural examination

The microstructural and elemental analysis of X0, EA5 and NT5 mortar specimens were carried out by SEM and EDX techniques using JSM-6510LV (JEOL) microscope, respectively. For both SEM and EDX analysis, the small fragments (approximately 10 mm diameter and 5 mm thickness) obtained from the middle part of the mortar cubes after 28 days compressive strength test. The surface of samples was made flat and regular in shape in order to avoid any misleading results. In order to stop hydration reaction through elimination of free water content, the samples were dipped in the pure alcohol for 3 days, and then were dried at 80°C for 8 hours.

## 2.7 Mineralogical examination

For mineralogical analysis, P-X0, P-EA5 and P-NT5 pastes samples of size 20 mm × 20 mm × 20 mm were prepared. After 24 hours of casting, each sample was kept in the separate container (containing tap water) for curing. After 28 days of curing, the hydration of the pastes was stopped by submerging the samples in pure alcohol for 3 days, and then the specimens were kept in the oven at 50°C for 4 hours to dry and were then kept at room temperature for 3 days to cool. Afterward, the specimens were transformed to powder form in order to carry out the XRD analysis using Bruker X-ray D8 Advance diffractometer (XRD) with Cu-K $\alpha$  ( $\lambda = 1.54187 \text{ \AA}$ ) radiation at room temperature. The data was collected with the step-length of 0.02°, scanning rate of 2°/min and 2 $\theta$  range of 10°–80°.

## 3. Results and discussion

### 3.1 Corrosion investigation

The Tafel potentiodynamic polarization curves of all the specimens exposed under tap water, saline water and acidic solution are shown in figures 9, 10 and 11, respectively. The corrosion kinetic parameters such as anodic Tafel constant ( $\beta_a$ ), cathodic Tafel constant ( $\beta_c$ ), corrosion potential ( $E_{corr}$ ), corrosion current density ( $I_{corr}$ ), linear polarization resistance (LPR) and corrosion rate (C.R) of different specimens as obtained from their respective potentiodynamic polarization curves are presented in table 2. The corrosion inhibition efficiencies (I.E) of different content of EA and NT were also calculated and are presented in table 2.

A substantial reduction in the corrosion rate of ferrocement specimens exposed to tap water were observed with the addition of EA. However, it has been observed that the corrosion inhibition effectiveness of EA rises with the rise in the dose up to 3%, and reduces at 5% dose. Similar trends of efficiency of EA were noticed in case of specimens exposed under saline and acidic environments. Thus,

the optimum quantity of EA may be assumed as 3%. The efficiency of EA in inhibiting the corrosion of steel may be owing to the development of a layer around the steel [22]. It can be seen that NT admixed specimens exhibited lower the corrosion rates as compared to the control specimens exposed under tap water. Similar effects were observed in case of the specimens exposed to saline and acidic environments. Moreover, the corrosion inhibition efficiency of NT rises with the rise in the dose. The corrosion inhibiting effectiveness of NT may be due to its filler property that produced dense ferrocement composite and reduced the ionic transport.

Furthermore, the corrosion rate of all the specimens exposed in saline solution was found to be substantially higher than the corresponding specimens exposed in tap water. On the other hand, the corrosion rate of all the specimens exposed in acidic solution was found to be marginally lower than the corresponding specimens exposed in tap water. This contrary effect may be due to the formation of gypsum and ettringite within the pores of mortar in the presence of H<sub>2</sub>SO<sub>4</sub> that reduces the ingress of aggressive ions.

### 3.2 Setting time investigation

The effect of different percentages of EA and NT on the IST and FST of OPC pastes is shown in figure 12. The IST as well as FST of OPC pastes was observed to be increased with the addition EA. For 1%, 3% and 5% EA addition, the increment in IST was 4.7%, 8.1% and 13.9%, while in FST it was 2.7%, 6.3% and 10.4%, respectively. Since EA increased the time to finish the hydration process of OPC paste, therefore, it can be assumed that EA acts as a retarding agent. In contrast, it has been observed that the IST and FST of OPC pastes was reducing with increasing the NT percentages. The addition of 1%, 3% and 5% NT decreased the IST by 6.8%, 17.4% and 23.3% respectively; and decreased the FST by 3.6%, 6.8% and 12.7%, respectively. Thus, it can be said that NT acts as accelerator and it may be owing to high specific surface area of NT that rises the overall wettable surface area. Consequently, the rapid reduction of free water content may possibly speed up the bridging process of gaps that lead to rise in the viscosity and speedy solidification.

### 3.3 Compressive strength investigation

Figure 13 shows the results of average compressive strength of 0%, 1%, 3% and 5% EA and NT admixed mortar after 28 days of tap water curing. The compressive strength of mortar was observed to be decreasing with increasing the EA percentages. The reductions in strength of mortar containing 1%, 3%, and 5% of EA was found as 0.5%, 4.6% and 9.4% respectively, compared to control

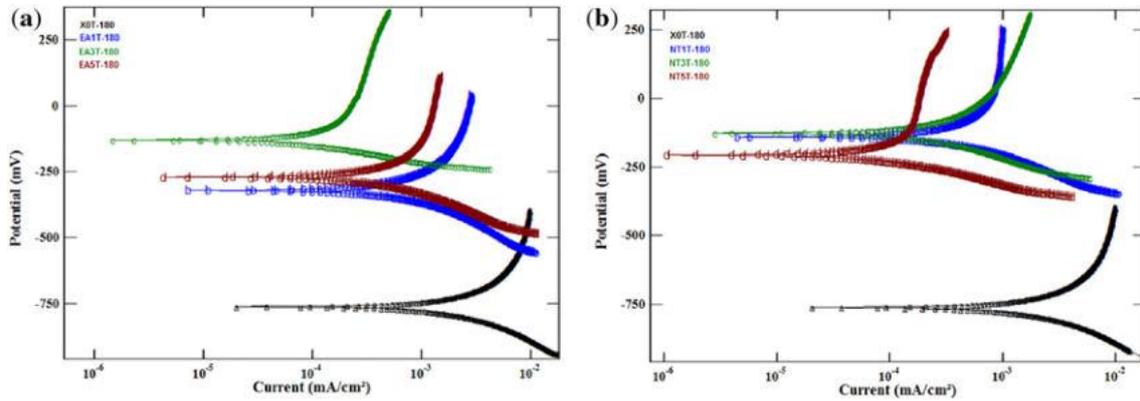


Figure 9. Tafel curves of (a) EA-admixed specimens. (b) NT-admixed specimens exposed under tap water.

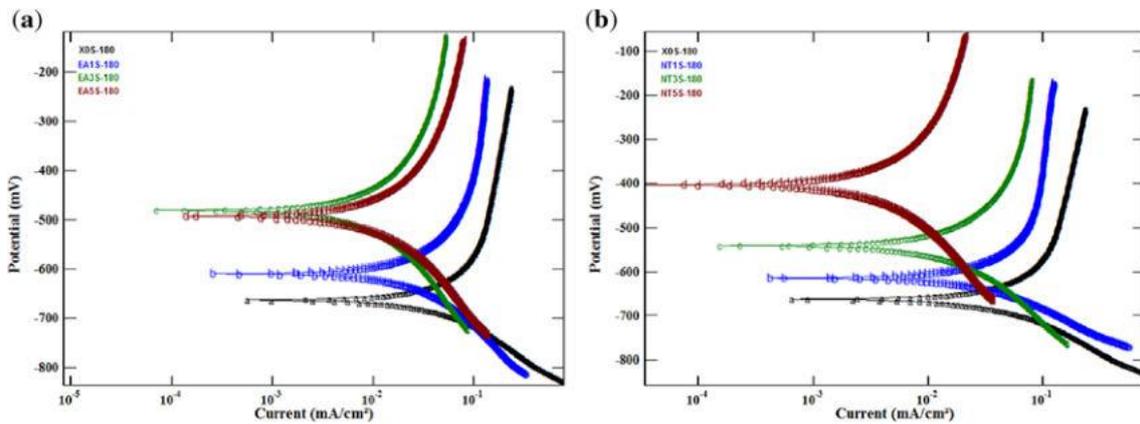


Figure 10. Tafel curves of (a) EA-admixed specimens. (b) NT-admixed specimens exposed under saline water.

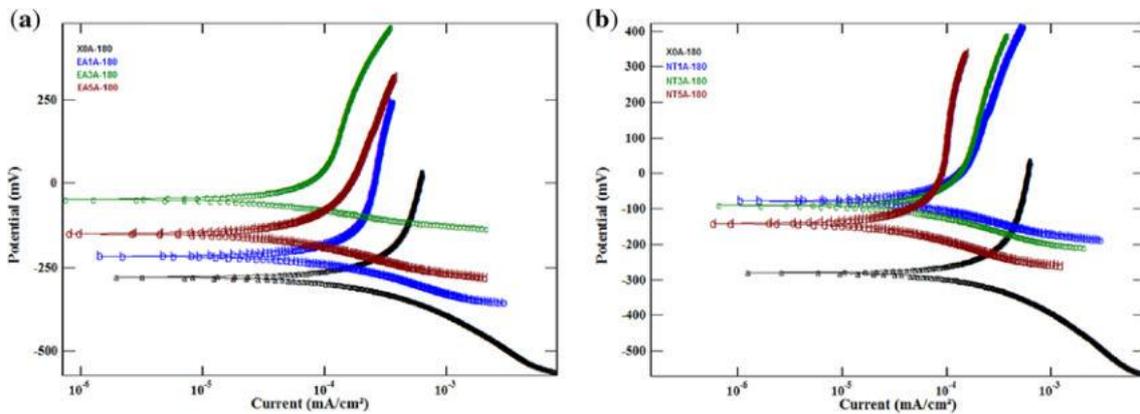


Figure 11. Tafel curves of (a) EA-admixed specimens. (b) NT-admixed specimens exposed under acidic solution.

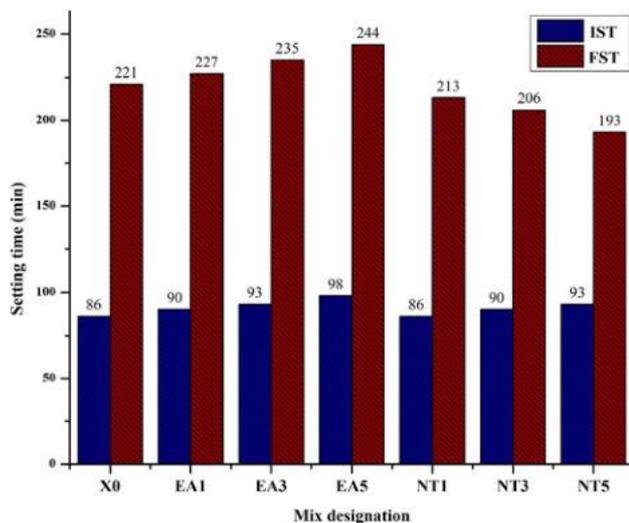
mortar. These reductions may be owing to adsorption of EA on the surface of OPC particles that interrupt the hydration process [71]. On the other hand, an upward trend in compressive strength of mortars with the increase in amount of NT was observed. The enhancements in strength of mortar containing 1%, 3% and 5% of NT was found to be 8.9%, 10.3% and 11.7% respectively, as compared to

control mortar. These enhancements in strength may be due to the smaller particle size and higher reactivity of NT that produces dense and homogeneous microstructure of cementitious composites [72, 73].

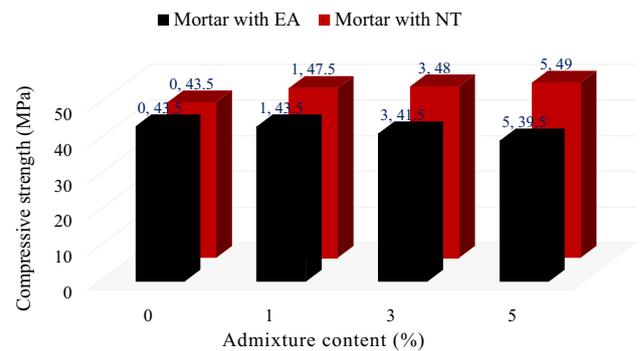
The mortar cube specimens after 180 days exposure under tap water, saline water and acidic solution are shown in figure 14. There is no obvious deteriorations on the

**Table 2.** Electrochemical parameters from polarization measurement and calculated values of inhibition efficiency of EA and NT.

Exposure medium	Specimen name	$\beta_a$ (mV/dec)	$-\beta_c$ (mV/dec)	$E_{corr}$ (mV)	$I_{corr}$ (mA/cm <sup>2</sup> ) $\times 10^{-3}$	C.R (mm/year) $\times 10^{-3}$	I.E (%)	LPR ( $\Omega$ cm <sup>2</sup> )
Tap water	X0T-180	581.20	173.65	-764.13	2.982	34.555	-	19497
	EA1T-180	541.35	199.35	-320.45	1.054	12.211	64.66	60127
	EA3T-180	624.46	96.14	-128.90	0.045	0.522	98.49	805020
	EA5T-180	596.02	156.51	-269.91	0.564	6.533	81.09	95609
	NT1T-180	683.76	160.38	-138.59	0.525	6.090	82.38	107500
	NT3T-180	562.49	124.58	-125.82	0.233	2.704	92.18	190070
	NT5T-180	699.28	107.25	-202.45	0.070	0.816	97.64	574540
Saline water	X0S-180	444.19	137.55	-663.06	41.127	476.665	-	1110.3
	EA1S-180	445.13	135.81	-610.94	27.125	314.380	34.05	1667.9
	EA3S-180	258.89	201.19	-481.76	10.272	119.051	75.02	4791.9
	EA5S-180	373.71	192.69	-493.41	16.090	186.487	60.88	3435.4
	NT1S-180	458.14	124.09	-614.57	24.432	283.169	40.59	1737.6
	NT3S-180	293.64	197.59	-539.54	18.045	209.142	56.12	2845.8
	NT5S-180	375.28	242.01	-405.44	5.441	63.056	86.77	11757
Acidic solution	X0A-180	499.91	187.25	-281.69	0.491	5.691	-	120630
	EA1A-180	586.86	123.93	-217.78	0.072	0.832	85.39	619930
	EA3A-180	593.91	54.63	-50.25	0.011	0.128	97.75	1969500
	EA5A-180	576.57	109.30	-148.66	0.039	0.446	92.16	1037300
	NT1A-180	470.84	91.39	-75.55	0.035	0.401	92.96	962890
	NT3A-180	493.56	95.44	-91.41	0.031	0.360	93.68	1120600
	NT5A-180	526.41	96.60	-142.94	0.017	0.198	96.52	2078300

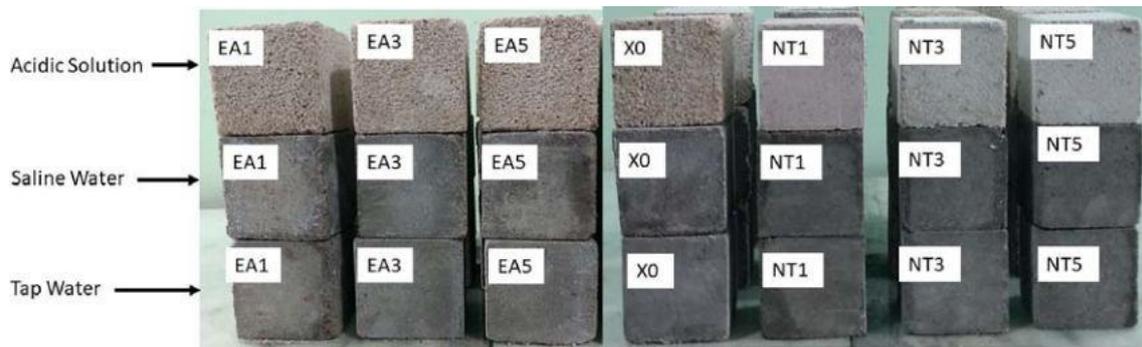
**Figure 12.** IST and FST of OPC pastes containing different percentages of EA and NT.

surface of any specimens exposed under tap and saline water were found by visual inspection. On the contrary, all the specimens exposed under acidic solution showed clear deteriorations on the surfaces. These damages are as a result of the reaction between hydration products of OPC and sulphuric acid that eventually forms of ettringite and gypsum. However, it can be seen that NT-containing specimens showed fewer signs of corrosion than other specimens. Thus, NT exhibited resistance to acid attack. In contrast, EA did not show effectiveness against acid attack.

**Figure 13.** 28-days compressive strength of EA and NT admixed mortars.

The effects of EA and NT on the compressive strength of mortar specimens after 180 days exposure under tap water, saline water and acidic solution are shown in table 3. It has been observed that the strength was reducing with increasing the content of EA in all the three exposure environments. On the contrary, NT was found to be effective in enhancing the strength and the higher NT dosage, the greater the strength in all the three exposure environments.

All the specimens exposed under saline and acidic solution showed lesser compressive strengths as compared to the corresponding specimens exposed under tap water. In saline environment, the decrease in strength is because of the formation of calcium chloroaluminate hydrate and the consumption of calcium aluminate hydrate. Apart from this,



**Figure 14.** Mortar cubes exposed under different solutions after 180 days.

it can be due to crystallization of salt in pores, which can develop stresses and cause micro-cracks [74]. In acidic environment, the loss in strength is more than the in saline environment and it attributed to the reaction between  $H_2SO_4$  and  $Ca(OH)_2$  that produce gypsum. The gypsum also reacts with calcium aluminate (C3A) to form ettringite. The volume of gypsum and ettringite is significantly higher than the initial compounds. This causes inner pressure in mortar leading to the development of cracks [75]. Besides, specimens containing EA exhibited greater strength reduction than the control specimens. On the other hand, specimens containing NT showed considerably lower strength loss compared to the control specimens. This ultimately showed that NT is effective in limiting the diffusion of aggressive agents into the mortar.

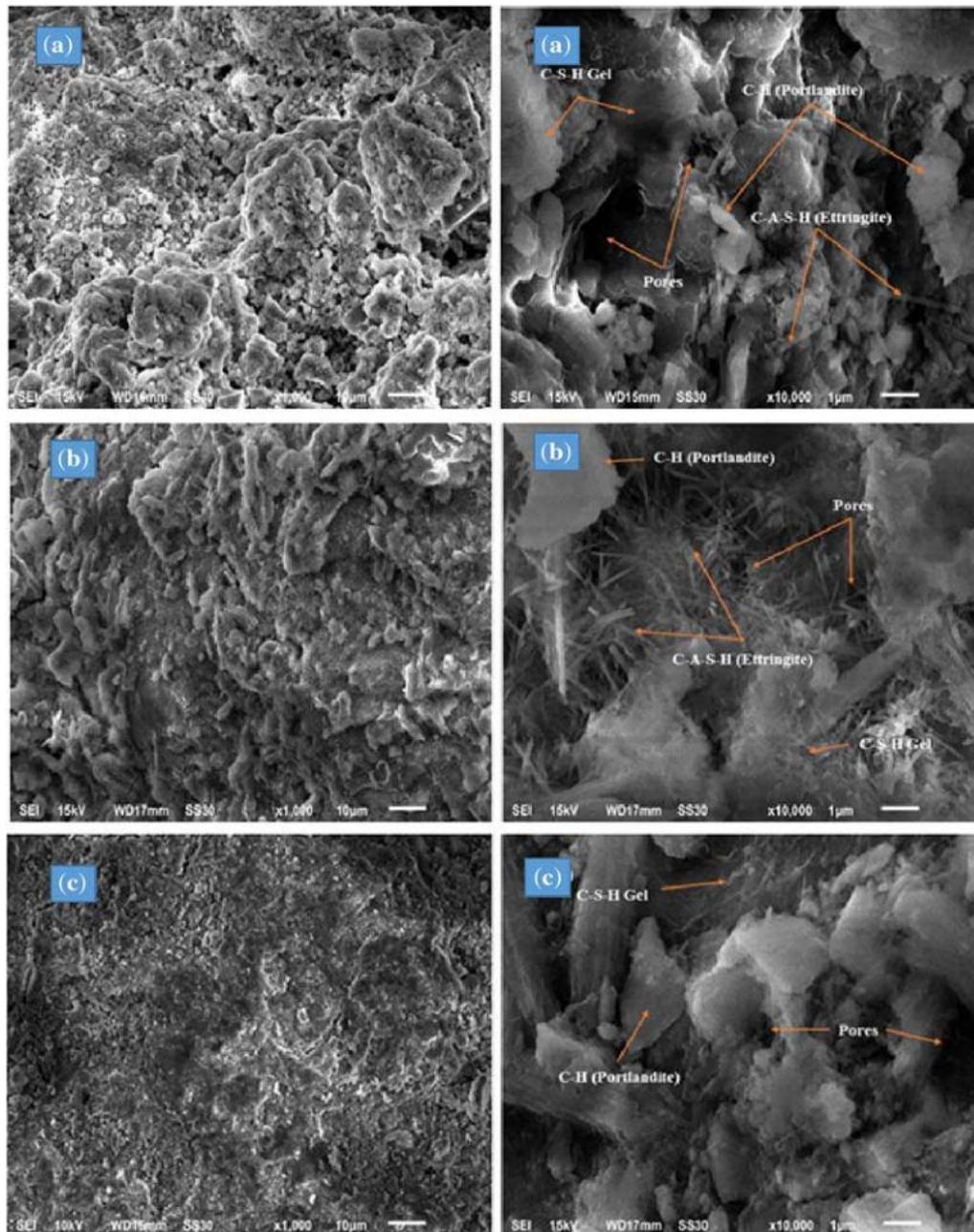
### 3.4 Microstructural examination

SEM images of X0, EA5 and NT5 mortars at the magnification of 1000 and 10,000 times were taken as shown in figure 15a–c, respectively. The EDX spectrums of X0, EA5 and NT5 mortars are shown in figure 16a–c, respectively.

The EA5 image depicts more quantity of pores and calcium aluminate trisulphate hydrate (C-A-S-H) than the X0 image. Since pores and C-A-S-H undesirable, therefore it can be said that the high percentage of EA may adversely affect the strength and microstructural properties of mortar. Hence, the above-mentioned compressive strength test results are completely validated by these microstructural analysis results. In addition, the existence of EA in the mortar can be confirmed from results of EDX analysis that

**Table 3.** Compressive strength of mortar specimens after 180 days exposure under tap water, saline water and acidic solution.

Exposure medium	Mix designation	Compressive strength (MPa)	% Variations w.r.t. control specimen	% Variations w.r.t. the corresponding specimens exposed in tap water
Tap water	X0	47.1	–	–
	EA1	46.2	–1.91	–
	EA3	44.4	–5.73	–
	EA5	43.1	–8.49	–
	NT1	51.8	9.98	–
	NT3	53.8	14.23	–
	NT5	54.4	15.50	–
Saline water	X0	40.6	–	–13.80
	EA1	39.3	–3.20	–14.94
	EA3	37.4	–7.88	–15.77
	EA5	36.0	–11.33	–16.47
	NT1	47.2	16.26	–8.88
	NT3	49.8	22.66	–7.43
	NT5	50.3	23.89	–7.54
Acidic solution	X0	38.2	–	–18.90
	EA1	37.4	–2.09	–19.05
	EA3	35.7	–6.54	–19.59
	EA5	34.4	–9.95	–20.19
	NT1	42.4	10.99	–18.15
	NT3	45.6	19.37	–15.24
	NT5	46.9	22.77	–13.79

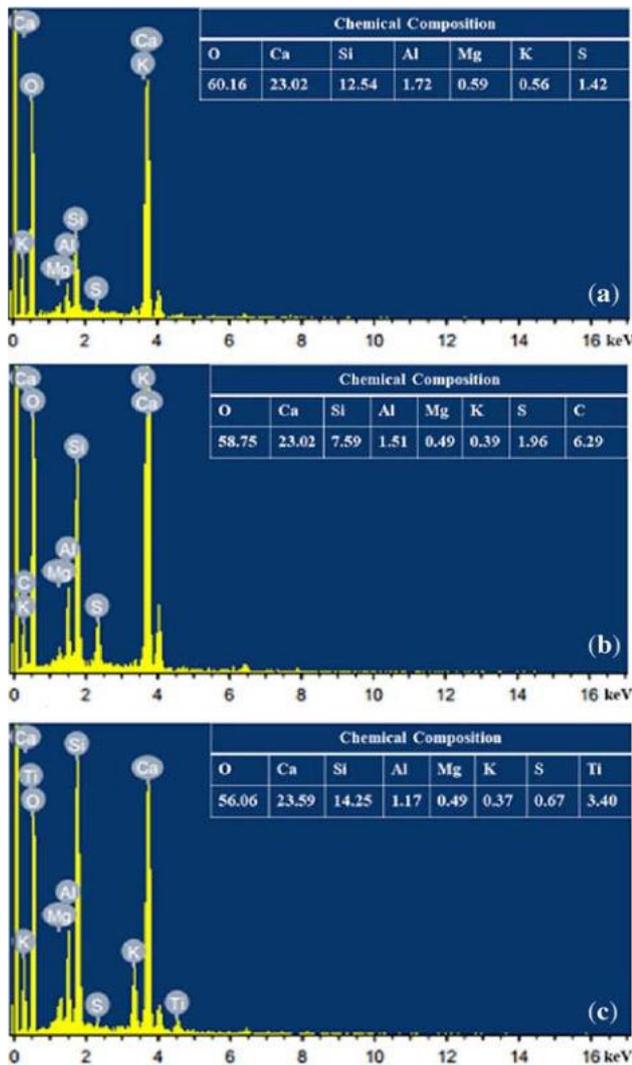


**Figure 15.** SEM images of (a) X0 mortar, (b) EA5 mortar and (c) NT5 mortar.

shows the presence of an additional carbon element. The image of NT5 exhibits a distinct kind of microstructure containing an ample amount of calcium silicate hydrate gel (C-S-H) and a little quantity of C-A-S-H (Ettringite) and pores. Thus, it is obvious that the strength and microstructural properties of mortars is enhanced by the addition of NT. These enhancements might be because of the improvements in particle-packing density, reduction in the porosity and development of intact bonds in the presence of NT. Furthermore, the EDX analysis confirmed the existence of NT in the mortar.

### 3.5 Mineralogical examination

XRD configurations of P-X0, P-EA5 and P-NT5 pastes are shown in figure 17a–c, respectively. The XRD configurations of control and admixed OPC pastes can be described through well-known hydration reactions of OPC. The calcium exists in the hydration products of OPC either as C-S-H gel or as  $\text{Ca}(\text{OH})_2$  (Portlandite) or as C-A-S-H because the over-all mole amount of calcium is constant. Normally, the amount of C-A-S-H is much lower than the C-S-H gel and Portlandite (C-H). Indeed, a lower quantity of C-H



**Figure 16.** EDX analysis of (a) X0 mortar, (b) EA5 mortar and (c) NT5 mortar.

corresponds to a higher amount of C-S-H gel. In general, the quantitative analysis of C-S-H gel cannot be carried out by means of XRD results owing to poorly crystalline fibrous structure of C-S-H gel and that is perhaps not reflected in XRD configuration. Since there is no direct technique for the assessment of C-S-H gel quantity, hence it can be estimated indirectly by determining the amount of C-H. Several investigators reported that the C-S-H concentration is inversely related to that of C-H concentration [76–78]. Accordingly, the smaller peaks of C-H in XRD configuration indicates the higher C-S-H gel concentration.

The presence of C3S (1), C2S (2), C-H (3) and C-A-S-H (4) can be seen in the results of XRD analysis of P-X0, P-EA5 and P-NT5 pastes. Since C-H peaks is considered as the principal performance indicator of OPC pastes, therefore it can be used for approximate calculation of C-S-H gel quantity. The XRD configuration of P-EA5 exhibited a number of low intensity and overlapping peaks that

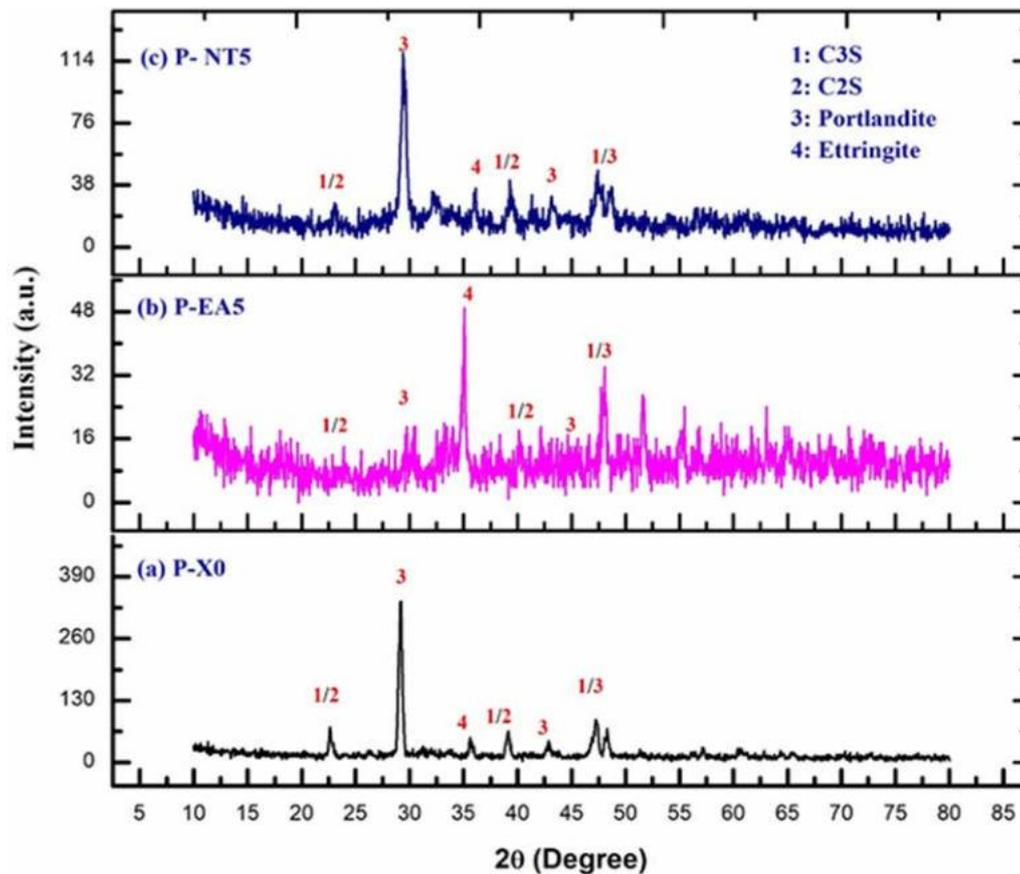
specifies the presence of C-A-S-H. Accordingly, the higher quantity of EA addition may adversely affect the desirable properties of cementitious composites. In contrast, the XRD configuration of P-NT5 presented significantly lower intensity peaks of C-H as compared to P-X0. This confirms that the addition of NT caused consumption of C-H crystals. Such consumption may lead to increase the quantity of desirable C-S-H gel and consequently improve the microstructural and engineering properties of cementitious composites.

#### 4. Conclusions

The main aim of this study was to compare the effects of ethanolamine (EA) and nano-TiO<sub>2</sub> (NT) on the corrosion resistance properties of ferrocement composites. However, their effects on the other properties of cementitious composites were evaluated. The EA was found to be effective in reducing the corrosion rate of ferrocement composites as observed in potentiodynamic polarization studies. However, the corrosion inhibition efficiency of 3% EA was found to be higher than the 5% content in all the three exposure environment. Thus, optimum content of EA was 3%. The corrosion rate exhibited by the NT admixed specimens was found to be significantly lower than the control specimens. The corrosion inhibition efficiency was observed to be increasing with the increase in the dosage of NT in all the exposure conditions. The optimal effectiveness was found at 5% content of NT. The LPR values of saline water exposure specimens was found very much lower than that of tap water/acidic solution. This is mainly because of the presence of chloride ions in saline water.

The setting time of the OPC was increased with increasing EA content. However, it was decreased with increasing NT content. The 28-days compressive strength of EA admixed mortar was found to be slightly less than the control mortar. This decrease was greater at the higher EA dose. When NT was added, a significant improvement in 28-days compressive strength of mortars was observed. This improvement was higher when larger amounts of NT were added. The 180-days compressive strength of the EA admixed mortar exposed under tap water, salt water and the acidic solution was found to be considerably lower than that of the control mortars. This was more pronounced at higher amounts of EA. However, with the addition of NT, a substantial increase in 180 days-compressive strengths was observed for all the exposure environments.

The SEM micrograph of EA admixed specimen showed more amount of C-A-S-H and pores compared to control specimen. This stipulates that the microstructural properties of cementitious composites may be adversely affected at higher percentages of EA. On the other hand, the SEM micrograph of NT admixed specimen exhibited a low amount of pores and C-A-S-H, and a large amount of C-S-



**Figure 17.** XRD configurations of (a) P-X0, (b) P-EA5 and (c) P-NT5.

H gel. The XRD configuration of EA admixed OPC paste presented numerous lower intensity and overlapping peaks that show the existence of C-A-S-H. As a result, the strength and durability characteristics of cementitious composites may adversely affected at the higher dose of EA. In contrast, the XRD configuration of NT admixed OPC paste exhibited lower intensity peaks of C-H and consequently higher amount of desirable C-S-H gel. This suggests that the addition of NT may lead to improve the microstructural and durability properties of cementitious composites.

Finally, it can be concluded that the NT was found to be effective in improving the compressive strength and corrosion resistance properties of ferrocement composites. The strength of the NT admixed mortar specimens was found to be significantly higher than the EA admixed specimens. Besides, the corrosion inhibition efficiency of NT was found to be quite comparable to the EA.

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# Using Thumb Impression Technique to Protect Payment Gateway Transaction

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**Abstract** - Web shopping, a solid decision instead of the standard "go, see, contact and purchase" shopping, has been one of the all-around utilized working environments of the Internet. Two or three electronic shopping frameworks serve web clients all around the globe and draw in individuals to get the things they need with a little exertion. Web shopping can be considered as "see and purchase" retailing. While the "see" part is executed by the limit and inventive mind of site aces, specific segment plans have been made for the "purchase" part. The most utilized media are online Mastercard exchange structures. Several unprecedented methods have been conveyed for Mastercard exchanges. In any case, get some information about has demonstrated that a colossal piece of web clients don't absolutely believe Visa divide structures by righteousness of cash related hazards, for example, loss of cash. Different procedures have been acted to get the customers' trust in Visa exchanges, yet no numbskull confirmation strategy has been found to beat the insufficiencies in those frameworks. This paper proposes another arrangement that hardens biometric ID cards with online charge card exchanges. Since the execution subtleties, for example, the sort and the arranging calculation of the biometrics information may move between nations due to the task necessities and laws, the proposed framework stays close by for every nation that may get the strategy. To explain the proposed structure and give a solid model, we utilized the Turkish e-ID pilot structure as the character assertion module since it best fits the necessities of the system.

*Acquirer Domain (the bank and the dealer to which the cash is being paid).*

*Backer Domain (the bank which gave the card being utilized).  
Interoperability Domain (the foundation gave by the card conspire, credit, charge, paid ahead of time or different sorts of an installment card, to help the 3-D Secure convention). It incorporates the Internet, shipper module, get to control server, and other programming suppliers.*

**Key Words:** internet shopping; e-ID; biometrics; credit card transaction; multi-factor authentication.

## 1. INTRODUCTION

Web shopping is one of the most remarkable organizations of the web. As web headway advances, further made online structures are made and jobs of those frameworks increment out and out. Ordinary Internet clients all around the world

examine representative Web regions to purchase things and associations [1]. Clients examine the online stores and obtain their necessities with the least exertion veered from standard retailing structures. The capability happens in the strategy for divide; while utilizing a POS contraption to play out a segment with their Mastercards in isolated retailing, clients outfit their own information close by charge card subtleties over the Internet so as to finish an online bit. Regardless, an impressive number of people don't add to giving such subtleties as a result of budgetary dangers. To enroll the paces of clients' affirmations in various dangers for web shopping, S. M. Forsythe and B. Shi [2] have investigated an edifying rundown taken from Graphic, Visualization, and Usability (GVU) Center from Georgia Institute of Technology. In the appraisal of the open blueprint that has been performed with 5645 people, 23% of the candidates have referenced cash related threat (i.e., chance concerning hardship from online charge card use) [2] in web shopping. Ridiculing, phishing, impedance, conceivable undermining changes to the information sent over the wire, revoking of associations (DOS), hoodwinking the clients [3] are money related dangers that dishearten web clients from performing electronic shopping utilizing their Mastercards. Several techniques have been formed to overcome the money related robbery prospects and restore the costumers' trust. Regardless, no sensible strategy has been point by point to totally beaten the referenced dangers and affirmation a far and away ensured and burglary check shopping condition for web clients. This paper proposes a structure that joins the Turkish e-ID framework, which gives a biometric ID card, and online charge card exchanges and leaves the low-level security issues to the e-ID framework use. Utilizing the restrictions of biometric ID cards, this structure proposes an undeniably secure shopping condition for the two purchasers and the seller, which sells things and association over the web. Since the e-ID framework gives a prepared to utilize security and undeniable proof foundation, the banks and the sellers need to expend less imperativeness in arranging the structure by then executing security instruments themselves. Despite the way that being a neighborhood game-plan considering the particular e-ID use, the system the two gives character check to the purchasers through multifaceted affirmation and attests the shippers' institutional information to guarantee a shielded strategy for a segment from the customers' fiscal acclimates to the sellers' records. The relationship of this paper is as indicated by the going with. The past research has been introduced in Section 2 and the upsides of biometric ID cards for online charge card exchanges are clarified in Section 3. In

Section 4 Turkish e-ID structure and the character confirmation associations, it offers are portrayed. In Section 5 the subtleties of the proposed structure have been given at last finishes of this appraisal are introduced in Section 6. 2010

## 2. PRIOR RESEARCH

The nonappearance of E-Commerce exchanges has executed individuals to take a gander at new strategies. One such perspectives is Visa's "Asserted by Visa" [7] program, which has been then gotten by MasterCard as "MasterCard SecureCode" [8] and by JCB International as "J/Secure" [9]. This program acquaints a riddle key assertion section with online charge card exchanges. The system depends upon a show called 3D Secure. In this show, the Visa guarantor bank bears witness to the store move bringing about supporting the cardholder through a once in the past depicted puzzle word for which the client is induced during an online Visa exchange. Regardless, being a simple to utilize structure particularly for the clients, the quality the show offers by secret key procedure has in like way become the deficiency by uprightness of phishing and key lumberjacks [10]. The sign to the client is remaining a calm key mystery.

Another technique is, utilizing the virtual charge card numbers in online bits. In this framework, a Visa holder is given out a virtual charge card that has a similar record as the cardholder's physical Mastercard. It will all in all be utilized in online exchanges as a standard Visa until its expiry date. The virtual card has a card number, a CVC number, an expiry date, and an adaptable money related cutoff that can be renamed by the client before the exchange and reset intermittently. The bit of breathing space offered by a virtual Mastercard is that, regardless of whether the charge card number is brought with different subtleties, it can't be utilized until the client renames another brief cutoff for another exchange. Despite the way that diminished, the burglary validity happens between the time length beginning with a cutoff redefinition and decision with an exchange or periodical reset.

A decision instead of a virtual Visa, which can be utilized two or multiple times, is the "Single Use Card Number". In this framework, the card-giving bank gives the client a particular use card number, which finishes after a solitary use in an exchange. This way of thinking limits twisting trustworthiness; and thrashings the key lumberjacks considering single-use. Notwithstanding, this procedure controls the client to play out a buy with this number at the most prompt possibility, since sparing the number secure changes into a test for the client.

In spite of the way that is significant and extensively used philosophies, the current game plans remain to express for each bank and customer pair. Either the customers need to spare a couple of passwords secret for each charge card they claim and oversee worm and key-logger issues themselves or contribute vitality observing single-use or virtual Mastercard numbers. A simpler to utilize and securer technique is required to both keep customers satisfied and comprehend security when they try to make online purchases. Utilizing

biometric ID cards in online trades turns into a fundamental factor now since it offers a couple of utilization of great conditions and an even more noteworthy and credible character affirmation instrument.

## 3. ADVANTAGES OF BIOMETRIC ID CARD IN CREDIT CARD TRANSACTIONS

Biometric ID card gives multifaceted attestation (MFA), a security structure where different authenticators are utilized so as to collect the realness of character check. A touch of that authenticator is passwords, tokens, keys, cards, and biometrics.

Check factors for MFA are ordinarily amassed into these three-game plans: 1) what you know (e.g., puzzle key), 2) what you have (e.g., token), and 3) what your character is (e.g., biometric) [4]. A blend of these classes diminishes the vulnerability that ascents when every authenticator is utilized alone in a confirmation situation. Around the day's end, hacking one's puzzle riddle word is less troublesome than hacking the secret articulation and exceptional finger impression together. Thusly, multifaceted attestation gives a more solid framework than a conventional riddle express endorsement plot.

The biometric ID card understands the three groupings of MFA as follows. 1) "What you know" is the PIN of the eID card, 2) "What you have" is the snappy card that is given by the administering body to the tenant, and 3) "What your character is" is the biometric information of the occupant spared safely in the breathtaking card or a focal database for biometric endorsement and acknowledge the key representatives in undeniable check. As being passwords that are genuinely bound to people and not should have been reviewed, biometrics gives continuously solid character checks ("Is this individual who he articulates to be?") [5]. In this way, if the utilized biometric certification framework is enough astonishing, it gets hard to play out an online exchange without the client's information, regardless of whether somebody takes her card and PIN some way or another.

Another great circumstance of a biometric ID card is that the e-ID structure gives an attestation plot that is affirmed by the managerial experts. This presents an obviously bonafide and focal character check structure, which can be used in various applications. Thusly, different connections, for example, human organization affiliations, banks, police working situations may encourage this focal assertion structure into their frameworks for express character check needs. This makes the biometric ID card the focal key and empowers occupants to utilize an equivalent card in each application by techniques for a card to get to the gadget.

In this manner, the occupant doesn't have to hold a few passwords or extra tokens for each record she has, in any case, the PIN number and the ID card. Utilizing the focal biometric character check structure, a bank will have the choice to avow the character of the individual who needs to play out a remote exchange (e.g., online buy). This additional items the banks from dealing with a lot of cash to get some information about a shocking assertion part and empowers

them to devour less essentialness and financials by solidifying an in the past endeavored and masterminded to utilize security foundation.

The proposed structure has been exemplified utilizing the Turkish e-ID System [11] since the structure and its parts best fit the MFA fundamentals of the system. Thusly, we present the Turkish e-ID structure, which is a propelling pilot experience, and mean how the working environments it gives can be created into our system.

#### 4. TURKISH E-ID SYSTEM

Turkish e-ID structure is a pilot experience that has been begun in 2006 by TUBITAK UEKAE [12] is up 'til now being made. The task movement is relied upon to be done in May 2010. There have been three pilot stages for e-ID card personalization and dissipating. The central stage was acted in TUBITAK UEKAE in April 2008 and 100 ID cards were revamped and given to the representatives as cardholders. The subsequent pilot discard was passed on in Bolu (Turkey) in a fourth of a year beginning from August 2008 and 13.000 ID cards were changed and given to occupants. The last stage began in July 2009 and it should have been done in May 2010 as the last improvement of the undertaking. In this last stage, for all intents and purposes, 300.000 ID cards are should have been changed and offered over to the occupants. Human organizations were picked to be the key utilization of the Turkish e-ID experience. For that, 5 patients' workplaces in 1 state emergency office, 95 drug stores, and 9 family experts joined the task for utilizing the ID card in clinical medications and overview the associations offered by the structure. Other than social insurance, there are in like the way 10 mechanization affiliations that are expecting to sort out the pilot e-ID experience into their obvious affirmation foundation.

Turkish e-ID structure offers indisputable character check plans relying on the significant certification level. The most essential level is the visual character check plot that somebody (e.g., a cop) organizes the occupant photograph that is printed or engraved on the card surface to the cardholder for ID by free eye. In this game plan, the security level is incredibly low, and misleading probability is high a quick eventual outcome of the human factor.

The most secure and solid condition is an electronic confirmation situation that depends upon the occupant's shrewd card, open information, PIN and biometric attestation, so to talk multifaceted check. Turkish e-ID framework parcels empower this most raised level of character check to be likewise utilized in remote certification.

##### A. Turkish e-ID System Components

Turkish e-ID card is a sharp card that works AKIS national amazing card working framework [13]. The tenants' biometric information is dealt with into a stand-out record portion that requires symmetric endorsement for perusing get to. Symmetric affirmation by techniques for External Authenticate and Internal Authenticate APDU orders (ISO 7814-4) is performed between the inhabitant ID card and

another remarkable sharp card called Secure Access Module (SAM), which is implanted into the stand-out Card Access Device (CAD) [14] that is masterminded by TUBITAK UEKAE. SAM contains symmetric keys that are required to check a tenant card and topsy turvy keys and declarations that are given by definitive help specialists. PC helped design is a particular card for every client that is in like way arranged for enlisting and avowing fascinating engraving and finger-vein information.

##### A. Remote Biometric Authentication in Turkish e-ID system

Having an implanted SAM card and biometric determination support, CAD can get to the unique finger impression or finger vein information of the tenant, check the information locally, and sign the biometric insistence result with the target that the outcome can be confirmed at remote structures. The CAD requires clients' PIN input, performs information arranging, and makes a stepped single-use character insistence pack (IVP). IVP contains a timestamp, the biometric sorting out outcome, the occupants' bit information, self-decided information field that may be utilized for stepping outside information, and SAM's endorsing. Since legitimate insistence specialists issue the CAD affirmations, any remote framework will be certain that a continuously essential position authority favors the attestation result by supporting the gathering by strategies for the official character check association (IVS), a web association gave in the e-ID structure. The IVS shows the IVP as finished after support so as to ensure that it has been utilized just a single time.

#### 5. PROPOSED FRAMEWORK

Having a remote biometric affirmation structure accessible, we show the online Mastercard exchange framework, model. The structure of the framework is portrayed in Figure 1. In our proposed technique we are going to use three stage authentication to validate payment from customer bank account to payment gateway providers. These steps are:

- 1) Login
- 2) OTP Validation and
- 3) Finger print authentication

In step one, Login is the initial stage in which user has to login to the e commerce website obviously before doing so, user has to first register him/herself to our website. In registration page five field are to be filed by the user namely username, Email, Contact, Password and his thumb impression. In Thumb impression field either user can upload their image from his computer or he can plug bio metric devices to upload thumb impression. Meanwhile having uploaded their thumb impression our application converts it into binary form so that it can be easily stored in database and remains more secure, which is not easily readably by any hacker after getting hacked of our database. In second step we are using OTP validation for further security of fund transfer. In our case we are generating 6-digit pin code and send it to user's email as well as on phone number. Once user puts his 6 digit OTP number in given textbox which he received on his phone and email. we

redirect user to upload finger print page to upload his/her thumb impression. If the given otp is invalid, we warn user to enter valid otp if the user continues to enter invalid OTP for three times, we will block his account. In either case if he entered valid OTP we will redirect him to thumb impression matching page. As explained earlier. For thumb impression matching we are using pixel to pixel matching algorithm.

In image acknowledgment, a typical issue is to coordinate two given pictures, for example, when contrasting a watched image with given references. In that procedure, extraordinary techniques can be utilized. For this reason, we can characterize cost capacities depending on the twisting presented in the coordinating and quest for the best coordinating concerning a given cost work [6]. One practical and thoughtfully basic technique for deciding the picture organizing is to utilize a zero-request model that dismisses conditions between the pixel mappings. This model has been depicted in writing a few times freely and is called picture Bending model (IDM) here. The IDM yields particularly great outcomes if the neighborhood. picture setting for every pixel is considered in the coordinating procedure by utilizing angle data and neighborhood sub-windows.

In this work, we center around the invariant separation coming about because of the picture coordinating the process and, in this way, just utilize a basic characterization approach. We quickly give a proper portrayal of the choice procedure: To arrange a test picture  $A$  with a given preparing set of references  $B_{1k}, \dots, B_{Nk}$  for each class  $k \in \{1, \dots, K\}$  we utilize the closest neighbor (NN) choice guideline. For example, the test picture is allocated to the class of the closest reference picture. For the separation computation the test picture  $A = \{a_{ij}\}$ ,  $i = 1, \dots, I$ ,  $j = 1, \dots, J$  must be clarified by an appropriate distortion of the reference picture  $B = \{b_{xy}\}$ ,  $x = 1, \dots, X$ ,  $y = 1, \dots, Y$ . Here, the picture pixels take  $U$ -dimensional values  $a_{ij}$ ,  $b_{xy} \in IRU$ , where a superscript signifies the vector segments  $U$ . It has been seen in past trials that the presentation of disfigurement models are substantially improved by utilizing nearby setting at the degree of the pixels [5,6]. For instance, we can utilize the flat and vertical picture angle as processed by a Sobel channel as well as nearby sub pictures that speak to the image setting of a pixel. Moreover, we can utilize a fittingly weighted position highlights (for example  $i-1$ ,  $i-1, j-1$ ,  $j-1, \dots$ ) that portray the relative pixel position to Relegate higher expenses to mappings that go astray much from a straight coordinating.

The proposed structure renders the security of the card data out of worry considering the way that the giving bank will never do the portion aside from in the event that it endorses the different sides (for instance the customer and the merchant) checking the IVP and ODP marks. Thusly, this framework stimulates the customers who don't trust in giving their charge card nuances to perform web shopping. The delineated model is difficult to be applied to PDAs, which is a fast-rising edge of the progression. This

confinement is a prompt eventual outcome of the CAD gadget, which needs a PC relationship for this situation. This downside may appear, apparently, to be constrained to the nation that the proposed structure is applied. Notwithstanding, performing biometric insistence on a discretionary cell phone utilizing the objective e-ID card is an open issue that requires thick conceptualizing, enormous rigging alteration, and normalization and is a check for the social event of the reaction for a self-earnest adaptable structure.

## 6. CONCLUSIONS

Security in online segment structures has been a wide research territory since the beginning of the Internet and two or three methodologies have been figured by different affiliations. Regardless, there has been no sure strategy squashed the insufficiencies in these frameworks totally.

Taking a gander at the issue from the other mirror, we have acquainted an answer subject with the quickly making gifted card-based biometric ID structures; and given a model execution on the Turkish e-ID framework. The model execution is clarified with a reasonable buy condition.

The proposed structure may be utilized in nations that utilization biometric ID cards with explicit alterations agreeing on the particular use subtleties of their e-ID courses of action. Regardless of the way that the game-plan isn't overall in light of the e-ID structure contrasts for every nation, it gives high security and flourishing to both the client and the seller close by online business frameworks.

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# A Study: 3D Secure Authentication Mechanism for Payment Gateway

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*Abstract*— In this paper the attempt of studying a Secure Gateway in payment system for Electronic transaction is made. The current research and development shows that the electronic payment system for such an electronic transaction is to be secure for participants such as Payment Gateway Server, Bank Servers and Merchant Servers, on Internet. The security architecture of such systems are designed by using various Security Protocols and Techniques, not only to safeguard but eliminate the fraud that occurs in such a transaction with stolen credit card/debit card payment information and customer information. Electronic commerce involves the tremendous exchange of some form of money for trade of goods and services over the Internet, and it is evident from the studies that the Internet is an insecure and unreliable media in many ways in such a trade. The primary goal of this paper is to review the asymmetric key cryptosystem methodology that uses Security Protocol, the Secure Communication Tunnel Techniques that protect conventional transaction data such as account numbers, Card number, amount and other information, and to finally provide secure implementation for such an electronic transaction on the Internet.

**Keywords:** SSL/TLS, SET Protocol, Symmetric/Asymmetric Methodology, TCP/IP Protocol, Dual Signatures, 3DES, AES, Communication Tunnel techniques

## I. INTRODUCTION

Online shopping by card is not new in the current e-commerce applications in our society today. The ease of purchasing and selling products over the Internet has helped the growth of e-commerce and as a result the e-payment services have proved to be the convenient and efficient way to perform financial transactions. In a nut shell, Electronic commerce involves the exchange of some form of money for goods and services over the Internet but associated with the issues and risks of insecurity and unreliable media. Therefore, in the work proposed, we focus on the following e-commerce scenario: a customer wishing to purchase goods online; Electronic Payment Methods-Electronic Fund Transfer (EFT) involved in such a transfer, Financial EDI, Credit Cards, Digital Cash, Online Stored Value Systems, and Smart Cards.

The major focus of this work is to explore the method of payment involved by means of a credit card/Debit card, and subsequently, to address methods that are to be adapted to ship the goods physically. A considerable need for secure and efficient payment systems that can operate over Internet has been created. Most people have tried at least once or twice to purchase something online. Purchasing online, whether services or products, requires that a customer have a valid credit card or International debit card or finance account such as Pay Pal but most online purchases use credit cards. Due to the increasing crime on the Internet, the customers still have second

thoughts over allowing others to view their credit account information.

Due to the nature of Internet, security and authenticity of payments and participants cannot be guaranteed with technologies that are not specifically designed for e-commerce. We need an e-payment system that would not only provide secure payments but should also have properties like online customer and merchant authentication, unforgivable proof of transaction authorization by the customer both to the merchant and the bank, privacy of customer and transaction data. To some it provides a sense of uncertainty and taking risks when purchasing online. Over the years there is lot of e-commerce technology that has been developed. This helps the customers in many ways in terms of convenience and accessibility. But still the security of their hard earned money is left unanswered. This led to the development of Secure Payment System in the e-commerce domain. It is a mode of operation wherein the security of financial transactions done on the Internet is ensured to be safe and confidential.

This application of an online store is an important service that keeps the customers of an online company coming back because they view the online store as safe and reliable. In a way also it provides them a sense of safety and security of their financial-transactions.

Under this type of e-commerce technology is SET or the Secure Electronic Transaction. The SET uses the unique process of encrypting the information obtained between the customers and the online-store. Transaction Participants scenario assumes the existence of three participants a customer (the payer), a merchant (the payee) and a financial institution (e.g. a bank).

All the participants are connected with communication links as shown in figure-1. In order to perform the purchase, the participants need to exchange certain information over those links. If the information is transmitted over the links in plain text, there is a possibility of eavesdropping. Anyone listening to the network traffic could gain access to sensitive information, such as card numbers, card type and or the complete details of the card holder. Credit card-such as a Visa or Master, has a preset spending limit based on user's credit limit. Debit Cards – withdraws the amount of the charge from the card holder's account and transfers it to the seller's bank. In electronic payment system, server stores records of every transaction. When the electronic payment system eventually goes online to communicate with the shops and the customers who can deposit their money and the server uploads these records for auditing purposes.

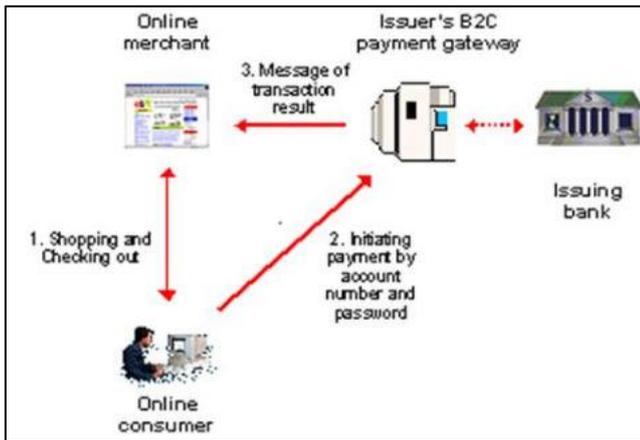


Fig. 1: A typical e-commerce scenario and Gateway Payment

We review Secure Payment System for such an Electronic Transaction. Secure electronic payment system uses different cryptographic algorithms and techniques to achieve: privacy, integrity, authentication and non-repudiation. In this work, we discuss various attacks and the important security requirements such a payment system must incorporate and satisfy, so as to be considered a safe and secure system. Initially, this work discusses some of the existing secure systems, how those systems work, their advantages and disadvantages. Subsequently, we compare and contrast the various existing solutions. Finally, we conclude this paper by showing the most efficient technique that must be incorporated for such a payment system in an electronic transaction.

## II. BACKGROUND & RELATED WORK

With the increasing impact of intangible merchandise in worldwide economies and their immediate delivery at small cost, traditional payment systems tend to be more costly than the modern methods. Online processing can be worth of value smaller than the smallest value of money in the manual world. However, there are two methods of running e-payment systems.

- Online payment: in which vendor checks the payment send by purchaser with a bank before serving the purchaser.
- Offline payment: in which over spending must be detected, and consequently, no online link to the bank is needed.

The e-payment schemes can be sub-divided into two groups according to the online assumptions.

- 1) Payments by transaction method: in which Single payment does not need previous arrangements between purchaser and vendor.
- 2) Payments by account method: in which purchaser and vendor should have system account with bank and certain type of agreement between both before carrying out the real payment transaction.

The payment by transaction can further be divided into two subgroups

- 1) The credit card payment transaction: is tailored for large charge payment of some hundreds or even thousands of dollars. In contrast, net money transaction is usually low value payment with difficult transaction cost and

online features, similar to the thought of the e-payment transaction. The drawback of the credit card payment transaction is the fee of transactions, particularly from the perspective of the vendor that have to pay some invoices to the clearing house according to the contract agreement with them. This certainly will have straight impact on the cost policy and the interest between the possible users.

- 2) The e-payment by small value transactions on service: This is acquiring certain interest from the area of research. A number of important services of e-payment are e-publishing and multimedia service. In these services, due to the small transaction amount, the merchant acquires relatively shopping mall revenue from every transaction

As a result, expensive calculations such as digital signature should be limited in order to reduce the investments in software applications. In the recent years, e-payments offering a relatively key improvement in the online revenue malls. The foundation of e-payments is to take benefit of the high level of viewers by present content for a low price. Other alternative of this thought is to rating fractions of cents for equally fractional contents sums.

The main features in e-payment protocol are less charges of payment amount and high occurrence of transactions on the e-commerce system.

### A. Secure E-payment Protocol

An e-payment process is a sequence of actions that involves a business task. There are mainly two kinds of payment transactions: i) Atomic payment transaction-single payment transaction and single payment and ii) Composite payment transaction-single payment transaction and multiple payments. Usually, a composite payment transaction involves multiple atomic transactions. Each atomic transaction supports the traditional ACID properties and must either fully commit or fully rollback. However, the classical ACID properties do not hold when a single payment transaction involves multiple atomic payments, especially when a failure occurs in any atomic payment transaction. Since atomic transactions use a two-phase commit protocol, a coordinating process is required to manage and synchronize the composite e-payment services within a given payment transaction. for example, consider a composite payment transaction. An organization has to pay Ethiopian Birr 10,000 for electricity board, Birr 20,000 for Telephone Office, Transports office-Birr 10,000 and Birr 4,000 to Water Board. At the time of issuing a debit instruction using e-check payment instrument with Birr 44,000 assume that by the time the e-check is cleared, the last date for payment towards Water Board is over and the organization has to pay a penalty of Birr 200. Since the balance after the two payments is not sufficient, it is not possible to transact the water board payment.

Though, the payment instruction toward the electricity and telephone was successful, the complete transaction has to roll back due to insufficient amount. This complete reversal based on nothing-or-all protocol may in turn lead to late payment to other successful utility services. Hence, the nothing-or-all protocol as described above is not

sufficient to handle composite e-payments. It can result in loss of confidence and trust in the e-payment services

Payments on the Internet [6] can therefore refer to either the particular type of electronic money that involves a software product (although at the moment there is no such product in general use) or to electronic access products (via a card reader and a computer), or to both of these. Systems are also emerging that will allow the use of electronic (prepaid) money to be used over a network, by allowing the cash balance of the prepaid card to be drawn in accordance with the value of the goods or services purchased. Internet payments systems cover transactions both wholesale (between companies) and retail (between consumers and companies). Methods of payments include: bank transfers, cheques, credit and debit cards, and prepaid debit cards.

### III. SECURITY REQUIREMENTS FOR SECURE PAYMENT SYSTEM

The primary goal of cryptography is to secure important data as it passes through a medium that may not be secure itself. Usually, that medium is a computer network. There are many different cryptographic algorithms, each of which can provide one or more of the following services to applications. It is generally accepted that, in order to be considered secure, a payment system must satisfy the following fundamental security requirements

#### A. Authentication

The assurance that the communicating party is the one that is claimed to be prevents the masquerade of one of the parties involved in the transaction. Both parties should be able to feel comfortable that they are communicating with the party with whom they think they are communicating. Applications usually perform authentication checks through security tokens or by verifying digital Certificates issued by Certificate authorities. Cryptography can help establish identity for authentication purposes

#### B. Access Control

The prevention of unauthorized use of a resource (i.e., this service controls who can have access to a resource, under what conditions access can occur, and what those accessing the resource are allowed to do.)

#### C. Data Confidentiality (Secrecy)

Data Confidentiality is the protection of data from unauthorized disclosure. Confidentiality is an essential component in user privacy, as well as in the Protection of proprietary information, and as a deterrent to theft of information services. The only way to ensure confidentiality on a public network is through strong encryption. Data is kept secret from those without the proper credentials, even if that data travels through an insecure medium.

#### D. Data Integrity (Anti-tampering)

The assurance that data received are exactly as sent by an authorized entity (i.e., contain no modifications, insertion, deletion, or replay) and prevents the unauthorized modification of data. Financial messages travel through multiple routers on the open network to reach their

destinations. We must make sure that the information is not modified in transit.

#### E. Non-Repudiation

Provides protection against denial by one of the entities involved in a communication of having participated in all or part of communication.

- Non-repudiation, Origin- Proof that the message was sent by the specified party.
- Non-repudiation, Destination- Proof that the message was received by the specified party.
- Non-repudiation is usually provided through digital signatures and public key certificates.

### IV. TYPES OF ATTACKS ON INSECURE SYSTEM

#### A. Network Attacks

These simple services can be used to stop a wide variety of network attacks, including

##### 1) Snooping (passive eavesdropping)

An attacker watches network traffic as it passes and records interesting data, such as credit card information.

##### 2) Tampering

An attacker monitors network traffic and maliciously changes data in transit (for example, an attacker may modify the contents of an email message)

##### 3) Spoofing

An attacker forges network data, appearing to come from a different network address than he actually comes from. This sort of attack can be used to thwart systems that authenticate based on host information (e.g., an IP address)

##### 4) Hijacking

Once a legitimate user authenticates, a spoofing attack can be used to "hijack" the connection.

##### 5) Capture-replay

In some circumstances, an attacker can record and replay network transactions to ill effect. For example, say that you sell a single share of stock while the price is high. If the network protocol is not properly designed and secured, an attacker could record that transaction, and then replay it later when the stock price has dropped, and do so repeatedly until all your stock is gone.

##### 6) PIN-guessing attack

An attacker can fake the digits and use the user authentication code (UAC) to launch a PIN-guessing attack.

#### B. Cryptographic attacks

In order to define the security level of a cryptosystem we have to specify the type of attack we are assuming (the power of the adversary) and the type of breaking which we wish to prevent (what tasks should the adversary be able to perform as the result of the attack) Given these specifications, we have to show that breaking the cryptosystem with the specified attack is as hard as performing a certain computational task. The types of attacks are

##### 1) Cipher text-only attack

Cipher text-only attack in which the adversary sees only cipher texts.

## 2) *known-plaintext attack*

Known-plaintext attack in which the adversary knows the plaintexts (messages) and the corresponding cipher texts transmitted.

## 3) *chosen-plaintext attack*

Chosen-plaintext (CP) attack; where the adversary gets to pick (adaptively); plaintexts of his choice and by exploiting the encryption mechanism he sees their encryption value.

## 4) *chosen-cipher text (CC) attack*

Chosen-cipher text (CC) attack - where in addition to access to the encryption mechanism the adversary can pick (adaptively) cipher texts of his choice and by using the decryption mechanism (as a black box) he gets the corresponding plaintexts.

## V. ISSUES OF SECURITY APPROACH TO SECURE PAYMENT SYSTEM

### A. *Secure Sockets Layer (SSL) protocol*

Netscape Inc. originally created the Secure Sockets Layer (SSL) protocol. On account of its popularity and acceptance, it is now implemented in all web browsers. SSL has two main objectives:

- 1) To ensure confidentiality, by encrypting the data that moves between the communicating parties (client and the server).
  - 2) To provide authentication of the session partners using RSA algorithm.
- 1) The SSL Handshake protocol, in which the communicating parties (client and the server) authenticate themselves and negotiate an encryption key. One point to note here is that the SSL there is significant additional overhead in starting up an SSL session
  - 2) The SSL Record protocol, in which the session data is exchanged between the communicating parties (client and the server) in an encrypted fashion. SSL is a great boon to the traditional network protocols, because it makes it easy to add transparent confidentiality and integrity services to an otherwise insecure TCP-based protocol. It can also provide authentication services, the most important being that clients can determine if they are talking to the intended server, not some attacker that is spoofing the server. SSL is currently the most widely deployed security protocol. It is the security protocol behind secure HTTP (HTTPS), and thus is responsible for the little lock in the corner of your web browser. SSL is capable of securing any protocol that works over TCP. An SSL transaction starts with the client sending a handshake to the server. In the server's response, it sends its certificate. As previously mentioned, a certificate is a piece of data that includes a public key associated with the server and other interesting information, such as the owner of the certificate, its expiration date, and the fully qualified domain name associated with the servers

### 1) *Problems with SSL*

SSL is an excellent protocol. Like many tools, it is effective in the hands of someone who knows how to use it well, but is easy to misuse. There are many pitfalls that people fall

into when deploying SSL, most of which can be avoided with a bit of work.

- 1) The merchant cannot reliably identify the cardholder. In cases where customers use stolen credit cards to initiate e-commerce transactions, merchants are responsible for card not present transaction charge backs. While SSL/TLS does provide the possibility of client authentication with the use of client certificates, such certificates are not obligatory and are rarely used. Furthermore, even if the client possesses a certificate, it is not necessarily linked with his credit card. This means that the client might not be authorized to use the credit card in question.
- 2) SSL/TLS only protects the communication link between the customer and the merchant. The merchant is allowed to see the payment information. SSL/TLS can neither guarantee that the merchant will not misuse this information, nor can it protect it against intrusions whilst it is stored at the merchants' server.
- 3) Without a third-party server, SSL/TLS cannot provide assurance of non-repudiation. So SSL protocol does not provide facilities for non-repudiation.
- 4) SSL/TLS indiscriminately encrypts all communication data using the same key strength, which is unnecessary because not all data needs the same level of protection.
- 5) MITM attacks: MITM attacks pose a serious threat to many relevant SSL/TLS-based applications, such as Internet banking and remote Internet voting's.

### 2) *Efficiency*

SSL is a lot slower than a traditional unsecured TCP/IP connection. This problem is a direct result of providing adequate security. When a new SSL session is being established, the server and the client exchange a sizable amount of information that is required for them to authenticate each other and agree on a key to be used for the session. This initial handshake involves heavy use of public key cryptography, which, as we've already mentioned, is very slow. It's also the biggest slowdown when using SSL. On current high-end PC hardware, Open SSL struggles to make 100 connections per second under real workloads. Once the initial handshake is complete and the session is established, the overhead is significantly reduced, but some of it still remains in comparison with an unsecured TCP/IP connection

### B. *Secure Electronic Transaction (SET) Protocol*

To carry out transactions successfully and without compromising security and trust, business communities, financial institutions and companies offering technological solutions wanted a protocol that works very similar to the way how a credit card transactions work. Visa and MasterCard, leading credit card companies in the world formed a consortium with computer vendors such as IBM and developed an open protocol which emerged as a standard in ensuring security, authenticity, privacy and trust in electronic transactions.

The main business requirements for SET are:

- 1) Provide confidentiality of payment information and enable confidentiality of order information that is transmitted along with the payment information.
- 2) Ensure the integrity of all transmitted data.

- 3) Provide authentication that a cardholder is a legitimate user of a branded payment card account.
- 4) Provide authentication that a merchant can accept branded payment card transactions through its relationship with an acquiring Financial Institution.
- 5) Ensure the use of the best security practices and system design techniques to protect all legitimate parties in an electronic commerce transaction.
- 6) Create a protocol that neither depends on transport security mechanisms nor prevents their use.
- 7) Facilitate and encourage interoperability among software and network provider

The goal of SET is to ensure that the payment process is private, convenient and most-important-of-all-secure.

SET ensures that the order and payment information of the customers are kept confidential. SET also has the capacity to authenticate the customer is the legitimate user of the credit account. The payment process is easy and simple. When the customer made a purchase, the SET will authenticate the credit card against the details provided by the customer, and then the merchant which is the online store will send the order details to the bank. Transaction will occur between the two for the approval of the purchase. When approved the bank will digitally sign and an authorization will be given to the merchant who can then process the order. This type of e-commerce technology is truly a breakthrough in online shopping and-transactions. The e-commerce technology developed are very important in the online e-commerce especially the secure payment system. It provides the customers a piece of mind when doing Internet transactions. Now customers will be safe against scams. A reliable e-commerce technology is truly what we need.

1) *Disadvantages of SET are as follows*

- 1) Implementing SET is more costly than SSL/TLS for merchants as well. Adapting their systems to work with SET is more complicated than adapting them to work with SSL/TLS. Furthermore, merchants must have accounts opened at business banks capable of handling SET transactions.
- 2) Business banks must hire companies to manage their payment gateways, or install payment gateways by themselves.
- 3) Despite being designed with security in mind, SET also has some security issues. In a variant of the SET protocol, the merchant is allowed to see the customer payment information. Just as with SSL/TLS. There are also some other, minor security issues in this protocol
- 4) SET employs complex cryptographic mechanisms that may have an impact on the transaction speed.
- 5) Despite being very secure, SET has not been a success in e-commerce environments. The reasons attributed are the overheads associated with SET are heavy.
- 6) For a simple purchase transaction:
- 7) Four messages are exchanged between the merchant and customer
- 8) Two messages are exchanged between the merchant and payment gateway.
- 9) 6 digital signatures are computed.
- 10) There are 9 RSA encryption/decryption cycles.

- 11) There are 4 DES encryption/decryption cycles and four certificate verifications.
- 12) It has been argued by merchants that they have to expend lot of money in order to process SET transactions. From consumer's point of view, they have to install appropriate software.
- 13) Inter-operability problem has not been solved.
- 14) With SET, while the payment information is secure, order information is not secure.

2) *D Secure*

The main advantage over SSL/TLS is that 3-D Secure provides credit card authorization and non-repudiation. 3-D Secure is built upon the relationships between three domains, named the acquirer, the issuer, and interoperability domains .The acquirer domain covers the relationship between the merchant and the acquirer. The issuer domain covers the relationship between the cardholder and the issuer. The interoperability domain supports the relationship between the acquirer and issuer domains. To protect the security of communication between the various entities, 3-D Secure requires the following links to be protected using SSL/TLS: cardholder merchant, cardholder-ACS, merchant Visa Directory, and Visa Directory-ACS (access control sever)

C. *Disadvantages*

The merchant still has access to the payment information, and all information is encrypted using the same key strength. The main advantage over SSL/TLS is that 3-D Secure provides credit card authorization and non-repudiation. On the other hand, prior customer registration is required

D. *Cyber Cash*

The Cyber Cash provide several separate payment services on the Internet including credit card and electronic cash. Cyber Cash uses specialized software on the merchant and customer's sides of the connections to provide secure payments across the Internet.

E. *The Secure electronic payment system using secure communication tunnel.*

Secure electronic payment system consists of four system participants (segments). The communication between the participants goes through secure communication tunnels.

1) *Secure Communication tunnel*

Means provide a secure way for communication between two or more parties or segments, i.e., Customer to merchant and merchant to payment gateway.

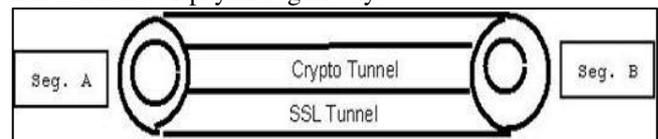


Fig. 2: Secure communication tunnel consists of SSL and nested crypto tunnel.

Secure communication tunnel consists of SSL and nested crypto tunnel, which is created by employing cryptographic algorithms and techniques on the information that are transmitted between parties. The SSL is based on session key and Crypto tunnel is based on public key cryptosystem. These Secure communication tunnel are work

between customer to merchant and merchant to payment gateway and transfer data securely.

2) Working of Tunnel

The customer decides to buy something and open the merchant's web site. Customer sees many item of merchant web site. At this time web server and our browser communicate through HTTP Protocol. To be securing this system, secure communication tunnel and key cryptosystem is used to protect conventional transaction data such as account numbers, amount and other information.

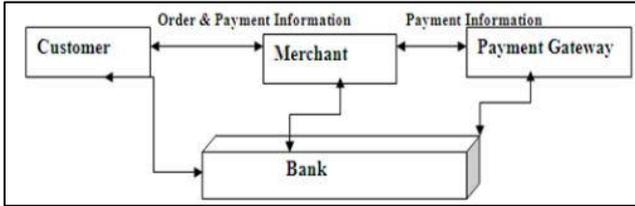


Fig. 3: Secure Communication tunnels between Customer, Merchant and payment gateway

The web payment segment creates two messages

- 1) The first message contains order information
- 2) The second message contains payment information-credit card number and other information like credit card type and expiration date. The order information is encrypted using symmetric session key and digitally signed using customer's private key. The payment information is double encrypted, first time using payment gateway public key and second time using symmetric session key. Merchant cannot peek the payment information because of the payment information is also digitally sign with the customer's private key.

VI. COMPARISON OF SECURITY SCHEMES FOR SECURE PAYMENT SYSTEM

Key Point	SSL	SET Protocol.	Tunnel
Security	Less Secure	More Secure	More Secure
Technique	Encryption /Decryption	Encryption/Decryption-With Dual Signatures	Encryption /Decryption With-Crypto Tunnel
Merchant security	Less	Yes	More
Client Security	Less	Yes	More
Payment Gateway	No	Yes	More
Channel Security	No	Yes	Using Tunnel
Use of Digital Certificates	No	Yes	Yes

Table 1: Comparison of SSL, SET and Secure Tunnel

The table-1 above outlines the key differences and similarities of major security schemes for any secure payment system.

A. Encryption: AES versus Triple-DES

As depicted in the table-2 below, all Good Link messages are encrypted end-to-end using the Advanced Encryption

Standard (AES). AES is a Federal Information Processing Standard (FIPS) selected by the U.S. National Institute of Standards and Technology (NIST) for its combination of resistance to attack, ease of implementation, efficiency, and scalable design. All Good Link clients (Mobitex, Palm OS, and Microsoft Windows Mobile 2003) support Good's implementation of AES.

	AES	Triple-DES
Description	Advanced Encryption Standard	Triple Data Encryption Standard
Timeline	Official standard since 2001	Standardized 1977
Type of algorithm	Symmetric	Symmetric
Key size (in bits)	192	168
Speed	High	Low
Time to crack (assume a machine could try 255 keys per second - NIST)	149 trillion years	4.6 billion years
Resource consumption	Low	Medium

Table 2: AES versus Triple-DES

VII. CONCLUSION

The work proposed reviews the Secure Electronic Payment schemes through SSL, SET, and Secure communication Tunnel. The security techniques are incorporated to provide security for the customers to be able to purchase the desired items on the Internet through Electronic Transaction. The system shall ensure the security of such a transaction, making it a reliable and an efficient solution to any E-business model. The primary benefits of such a Payment System over Internet are many folds: it uses strong cryptographic and authenticity checking models, thus improving the security; the merchant is prevented from seeing payment information, thus improving the privacy; as a result the customer has the freedom to use the system safely. Additionally, as the customers can use such a system without having the additional software installed, he / she can rely on these secure payments or can rely to have a digital certificate. It is evident from the literature that with the use of security principle for secure communication channels, it provides the significant level of protection over unsecured communication channels.

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# Security Enhancement of RSA Algorithm using Increased Prime Number Set

Nitin Jain, Surendra Singh Chauhan, Alok Raj

**Abstract:** In this era of digital age a lot of secret and non-secret data is transmitted over the internet. Cryptography is one of the many techniques to secure data on network. It is one of the techniques that can be used to ensure information security and data privacy. It is used to secure data in rest as well as data in transit. RSA is the most commonly used cryptographic algorithm and it is also used for the creation of Digital Certificates. RSA algorithm is now not considered to be as secure due to advancement in technology and newer attack vectors. This paper proposed an algorithm for security enhancement of RSA algorithm by increasing prime numbers count. Proposed algorithm has been implemented to encrypt and decrypt the data and execution results for encryption and decryption time have been compared for increased prime numbers count. This proposed algorithm of RSA can be used to replace the existing RSA algorithm in digital signature certificates as well as in all other places where the base RSA algorithm is currently being used. In the proposed technique, as the number of prime number count increases, prime factor calculation becomes difficult. If the attacker has encryption key ( $e$ ) and Product of prime numbers ( $N$ ) then it is not easy to find out the prime number combinations and hence decryption key ( $d$ ) will be more secure by using proposed algorithm. This will be more difficult because given a number  $n$ , it is easy to find two numbers whose product is equal to  $n$  using Shor's algorithm and Grover's Search Algorithm but it is not very difficult and time taking to exactly determine  $m$  numbers whose product is equal to  $n$ .

**Keywords:** Cipher Text, Decryption, Decryption Time, Encryption, Encryption Time, Plain Text, RSA Algorithm.

## I. INTRODUCTION

Cryptography is a technique to make a readable data into unreadable data. Modern cryptography is part of mathematics and technology of computer science.[1],[2],[3]

### A. Goals of Security (Purpose of Cryptography)

There are some specific security requirements within the context of any application-to-application communication, including these goals.[3],[4],[5]

1) **Confidentiality:** It specifies that only sender and intended recipient should be able to access the contents of

message. The attack on the availability is called interception. There are two main threats to confidentiality, snooping and traffic analysis.[3],[4],[5]

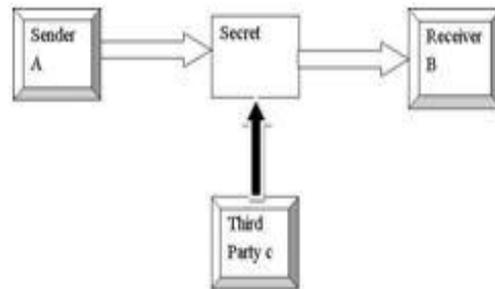


Fig. 1. Loss of Confidentiality [4]

2) **Integrity:** When sender sends a message and ensuring that the receiver receives the message as it was, wholly and error free without any changes. Attack on the integrity is called modification. [3],[4],[5]

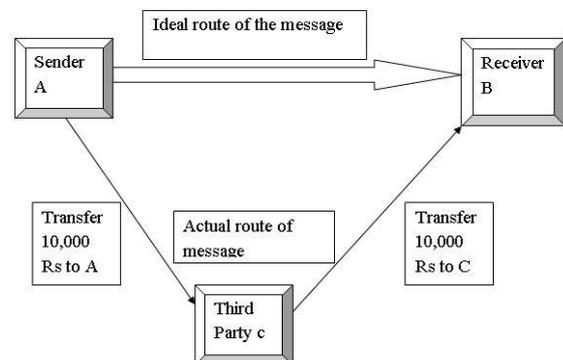


Fig. 2. Loss of Integrity [4]

3) **Availability:** Availability is ensuring that those who have the rights to information or material have always got the access to it or resources should be available to authorized parties at all time. The attack on the availability is called interruption [3],[4],[5].

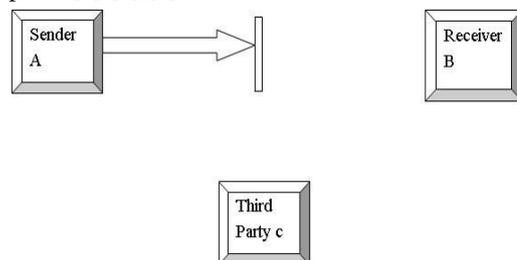


Fig. 3. Attack on Availability [4]

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4) *Authentication*: It helps establish proof of identities. It ensures that the origin of a documents or message is correctly identified. Suppose that third party C sends an electronic message over the internet to receiver B. However, the third-party C had posed as Sender A when C sent this document to user B. How would Receiver B know that the message has come from C. Who is posing as Sender A.? This type of attack is called as fabrication [3],[4],[5].

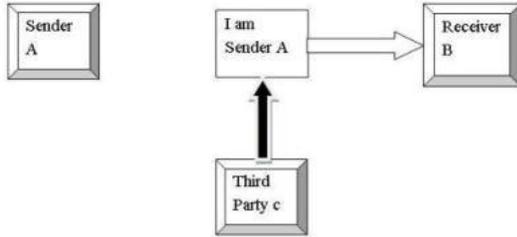


Fig. 4. Absence of Authentication [4]

5) *Non-repudiation*: It is a mechanism to prove that sender really sent this message [3],[4],[5].

**B. Types of Cryptosystem**

There are two types of cryptosystem:

1) *Symmetric Key Cryptography*: If sender and receiver share the same key for encryption and decryption of message than it is called symmetric key cryptography.[7],[9]

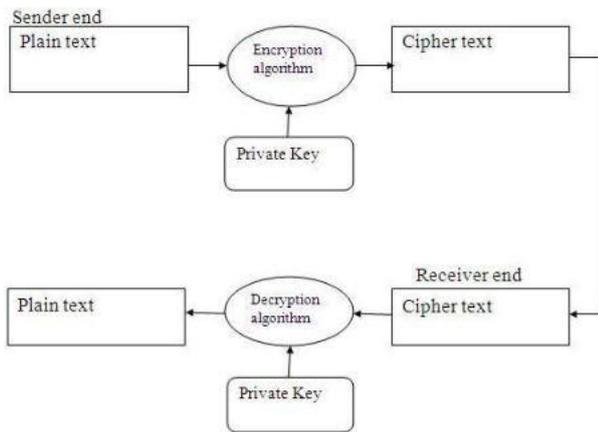


Fig. 5. Private Key Cryptography

2) *Asymmetric Key Cryptography*: If sender and receiver share the one key for encryption and another key decryption of message than it is called asymmetric key cryptography.[6],[7],[9]

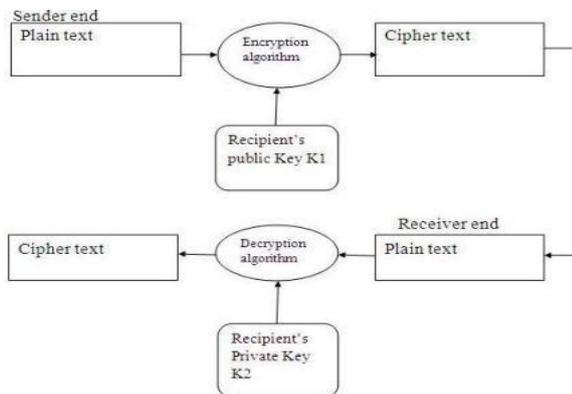


Fig. 6. Public Key Cryptography

- RSA Cryptography is the most commonly implemented Asymmetric Key Cryptography. [7],[8],[9],[10]

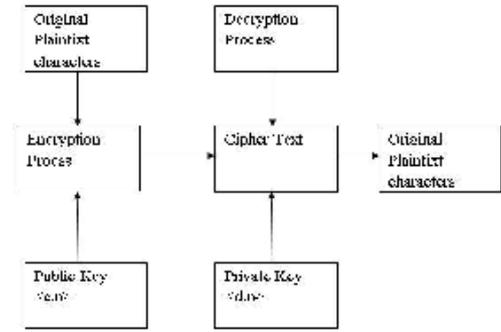


Fig. 7. RSA Model [4]

**II. PROPOSED ALGORITHM**

- Step 1 – Take the n prime numbers (P<sub>1</sub>, P<sub>2</sub>, P<sub>3</sub>, .....P<sub>n</sub>) instead of two prime numbers that is used in RSA Algorithm.
- Step 2 – Calculate the product of these prime numbers (N = P<sub>1</sub> x P<sub>2</sub> x P<sub>3</sub> x ..... P<sub>n</sub>)
- Step 3 – Now, select the encryption key e, such that it is not a factor of numbers ((P<sub>1</sub>-1), (P<sub>2</sub>-1), (P<sub>3</sub>-1) ..... (P<sub>n</sub>-1))
- Step 4 – Calculate the decryption key d, such that (d x e) mod ((P<sub>1</sub>-1), (P<sub>2</sub>-1), (P<sub>3</sub>-1) ..... (P<sub>n</sub>-1)) = 1
- Step 5 – Calculate cipher text (CP) from plain text (PT) as CT = PT<sup>e</sup> mod n
- Step 6 – At the receiver's end, calculate plain text (PT) as PT = CT<sup>d</sup> mod n

**III. FLOW CHART**

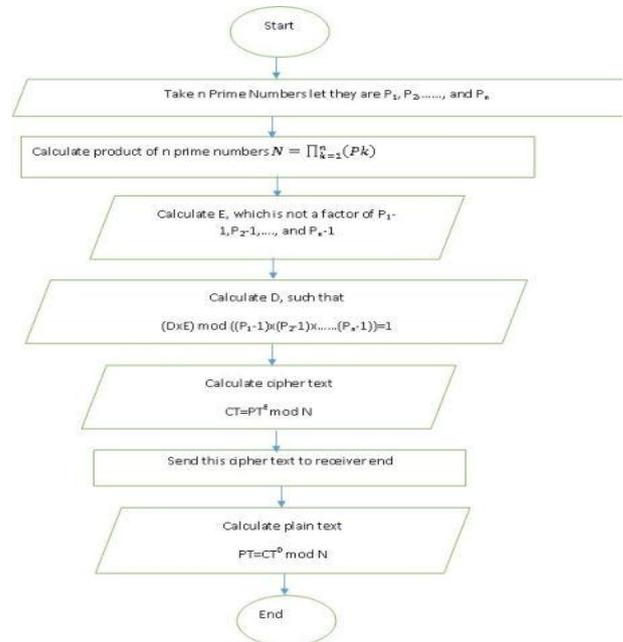


Fig. 8. Flowchart of Proposed Algorithm

**IV. PROPOSED ALGORITHM IMPLEMENTATION RESULT**

The proposed algorithm is implemented in C and python. We take here 4 types of examples. In these example there is plain text is same for all example that is "India is a Nation." and there are 2, 3, 4 and 5 different prime numbers are used and we calculate the



value of N, encryption key value, decryption key value, Encryption time, Decryption time, cipher text and again plain text from cipher text for different combinations.

We check variations in encryption and decryption time according to the prime numbers count and check the behavior of time graphs. Here the prime numbers are small for making calculations easy, but we can take large prime numbers in our practical life.

**Table- I: List of Prime Numbers Used in this Experiment**

	P1	P2	P3	P4	P5
1	23	53	11	37	17
2	29	59	13	41	19
3	31	61	17	43	23
4	37	67	19	47	29
5	41	71	23	53	31
6	43	73	29	59	37
7	47	79	31	61	41
8	53	83	37	67	43
9	59	89	41	71	47
10	61	97	43	73	53

If we are using 2 prime numbers, then P1 and P2 are used. If we are using 3 prime numbers then P1, P2 and P3 are used. If we are using 4 prime numbers then P1, P2, P3 and P4 are used.

If we are using 5 prime numbers then P1, P2, P3, P4 and P5 are used.

```

Enter the message (plain text)=India is a Nation.

the length of the plain text message=18
the message is=India is a Nation.
Enter prime No.s p,q :23
53

Select e value:633

Public Key KU = (633,1219)
Private Key KR = (1641,1219)

message into ASCII code

73  110  100  105  97  32  105  115  32  9
32  78  97  116  105  111  110  46  0

Cipher Text is
798  117  685  1112  596  357  1112  782  357  5
357  679  596  576  1112  352  117  1835  0

Cipher text in the text form is=
Au;kTeK;leTe=TeK'u6

Plain text after decryption in ASCII
73  110  100  105  97  32  105  115  32  9
32  78  97  116  105  111  110  46  0

the plain text at the receiver end after decryption
India is a Nation.
    
```

**Fig. 9.Example for Two Prime Numbers**

```

Enter the message (plain text)=India is a Nation.

the length of the plain text message=18
the message is=India is a Nation.
Enter prime No.s p,q,r :23
53
31

Select e value:5887

Public Key KU = (5887,13489)
Private Key KR = (10943,13489)

message into ASCII code

73  110  100  105  97  32  105  115  32  97
32  78  97  116  105  111  110  46  0

Cipher Text is
1825  8885  331  2119  1851  12338  2119  6417  12338  1851
12338  991  1851  7223  2119  12786  8885  7774  0

Cipher text in the text form is=
G0R0;04e;=;7G56^

Plain text after decryption in ASCII
73  110  100  105  97  32  105  115  32  97
32  78  97  116  105  111  110  46  0

the plain text at the receiver end after decryption
India is a Nation.
    
```

**Fig. 10. Example for Three Prime Numbers**

```

Enter the message (plain text)=India is a Nation.

the length of the plain text message=18
the message is=India is a Nation.
Enter prime No.s p,q,r,s :23
53
31
37

Select e value:267791

Public Key KU = (267791,496133)
Private Key KR = (445871,496133)

message into ASCII code

73  110  100  105  97  32  105  115  32  97
32  78  97  116  105  111  110  46  0

Cipher Text is
483446 -67441 233879 -412254 398588 168738 -412254 16399 168738 398588
168738 -123717 398588 161435 -412254 84841 -67441 -173428 0

Cipher text in the text form is=
uRueW0eW;7W6i8s

Plain text after decryption in ASCII
-421832 99881 23284 -236231 273224 -127446 -296231 -476814 -127446 273224
-127446 -24288 273224 -281883 -296231 222451 99881 479314 0

the plain text at the receiver end after decryption
India is a Nation.
    
```

**Fig. 11. Example for Four Prime Numbers**

```

Enter the message (plain text)=India is a Nation.

the length of the plain text message=18
the message is=India is a Nation.
Enter prime No.s p,q,r,s,t :23
53
11
37
17

Select e value:3368249

Public Key KU = (3368249,8434261)
Private Key KR = (7758889,8434261)

message into ASCII code

73  110  100  105  97  32  105  115  32  97
32  78  97  116  105  111  110  46  0

Cipher Text is
-1884581 5889837 752838 164194 2386813 -7532278 164194 -5757636
-7532278 2386813 -7532278 6844576 2386813 5122659 164194
8400443 5889837 -2386813 0

Cipher text in the text form is=
%i;h]
k\
j
a\cb;iã

Plain text after decryption in ASCII
-1964937 -432789 2283888 6668782 3715159 -6668449 6668782
-5946882 -6668449 3715159 -6668449 788835 3715159 -415423
6668782 5888159 -4932769 -6846475 0

the plain text at the receiver end after decryption
India is a Nation.
    
```

**Fig. 12. Example for Five Prime Numbers**

**V. PERFORMANCE ANALYSIS OF PROPOSED ALGORITHM**

10 sets for 2, 3, 4 and 5 prime numbers have been taken. Tables II,III,IV and V shows the values obtained during the use of two, three, four and five prime numbers.



**Table- II: List of Values obtained using Two Prime Numbers**

P <sub>1</sub>	P <sub>2</sub>	n	e	d	encryption time (in sec)	decryption time (in sec)
23	53	1219	633	1641	0.000062900000003197	0.0000619999999997844
29	59	1711	429	1677	0.000057400000002872	0.0000637000000054400
31	61	1891	799	1399	0.000069099999997491	0.0000732000000027710
37	67	2479	779	2315	0.000058899999999085	0.0000652999999957160
41	71	2911	277	4013	0.000055599999996048	0.0000744999999966467
43	73	3139	319	2095	0.000058299999999178	0.0000666000000038025
47	79	3713	511	2935	0.000060699999998803	0.0001193000000014880
53	83	4399	1263	2711	0.000069000000003427	0.0000682000000011840
59	89	5251	1095	3687	0.000074800000000153	0.0000787000000030957
61	97	5917	5563	3187	0.000091199999999958	0.0000785000000007585

**Table- III: List of Values obtained using Three Prime Numbers**

P <sub>1</sub>	P <sub>2</sub>	P <sub>3</sub>	N	e	d	encryption time (in sec)	decryption time (in sec)
23	53	11	13409	5087	10943	0.0000921000000033700	0.0000945000000029950
29	59	13	22243	11957	13469	0.0000849999999985585	0.0000775999999973465
31	61	17	32147	27403	21667	0.0000900999999942087	0.0000864000000007081
37	67	19	47101	8689	25585	0.0000847000000021580	0.0000895000000014079
41	71	23	66953	45811	72091	0.0001067999999975200	0.0001084000000020070
43	73	29	91031	18749	123989	0.0000974000000013575	0.0001036000000027570
47	79	31	115103	52093	61237	0.0001096999999958820	0.0001018999999899960
53	83	37	162763	104861	126005	0.0001141999999987320	0.0001058000000000450
59	89	41	215291	133999	205839	0.0001196999999990570	0.0001091999999971450
61	97	43	254431	4283	186227	0.0000848999999902844	0.0001457999999985300

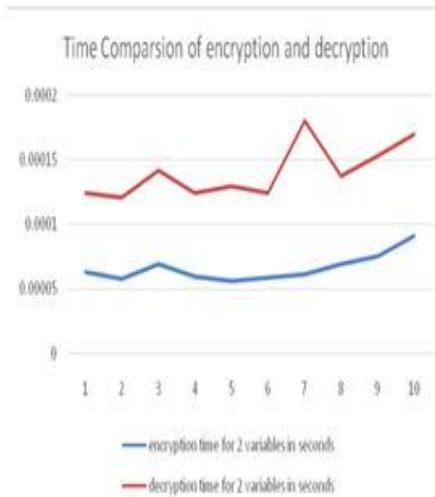
**Table- IV: List of Values obtained using Four Prime Numbers**

P <sub>1</sub>	P <sub>2</sub>	P <sub>3</sub>	P <sub>4</sub>	N	e	d	encryption time (in sec)	decryption time (in sec)
23	53	11	37	496133	257791	432511	0.0001244000000042430	0.0001199999999954570
29	59	13	41	911963	617993	1126457	0.0001297000000022310	0.0001265999999873200
31	61	17	43	1382321	675587	1271723	0.0001284000000083550	0.0001371999999975060
37	67	19	47	2213747	1403035	1429843	0.0001374999999939060	0.0001302000000009680
41	71	23	53	3548509	1670597	3166733	0.0001431000000025050	0.0001338000000004060
43	73	29	59	5370829	4226941	5490901	0.0002096000000051390	0.0001463999999913310
47	79	31	61	7021283	2868137	7946873	0.0001446999999927810	0.0001470999999924060
53	83	37	67	10905121	1542943	11135071	0.0001385000000198030	0.0001543000000197030
59	89	41	71	15285661	12370703	9366767	0.0001847000000054780	0.0001547999999900190
61	97	43	73	18573463	6919681	23585281	0.0001405000000431760	0.00014779999999792700

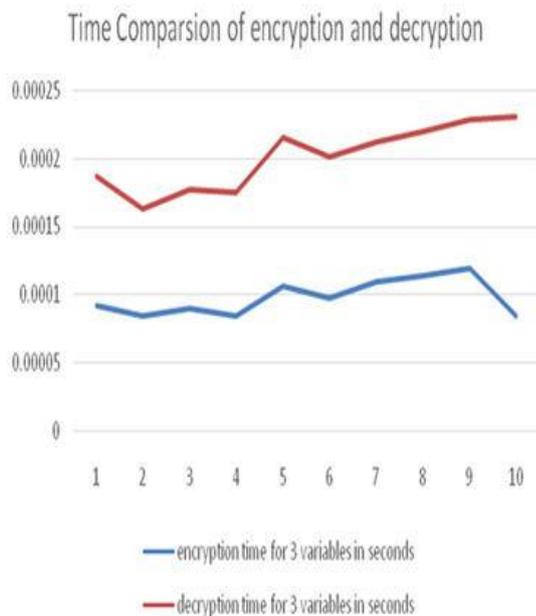
**Table- V: List of Values obtained using Five Prime Numbers**

P <sub>1</sub>	P <sub>2</sub>	P <sub>3</sub>	P <sub>4</sub>	P <sub>5</sub>	N	e	d	encryption time (in sec)	decryption time (in sec)
23	53	11	37	17	8434261	3368249	7758089	0.0001458000000056360	0.0001405000000005430
29	59	13	41	19	17327297	5298563	12062507	0.0001500000000049800	0.0001534000000020800
31	61	17	43	23	31793383	21087041	18400961	0.0001553999999828190	0.0001479999999958180
37	67	19	47	29	64198663	36667549	28792117	0.0001725999999848680	0.0001637999999957170
41	71	23	53	31	1.1E+08	51873697	87112033	0.00017599999998967030	0.0001730000000179640
43	73	29	59	37	1.99E+08	1.49E+08	227267713	0.0001886000000013150	0.0001746000000366620
47	79	31	61	41	2.88E+08	64729411	184227691	0.00017380000000841570	0.00018779999998214360
53	83	37	67	43	4.69E+08	3.05E+08	394023173	0.0001965999999811170	0.00018619999999164250
59	89	41	71	47	7.18E+08	2.64E+08	513683237	0.0002696999999898250	0.00022649999993712990
61	97	43	73	53	9.84E+08	1.03E+08	465483839	0.00030109999998783160	0.00019729999998542950

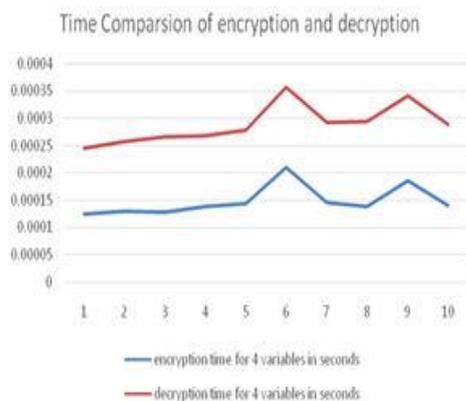




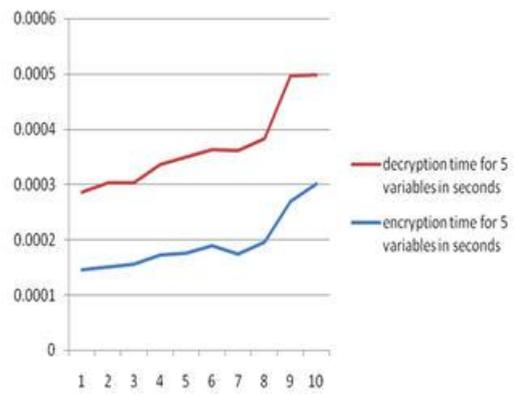
**Fig. 13. Encryption-Decryption Time Graph for Two Prime Numbers (based on Table II)**



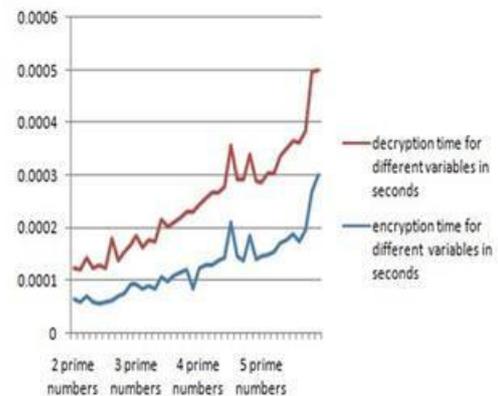
**Fig. 14. Encryption-Decryption Time Graph for Three Prime Numbers (based on Table III)**



**Fig. 15. Encryption-Decryption Time Graph for Four Prime Numbers (based on Table IV)**



**Fig. 16. Encryption-Decryption Time Graph for Five Prime Numbers (based on Table V)**



**Fig. 17. Behavior of Encryption-Decryption Time Graph for all combinations from 2, 3, 4 and 5 Prime Numbers**

By analysis of these graphs we can say that if we increase the prime number then encryption and decryption time will be increased in terms of  $e^x$ .

#### VI. ADVANTAGES OF PROPOSED ALGORITHM

1) It is very hard to find out the factors of N. In this case  $((P_1-1), (P_2-1), (P_3-1) \dots \dots \dots (P_n-1))$  because when we increase number of prime numbers then its product is also a big number.

2) The security aspects are not compromised here like confidentiality, availability, integrity, Authentication.

#### VII. CONCLUSION

At the end by comparing and checking all the parameters of proposed algorithm with existing algorithm, we can say that when we increase the number of prime numbers in RSA algorithm then its security also improves because it's hard to find the factor of N, while there are more than two prime numbers.

Encryption and Decryption time is depends on the value of e (encryption key) and d (decryption key) and here value of e is smaller because we are using more than 2 prime numbers so due to this the value of d is also not so big and by this process the encryption and decryption time is less.

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# A STUDY ON INDIAN FAKE CURRENCY DETECTION

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# A STUDY ON INDIAN FAKE CURRENCY DETECTION

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**Abstract:** Counterfeit currency detection is a major issue around the world, influencing the economy of pretty much every nation including India. The utilization of fake money is one of the significant issues looked all through the world now days. The forgers are getting more earnestly to find as a result of their utilization of profoundly trend setting innovation. One of the best techniques to quit forging can be the utilization of fake location programming that is effectively accessible and is proficient.

**Index Terms - Image Processing, Feature Extraction, K-means Algorithm, Edge Detection.**

## I. INTRODUCTION

Duplicating money represents the unlawful replication of unique money, henceforth fake money is a phony cash that has not been approved by the administration. RBI is the main body which has sole duty to print cash notes in India. Consistently RBI faces the issue of fake money notes, once separated and flowed in the market.

Counterfeit note discovery framework is created for perceiving counterfeit note from the certifiable. The main arrangement that is by and by accessible for basic man to recognize fake cash is Fake Note Detector Machine. This machine is for the most part accessible just in banks which aren't reachable each time by normal resident. . Every one of these situations needs a sort of answer for average folks to pass judgment on a fashioned monetary certificate and to cease our money from losing its worth.

The technique of picture preparing depends on the extraction of the highlights of Indian banknotes. Pictures are handled by utilizing different procedures of picture preparing and assist different highlights are extricated from the pictures. The methodology comprises of various segments including picture handling, trademark extraction, looking at pictures. The essential thing of approach is that we extricate the highlights based on which we will arrange the phony note. Security highlights of money are basic for deciding genuine and phony cash. Regular security highlights incorporate watermarks, idle pictures, security string, and optically factor ink.

In the study, a methodology for counterfeit money detection separates the general characteristics dormant pictures and ID mark from the picture of money. Extricate traits from pictures of money notes can get very mind boggling as it includes the extraction of some obvious and undetectable highlights of Indian cash. After demonetization 500 and 2000 are the high esteemed money notes existing till date so there is a most extreme likelihood that this notes can be falsified so as to dodge this we are utilizing programming to recognize the phony notes utilizing picture handling system.

## II. LITERATURE REVIEW

The approaches of picture preparing based extraction of the current highlights of banknotes are delineated in subtleties to show the attainability of programming helped fake cash location framework. For Indian monetary orders following highlights are considered. Here, for testing reason Indian money has taken parameters they utilized was:

1) Micro-printing 2) Watermark 3) Optically Variable Ink 4) Iridescent Ink 5) Security Thread 6) Ultraviolet Lines.

Zahid Ahmed et...al; The proposed approach separates different highlights from Indian cash and uses them for counterfeit money location. The picture was gained utilizing picture obtaining gadget. The security highlights were extricated utilizing different picture handling calculations and afterward layout coordinating was done to distinguish counterfeit money. We will beat this issue by utilizing various parameters which will be sufficient adequate to perceive the contrast among phony and unique cash takes note of, this will be executed utilizing picture handling systems.

Hariri et...al; Iranian banknote ID should be possible through utilizing wavelet change and neural system. This strategy utilizes wavelet change to extricate picture highlights. The proposed technique comprises of two stages: In the principal stage, a pre-procedure of the picture is taken and its size is diminished and RGB picture gets dark. Removed data can be utilized as contributions to the neural system.

Hassanpour,H et...al; Indian is a developing country, Production and printing of Fake .In this article, recognition of paper currency with the help of digital image processing techniques is described. Around eight characteristics of Indian paper currency is selected for counterfeit detection. The identification marks, optical variable link, see through register and currency color code decides the currency recognition. The security threads, water mark, Latent image and micro-lettering features are used for currency verification. The characteristics extraction is performed on the image of the currency and it is compared with the characteristics of the genuine currency.

R.C.Gonzalez et...al; The extension of present day banking administrations requires the requirements for programmed money acknowledgment and verification framework, consequently reassuring numerous scientists to grow high exactness, dependable and high handling speed methods. To recognize the validness of money note there are two techniques for example first line investigation strategy and second line review technique. First line review strategy incorporates differed thickness watermarks, bright fluorescence, intaglio printing, miniaturized scale content and multi dimensional image while the second line examination techniques incorporate isocheck/isogram, fiber based testaments of genuineness, shading and highlight investigation.

Mriganka Gogoi, et al; Money is a vital piece of our needs so its truly is significant. Flow of phony cash can upset the financial development procedure of our nation. Course of phony cash makes a lot of burden individuals. Numerous individuals are as yet not mindful of how to identify counterfeit notes and the measures which are to be thought about. Right now are concentrating on a propelled portable based application that is utilized to recognize counterfeit cash. Utilization of Counterfeit is to engage the basic man with an effectively accessible gadget to assist him with distinguishing counterfeit notes. This application can be utilized on everyday premise by us for recognizing deceitful cash notes without further ado. Dissimilar to existing cash indicators in banks, Counterfeit: Currency Detector will give easy to use and convenient application to discover produced banknotes.

### III. METHODOLOGY

Being roused by the ongoing improvements in the field of picture preparing and accessibility of ease picture procurement gadgets, we present a methodology for counterfeit money discovery dependent on picture handling. The proposed approach separates various highlights from Indian cash and uses them for counterfeit money discovery. The diagram of the proposed work is introduced in framework design.

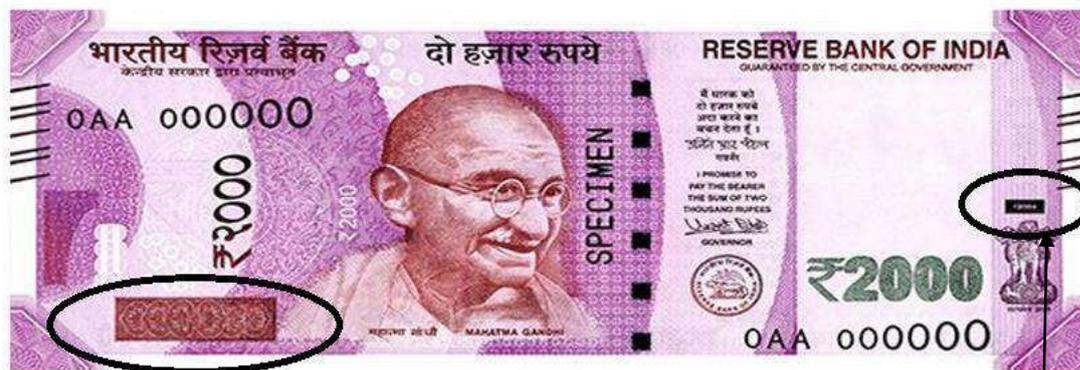
The image is procured utilizing picture obtaining strategy. The security highlights are removed utilizing different picture handling calculations and afterward format coordinating is done to recognize counterfeit money. The oddity of the methodology is in picture handling applied for extraction of security highlights from the given picture of cash. Another oddity is to utilize various securities includes as opposed to the single component.

#### A. Currency Features

The features extracted so far might be classified as general features. The general features are essentially application independent features, for example, surface, shading and differentiation, and shape. Counterfeit money detection system differs relying upon explicit features of notes of a nation.

For Indian notes following features are considered:

- Latent Image
- Identification Marks



Latent Image

Identity Marks



Latent Image

Identity Marks

Feature extraction refers to the retrieval of information about the image by applying image processing algorithms. The images of a currency note were acquired using a digital camera or scanning the currency

using a scanner. After acquiring the image, first pre-processing and then feature extraction is done to extract features. Both the steps are described in this section:

### a. Pre-Processing:

In pre-processing the operations normally initial to main data analysis and extraction of information. In this unwanted distortion are suppressed and enhance some image features that are important to further processing. It includes image adjusting and image smoothening. After these two pre-processing steps, the images of the currency were applied for feature extraction.

### b. Feature Extraction:

Feature extraction employs the selection and extraction of some of the Effective and important features, among the largest data set of the features which are extremely important for the recognition of fake currency. Some Features of an image are Latent image and Identification Mark. We first create a database of a number of authentic Indian notes and then extract their features. The extracted features are used for detection of fake currency.

## B. System Block Diagram

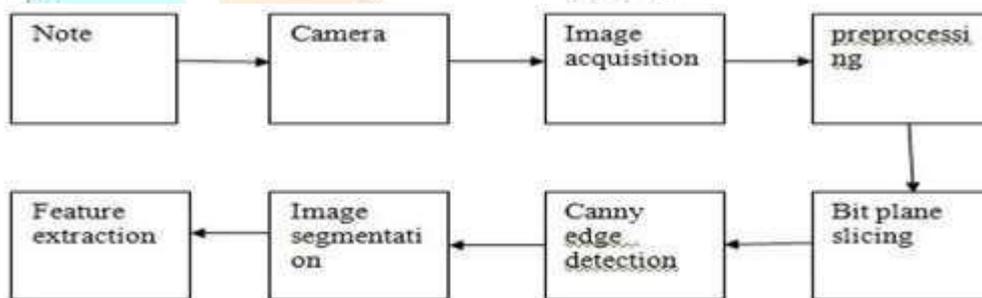


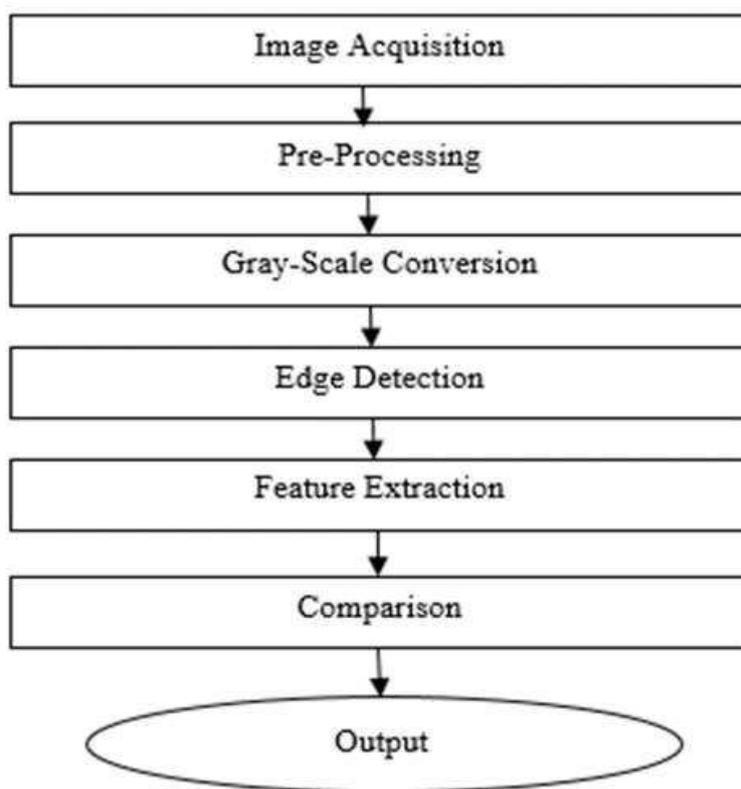
Fig.1: System Block diagram

## C. Steps of Implemented System

Image processing based currency detection technique consists of few basic steps like image acquisition, its pre-processing and finally recognition of the currency.

Image processing generally involves five steps:

- i. Image Acquisition: Importing an image with a webcam.
- ii. Performing Image pre-processing techniques such as:
  - Image Adjusting: Reduces the calculations and complexity of the size of the image and used for rotating, zooming, shrinking and for geometric corrections.
  - Image Smoothening: Reduces the noise introduced in the image.
- iii. Detect the edges of the note and partition it from the surrounding background of the image.
- iv. Perform feature extraction on the note to detect whether the note is real or fake by comparing the features of the note with the stored database.
- v. After feature extraction, the application will detect and recognize the note. The final result will be an output.



#### D. The Major Units of this Proposed System

##### K-means Algorithm

K-means algorithm is a strategy for vector quantization, initially from signal handling, that is main stream for group examination in information mining. K-means clustering intends to parcel n perceptions into k clusters in which every perception has a place with the group with the closest mean, filling in as a model of the bunch.

The algorithm has a free relationship to the K-means cluster classifier, a well known AI strategy for characterization that is frequently mistaken for k-means as a result of the k in the name. One can apply the 1-closest cluster classifier on the group communities acquired by k-intends to order new information into the current bunches. This is known as closest centroid classifier or Rocchio algorithm.

##### SVM Algorithm

In machine learning, support vector machines (SVMs, likewise support vector systems) are administered learning models with related learning calculations that investigate information utilized for grouping and relapse examination. Given a lot of preparing models, each set apart as having a place with either of two classes, a SVM preparing calculation constructs a model that allots new guides to one class or the other, making it a non-probabilistic paired direct classifier (despite the fact that strategies, for example, Platt scaling exist to utilize SVM in a probabilistic grouping setting). A SVM model is a portrayal of the models as focuses in space, mapped with the goal that the instances of the different classifications are partitioned by an unmistakable hole that is as wide as could be allowed.

In addition to performing linear classification, SVMs can efficiently perform a non-linear classification using what is called the kernel trick, implicitly mapping their inputs into high-dimensional feature spaces. When data are not labeled, supervised learning is not possible, and an unsupervised learning approach is required, which attempts to find natural clustering of the data to groups, and then map new data to these formed groups. The clustering algorithm which provides an improvement to the support vector machines is called support vector clustering and is often used in industrial applications either when data are not labeled or when only some data are labeled as a pre-processing for a classification pass.

## IV. CONCLUSION

In this study, we discuss various currency detection techniques and currency security feature, everybody has its own centrality. By using said technique we have watch that extraordinary results can be gotten quickly what's more, viably. The upsides of this assessment for the per user are that this study will give information about the particular systems what's more, calculations used for counterfeit currency detection system.

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# INDIAN FAKE CURRENCY DETECTION USING COMPUTER VISION

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**Abstract** - This paper developed a computer vision based approach for Indian paper currency detection. In this approach, extract currency feature and develop an own datasets used for the currency detection. By using feature extraction method of front and back side Rs. 200 denomination security feature of Indian currency note. The mainly use ORB (Oriented FAST and Rotated BRIEF) and Brute-Force matcher approach to extract the feature of paper currency, so that can more accurately detection the denomination of the banknote both obverse and reverse. Our main contribution is through using ORB and BF matcher in OpenCV based, the average accuracy of detection is up to 95.0% and tested this method on different denominations of Indian banknote.

**Key Words:** Feature Extraction, ORB Algorithm, Edge Detection, Computer Vision, OpenCV.

## 1. INTRODUCTION

Today, the technology is very fast growing in the world. This increasing of technology the every year government or bank sector faces the problem of fake currency. This problem is very serious issue in India now a day. Similarly the government is also improving day to day but using high printing technology counterfeit circulates the fake banknote in the Indian market [1]. The Reserve Bank of India (RBI) in its latest annual report said that the during 2017-2018, 17,929 pieces of Rs 2,000 notes were detected in 2017-2018 while only 638 counterfeit notes of the same denomination had been detected the year before. In the past, people detecting of counterfeit banknote only manual or a hardware machine which is not easy available in market [3]. The technology of currency detection system basically used for identification and extraction the features of bank note [2].

The main objective of this paper is to get familiar with the new security feature which is provided by the government of India so that they can differentiate between the fake and real note. Detecting of fake note some module including image acquisition, Image per-processing, Image adjusting, Gray-scale conversion, Edge detection, Segmentation, Feature extraction classification every step required algorithm for which using OpenCV library ( open source computer vision library) [3]. Acquisition of image is process of capture a digital image from camera such that all features are highlighted. In the project we proposed a novel approach for the detection and classification of duplication in currency

note using ORB (Oriented FAST and Rotated BRIEF) and Brute-Force matcher in OpenCV.

## 2. LITERATURE REVIEW

Over the year a lot of researchers have made several contributions in this field of currency note detection. The researchers have done detection based on security feature, texture, color etc. In this section, we review previous work in currency detection techniques.

Deshpande and Shrivastava [1], the propose a recognition and authentication system using image processing which can be a good for recognition the fake currency note. In this methodology, extract the security features with Multi-spectral imaging. They are so many feature extract in this process is Mahatma Gandhi portrait, watermark, RBI watermark , 2000 watermark, electrotype watermark of 2000 denomination note.

Y. Neeraja et.al. [2], describe a fake currency detection using k-nn technique. In this methodology, the feature extraction process by k-nn technology is a robust and versatile classifier that is often used as a benchmark for more complex classifiers such as support vector machines (SVM).

Sawant and More [3], introduce an approach to detect fake note using minimum distance classifier technique. In this paper, the extract an ID mark and latent image and compute the Euclidean distance between the test sample and train sample. The Fourier descriptor is used for the describe the note boundary. The experimental setup is done on rupees 20, 50, 100,500 and 1000.The average success rate achieved is 90.0%.

K. B. Zende et.al. [4], describe a fake note detection system automatic recognition of Indian currency security feature based on MATLAB system. They are so many step including in this process is feature extraction, image segmentation, edge detection, bit plane slicing and comparison of image. In this paper extract some many feature watermark Detection, Security Thread Detection, checking currency series number, identification mark and sees through register. Here, they propose a GUI platform to check the currency is fake or real.

Li Liu et al. [5], introduce an approach to detect fake coins using digital images. In this paper, represented in the dissimilarity space, which is a vector space constructed by comparing the image with a set of prototypes. To recognized key points they used DOG and SIFT detector.

Ali and Manzoor [6], describe a Recognition System for Pakistani Paper Currency system. In this methodology, the scan an image and classifier used Knn. They are extract the currency feature area, height, width, and aspect ratio. They

proposed the system used the different feature of the currency for detection currency and a low cost machine. The experimental setup is done 100 Pakistani currency notes 20 each on rupees Rs. 10, 20, 50, 100, 500 and 1000. The average success rate achieved is 98.57%.

Bhagat and Patil [7], proposed a fast binary descriptor based on BRIEF, called ORB, which is resistant to noise. In this paper, proposed the system on both sides of currency feature. The recognized samples for conditions as illumination changes, rotation and scale change. The experimental setup is done 210 Indian currency notes sample 15 each on rupees Rs. 5, 10, 20, 50, 100, 500 and 1000. The average success rate achieved is 97.14%.

Yanyan Qin et al. [8], proposed systems provided by SIFT (Scale-Invariant Feature Transform). Initially, the scale spaces were built for the detection of stable extreme points, and then the detected stable extreme points were considered to be feature points which have scale invariance. Secondly, ORB descriptor is used to describe the currency feature points. This finally generated the binary descriptors with scale and rotation invariance. The ORB is 65.28 times faster than SIFT. The experimental setup is done 20 images and achieves accuracy 92.53%.

### 3. METHODOLOGY

The system proposed here works on the image of Indian currency note acquired by a digital camera. The method which is applied here is as follows

- a. Acquisition of image of Indian currency note by simple digital camera or scanner.
- b. Image acquired is RGB image and converted to Gray-scale image.
- c. Edge detection of whole gray scale image.
- d. Now Indian currency features of the paper currency both observe and reverse will be cropped and segmented.
- e. After segmentation, feature of Indian currency note are extracted.
- f. BF matcher match that database features with test images note then the test note is said as original otherwise fake.

#### 3.1 Security Features of New Indian Currency Note

**1. See through Register:** The small floral design printed both on the observer side (hollow) and reverse side (filled up) with note colour. The denomination numeral of note is written horizontally along bottom the motif on the right side (reverse side) and above the latent image on the left side (observer side). The design looks like a single floral design when seen against the light.

**2. Bleed line:** The bleed line printed on the obverse in both, the upper left and the right hand edge of the notes to aid the visually impaired. The bleed line is printed only 2000, 500, 200, 100 notes.

**3. Water marking:** The water marks seen in the new MG series note of Mahatma Gandhi and denominational value on the centre of the note. The portrait of Mahatma Gandhi is displayed in raised manner as compared to the old currency note.

**4. Security Thread:** The security thread is different in the denomination. In 2000 denomination currency note is a 3mm wide strip and usually 6 windowed and similar visible features and inscription "Bharat" (in Hindi), "RBI" and "2000". The 500, 200, 100, 50, 20, 10 denomination security thread inscription "Bharat" (in Hindi) and "RBI". The security thread changes from green to blue when the note is tilted. The security thread appears between the Mahatma's portrait and guarantee clause, Governor's signature panel.

**5. Intaglio Printing:** The portrait of Mahatma Gandhi printed in centre, the Reserve Bank seal, guarantee and promise clause printed after security thread, Ashoka Pillar Emblem on the right and RBI Governor's signature are printed in intaglio. Inscription printed using the Intaglio printing or raised printing can be felt by touch.

**6. Latent image:** On the obverse side of Rs. 2000, Rs. 500, Rs. 200, Rs. 100, Rs. 50 and Rs. 20 and Rs. 10 notes, a vertical band on the left side of the currency note. It is visible only when the note is held horizontally at eye level.

**7. Micro lettering:** The Micro lettering is written on the inside of the frame of the spectacles of Mahatma Gandhi. It always contains the word "Bharat" (in Hindi) and "India". On the Indian currency note contain the denominational value of the notes in micro letters. This feature can be read under a microscope or by using a hand magnifying glass.

**8. Identification Mark:** Each currency note has a unique mark of it. Identification marks are made for identifying the denomination of note with a visually impaired. A special feature in intaglio has been introduced on above the Ashoka Pillar Emblem in right side. The identification marks only appear 2000, 500, 200, 100 denomination notes.

**9. Optically variable Ink:** The denominational numeral of a note with rupee symbol in the Mahatma Gandhi watermark window. The optically variable ink printed on the observer side. The numeral changing the colour green to blue on bottom side.

#### 3.2 Proposed Method to Detect Fake Currency

The design flow of fake Indian currency detection system includes following stages:

1. Image acquisition
2. Pre-processing
3. Gray scale conversion
4. Binarization Image
5. Edge detection
6. Image segmentation
7. Feature extraction
8. Comparison
9. Result

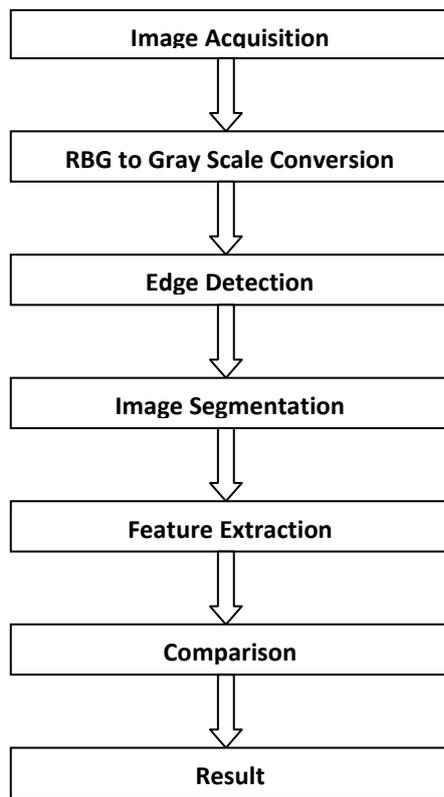


Fig -1: Block diagram of Indian Currency Detection System

The proposed system is works on two modules, one is the extract the Indian currency security feature and creates a datasets and other is the test currency dataset image on which authentication is too performed.

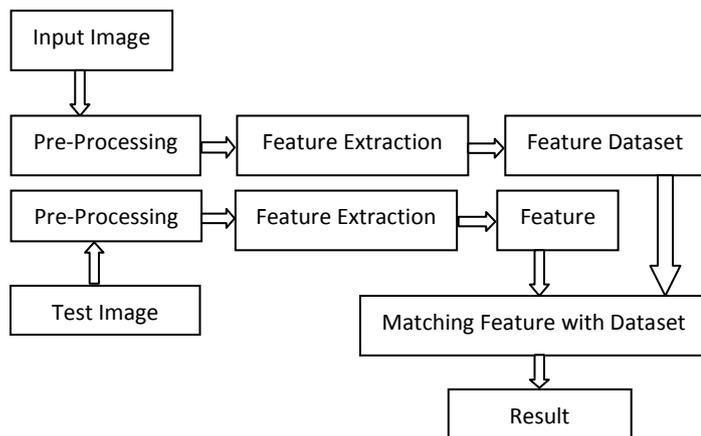


Fig -2: Proposed Detection System

**1. Image Acquisition:** Fig 3 shows the acquisition image. In this process, first image by using various ways to acquire image such as with the help of camera or scanner. This part is very important for extraction and detection of a currency.



Fig-3: Input Test Image

**2. Pre-Processing:** Image pre-processing is required prior to the main dataset and extraction of information and performs different operation for any currency verification. It includes

**Image Adjusting:** When we get the image from a camera, Fig 3 is capture in big size. Fig 4 shows reduce the calculation and decrease size of an image. These will also removing the background form the image also helping in reducing the size of the image [6].



Fig-4: Resize Image

**3. RGB to Gray-Scale Conversion:** The capture image acquired is in RGB colour. This image is heavy and has more noise. Fig 5 shows by converting into gray scale, it reduces the size of the image and also the intensity information which is easy to process instead of processing three components R (Red), G (Green), B (Blue).



Fig-5: RGB to Gray-Scale Image

**4. Edge Detection:** Edge detection is a tool in computer vision, particularly in the process of feature extraction and detection, which aim at identifying key points in a digital image. To segment an object from capture image, one needs closed region boundaries. Edge detection is one of the processes in image processing, image analysis, image pattern recognition, and computer vision techniques.

**5. Image Segmentation:** The image segmentation is the process which is divided a digital image into multiple segments, set of pixel. It is also called the image thresholding which threshold is decided and if value of given pixel is

above threshold then is converted into white pixel otherwise converted into black pixel.

**6. Feature Extraction:** Feature extraction process very important role in image processing and computer vision. In computer vision, feature extraction is the special form of dimensionality reduction. It is method of capturing image for retrieval and indexing. The aim is to extract and identify the unique feature of each Indian denomination under various challenging condition such as rough note, fold condition also under different background.



Fig-6: Observe Side Feature of Indian note

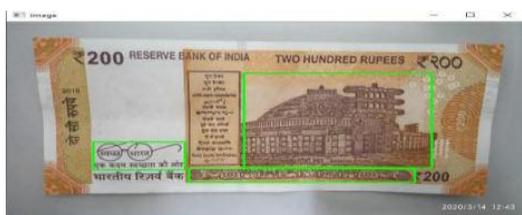


Fig-7: Reserve Side Feature of Indian note

**4. RESULTS AND DISCUSSION**

The system trained with 50 trained Indian currency note security features and the system is tested 29 testing images of denomination 200 and 500 Indian banknote. The security feature extracts of both side and compare with trained security feature. The accuracy calculated base on the testing image. The Table- I represent the accuracy in %. In denomination 200 testing images pass 29 banknotes out of 30 and the obtain accuracy 96.6%. In denomination 500 testing images pass 28 out of 30 and the obtain accuracy 93.3%. The average accuracy is obtaining 95.0%.

**Table -1: Test accuracy (%)**

Denomination	Image Datasets	Test Pass	Test Fail	Accuracy
200 Rupee Notes	30 Training and 30 Test Banknote Image	29	01	96.6%
500 Rupee Notes	30 Training and 30 Test Banknote Image	28	02	93.3%
<b>Average Accuracy</b>		<b>95.0%</b>		



Fig-8: RBI\_HIN Matches



Fig-9: RBI\_ENG Matches

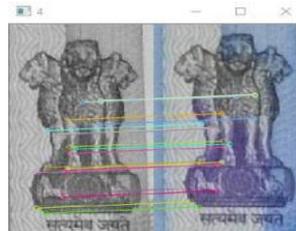


Fig-10: EMBLEM Matches



Fig-11: SEC\_THRE Matches

**5. CONCLUSION**

In this paper, we proposed ORB (Oriented FAST and Rotated BRIEF) and Brute-Force matcher in OpenCV for Indian currency detection system and currency security feature; everybody has its own centrality. By using said technique we have find that extraordinary results can be complete less time. The paper also includes the study of detailed information about various Indian currency notes. This is an OpenCV based using effective computer vision methods and algorithm which provide accurate and reliable result. At present we are having new MG series Indian currency note Rs. 200 and we can also experiment of notes Rs. 2000, Rs. 500, Rs. 100, Rs.50, Rs.20 and Rs.10. Our experiment shows that this is the low cost system to detection the Indian banknote. We had checked different notes on this system and the result is 95.0% which means that the system is working efficiently. In future, we will develop android app for detection Indian currency.

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# A Necessary Review on Optical Character Recognition (OCR) System for Vehicular Applications

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**Contents****I. Introduction**

In today's development, the world is followed by the association of things and people. Today, as technology increases in every phase of life, services are also getting better using such technologies [1]. The vehicle transport system is also playing an important role in technology. As the inhabitants increase, the vehicles are also increasing speedily due to the daily desire of the citizens. The automobile transportation System plays a primary task in the traffic monitoring system [2], crime detection system, Tracking stolen vehicles, and protection applications, etc. Vehicle Number Plate Reader is an illustration Processing Technique that uses OCR (Optical Character Recognition) [5] technology to perceive the familiar terms to classify fine vehicle points. Administration of vehicle transportation is monotonous if the occurrence over the shadowing mission is not performed automatically. Accordingly, it is indispensable to build up an automatic license plate recognition system to decipher the troubles discoursed beyond which will involuntarily recognize digit from the frontage elevation image of the vehicle. Vehicle Number Plate Reader (VNPR) [16] is an organization that consists of the equipment which can examine the character and number on the vehicle's license plate. The VNPR captures the image of a verified license plate of a vehicle. These images were taken by a digital camera/gray-scale digital camera, as well as an infrared camera [11]. An optical Character Recognition (OCR) or Optical Character Reader technique was further applied to these images to categorize the vehicles [8]. The Indian number plate mostly uses a white background and black font of letters on it or the yellow background and black font letters [12].

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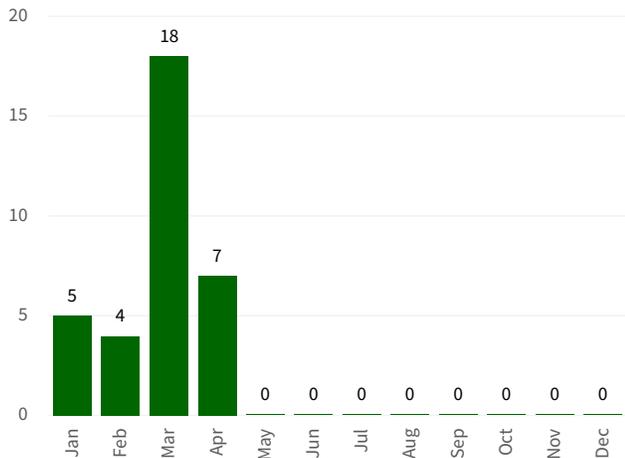
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## RESEARCH ON TEXT IDENTIFICATION, EXTRACTION AND RECOGNITION FROM NATURAL IMAGES

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**Abstract** — Text extraction is that the way toward separating content from an image. The most work of an OCR is to frame editable papers from existing report papers or picture documents. Huge number of calculations is required to build up a Test extraction and essentially it works in two stages like character and word acknowledgment. Just if there should be an occurrence of a progressively modern methodology, an OCR likewise chips away at sentence location to safeguard a report's structure. Test extraction frameworks have set up a particular section place in design acknowledgment. OCR is furthermore well known among Android applications. Format is one among the premier open source libraries wont to actualize OCR in Android applications. It's discovered that in order to wash the picture record, the precision of the product is as high as 97.56%. It ought to be noticed that the exactness is estimated in light of the fact that the level of right characters and words. The existing system/the previous system of OCR on a grid infrastructure is just OCR without grid functionality. That is the existing system deals with the homogeneous character recognition without space or character recognition of single file with low Accuracy. Existing system convert only signal character detect. The benefit of proposed system that overcomes the drawback of the existing system is that it supports multiple functionalities such as character recognition with space and high accuracy and multi character convert in image to text. It also adds benefit by providing characters recognition. An accuracy of 99% means that 1 out of 100 characters is uncertain. While an accuracy of 99.9% means that 1 out of 1000 characters is uncertain. Measuring OCR accuracy is done by taking the output of an OCR run for an image and comparing it to the original version of the same text.

**Index Terms** — pre-processing, segmentation, feature extraction, pattern recognition

---

### I. INTRODUCTION

The expanding headways inside the electronic data recovery and example acknowledgment has prompted the examination inside the advancement of ongoing applications which aren't just testing yet in addition with high computational capabilities [1 2 3]. One among the machine as of late affecting the instructional exercise explore and in this manner the business is that the Optical Character Recognition for example OCR. The OCR method has gotten one among the significant

part inside the scanners which are used in applications like language recognizable proof, identification verification, and so on it is regularly been an alluring idea of getting a machine which may supplant human functionality[4 5 6]. Be that as it may, when it includes design acknowledgment, a machine isn't as shrewd as human to just perceive the character or content, particularly from the photos. Here OCR comes into picture. There are fundamentally two sorts of OCR depending on the archive, regardless of whether it's written by hand or print[7 8]. First is that the Offline OCR which manages the prevalence of the content from the picture when filtered. What's more, second is that the Online OCR which perceives the character while it's being composed through detecting the development of the pen. It's generally utilized for transcribed content.

In the past two decades, researchers have proposed numerous methods for detecting texts in natural images or videos. There are mainly three types of methods:

**1. Edge based Method:** Edges are a solid capacity of the content power, game plan, direction, and so tense based strategy doesn't make a difference shading/focused on a high differentiation between the content and thusly the foundation [9 10 15 16]. is implanted, the three distinctive highlights of content in pictures for identifying content edges are quality, thickness and along these lines the direction fluctuation are utilized. Edge-based content extraction calculation might be a universally useful technique that can find rapidly and viably and separate the content from the two records and indoor/outside pictures. This technique isn't strong for enormous content taking care of it.

**2. Texture based Method:** This strategy uses the way that the content in the picture discrete surface properties that recognize them from the foundation [11 12 13 14]. Procedures Fast Fourier Transform (FFT) to the spatial difference, et al SVM classifier bolsters Gabor channels, wavelet are used the printed idea of the content can be seen inside the picture region. [17] This method can perceive the content in complex foundation [18]. The main downside of this strategy is that the enormous computational exertion in grouping stage surface.

**3. Morphological based Method:** scientific morphology, a procedure upheld topology and geometry for picture investigation to be morphological element extraction procedure has been applied adequately for character acknowledgment and report investigation [19, 20]. It is utilized to extricate the basic qualities content difference of the picture is handled. These highlights are invariant to changes in geometric figures, for example, interpretation, revolution and scaling is likewise changed by the condition of the blaze or content shading, nor the qualities can generally be kept up. This technique utilizes a strong under various picture changes.

## II. LITERATURE SURVEY

Table 1. shows performance of various approaches in text detection and extraction.

**Table 1.** Various Text Extraction Techniques

<b>Author, Year</b>	<b>Technique Used</b>	<b>Images</b>	<b>Parameters</b>	<b>Remarks</b>
Raj et al. [14], 2014	CC based	Natural Scene Images (Devanagari text)	PR= 72.8%, RR=74.2 %	Fails for small slanted/curved text.
Anupama et al.[4], 2013	Morphology operators, Histogram Projection ( X and Y histogram)	Handwritten Telugu document images.	DR=98.54%, Accuracy =98.29%	Fail in case of touching characters and over- lapping lines.
Azadboni et al. [6], 2012	FFT Domain Filtering , SVM Classification,K-means clustering	Scene text images	DR= 98.10%	Text characters having uniform colour.
Seeri et al. [15], 2012	Median filter, Sobel edge detector connected component labeling, order static filter.	Kannada text images	PR=84.21% RR=83.16% Accuracy = 75.77%	Fails to extract very small characters.

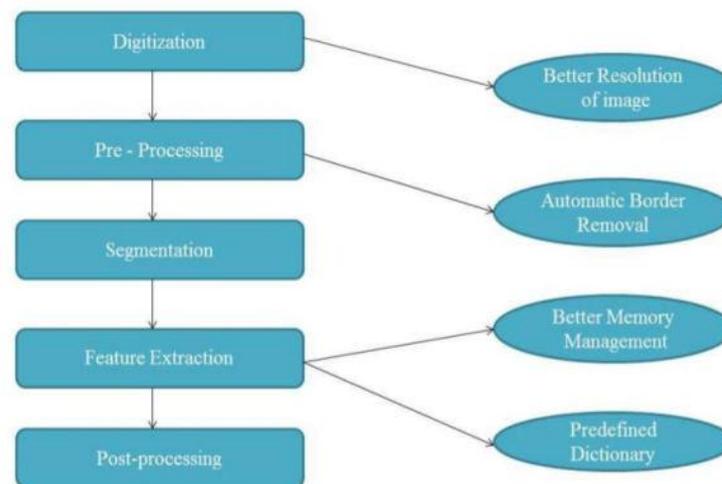
## III. PROPOSED METHODOLOGY

There are five major stages in Text extraction. They are as follows:

1. Image Digitization
2. Image Pre-processing
3. Image Segmentation
4. Image Feature Extraction
5. Image Post-processing

1) **Digitization** – In this step of image processing digital image of document is captured that is image is represented into bits for further processing of text extraction. Here Input threshold image is a colored image which is converted into a gray scale image.

- 2) **Pre-processing** - during this stage, defects in the image are eliminated which could lead to poor recognition. This binary image is given as input. Character is damaged or smeared mashed with a filling and thinning process.
- 3) **Segmentation** - character image is segmented into sub-components, namely the segment. Segments can also be identified supported supported characters such as property or popularity, a component corresponding to a predetermined class. Segmentation in the context of the text isolates individual characters of the text.
- 4) **Extraction feature** - The target feature extraction is to capture the essential characteristics of symbols. Another important task relating to the classification feature extraction. Classification is that the process of identification of each character and assign it the correct character classes. Features extracted features diagonal, transitional features, zoning, directional, parabolic curve fitting features, crossing and features open end points, etc.
- 5) **Post-processing** - This includes clustering and fault detection. recognized text characters associated with the string, so we want to develop the first string. Error detection is also underway. If the word is not in the dictionary, errors are detected and corrected by changing the words to be the most similar word.

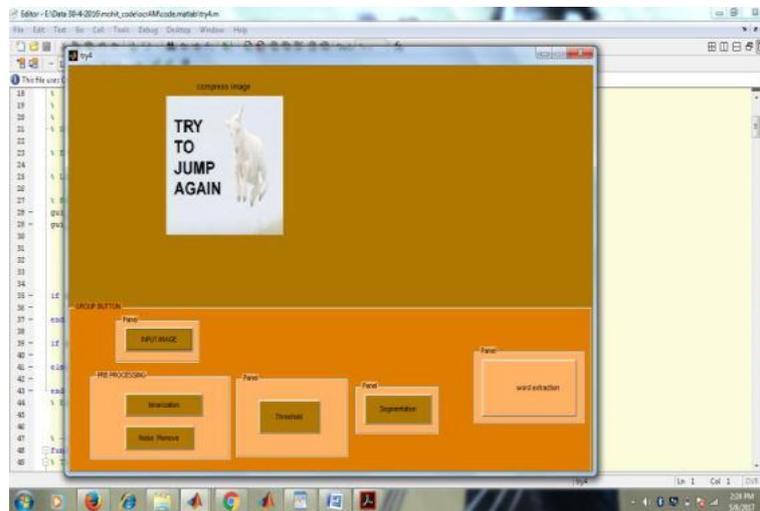


**Figure 1. Flow chart**

Digitization is just the conversion of handwriting or text documents in electronic form. Further image pre-processing pass, Pre-processing includes segmentation locations, noise reduction which consists of smoothing, thinning, fix broken, de-skewing, etc. images. The segmentation process with reference to the separation of the individual characters from the image. Once the characters are separated, the features of the individual characters are taken, which include the

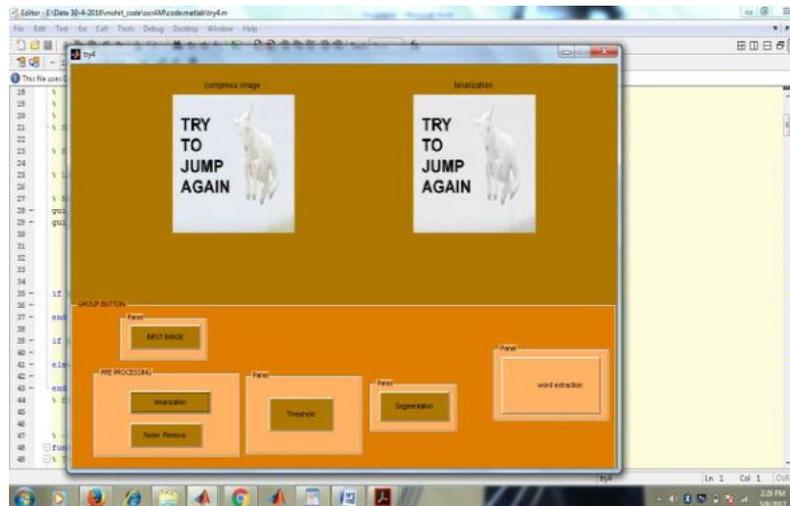
diagonal, crossing, transition, direction, curve fitting, etc., and sent for post-processing. Post processing includes grouping character and fault detection.

#### **IV. RESULTS**



**Figure 2. Browse Image in GUI (Graphical User Interface)**

In this figure we can take input image in button click event made a press button which presents me to scrutinize via my working vault and select either a 'jpg' or 'bmp' photo.



**Figure 3. Preprocessing binarization & noise Removal images**

In this figure The broken or smeared characters are smoothed by filling and thinning processes. Filling eliminates small gaps, holes, breaks in the character. Thinning reduces the width of the line. Also de-skewing of the image takes place. Pre-processing – In this stage, the defects in the image are eliminated which may cause poor recognition.

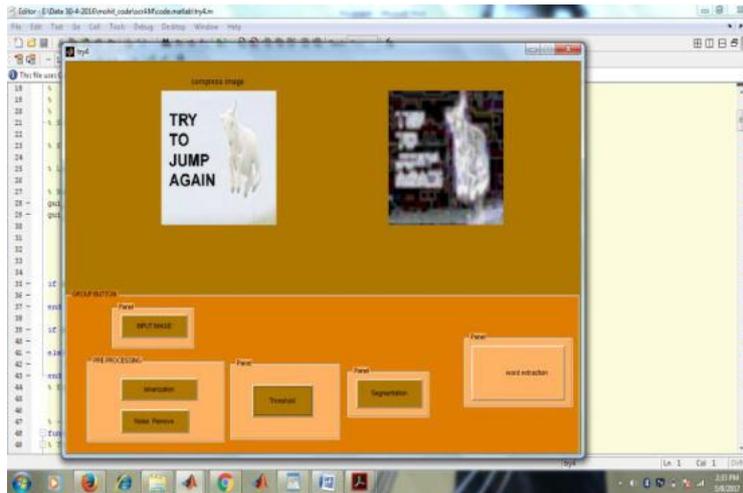


Figure 4. Images Thresholding

**Thresholding** – Character image is Threshold into its sub-components i.e. Threshold. The Threshold may identified based on character like properties or based on the recognition, components that match the predefined class. Threshold in context of text is isolating the individual character from the text.

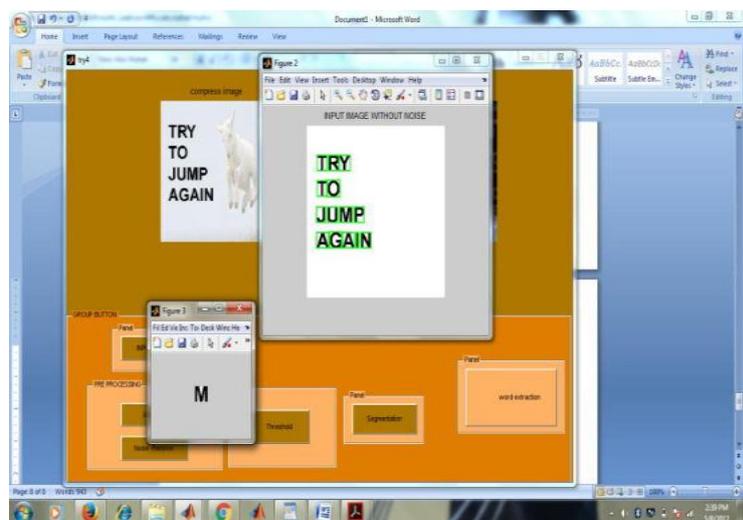
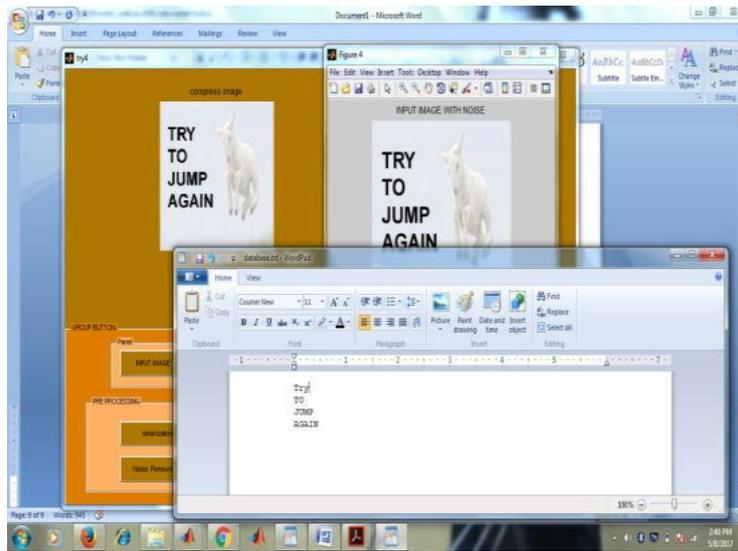


Figure 5. Segmentation and feature extraction

**segmentation and feature extraction**– The objective of feature extraction is to capture essential characteristics of symbols. Another important task associated with feature extraction is classification. Classification is the process of identifying each character and assigning to it correct character class. The features extracted are diagonal features, transition features, zoning, directional, parabolic curve fitting features, intersection and open end point features, etc.



**Figure 6. Final Output After all process we can get output in text format form image.**

**PRECISION AND RECALL**

Precision is defined as follows:

$$\text{Precision} = \frac{TP}{TP+FP}$$

recall is defined as follows:

$$\text{Recall} = \frac{TP}{TP+FN}$$

No. Image	Image type	Precision	Recall
50	Simple text text image	98%	78%
50	Image text	97%	72%

**Table 2. Precision and Recall**

## **V. CONCLUSION**

As a result, text-image analysis required to enable the text information extraction system which will be used for all kinds of images, including scanned images of documents, real scene image through a video camera, a picture of a text description. Studies show above that, most methods fall under one among techniques above and also that there are limitations of every technique to supply better detection rate with fewer false alarms without constraints for extracting text regions in various sorts of images. But still, it requires a very powerful technique and customary for text segmentation, it's difficult to supply appropriate input for optical character recognition systems. Thus, the combined methods are proposed for automatic extraction of text content from a special image that's independent of the varied characteristics of the text.

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# SURVEY ON TEXT IDENTIFY, EXTRACTION AND RECOGNITION FROM NATURAL IMAGES

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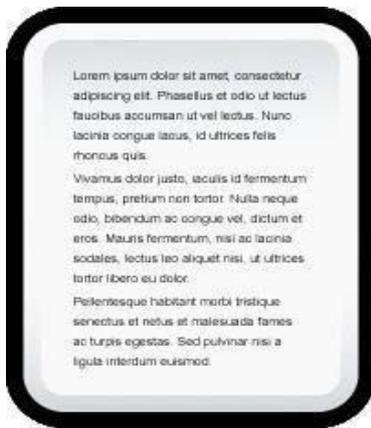
**Abstract:** Images carries important information that should be extracted whenever we need to extract. Number of algorithms and methods are proposed to extract text from the given image, and by using that user will be able to access the text from any image. Variations in text may occur because of differences in size, style, orientation, alignment of text, and low image contrast, composite backgrounds make the problem during extraction of text. If we develop an application that extracts and recognizes those texts accurately in real time, then it can be applied to many important applications like document analysis, vehicle license plate extraction, text- based image indexing, etc and many applications have become realities in recent years. To overcome the above problems we develop such application that will convert the image into text by using algorithms, such as bounding box, HSV model, blob analysis, template matching, template generation.

**Index Terms - Text Detection, Text extraction and Text Recognition.**

## I. INTRODUCTION

Text is born as an explicit carrier of high level semantics. This unique property makes text different from other generic visual cues, such as contour, color and texture. Therefore, detecting and recognizing texts in natural scenes have become important and vibrant research areas in computer vision. Text extraction is the task of automatically extracting structured information from unstructured and/or semi-structured machine-readable documents (text). The problem is challenging in nature due to variations in text properties and reflections. Text appearing in images is classified into three categories: document text, caption text, and scene text [6]. In contrast to caption text, scene text can have any orientation and may be distorted by the perspective projection therefore it is more difficult to detect scene text.

- Document text: A document image (Fig. 1) usually contains text and few graphic components. It is acquired by scanning journal, printed document, handwritten historical document, and book cover etc.
- Caption text: It is also known as overlay text or artificial text (Fig. 2). It is artificially superimposed on the image at the time of editing, like subtitles and it usually describes the subject of the image content.
- Scene text: It occurs naturally as a part of the scene image and contains important semantic information such as advertisements, names of streets, institutes, shops, road signs, traffic information, board signs, nameplates, food containers, street signs, bill boards, banners, and text on vehicle etc (Fig. 3).



(a)



(b)



(c)

Fig. 1: Document Images (a) Gray-scale (b) Handwritten (c) Multi-color

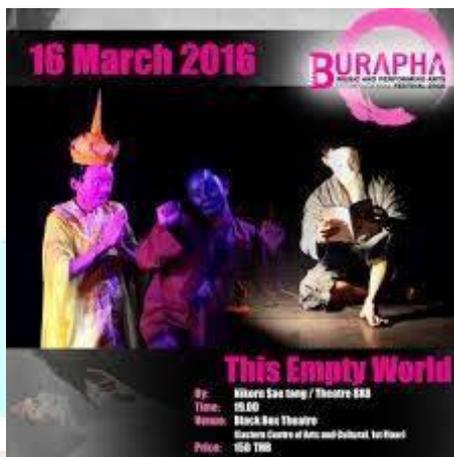


Fig. 2: Caption text images



Fig. 3: Scene text images

**A. Properties of Text in Images:**

Texts usually have different appearance due to changes in font, size, style, orientation, alignment, texture, color, contrast, and background. These changes will make the problem of automatic text extraction complicated and difficult. Text in images exhibit variations due to the difference in the following properties:

- **Size:** The size of text may vary a lot.
- **Alignment:** Scene text may be aligned in any direction and have geometric distortions while caption text usually aligned horizontally and sometimes may appear as non-planar text.
- **Color:** The characters tend to have same or similar color but low contrast between text and background makes text extraction difficult.
- **Edge:** Most caption and scene texts are designed to be easily read, hence resulting in strong edges at the boundaries of text and background.
- **Compression:** Many images are recorded, transferred, and processed in compressed format. Thus, a faster text extraction system can be achieved if one can extract text without decompression.
- **Distortion:** Due to changes in camera angles, some text may carry perspective distortions that affect extraction performance.

## II. LITERATURE SURVEY ON TEXT EXTRACTION TECHNIQUES

In the past two decades, researchers have proposed numerous methods for detecting texts in natural images or videos. There are mainly three types of methods: Region based methods, texture based methods and morphological based methods. The various text extraction techniques are as follow:

### A. Region based Method:

Region-based method uses the properties of the color or gray scale in the text region or their differences to the corresponding properties of the background. They are based on the fact that there is very little variation of color within text and this color is sufficiently distinct from text's immediate background [20]. Text can be obtained by thresholding the image at intensity level in between the text color and that of its immediate background. This method is not robust to complex background. This method is further divided into two sub-approaches: connected component (CC) and edge based.

#### i.) Connected Component (CC) based Method:

CC-based methods use a bottom-up approach by grouping small components into successively larger components until all regions are identified in the image. A geometrical analysis is required to merge the text components using the spatial arrangement of those components so as to filter out non-text components and the boundaries of the text regions are marked. This method locates text quickly but fails for complex background.

#### ii.) Edge based Method:

Edges are a reliable feature of text regardless of color/intensity, layout, orientations, etc. Edge based method is focused on high contrast between the text and the background [5]. The three distinguishing characteristics of text embedded in images that can be used for detecting text are edge strength, density and the orientation variance. Edge based text extraction algorithm is a general-purpose method, which can quickly and effectively localize and extract the text from both document and indoor/ outdoor images. This method is not robust for handling large size text.

### B. Texture based Method

This method uses the fact that texts in images have discrete textural properties that distinguish them from the background. The techniques based on Gabor filters, Wavelet, Fast Fourier Transform (FFT), spatial variance, SVM classifier and etc are used to detect the textual properties of the text region in the image [16]. This method is able to detect the text in the complex background. The only drawback of this method is large computational complexity in texture classification stage.

### C. Morphological based Method:

Mathematical morphology is a topological and geometrical based method for image analysis. Morphological feature extraction techniques have been efficiently applied to character recognition and document analysis. It is used to extract important text contrast features from the processed images. These features are invariant against various geometrical image changes like translation, rotation, and scaling. Even after the lighting condition or text color is changed, the feature still can be maintained. This method works robustly under different image alterations.

## D. Other approaches:

Epstein et al. [8] proposed SWT, an image operator that allows for direct extraction of character strokes from edge map. Binarization techniques, which use global, local, or adaptive thresholding, are the simplest methods for text localization. These methods are widely used for document image segmentation, as these images usually include black characters on a white background, thereby enabling successful segmentation based on thresholding. This approach has been adopted for many specific applications such as address location on postal mail, courtesy amount on checks, etc., due to its simplicity in implementation [11].

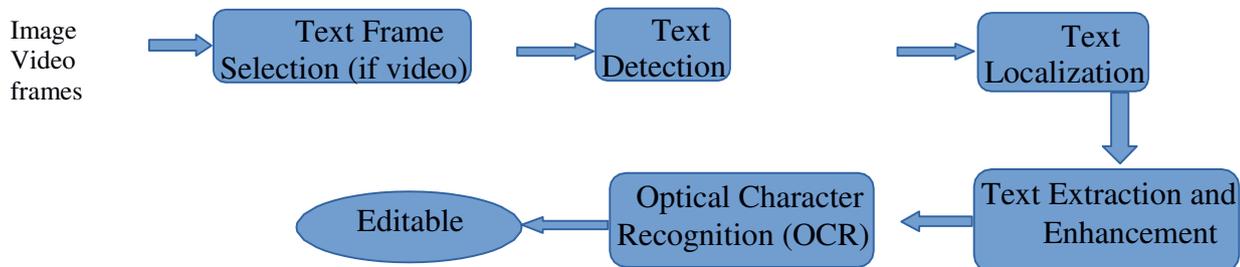


Fig. 4 Block Diagram of Text Extraction

## III. METHODOLOGY OF TEXT EXTRACTION

The input image may be gray scale or color, compressed or uncompressed format. Text detection refers to the determination of the presence of text in the image while text localization is the process of determining the location of text and generating bounding boxes around it. After that, text is extracted i.e. segmented from the background. Enhancement of the extracted text is required as the text region usually has low-resolution and is prone to noise. Thereafter, the extracted text can be recognized using OCR. The block diagram of text extraction is shown in Fig. 4.

### A. Applications of Text Extraction

Text extraction can be used for:

- Data entry for business documents, e.g. check, passport, invoice, bank statement and receipt.
- Automatic number plate recognition.
- Automatic insurance documents key information extraction.
- Extracting business card information into a contact list.
- More quickly make textual versions of printed documents, e.g. book scanning.
- Make electronic images of printed documents searchable.
- Converting handwriting in real time to control a computer.
- Assistive technology for blind and visually impaired users.

## IV. DISCUSSION ABOUT PERFORMANCE EVALUATION

There are several difficulties related to performance evaluation in nearly all research areas in computer vision and pattern recognition (CVPR). The empirical evaluation of CVPR algorithms is a major endeavor as a means of measuring the ability of algorithms to meet a given set of requirements. Although various studies in CVPR have investigated the issue of objective performance evaluation, there has been very little focus on the problem of TIE in images and video. This section reviews the current evaluation methods used for TIE and highlights several issues in these evaluation methods.

The performance measure used for text detection, which is easier to define than for localization and extraction, is the detection rate, defined as the ratio between the number of detected text frames and all the

given frames containing text. Measuring the performance of text extraction is extremely difficult and until now there has been no comparison of the different extraction methods. Instead, the performance is merely inferred from the OCR results, as the text extraction performance is closely related to the OCR output. Performance evaluation of text extraction is not simple. Some of the issues related to the evaluation of text localization methods have been summarized by Antani et al. [2].

**(i) Ground truth data:** Unlike evaluating the automatic detection of other video events, such as video shot changes, vehicle detection, or face detection, the degree of preciseness of TIE is difficult to define. This problem is related to the Construction of the ground truth data. The ground truth data for text localization is usually marked by bounded rectangles that include gaps between characters, words, and text lines. However, if an algorithm is very accurate and detects text at the character level, it will not include the above gaps and thus will not have a good recall rate [1].

**(ii) Performance measure:** After determining the ground truth data, a decision has to be made on which measures to use in the matching process between localized results and ground truth data. Normally, the recall and precision rates are used. Additionally, a method is also needed for comparing the ground truth data and the algorithm output: pixel-by-pixel, character-by-character, or rectangle-by-rectangle comparison.

**(iii) Application dependence:** The aim of each text localization system can differ. Some applications require that all the text in the input image must be located, while others only focus on extracting important text. In addition, the performance also depends on the weights assigned to false alarm or false dismissal.

**(iv) Public database:** Although many researchers seek to compare their methods with others, there are no domain-specific or general comprehensive databases of images or videos containing text. Therefore, researchers use their own databases for evaluating the performance of the algorithms. Further, since many algorithms include specific assumptions and are usually optimized on a particular database, it is hard to conduct a comprehensive objective comparison.

Table 1 shows performance of various approaches in text detection and extraction.

**Table 1:** Various Text Extraction Techniques

Author, year	Technique Used	Images	Parameters	Remarks
Yao et al.[17], 2007	CC and Support Vector Machine (SVM)	Complex background images	PR=64% RR=60%	Pixels of each character assumed to have similar color.
Lai et al. [13], 2008	Edge detection and K-means Clustering	Signboard Images		Efficient for uneven illumination.
Zhang et al. [20], 2008	Discrete Wavelet Transform (DWT), k-means clustering, Morphology Operations	Background images with different languages, fonts and sizes	DR= 94.5%, FAR= 13.6%	Text character Color independent.
Song et al. [16], 2008	Histogram Projection and color based K-means clustering	Chinese text	PR=77.05% RR=75.63%	K=3 gives performance
Dinh et al. [7], 2008	Edge detection and Histogram Projection	Signboard Texts		Low complexity algorithm
Fan et al.[9], 2009	Stroke features and connected component	Caption text images	PR=95.2% RR= 94.5%	Color information is not fully used
Audithan et al.[5], 2009	Haar DWT, Morphological Dilation operator, logical AND operator, Dynamic	Document images	DR =94.8 %	Independent of contrast

	Thresholding			
Anoualet al.[3], 2010	Edge detection, texture features, connected component analysis	Complex background images	PR=95% RR=89%	Robust and effective.
Kumar et al [12], 2010	CC Analysis	ICDAR 2003 scene images	PR=90% RR=89%	Capable of Multilingual Text extraction
Hassanzadeh et al.[10], 2011	Morphological operator, Decision classifier	Logo detection in document images	PR=95.6% Accuracy=86.9%	A novel and fast method for logo detection
Zaravi et al. [18], 2011	DWT, Dynamic thresholding, Region of Interest (ROI)	Colored book and journal cover sheets	DR=91.20%	Robust to noise
Zhang et al. [19], 2012	Edge Enhancement and CC	Web images and caption text Images	DR=92.4%	Not sensitive to various types of background noises
Seeri et al. [15], 2012	Median filter, Sobel edge detect or econnected component labeling, order static filter	Kannada text images	PR=84.21% RR=83.16% Accuracy = 75.77%	Fails to extract very small characters
Azadboni et al. [6], 2012	FFT Domain Filtering , SVM Classification, K-means clustering	Scene text images	DR= 98.10%	Text characters having uniform colour
Anupama et al.[4], 2013	Morphology operators, Histogram Projection ( X and Y histogram)	Handwritten Telugu document images	DR=98.54%, Accuracy =98.29%	Fail in case of touching characters and over-lapping lines
Raj et al. [14], 2014	CC based	Natural Scene Images (Devanagari text)	PR= 72.8%, RR=74.2 %	Fails for small slanted/curved text

## V. CONCLUSION

This paper provided a survey of text information extraction from natural images. As a result a text- image-analysis is needed to enable a text information extraction system to be used for any type of image, including scanned document images, real scene images through a video camera, caption text images and video images. This review shows that, most of the procedures fall into any one of the above methods and also that there is a limitation in each technique to give a better detection rate with fewer false alarms without any constraints for text region extraction in different type of images. But still, to need a completely robust and generalized technique for text segmentation, it is difficult to provide appropriate input to the OCR system. So, a combined method has been proposed for automatic text content extraction.

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**A STUDY OF PARENTAL ENCOURAGEMENT ON EMOTIONAL INTELLIGENCE OF 11<sup>TH</sup> GRADE STUDENT**

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**ABSTRACT**

*Parental Encouragement plays a significant role in developing emotional well-being of the students. Now a days we can see that in this fast paced world, no one has time to spend with each other and to share their feelings as we are living in 21<sup>st</sup> century where the life has become really busy. Due to complexities of life, the students, especially the adolescents, always want someone to stand on their side as this stage is regarded as very crucial in their lives. They are on that path where they can't take correct decision for their lives. Therefore, this stage requires constant support being provided by the parents as they act as the biggest guiding force in the students' life. This support, emotions if channelize properly, can help the students to achieve their goals in their lives. The present study was undertaken to study the effect of parental encouragement on emotional intelligence of 11<sup>th</sup> grade students. The sample of the study composed of 160 senior secondary school students in which 80 were Males and 80 were females of 11<sup>th</sup> grade. The sample was collected through simple random sampling technique based on gender from 8 senior secondary schools. Descriptive Survey Method was employed for the present study. Parental encouragement scale (APES) developed by Dr. Kusum Agarwal and Mangal Emotional Intelligence Inventory developed by Dr. S.K. Mangal and Mrs. Shubhra Mangal was used for data collection from the selected sample. The objective that has been formulated for the present study were i) To find out the effect of parental encouragement on emotional intelligence of male students studying in 11<sup>th</sup> class. ii) To find out the effect of parental encouragement on emotional intelligence of female students studying in 11<sup>th</sup> class. Mean, Standard Deviation One – Way Anova and 't' test were used for the analysis and interpretation of data. After the analysis of the results it was found that there was significant effect of parental encouragement on emotional intelligence of both male and female students.*

*Keywords: Parental Encouragement, Emotional Intelligence*

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**INTRODUCTION**

Yes, now a days life has become very complex and full of challenges. The life which was lived by our ancestors was totally different from the one that we are living today. The competition in every field has increased a lot and everyone, especially the students who are at their adolescent stage, want to be first at every step. At this stage they want someone who can show them a right path, provide them guidance and support them for their good deeds. Earlier, neither the parents nor the students were, in most cases worried about their future, as the options for career were limited and competition was also not at its peak like it is these days. Now the things have changed a lot. There is a change in our education system and despite a plethora of opportunities, competition has created multiple obstacles. For overcoming these obstacles, students must need encouragement from their parents and that too at an appropriate time and in an appropriate manner, i.e. without hurting their emotions. Emotions play a vital role in one's life, especially in the students who are at the critical stage of their lives when they can't decide what is good and what is bad for them. Under such circumstances parent need to step in and try and take control of their child's emotions in a most effective manner. It is absolutely true that emotionally intelligent people get more success in life then those who are not as they are able to understand their emotions and others too. They know how people would react if their emotions get hurt. This helps them to handle their relationships in a better manner, both in personal as well as in professional life. This is because the above mentioned quality makes them to feel and understand the emotions and problems of others. So, both the qualities i.e. parental encouragement and emotional intelligence are necessary for one's life, especially for those who are at their adolescent stage for achieving desired objectives.

**STATEMENT OF THE PROBLEM**

“A Study of Effect of Parental Encouragement on Emotional Intelligence of 11<sup>th</sup> Grade Students”.

**DEFINITIONS OF KEY TERMS**

**1. Parental Encouragement:** Parental encouragement is the motivation provided by parents to their children at every stage of their lives. With the help of this support, the children are encouraged to achieve success in every field and do not get disheartened in spite of failures.

**2. Emotional Intelligence:** Emotional Intelligence is the good aspect of one's personality in which an individual develops the quality of understanding the emotions of others as well his too. This quality helps the person to maintain relationships with others in a better manner.

### **OBJECTIVES OF THE STUDY**

The objectives for the present study have been formulated below:

1. To find out the effect of parental encouragement on emotional intelligence of male students studying in 11<sup>th</sup> class.
2. To find out the effect of parental encouragement on emotional intelligence of female students studying in 11<sup>th</sup> class.

### **HYPOTHESIS**

Following hypothesis have been formulated for the present study

H<sub>01</sub> - There is no significant effect of parental encouragement on emotional intelligence of male students studying in 11<sup>th</sup> class.

H<sub>02</sub> - There is no significant effect of parental encouragement on emotional intelligence of female students studying in 11<sup>th</sup> class.

### **REVIEW OF LITERATURE**

#### **1. Studies on Parental Encouragement**

Rafiq, Waqas, Fatima, Tehsin, Sohail, Muhammad, Saleem, Muhammad, Khan, Ali (2013) conducted a study on "Parental Encouragement and Academic Achievement; A Study on Secondary School Students of Lahore, Pakistan". The sample was selected from 9<sup>th</sup> class of secondary schools (public and private) from Allama Iqbal Town, Lahore City. A total of 150 students (boys and girls) were included in the sample. Simple random technique was adopted for the purpose of the study. Survey questionnaire was used as a tool for data collection. Through the results it was found that parental encouragement has significant effect in better academic performance of their children. Kishore, Vimal (2014) conducted a study on "influence of parental encouragement on students' academic achievement of high school students". The sample comprised of 200 (both male and female) from government and private high school. For the research study, the parental encouragement scale developed and standardized by Dr. R.R. Sharma was used. For testing the hypotheses descriptive statistics, 't' test and product moment coefficient of correlation has been used. The findings of the study showed that government and private high school students differ significantly on their parental encouragement and academic achievement. The study also revealed that there is a significant and positive relationship between parental encouragement and academic achievement of government and private high school students. Afroza, Akhter & Pandey, Shalini (2018) conducted a study on "A study of parental encouragement on the academic achievement of secondary level students in J & K". The sample was selected from 10<sup>th</sup> and 12<sup>th</sup> grade by using purposive sampling technique. It consists of hundred secondary school students in which 50 were Rural (25 Male and 25 Female) and 50 were Urban (25 Male and 25 Female). Parental Encouragement Scale (PES) by R.R. Sharma and for deducing the academic achievement of the students, result of High School Board Examination (2014) was used. The findings revealed that there is significant difference between rural secondary students and urban secondary students on their parental encouragement. Further it was found that secondary students have better academic achievement as compared to male secondary students. It was also found that parental encouragement with respect to domicile is positively correlated with academic achievement. The study also indicates that parental encouragement with respect to gender is positively correlated with academic achievement.

#### **2. Studies on Emotional Intelligence**

Lawrence, Arul & Deepa. T (2013) conducted a study on "Emotional Intelligence and Academic Achievement of High School Students in Kanya Kumari District". The sample comprised of 400 students (male and female) studying in IX and X standard. The tools employed in the study were self – made Trait Emotional Intelligence Questionnaire Form (TEIQue SF) and Achievement Test Questions. The findings of the study revealed that there is no significant difference between male and female high school students in their emotional intelligence. The study also indicated that there is no significant correlation between emotional intelligence and academic achievement of high school students. Chamundeswari, S. (2013) conducted a study on "Emotional Intelligence and Academic Achievement among Students at the Higher Secondary Level". The sample comprised of 321 students, selected from the higher secondary level through random sampling technique. The tools that were employed for the study were Emotional Intelligence Scale (Hydes and others, 2002) and the marks scored in

Science Subject in half yearly examination was taken to measure the academic achievement of the students. The findings of the study revealed that there was a positive significant correlation between emotional intelligence and academic achievement among the students. The students belonging to the central board schools have a higher level of emotional intelligence compared to students in state board but did not differ with students in matriculation board schools at the higher secondary level. Further the study indicates that the students belonging to central board schools are found to perform better in academics in comparison to the students who are in state and matriculation board schools at the higher secondary level. Sarita & Kataria, Sumit (2014) investigated “A Study of Emotional Intelligence and Academic Achievement among Secondary School Students”. The sample consists of 100 secondary school students selected through stratified sampling technique. The tools that were used for the study were, Emotional intelligence scale developed by Anukool Hyde and Sanjyot Deth. Descriptive Survey Method was employed in the study. The results showed that there was no significant difference in the mean score of emotional intelligence in relation to gender. There was significant difference in the mean score of Academic Achievement in relation to gender. Further it was also highlighted that there was slight relationship between Emotional Intelligence and Academic Achievement among secondary school students.

**METHODOLOGY**

Descriptive Survey Method was employed in the present research study. Quantitative approaches were adopted for the analysis and interpretation of data.

**SAMPLE USED FOR THE PRESENT STUDY**

The sample for the current research study comprised of 160 senior secondary school students, i.e. of 11<sup>th</sup> grade in which 80 were males and 80 were females which were selected by simple random sampling technique.

**TOOLS USED IN THE PRESENT RESEARCH STUDY**

1. Parental Encouragement Scale (APES) developed by Dr. Kusum Agarwal and
2. Mangal Emotional Intelligence Inventory (MEII) developed by Dr. S.K. Mangal and Mrs. Shubhra Mangal was used for the collection of data.

**STATISTICAL TECHNIQUES USED IN THE RESEARCH STUDY**

With a view to understand the parental encouragement on emotional intelligence of students at (10+1) stage, different statistical techniques were adopted for testing the hypothesis. Mean value and standard deviation were calculated from the obtained scores. Then F – ratio was worked out to judge the difference among several samples means was significant or it just a matter of sampling fluctuations. Further T – Test was used to see the significant difference among each two groups i.e. i) High – Average, ii) High – Low and iii) Average – Low.

**ANALYSIS AND INTERPRETATION OF DATA**

**Table – 1.1: Table showing Numbers, Means, Standard Deviation of High, Average and Low groups of Male Students Emotional Intelligence with respect to parental encouragement**

Different Groups/Levels	High			Average			Low		
	N	M	SD	N	M	SD	N	M	SD
Male Students	15	61.73	7.41	37	60.72	8.45	28	53.53	6.47

The groups were made on the basis of parental encouragement and scores of emotional intelligence have been taken according to these groups. From the table it was found that there is not much difference between High and Average groups’ mean scores which was 61.73 and 60.72 respectively. But High and Average groups’ mean scores were quite high than Low groups’ mean scores which was found to be as 53.53. To see whether the difference was significant or not, One Way ANOVA was calculated whose summary were as follow.

**Table - 1.2: Table showing One Way ANOVA (Male Students)**

Source of Variation	Sum of squares	df	Mean square variance	F – Ratio	Result
Between - groups	1029.99	2	514.995	8.53	Significant P < 0.05
Within - groups	4645.21	77	60.32		
Total	5675.2	79			

From the above table, it was found that calculated value of ‘F’ was 8.53 which was significant at 0.05 level. Since table value of ‘F’ was less i.e. at df = (2,77) it was 3.11. So, Hypothesis H<sub>0</sub>1 was rejected at point 0.05 level of significance with respect to groups of Male students.

**Table – 1.3: Table showing ‘t’ value of Male students**

Groups/Levels	Percentage	‘t’ value	Level of Significance
High/Average	73%/54%	5.98	P < 0.05
High/Low	70%/25%	4.87	P < 0.05
Average/Low	50%/17%	5.66	P < 0.05

To find whether there was significant difference between each two groups or not ‘t’ value was calculated. ‘t’ value between High and Average group was 5.98 and table value was 1.98 which was significant at 0.05 level. Percentage value concludes that High groups were more affected by parental encouragement on emotional intelligence as compared to Average groups of Male students.

When ‘t’ was worked out in between High and Low groups, it was found to be 4.87 which was significant at 0.05 level of significance. Table value was 2.63 and Percentage value concludes that High groups were more affected by parental encouragement on emotional intelligence as compared to Low groups of Male students.

Again, when ‘t’ was worked out in between Average and Low groups, it was found to be 5.66 which was significant at 0.05 level of significance. Table value was 2.62 and Percentage value concludes that Average groups were more affected by parental encouragement on emotional intelligence as compared to Low groups of Male students.

**Table – 2.1: Table showing Numbers, Means, Standard Deviation of High, Average and Low groups of Female Students Emotional Intelligence with respect to parental encouragement**

Different Groups/Levels	High			Average			Low		
	N	M	SD	N	M	SD	N	M	SD
Female Students	24	59.87	7.07	22	61.63	8.41	34	52.11	5.71

The groups were made on the basis of parental encouragement and scores of emotional intelligence have been taken according to these groups. From the table it was found that there is not much difference between High and Average groups’ mean scores which was 59.87 and 61.63 respectively. But High and Average groups’ mean scores were quite high than Low groups’ mean scores which was found to be as 52.11. To see whether the difference was significant or not, One Way ANOVA was calculated whose summary were as follow.

**Table - 2.2: Table showing One Way ANOVA (Female Students)**

Source of Variation	Sum of squares	df	Mean square variance	F – Ratio	Result
Between - groups	1481.425	2	740.72	14.73	Significant P < 0.05
Within - groups	3871.255	77	50.27		
Total	5352.68	79			

From the above table, it was found that calculated value of ‘F’ was 14.73 which was significant at 0.05 level. Since table value of ‘F’ was less i.e. at df = (2,77) it was 3.11. So, Hypothesis H<sub>02</sub> was rejected at point 0.05 level of significance with respect to groups of Female students.

**Table – 2.3: Table showing ‘t’ value of Female students**

Groups/Levels	Percentage	‘t’ value	Level of Significance
High/Average	76%/57%	7.89	P < 0.05
High/Low	72%/23%	7.11	P < 0.05
Average/Low	52%/13%	6.20	P < 0.05

To find whether there was significant difference between each two groups or not ‘t’ value was calculated. ‘t’ value between High and Average group was 7.89 and table value was 1.98 which was significant at 0.05 level. Percentage value concludes that High groups were more affected by parental encouragement on emotional intelligence as compared to Average groups of Female students.

When ‘t’ was worked out in between High and Low groups, it was found to be 7.11 which was significant at 0.05 level of significance. Table value was 2.63 and Percentage value concludes that High groups were more affected by parental encouragement on emotional intelligence as compared to Low groups of Female students.

Again, when ‘t’ was worked out in between Average and Low groups, it was found to be 6.20 which was significant at 0.05 level of significance. Table value was 2.62 and Percentage value concludes that Average groups were more affected by parental encouragement on emotional intelligence as compared to Low groups of Female students.

**EDUCATIONAL IMPLICATIONS**

1. The study should be simulated on a vast sample.
2. The study may be investigated to study the parental encouragement of exceptional students.
3. A comparative study may be investigated to study the parental encouragement, emotional intelligence of Government and Private senior secondary school students.
4. The study may be investigated to study the parental encouragement, emotional intelligence in different area i.e. Rural, Urban, Semi – Rural and Semi – Urban.
5. The students in various streams (i.e. Arts, Science, Commerce, Humanities) may be compared on parental encouragement and emotional intelligence.

**SUGGESTIONS FOR PARENTS**

1. Parents are the first teachers of a child, so parents should provide proper and conducive environment for the development of its emotional intelligence.
2. The small accomplishments of the child ought to very warmly appreciated by the parents.
3. Parents should not focus on what the child could not do, but instead encourage him and be positive about whatever he does.
4. Parents should not be harsh while giving any kind of instructions to their child.
5. Parents should motivate their child by giving rewards for achieving good grades.

**SUGGESTIONS FOR TEACHERS**

1. Teachers should recognise the importance of emotions of students and proper encouragement should be given to them based on those teachings.
2. Teachers should help the students to become emotionally strong by making them practice yoga and meditation.
3. Teachers should develop democratic attitude towards the students and should encourage them to express their own ideas and views.
4. Teachers should provide extra attention to the students who are emotionally weak.

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**CONTINUOUS AND COMPREHENSIVE EVALUATION AND LEARNING TECHNOLOGY****Ghazala Khatoon**

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**ABSTRACT**

*Continuous and Comprehensive Evaluation (CCE) refers to a system of school-based evaluation of students that covers all aspects of students' development. The main aim of CCE was to evaluate every aspect of the child during their presence at the school through integrating assessment with the teaching-learning process on learning and development of children holistically. Comprehensive means the scheme attempts to cover both the scholastic and the co-scholastic aspect of student's growth and development. This study covers implementation and recommendations by Kothari Commission (1964-66), acceptance and modification through different educational supportive bodies. Evaluation process developing ICT enabled CCE framework to help teachers manage the complex learning and assessment activities in CBSE schools with tools and techniques. It covers assessment pattern with advantages and disadvantages of CCE.*

*Keywords: Evaluation, Curricular, ICT, CCE, RTE Act 2009, Assessment*

Implementation of Continuous and Comprehensive Evaluation was one of the recommendations of Kothari Commission (1964-66). The recommendation was accepted by the Govt. of India under National Policy of Education (NPE), 1968 which was formulated on the basis of the recommendations of the Kothari Commission. Since then lot of changes was made by introducing unit tests in place of Term end exam or yearend exam. All the documents such as National Curriculum Framework for School Education (2000) and the National Curriculum Framework (2005) also stressed on the implementation of the CCE. One of the important features of right to education act (RTE) was the introduction of continuous and comprehensive evaluation (CCE). Thus CCE is implemented now during the tenure of Shri Kapil Sibbal, Minister of Human Resource Development. This is the new evaluation method introduced recently to decrease the accumulated stress of board exams. To achieve the objectives of evaluation or to work on the functions of evaluation "The Central Board of Secondary Education introduced Continuous and Comprehensive Evaluation (CCE) in Primary Classes in 2004 (Circular No. 5/18/25/04). The achievement records and its formats was also circulated for Classes I to V with the objective of facilitating holistic learning in the school. The Board recommended a five-point rating scale, it also recommended the elimination of the pass/fail system at the primary classes (Circular No. 31/04/21/05). The Board has also followed it up by extending this scheme up to classes VI to VIII and developed a CCE card on School Based Assessment for the same Circular No./2/06). The scheme of Continuous and Comprehensive Evaluation (CCE) will be now further strengthened in all affiliated schools from October 2009. The Class IX students will be assessed through the CCE by the school itself.

In 2009, the Right to Education (RTE) Act had mandated 'continuous and comprehensive evaluation (CCE) of a child's understanding and ability to apply the same' (Section 29.2.h) to complement policies such as no detention and age appropriate admission at the elementary stage among its slew of reform measures having the potential to transform the institutional structure and climate of elementary education in India (Kumar, 2017). Simultaneously, for the secondary stage, the CBSE announced a paradigm shift from examination to effective pedagogy in the replacement of its 10th class board exams with school-based evaluation—CCE with effect from 2011 (CBSE, Circular No. 39).

As per its provisions, section 29(2) ensures the right of each child to full time elementary education of satisfactory and equitable quality in a formal school that satisfies certain essential norms and standards. The RTE Act demands that each child should get an opportunity to learn and progress and be supported during this process. CCE can be a potent tool in respecting the intent of the RTE Act by ensuring learning for all children, as assessment during teaching-learning process would help teachers observe child's learning progress, provide timely feedback support to help the child to overcome the learning difficulties. In that case the state of 'failing' and thus detaining any child at the end of a term can be minimized. Therefore, it is crucial to understand and use both teaching learning and assessment in tandem, one complementing the other to arrive at a realistic picture of students' learning and development to help them accomplish the desired goals of education.

Thus, in order to impart quality education and help children develop holistically it is important to know their learning progress in such a manner through CCE so that it helps to;

- Find out the change in a child's learning and development over a period of time.
- map these changes through assessment of different curricular areas

## DIGITAL RESOURCES OF EDUCATION

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HOD<sup>2</sup>, School of Education, Lingaya's Vidyapeeth, Faridabad**ABSTRACT**

*In a technology driven world where change is constant, there is a perpetual need to acquire new skills, knowledge and gain insight. In today's competitive and globalized world, digital learning provides learners not only with the different tools to add value to their current skill set but also to refine old set of skills and knowledge and provide opportunities to broaden their horizons without the constraints of time and pace. Digital learning helps to eliminate all types of borders and barriers whether social and physical. Emerging Online courses are a great solution to the challenges that learners face as they are provided with high-quality education according to their learning pace and on their own place and time. Everyone can access to the information and knowledge through various tools of digital learning. Through digital learning, the society can pave its way to accessing a conducive and effective e-learning environment with the ease of availability to necessary resources, teacher and learner-controlled activities, and collaborative opportunities & activities with peers. The digital platforms are able to enhance the learning and knowledge with respect to any field and across all age groups There are several online tools of learning that offer high-end innovative and budget-friendly digital learning opportunities.*

*Keywords: Digital Learning, Online Courses*

Technology is becoming an essential part of people's lives, and it has led to many drastic changes – both in how we think and in how we learn. The globalization of our society is a direct result of the recent technological development, which means that the barriers between different parts of world are starting to break down and world is becoming more and more closer. In today's competitive and globalized world, digital learning provides learners not only with the different tools to add value to their current skill set but also to refine old set of skills and knowledge and provide opportunities to broaden their horizons without the constraints of time and pace. Digital learning helps to eliminate all types of borders and barriers whether social and physical. Education system is moving into a new phase when it comes to the power of innovations and technology in a classroom. More effective, stimulating and sophisticated learning tools are being developed and they changed the whole scenario of how teacher will teach and students will learn. Such innovations and technological developments are being met with a blend of resistance and acceptance. Some educators worry that these new innovations may reduce their importance and role in the education process and eventually will replace them, or these learning tools are too costly, complex to understand or not required. Some are concerned that their teaching work will increase with these learning tools. Despite of these contradictory views, a growing number of teachers are accepting these tools and utilizing them in innovating ways to enhance students learning.

**DIFFERENT DIGITAL LEARNING TOOLS AND RESOURCES**

The medium of digital learning makes the overall education system highly comprehensive and effective. Development of Technology allows for various interactive activities for consolidating learning in an effective manner.

**• Webinars (Web-based Seminar)**

These are web-based seminars which are organized through the medium of the Internet. The webinars are a productive and interactive way of preaching the recent trends as well as updates with respect to global education. The webinars are held live which is attended exclusively by an online audience. These offer the opportunity to ask a question, poll, chat, survey, test, and so more over a specified topic. From a teaching and educational perspective, webinars are interesting and stimulating tool because of the very high degree of interaction, helping participants to learn and understand more rapidly.

**• E-Learning Portals**

Through e-Learning portals, effective educational and training programmes can be brought to the desktops and mobile devices of learners. They can benefit from them, by receiving up to date information. These learning portals can be customized, made accessible 24/7, are flexible, convenient and user-friendly as a centralized knowledge management entity. Learners can enhance their skills and knowledge over a certain subject or topic, learn about the latest trends and acquire some new skill through these online learning portals.

- **Massive Open Online Course (MOOC)**

A Massive Open Online Courses is a completely free online portal that offers high-end educational materials for the students of all intellectual levels. Anyone can access these courses depending upon his time and pace. Through this portal, the learners are able to participate, engage, connect, or collaborate in various interactive learning processes and programs.

- **Edublogs (Educational Blog)**

Educational Blogging is another significant aspect of digital learning in the current education system. Through education-based blogging, teachers as well as students can utilize to their advantage. Edublogs is a specialized WordPress-based blogging platform that has been designed by keeping the teachers on focus specifically. This platform serves to be a great platform for the creation of online documents like handouts and assignments that can be easily shared with students. There is even an option of adding images with the given assignments.

- **Learning Management System (Moodle)**

A Learning Management System (LMS) is a secure and private online space to post content and to facilitate online learning activities and communications for a course. Instructors can use an LMS to enhance a face-to-face class or as an integral part of blended or online classes.

- **Learning Apps/Google Apps**

Through the means of advanced smartphone technology, there are various e-learning apps available for the students. Google consists of a set of apps that have been specifically designed for educators and teachers of the current education system. There are several teachers and educators that utilize Google Hangouts as it allows the students to initiate video-based conversations even from the most remote locations. Through these apps, the students can learn content. They can also enhance their skills and talents through these apps. For eg: E-Pathshala an initiative by NCERT and MHRD.

- **Clickers**

Clickers, are a tool used to make lectures more active, effective and engaging. Clickers use PowerPoint Presentations as a vehicle for delivering questions throughout the lecture that students can answer using a personal device. Clickers can make lectures more engaging by requiring students to actively apply their learning in class, and they provide very helpful feedback about student learning to instructors.

- **Lecture Capture**

Lecture capture is a tool used to record what the instructor is displaying on the computer along with the accompanying audio of a lecture. Instructors can use lecture capture to record in-class lectures for students to use as a review resource and to improve accessibility for all learners. An instructor can also record lectures to use in place of in-class meetings in other or future sections of the course. Concordia currently supports *Panopto* and *Camtasia* as lecture capture solutions.

- **Dropbox**

Cloud computing has changed the way people store files on their computers and Laptops. Many organizations have used it to make it easier for people to access files from multiple systems, as well as to share information with different users on their network. The same technology can also be used in a classroom setting, as it can make it easier for teachers and students to share files and electronic documents. Dropbox has a number of features that can allow teachers to share specific folders with their students, and they can access them from their computers.

- **ClassDojo**

A large part of teaching is managing the classroom, and ClassDojo makes the process easier. It puts more emphasis on providing “positive feedback” to students. One can also add more detailed information about the student’s performance or behavior, and can send messages to parents about their progress. It will even allow parents to look at their children feedback in real time, so they can stay up to date about how they are doing in class.

- **Edmodo**

Classroom Communication can be a challenge, especially if one has a large group of students to manage. Edmodo can offer a more streamlined approach to this part of classroom management. It can serve as a means for submitting assignments, getting grades, and sending any relevant information to students. It makes it easier to post assignments, messages, polls, quizzes, calendars, and other classroom resources, and they can access them online.

- **Slack**

This is a great tool for assigning group projects, as students can easily collaborate with others in their group. Slack also streamlines the communication among students so they can work together from remote locations. It incorporates Google Docs and Google Hangouts so students can share files with each other.

- **Educreations**

It gives the ability to create electronic whiteboards with lessons and tutorials that teachers can share with students. It's easy to create diagrams, commentaries, animations, and other instructions, and one can even record audio for narrative purposes and share it with students – both in the classroom or via e-mail or social media.

- **Cloud-Based Word Processors (e.g., Google Drive)**

Cloud-based word processors were a boon to teachers. With cloud-based word processors, students can collaborate on writing pieces from anywhere, save comments, and curate all steps of the writing process in digital portfolios.

- **TED Talk (Technology, Entertainment and Design)**

TED Talk has a library of video lectures that cover a wide range of topics and content, and they can be used in the classroom to supplement what one is teaching. This covers almost all topics — from science to business to global issues — in more than 100 languages.

- **Kahoot**

It is a game-based learning platform where students can learn through games or, 'Kahoots,' which are multiple-choice quizzes. With this digital learning tool, which can be accessed through a web browser, teachers can draft questionnaires, discussions online with academic lessons. The material can be then projected in the classrooms and questions are answered by students while playing and learning at the same time. This not only enhances student engagement but also creates a dynamic, social, effective and fun educational environment.

The digital world has blurred the walls of the schools and places of learning. Individual learners can learn anywhere, anytime and at their own pace. Digital learning resources can add considerable value to the quality teaching and to the learner's experience. Use of Technology extends our communications ability beyond face-to-face talking. It expands it beyond the printed page and reading to a new dimension. It is building a new and more efficient means of sharing ideas and information among all people.

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**SKILL DEVELOPMENT IN INDIA****Dr. Sushma Rani<sup>1</sup> and Swati Chaudhary<sup>2</sup>**HOD<sup>1</sup> and Research Scholar<sup>2</sup>, Department of Education, Lingaya's Vidhyapeeth University

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**ABSTRACT**

*We have started Digitalization of education and try to educate each citizen of India digitally so skill development is important to propagate digitalization of each field. If we have well skilled population, sufficiently equipped with knowledge is not only necessary to sustain economic growth, but is also an important for integrated growth in every field because literate and skilled citizens able to stand for benefit most from the employment opportunities which provide growth to our India. Skills and knowledge are the driving forces of economic growth and social development for any country. Nowadays India has approximately over 460 million internet users, India is the second largest online market after China. By 2021 there will be about 635.8 million internet users in India. Therefore it is important to give them right direction to use internet and develop their skills. In this paper author focused on Professional ethics of teachers in schools, Non-profit organizations in societies and communities. Fundamentally, the Author has find that teachers are not enough digitally literate and Non-profit organizations are not ready to work on ground level even government wants to create a manufacturing-hub only. This paper based on descriptive research with qualitative and quantitative research method and higher secondary school teachers and ngo's are targeted population.*

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**INTRODUCTION**

Education system makes expectation and it should by no means aim at creating simple advertises. Over a period of time lots of alters have take placed in dissimilar zones of economy including the education system. Education zone different any other zone has seen numerous phases in its development. From Guru-Shishya method of accomplishing the class in open garden under the trees to locked class room lectures, presentation type of teaching with the help of laptops touch-screen projector to online notes for teachers and students, at the present instantaneous Whatsapp communications is the exhortation among the learners. Whatsapp has increased the position of individual genuine prescribed signifies of communication among the students and the teachers. Indian subcontinent is included of different population belonging to diverse national and cultural clusters. Away from each other from these differentiations, the mainly noticeable divergence that creates a through impact on the Indian education system is the variety in purchasing power and affordability of the Indians. This paper is aimed at investigating the nature and capability of the teachers in modern education process in India. Digitalization means alteration of the entire information kinds (texts, sounds, visuals, video and other data from various sources) into the digital language. Discussing the observable fact of digitalization it should be note down those different analysts and predict specialists consider change of education procedure into digital phase as the twisting point in the history of education. The United Kingdom is supposed to be the first in the world to introduce required software engineering and IT education in the program for schoolchildren aged 5 - 16 years in 2015. The stated approach was accepted by the European Union. EU 2020 education improvement approach, accepted in 2014, centers on digital technologies. This research paper appeared to reflect remarkable accomplishments in IT region with its center purpose being combination of state-of-the-art IT-solutions in education institutions' activities across EU.

**OBJECTIVES**

1. To the study of availability of mobiles, laptops and other smart gadgets.
2. To the study of importance of Digitization in Education
3. To find out the challenges in skill development
4. To the study of digital literacy rate in teachers at higher secondary level.

**LITERATURE REVIEW**

• **Digital Strategy for Schools 2015-2020 ENHANCING TEACHING, LEARNING AND ASSESSMENT:** The Digital Strategy for Schools provides a rationale and a Government action plan for integrating ICT into teaching, learning and assessment practices in schools over the next five years. This Strategy builds on previous strategies in the area of ICT integration and it takes cognizance of current education reforms that are already underway within the education system at primary and post primary level. This Strategy focuses on the schools' sector and the proposed actions are designed to embed ICT more deeply across the system to enhance the overall quality of Irish education. Care has been taken, in developing the Strategy, to ensure that the actions align with and complement strategies and initiatives to

support digital learning in the further education and higher education sectors. In developing this Strategy, the Department adopted an evidence-based approach. A Census Report was initially conducted to provide base-line data on the levels and usage of ICT by teachers and schools. A raising from this research a consultative paper, Building towards SLearning with the launch of a public consultation phase. One hundred and twenty-four (124) submissions were received from various organizations and individuals on the content of the consultative paper and these views were further augmented by face-to-face meetings with a number of stakeholders groups.

- **The role of e-learning, the advantages and disadvantages of its adoption in Higher Education by Nelly Abaidoo and Valentina Arkorful:** earning involves the use of digital tools for teaching and learning. It makes use of technological tools to enable learners study anytime and anywhere. It involves the training, delivery of knowledge and motivates students to interact with each other, as well as exchange and respect different point of views. It eases communication and improves the relationships that sustain learning. Despite some challenges discussed, the literature has sought to explain the role of e-learning in particular and how eLearning has made a strong impact in teaching and learning. Its adoption in some institutions has increased faculty and learner's access to information and has provided a rich environment for collaboration among students which have improved academic standards. The overall literature which explains the advantages and disadvantages of e-learning suggests the need for its implementation in higher education for faculty, administrators and students to enjoy the full benefits that come with its adoption and implementation.

- **E-Learning in Rural India by Ms. Swati Yadav and Dr. Anshuja Tiwari:** has been said that development of any society depends on its access to information and the same is applicable to rural India too. E learning can work wonders in this direction and help the socially marginalized community to attain their entitlements. Launch of Digital India Program is a welcome step in this direction. It is anticipated that with dedicated leadership, willpower and control and an integrated framework comprising of the government, technology industry and society, E-learning interventions in the rural areas will undoubtedly pave way towards sustainable growth.

- **E-LEARNING TECHNOLOGY FOR RURAL CHILD DEVELOPMENT by Lect. S.K.Nayak and Dr.Kalyankar N.V.** they said Education is essential for everyone. The increased rate of literacy will push the nation towards development. E-learning is a useful way to provide education. Considering India's rural areas, problems create difficulties to implement the e-learning system but strategies can be developed and implemented. Before the actual implementation of e-learning system, the understanding of different components and their functions is necessary. A policy should be developed to implement the functions and to maintain the quality of system. With introduction of Web Based Education at school level rural children and youngsters will grow as "Computer kids". Their exposure will get increased due to which the Knowledge level will get definitely improved. Web-Based Learning adds human support through on-line tutor, thereby extending the scope of what can be effectively taught into many new subject areas. It will enhance the quality of education in our country at all levels i.e. Primary, Secondary and Higher Education. Computers are reshaping children's lives, at home and at school, in profound and unexpected ways. Common sense suggests that we consider the potential harm, as well as the promised benefits, of this change. E-learning technologies have great potential to spread learning however, the benefits of these technologies have to reach the rural masses of India, and otherwise they will be one of the causes of the Digital Divide. Development in the 21st century will be determined, to a large extent, by the thought, action and imagination of young people. This in turn, is shaped by the education system.

- **Role of e-Learning in a Developing Country like India by Deepshikha Aggarwal,** has been said that "In a market such as India where the concept is still new, one crucial element that will make a difference in generating a good response is marketing. This not only holds true for segments such as government and education, but for the corporate sector as well. Experts are of the view that there needs to be a mindset for the adoption of e-learning. The other point is content. If content providers are giving off-the-shelf content, there should be scope for customization since each organization has its own needs. Regions without university education can access universities in other regions via the Web, a solution much cheaper than building university infrastructure. In underdeveloped countries, e-learning can raise the level of education, literacy and economic development. This is especially true for countries where technical education is expensive, opportunities are limited, and economic disparities exist. However, one of the problems with e-learning in India is the lack of course content, especially outside the mainstream focus areas of IT education, English-language content, and tutorial-like courses. There will be high demand for people who can develop multi-lingual courseware that addresses various topics. The social implications of online learning center around one primary requirement that students need to feel a part of the class, regardless of where they are located physically or geographically. The

—missing of connection to the other students in the class and with the institution can impact the success of an online student. Bottom line: the Indian market is still young, but it will continue to adopt the concept of e-learning in order to meet its communication needs and seize business opportunities".

- In “**Empowering Indian Citizens Through Technology, September 2015**” ASSOCHAM suggested “To realize the vision of promoting inclusive growth through empowerment of citizens, it is important to reach out to citizens in the remotest of locations and make them part of India’s growth story. Globally, technology has been the greatest enabler in causing disruptive change. India’s story is no different, and the use of digital technologies to educate and empower citizens is being seen as a game-changer. Given India’s vast expanse and differences in demographics across the nation, there is also a vast difference in the level of adoption among the citizenry.”

### **METHODOLOGY**

According to researchers and educationists, very shortly digital layout will eradicate the require for handwriting lectures and speech, when every student will get all the materials and will be capable to progression them on a real-time basis and work interactively. The entire texts will be accessible online and stored in a digital ‘cloud’ (Apple iCloud alternative), which will sensibly remove some negative results related to absence from school. In accordance with the nature of the present study, quantitative and qualitative Method was used for the collection of information. The tools were administrated upon the sample and the descriptive data was collected by the investigator. Qualitative and quantitative method is concern with present situation, event, and practices with relationship among variables. These methodologies have been classified differently by various authors.

### **FINDINGS/ RESULTS**

In this research paper we find that teachers are not enough literate to digital literacy at higher secondary level. Teachers are feeling over saturated and overloaded with digitalized education. Demanding digital technologies access in education increases a number of sensible issues. Same like with the other innovations, the world of online technologies is associated with certain contradictions and unforeseen circumstances. For instance parents, who want their child to spend less time at the computer, should change their mind, since education process modernization presupposes the opposite. According to Lego analysts “Each education situation and each child is unique; therefore parents and teachers should determine how much time their child can spend in front of a computer. Therefore it’s vital to interactively find solution regarding correct “digital” behavior of a student and teachers work out “digital activity rules”. Although this statement is directly related to video games, teachers presentations for classrooms it can be applied to any “digital” activity, so much the more, as it was stated above, we face the tendency of ‘binding’ the games and education, especially in higher secondary schools.

According to the findings teachers should know about current technologies related to Education and also capable to use educational applications those are easy to access on smart phones and laptops. Another issue in this circumstance is wide-ranging digitalization of student’s life, forecasted by various scientists and educationists. Today digital technologies are not available in rural areas therefore mostly teachers and students are not enough literate by the technologies. At the same time the society demands turn to rise, forcing us to adapt to the 21st century progress. Nowadays the ability to adapt to new technologies is a success prerequisite, as stated in the 8-th issue of newsletter of global recruiting company Heys. (Digital Dawn, 2015).

Currently Khan Academy is a multi-field global education institution with numerous administrative and more than 80 teachers, actively engaged in their activities with wide range of classes: from online lectures and seminars for students of the academy to extensive archive of special digital records, used as a huge digital library. The key feature of the Academy is a simplified form of participation and presence at classes (personal presence, distant online or extra-mural offline). This academy concept was established when Sal Khan worked as hedge fund analyst in California, and in between was engaged in online teaching of people from all over the country. At a certain stage he collected enough records and his colleagues from Google advised him to upload these records on YouTube channel. Soon after Khan received feedback from people from all over the country and from abroad, particularly from Singapore, who asked for more uploads. The channel turned to be the starting point for today’s Khan Academy.

Today Khan Academy is a large organization with its base comprising more than 400 million lessons for students in 28 languages. In 2015 the number of languages reached its peak point according to statistical data, with more than 2.5 billion users connected to the Academy’s server. And finally more than 50000 teachers worldwide have cooperated with the Academy since its establishment. But the point is to be noted that it only limited to urban areas not for rural areas because there is no availability of smart gadgets and digital literacy educators as well.

Technologies have today redefined the conservative role of the teacher. No longer does a teacher enjoy a positive knowledge remaining over the taught. In fact, the knowledge gap is speedily narrowing between the teacher and the taught. Present teachers will require reinventing themselves by embracing technology and continuously developing to remain ahead of the knowledge curvature.

They will have to contact to their students and play catalysts for transferring information into knowledge. Application of academic perceptions in genuine life circumstances, make sure worldwide absorption and creating a vigorous and favorable learning environment will be challenges that innovative technologies can never overcome.

## **DISCUSSION**

However it should be noted that the stated education digitalization trend in India may soon raise numerous challenges for Teachers and schools. First it's digital separate between provision of information gadgets to teachers, who make lively use of them, and conventional approaches to studies. Therefore, digitalization has both realistic followers and unconvinced challengers. Thus, Y. Shikova considers that new explanations will personalize the education procedure, adjusting the program to a student's person requires. If a technology contributes to better understanding, memorizing, knowing or using any content, it's worth considering and implementing, even if it presupposes fundamental changes in academic activity. Alexander Sidorkin is however more skeptical about it, stating that Indian education digitalization process embodies major challenges; thus educational resources digitalization (for instance, tutorials) doesn't keep up with informatization of education process. The education lacks initiatives related to intensification of education communicative component using information technologies, as well as basic ideas. This area requires sustained flow of breakthrough ideas and venture projects (Internet and education, 2015). The aforementioned innovative tendencies will govern education development in terms of globalization and, as it was stated above, will influence all sides of education and will be followed by major changes in academic activity, i.e. class work and in classrooms. Classroom activities of the future will not represent a typical picture of a teacher in front of its students, sitting at desks arranged in perfect rows. Introduction of innovation digital technologies will change not only teaching form and tools, but its environment as such.

## **RECOMMENDATIONS**

### **1. Teachers should be permanent at their positions**

For the most part of the teachers in schools in rural areas are run by the government. They assign ad hoc teachers, instead of permanent ones, who are poorly paid as compared to the huge remuneration of a full-time Trained Graduate Teacher (TGT).

Furthermore, promising career views, which is pretty a motivation booster, is just about nothing for the non-permanent teachers. This leads to dissatisfaction, eventually resulting in a lack of teachers because they move away to more permanent jobs.

### **2. Lack of Responsibilities**

Lack of responsibilities of teachers and school authorities has raised the rate of absenteeism. School Development and Management Committees (SDMCs), comprising parents and members of the local community, have been entrusted with the responsibility of overseeing teachers and their duties. However, research suggests that the committee has hardly seen success.

### **3. Teachers should not take burden of non-teaching duties**

Additionally, non-teaching duties like appointment in invigilation often keep teachers away from schools and classrooms. Moreover, teachers often have to report for duty far away from their home. With an insufficient transportation system in rural India, the distance only adds to their despairs and often consequences in absenteeism.

### **4. Freedom from Teachers' Eligibility Test**

Some states have freed from candidates from Teachers' Eligibility Test (TET) as only 20 per cent of the candidates obvious it. This wrong move, in an effort to rapidly fix the matter of lack of teachers, has depreciated the feature of education in the states even further. However, quality of teachers is a most important concern not only in these states, but across the whole country.

### **5. Teacher training should emphasized on digital skills**

There are many private teacher-training institutes in India, but the quality and lack of emphasis on digital skills in the training they provide is unsatisfactory. Continuous professional development is a motivator for teachers, and adequate awareness is required in this regard.

**CONCLUSION**

We might state that modern educational system faces creative crisis. Class work and lessons do not contribute to students' personal initiatives to learn something new, establish objective connection between their knowledge and the real world, use their imagination to look for nonstandard answers to standard questions instead of using stereotypic models. Therefore the classroom of the future should not be a place of knowledge transfer, but a place of investing in the mind of students, focusing on creativity and innovation and not on repeating ready-made opinions or mechanical response to test questions. The stated approach to education will force us to reconsider curricula and integration of conceptual and actual innovations. New curricula should stipulate not only obligatory transfer of facts, but focus on students' reaching certain objectives, namely creativity, imagination and teamwork irrespective of team members' location. Finally, it should be noted that today's global education has faced major transformations, caused by further integration of new digital technologies in academic activity and is actively searching for efficient implementation models, which will compromise with traditions and innovations.

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# Sustainable Solid Waste Management

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**Abstract:** *In this paper, an attempt is made to understand the sustainable solid waste management, its composition, characteristics, collection and its transportation. Solid waste management is been a vital environmental issue since last few decades. Due to improper waste management, lots of health issues are arising, apart from that the ground water quality is affecting, due to which the drinking water quality is affecting. The Addition to a comprehensive analysis of solid waste storage, generation (as per lower, middle and higher income group households), its composition, characteristics, collection and transportation. It is found as per some researches that the lower income group (LIG) generate less quantity of waste and also found more of biodegradable waste generation from the households. The necessities of waste management system, bad effects of mismanagement, various issues are raised in several studies are mentioned in the paper. It is found as per some researches that waste management should adopt by Proper collection, storage, processing, transport & disposal of waste so that the impacts of waste can be minimised & the quality of life can be improved. Therefore, sustainable solid waste management should be implemented to maintain an sustainable and pollution free environment.*

**Keywords:** Solid waste management, Health hazards, Reuse, Recycle, Environmental issue.

## 1. Introduction

Solid waste is unwanted materials disposed off from homes, industries, shops, offices, hospitals etc. The quality and quantity of municipal solid waste generated by a particular community will vary according to their socio-economic status, cultural habitats, urban structure, population and commercial activities (Esakku et al. 2007). Urban India is facing an ever increasing challenge of providing for the incremental infrastructural needs of a growing urban population. According to the 2011 census, the population of India was 1.21 billion, out of which 31% live in cities. It is projected that by 2050, half of India's population will live in cities.

With this increasing population, municipal solid waste management (MSWM) in the country has emerged as a challenge not only because of the environmental and aesthetic concerns, but also because of the huge quantities of municipal solid waste (MSW) generated per day. According to Central Pollution Control Board (CPCB, 2013) 1,43,449 tonnes per day (TPD) of municipal solid waste was generated in India during 2014–2015, with an average waste of 0.11 kilogram (kg/capita/day). Therefore the total municipal solid waste, approximately 1,17,644 tonnes per day, (80%) was collected, while only 25,805 tonnes per day, (20%) was processed or treated. Segregation at source, collection, transportation, treatment and scientific disposal of waste was largely insufficient leading to degradation of the environment and poor quality of life (CPCB 2013).

The waste generation in small cities is lesser than larger cities. The amount of solid waste generation is also directly related to the economic status of families. As per studies conducted by Tata Energy Research Institute, higher income group generate more solid waste than middle and lower income groups (CPCB 2013).

Apart from creating air pollution, soil contamination and groundwater contamination, open dumping of wastes generally becomes breeding ground for various dreadful

disease causing health issues towards peoples or residents, particularly in the vicinity of the waste disposal sites. Further, with increasing awareness of public on environmental and health issues, there is a general opinion that the standard of services with respect to collection and disposal of municipal solid waste is progressively declining. It is also true in many cities that as much as half of the solid waste generated remains unattended.

## 2. Classification by Source of Solid Waste

- 2.1 Household Waste: this category comprises waste that are consequence of household activities, these include food preparations, sweeping and garden waste. They also include old clothing, retired appliances, packaging and etc.
- 2.2 Commercial Waste: this category consist of waste from stores, offices, fuel service stations, restaurants, hotels, informal shops and hawkers.
- 2.3 Institutional Waste: schools, offices, hospitals etc, are included in this category, this category generally involves a large proportion of paper than food.
- 2.4 Street Sweeping: this category of waste includes dirt and litter and also contain an amount of household waste, drain cleaning, animal manure and small dead animals.
- 2.5 Construction And Demolition Waste: these consist of bricks, concrete, sand etc, which are generated due to construction & demolition activities.

## 3. Classification Based on Material Composition

- 3.1 Rubbish: refers to waste which consist of inorganic material such as metal cans, dirt stones, ceramics, glass bottles and etc.
- 3.2 Garbage: refers to waste consists of organic and decomposable, paper, plastics, rags, leather, rubber, grass and garden waste.
- 3.3 Ash: this refers to residue from fires used for cooking, burning wood and leaves etc.

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3.4 Treatment residues: consist of septic tank sludge, De watered sludge or chemicals.

#### 4. Classification Based on Environmental Consideration

- 4.1 Bio - degradable waste: are those waste which can be naturally decomposed, food waste ,garden waste and some other organic waste which are biodegradable and usually don't have long term effects, on the environment.
- 4.2 Non- biodegradable waste: include all other waste which cannot be naturally decomposed, example for e-plastic, glass, metals and other inert materials.
- 4.3 Hazardous waste: are those which pose a high environmental and health risk for the community and require special handling. Waste which are toxic, reactive, radioactive, explosive are included in hazardous waste.

#### 5. Solid Waste Management

**Solid waste management** includes the entire process of dealing with solid waste ,starting from the collection from the primary source to ultimately disposing off it hygienically, so that it may not be a nuisance or create any harmful effect on nearby community. The solid waste management involves , management at waste generation level , storage at the source of generation , primary collection , street cleansing , temporary storage at locality level , regular and periodic transportation of this temporarily collected waste to disposing sites and treatment plants.

Segregation at source, collection, transportation, treatment and scientific disposal of waste was largely insufficient leading to degradation of environment and poor quality of life. The objective of Solid Waste (SW) Management is to maintain clean and hygienic conditions and reduce the quantity of solid waste. (Shuddhi, 2014)

Solid waste management (SWM) is a basic public necessity and this service is provided by respective urban local bodies (ULBs) in India. SWM starts with the collection of solid wastes and ends with their disposal and/or beneficial use. Proper SWM requires separate collection of different wastes, called source separated waste collection. Indian cities are still struggling to achieve the collection of all MSW generated. Metros and other big cities in India collect between 70- 90% of MSW. Smaller cities and towns collect less than 50%. The benchmark for collection is 100%, which is one of the most important targets for ULBs at present. (kurian joseph, 2016 )

#### 6. Impacts of Improper Solid Waste Management

Improper solid waste management causes air, water and soil pollution. It clogs drains, creating stagnant water for insect breeding and causes floods during rainy seasons. Greenhouse gases are generated from the decomposition of organic wastes in landfills; insects and rodent vectors are attracted to

the waste and can spread diseases such as cholera and dengue fever. Some health problems linked to improper solid waste management are, nose & throat infections, lung infection, breathing problems, inflammation, high pollution load, bacterial infections, obstruction in airways, elevated mucus production, covert lung haemorrhage, chromosome break, anaemia, cardiovascular risk, altered immunity, allergy, asthma and other infections.

Open burning is the burning of any matter in such a manner that products of combustion resulting from the burning are emitted directly into the ambient (surrounding outside) air without passing through an adequate stack, duct or chimney. Open burning of wastes is practiced all over India due to reasons like, open burning by waste-pickers for recovery of metals from mixed wastes, open burning in bins by municipal workers or residents to empty MSW collection bins, open burning of plastic wastes by street dwellers for warmth at night (Joshi and Ahmad 2016).

The occupational health hazards of waste pickers arise from two aspects – poverty and their occupation itself. Since they belong to the poorest and most deprived section of the urban population, under nutrition, growth retardation, anaemia, tuberculosis and other bacterial and parasitic diseases are very common amongst waste pickers. These make them all the more susceptible to occupational health hazards. In the hope of discovering some saleable item the waste pickers rummage through putrefying waste heaps including toxic medical waste using their bare hands and feet and hence come in direct contact with waste material. Infections and infestations results due to such contact with human and animal excreta, sputum, dead animals and potentially infectious hospital waste dumped in refuse dumps This makes them highly susceptible to a number of health hazards.(Suresh et al. 2003)

#### 7. Conclusion

Raising awareness amongst the residents and waste collectors to prepare them to anticipate in the community based solid waste management programme. Waste Segregation, segregation of organic and non-organic waste should be maintained through the societies. Material recovery facilities can be set up at community level with space allocation for segregation by workers. These facilities can hold the segregated waste for further collection or reuse by different dealers like paper, textile, metal, glass, plastics etc. Door to door waste collection of segregated waste, Abolition of open storage, daily sweeping of the street, Transportation of waste to disposal place should be in covered, Capacity building of waste pickers and inclusion of scrap dealers in organized way.

Wastes processing by energy recovery or composting, Composting pits are a low budget, practical solutions to convert large amount of Organic waste being produced by residential population through kitchen and gardens (about 40% of the total waste generated is organic) into rich organic manure/ fertilizer which can be then sold into the open market or utilization in terrace gardens or local parks

for horticulture. Training the workers for the required skills and also improves their earning capacity. Therefore, by adopting all these methods and precautions, we are able to achieve sustainability towards the solid waste management.

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## STUDY OF PHYSICO-CHEMICAL PROPERTIES OF LAKE PICHOLA, DIST. UDAIPUR, RAJASTHAN

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### ABSTRACT

The present study was carried out to study various physico chemical factors which are affecting the water quality of Lake Pichola, District: Udaipur, Rajasthan. City Udaipur is completely dependent on its lakes water. Various parameters such as temperature, transparency, total dissolved solids(TDS), pH, alkalinity, hardness, dissolved oxygen (DO) and Biochemical oxygen demand (BOD), Phosphate, Nitrate, Chloride, Fecal Coliform and Total coliform were analyzed for year 2016 and 2017. The present study was aimed to assess the different parameters so that efficient approach can be made for the treatment of water of lake Pichola. The water was found to be polluted due to presence of high quantity of total coli and fecal coliforms.

**KEY WORDS:** Phosphate, Nitrate, Chloride, Fecal Coliform and Total coliform

### INTRODUCTION

Udaipur is a beautiful city located on the eastern flank of Aravalli hills in Southern Rajasthan. It is a bowl-shaped basin surrounded with magnificent lakes. The placid charm and beauty of the city make it one of the most picture perfect city. It has number of lakes in which few prominent lakes are Fatehsagar, Pichola Lake, Udaisagar and Badi Lake, etc. The lakes in Udaipur form essential infrastructure and they provide visual/psychological relief in the hot and dry environment. The lakes make a profound influence on the environment by bringing about favourable changes to the microclimate in a region where people are facing low humidity, scorching heat and glare (Samant, 2010). Hence water quality analysis of these lakes becomes important. Apart from imparting beauty to this city, these lakes also form the surface source of water (Rai & Chouhan, 2017) and thus, water quality testing is a vital aspect.

Pichola Lake is an important lake in the formation of Udaipur lake system. It is the oldest lake in the Udaipur city; it shares its eastern bank with "City Palace" and thus holds a historic and heritage value. The lake is extended towards north

and south forming smaller lakes viz. Doodh Talai and Swaroop Sagar. The surface water spread of Pichola lake is 10.8km<sup>2</sup> and maximum depth of 9.15m. The net catchment area of the lake is 142km<sup>2</sup>. "Presently 13.50 mld of water is drawn from the lake by PHED to serve the thickly populated areas of the old city lying around this lake" (Mangal and Pathania, 2015).

Considering these aspects; physical and chemical parameters of Lake Pichola was analyzed. Water testing is vital before it's used for drinking, domestic, agricultural or industrial purpose. Physico chemical features of any water body grossly influence the trophic status of that water body. (Mishra *et al.*, 2017). These parameters have direct relation with primary productivity (phytoplankton and zooplankton) and in turn the growth of fish. Water has different types of floating, dissolved, suspended and microbiological as well as bacteriological impurities (Sawant *et al.*, 2012). The Water quality of lake depends upon geological factor, morphological factor, vegetation, industrial and agricultural land in its proximity.

Total 15 parameters have been assessed for lake Pichola. All these parameter and their method of determination have been discussed in this paper.

The present study was undertaken with following objective:

- To assess the current status of Pichola Lake.
- To study the environmental characteristics of the study area.
- To understand the physical, chemical and biological characteristics of water of lake Pichola which is the lifeline of Udaipur.

## METHODOLOGY

### Reagents

Sulphuric acid, Phenolphthalein, Methyl Orange, Manganese sulphate Alkali-iodide-azide, concentrated sulphuric acid, Silver nitrate solution and chloride solution were obtained in our laboratory from Central Drug House Pvt. Limited (India) Molybdate dihydrogen, Brucine sulphate, sulfanilic acid and acetic acid were obtained in our lab from CDH (India).

**Analytical methods** The water samples of lake Pichola were collected at 3 points in the lake in different season. The points were selected as shown in the Fig 1. The Point A is near the inlet where the water is coming from the catchment area.

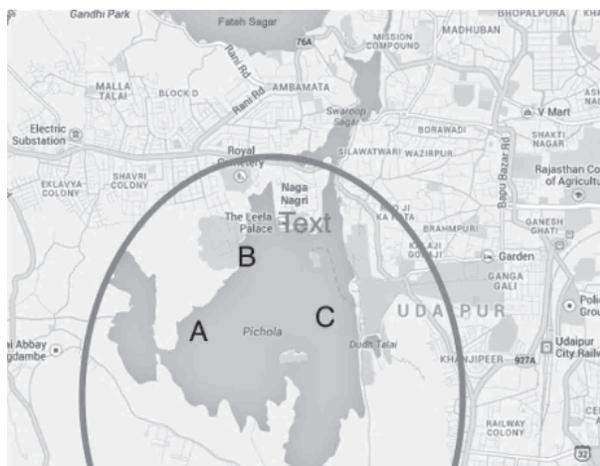


Fig.1. Showing the water collection points on lake Pichola

Point B is at the other end of the lake. Point C is near the boat jetty where the tourist and hotels boats go in the lake. The samples were collected in sterilized plastic bottles. Samples were labeled properly. Few parameters like temperature, pH and dissolved oxygen were measured at the site. Grab sampling method ((Rai and Chouhan, 2017) was applied during the sampling. Water samples were

further analyzed by standard methods (APHA, 2005). The samples were tested for important physicochemical parameters such as Water Temperature, pH, hardness, total dissolved solids (TDS), dissolved oxygen (DO), biochemical oxygen demand (BOD), alkalinity, Fecal coliforms and Total coliforms. The water temperature was measured just after the sample was taken, as it tends to change swiftly. The temperature was measured by using an alcohol filled thermometer. The transparency of water was determined using a standard secchi disc of 20 cm diameter. pH of lake Pichola was determined by using Hanna pH meter. For determining alkalinity, titration method was used. Electrical conductivity was measured using a conductivity meter of Hanna (USA). To determine dissolved oxygen (DO) and biological oxygen demand (BOD), basic Winkler's method (APHA, 1998) was followed. Total hardness was determined by using EDTA method (APHA, 1998). The phosphate was determined using a visible spectro photometer. Bruice method was used for determining nitrate content in the Lake. Total Coliform and Fecal Coliform was determined using five-tube method (APHA, 1980).

## RESULTS AND DISCUSSION

The result of investigations of various parameters of Lake Pichola water was recorded for two years (2016 and 2017) in four four seasons (winter, summer, pre-monsoon and monsoon). During these period, analysis of various physico- chemical parameters was done. The physico-chemical properties of Lake Pichola are shown in Fig. 2 and 3.

The most common and well-known physical attribute of water testing is temperature. "All metabolic and physiological activities and life processes such as feeding, reproduction, movement and distribution of aquatic organisms are greatly influence by water temperature (Gupta *et al.*, 2008). The water temperature was found to be 21.9 °C and 37.2 °C in winter and summer in 2016 respectively as shown in Table 1 and 2. However, the water temperature was recorded 23.7 °C and 38.7 °C in winter and summer season of 2017 respectively. It was also found that water temperature dips in monsoon season in 2016 and 2017 and it was found to be 29 °C in 2016 and 30.5 °C in 2017 respectively.

Fig 2 and 3 shows that transparency of water of Lake Pichola of all the seasons. It was found to be minimum in pre-monsoon season (64cm) and

maximum in winter (116cm) in 2016. However, the same trend was found in case of transparency for the year 2017. "pH is most important in determining the corrosive nature of water. Lower the pH value, higher is the corrosive nature of water. pH is positively correlated with electrical conductance and total alkalinity (Gupta *et al.*, 2009). The pH found to be alkaline in all seasons in Lake Pichola in both 2016 and 2017. The pH was found to be 7.8, 8.7, 8.5

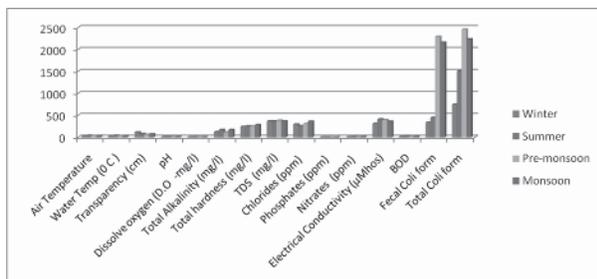


Fig. 2. Physico Chemical components of Lake Pichola - 2016

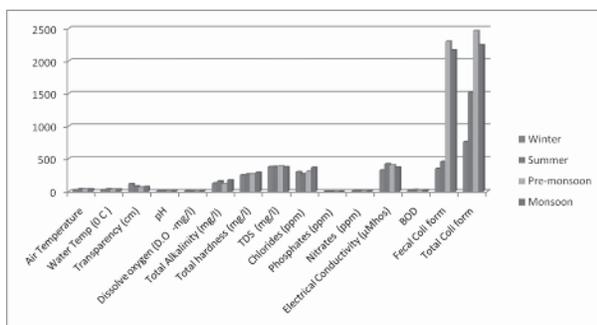


Fig. 3. Physico Chemical components of Lake Pichola - 2017

and 7.7 in winter, summer Pre-monsoon and Monsoon season of 2016 respectively. Whereas, it was found to be 8.5, 8.9, 8.8 and 7.6 in winter, summer, pre-monsoon and monsoon in 2017 respectively. It can be seen from the result that there is not much variation in the value of pH in Lake Pichola in both the years.

The DO was found to be 6.5 mg/L, 5.5 mg/L, 6.4 mg/L and 6.3 mg/L in winter, summer, pre-monsoon and monsoon season in 2016 respectively. The DO was found to be 6.8 mg/L, 4.8mg/L, 5.6mg/L and 6.7mg/L in winter, summer, pre-monsoon and monsoon in 2017 respectively. Dissolved oxygen gives direct information about bacterial activity, availability of nutrients, stratification, etc.

The total alkalinity was found to be maximum in monsoon season in Lake Pichola in both 2016 and 2017. The total alkalinity was found to be 122 mg/L, 169mg/L, 115 mg/L and 170 mg/L in winter, summer, pre-monsoon and monsoon season in 2016. However, it was found to be 125mg/L, 159mg/L, 118mg/L and 173 mg/L in winter, summer, pre-monsoon and monsoon season in 2017 respectively. The term 'hardness' is frequently used to assess the water quality and is governed principally by the concentration of calcium, magnesium and even iron and aluminum salts which combined largely with bicarbonate, carbonate, sulphate, chloride and other anions of mineral acids. It can be seen in Fig. 2 and 3 that total hardness was observed to be minimum in Lake Pichola in winter season and maximum in monsoon season for both 2016 and 2017.

Table 1. Physico-Chemical components of Lake Pichola-2016

Sl. No.	Parameter	Units	Winter	Summer	Pre-monsoon	Monsoon
1.	Air Temperature	$^{\circ}$ C	20.8	38.2	36.7	33
2.	Water Temp	$^{\circ}$ C	21.9	37.2	31.3	29
3.	Transparency	cm	116	80	64	69
4.	pH		7.8	8.7	8.5	7.7
5.	Dissolve oxygen (D.O)	Mg/L	6.5	5.5	6.4	6.3
6.	Total Alkalinity	Mg/L	122	169	115	170
7.	Total hardness	Mg/L	241	254	256	280
8.	TDS	Mg/L	368	370	381	365
9.	Chlorides	ppm	294	259	301	360
10.	Phosphates	ppm	0.99	1.1	0.87	0.63
11.	Nitrates	ppm	6.85	7.8	7.9	7
12.	Electrical Conductivity	$\mu$ Mhos	314	412	395	358
13.	Biochemical Oxygen Demand (BOD)	Mg/L	18	24	19	23
14.	Fecal Coli form	MPN/100mL	340	446	2294	2156
15.	Total Coli form	MPN/100mL	748	1506	2455	2236

The total hardness was found to be 241mg/L, 254mg/L, 256 mg/L and 280mg/L in winter, summer, pre-monsoon and monsoon seasons in 2016. However total hardness was found to be 246mg/L, 259mg/L, 261mg/L and 285mg/L in 2017 respectively. However TDS was recorded as 368mg/L, 370mg/L, 381mg/L and 365mg/L in winter, summer, pre-monsoon and monsoon season in 2016 whereas total dissolved solids recorded was 374mg/L, 376mg/L, 387mg/L and 371mg/L in winter, summer, pre-monsoon and monsoon season respectively.

Fig. 2 and Fig 3 show that chloride content is increasing in monsoon season in lake pichola in both year 2016 and 2017. The chloride content was recorded 294ppm, 259ppm, 301ppm and 360ppm in winter, summer, pre-monsoon and monsoon season of 2016. However, chloride content was observed 296ppm, 261ppm, 303ppm and 362ppm in winter, summer, pre-monsoon and monsoon season in 2017 respectively.

Phosphorus is an essential element for living organisms. "Of all the elements present, phosphorus seems to be limiting factor to some extent in nearly all-fresh water bodies" (Odum and Barrett, 1971). The phosphate content in lake Pichola was observed highest in summer season in both 2016 and 2017. The phosphate content was found to be 0.99ppm, 1.1ppm, 0.87ppm and 0.63ppm in winter, summer, pre-monsoon and monsoon season in 2016 whereas, the phosphate content was found to be 1.49ppm, 1.6ppm, 1.37ppm and 1.13ppm in winter, summer, pre-monsoon and monsoon season in 2017

respectively.

The nitrate content was found to be highest in pre-monsoon season in both 2016 and 2017. The nitrate content was 6.85ppm, 7.8ppm, 7.9ppm and 7ppm in winter, summer, pre-monsoon, monsoon season in 2016. Whereas, nitrate content recorded as 8.05ppm, 9ppm, 9.1ppm and 8.2ppm in winter, summer, pre-monsoon, monsoon season in 2017 respectively. Electrical conductivity observed highest in summer season in both 2016 and 2017. The electrical conductivity was found to be 314µMhos, 412µMhos, 395µMhos and 358µMhos in winter, summer, pre-monsoon and monsoon season in 2016. However, the electrical conductivity was found to be 319µMhos, 417µMhos, 400µMhos, 363 µMhos in winter, summer, pre-monsoon and monsoon season in 2017 respectively. Biological oxygen demand (BOD) was noted as 18mg/L, 24mg/L, 19mg/L and 23mg/L in winter, summer, pre-monsoon and monsoon season in 2016 whereas BOD was 18 mg/L, 25 mg/L, 20mg/L and 24mg/L in winter, summer, pre-monsoon and monsoon season in 2017 respectively. BOD was found to be within limit as per Central Pollution Control Board (CPCB).

The presence of Coliform bacteria in the water body is the primary indicator for pollution (Sharma *et al.*, 2007). It means there are lots of anthropogenic activities taking place near the water body. The fecal coli form observed to be increasing with onset of monsoon season in both 2016 and 2017 respectively. The fecal coli form observed was 340MPN (Most Probable Number), 446MPN, 2294MPN, 2156MPN

**Table 2.** Physico Chemical components of Lake Pichola – 2017

Sl. No.	Parameter	Unit	Winter	Summer	Pre-monsoon	Monsoon
1.	Air Temperature	°C	22.8	40.2	38.7	35
2.	Water Temp	°C	23.7	38.7	32.8	30.5
3.	Transparency	cm	118	82	66	71
4.	pH		8.5	8.9	8.8	7.6
5.	Dissolve oxygen (D.O)	Mg/L	6.8	4.8	5.6	6.7
6.	Total Alkalinity	Mg/L	125	159	118	173
7.	Total hardness	Mg/L	246	259	261	285
8.	TDS	Mg/L	374	376	387	371
9.	Chlorides	ppm	296	261	303	362
10.	Phosphates	ppm	1.49	1.6	1.37	1.13
11.	Nitrates	ppm	8.05	9	9.1	8.2
12.	Electrical Conductivity	µMhos)	319	417	400	363
13.	BOD (mg/L)	Mg/L	18	25	20	24
14.	Fecal Coli form	MPN/100mL	346	452	2300	2162
15.	Total Coli form	MPN/100mL	757	1515	2464	2245

in 2016 and fecal coli form observed in 346MPN, 452MPN, 2300 MPN, 2162MPN in 2017 respectively. The total coli form observed was 748 MPN, 1506 MPN, 2455 MPN and 2236 MPN in 2016 and 757 MPN, 1515 MPN, 2464 MPN and 2245 MPN respectively.

### CONCLUSION

The goal of this research work is to understand the nature of water in Lake Pichola so that appropriate water treatment system can be designed for purification of Lake Pichola. Dissolved oxygen, Alkalinity, Hardness, Total dissolved solids, Chloride, Phosphate, Nitrate, Electrical conductivity, Biological oxygen demand, Fecal Coli and Total fecal coli have been determined and assessed. On the basis of experimental result, it was found that pH is alkaline throughout the year in both 2016 and 2017. However, Dissolved oxygen, Alkalinity, Phosphate, Nitrate are within the limit of Central Pollution Control Board (CPCB) so no treatment is required for Dissolved oxygen, Alkalinity, Phosphate, Nitrate. However, the Hardness and Total dissolved solid are slightly higher. So the treatment is required for TDS before domestic use. The result also indicated that Biological oxygen demand is found to be within the limit. Overall, results indicate that Fecal coliform and Total coliform are present much beyond the limit as per Central Pollution Control Board (CPCB), so it is recommended that alternate technique can be implemented for treatment of water of Lake Pichola for the removal of Fecal Coliform and Total coliform. So it should be understood from the result that this paper would provide a direction for further treatment of water of Lake Pichola.

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8th International Conference on Advances in Computing and Communication (ICACC-2018)  
Techniques and Challenges of Face Recognition: A Critical Review

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**Abstract**

A lot of researches are going on since last two decades for object recognition, shape matching, and pattern recognition in the field of computer vision. Face recognition is one of the important issues in object recognition and computer vision. In our day to day activities, a number of biometric applications are available for recognizing humans such as eye or iris recognition, fingerprint recognition, face recognition. Face is an important part of human being and requires detection for different applications such as security, forensic investigation. It requires proper techniques for face detection and recognition with challenges of different facial expressions, pose variations, occlusion, aging and resolution either in the frame of stationary object or video sequencing images. Authors tried to put the concept of face synthesis, for improving accuracy and recognition rate on different face database like ORL, YALE, AR and LFW. Authors had presented a critical review of various types of face recognition techniques and challenges, to improve efficiency and recognition rate for identifying face images in large database, with comparison of accuracy or recognition rate.

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*Keywords:* Face feature extraction; face detection; synthesis; object recognition; occlusion; recognition rate.

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**1. Introduction**

Face recognition is always an interesting area and one of the challenging tasks in computer vision and image retrieval. It is applicable in variety of domain such as in ATM, healthcare system, driving license system, railway reservation system, surveillance operation and passport authentication. In large database, face image recognition is always a challenging task. There are various biometric features which can be used to identify human such as fingerprint, palm print, hand geometry, iris, face, speech, gaits and signature. But, the major issue was they require

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active co-operation of person for authentication, whereas face recognition does not require active cooperation of person. Therefore, face recognition is much more convenient as compared to the other biometrics.

Let us first discuss what do you mean by face recognition? One can simply define: Face recognition is the procedure of recognizing an already detected face. It can be known or unknown, in other words, it could be defined as recognizing the person who it is from our enrolled user database? Face recognition has two important tasks: verification and identification. Face verification can be defined as one to one match that correlate a face image against available face image databank whose personality being matched. Face identification is a one to N problem that match a query image of a face against available image in a face database. Third case is also considered when a query face may or may not be in the available databank. In such case, one can compute similarity score and on the basis of highest similarity score one can find out match. Shwetank Arya et al. [30] studied a number of 2D and 3D face recognition techniques and proposed Infrared Spectrum (IRS) to overcome the challenges in face recognition. Face detection and matching is important for face feature extraction and accuracy calculation. Face recognition is still a challenge for recognizing face in motion images, twin's, pose variations, having different accessories like beard, glasses, hair colour, hair partition, make-up, different facial expressions under different illumination condition, light intensity, noise, occlusion and thermal image for face matching and error generation. Jyoti kumar et al. [29] discussed various facial expression recognition (FER) based on geometry and appearance. They had compared different feature extraction techniques based on JAFFE dataset. Abdol hossein et al. [9] proposed Gabor-Zernike face feature descriptor and HOG descriptor to extract local stastical feature. They tested result on three different database and retrieved face recognition rate of 98% on ORL database, 97.8% on Yale database and 97.1% on AR database.

## 2. Types of face recognition

A human being can be identified with the help of different face features, fingerprint, eye/iris, body structure, spot mark and so on. Face is one of the important parts of the body, which plays an important role in recognizing humans. Resolution plays a vital role in face recognition while identifying face in surveillance or CCTV. In face recognition system, first step is to detect a face in an image [6]. Faces decompose into mainly four features like eye, lip, nose and mouth for recognition. Main theme of face detection is to identify whether there are single faces in the image or more in view of stationary picture or video picture. Faces are mainly having dimension in 2D and 3D with different textures and facial expressions [5, 7, 8].

### 2.1. 2D face recognition

Previously for 2D face recognition following four steps was used:

In face recognition first step was to detect face, second step was face alignment, third step was feature extraction and fourth step was feature matching from database of enrolled users to recognize face. Matrix has been computed on the basis of pixel values at corner of face under different illuminations conditions for 2D face recognition. Normally, face images are represented by a high dimensional vector containing pixel values. Feature matching is done to match the input face in the form of image or video from available database of enrolled images with unique face identity. Various techniques adopted for face detection were based on color, intensity and illumination. It is one of the challenging tasks to recognize who it is? and researcher faces many challenges like facial expression, illumination, poses variations image orientation and occlusion in face recognition. There were some limitations of 2D face recognition. In 2D face recognition system recognition rate and performance is dependent on image capture conditions like head orientation, image quality, lighting conditions, partial occlusion, facial expressions.

### 2.2. 2D -3D face recognition

Andrea F. Abate et al. proposed a reliable technique for collective 2D visual images and 3D model face recognition based on different parameters such as input size, number of addressed tasks and recognition rate. Comparison of different techniques provides future perspective to the researchers for enabling new techniques in the field of face

recognition [1]. Eigen faces and stereovision techniques used to improve the performance of 2D face recognition system with 3D information known as disparity of face. Face of a person at different position was matched with the help of scan lined-based neural network. Principal component analysis (PCA) for feature extraction and recognition were effectively used for face recognition. 2D- 3D face recognition rate were improved by adding up information in-depth [2]. Face identification process is shown in figure 1.

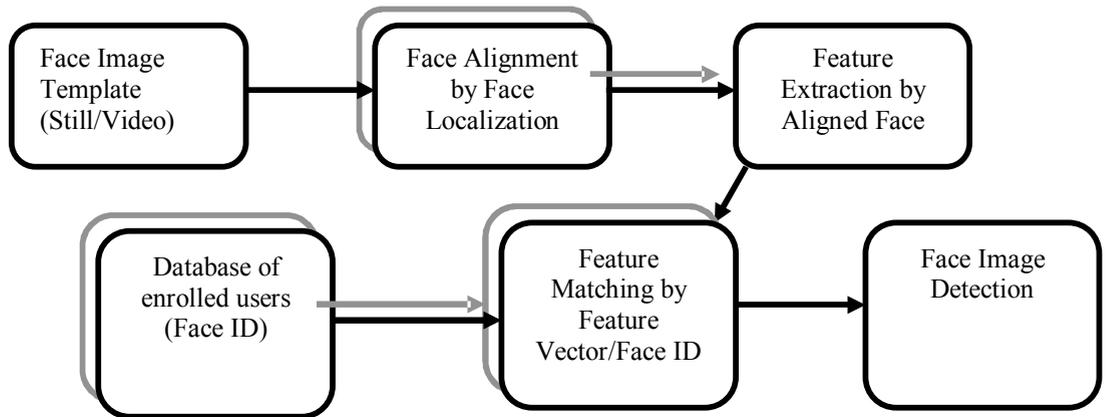


Fig. 1. Face detection process.

### 2.3. 3D face recognition

Faces are in the form of real image, various textures, different framework which convolute in three dimensions. It seems to be more precise recognition of the face image and minimize the problem of pose variations, occlusion and different illumination condition [30].

Sima Soltanpura et al. [31] proposed a survey for 3D face recognition based on local features. They divided the local descriptor into curves, key points and surface. They had applied image acquisition technology on 3D face database to compare under different conditions. Feature extraction is one of the important modules in face recognition which was considered by authors. They studied about different types of face descriptor and feature extractors for 3D face recognition. They also consider the challenges of face recognition with different face expression and occlusions.

3D image and face feature extraction adopted various techniques and methods for efficient and effective recognition. Normalization between probe and gallery texture is done with the help of bidirectional relighting. Introduction of correlation metrics for finding out similarity scores and concept of pose and light normalized signatures for face verifications applied frequently [5]. Motivation to use 3D face recognition technology is to overcome the drawback of 2D face recognition systems. 3D face images were recognized with the help of different augmentation techniques and tested on various database [6]. It was enhanced with the help of experienced sensors camera capturing better 3D face image which can generate 3D face models [4, 5, 7]. Various techniques are available to recognize a 3D face from a range of viewing angles. One of the benefits of 3D face recognition system is that it is not affected by light intensity. Several methods were introduced to extract the features so that accuracy and recognition rate will be higher [10, 29].

Ge Wen et al. [38] proposed improved face recognition with domain adaptation. In this authors, tried to evaluate face recognition by taking Labeled Faces in the Wild (LFW) dataset as a bench mark. They considered data bias as one of the problem. They had replaced the training data with same distribution because according to them web-collected dataset come from celebrities are quite different from faces of normal people in day to day activities and harder to collect due to privacy concerns. They had applied FaceNet triplet loss function. They achieved accuracy rate of 99.33% with single CNN model without face alignment.

### 3. Challenges of face recognition

#### 3.1. Aging

Face in the form of various texture entail characteristics value changes over a period of time and reflect as aging, which has a prompt importance in face recognition. Age invariant is also important for visual observation and image retrieval after a long time access. Coupled auto-encoder networks called CAN and non-linear analysis was done for aging and de-aging for the face data set called FGNET, CACD, CACD-VS [14]. Aging factor in face recognition system in different age group for various face set over a period of time calculated for accuracy checking. Aging effect descriptor for various age groups and classification need similarity measure for age discrimination. Various analyses were done globally for the different age group to compute similarity index and finding [15].

Face recognition depends on the features extraction, concerned about the data extraction and basic features properties like wrinkle, marks, spot eyebrow, makeup and so on. An Active Appearance Model (AAM) technique was introduced for reduction of image dimension in face recognition process [16]. Performance of the face feature recognition is extremely important for simulation of sparse-constrained method proposed for face recognition with aging factor to look aging over a span of time period. [17].

#### 3.2. Thermal image

Multi-feature extractions for small and large database need suitable technique for thermal face recognition system. In low resolution Gabor system, thermal image detection needs main attention on the environment based on illumination [18]. Multi-fusion techniques illustrated about Gabor jet descriptor which was used for multi-feature extraction. Fusion algorithms were used for visible thermal infra-red image detection for face recognition system, which requires formation of accuracy and recognition rate. Formation of universal image index quality for thermal image measurement was satisfactory for face recognition. Recognition rate was also checked with UGC-JU for measuring performance [19]. Gabriel Hermosilla et al, [20] stated about thermal spectrum for face recognition in unconstrained environments require local matching method based on the binary pattern, Weber Linear Descriptors and Gabor Jet descriptor. All the face recognition method compared and analyzed for performance evolution. New entropy functions also needed for infra-red image feature extraction and recognition. Feature property extraction for infra-red entropy analysis entail checking of face recognition using different discriminating characteristics on available database for performance evaluation [21].

#### 3.3. IRIS

IRIS is important part of the face, and feature extraction of IRIS plays a vital role in face biometrics analysis. IRIS recognition methods are available and mostly based on the Bio-Hashing techniques. In IRIS Mapping, robustness improved will be checked on the six databases and then results are tabulated for IRIS recognition. It has effectiveness and robustness in the recognized system for better performance [11]. Face and Iris Recognition both are having extraction and recognition for Mobile Engagement system. This application had viability on mobile for response reliability, fusion technology and sample show better accuracy result [12]. Multi-biometrics system accuracy is very important for various features. IRIS corner data loss during the filtering and synthesis of data on bin base framework causes loss of information and again checked with the help of fusion. Experimental results were checked on CASIA-IRIS Framework [13].

#### 3.4. Occlusion

Yu-Feng et al. discussed about single sample face recognition with occlusion, sparsity and robustness. Learning based PCA was used for intra-class variant dictionary and optimization for solving multi-scale sparse coding model. It was a discriminative multi-scale model, promptly used for face recognition with occlusions [23]. Partial occluded face recognition systems for large database were based on generic occlusion and structured sparse dictionary approach. Mutual incoherence regularization and fast algorithm proposed for occlusion with dictionary learning approach, which had lower computational cost for large database representation and performed better as compared to other methods [24]. Mustafa M. Alrjebi et al [22] proposed face recognition against occlusion using two

dimensional multi-colour fusion (2D-MCF) model and SRC. They used fused colour information for effective face recognition against occlusions. They first devised a new local representation for face images and then applied partitioned sparse sensing recognition (P-SRC) for improving accuracy. They applied the result on four different databases for improving the recognition rate. They improved the recognition rate on AR database up to 24.5%, 3.8% recognition rate was improved on Curtin database, up to 25% was improved on FRGC database and 2.86% on Bosphorus database. Face recognition with occlusion in different trained model of 2D-MCF widely used and in that method the previous occlusion fusion details requirement is less and accuracy rate also improved with other method. Two dimension multi colour fusion technique had improved accuracy for face recognition with occlusion.

### 3.5. Facial expressions

Yulan Guo et al. [32] proposed expression invariant 3D face recognition which was based on feature and matching shape which encompasses local geometric feature, with the help of global similarity between faces. They tested their results on FRGCv2 dataset. They had taken a probe face which was compared against face database using both local feature and 3D cloud registration. They achieved recognition rate of 97.0% and verification rate of 99.01% for different faces either having neutral expressions or having non-neutral expressions. Li Ye et al. [34] proposed an expression insensitive 3D face recognition using multiple subject specific curves. They applied 3D face matching with the iterative closest point algorithm and an expression-irrelevant factor as weight to increase the performance of face matching algorithm. Sparse Representation Classification-SRC and Collaborative Representation Classification –CRC approaches were widely used for facial expression analysis [25]. Facial expression and feature extractions for the six objects joy, sadness, anger, fear, disgust and surprise were needed to extract and classified with the help of NN classifier in 3D Face model [26]. Linearity and faster recognition of facial expression will be achieved with Modified Local Directional Patterns (MLDP) approach. Video based image and face expression with different features were also important for facial expression recognition. Facial expression with generalized discriminant analysis performed on deep belief network had better performance as compared to other available technology [27]. Multimodal model detection is widely adopted for landmark and texture value in facial expression recognition system and analysis of facial expression experiments for better performance [28]. Abdelghafour Abbad et al [35] proposed 3D face recognition based on geometric and local shape descriptors to overcome the challenges of different facial expressions. They had applied four different steps to solve the problem: first step was to model 3D face, second step was feature extraction, third step was to find out geometric information on the 3D surface in terms of curves and fourth step was to find out feature vectors on each scale. They studied and compared their result on GavabDB and Bosphorus datasets and retrieved the recognition rate of 98.9%.

### 3.6. Poses

Li-Fang Zhou et al. [36] proposed pose robust face recognition with LBP and Huffman coding. They had applied divide and rule technique on face representation and their classification to improve pose variation. Also, they had applied Region Selection Factor (RSF) for face representation of a face image to consider different poses specifically, instead of, generally and applied patch based SRC fusion classification strategy to improve the technique. They studied result on FERET database and LFW database for improving the accuracy. Thibault Napoleon et al. [33] proposed pose invariant 3D face recognition. They proposed an active shape model to detect key features with the help of finite element method. They tried to improve recognition rate by applying LBP technique and applied VanderLugt correlator and Gaussian filter to identify the edges of the image on the basis of local binary patterns for image identification. They studied their result on the PHPID database with 3D reconstructed faces of each person with an azimuth. They proved identification rate of 88.76% with proposed method and compared the result with 2D approach based on VLC database with recognition rate of just 44.97%. Brahmin Aksasse et al. [37] proposed a new technique to pose invariant face recognition. They tried to improve face recognition rate in the wild animal and proposed a technique for face alignment with the help of single 3D face model in context to FaceGen Modeller. They also introduced a new face descriptor based on Gabor Filters which was combination of Gabor phase and Gabor magnitude in a given framework. It was able to overcome standard presentation in Labeled Faces in the Wild dataset (LFW). They tried to prove accuracy rate of 97.29% on LFW dataset.

### 3.7. Facial advances

Face recognition becomes more challenging in case when an image differs by surgical variations of faces for increasing beauty. Coarse-to-fine strategy was used to identify landmarks under different poses in 3D face [3]. Half face matching algorithm technique was introduced, based on geometrical structure-based search and modified FLM based search using HK curvature analysis. Robustness and accuracy is important in HK Curvature analysis under different poses [4]. Face transposition patterns used to find out how holistic and distinctive features influenced by 2D and 3D faces detection. 3D stereoscopic effects are more accurate during holistic extraction but not during inverted face feature extraction.

It was noted that in facial inversion of 2D and 3D faces both, recognition rate and performance is almost same and focus on how 3D face recognition influenced by the integration of GPU [7]. External, internal features, facial expressions and face dynamics findings are easier to discriminate in isolated features rather than embedded features [8]. Authors tried to figure out different challenges of 2D and 3D face recognition. In table 1, different techniques and applications were compared with different face database for accuracy and recognition rate.

Table 1. Comparison of different face recognition techniques, applications and accuracy rate

S.No.	Techniques	Applications	Face database applied	Accuracy/Recognition rate
1	Histogram Oriented Gradient(HOG)[9]	Global gabor/Zernike descriptor	ORL	98%
			YALE	97.80%
			AR	97.10%
2	Featural Processing[10]	2D/3D Face recognition	Stereoscopic information	Higher in 3D Face
3	Fusion algorithm/RF classifiers[19]	Visible and Thermal Image faces	UGC-JU	99.07%
			AR	up to 24.5% improved
4	Two dimensional multicolour fusion [22]	2D-MCF Model/Partitioned sparse sensing recognition(P-SRC)	CURTIN	up to 3.8% improved
			FRGC	up to 25% improved
			Bosphorus	up to 2.86% improved
5	Modified Local Directional Patterns[27]	General Discriminant Analysis	Deep Belief Network	96.25%
6	Multi-scale strategy based on geometric and local descriptors[36]	3D face recognition	GavabDB and Bosphorus	98.90%
7	LBP technique, shape model [33]	3D face recognition	PHPID database	88.76%
			VLC database	44.97%
8	local geometric feature and shape matching[32]	3D face recognition	FRGCv2 dataset	97.00%

9	face descriptor based on Gabor filter [37]	face recognition in wild animal	LFW dataset	97.29%
10	domain adaptation [38]	face recognition in wild animal	LFW dataset	99.33%

#### 4. Conclusions

Face is the most important feature of living body, which plays important role in recognizing human beings. Various techniques across the world are used for face recognition application and research. In this paper, authors tried to extend review of face recognition techniques and its challenges for performance comparison, accuracy and recognition rate on different face database such as ORL, YALE, PHPID, VLC, GAVAbDB, AR, UGC-JU, CURTIN, FRGC, Bosphorous, LFW dataset. Face recognition has increasing applications area such as in the field of security, forensic and requires more accuracy and reliability. Synthesis of various textures is also presented here for face recognition and various challenges were also considered like aging factor, facial features, expressions, pose variations, thermal image, occlusion and illumination. On the basis of review, authors found that, till now maximum accuracy rate of 99.33% achieved for face recognition of wild animal tested on LFW dataset with domain adaptation technique and 99.07% accuracy rate achieved using Fusion algorithm or RF classifiers for human face which was tested on UGC-JU face database. Presented review will be useful for upcoming researchers for selection of appropriate techniques for face recognition.

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# A Review towards the Approach for the Detection of Malicious Nodes in Mobile Adhoc Network

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**Abstract**—In order to ensure the users security within the vehicle-specific applications Intelligent Transport Systems (ITS) are designed. For avoiding any kind of loss there is a communication between the users for exchanging important data. Related to the Vehicle Transportation there are several applications of the ITS. There is a requirement for which there is an introduction of Ad hoc Networks (VANETs) for enhancing the safety and efficiency of ground transportation networks and real time information which is its main purpose.

**Keywords:** VANET Architecture, DoS Attacks, Review, Objectives

## I. INTRODUCTION TO VANETS

Vehicular Ad hoc Network provides vehicle to vehicle and vehicle to roadside communication by a self-configuration type of network. Through the nodes the data is shared representing themselves as servers and clients across the network. Computers, communications, management technologies, sensor and control innovations comprises of several components. For integration of these functions there can be an improvement in the functioning of a transportation system. By using Vehicular Ad-Hoc Networks the warnings related to the environmental hazards, traffic, road conditions and data regarding the transmission amongst vehicles is provided. The information can be spread across the network if there is any kind of traffic jam or road closure. This saves time and also helps the drivers for avoiding the specific routes. Through paper communication the warnings are spread by the vehicles across the other vehicles [1].

Following are the advantages of implementing the VANETs in various applications:

1. Routers can be considered as the self-configuring nodes.
2. There is no central authority for controlling these networks called decentralized ne
3. Through 5e7which the network heals on its own there is an occurring of re-configuration within the network.
4. Due to its scalable property higher number of nodes can be added to the network.

5. A flexible ad hoc network can be generated besides of the time and location.
6. The costs to create the network finally are very low as this network is decentralized in nature.
7. Establishing the connections at higher speed the nodes are independent of the hardware and software including in the systems.

## II. VANET ARCHITECTURE

The 3 domains in which the architecture of VANET is divided are as follows:

### A. VANET System Architecture

Within the In-Vehicle domain includes the On-Board Unit (OBU) and the Application Units (Aus). The AUs act as user devices while the interaction with the OBU. The ad hoc network comprises of the OBUs present in the RSUs and vehicles. In a wireless manner there is an easy communication of the OBUs and RSUs within a proper range. As the vehicles connect to RSU in an ad hoc manner on the basis of their requirements an ad hoc domain is formed. Within the Infrastructure Domain the RSUs and CA are presented. RSU and CA are connected with each other. For the CA the RSU acts as a proxy. For helping to reach the RSU the packet is to be forwarded from one OBU to another there is a requirement in between the OBUs and the RSUs. The information is passed within the network and also to the RSU by which GW represents the gateway through [3]. information is exchanged for providing warnings on roads.

### B. Routing in VANETs

Within the VANETs the basic ad hoc routing protocols cannot be used adequately due to the change for various other reasons like mobility patterns, the entering and leaving of various vehicles. The major objective of routing protocols in VANETs is the utilization of less

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communication time while doing fewer amounts of network resources. The VANET routing protocols can be categorized on the basis of the position accusation and route update technique. The types of routing protocols involved in VANETs are as follows[5]:

- a. *Position Based Routing Protocols*: The geographic positioning of information is shared amongst the nodes by a class of routing algorithm provided within the position. Within the network it can help in selecting the next forwarding hops. The packet is transmitted to the closed destination available without giving any map knowledge to one of the hop neighbor.
- b. *Cluster Based Routing*: The clusters based routing protocols are used within the clusters which are generated within the network. For helping in broadcasting the packet to the cluster present are the nodes which are similar for forming clusters and one cluster head will be selected. Even when there is high scalability of these networks there is an occurrence of delay and overhead within the high mobile VANETs. The virtual network infrastructure might be created within the cluster based routing with the help of clustering nodes for providing scalability.
- c. *Broadcast Routing*: Related information from the roads, the broadcasting routing is utilized within VANETs in order to share the traffic, weather and any emergency. Amongst the vehicles through this protocol the major function can be delivered and the announcements can be made. The various broadcast routing protocols involved are BROADCAST, UMB, V-TRADE and DV-CAST.
- d. *Geo Cast Routing*: geo cast routing is a multicasting routing that helps in delivering the packets from source needs to all the other various nodes present in a geographical area on the basis of its location. Geo casting scenarios can avoid any unnecessary hasty reaction by not informing the vehicles outside the Zone of Relevance (ZOR). IVG, DG-CASTOR and DRG are the several Geo cast routing protocols.
- e. *Topology Based Routing Protocols*: Within the network by the topology based routing protocols the data related to the links are present [6]. For forwarding packet across the network is done in order to perform. Proactive and reactive type of protocol in the broader categories of protocols is as follows:
- f. *Proactive routing protocols*: Most of the protocols are built based on the shortest path algorithms. On the basis of table all the information collected from several nodes is kept in the form of tables. Each node updates its routing table on the changes made as the tables created are shared amongst neighbors and in case

any occurrence of change is present. The link-state routing and the distance vector routing are the various proactive methods. LSR and FSR are various types of proactive routing protocols.

- g. *Reactive/Ad hoc based routing*: by the demand or reactive routing protocols is overcome for the overhead which is created by the proactive routing protocols. Using this type of protocol there is maintenance of the route that is currently active. For route discovery and maintenance currently used nodes for sending the packets from the source to destination are highlighted only. AODV, PGB, DSR and TORA are the various types of reactive routing protocols.

### III. TYPES OF ATTACKS IN VANET

Through various attacks VANET suffers. Following subsections classify different types of attacks [7]:

*Denial of Service Attack*: the most adverse affects within the VANETs is the type of attack. The users exchange information jammed by the attacker of the main communication medium through. The users cannot access the medium further because of this.

*Distributed Denial of Service Attack (DDOS Attack)*: DDOS attacks are caused from various locations in distributed form by one attacker. Within different time durations the messages might be transmitted by an attacker. There is a difference in the nature as well as time duration within which the message is to be transmitted based on the vehicles presented by the attacker. By this attacker there is same objective of the DOS attack.

*Sybil Attack*: within this type of attack multiple messages are transmitted by the attacker. In every message present in the network several sources of identity are present. For creating confusion to vehicles wrong messages are sent by the attacker in order to jam the traffic. In order to communicate with each other the vehicles are forced to follow the next path. Therefore, the prior objective of the attacker is to choose another route forcefully mainly the generation of illusion of multiple vehicles [8].

*Node Impersonation Attack*: a unique identifier is utilized by the vehicular networks in order to verify the messages. When any accident occurs wrong messages are sent to various vehicles.

*Application Attack*: various applications are attacked mainly by the attacker in this type of attack of the information which is relevant to safety and non-safety with the help of safety applications warning messages are provided to users. Through the attacker in this attack which results in sending wrong information to other vehicles the information present within actual message is altered.

*Non Safety Application Attack*: within the journey and the safety applications not disturbed the types of attacks

are concerned with the comfort of user. The traffic system is enhanced and the comfort is provided to the passengers by the non-safety applications. Passengers are discomforted by the generation of attacks in such scenarios.

*Timing Attack:* the attacker attacks the transmitting data in order to add the time slot within the original message. The attacker delays the original message. The messages are not able to be received on the required time and within the complete network there is a delay in occurring. The applications are unsafe as the required data to warn them is not provided in case the delay occurs within the applications.

#### IV. DISTRIBUTED DENIAL OF SERVICE ATTACK (DDOS ATTACK)

Distributed Denial of Service Attack (DDOS) attack is an attempt made by an attacker from different location for stopping the legitimate users from the system for accessing the required objects. Examples of the DDOS attack are as follows:

1. Flooding the network prevents access of legitimate network traffic.
2. Disruption of the connections amongst two machines prevents users to access service.
3. Through preventing one individual user to have access to it prevents the user from accessing a service.

Within the DDOS attacks there are different tools utilized. Even though they have different name they have same basic structure of the tools. Following are the components as shown in figure 1.2:

- *Attacker:* If the hacker uses the personal computer it is the responsibility of the hacker.
- *Master:* the system receives direct command from the attacker also the other agents are controlled by it.
- *Handler:* through this program the tasks are performed on the program master system.
- *Agent:* the system directly attack the target.

#### V. LITERATURE SURVEY

Mohamed NidhalMejri et al. (2015) [11] proposed Greedy Detection for Vehicular ad hoc Networks (GDVAN) which is a new detection mechanism. Within the VANETs this mechanism was proposed in order to detect the greedy behavior attacks which occur. Suspicion phase and decision phase are the two phases involved within this proposed mechanism. There was a development of the concept of suspicion phase based on the linear regression mathematical concept. For developing the decision phase the fuzzy logic decision method was used. Along with the establishment of a list which contains the potentially compromised nodes there

was a detection of the greedy behavior of the proposed algorithm. In order to provide such evaluations from the network utilization of the newly defined metrics is done. It was also known as passive technique. Major benefit of this proposed technique in this proposed approach was executed by any node present in the network. Within this mechanism there was no need of modification in the IEEE 802.11p standard. In terms of various performance parameters the already existing techniques in the proposed algorithm with the help of various simulations and experiments the effectiveness and efficiency of the proposed method was computed.

Pooja. B, et al. (2014) [12] presented protected and secure correspondence of messages in VANETs in this paper for which the fundamental structure was authenticated. In order to authenticate the messages present within the IEEE 1609.2 standard as a standard digital signature calculation method ECDSA is utilized. ECDSA signature provides a higher verification time. In order to flood the complete network with invalid signatures external and internal attacker uses a part of bandwidth. Within the network this outcomes are in causing Denial of Service (DoS) attack. In this paper a two phase method was proposed within VANETs for mitigating the internal and external DOS attackers are present. The HMAC signatures were calculated within the principal phase of this method through the pair of private and public key. Through this method the authentication of the communication object was done. Due to the external attackers computation of HMAC signatures was done by the authentic users of the mitigation of DOS attack. The internal attacker was recognized through the designed secondary phase in case the entity was authenticated as well as the next vehicle was subjected to DOS attack. Within this phase with the help of number of invalid signatures that were flooded by the attacker the comparisons were made with the threshold value for the identification of internal attacker. The DOS attack was mitigated with the help of both internal and external attackers. The result was taken out and shown that least computation was provided overhead to the network and on the basis of the results shown the experiments were conducted and shown that the detection of DOS attack was performed better in this proposed method.

Munazza Shabbir, et al. (2016) [13] presented the modern intelligent transportation world vehicular ad hoc networks turning into a mainstream and promising technology. Any information circulating through the network can be life crucial on the basis of the safety applications of VANETs. Towards numerous security threats the mobility of the nodes and an unpredictable way of the associations in the network made VANET vulnerable. Utilizing the greater part of its assets is DDOS attack which is one of the important attacks that exhausted the network by illegitimately. Utilizing spoofed IP addresses for exhaustion of the network in this sort of attack circulated bogus messages. For services it denied to

cater for legitimate solicitations for services. Practically, its security needs should be met so before the proper deployment of this network. After the prevention scheme was proposed DDOS attack was detected in this paper.

Nirav J. Patel, et al. (2015) [14] studied in this paper over the vehicular ad hoc networks there is vehicle to vehicle communication provided. Within the locations of the vehicles within VANETs there was a continuous change. In order to provide a mutual trust amongst the nodes present in the network there is a need to provide secure routing during the routing process. The fake data was transmitted to other nodes in order to cause attacks because of the presence of malicious nodes within the networks. By these malicious nodes as the route discovery or data transmission occurring within the network was disrupted it was very difficult to trust the nodes present in the network. Several researchers have proposed many studies to provide trust-based techniques within these networks. In this paper, in order to study the secure the routing processes the enhancement of different ad hoc routing protocols were reviewed. The different enhancements were made within the trust-based techniques that were understood on the basis of this review.

Vinh Hoa LA, et al.(2014) [15] studied in this paper in order to improve the VANETs there were numerous studies that was proposed by researchers. To the users present in these networks the traffic safety was ensured long with providing other efficient services with the applications of these systems. For the degradation of the performance of these networks there were several attacks which occurred. There was a huge loss observed in terms of time, money and the live of users because of this. In this study in a survey, different types of attacks occurred within these networks. Several techniques were proposed in this paper for the prevention of these networks from various kinds of attacks. Methods based classification of all such techniques was categorized. There was a need of introduction to intrusion detector for alerting the system related to the arising attacks. For the identification of the types of attacks the utilization of the BRO or MMT was done in this network.

Kirti A. Yadav, et al. (2016) [16] proposed in this paper a vehicular ad hoc network applied by various types of routing protocols. Generation of the securities regarding scenario within these systems by the presence of routing techniques was done. Providing security applications to the users are included in this study which is done for the identification. In this paper several security measures were provided in VANET. In order for the comparison of the performance of several techniques amongst each other different techniques were presented in this paper. Through this survey within the VANETs a successful achievement required for providing secure scenarios was done under this approach. Ensuring the security, availability as well as non-repudiation of the techniques within the security scenarios was a need for providing a future scope which was a great help. In order to provide higher level of secure environment within these networks through this study it

was analyzed for the intelligent transport system, enhancement should be provided.

Deepak Raghuvanshi, et al. (2013) [17] proposed different applications regarding the research and technology and also in this paper through the digital images a major role was played. Within digital image processing technology some degree of noise was present within digital images. There is an introduction to the noise within these images when images are clicked. In order to decrease the noise from the images several image denoising algorithms are introduced. MATLAB simulator was implemented on the basis of nonlocal means (NL-means) algorithm, the image denoising was proposed. Within the nonlocal means (NLM) algorithm there was a concept of self-similarity presented. From the internet there was an aligned pixel within the image that was collected. Alignment was not done properly from capturing the image from digital media. In comparison with other existing techniques Different experiments were conducted in this paper and as per the results was achieved it was observed that the performance of NL-means denoising was better.

Wenshuang Liang, et al. (2015) [18] presented in this paper over the recent years there was huge demand of VANET applications. These networks were deployed both in academic and industrial properties too because of their unique properties. An overview of VANETs was proposed in this paper by the view point of research. Finally, the author has presented the most famous research issues being faced within VANETs. In order to simplify the challenges and also the future enhancements within these networks that were made there was a discussion of general research techniques. Involving the network components, communication types and layered network architecture VANETs architecture was introduced in this paper. Then the discussion of the three aspects of VANETs research issues that are routing, security and privacy were done. Simulator tools were also provided and the focus of this paper was on VANETs research methodologies. On the VANETs research challenges and future trends analysis was provided. On vehicular ad hoc networks comprehensive reference was provided. From the research perspective, covers basic architecture, critical research issues, and general research methods of VANETs the introduction of vehicular ad hoc networks was done in this paper.

*Bassem Mokhtar*, et al. (2015) [19] proposed in this paper besides lacking infrastructure and communicating entities shifts with several accelerations defines the vehicular ad hoc networks as a special case of ad hoc networks. Establishment of reliable end-to-end communication paths and has an efficient data transfer was impeded. To get the availability of ubiquities connection, secure communications and reputation management systems the trust in cooperation was affected between the cell phone networking firms with different network concerned security challenges in VANETs. Because of several network layers the security attacks of

VANETs were classified and security features, challenges and attacks of VANETs in this proposed approach discussion was done on different main concerns.

Uzma Khan, et al. (2015) [20] proposed in this paper wireless communication given by VANETs within the vehicle to vehicle infrastructure. Within this approach there was a need for ensuring of the users travelling to be ensured for a comfortable and safe journey. VANETs are completely different from other networks because there are several different unique properties of these networks. There is a centralized administration and within these networks the infrastructures are fixed. Such networks are prone to several types of attacks because of these properties. The securities of techniques consequences are spoiling. Within these networks in order to present safe communication there was a need to provide correct security measures. Form the networks identification o the malicious nodes were done that was proposed by the novel DMN method presented in this paper. The enhancement of the network's performance was observed on several experiment's basis that were conducted when the algorithm was applied within the applications.

## VI. PROBLEM DEFINITION

Since the nodes can join or leave the network as per their requirement in VANETs, the possibility of malicious nodes to enter the network is also high. Several active and passive types of attacks might be generated in the network due to the presence of malicious nodes. The network can include several types of malicious nodes and a DDoS type of attack can be caused due to this. There is degradation in the performance of networks due to the presence of these attacks. The victim nodes are chosen by the malicious nodes to trigger DDoS attack in the network. The single genuine node is attacked further, by that victim node. For the detection of malicious nodes in the network, several techniques have been proposed based on signature verification amongst which some are also mentioned in the literature review. There is higher complexity of the signature verification technique. The performance of network will degrade with the increase in time required to detect the malicious nodes. A novel technique is proposed in this research using which the malicious nodes are detected from the network in minimal time.

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## An analysis on impact of demonetization on rethinking of tax disclosure-A study based on national capital region

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### Abstract

Demonetization refers to the withdrawal of particular currency (legal tender currency of country) from circulation. Demonetization done to reduce the black money, eradicate fake currency and to promote digital India. This is the bold step taken by the Indian government on 8 November 2016 for the betterment of the economy and country. In this paper, perception of general public towa tax disclosure after demonetization is analyzed through primary data collected. Questionnaire is prepared for primary data and fill with 81 respondents i.e. trader, manufacturer and service provider of Delhi NCR and this data used for further analyses by using descriptive table. After this research work, I concluded that almost all have neutral opinion toward demonetization impact on tax disclosure.

### Keywords

Demonetization, Legal Tender, Black Money, Fake Currency.

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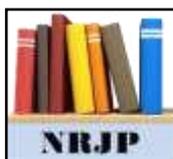
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Review Article

## A Comparative Study of the Academic Motivation & Academic Achievement among Senior Secondary Students

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### Abstract

Poor academic achievement in school can be the result of differences between child factors and environment. Studies have shown that during the early years, the effects of poor academic achievement often lead to population, along with a crime, to the years of adolescence. This paper describes the attitude of CBSE & HBSE students in relation to their academic motivation and academic achievement.

**Keywords:** Academic motivation, Academic achievement.

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### INTRODUCTION

“Education is a process of development which consists the passage of human being from infancy to maturity, the process whereby he adopts himself gradually in various ways to his physical and spiritual environment.”

**-T. Reymont**

“Education” we often think ourselves to be educated and use the word “Education” in our daily life. But what’s the real meaning, of it. (1)

Is it mere collection of information or receipt of degree of diplomas. People have already be considering the deviation of the work “ Education”, initially it was related to an original, Latin work Education which is a combination of two, words E and Duco meaning “ out of and to lead” According to Mahabhart, Abhimanyu had learnt how to break the chakravyuha in the womb of his mother Subhadra. It beings from the birth and lasts long even after death as according to

Hindu Philosophy there is an immortality of soul. In broader sense the process is broad- based. Every woman we gain new experiences and transfer it to the other generation. It is a process of growth and development. Every individual is both a teacher and a taught and the place of giving and receiving the process is a ‘School’ Impact, life education, and education is life. Rousseau promoted his vision of maturity, keeping this broad concept of education in his view.

In a narrow sense, school education is called education. Education is called education. Education is imparted at a definite place – school, college or university and at a definite time, with definite curriculum.

### Indian Education System

India's current educational system is an important center for the British rulers. In 1854 Woods Despatch laid the foundations of the present system of education in India.

Prior to the advent of British in India, the education system was private, in which the Woods Despatch was known as the Magna Carta of Indian Education, which changed the whole scenario. Its main purpose was to prepare Indian clerks to run local administration. Under it the means of school education were the vernacular language while the higher education was granted in English only.

British government started giving funds to indigenous school in need of help and thus slowly some of the school becomes government aids.(2)

### **Sarva Siksha Abhiyan (SSA)**

The main goal of this program is that all children (6-1) years should complete primary education by the year 2007 and all children (6-14) years of age must complete eight years of schooling till 2010.

This plan covers the whole country with special emphasis on girl education and education of schedule caste (SC) and schedule Tribe (ST) children and children with special needs SSA centers are mainly opened in areas where there is no school or where the school is very far away. Special girl oriented programs are included.

- Girl education at elementary level.
- National Program for Education of Girls at Elementary Level (NPEGEL).
- Kasturba Gandhi Balika Vidhyalaya (KGBV).
- Mahila Samakhya Scheme.

### **Intellectual Development**

Through college courses, we hope that students will develop intellectual qualities that reflect a well-educated person. We help them develop these traits by holding

them given intellectual standards (through their assignment).

Naturally, this is a learning process for students and tasks time, Faculty should plan according by developing activities appropriate to student's skill and abilities. Jump too high and cause frustration.(4) Jump just beyond and you pull students towards you. Scaffold and support this development process by providing relevant and thoughtful feedback to student's work that helps students to grow intellectually. While reading texts, students can use the questions related to the above intellectual standards to think critically about the text. Encourage the students to use the intellectual elements to examine the Scriptures more deeply and to outline those methods, in which they think of the methods written. (5)

Remember also, that modes of thinking and ways to approach texts critical, varies (sometimes greatly) between content areas. Make the ways in which people approach thinking in your discipline transparent for students.

### **Social Development**

The current paper analyzes key issues related to access to rural poor for safe and sustainable land and water rights in India, thereby identifying and suggesting policies that help improve rural access to land and water.

### **Emotional Development**

Children who learn to manage their emotions, they are benefited in many ways. Most experts agree that when children develop skills to deal with their emotions, they are better with others, academically better, and feel better themselves.

The American Psychological Association said that children who are capable of successfully controlling their emotions are better at focusing, focusing and less impulsive behaviors. Parents can help with their children by talking about emotions. (3)

### **Physical Development**

The love to demonstrate their abilities and area's too inhibited as to where; whether in the grocery store, the bank, or a crowded restaurant; here's the lowdown on movement milestones for first graders. Poor academic achievement in school may be the result of interplay between child factors and the environmental milieu. Studies have shown that the effects of poor academic achievement during the early school years often carry over to the adolescent years, with a delinquency among this population.

### **Objectives of the Study**

The objectives can broadly be stated as:

1. To study the academic motivation of C.B.S.E. & H.B.S.E. students of senior secondary school.
2. To compare the academic motivation of C.B.S.E & H.B.S.E. board students of senior secondary school.
3. To compare the academic achievement of C.B.S.E & HC.B.S.E. students of senior secondary school.
4. To study the academic motivation effects on the academic achievement of C.B.S.E. & H.B.S.E. board students of senior secondary school.

### **Hypothesis of the Study**

- There is no significant difference between the academic achievement of

C.B.S.E. & H.B.S.E. students of senior secondary schools.

- There is no significant difference between the academic motivation of C.B.S.E. & H.B.S.E. board students of senior secondary schools.

### **Research Methodology**

The researcher used simple random sampling for the present research study. A sample of 250 students is selected from the Gurgoan region of Haryana district in which students of +1 & +2 students are included. Out of these 150 students are selected from CBSE and 100 students are selected from HBSE.

### **Statistical Technique Used**

Analysis of data for the present study has been made in conformity with the objectives and hypothesis formulated. The researcher has used SD (Standard Deviation) and 't' test for the present research study to find out the significance of different between Mean, Academic Motivation and Achievement scores of H.B.S.E. and C.B.S.E. of senior school students.

### **Delimitations of the Study**

Keeping in the views the time factor and resources available the present study was delimited to the following

- The present study is confined to only one variable i.e. the academic motivation and the academic achievement.
- The study is delimited to 250 secondary school students C.B.S.E. & H.B.S.E. board senior secondary students.

### Main Findings

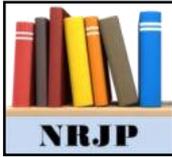
- The academic motivation and achievement level of senior secondary school students of H.B.S.E Board is average.
- The senior secondary students of CBSE students are average motivated.
- There is a significant difference in the academic motivation of C.B.S.E. and H.B.S.E. senior secondary students. The t value is more than the table

value, thus null hypothesis is rejected. There is a significant difference between the academic motivation of CBSE and HBSE senior secondary students.

- For the present research study, the researcher revealed that CBSE students are more motivated and goal-oriented than the HBSE senior-secondary students.

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*Review Article*

## Enhancing Quality of Education through Ict Based Approaches

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### **Abstract**

*Information and Communication technology has opened up new challenges for education . ICT has become the part and parcel of human life. The discoveries and inventions in science and technology have led to improvements in the speed of communication. Information technology has been influencing our lives in the recent years in the fields of education, healthcare, and business. Information and communication technology in educational institutions has had a major impact. Information and communication technology in educational institution can be used as an integral communication tool to improve student learning and better teaching techniques. With the advancement of technology in education, educational institutions adopt communication software to transmit, store, share or exchange information. In this technological era, ICT in education has compelled many educational institutions to get accustomed to smart technology. ICT can be a powerful enabler of development goals because its unique characteristics dramatically improve communication and the exchange of information to strengthen and create new economic and social networks.*

**Key words:** *ICT, Digital technologies, Education, Learning.*

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### **Introduction**

#### **Concept of ICT (Information and Communication Technology)**

Technology is the nonlinear tool for accelerated economic growth, and the foundation for the sustained development of the nation.

- APJ Abdul Kalam

Information and Communication technology refers to the technology which is employed in the shape of tools equipments and application supports. It involves collection, use, storage, retrieval, transmission, manipulation and dissemination of information. ICT includes the use of hardware and software for efficient management of information. ICT means use of certain tools to represent our

knowledge and express our ideas and leads to enhance learning. (1)

According to Education Review Office 2000:," The phrase Information and Communication technology is now being used, to include telecommunications equipment through which information can be sought and accessed through the internet, television, phones , Faxes, modems and computers."

ICT has the potential to be used as a supportive and collaborative educational tool enabling students' learning by doing. ICT can make it possible for teachers to engage students in self-paced, self-directed problem-based or constructivist learning

experiences; and also test student learning in new, interactive, and engaging ways that may better assess their understanding of the content. (2)

### **According to the QCA scheme of work for ICT:**

“ICTs are the computing and communication facilities that variously support teaching, learning and range of activities in education.”

There are five aspects of the educational use of ICT –

- supporting new pedagogical methods
- accessing remote resources
- enabling collaboration
- extending educational programs and
- developing skills for the workplace

ICT is a big stimulating force which not only influences the human cognition and its thought process but also help human to construct knowledge. It enhances teaching learning process by making it more effective and interesting. It improves availability of content material and support distance and correspondence education through e-resources. it improves enrolment by convenient admission and examination process. It assists in research and development activities

ICT tools help to open up opportunities for learning by enabling four major key processes in transforming teaching and learning as follows:

Access ideas and information from diverse sources through searching, locating, selecting, and authenticating material in a wide range of multimedia forms;

Extend ideas and information through processing, manipulating, analyzing &

publishing material in different multimedia forms;

Transform ideas and information into new or different forms through synthesizing, modeling, simulating and creating material in many multimedia styles and formats; and Share ideas and information across local, national and international networks by interacting electronically with others in actual and/or delayed time. (4)

Access, extend, transform and share represent key processes by which students learn and become independent learners and self-starters. Through the processes learners express their creativity and imagination. These processes can be applied in all areas of learning and in all levels of education.

### **Importance of ICT in Education**

#### **1. Assist students in accessing information**

ICT is used as a tool for students to discover learning topics, solve problems and provide solution to the problems in the learning process. ICT makes knowledge acquisition more accessible concepts in learning areas are understood while engaging students in the application of ICT.

#### **2. Support Student -Centred and Self-directed learning**

Students are now more frequently engaged in the efficient use of technology. They build new knowledge through accessing , selecting , organizing and interpreting information and data. Based on learning through ICT, students are more capable of using information and data from various sources and critically assessing the quality of the learning materials.

### **3. Produce a conducive and creative learning Environment**

ICT develops students' new and more developed understanding in their areas of learning. ICT provides more creative solutions to different types of learning by providing stimulating and conducive environment.

### **4. Promote Collaborative learning in a distance-learning Environment**

ICT enables students to communicate, share and work collaboratively anywhere, any time. Students not only acquire knowledge together, but also share diverse learning experiences from one another in order to express themselves and reflect on their learning.

### **5. Offer more opportunities to develop critical thinking skills**

Based on a constructive learning approach, ICT helps students focus on higher-level concepts rather than less meaningful tasks. A longer exposure in the ICT environment can foster students' higher critical thinking skills.

### **6. Improve teaching and learning quality.**

The students have more opportunity to build the new knowledge onto their background knowledge and become more confident to take risks and learn from their mistakes. It concluded that ICT fosters autonomy by allowing educators to create their own material, thus providing more control over course content.

The world is changing due to technological developments in all the areas hence education is also changing. As a result imperatives of new times, new demands and new visions assign more

challenging role and responsibility to the teacher (Das.2015)

### **Effective use of ICT for quality Learning**

ICT increases the flexibility of delivery of education so that learners can access knowledge anytime and from anywhere. It can influence the way students are taught and how they learn as now the processes are learner driven and not by teachers. This in turn would better prepare the learners for lifelong learning as well as to improve the quality of learning. The rationale and guiding principles for effective use of ICT in learning and teaching can be summed up as follows:-

#### **1. Using a variety of Pedagogies**

A variety of learning and teaching pedagogical approaches and activities should be planned through various computerized softwares and programs to suit different purposes and individual styles of learners.

#### **2. Knowledge**

Knowledge is available in different forms and contexts. While some knowledge is established, some is undergoing dynamic changes with time. To be useful, construction of knowledge by the learner should take place. ICT provides infinite opportunities and resources for the construction of new knowledge and reconstruction of existing concepts.

#### **3. Optimum utilisation of Resources**

The curricula shall promote the full utilization of infrastructure and resources, integrating it with the ICT based programs. Universal access and fostering of a sense of ownership shall be encouraged to ensure maximum impact.

#### **4. Integration with learning objectives**

For the wholesome personality development, range of assessment practices such as project work, various types of tests should be used for assessing the achievement of different learning objectives.

#### **5. Tracking pace of Learning**

Assessment is a continuous process aiming at tracking learning progress over time. ICT allows students in establishing their own incremental targets and controls their own pace of learning, which in turn positively impacts their commitment to learning.

#### **6. Encouraging and Timely Feedback**

ICT can be used for keeping timely feedback through various feedback and assessment devices. A variety of encouraging feedback means can be utilized by a teacher along with an indication of areas for improvement.

#### **7. Promoting Interaction**

Interaction with students to explore their existing knowledge and notions should be used. Open-ended questions that make students think and offer views will assist students in learning from each other.

#### **8. Considering diversity of learners.**

A variety of strategies are employed under ICT that provide ease of learning for catering to learner diversity due to individual differences. (5) Development of full competency in the use of digital technologies and ICT has been the need of the hour.

The adoption and use of ICTs in education have a positive impact on teaching, learning, and research. ICT can affect the delivery of education and enable wider access to the same. In addition, it will increase flexibility so that learners can access the education regardless of time and geographical barriers. It can influence the way students are taught and how they learn. It would provide the rich environment and motivation for teaching learning process which seems to have a profound impact on the process of learning in education by offering new possibilities for learners and teachers.

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## **Pragmatic and Innovative Learning Strategies for Effective Learning**

**Ms. Jugnu Khatter\***

**Dr. Sushma Rani\*\***

The conventional methods of learning call for drastic changes in the modern age through improvised technology and innovations in curriculum and assessment. The expectations and demand of modern age is to have pragmatic and innovative techniques so as to equip learners with necessary skills through their active engagement and participation in teaching and learning process.

**Key Words:** Active Participation, Innovative teaching Techniques

*"Innovation is not about timing. it is about creating something that fulfils an unmet need."*  
**-Jeremy Gutsche**

In education process, learner active participation refers to the extent of attention, curiosity, interest, optimism, motivation and passion that learners show in teaching leaning process. When learners are actively engaged with the content being taught, they learn more rapidly and retain more. Learners who are actively engaged in the work tend to persist more and find more joy in completing the work. The biggest challenge for any teacher in learning process is capturing each learner's attention, and conveying ideas effectively enough to create a long lasting impression. Innovative Learning Strategies can empower learners to think critically, access and analyze information, creatively problem solving, work collaboratively and communicate with clarity and impact.

In this research article, few innovative teaching strategies are discussed that engage learners: (1) inquiry-based learning, (2) problem-based learning (3) Review Learning (4) Jigsaws Learning (5). Smart classroom technology (6) Heuristic learning .These innovative teaching strategies encourage learners to use their imagination to dig deep when engaging with the content in the teaching learning process. The learners are actively involved with the learning and can work with their peer group in collaborative groups to showcase their learning achievements.

### **Inquiry-Based Learning**

Inquiry-based learning is one of the effective teaching strategies in the classroom because learners learn best when they construct their own meaning with the help of their abilities, capacities and interests. Inquiry-based learning helps in generating learner curiosity. Teachers act as a guide and facilitators during the inquiry-based learning process.

There are mainly three steps in the process:

1. To prepare questions and arrange them in a sequence.
2. To present the questions in appropriate way so that curiosity may be created among the learners.
3. To ask new questions by liking with learner's responses. Teacher is able to recognize the intention of learners and provides motivation accordingly.

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Inquiry-based learning allows learners to pose the questions and convert that information into useful knowledge, thus increase the level of learner engagement.

### **Project-Based Learning**

*"A problem well defined is a problem half-solved."*

*–John Dewey*

Project-based learning is an effective and enjoyable way to learn. It also develops deeper learning competencies required for success in real life situations. The main focus of this is to socialize a child as it provides an opportunity for work experience, divergent thinking and social efficiency.

There are six steps in the process:

1. To identify a problem related to life situation of the learner.
2. To select and define the problem.
3. To prepare a plan for finding out the solution of the problem.
4. To implement the plan.
5. To evaluate the workability of the project plan.
6. To prepare of record of the project.

Project-based learning uses real-world scenarios, challenges, and problems to engage learners in critical and creative thinking, problem solving, teamwork, and self-management. The teacher's work is to provide proper guidance. It uses collaboration, digital tools, and problem solving skills to come up with a solution to the problem presented.

### **Review Learning**

Review learning develops the ability of critical thinking among learners. The learners are assigned to review an independent topic or one topic is assigned to a group of learners. This type of learning requires self-motivation and involvement in the subject matter.

This mainly involves four steps:

1. A topic, problem or area is selected to review critically.
2. A list of relevant literature and sources is prepared by pupils with the guidance of a teacher
3. To go through the available material to collect relevant information or material.
4. On the basis of relevant literature, the pupils prepare a review of the topic or idea or problem assigned to him.

In this type of learning, learners have to perform much of library and historical work. The learners should have the patience consulting the topic from available literature and should have the feeling of cooperation to help each other in this regard, if working in a group.

### **Jigsaws Learning**

The jigsaw learning technique is a "tried and true" i.e. co-operative learning technique that helps learners to create their own learning. Learners are arranged in groups and assigned a different piece of information. In their own groups, learners learn and understand the piece of information well enough to be able to teach it to another group of learners.

Through this learning technique, learners become experts on the learning as they teach their peer group. Once all groups have learned their information, they are placed into new groups with members from each of the small groups. Each group member shares the information and knowledge they gained in their informational group. This learning technique brings lessons to life and challenges learners to create their own learning. This challenge engages learners and motivates them to share their learning with others learners.

### **Smart Classroom Technology**

Many schools have become one-to-one schools, i.e., each Learner has his/her own technology device (a tablet or Laptop) to work with each day. Learners can take the technology device home to complete their homework.

Teachers must use technology in a smart managed way and with a wide variety of activities. Several activities that lead to learner engagement are Google Docs, YouTube videos, Quizlet, Kahoot!, and the Remind app. These innovative apps and websites can help teachers engage the learners, remind them and encourage them about upcoming assignments and homework, provide visual learning through videos, organize their learning, provide group collaboration, and provide check-ups on learning through games and online quizzes.

### **Heuristics Learning**

*"Heuristic Method is a method of teaching which involves our placing the learners as far as possible in the attitude of a discoverer"*- **Armstrong**

It is based upon the assumption of Herbert Spencer that the learner should be told as little as possible and he should be encouraged to learn himself as much as possible.

This learning technique involves 'trial and error' and invention technique. It requires more logical and imaginative thinking in formulating the number of tentative solutions for the problem. It helps in developing scientific attitude towards the problem.

Main steps of this type of learning are:

1. Define objectives and opportunities.
2. Map the process or constituent elements of system.
3. Express impact of each step or element.
4. Link each impact back to each objective.
5. Organize and consolidate generated statements.

This is a psychological method as the learner learns and experience by self-practice. It inculcates in the learner the interest for the subject and also develops willingness in them.

### **Brain Storming Learning**

This type of learning consists of a problem solving situation in which learners have to analyze and evaluate the workability of their own suggestions of the problem. It is based on an assumption that learners can learn better in a group rather than in individual study. It encourages for the original ideas and more creative strategy of learning.

This learning technique involves following steps:

1. Plan all phases of the problem and think about the sub-problems which may emerge.
2. Select sub-problems to be attached.
3. Think about the data or differences which may help involving them.
4. Select the probable sources of data and collect most relevant data.
5. Decide and select ideas most likely lead to the situation.
6. Consider the possible ways to test these ideas and test them in terms of relevance, adequacy and sufficiency.
7. Imagine all possible contingencies and ways of meeting them.
8. Take decision about the final solution of the problem.

This learning technique provides more ideas of good quality.

Each of the above discussed learning techniques provide an opportunity to learners for questioning, research, use of smart technology, and create meaning from provided materials and research. These techniques also allow learners to solve problems, challenge

themselves, and present their findings to others. Learner's engagement builds on curiosity, interest, passion, abilities, aptitude and attention.

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# APPLYING CONSTRUCTIVIST APPROACH IN SCIENCE TEACHING

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## ABSTRACT

*Constructivism is basically a theory -- based on observation and scientific study -- about how people learn. It says that people construct their own understanding and knowledge of the world, through experiencing things and reflecting on those experiences. Constructivism is currently the predominant perspective within which human learning is described and explained. It emphasizes on learners being active players in the process of learning and modifies the role of teacher from knowledge transmitter to that of facilitator. It is quite unfortunate that even today learning in classrooms is rote memorized and exam oriented. Students are not interested to learn as learning is not meaningful to them. The prime reason for such a situation is that most of the teachers continue to teach through traditional methods and do not involve students in the process of learning thus making the process of learning uninteresting for the students. Teachers cite several factors for not being able to teach using constructivist approach. The reasons will always be there. What we have to see as teachers is that how we can make the best use of our time, resources and talents to promote active learning in classrooms and make our learners self directed learners.*

**Keywords:** Constructivism, facilitator

## INTRODUCTION

Constructivism is basically a theory -- based on observation and scientific study -- about how people learn. It says that **people construct their own understanding and knowledge** of the world, through experiencing things and reflecting on those experiences. When we encounter something new, we have to reconcile it with our previous ideas and experience, may be changing what we believe, or maybe discarding the new information as irrelevant. In any case, we are active creators of our own knowledge.

In the classroom, the constructivist view of learning can point towards a number of different teaching practices. In the most general sense, it usually means encouraging students to use active techniques (experiments, real-world problem solving) to create more knowledge and then to reflect on and talk about what they are doing and how their understanding is changing.

The teacher makes sure she understands the students' preexisting conceptions, and guides the activity to address them and then build on them. Constructivist teachers encourage students to constantly assess how the activity is helping them gain understanding. By questioning themselves and their strategies, students in the constructivist classroom ideally become "expert learners." This gives them ever-broadening tools to keep learning. With a well-planned classroom environment, the students learn **HOW TO LEARN**

Contrary to criticisms by some (conservative/traditional) educators, **constructivism does not dismiss the active role of the teacher** or the value of expert knowledge. Constructivism modifies that role, so that teachers help students to construct knowledge rather than to reproduce a series of facts. The constructivist teacher provides tools such as problem-solving and inquiry-based learning activities with which students formulate and test their ideas, draw conclusions and inferences, and pool and convey their knowledge in a collaborative learning environment. Constructivism transforms the student from a passive recipient of information to an **active participant in the learning process**. Always guided by the teacher, students **construct** their knowledge actively rather than just mechanically ingesting knowledge from the teacher or the textbook.

Constructivism is also often misconstrued as a learning theory that compels students to "reinvent the wheel". In fact, constructivism taps into and triggers the student's innate curiosity about the world and how things work. Students do not reinvent the wheel but, rather, attempt to understand how it turns, how it functions. They become engaged by applying their existing knowledge and real-world experience, learning to hypothesize, testing their theories, and ultimately drawing conclusions from their findings. The classroom is no longer a place where the teacher pours knowledge into passive students, who wait like empty vessels to be filled. In the constructivist model, the students are urged to be actively involved in their own process of learning. The teacher functions more as a facilitator who coaches, mediates, prompts, and helps students develop and assess their understanding, and thereby their learning.

In the constructivist classroom, both teacher and students think of knowledge not as inert factoids to be memorized, but as a dynamic, ever-changing view of the world we live in. The constructivist classroom relies heavily on collaboration among students. There are many reasons why collaboration contributes to

learning. The main reason it is used so much in constructivism is that students learn about learning not only from themselves, but also from their peers. When students review and reflect on their learning processes together, they can pick up strategies and methods from one another and explore that view.

### What are the benefits of constructivism?

1. Children learn more, and enjoy learning more when they are actively involved, rather than passive listeners.
2. Education works best when it concentrates on thinking and understanding, rather than on rote memorization. Constructivism concentrates on learning how to think and understand.
3. Constructivist learning is transferable. In constructivist classrooms, students create organizing principles that they can take with them to other learning situations.
4. Constructivism gives students ownership of what they learn, since learning is based on students' questions and explorations, and often the students have a hand in designing the assessments as well.
5. Constructivist assessment engages the students' initiatives and personal investments in their journals, research reports, physical models, and artistic representations.
6. Engaging the creative instincts develops students' abilities to express knowledge through a variety of ways.
7. The students are also more likely to retain and transfer the new knowledge to real life.
8. By grounding learning activities in an authentic, real-world context, constructivism stimulates and engages students.
9. Students in constructivist classrooms learn to question things and to apply their natural curiosity to the world.

### THE FIVE CENTRAL TENETS OF CONSTRUCTIVISM

1. First, constructivist teachers seek and value students' points of view. Knowing what students think about concepts helps teachers formulate classroom lessons and differentiate instruction on the basis of students' needs and interests.
2. Second, constructivist teacher structure lessons to challenge students' suppositions. All students, whether they are 6 or 16 or 60, come to the classroom with life experiences that shape their views about how their worlds work. When educators permit students to construct knowledge that challenges their current suppositions, learning occurs. Only through asking students what they think they know and why they think they know it are we and they able to confront their suppositions.
3. Third, constructivist teachers recognize that students must attach relevance to the curriculum. As students see relevance in their daily activities, their interest in learning grows.
4. Fourth, constructivist teacher's structure lessons around big ideas, not small bits of information. Exposing students to Wholes first helps them determine the relevant parts as they refine their understandings of the wholes.
5. Finally, constructivist teachers assess student learning in the context of daily classroom investigations, not as separate events. Students demonstrate their knowledge every day in a variety of ways. Defining understanding as only that which is capable of being measured by paper-and-pencil assessments administered under strict security perpetuates false and counterproductive myths about academia, intelligence, creativity, accountability, and knowledge.

### The 5 E's - An Instructional Model Based On The Constructivist Approach To Learning

Each of the 5 E's describes a phase of learning, and each phase begins with the letter "E": Engage, Explore, Explain, Elaborate, and Evaluate. The 5 E's allows students and teachers to experience common activities, to use and build on prior knowledge and experience, to construct meaning, and to continually assess their understanding of a concept.

#### 1. Engage

This phase of the 5 E's starts the process. An "engage" activity should do the following:

Make connections between past and present learning experiences.

Anticipate activities and focus students' thinking on the learning outcomes of current activities.

Students should become mentally engaged in the concept, process, or skill to be learned.

#### 2. Explore

This phase of the 5 E's provides students with a common base of experiences.

They identify and develop concepts, processes, and skills.

During this phase, students actively explore their environment or manipulate materials.

### 3. Explain

This phase of the 5 E's helps students explain the concepts they have been exploring.

They have opportunities to verbalize their conceptual understanding or to demonstrate new skills or behaviors.

This phase also provides opportunities for teachers to introduce formal terms, definitions, and explanations for concepts, processes, skills, or behaviors.

### 4. Elaborate

This phase of the 5 E's extends students' conceptual understanding and allows them to practice skills and behaviors. Through new experiences, the learners develop deeper and broader understanding of major concepts, obtain more information about areas of interest, and refine their skills.

### 5. Evaluate

This phase of the 5 E's encourages learners to assess their understanding and abilities and lets teachers evaluate students' understanding of key concepts and skill development .

## CONSTRUCTIVISM IN SCIENCE

Humans are curious by nature. This curiosity has driven them since time immemorial to explore the world around them. Over time, manipulation and controlling nature for the benefit of humans has become an objective of exploration. Science is all about exploration and children are very curious by nature. A science teacher can exploit this curiosity of learners in teaching - learning of sciences.

However, often, the investigations are carried out in a routine fashion to let the children score in examination. If conducted properly, these activities not only raise the motivation but also develop interest and curiosity to learn and try things in different ways. In their strive to answer, 'what if,' children get actively involved in different processes such as observation, discussion, collecting information, manipulation, comparing, classification, improvisation, experimentation, critical thinking, logical reasoning, etc., thus enabling them to go through the processes of not only 'hands-on' but 'minds-on' as well. For example, children could be facilitated to observe natural phenomenon such as condensation, evaporation, rusting, seed germination, reflection, refraction, interference of light, electromagnetic induction, etc. Based on the observations and questions raised in the minds of children and asked by the teacher, problems could be identified and defined and hypothesis could be made. To test the hypothesis(es), experiments should be performed to validate or discard their hypothesis.

Curiosity gets aroused as a result of doubt, perplexity, contradiction, cognitive conflict, ambiguity, lack of clarity, etc. A teacher needs to create suitable learning situations for this. Science teacher must take advantage of natural curiosity of children by engaging them in the exploration of the ideas of the concept being transacted through scientific processes and inquiry.

## WAYS OF PRACTICING CONSTRUCTIVISM IN SCIENCE

There are numerous ways in which constructivist approach can be practiced in classrooms. Discussed below are few examples.

**Example 1:** The teacher may probe students with simple questions such as whether water boils faster in closed container or open container. The student should be motivated to perform an activity to solve the query.

**Sensing and identifying the problem:** Water boils in the container faster, when the lid is placed over it than when it is not placed.

**Defining the problem:** Does it have a higher temperature with the lid-on than the lid-off?

**Hypothesis:** I (child) think that water will boil at higher temperature with the lid-on as the lid prevents heat loss.

**Testing hypothesis:** Two sets of each of the following materials were required for testing the hypothesis—beaker, tripod, thermometer, wire gauze and Bunsen burner. A square/circular piece of cardboard was also taken to make the lid for the beaker. I used two beakers that were of same size and material. Then I put same amount of water in each beaker. The lid was placed on one beaker. When water started boiling I noted its temperature. The lid was kept off the other beaker. Temperature of water taken in the second beaker was noted down when it started boiling.

**Collecting data :** I did the investigation as described above. I pierced a hole in the cardboard lid to insert thermometer to take the temperature. I let the water boil for one minute before taking the observations.

**Recording data**

Temperature

With lid 99.5 oC

Without lid 99 oC

**Interpreting data:** The two readings were almost same.

**Drawing conclusion:** I think that there is no difference in the temperature of boiling water with or without lid-on the beaker.

**Making generalisation:** I think fast boiling of a liquid does not mean high temperature of the liquid, that is why its boiling point does not change.

**Further questions :** Why do we cook food in closed vessels, rather than in the open ones? I read on the LPG slip that cooking with the lid on saves fuel. How does it save fuel? How the food gets cooked faster in the pressure cooker?

The problem may either be posed by the student or the teacher. It may also arise as an idea during discussion. The teacher need not provide the whole plan to carry out the investigation, but should involve children to evolve the plan through discussion. She may help children to work in groups to carry out the investigation. Some children might be trying to heat water in beakers of different sizes/materials. Some might use unequal amount of water in the beakers. There could be variations in taking the temperatures, readings of the thermometer, etc. Through questioning, discussion and sharing the work mutually and with the whole class, the children may be trained in this approach over a period. This can help them develop the skills of scientific process and inquiry.

**Example 2:** A discussion on natural satellites was going on in Class XI when a student asked, “what would happen if there is no moon in the sky?” Rohit, the teacher directed this thought provoking question to the whole class. Students came up with a number of answers— some relevant, some irrelevant. Rohit listened, called a student to write all answers on the blackboard without labelling them as right or wrong. Some of the responses were, “our earth would spin faster;” “days and night would be shorter;” “we would get less time at school/to watch TV/to sleep;” “there will be complete darkness in the night;” “whom with the poets would compare the beauty;” “wind would blow faster;” “life would not have existed on the earth;” “centre of mass of the earth would have been different;” and “the axis of rotation of the earth would be different.” Later Rohit discussed with them the probable answers and asked students to collect more information related to the question and justify their answers through the group project work in the class.

Creativity is doing or seeing the things differently. It cannot be taught, but developed in children by using planned strategies and techniques. Emphasis should be given on providing appropriate concrete experiences which nurture creative traits in a learner, viz. curiosity, ability to fantasise, playfulness, as well as cooperative and helpful attitudes in teaching-learning of science.

**Example 3:** Angela, a teacher is transacting the concept ‘what dissolves in water and what does not’ in Class VII. She forms small groups of students and asks them to see themselves which of the following materials dissolve in water.

Sugar, Wooden shavings, Salt, Lemon juice, Iron filings, Mud/Sand, Coffee powder, Sharbat

She helps the students to think about the following questions and discuss among themselves in groups.

Q.1 Which of the substances in the above list dissolve in water?

Q.2 What happens to a substance when it is dissolved in water?

Q.3 Try to dissolve four teaspoonful of sugar in a glass of water. Observe the level of water. Does it rise?

Q.4 Do you see some undissolved sugar at the bottom? How can you dissolve it in water?

And the list of questions goes on with students’ added questions. The students perform the activities in groups and enter into argumentation among themselves about the observations and the reasons for such observations. In the process they

listen to other students and discuss with them;

express their point of view justifying their statements;

accept/reject and acknowledge other student’s point of view;

make other students understand their point of views; and

mutually arrive at the correct reason.

They interact with the teacher and students of other groups to arrive at scientific explanations.

**Example 3:** 'Air is everywhere' is a statement that every school child learns. Students may know that the earth's atmosphere consists of several gases, or that there is no air on the moon. We might be happy that they know some science. But consider this exchange in a Class IV classroom.

**Teacher: Is there air in this glass?**

**Students (in chorus): YES!**

The teacher was not satisfied with the usual general statement, 'Air is everywhere.' She asked the students to apply the idea in a simple situation, and found, unexpectedly, that they had formed some 'alternative conceptions'.

**Teacher: Now I turn the glass upside down. Is there still air in it?**

Some students said, 'Yes', others said, 'No', still others were undecided.

**Student 1: The air came out of the glass.**

**Student 2: There was no air in the glass.**

In Class II, the teacher put an empty glass over a burning candle and the candle went out! The students had performed an activity whose memory had remained vivid even two years later, but some of them at least had taken away an incorrect conclusion from it. After some explanation, the teacher questioned the students further—Is there air in this closed cupboard? Is there air in the soil? In water? Inside our body? Inside our bones? Each of these questions brought up new ideas and presented an opportunity to clear some misunderstandings. This lesson was also a message to the class: do not accept statements uncritically. Ask questions. You may not find all the answers, but you will learn more.

**Example 4: Traditional way:** The teacher may take an aqueous solution of  $\text{CuSO}_4$  in a beaker and dip a strip of Zn in it. She leaves the beaker undisturbed for sometime. Then, the teacher asks the students, what do you observe? The students may reply that blue colour of the solution fades and a brown coating appears on the strip of Zn. Teacher then explains that this is because zinc is more reactive than copper, it displaces copper from its salt solution.

**Constructivist Way:** The teacher may take two beakers and label them as 'A' and 'B'. In beaker 'A', she takes aqueous solution of  $\text{CuSO}_4$  and calls a student to dip a Zn strip in it. In beaker 'B', aqueous solution of  $\text{AgNO}_3$  is taken and a Cu strip is dipped in it. She suggests to the class, "Let us keep the two beakers undisturbed for sometime and observe what happens."

Students observe that blue colour of the solution fades and brown coating appears on Zn strip in beaker 'A'. She draws attention of students to beaker 'B'. Students observe and state that colour of solution changes from colourless to blue and a shiny coating appears on Cu strip.

**Student 1:** Why do these changes occur in beakers 'A' and 'B'? Teacher encourages the class to think about it. Students come up with some responses.

**Student 2:** I think that Zn being more reactive than Cu. Therefore, Zn displaces Cu from  $\text{CuSO}_4$ .

**Teacher:** Yes, you are right. And Cu being more reactive than Ag, displaces it from  $\text{AgNO}_3$ . What type of reaction do you think is occurring in this activity?

**Student 3:** Displacement reaction.

**Teacher:** Which metal in this experiment is most reactive? How can we arrange the three metals involved in this activity in the order of their decreasing reactivity?

**Student 2:**  $\text{Zn} > \text{Cu} > \text{Ag}$ .

**Teacher:** Now, think about a situation, where we can store a solution of  $\text{ZnSO}_4$  in a copper container.

**Student 4:** Yes, we can. Because it will not react with copper.

**Teacher:** Do you now think that the reaction taking place is a displacement reaction? Here a more reactive metal displaces a lesser reactive one from its salt solution.

**Student 5:** Yes, now I understand well.

**Student 2:** Can we arrange metals on this basis in the order of their decreasing reactivity?

**Student 6:** Yes, I have seen it in the book. Various metals are arranged as reactivity series. Because of reactivity, it is safe to store a salt solution of a metal in a container made of a lesser reactive metal.

**Example 5:**

Following is an example of activity that can be conducted in the class engaging students in teaching-learning of science.

### Concept

Solubility of common salt/sugar in water

### Observation

1. If sugar is added into still water, it takes longer time for dissolution.
2. Salt/Sugar dissolves fast in water on stirring or heating the mixture.

**Inquiry**

1. What is the reason for fast dissolution of salt/sugar in water?
2. Whether volume of solvent increases on forming solution?

**Hypothesis**

1. On increasing kinetic energy of particles, either by stirring or by increasing temperature, the components of solution intermix fast.
2. Volume of solution increases, because solute particles also occupy space.

**Experimentation**

1. Take 100 ml of water each in three beakers 'A,' 'B' and 'C.'
2. Put one teaspoonful of salt/sugar in each beaker
3. Do not disturb beaker 'A.'
4. Stir the mixture of beaker 'B' with the help of a glass rod.
5. Heat the mixture of beaker 'C' on the tripod stand with the help of spirit lamp/burner.
6. Record the time for complete dissolution of salt/sugar in beaker 'A,' 'B' and 'C'.
7. Measure the volume of solutions in beakers 'A,' 'B' and 'C' with the help of a measuring cylinder.

**Conclusion**

1. Complete dissolution of salt/sugar in beaker C takes the least time. Time taken for complete dissolution of salt/sugar in beaker 'A' is maximum out of the three cases.
2. Volume of solution in each case remains 100 mL.

**Comments**

Hypothesis no. 1 is correct, but hypothesis no. 2 is incorrect, since, there is no change in the volume of solvent on forming solution. There is a need to alter the hypothesis no. 2. The correct reason is that the solute particles occupy the spaces available in the solvent itself, called intermolecular spaces. No new space is occupied by the solute particles.

**CONCLUSION**

When a teacher enters into a classroom she is expected to be well equipped with the content knowledge as well as the pedagogical principles of teaching –learning. For constructing the knowledge of a learner, she has to adapt and adopt various strategies of teaching – learning that come in the purview of constructivist pedagogy. The teacher should motivate a learner to pursue inquiry by exploring things in his surrounds. Mostly teachers cite lot of reasons for not being able to practice constructivist approach in class. It is to inform teachers that they necessarily don't need to engage their students in performing high end experiments which perhaps needs a lot of sophisticated instruments and a lengthy protocol to follow. Even a simple experiment can satisfy the doubt, query and curiosity of a learner. Teachers should judge the previous knowledge of a learner correctly. Learners always have some doubts, misconceptions and curiosity about nature in their minds . Teachers should take these doubts seriously and encourage learners to come up with an answer to their by performing simple activities. Learning can then become meaningful for them as they themselves involved in constructing knowledge about the world around them.

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# Analysing the Bit-error Probability of a receiver in Multi-User MIMO SC-FDMA systems

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**Abstract-** SC-FDMA signals are currently espoused equally the Long Term Evolution (LTE) standard for the uplink due to its high data rate and low Peak to Average Power Ratio (PAPR). In SC-FDMA, two methods of choosing subcarriers for transmission are used; distributed using Interleaved (IFDMA) and localized (LFDMA). The Interleaved FDMA (IFDMA) is a distributed mode with equidistance between occupied subcarriers. In this paper, the PAPR for LFDMA and IFDMA techniques is simulated and compared. Simulation shows that the reduction of PAPR for IFDMA decreased more than 3 dB compared with LFDMA, which means that the IFDMA has better PAPR Performance than LFDMA. Moreover as shown as in the Figures there is a direct relationship between the Roll-off-factor (Alpha,  $\alpha$ ) and subcarriers, When the value of Alpha increases and the subcarriers increase, the result is a good performance of PAPR.

**Keywords-** SC-FDMA, PAPR, LTE, IFDMA, LFDMA

## I. INTRODUCTION

To design a SC-FDMA, OFDMA is the inner part of SC-FDMA thus multiple user structures are not disparate as it performs at first. In totting of the SC-FDMA quite is deceptive as that technology similar OFDMA too uses sundry sub-carriers on the airborne interface. To elucidate how SC-FDMA mechanism is best to take a mien at OFDMA used by wi-max and to be find out the difference to SC-FDMA. SC-FDMA uses a cross format that its combine the lpar by the subcarrier network over multipath intrusion springiness and malleable sub-carrier frequency allocation.

**SC-FDMA:** In SC-FDMA transmits data through the communication channel in various sub-carriers then adds an extra dispensation step as shown in the below figure. In its place 4 bits are putting calm OFDM is one of the sample to practice the signal for additional subcarrier processing block. In SC-FDMA transfers the info to each bit to overall the sub-carriers. In this process will be done as a trails of some bits e.g. 4 signifying a 16 qam lilt are grouped calm. In the part of OFDM these group of bits oblige the input of the IDFT.

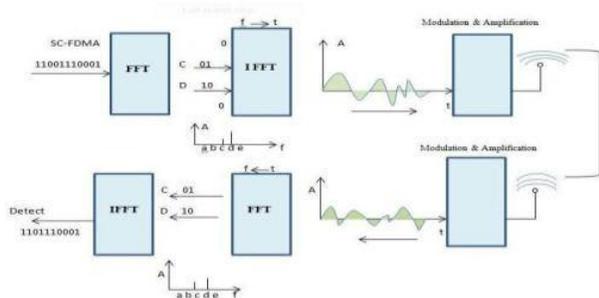


Fig.1

In some of the bits are piped into a fast Fourier function the output process for the creation of the sub-carriers are to follows IFFT. All sub-carriers are not used by the mobile station many of them are set to be zero in the following diagram. These may or may not be used in other mobile stations.

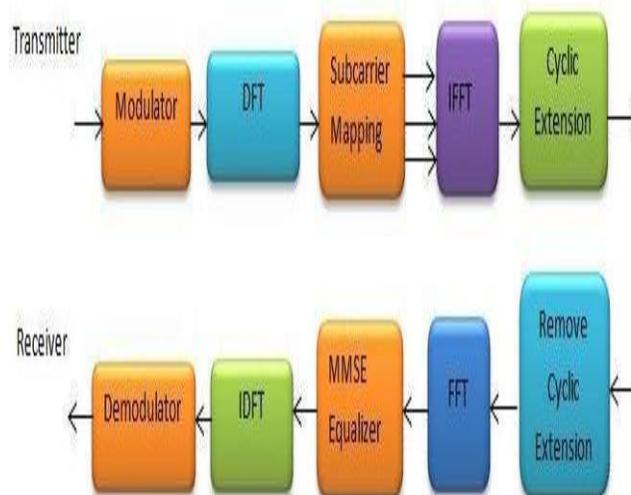


Figure2. The block diagram of an SC-FDMA system

**OFDMA:** OFDMA transfers a data creek through using some slender set of sub-carriers concurrently e.g. 512,1024 or even more reliant on the global open bandwidth e.g. 5 ,10, 20 mhz of the channel. Equally several bits are elated in comparable transmission speed on every sub carrier tin be ample lower than the whole ensuing data rate. This is significant in a practical radio atmosphere in edict to minimize weight of multipath fading formed by faintly

different influx eras of the signal from different directions. on the receiver side the indicator is first demodulated and amplified. The outcome is then treated by a fast Fourier transformation function which converts the time signal hind into the frequency domain. This re-enacts the frequency/ amplitude diagram bent at the transmitter. At the centre frequency of each sub-carrier a gauge function is used to produce the bits which remained originally used to generate the sub-carrier.

I've happened to stumble over PAPR (peak to average power ratio) quite a lot lately as it seems to play a big role in wi-max and 3gpp lte mobile devices. Most papers mention that lte has a better PAPR than wi-max but fail to explain what it is and why this is so important. After some research and help from a number of expert's heres an intro to papr:

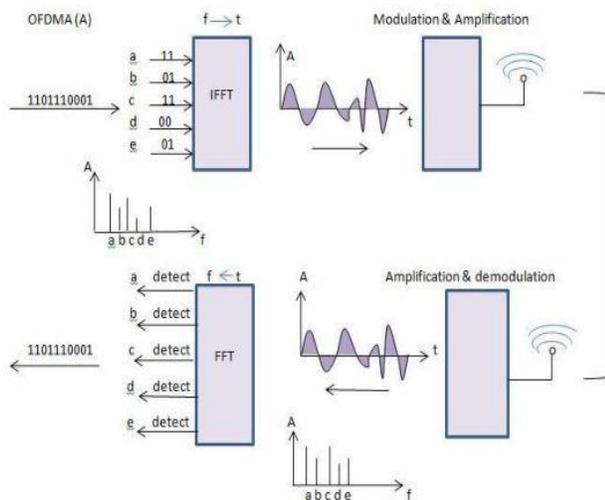


Fig.3

When diffusing data from the mobile fatal to the system a power amplifier is required to lift the outbound signal to a level high enough to be picked up by the network. The power amplifier is one of the biggest consumers of energy in a device and should thus be as power competent as possible to increase the operation stint of the device on a battery charge. The internal efficiency of a amplifier should be depends on two factors.

amplifier will able to amplify upper most value of wave due to silicon constraints utter most charge decides over the power consumption of the amplifier to take the high peaks of the waves. But do not transpose any information more than the average power signal over a time. Transmission speed does not depends on the peak output power. Output power required for the peak values of the waves but rather than average power level.as both power consumption and transmission speed are of importance for designers of mobile devices the power amplifier should consume as little energy as possible. Thus the lower

the difference between the peak power to the average power papr the longer is the operating time of a mobile device at a certain transmission speed compared to devices that use a modulation schemes with a higher papr.

Now lets moving back towards the blog entry in mobile communication as I studied & analysed that LTE has better PAPR than wi-max. Different modulation schemes are used in the uplink communication. While wi-max uses the OFDMA which one is fast but has high PAPR.LTE designers to choose the SCFDMA because higher order modulation increases in PAPR.so that OFDMA and SC-FDMA fit for another blog entry.

### II. SC-FDMA SYSTEM MODEL

The system model of a MIMO uplink SC-FDMA system consists of a base station bs with nr receive antennas and a user equipment ue with nt transmit antennas. The ue is allocated m contiguous subcarriers over the n available subcarriers and transmits independent streams or layers over each transmit antenna using a single code word or multiple code words. transmission starts with the encoding of the information bits for each code word and using appropriate mapping onto the streams. the bits over each stream are mapped to time domain constellation symbols s which are then converted into the so called frequency domain samples x by taking a m-point dft over each stream. The sample at the m<sup>th</sup> subcarrier x<sub>m</sub> is represented as

$$X_m = G_L \cdot y^m$$

The frequency domain representation of k-th user signal is **X<sub>m</sub>**

$$X_m = G_M X^m = [X_m^1, X_m^2, \dots, X_m^L] \rightarrow (1)$$

Where FM is the normalized M-point DFT operator  $FM = 1/M \sum_{n=0}^{M-1} x_n e^{-j2\pi kn/M}$

SC-FDMA supports two different subcarrier mapping techniques, namely localized and inter leaved. In former the data is mapped to adjacent localized subcarriers, whereas the latter allows to fill subcarriers that are equi-distant from each other. Localized-SCFDMA (LFDMA) provides ease of practical implementation, and multi-user diversity if combined with channel dependent scheduling. For these reasons, LFDMA has been adopted in LTE. On the other hand, interleaved-SC-FDMA (IFDMA) is robust against frequency selective channels but it's practical implementation is un-convenient. In order to have a compliancy with existing and future LTE standards, we will only deal with LFDMA2 in this work. The k-th user SC-FDMA signal as in (1) is passed through N-IFFT block and is given as,

$$(x)^{-m} = G^1_K \cdot G_L \cdot y^m \rightarrow (2)$$

Where  $F^N$  is the  $N$ -point IDFT matrix. The signal at each transmitter is then added with cyclic prefix (CP), that has length greater than channel impulse response (CIR). The received multi-user signal at  $r$ -th receiver antenna  $Y_r$  is given as,

$$x_r = \sum_{m=1}^m i_r^m \cdot x^m + W_r \quad \rightarrow (3)$$

Where  $h_{kr}$  is the time domain channel impulse response between  $k$ -th transmit antenna and  $r$ -th receiver antenna and  $z_r$  is the independent identically distributed (i.i.d) AWGN samples with zero-mean and covariance  $\sigma^2$ . For the sake of simplicity, we are dropping the user index  $k$  and receive antenna index  $r$  from the equations as received signals at the receiver are jointly detected at MUD block. The frequency domain matrix representation of (3) is,

$$X = I \cdot X + W \quad \rightarrow (4)$$

In (4)  $X$  is  $R \times 1$  matrix corresponding to signals received at  $R$  antennas of receiver and  $H$  is the  $R \times K$  channel matrix between transmit antennas and receive antennas. In this work we assume ideal channel estimation where channel estimation operation is performed at receiver for each received antenna. In the following section, we will discuss the proposed MCBEP receiver for MUMIMO SC-FDMA system.

### III. PROPOSED MINIMUM CONDITIONAL BIT-ERROR PROBABILITY RECEIVER

In this section, we will derive the cost-function for the proposed minimum conditional bit-error probability (MCBEP) receiver in MU-MIMO SC-FDMA systems. Unlike classical linear detectors that aim at maximizing signal-to interference- noise-ratio (SINR) in multi-user environment, the proposed MCBEP receiver targets the minimization of conditional bit-error-rate at the output of MUD with computational complexity more-or-less the same as linear MMSE.

State-of-the-art show such criterion based on minimum-BER provides close to optimal results. The frequency domain equalizer weights  $w$  are to demodulate signal at the receiver after removal of cyclic prefix and  $N$ -point FFT  $FN$  operation. The decision variable  $X^k$  for  $k$ th user is obtained after detection with the help of optimal weights  $w^k$ .

The MUD output  $X_m$  is given by,

$$X_m = u_m^i \cdot I_m \cdot X + u_m^i \cdot W \quad \rightarrow (5)$$

Where,  $I_m$  is the  $m$ -th column of matrix  $I$  whose size is  $(Q \times K)$  and  $(\cdot)$   $I$  is hermitian operator.

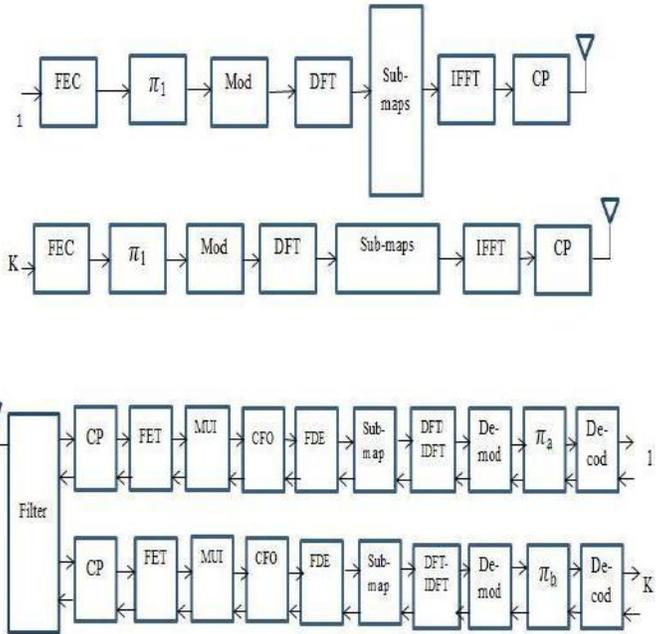


Fig.4

$$X_m = Q_m + W_m \quad \rightarrow (6)$$

Where  $Q_m = u_m^i \cdot I_m \cdot X$  and  $W_m = u_m^i \cdot W$

Performing  $M$ -point IDFT  $F^M$  on the noiseless signal  $\hat{X}^k$  at the output of MUD for  $k$ -th user, the signal  $\hat{x}^k$  is passed to decision device.

For only real-valued modulations like considered BPSK, the probability of error after decision depends on the real value of decision variable  $x^k$ . The probability density function (PDF) of noisy received signal is the mixture of Gaussian distributions associated with each possible symbol transmitted by all the users. The conditional probability of error MUD takes the  $\mu^+ k$  as the mean of  $\mathcal{N}(\hat{X}^k)$  when user  $k$  transmits symbol  $x^k = 1$ , and the mean is  $\mu^- k$  when  $x^k = -1$ . We can write as,

$$\mu_m^+ = p(Q_m | x_m = 1) \quad \rightarrow (7)$$

$$\mu_m^- = p(Q_m | x_m = -1) \quad \rightarrow (8)$$

The effective noise variance of  $\hat{Z}$  in (6) is given as,

$$\sigma_m^2 = \sigma^2 \| u_m \|^2 \quad \rightarrow (9)$$

The symbols in BPSK are assumed to be equi probable  $P(+1, -1) = 1/2$  and with the help of BPSK error probability reported in [12], the conditional bit error probability for BPSK using (7) and (8) is given as,

$$S_{m,c} = \frac{1}{2} \cdot R(\mu_m^+ / \sigma_m) + \frac{1}{2} \cdot R(-\mu_m^- / \sigma_m)$$

$$\rightarrow (10)$$

Where  $(\nu) = \sqrt{12} \int_0^\infty \nu e^{-\nu^2} 2 \nu, \nu > 0$ . The proposed MCBEP algorithm computes the filter weights  $W$  for all the transmit users by minimizing the bit-error probability as given in (10). Hence the MCBEP solution is,

$$u_{m,c} = \arg \min u_m \cdot S_{m,c} \quad \rightarrow (11)$$

$w_k$ , are the weights obtained as a result of minimization of  $P_k$ . The subscript 'c' in  $w_k$ , is acronym for "conditional". The MCBEP algorithm minimizes the conditional probability given in eq (10) with the help of an optimization rule. We employ conjugate gradient descent (CG) approach because of its simple implementation that allows to attain adequate performance. CG first computes the conjugate gradient of cost function (10) and iteratively reaches the minima with step size equal to  $\lambda$ . For the  $i$ -th iteration with step size  $\lambda$ , we have

$$u_{m,c}(i+1) = u_{m,c}(i) - \lambda(\nabla S_m | x) \quad \rightarrow (12)$$

$\nabla P_k/x$  is the gradient of (10) associated with  $k$ -th user and can be expressed in full form as,

$$\begin{aligned} \nabla S_m | x = & -1/2\sqrt{2} \exp(-(\mu_m^+)^2/2 \sigma_m^2) \\ & 1/\sigma_m(\mathbb{I}_x | x_m=1 - \mu_m^+ \cdot \mu_m / \|u_m\|^2) + 1/2\sqrt{2} \exp \\ & (- (\mu_m^-)^2/2 \sigma_m^2) \cdot 1/\sigma_m(\mathbb{I}_x | x_m=-1 - \mu_m^- \cdot \mu_m / \|u_m\|^2) \end{aligned} \quad \rightarrow (13)$$

The algorithm converges to optimal weights when (13) goes to zero or global minima. Step size  $\lambda$  should be adjusted properly because CG algorithm is sensitive to step size. Algorithm might not converge with larger step size, whereas small size will take too long to reach the minima.

#### Comparative analysis with ideal-MMSE and LMS-MMSE

In our work, we compare the performance of our proposed receiver with other two state-of-the-art approaches, namely ideal-MMSE and adaptive LMS based MMSE. MCBEP MUD receiver optimizes the filter weights of  $k$ -th user,  $w_k$ , separately by estimating symbol energy conditioned on transmitted symbols computed using (7) and (8) considering only 3  $k$ -th column of  $H$  (removing interference from other terminals).

Hence it increases the terminal signal to noise ratio that is in argument of Q-function in (10) by greatly eliminating the MUI. This helps the MCBEP MUD in achieving the near optimum performance. The ideal-MMSE MUD, minimizes the mean square error between transmitted symbols and demodulated symbols, is given by:

$$Y = [I \cdot I^H + \sigma^2 \cdot H_{Q \times Q}]^{-1} \cdot I \quad \rightarrow (14)$$

The MMSE MUD increases the output SINR by appropriately using the channel matrix  $H$  when computing the filter weights  $W$ . However, MMSE MUD does not consider the MUI from other interfering users in (14) hence causing residual MUI that makes the MUD. An adaptive version of MMSE is considered based on least mean square (LMS-MMSE) in frequency domain. LMS-MMSE considers training sequence that is known to receiver for estimating the channel  $H$  by minimizing the mean square error  $\epsilon$ , suboptimal.

$$\epsilon = F[(X - I \cdot Y_{Tq})] \quad \rightarrow (15)$$

Where  $XTr$  is the training sequence and  $\hat{H}$  is the estimate of true channel  $H$ . The filter weights  $w_k$  for user  $k$  update iteratively using (15) as,

$$u_m(i+1) = u_m(i) + \alpha \cdot X \epsilon \quad \rightarrow (16)$$

where  $\alpha$  is the step size chosen for LMS-based filter.

#### IV. SIMULATION RESULTS:

We have performed simulations in MATLAB environment where we test the proposed MCBEP approach together with state-of-the-art adaptive least mean square (LMS) based MMSE and ideal-MMSE. The parameters are selected based on 3rd generation partnership program (3GPP) LTE-A [2] uplink as listed in Tab. 1. A convergence test is conducted between iterative detectors, LMS-MMSE and proposed LMSMCBEP, with fixed number of users and transmit per-bit signal to noise ratio. In Fig. 2, the measured bit-error probability versus iteration number is shown for the MCBEP MUD, considering 6 transmitting users and transmission SNR equal to 18dB. The LMS-based MCBEP reaches the obtainable BER value in less than 50 iterations. The convergence to the averaged Mean Squared Error (MSE) of the LMS-based MMSE is shown in Fig. 3. With same number of transmit users and signal to noise ratio considered for MCBEP, the convergence of adaptive MMSE is slow and requires higher number of iterations for convergence to minima. The convergence of MCBEP is lot faster with a simple-to-implement conjugate gradient algorithm. The second series of simulation results is related to BER performance of proposed MCBEP against the approaches mentioned in Tab. 1. The first use-case is single antenna two-user MU-MIMO. The BS allows paired users to transmit over the same set of radio resources hence it is equivalent to 2x2 MU-MIMO system. Due to low interference environment where only one user is causing interference to the other, the receiver is able to distinguish the uplink streams without much performance degradation, as evident in Fig. 4.

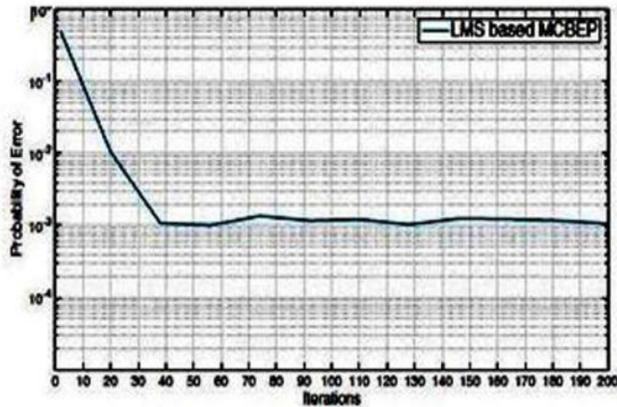


Figure 5: Convergence of MCBEP receiver with  $K=6, R=6, SNR=18dB$ .

Table 1

Bandwidth	5 MHz
Number of Subcarriers	512
CP length	36
Resource Blocks (RBs)	6
Subcarriers in RB	12
Subcarrier Spacing	15 KHz
Sampling frequency	7.68 MHz
Channel Estimation	Ideal
Channel Impulse response	Extended Vehicular A (EVA)
Receiver Algorithm	MCBEP, ideal-&LMS-MMSE

The performance of proposed MCBEP is closer to SISO-AWGN bound and shows improvement of around 3dB w.r.t ideal-MMSE MUD detector and ~4dB over LMS-MMSE in interference-limited region (high-SNR regime). Exactly the same trend can be observed in Fig. 5 when number of paired users increased to 4, thus forming 4x4.

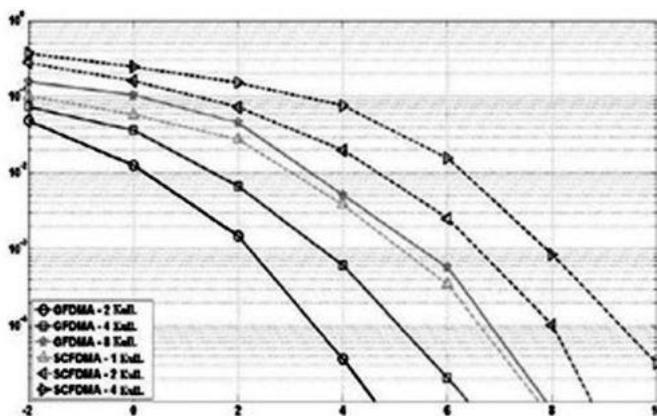


Figure 6: GFDMA with the number of users 1, 2, 4 and 2, 4, 8 SC-FDMA.

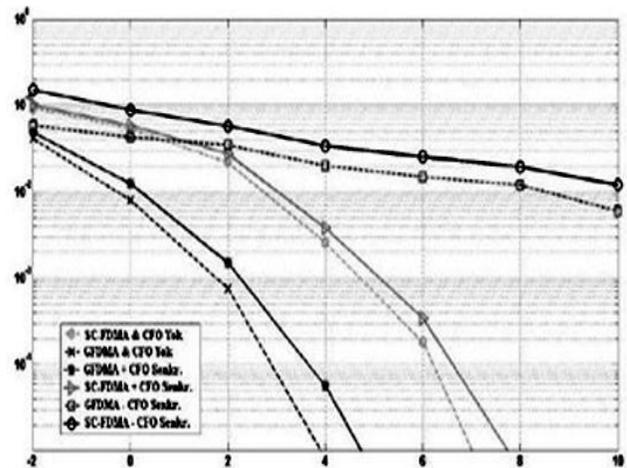


Figure 7. CFO and GFDMA with and without synchronization and SC-FDMA

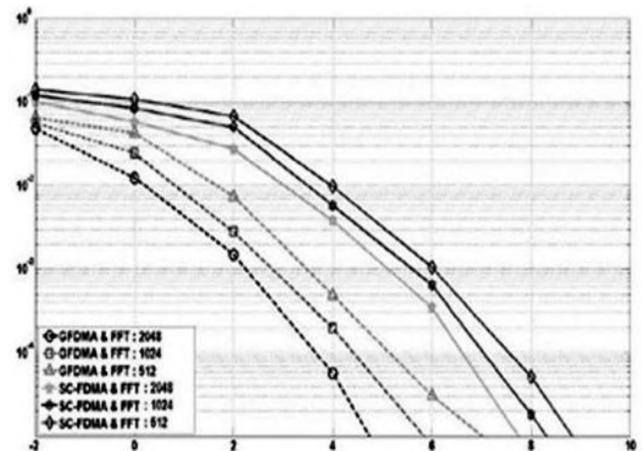


Figure 8: GFDMA with FFT sizes of 512, 1024 and 2048 and SC-FDMA.

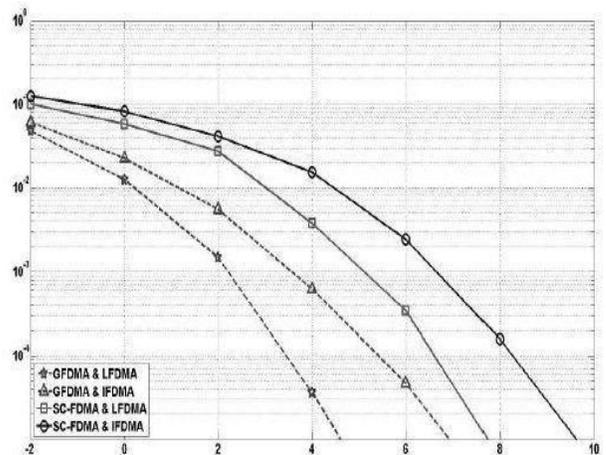


Figure 9: Sub-band approach using LFDMA and IFDMA GFDMA and SC-FDMA.

## V.CONCLUSION

In this article, a CFO synchronization using zero sub-carriers algorithm and in accordance with the algorithm GFDMA and SC-FDMA models that can operate and subcarrier suggested mapping methods. From simulations performed the findings show that the proposed method can be quite successful in influencing the CFO. Another result obtained from the simulations is the FFT increase the number of users, reduce the number of sub-bands system of using the approximate LFDMA mapping method performance. In addition, multi-user GFDMA's performance for single-user SC-FDMA and that this performance can be overcome.

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# AN FPGA IMPLEMENTATION OF SCFDMA USING WIRELESS NETWORK SYSTEMS

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**Abstract-** In wireless communication SC-FDMA is wide a vital role in the unified network systems. The real time transceivers are using in Single Carrier Frequency Division Multiple access (SC-FDMA)

Signalling system. The transceiver is implemented on a field programmable gate array using Xilinx system generator for DSP applications. In all the blocks are to be needed for the transmission path of SCFDMA.

The transmitter mount can be configured for different Flier and data schemes. In receiver side, time domain Synchronization is attained throughout a joint hood Symbol setup time, hold time, minimization period. And carrier frequency offset signal elevator through the fired information confined in the cyclic prefix. In a least square channel information rescues the channel formal information and a simple zero forecasting scheme has to be implemented for the equalization of the channel information. Results to be showed in implementation of the signal path can be implemented by using the Xilinx system generator for DSP.

**Keywords-** SCFDMA; FPG ;Frequency; time domain synchronization; Square channel estimator .

## I. INTRODUCTION

FDMA (Frequency Division Multiple access) is the division of the frequency band allocated for wireless cellular telephone communication into channels. Each of which can carry a conversation or, with digital service, carry digital data. FDMA is a basic technology in the analog advanced mobile phone system (AMPS), the most widely-installed cellular phone in all over country. FDMA each channel can be assigned to only one user at a time.



Fig.1: Mobile channel communication

FDMA is one way method of more than one user to share the single radio frequency (RF) spectrum. It's will be done by the all active users in different frequency channels. Track defined ratio (TDR) is the both popular direction of research to the modern communication and key technology of the 5G communications. Now a days green communications is plays a spirited role in wireless communication network.

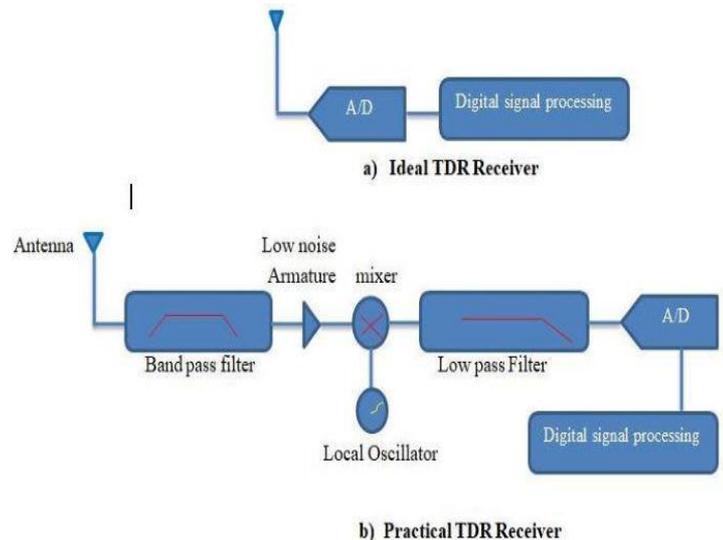


Fig.2:Track Defined Ratio Architecture

TDR is changing towards the ideal and feature TDR's to be replacing with an intelligent system controlled front end RF. It controls the range of the communication system in the main while of modulation techniques, filtering, frequency bands and bandwidths aiding its flexibility to numerous wireless canons. The Digital-Advanced Mobile Phone Service (D-AMPS) also uses FDMA but adds time division multiple access (TDMA).

TDR's Reconfigurable to allow the programmability of the standard structure to build an extra hardware is to be added to the basic module. In FPGA's (field programmable gate arrays) Gate array - a custom VLSI circuit consisting of huge number of unconnected gates. Circuit functioning is to be determined at the field by the user. Pre-tested for manufacturing defects. FPGA's are having Re-programmable logic components, Re-programmable routing resources and Re-programmable I/O blocks.

In QPLC's are Pre-laid clock trees, integrated big RAM blocks, DLLs, Embedded CPU cores, Special I/O's and Mathematical functions.

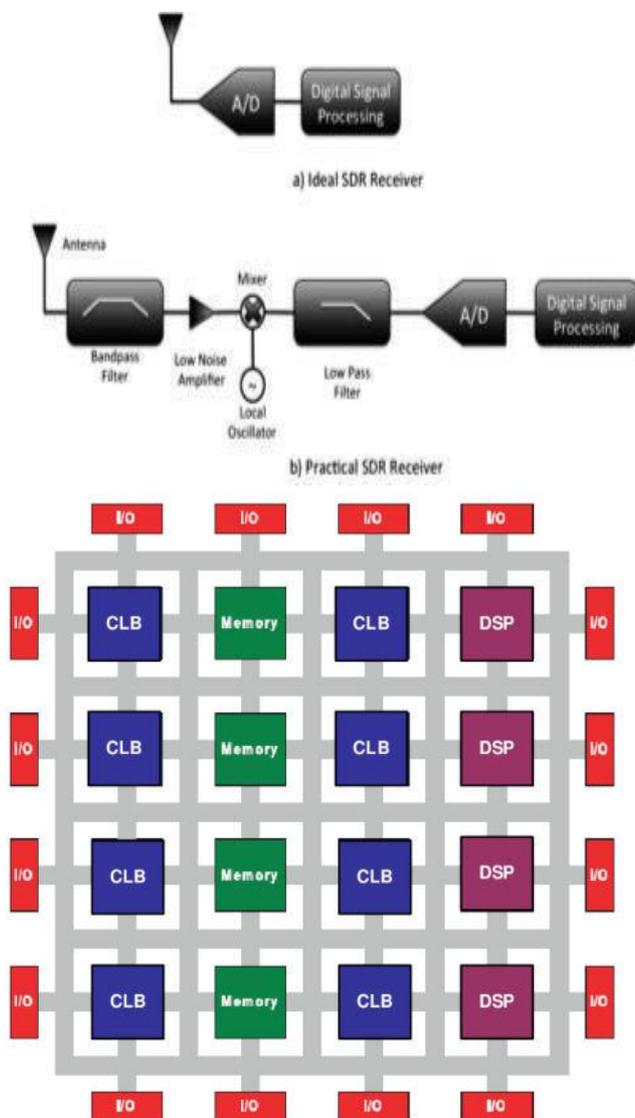


Fig.3: FPGA Structure

Present-day FPGA purveyors include Xilinx FPGA, Altera FPGA, Micro semi FPGA, Lattice FPGA, Tabula FPGA, Quick Logic FPGA among others. Each purveyor has follows its own architectural design approach. A FPGA, see Figure 3, is a reconfigurable logical device involving a group of small logic blocks are to be distributed in a interconnection of array elements. They provide a high computational power while comparing to the other processors.

In Digital signal processing, the audial range providing by a floating point representation, most of the cases fixed-point representation on DSPs and FPGAs are to be provide by a hefty speed and cost value owing to their keen cores. Static apropos process speed, once consecutively a package on a GPP it has various fixed-point swell/hoard cores formerly they were be a far-faster in fixed-point. To comparing the other chips a standard x 86 chips may be slower in fixed point. A floating point depiction will be having a high accuracy rate.

The advance of wireless systems is a long-lasting process that comprises many phases, and then at certain point, corroboration on a hardware test is needed to validate a theoretical and simulation work. Such test beads are used not only for theory verification, but they were also some concepts that can only be truly studied in practice (for e.g., interference modelling).

In a distributed antenna, the radio signals are equally process at a mid-point, therefore the enabling co-efficient interference modification, space diversity besides identical coverage esoteric the cell. Newly, some of the practical centralized pre-coding schemes are to be employed in the painstaking platform. Two centralized multicellular pre-coding schemes based on the water filling technique have been proposed. These techniques are to be achieving a close to the optimal weighted parallel interference cancellation algorithm. A blocking cell optimization (BCO) supportive multi-cell scheme was proposed in [11], the weighted sum-rate attainable for all the user stations (US's) is exploited. A auspicious unified pre-coding structure centred on Zero-Forcing (ZF) condition through numerous power distribution approaches, to reduce the average BER and signal-to-noise ratio (SNR) was proposed in [13]-[14].

The main object of this paper is to implementation of an FPGA based single carrier frequency division multiple accesses (SC-FDMA) receiver with a frequency domain, time domain synchronization using the Xilinx ISE Design suite and Xilinx system generator for DSP processors. System generator will be follow the high-level of abstractions built into Mat lab. The system will be automatically compiled into an FPGA.it provides a user defined primitives of a boundary between software and hardware, it will enables to the hardware design through allowing logical blocks will be synthesize into Verilog and compile them into FPGA.

II. BACKGROUND AND RELATED WORK

SCFDM is a single carrier bandwidth efficiency scheme used in digital communications, The main difference is conventional frequency domain multiplexing (FDM) is that frequency domain of the SC-FDMA sub-carriers overlap to each other, providing spectrum efficiency.SC-FDMA operations are conceded into a digital field, there are more platforms able to design an SC-FDMA system suitable for TDR development.

TDR can be recognised between two main fields: hardware fields and software field. The hardware features of an TDR consist radio frequency parts and communication contacts to the software-based signal processing. The lasting parts will be composed in a DSP's, FPGA.

The Tera-ASIC is chooses Enyx to propose ultra-low latency growth structure and design facilities for their latest FPGA platform. Here we are using the DE2i-150 board it's having the four modules each module associate a multiplicity of Altera Cyclone-IV, letting the provision of 30 million of gates design for each module.it runs logic up to 700 MHz in the digital communication speed at 720 Gbps per module, along through a lithe expansion such as HDMI.it explores the large amount of the data will be possess parallel. Similarly most of

the systems are to be implemented for a design flow model in the process of system generation.

In the view of Software architecture, GNU & C++ is open-source [4] software development toolkits distributed under the General Public License. It provides a set of audio signal processing library's to implementation of the processing blocks are required to transmit the sub-system. It runs only on Linux-based machine processing platform. In graphical flow of the systems they used python programming language.

To implement the RF communication systems one external hardware is rapidly used in communications. An SC-FDMA modulation/demodulation having two synchronization options and error-regulatory techniques is described in [6]-[9]. The working process of SC-FDM signals with Quaternary Phase Shift Keying (QPSK) and Binary Phase Shift Keying (BPSK) modulation techniques are to analyse the package ratio used for eminence service process. To design a super-position technique of SC-FDMA systems are used in GNU Radio processing in FPGA [11]-[13] modulators using the Xilinx ISE suite for the DSP based level designs are to be found [14]-[15].

### III. THE SINGLE CARRIER FREQUENCY DIVISION (SC-FDMA) MULTIPLEXING TRANSCEIVER

#### A. Test bench Architecture

SC-FDMA transceiver of the systems, that data will be generated erratically through an Inverse Fast Fourier Transform (IFFT) of phase shift keying (PSK) sign arrays through 1024 sub-carriers. The cyclic prefix tree is added to the IFFT and symbolic representation is turned into original frames. A Logical look-up conversion is formed by the Digital up conversion block. A DUC is a set of two interpolated filters. They are cosine filters and Half-band filters.

The Direct Digital Synthesize (DDS) and mixer blocks are to be performs translation of frequency into an intermediate frequency and attained by mixing of the frame through DDS. and another translator is used in the Receiver side to transforming signals of the inverse Fourier base band signalling blocks are there in a system. Top-Down conversions of the matched filters are to be performed by a set of similar filters as first one will be used in the transmitter block by using a digital top-down conversion.

When the esteemed offsets of the signals are performed, the frame to symbol and also carrier frequency offset correction blocks implements the reparations. A Fast Fourier Transform (FFT) signals are shifted data into Frequency domain. A lower state channel is applied to recover the esteemed state channel information and zero frequency analyser spread over the valuations.

In both perilous of the receivers are time -domain synchronized and device channel estimation signals of the sub-systems.

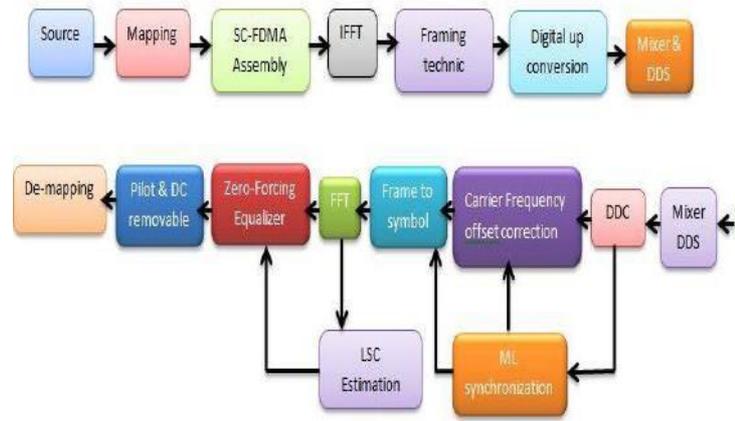


Fig.4: Mapping Architecture of transceiver

Inside the time-domain synchronization process we were calculate the frame levels of time and frequency of equalizer among the resident oscillators and Radio frequency carrier signals. In the carrier channel frequency assessment will be rectified through an equaliser.

#### B. Peak - Time organisation

In a de-modulation technique, the receiver signals are to be performing a digitalized framing signals and carrier signal synchronization. In order to define the signal synchronization of the phase and frequency among the transition and receiver section. All the sub carrier signals are shifted from the projecting diffusion to pattern plugs.

$$G. \quad x = k. (x - \tau). e^{j 2\pi\epsilon_0 k / N} + n \quad x$$

Here  $\epsilon_0$  is minimized the carrier signal optimization, T is the arrival framing time.  $k(x)$  is transmitting signal, N is no.of sampling signals,  $n(x)$  is the Gaussian noise,  $x$  is the sampling index of each signal up to 1024.

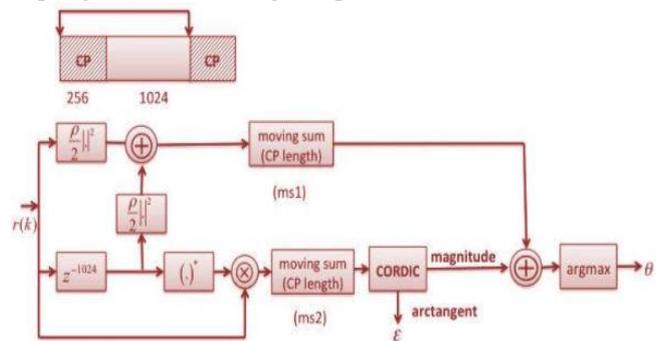


Fig.5: Peak estimation algorithm architecture

We are not using these types of preface conditions on our systems, while we are using a loof structures in each frame for time-domain synchronization owing the auto-correlation assets are given from a part of 3Gpp long term evolution interfaces. In above figure was choosing the design complexity and it's easily changed to take the adoptive gain of a loof systems.

C. Frequency domain channel estimation

Frequency domain channel estimation process will be existing in wireless systems. In this type of wireless systems are braced in the receiver section to eradicate the multi-path phase tracks inside the receiver segment. In SCFDMA systems acquire a precise stands to attain the high possessive spectral density and compactness of demodulation process. Somewhere the frequency response of co-channels by using the discrete sub-carrier frequencies require to accurate esteemed process used in decoding systems. Moreover the synchronization process boons a segment offset register uncertainty later frequency offset correlation must be highly esteemed by the source channel estimator and removing the equalization of system process.

In this process we conferred the uses of circular patterns espoused by the standard LTE with certain variations, here we are taking 24 frame SCFDMA carrier guides in their 1<sup>st</sup> and 10<sup>th</sup> and 19<sup>th</sup> symbol. The carrier guide sub-carriers are optimized and equip-power, equip-distance to achieving the low mean-square error (LMSE).

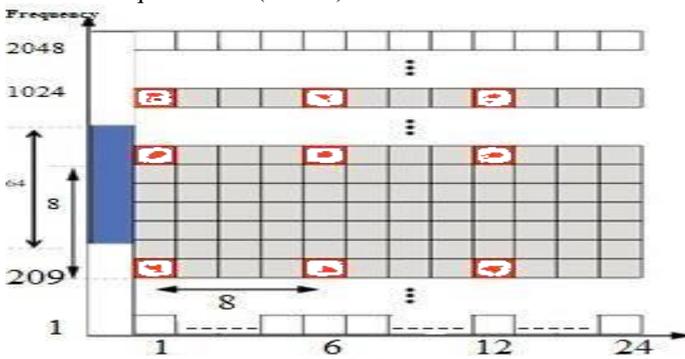


Fig.6: Frame structure

The proper distances of aviators are having 8 subcarriers. In the starting bit and ending bits are not laden building-up of the band Pickets on each and every gamut to comprise the phantom leakage of SC-FDMA systems.

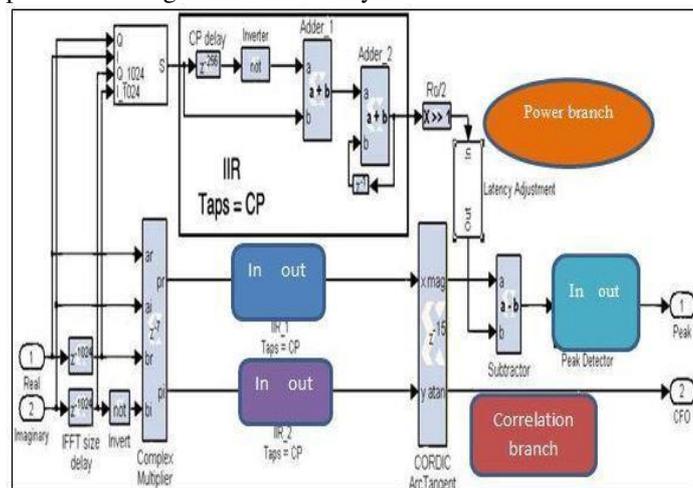


Fig.7: Peak estimation algorithm on Xilinx System Generator for DSP

To overcome these issues to extort the brink of sub-carriers with this subsequence of the assessment accuracy, the

espoused framing structure has guides at both brink sub-carriers. In initial stage of work, the guided sub-carriers are using the whole estimator. These conventional estimators are not taking any improvement on the parallel link process the sub-carriers an depends on the time dominie and frequency dominie nor it does across the prior information channel statistics are obtain to estimate, but on another hand to reduce the complexity and requiring the inversion capacity of multiplexing sub-carriers. To check the value of receiving the n<sup>th</sup> sub-carrier k (n) will be stated as

$$s_n \quad p_n \quad q_n \quad k_n \rightarrow$$

Where q (n) is the effecting channel of the n<sup>th</sup> sub-carrier. The estimation output channel can be stated as

$$q^{\wedge}(n) = k(n) / p(n) = q(n) + k(n) / p(n) \rightarrow$$

that it can be taken as strident sections of the carrier channel frequency interference (CFI).

IV. PEAK ASSESSMENT, FRAME SYNCHRONIZATION AND CFI SYNCHRONIZATION.

In a time domain synchronization algorithm will be divided in to three subcarriers.

A. Assessment of arrival time (T<sub>a</sub>) and carrier Frequency (F<sub>c</sub>).

In this algorithm is presented on the carrier sub sequent of the framing structure and it's will be adopted from the framing patterns on the above Figure (5). Peak channel feats the carrier frequency interference by comparing with the delayed version. Again a pattern is repeated to detect the arrival framing time and phasing patterns gives to the channel frequency interference.

In this algorithm will showed in the three branches .then first one is to calculating the rising time and second one calculating the falling time and last one calculating the correlation time. These are required to estimate the arrival time and phase offset.

$$Es_1 = \frac{\rho E}{2} \sum_{k=m}^{k+1} \gamma |(I)|^2 + |\gamma(I + N)|^2 \rightarrow (4)$$

$$Es_2 = \frac{IE}{2} \sum_{k=m}^{k+1} \gamma (I) \cdot \gamma * (I + N) \rightarrow (5)$$

Here Equation (4) is to show the calculation of rising time and Equation (5) is to show the calculation of the correlating time. ρ is the magnetic coefficient between γ(I) and γ(I+N) it depends on SNR but it can be set at the same. Both moving sub-carriers are designed by using the Harman filters.

The code multiplier is to boons on system libraries performing the multiply operations during the sub-system. In order to continue the two operations are performed on the foot layer. A composite module generate the peak channel it's to be associate the tardy type and to estimate the angle between the IR signals

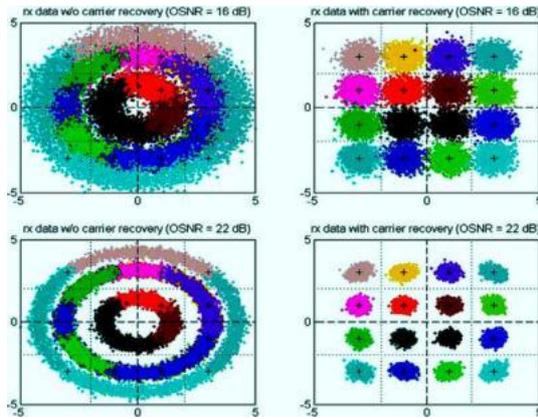


Fig.8: SC-FDMA symbol constellation with rx data W/o Carrier recovery (OSNR= 16 dB & 22 dB)



Fig.10: FPGA hardware platform set-up

System Parameters	
Baseband frequency    Bandwidth	20 MHz    10 MHz
FFT size    CP size	2048    512
Modulation	PSK - 16QAM
Subcarrier separation	30 kHz
Symbol duration (Symbol +CP)	68.78 + 18.56 = 87.34 *s
IF sampling frequency	98.64 MHz
Oscillator frequency	30 MHz

Table.1: System parameters

In system libraries are providing a Gaussian allusion block that it can be implement a rectangular eclipse direct transformation by using a Gaussian algorithm in globular vector mode, it calculates a magnitude and impious angle equation (6),(7) respectively.

$$|L, P| = \sqrt{L^2 + P^2} \quad \rightarrow(6)$$

$$\text{Avg} = 2\pi\epsilon_0 = \text{arc} (L / P) \quad \rightarrow(7)$$

If assume that the offset between the oscillators are lower than the single sub-carriers. A division operation is accomplished to build the arrival framing detection, but these types of operations in hardware mode is costly that's why it should be avoided. The compiled angle is only way to use find peak is spotted, to conforming the channel frequency interference (CFI) is to use if correlating is ample.

1) Carrier channel Frequency Interference (CFI)

Carrier channel frequency interference is attained with using the Harman filters to executing a switch function.to correlating a vector function (L,P) by angle  $\Phi$  springy a new functioning a vector(L',P')

$$L'(I) = L(I) \times \cos \Phi - P(I) \times \sin \Phi \quad \rightarrow (8)$$

$$P'(I) = P(I) \times \cos \Phi + L(I) \times \sin \Phi$$

Where,  $\Phi = 2\pi\epsilon_0 \frac{1}{N} \quad \rightarrow (9)$

By taking the angle it can be attained at section A, if the angle is divided by N samples and each sample can be quashing the phase equalizer of each emblem.

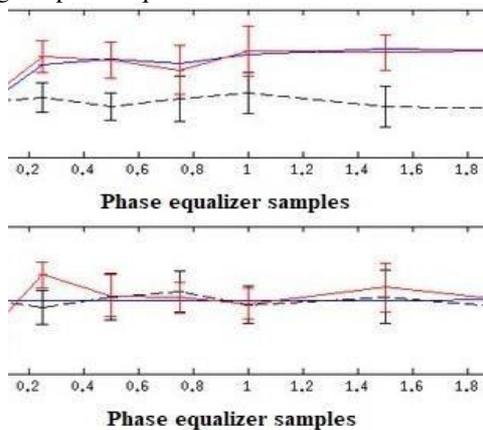


Fig.9: Peak detection phase equalizer samples

V. SIMULATION & RESULTS

This Design process will be compiled and executed on Xilinx software, which allows a simulation of system to be completely run on Hardware (FPGA) .while showing the results on Modelsim software.it, can be enable to accurate hardware exhibiting along with quick simulation and faster design. This is the easiest way to calculate the hardware verification by implementing the contrived algorithm using the Altera FPGA. In impartial way is to get both Software and Hardware working principles on prototyping stage. In this simulation model was using on the DE2i-150 board is able speed up the responsiveness of the system which contains a Altera Cyclone IV GX FPGA and an On-board USB-Blaster with JTAG and AS mode configuration; 128MB SDRAM; 4MB SSRAM; 64MB Flash and 802.11 b/g/n; Bluetooth 4.0; SSD 64GB; HDMI 1.3a;VGA output see Figure10.

In the test parameters of a wired co-channel systems are run at clock frequency ranges are 98.64 MHZ with an IF of 20 MHZ. The BER hardware results are acquired by using the simlink software. The speculative results are gained from an altered Mat lab SC-FDMA chain.

In Figure 11 illuminate the BER ratio of theoretical and practical effects for four altered simulations: to attain a flawless CSI, there is without time domain synchronization of a RF equalizer and with time domain synchronization of RF equalizer.

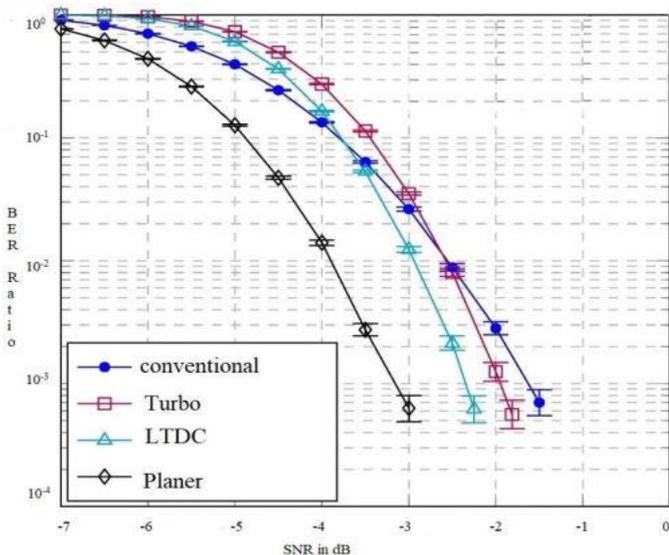


Fig.11: Baseband BER Ratio for 4 simulations

## VI. CONCLUSION AND FUTURE SCOPE

A Full baseband signal of RF design was presented focused on the synchronizing and channel estimating algorithm. In this total graft will be performed by using the Xilinx software, chipset pro-tool and validate with Mat lab simulation link. FPGA simulations are possible by using a floating point representation but some of the blocks are functioning on the system libraries to allow such type of floating point operations are used in hardware systems. When the parallel link is occurred the correlated angle should be uttered has a Flat line. But, due to lower Precision will be occurred on fixed point presentation. There are some instantaneous links on the same fixed point line. Our BER results shows that there is no pertinent humiliation between the Mat lab Floating point and FPGA fixed point simulations, we are limiting the bit registers width along with the Floating point algorithm and different system parameters.

In the next stage is to short out the SC-FDMA system generator parameters to words the 5G green communications.

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## Author's Profile-



Javalkar Dinesh Kumar received his B.Tech. Degree in Electronics and Communication Engineering from the Anantha Lakshmi Institute of Technology & Sciences, Anantapur, JNTUA, A.P, India, in 2012. and the M.Tech Degree in VLSI System Design from JNTU Hyderabad, T.S, India, in 2014 and Now pursuing Ph.D. Degree in school of

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(corporate affairs), He has developed test and measuring instruments like High voltage tester, VHF Wattmeter, standard signal generator, AM/FM modulator, wireless Beacon, high power and low sensitivity, low distortion audio amplifiers, wireless microphone and many more during the span of 25 years (1981-2007). His research area includes wireless communication,

satellite communication & acoustics, antennas, neural networks & artificial intelligence, Brain mapping, image processing & pattern recognition, early diagnosing of breast cancer and so on. Reviewer for various national and international journals, and has published 162 papers in various national & international journals and conferences.

# ARCHIVES

## FPGA Design & Implementation of SC-FDMA Carnal Layer for TDR-based Applications

 Javalkar Dinesh Kumar, Dr. Alok agarwal and Dr.S.V.A.V. Prasad

### Abstract

Single Carrier Frequency Division Multiple Access (SC-FDMA) technique places a vital role in the wireless communications. As per its ability to certifying the high level toughness against the nosiness. Now presents a paper on a high output low power consumption and low complexity of SC-FDMA transceiver. SC-FDMA is a modulation technique it's generally recycled in the several high speed wireless communications and also various wireless mobile communications systems like as, secure Wi-Fi communication system (IEEE 802.11a), wireless mobile systems (IEEE 802.11b), static Wi-MAX systems (IEEE 802.16a), and wireless mobile Wi-MAX system (IEEE 802.16e standard). Now, in this paper, FPGA Design and implementation of SC-FDMA systems are drives classically. Additionally, a graphical design of the systems is simulated. in the simulation process the SC-FDMA using MATLAB it will observes in a practical manner. In our proposed modules were designed by a using Verilog software development language. In a transceiver is very useful on Field-Programmable Gate Array (FPGA) through Xilinx System Generator designed for DSP. Our research display we are proposing the transceiver utilization of the piece Look up table's (78.10%) plus (66.10%) of wedge registers on Virtex-7 FPGA, working by an extreme frequency 120MHz, Our design have the high PAPR, low power consumption.

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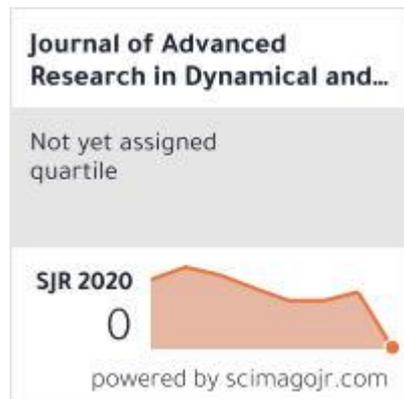
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# Effectiveness of enhanced external counter pulsation on clinical profile and health-related quality of life in patients with coronary heart disease: a systematic review

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## Abstract

**Introduction.** *Enhanced External Counter Pulsation (EECP) is a non-invasive United States Food and Drug Administration (FDA) approved outpatient treatment option for the complex problem of angina, a common symptom of coronary heart disease. A systematic review of the literature searched to assess the effect of EECP on the clinical profile that comprised physiological measurements, biochemical assessments, cardiac clinical symptoms, physical functional status, and Health-Related Quality of Life (HRQoL) in Coronary Heart Disease (CHD) patients.*

**Material and methods.** *Total 258 EECP research articles from the early stage of EECP development to till date screened. Out of 258 EECP articles, total 60 articles (53 EECP articles for clinical profile and 7 article for HRQoL matched the inclusion criteria and other (n = 198) articles excluded due to irrelevant to study objectives.*

**Results.** *All enrolled studies showed a significant improvement in angina pectoris and HRQoL with reduction of nitroglycerine use and exercise tolerance. There are several gaps in research has been found for further research to evaluate the EECP effectiveness on Body Mass Index (BMI), Heart Rate, Cholesterol, Triglyceride, High Density Lipoprotein (HDL), Low Density Lipoprotein (LDL), HbA1C, SpO<sub>2</sub>, Vo<sub>2</sub>max level with a comparative assessment of cardiac and non-cardiac metabolic markers including blood glucose.*

**Conclusions.** *There is further need of multi-centric randomize controlled trial studies to evaluate the effect of EECP on obese, diabetic, hypertension and other metabolic disease patients and more research required for further modifications in EECP device to cure, prevent and treat chronic diseases by the non-invasive procedure.*

**Key words:** enhanced external counter pulsation, angina pectoris, health-related quality of life, coronary heart disease

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## Introduction

Cardiovascular disease, especially Coronary Heart disease (CHD) is the number one killer and foremost

cause of deaths around the world [1]. Angina pectoris, the prime symptom of coronary heart disease ranked first among causes of mortality [2]. The current non-pharmacological and non-invasive therapy available

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for chronic stable angina (a typical symptom of coronary heart disease) and heart failure is Enhanced External Counter Pulsation (EECP). EECP is USA-FDA approved therapy for coronary heart disease patient [3]. EECP, an electro-mechanical system is a registered trademark of Vasomedical, Inc, New York, USA and PSK (Chinese Company) is the exclusive distributor of Vasomedical's devices all over the world [4–8]. CHD patients usually undergo EECP treatment of 35 consecutive 1-hour sessions over 5–7 weeks. Treatment patient is continuously monitored for cardiac outputs, heart rate and spo2 using ECG and finger plethysmogram, which are connected to the EECP device [9–11]. This study designed to evaluate the effect of EECP in Clinical profile and HRQoL in CHD patients.

### Material and methods

#### Searching methods

A systemic review of the literature of EECP on clinical profile and HRQoL in coronary heart disease patients was search through PubMed, Medline, Vasomedical EECP manufacturer web-link, and Google scholar sources. Searching for the articles done as per the inclusion and exclusion criteria of the study and the studies summarized in Figure 1.

#### Inclusion criteria

EECP article of Randomized Control Trial (RCT), case studies, prospective and retrospective studies on clinical profile and HRQoL in coronary heart disease patients were included.

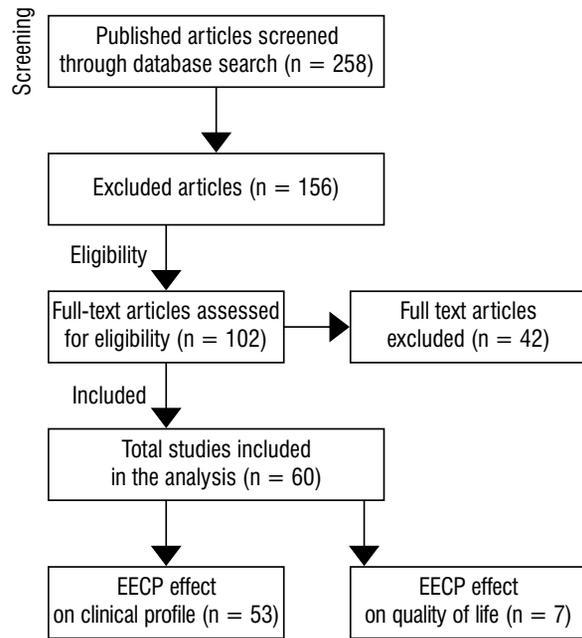


Figure 1. Flowchart of screened and included studies

#### Exclusion criteria

Heart Failure studies, Non-cardiac EECP studies with RCT, Case studies, Prospective and Retrospective and reviews of EECP papers excluded from the study.

#### Quality assessment

Study quality was assessed through two authors independently. Newcastle-Ottawa scale (NOS) was used to assess the quality of studies. Detail of assessment is given in Tables 1, 2.

Table 1. Newcastle-Ottawa scale in the assessment of clinical profile included studies

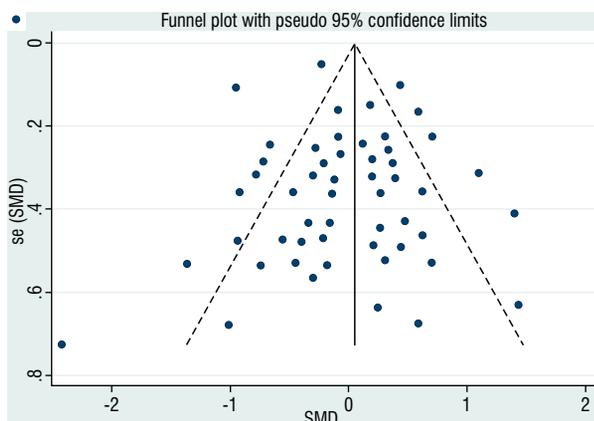
Study	Is the case definition adequate? (one point)	Representativeness of cases (one point)	Selection of controls (one point)	Definition of controls (one point)	Assessment of outcome (one point)	Adequacy of cohort follow-up (one point)	Was follow-up long enough for outcomes to occur? (one point)	Comparability of cases and controls on basis of design or analysis (two points)	Total score (nine points)
Lawson et al. 1992	1	1	1	1	1	1	1	2	9
Sjukri et al. 1995	1	1	1	1	1	1	1	2	9
Arora et al. 1999	1	1	1	1	1	1	1	2	9
Lawson et al. 2000	1	1	1	1	1	1	1	2	9
Lawson et al. 2000	1	1	1	1	1	1	1	2	9
Urano et al. 2001	1	1	1	1	1	1	1	2	9
Stys et al. 2001	1	1	1	1	1	1	1	2	9
Barsness et al. 2001	1	1	1	1	1	1	1	2	9
Springer S et al. 2001	1	1	1	1	1	1	1	2	9
Lakshmi et al. 2002	1	1	1	1	1	1	1	2	9
Stys et al. 2002	1	1	1	1	1	1	1	2	9
Michaels et al. 2002	1	1	1	1	1	1	0	2	8

**Table 1. cont.** Newcastle-Ottawa scale in the assessment of clinical profile included studies

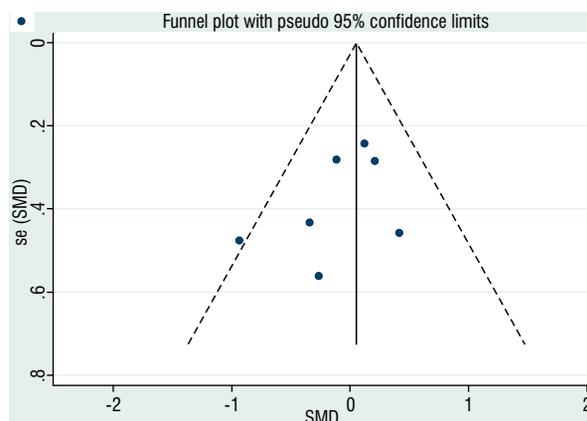
Study	Is the case definition adequate? (one point)	Representativeness of cases (one point)	Selection of controls (one point)	Definition of controls (one point)	Assessment of outcome (one point)	Adequacy of cohort follow-up (one point)	Was follow-up long enough for outcomes to occur? (one point)	Comparability of cases and controls on basis of design or analysis (two points)	Total score (nine points)
Soran et al. 2002								2	9
Fitzgerald et al. 2003								2	9
Bonetti et al. 2003								2	9
Schechter et al. 2003								2	9
Tartaglia et al. 2003								2	9
Werner et al. 2003								2	9
Lawson et al. 2003								2	9
Linnemeier et al. 2003								2	9
Linnemeier et al. 2003								2	9
Bagger et al. 2004							0	2	8
Michaels et al. 2004								2	9
Lawson et al. 2004								2	9
Masuda et al. 2004								2	9
Henrikson et al. 2004								2	9
Taguchi et al. 2004								2	9
Lawson et al. 2005								2	9
Michaels et al. 2005								2	9
Arora et al. 2005								2	9
McCullough et al. 2006								2	9
Soran et al. 2006								2	9
Akhtar et al. 2006								2	9
Nichols et al. 2006								2	9
Lawson et al. 2006								2	9
Novo et al. 2006								2	9
Loh et al. 2006								2	9
Arora et al. 2007								2	9
Michaels et al. 2007								2	9
McCullough et al. 2007								2	9
Yavari et al. 2007								2	9
Loh et al. 2008								2	9
Erdling et al. 2008								2	9
Buschmann et al. 2009								2	9
Esmailzadeh et al. 2009								2	9
Soran et al. 2012								2	9
Eslamian et al. 2013								2	9
Bozorgi et al. 2014								2	9
Beck et al. 2014								2	9
Tabary et al. 2015								2	9
Subramanian et al. 2016							0	2	8
Beck et al. 2016								2	9

**Table 2.** Newcastle-Ottawa scale health related quality assessment of included studies

Study	Is the case definition adequate? (one point)	Representativeness of cases (one point)	Selection of controls (one point)	Definition of controls (one point)	Assessment of outcome (one point)	Adequacy of cohort follow-up (one point)	Was follow-up long enough for outcomes to occur? (one point)	Comparability of cases and controls on basis of design or analysis (two points)	Total score (nine points)
Arora et al. 2002								2	9
Kumar et al. 2009								2	9
Wu et al. 2012							0	2	8
Ziaeirad et al. 2012								2	9
Jorgensen et al. 2013								2	9
May et al. 2015							0	2	8
Shakouri 2015								2	9



**Figure 2.** Funnel plot of included studies in clinical profile — EECP



**Figure 3.** Funnel plot of included studies in HRQoL — EECP

**Statistical analysis**

Statistical analyses were performed using RevMan 5.0 (Cochrane Collaboration). A random-effects model was used with weighted mean difference (WMD) in clinical profile and HRQoL from pre-EECP to post-EECP. Bias in studies was assessed through visual inspection of the funnel plot as well as Begg’s and Egger’s testing. Detail of analysis is given in Figures 2 to 5.

**EFFECT OF EECP ON CLINICAL PROFILE IN CORONARY HEART DISEASE PATIENTS**

Lawson et al. [12] conducted a study on 18 patients with chronic angina treated with an improved system of enhanced external counter pulsation (EECP) and found that all patients improved in angina symptoms and generally decreased anti-angina medications. A decrease in myocardial ischemia observed in 67% patients and 89% of patients were symptom-free. Sjukri et al. [13] carried out a study on 201 coronary heart disease

patients. The results of the study showed significant improvement in coronary perfusion by 86.8% and exercise tolerance by 94.2%. Arora et al. [14] performed a multi centric prospective randomized control study to assess the safety and efficacy of enhanced external counterpulsation (EECP). A significant improvement in angina severity and exercise tolerance and timing was reported. EECP showed well tolerated and safe therapy for CHD patients. Lawson et al. [15] carried out a study on 33 patients to evaluate the effect of EECP on long-term prognosis in CHD patients. The study suggests that particularly for the majority of patients demonstrating improvement by 64% in radionuclide stress perfusion post-treatment and EECP may be an effective long-term therapy. Lawson et al. [16] conducted a cohort study in 2,289 CHD patients to evaluate EECP safety and efficacy. EECP was found to be safe and well-tolerated therapy with improvement in angina class by 74% with significant p-value ( $p < 0.001$ ). Urano et al. [17] performed a study on 512 CHD patients to examined EECP efficacy in myocardial ischemia, exercise tolerance and cardiac

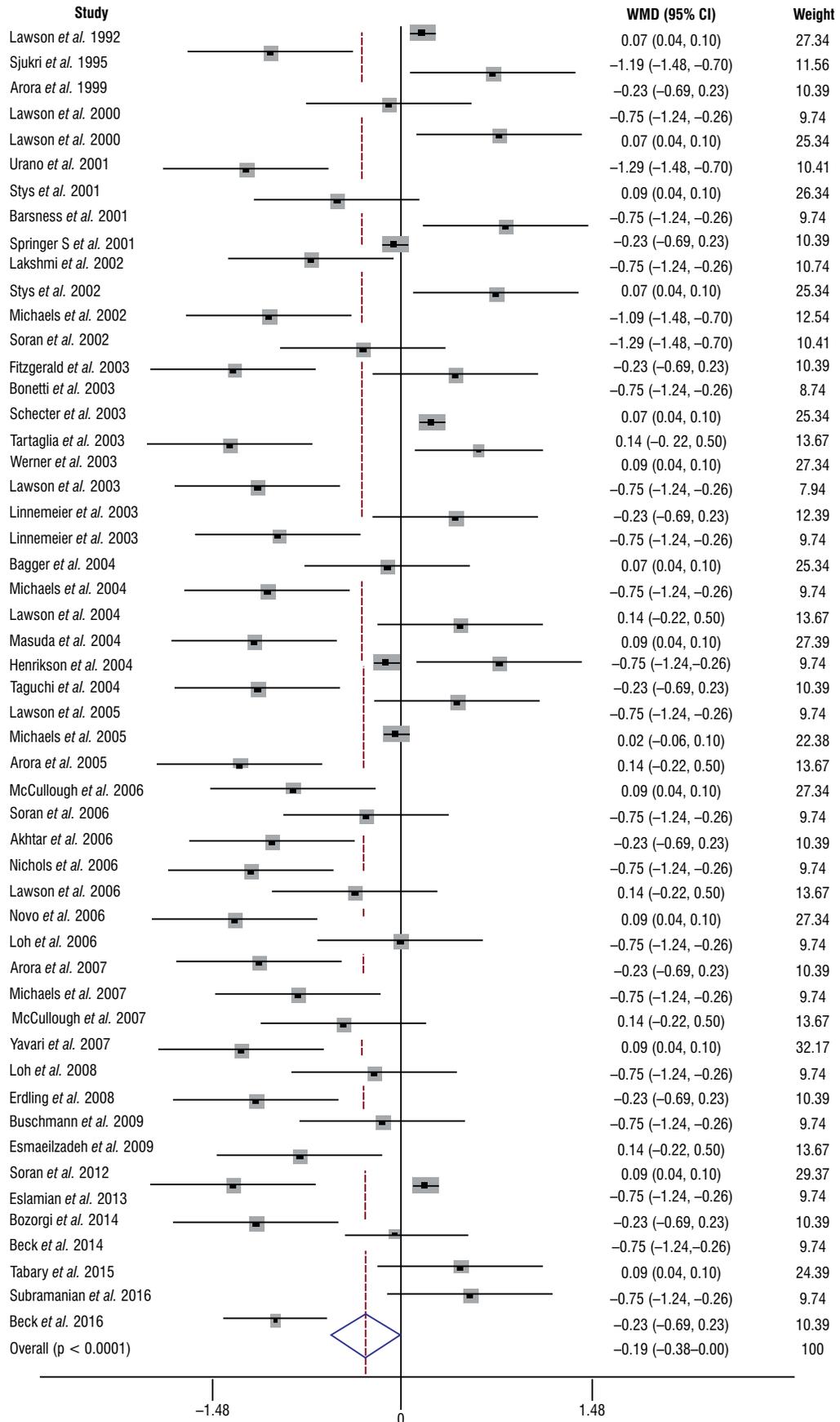
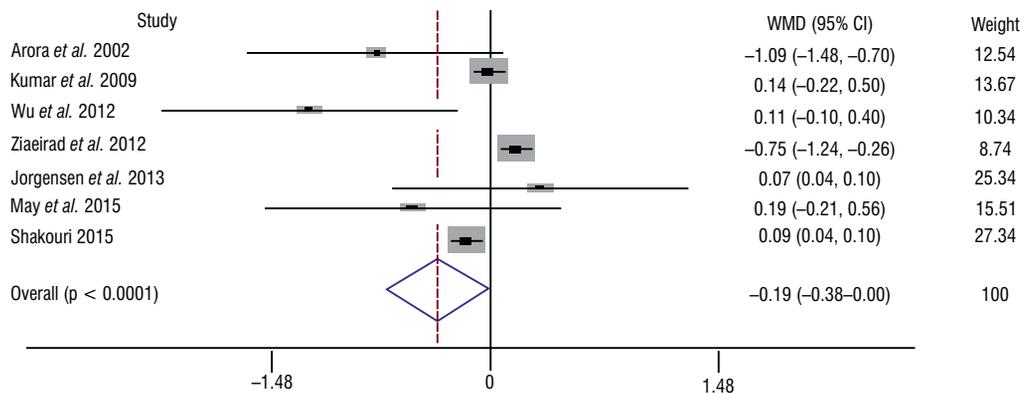


Figure 4. Forest plot of weighted mean differences in clinical profile in pre- and post-EECF



**Figure 5.** Forest plot of weighted mean differences in HRQoL in pre- and post-EECP

function. The result of the study reveals the improvement in exercise test parameters reduced myocardial ischemia by thallium scintigraphy in association with improved LV diastolic filling in patients with stable CAD. Stys *et al.* [18] carried out a clinical registry of 37 centers with the enrollment of 395 chronic stable angina patients to examine the relation of the ER to post treatment improvement in Canadian Cardiovascular Society (CCS) angina class. After EECp, CCS improved by at least I class in 88% of patients, 87% of men and 92% of women. EECp is effective in improving CCS in chronic stable angina patients. Barsness *et al.* [19] performed a study on 1246 CHD patients to determine whether EECp is a safe and effective treatment for patients with angina pectoris. The results demonstrated significant improvement in angina and reduction in nitroglycerine anti-angina drugs by 61.7%. Springer *et al.* [20] conducted a study on 28 CHD patients to assess psychological function and well-being status and observed significant improvement in psychological and well-being status. Lakshmi *et al.* [21] carried out a study on 2486 patients those were enrolled in the IEPp. The study revealed a significant improvement in angina class in patients whose DA ratio was increased and results sustained for 6 months. Stys *et al.* [22] performed a study on 175 CHD patients and found a significant improvement in angina class in 85% of patients. This study results showed the EECp effectiveness in improving stress myocardial perfusion with exercise tolerance in CAD patients.

Michaels *et al.* [23] conducted a study on 10 CHD patients and found the significant improvement in diastolic and mean pressures with reduction of systolic pressure in the central aorta and the coronary artery of CAD patients. The study concludes that EECp may serve as a potential mechanical assistant device for CAD patients. Holubkov *et al.* [24] carried out a study on 771 CHD patients treated with EECp and the results of this study conclude that EECp may be a safe treatment option for

CAD patients. Soran *et al.* [25] performed a study on 1402 CHD patients and the results showed that angina decreased by at least one class in 67% of patients with LV dysfunction just after completion of EECp treatment. Fitzgerald *et al.* [26] conducted a cohort study on 4669 CHD patients and found decreased angina episodes and nitroglycerin use and 74.8% reduction in Canadian Cardiovascular Society (CCS) functional class and improvement in angina sustained for 6 months. Bonetti *et al.* [27] performed a study on 23 CHD patients to examine the effect of enhanced external counter pulsation (EECP) on endothelial function and found that 70% patients get symptomatic relief by EECp treatment. The author revealed that significant improvement in endothelial function by EECp may benefit to the clinical status of CHD patients.

Schechter *et al.* [28] carried out a study of 20 CHD patients to investigate the influence of short-term external counterpulsation (ECP) therapy on flow-mediated dilation (FMD) in patients with coronary artery disease (CAD). The author revealed that external counter pulsation may improve vascular endothelial function and refractory angina pectoris in CHD patients. Tartaglia *et al.* [29] conducted a study on 25 CHD patients to determine the effect of EECp on exercise capacity and myocardial perfusion by comparing results of maximal exercise radionuclide testing pre- and post-EECP treatment. A significant improvement in treadmill times has been reported and radionuclide perfusion scores also showed a significant reduction in ischemic segments. Werner *et al.* [30] performed a study on 48 CHD patients and weekly angina episodes were reduced by 48%, nitroglycerin puffs were reduced by 51%, work capacity was improved by 22%. Study validates the reduction of angina with significant improvement of work capacity after EECp.

Lawson *et al.* [31] carried out a study on 4592 CHD patients and his collected data from international enhanced external counter pulsation (EECP) patient regis-

try showed significant improvement in angina by 73% in at least 1 class and 2 classes by 35.2% and 3 classes by 17.3%. The mean angina episodes per week decrease to 2.5 per week after EECP treatment and nitroglycerine uses per week after EECP was 2.5 times per week and improvement in functional status also observed in the study. Linnemeier *et al.* [32] conducted a study on 3037 CHD patients to determine whether enhanced external counterpulsation is a safe and effective treatment for angina in octogenarians. At 6-month follow-up, 81% of patients sustained angina improvement. This study concludes that enhanced external counterpulsation is effective and well tolerable non-invasive treatment. Linnemeier *et al.* [33] performed another study on 1532 IEPR patients. The author demonstrated that after 1 year, maintenance of angina rate was reduced in 86% of patients with diabetes. This study also suggests that in diabetes patients, EECP can be a safe, effective, well-tolerated treatment option for the relief of angina. Bagger *et al.* [34] carried out a study on 23 patients with angina pectoris with positive dobutamine stress echocardiogram. This study was done to evaluate EECP effectiveness on dobutamine stress-induced wall motion score among angina patients. The reduction in dobutamine-induced wall motion abnormalities after EECP therapy was reported.

Michaels *et al.* [35] conducted the long-term outcomes of enhanced external counterpulsation in 1097 CHD patients to relieve angina and improving the quality of life in a large cohort of patients with chronic angina pectoris. 73% patients had a reduction by at least 1 angina class at the end of treatment, and 50% reported an improvement in the quality-of-life assessment after enhanced external counterpulsation was; these results were sustained at 2-year follow-up. Lawson *et al.* [36] performed a study on 2861 CHD patients to examine the safety and effectiveness of EECP therapy. Post-EECP, patients had improved their CCS angina by at least one class. At 6-month follow-up, the CCS-class improved reduction in angina episodes and nitroglycerin use. Enhanced external counterpulsation was proved an effective therapy in relieving angina in patient's angina patients. Masuda *et al.* [37] carried out a study on total 18 CHD patients. Out of 18 patients, 11 were treated with EECP and 7 were treated 5000 IU heparin pretreatment along with EECP. The study was done to evaluate EECP and intravenous heparin injection therapy effectiveness in angina pectoris patients and the results of the study showed significant improvement in exercise capacity and oxygen metabolism of coronary heart disease patients treated with combination therapy of EECP and heparin.

Henrikson *et al.* [38] conducted a study on 28 CHD patients and found that post EECP most patients (82%)

had at least one full class improvement in their angina pattern. EECP remains an effective treatment for severe CAD. Taguchi *et al.* [39] performed study on 24 patients with myocardial infarction. This study was done to assess the haemodynamic effects of EECP and its mechanism with special reference to neurohumoral factors. The finding of this study suggests that an increase in ANP without an increase in BNP is an important mechanism for the effects of EECP therapy. Lawson *et al.* [40] carried out a study on 2007 CHD patients and demonstrated the angina reduction by 83% at least one CCS angina class and improvement in weekly angina episodes and their frequency of nitroglycerine use decreased with improvement in well-being status by 63%. Michaels *et al.* [41] conducted a study on 1192 CHD patients to assess the frequency, efficacy, predictors, and long-term success of repeat enhanced external counter pulsation (EECP) therapy in relieving angina in a large cohort of angina patients. After 2 years of EECP therapy, 70% of patients reported the significant decrease in angina and nitroglycerine consumption. Arora *et al.* [42] performed a study on 30 patients with stable angina pectoris having class II-IV. This study was done to assess the effect of EECP on vascular cell release of coagulation factors. The author reveals that EECP may not play a significant role in controlling coagulation factors in CHD patients.

McCullough *et al.* [43] carried out a study on 2730 obese heart patients to evaluate the association of baseline body mass index (BMI) on the outcomes of enhanced external counterpulsation (EECP) therapy for chronic stable angina. A greater reduction in weekly angina episodes from baseline to follow up observed and study conclude that reduction of angina is directly proportional to BMI value. Akhtar *et al.* [44] conducted a study on 13 CHD patients to evaluate the effect of EECP treatment on plasma nitric oxide and endothelin-1 level. This study concludes that EECP may increase nitric oxide and decreases endothelin-1 levels.

Soran *et al.* [45] carried out a cohort study on 363 CHD patients and post EECP treatment, there was a significant decrease in severity of angina class ( $p < 0.001$ ), and 72% patients were improved from severe angina and 52% of patients discontinued nitroglycerin use. At 2 years of follow up 55%, patients showed improvement in angina and prove that EECP is effective and durable therapy approach for CAD patients and 52% CHD patients discontinued nitroglycerin use. Nichols *et al.* [46] performed a study on 20 angina patients to prove the hypothesis of arterial properties and wave reflection characteristics favourably altered after EECP. The study revealed that EECP treatment may reduce arterial stiffness and can improve wave reflection characteristics in patients with angina.

Lawson *et al.* [47] conducted a study on 1458 CHD patients and found that EECP significantly reduced angina frequency, nitroglycerin use. Significant improvements in angina by 70–74% with reduction of nitroglycerine use by 52% with better well-being persist until 2 years of follow up. Novo *et al.* [48] carried out a study on 25 CHD patients to evaluate the efficacy of EECP on clinical symptoms, myocardial ischemia and cardiac perfusion in intractable angina patients. 84 per cent of patients showed an increment in at least one functional angina class and reduced inducible ischemia and maximal benefits observed in patients with worst systolic failure had been observed.

Loh *et al.* [49] did a study on 58 CHD patients to assess EECP immediate and long-term effectiveness in chronic stable refractory angina patients. This study results showed that angina improved at least one class CCS angina improvement by 78% after 1 year and increase exercise capacity with the reduction in nitroglycerine use. Arora *et al.* [50] conducted a study on 11 CHD patients to assess the effect of EECP on myocardial perfusion. In this study no significant effect on myocardial perfusion seen due to very less sample size and highly variable clinical responses. Michaels *et al.* [51] performed a study on 27 patients and significant improvement in heart rate variability in diabetic CHD patients and associated with reduced mortality rate had been reported. McCullough *et al.* [52] did a study on 902 patients from the IEPR. This study was done to evaluate the degree of residual angina on the clinical outcomes of EECP and conclude that residual high-grade angina pectoris occurs after post EECP in those patients who had the history of severe angina and multi-vessel disease.

Yavari *et al.* [53] conducted a study on 67 CHD patients to assess EECP efficacy in relieving angina and improving myocardial ischemia. The results of this study conclude that EECP is safe, effective and well-tolerated therapy for angina pectoris treatment. Loh *et al.* [54] did a study on 1477 CHD patients to evaluate EECP effectiveness. Immediately after EECP, angina reduction has been seen with  $p < 0.001$ . The improvement in CCS class was improved by at least 1 class in 78% of the patients and by at least 2 classes in 38% and sustained in 74% of the patients during follow-up for 3 years. Erdling *et al.* [55] carried out a study on 86 CHD patients and conclude that after EECP treatment 79% of patients showed improvement in CCS class immediately and 61.5% of patients sustained these benefits till 12 months and 29% at 2 years follow up. The author concludes that EECP is safe & effective for CAD with angina pectoris patients and patients with CCS angina class III & IV reported maximum improvement. Buschmann *et al.* [56] conducted a study on 23 CHD patients and found

improvement in CCS and NYHA class in CAD patients with significant improvement in pressure derived collateral flow index and fractional flow, which also increased. Esmailzadeh *et al.* [57] performed a study on 20 CHD patients to assess the effects of EECP on cardiac functions and found a reduction in NYHA angina class. Significant improvement was observed in LV systolic, diastolic function in angina patient. Soran *et al.* [58] conducted a study on 2072 patients and treated with EECP. Significant reduction by 76–84% in the severity of angina in CAD patients at 1 year of follow up was reported and both US and turkey group got good results. Eslamian *et al.* [59] performed a study on 50 CHD patients to assess Enhanced External Counter Pulsation (EECP) effectiveness on clinical symptoms, echocardiographic measurements, and perfusion scan parameters and exercise tolerancetest. A significant improvement was observed in angina severity and well-being status. Bozorgi *et al.* [60] did a study on 20 CHD patients with refractory angina. A significant reduction in angina classes III and IV was reported with sustained results for 6 months. The author concludes that EECP decreased symptoms and increased total exercise time and sustained these results for 6 months.

Beck *et al.* [61] conducted a study on 24 CHD patients and significant improvement in plasma level of nitrates, improved peak VO<sub>2</sub>, and reduced LV function with significant improvement in peripheral vascular function and functional capacity had been reported. Tabary *et al.* [62] performed a study on 48 CHD patients to assess clinical and para-clinical effects of enhanced external counterpulsation (EECP) effectiveness. Significant improvement in hemoglobin, LVEF, diastolic and systolic B.P, Chest pain, dyspnea and improvement in clinical conditions had been reported. Subramanian *et al.* [63] did a study on 72 CHD patients and found significant improvement in central systolic pressure, brachial systolic pressure, aortic pulse pressure, and augmentation pressure and augmentation index. Beck *et al.* [64] conducted the study on 17 CHD patients. The author concludes that EECP may be useful as an adjuvant therapy for improving functional classification and improve central blood pressure, aortic pulse pressure, wasted left ventricular energy, and myocardial oxygen demand in CHD patients.

## EFFECT OF EECP ON HR-QoL IN CORONARY HEART DISEASE PATIENTS

Arora *et al.* [65] conducted a study to assess EECP effectiveness on HRQoL. A significant improvement in HRQoL was observed at 12 months of follow up. The result shows improvements in HRQoL changes after EECP treatment. Kumar *et al.* [66] did a prospective

study and found that EECP significantly improved angina symptoms, dyspnea on exertion, and quality of life after 35 days of treatment and at 1 year follow up. EECP also improved the 6-minute walking capacity. Wu *et al.* [67] performed a study to evaluate EECP after six months regarding physical capacity and HRQoL in patients with refractory AP. Patients enhanced walking distance on average by 29 m after EECP. CCS class also improved and persisted at six months follow-up. HRQoL improved significantly and the effects maintained at follow-up after the treatment.

Ziaeirad *et al.* [68] did a quasi-experimental study on 64 patients to evaluate the QoL of patients with angina pectoris after treatment with enhanced external counterpulsation. The author reveals that EECP is an

effective noninvasive method in treating patients with angina pectoris and in developing their HRQoL. Jorgensen *et al.* [69] conducted a special case study of the 43-year-old woman who had 15 hospital admissions in six years due to angina. The case study proves the EECP effectiveness towards angina recovery and significant improvement in HRQoL. May *et al.* [70] performed a study to assess the effect of EECP on QoL and exercise capacity in CAD patients. Author of this concludes that quality of life and exercise capacity was improved after EECP. Shakouri *et al.* [71] conducted a study to investigate the effect of EECP on plasma nitric oxide (NO) and HRQoL in CAD patients. The author revealed that HRQoL and NO level increased after EECP treatment in CHD patients. Summary of studies given in Tables 3, 4.

**Table 3.** EECP effectiveness on clinical profile in coronary heart disease patients

Author	Study (year)	Title of study	Sample size	Findings & conclusion
Lawson <i>et al.</i> [12]	1992	Efficacy of enhanced external counterpulsation in the treatment of angina pectoris	18	Myocardial ischemia 67% decrease, exercise duration increased, reduction in anti-anginal medicines and 89% patients were symptom-free
Sjukri <i>et al.</i> [13]	1995	EECP in the treatment and rehabilitation of coronary patients in Indonesia	201	Exercise tolerance 94.2%, improvement in CCS angina class
Arora <i>et al.</i> [14]	1999	The multicenter study of enhanced external counterpulsation (MUST-EECP): effect of EECP on exercise-induced myocardial ischemia and anginal episodes	139	Exercise duration increase, angina severity reduced, extends times to exercise-induced ischemia, Nitroglycerine usage decrease
Lawson <i>et al.</i> [15]	2000	Long-term prognosis of patients with angina treated with enhanced external counterpulsation: five-year follow-up study	33	Improvement in stress perfusion after EECP, 64% did not suffer any major adverse cardiovascular event due to the effect of EECP at 5 year of study follow up
Lawson <i>et al.</i> [16]	2000	Treatment benefit in the enhanced external counterpulsation consortium	2289	74% angina pectoris patients improved in CCS angina class III & IV with significant p-value ( $p < 0.001$ )
Urano <i>et al.</i> [17]	2001	Enhanced external counterpulsation improves exercise tolerance, reduces exercise-induced myocardial ischemia, and improves left ventricular diastolic filling in patients with coronary artery disease	512	Improvement in Exercise duration and tolerance with improvement in LV function. Improvement in diastolic filling and diastolic function
Stys <i>et al.</i> [18]	2001	Acute hemodynamic effects and angina improvement with enhanced external counterpulsation	395	CCS angina class improvement by at least I class in 88% of patients
Barsness <i>et al.</i> [19]	2001	The International EECP Patient Registry (IEPR): design, methods, baseline characteristics and acute results	1246	Decrease in at least I anginal class by 81% and mean change decrease in anginal episodes per week ( $6.4 \pm 12.6$ ) with reduction of nitroglycerine use by 61.7%
Springer <i>et al.</i> [20]	2001	Psychosocial effects of EECP in the angina patient: A second study	28	Improvement in physical functioning and mental health with special reference to stress and QoL

**Table 3. cont.** EECP effectiveness on clinical profile in coronary heart disease patients

Author	Study (year)	Title of study	Sample size	Findings & conclusion
Lakshmi <i>et al.</i> [21]	2002	Relation of the Pattern of Diastolic Augmentation During a Course of Enhanced External Counterpulsation (EECP) to Clinical Benefit (from the International EECP Patient Registry [IEPR])	2486	At 6 months of follow up, the patients showed a higher reduction in angina class who had the greatest increase in the DA ratio as compared to those who had a decrease in the DA ratio
Stys <i>et al.</i> [22]	2002	Effects of enhanced external counterpulsation on stress radionuclide coronary perfusion and exercise capacity in chronic stable angina pectoris	175	85% angina improvement, improvement in stress myocardial perfusion and maximize exercise functions
Michaels <i>et al.</i> [23]	2002	Left ventricular systolic unloading and augmentation of intracoronary pressure and Doppler flow during enhanced external counterpulsation	10	Diastolic BP increase, Systolic B.P decrease and increment in coronary flow by 28% during EECP treatment
Holubkov <i>et al.</i> [24]	2002	Comparison of patients undergoing enhanced external counterpulsation and percutaneous coronary intervention for stable angina pectoris	771	Angina improvement in CCS class higher who received EECP therapy as compared to PCI group
Soran <i>et al.</i> [25]	2002	Enhanced external counterpulsation as treatment for chronic angina in patients with left ventricular dysfunction: a report from the International EECP Patient Registry (IEPR)	1402	Improvement in angina at least one class in 67% of patients with LV dysfunction 70.6% after 6 months of follow up
Fitzgerald <i>et al.</i> [26]	2003	Enhanced external counterpulsation as initial revascularization treatment for angina refractory to medical therapy	4,669	The decrease in anginal episode per week with significant value $p < 0.001$ , reduced nitroglycerine uses and CCS angina class reduction in 74.8 patients
Bonetti <i>et al.</i> [27]	2003	Enhanced external counterpulsation improves endothelial function in patients with symptomatic CAD	23	Enhanced peripheral endothelial function immediately after EECP treatment with a contribution to the clinical benefit of EECP
Schechter <i>et al.</i> [28]	2003	External counterpulsation therapy improves endothelial function in patients with refractory angina pectoris	20	Significant improvement in angina class ( $p < 0.001$ ), nitrate consumption decrease ( $p < 0.001$ ) with improvement in endothelial functions
Tartaglia <i>et al.</i> [29]	2003	Exercise capability and myocardial perfusion in chronic angina patients treated with enhanced external counterpulsation	25	96% patients improved by at least one functional angina class and exercise duration increased in treadmill exercise testing and reduction in ischemic segments
Werner <i>et al.</i> [30]	2003	Practicability and limitations of enhanced external counterpulsation as an additional treatment for angina	48	Anginal episode reduced by 48%, Nitroglycerine reduction by 51% and work capacity increase by 22%

**Table 3. cont.** EECp effectiveness on clinical profile in coronary heart disease patients

Author	Study (year)	Title of study	Sample size	Findings & conclusion
Lawson <i>et al.</i> [31]	2003	Analysis of baseline factors associated with a reduction in chest pain in patients with angina pectoris treated by enhanced external counterpulsation	4592	Significant improvement in angina by 73% in at least 1 class and 2 classes by 35.2% and 3 classes by 17.3%. Mean angina episodes per week decrease to 2.5 per week after EECp treatment and nitroglycerine uses per week after EECp was 2.5 times per week and improvement in functional status also observed
Linnemeier <i>et al.</i> [32]	2003	Enhanced external counterpulsation in the management of angina in the elderly	3037	Angina improvement in 81% at 6 months with a reduction in nitroglycerine use and improvement in well-being status with decrease rate of cardiac hospitalization has been observed
Linnemeier <i>et al.</i> [33]	2003	Enhanced External Counterpulsation for the relief of angina in patients with diabetes: safety, efficacy and 1- year clinical outcomes	1532	Significant improvement in CCS angina class by 69% in diabetes mellitus immediately after EECp and 86% at 1 year follow up, reduction in nitroglycerine use and improvement in well-being status has been observed and confirm that EECp is safe, effective and well tolerable treatment
Bagger <i>et al.</i> [34]	2004	Effect of enhanced external counterpulsation on dobutamine-induced left ventricular wall motion abnormalities in severe chronic angina pectoris	23	Reduction in dobutamine-induced wall motion abnormalities observed after EECp treatment
Michaels <i>et al.</i> [35]	2004	Two-year outcomes after enhanced external counterpulsation for stable angina pectoris (from the International EECp patient registry [IEPR])	1097	Significant improvement by 73% angina improvement, 50% improvement in well-being of CAD patients at 2 years of follow up
Lawson <i>et al.</i> [36]	2004	The effectiveness of enhanced external counterpulsation in patients with left main disease and angina.	2861	Significant improvement in angina pectoris and reduction in nitroglycerine use and reduction in weekly angina episodes observed
Masuda <i>et al.</i> [37]	2004	Improvement of oxygen metabolism in ischemic myocardium as a result of enhanced external counterpulsation with heparin pretreatment for patients with stable angina	18	Significant improvement in exercise capacity and oxygen metabolism of CHD patients treated with EECp and intravenous heparin infusion combined therapy was observed
Henrikson <i>et al.</i> [38]	2004	Enhanced external counterpulsation therapy: significant clinical improvement without electrophysiologic remodelling	28	Significant improvement in angina by 82% and effective treatment for CAD patients
Taguchi <i>et al.</i> [39]	2004	Effects of enhanced external counterpulsation on hemodynamics and its mechanism relation to neurohumoral factors	24	Study concludes that increments in ANP without enhancement in BNP was an important mechanism for EECp effectiveness
Lawson <i>et al.</i> [40]	2005	Predictors of benefit in angina patients one year after completing enhanced external counterpulsation: initial responders to treatment versus non responders	2,007	Angina reduced by at least 83% immediately, and improvement in weekly anginal episodes, the frequency of nitroglycerine use decreased and well-being status improved by 63%

**Table 3. cont.** EECP effectiveness on clinical profile in coronary heart disease patients

Author	Study (year)	Title of study	Sample size	Findings & conclusion
Michaels <i>et al.</i> [41]	2005	Frequency and efficacy of repeat enhanced external counterpulsation for stable angina pectoris (from the International EECP Patient Registry)	1192	After EECP treatment 86% reported decrease in angina CCS class by at least one and 57% patients discontinued nitroglycerine use  After 2 years 70% patients reported significant decrease in angina and nitroglycerine consumption
Arora <i>et al.</i> [42]	2005	Effects of enhanced counterpulsation on vascular cell release of coagulation factors	30	The study suggests that EECP may not play a vital role in controlling coagulation factors in coronary heart disease patients, further research required
McCullough <i>et al.</i> [43]	2006	Impact of body mass index on outcomes of enhanced external counterpulsation therapy	2730	Changes in angina and duke activity status have been observed in all BMI patients. Greater reduction of angina is directly proportional to BMI value
Soran <i>et al.</i> [44]	2006	Two-year outcomes after enhanced external counterpulsation (EECP) therapy in patients with refractory angina pectoris and left ventricular dysfunction (report from the International EECP Patient Registry)	363	At 2 years of follow up 55% of patients showed improvement in angina and prove that EECP is effective and durable therapy approach for CAD patients and 52% CHD patients discontinued nitroglycerin use
Akhtar <i>et al.</i> [45]	2006	Effect of external counterpulsation on plasma nitric oxide and endothelin-1 levels	13	EECP increases nitric oxide and decreases endothelin-1 level and changes sustained for 3 months in CHD patients
Nichols <i>et al.</i> [46]	2006	Enhanced external counterpulsation treatment improves arterial wall properties and wave reflection characteristics in patients with refractory angina	20	The study suggests that EECP can reduce arterial stiffness and may improve wave reflection characteristics in CHD patients and these changes decrease left ventricular afterload, myocardial oxygen demand and can reduce anginal episodes
Lawson <i>et al.</i> [47]	2006	Two-year outcomes in patients with mild refractory angina treated with enhanced external counterpulsation	1458	Improvement in angina by 70–74% with reduction of nitroglycerine use by 52% with better well-being persist till 2 years of follow up
Novo <i>et al.</i> [48]	2006	Enhanced external counterpulsation for treatment of refractory angina pectoris	25	Significant improvement in angina by 84% and reduced inducible ischemia and maximal benefits observed in patients with the worst systolic failure
Loh <i>et al.</i> [49]	2006	The immediate and long-term outcome of enhanced external counterpulsation in treatment of chronic stable refractory angina	58	At least one class CCS angina improvement by 78% after 1 year and increase exercise capacity with a reduction in nitroglycerine use
Arora <i>et al.</i> [50]	2007	Effect of enhanced external counterpulsation on myocardial perfusion in patients with stable angina: A multicenter radionuclide study	11	No significant effect on myocardial perfusion has been observed due to very less number of sample size and highly variable clinical responses and study suggest for further research to assess EECP effectiveness on myocardial perfusion
Michaels <i>et al.</i> [51]	2007	The effects of enhanced external counterpulsation on time- and frequency-domain measures of heart rate variability	27	Improvement in heart rate variability in diabetic CHD patients and associated with reduced with reduced mortality rate

**Table 3. cont.** EECP effectiveness on clinical profile in coronary heart disease patients

Author	Study (year)	Title of study	Sample size	Findings & conclusion
McCullough [52]	2007	Residual high-grade angina after enhanced external counterpulsation therapy	902	The researcher observed high residual grade angina after EECP in those patients who had severe angina and multivessel diseases
Yavari <i>et al.</i> [53]	2007	Effects of enhanced external counterpulsation on anginal symptoms and improvements in objective measures of myocardial ischaemia	67	The study concludes that EECP is a safe, well tolerated and effective non-invasive therapy for CHD patients
Loh <i>et al.</i> [54]	2008	Enhanced external counterpulsation in the treatment of chronic refractory angina: a long-term follow-up outcome from the International Enhanced External Counterpulsation Patient Registry	1477	After 1-year EECP treatment 78% patients reported reduction in CCS angina class and 74% of patients sustained improvement at 3-years follow
Erdling <i>et al.</i> [55]	2008	Enhanced external counterpulsation in treatment of refractory angina pectoris: two-year outcome and baseline factors associated with treatment failure	86	After EECP treatment 79% of patients showed improvement in CCS class immediately and 61.5% of patients sustained these benefits till 12 months and 29% at 2 years follow up and study conclude that EECP is safe & effective for CAD with angina pectoris patients and patients with CCS angina class III & IV reported maximum improvement
Buschmann <i>et al.</i> [56]	2009	Improvement of fractional flow reserve and collateral flow by treatment with external counterpulsation.	23	Improvement in CCS and NYHA class in CAD patients with significant improvement in pressure derived collateral flow index and fractional flow also increased
Esmailzadeh <i>et al.</i> [57]	2009	Evaluation of left ventricular systolic and diastolic regional function after enhanced external counterpulsation therapy using strain rate imaging	20	Reduction in NYHA angina class & improvement in LV systolic and diastolic function in patients with chronic angina with increment in LVEF from 40.25–46.25% with significant p-value ( $p < 0.001$ )
Soran <i>et al.</i> [58]	2012	Comparison of long-term clinical outcomes, event-free survival rates of patients undergoing enhanced external counterpulsation for coronary artery disease in the united states and turkey	2072	Significant reduction in the severity of angina in CAD patients at 1-year of follow up
Eslamian <i>et al.</i> [59]	2013	Therapeutic effects of enhanced external counterpulsation on clinical symptoms, echocardiographic measurements, perfusion scan parameters and exercise tolerance test in CAD patients with refractory angina	50	Significant improvement in angina severity ( $p < 0.001$ ), wellbeing status and ischemia severity ( $p = 0.044$ ) and demonstrated useful safe and effective treatment method for angina pectoris in CHD patients
Bozorgi <i>et al.</i> [60]	2014	Effect of enhanced external counterpulsation (EECP) on exercise time duration and functional capacity in patients with refractory angina pectoris	20	Significant reduction in the severity of angina and physical functioning sustained for 6 months

**Table 3. cont.** EECP effectiveness on clinical profile in coronary heart disease patients

Author	Study (year)	Title of study	Sample size	Findings & conclusion
Beck <i>et al.</i> [61]	2014	Enhanced external counterpulsation improves endothelial function and exercise capacity in patients with ischaemic left ventricular dysfunction	24	Significant improvement in plasma level of nitrates and improved peak VO <sub>2</sub> and reduce LV function with significant improvement in peripheral vascular function and functional capacity
Tabary <i>et al.</i> [62]	2015	The assessment of the clinical and paraclinical effects of enhanced external counterpulsation therapy in patients with coronary artery disease	48	Improvement in Hemoglobin, LVEF, Diastolic and systolic B.P, Chest pain, dyspnea and improve clinical conditions
Subramanian <i>et al.</i> [63]	2016	Effect of enhanced external counterpulsation treatment on aortic blood pressure, arterial stiffness and ejection fraction in patients with coronary artery disease	72	Central B.P significantly decrease with improvement in LV function in CAD patients
Beck <i>et al.</i> [64]	2016	Enhanced external counterpulsation reduces indices of central blood pressure and myocardial oxygen demand in patients with left ventricular dysfunction	17	EECP worked as adjuvant therapy and improvement in functional status, central B.P and myocardial oxygen demand in CAD patients

**Table 4.** EECP effectiveness on health-related the quality of life in coronary heart disease patients

Author	Study (year)	Title of study	Sample size	Findings & conclusion
Arora <i>et al.</i> [65]	2002	Effects of enhanced external counterpulsation on health-related quality of life continue 12 months after treatment: a substudy of the multicenter study of enhanced external counterpulsation	139	Significant improvement in Health-related QoL in patients who had active EECP as compare to those having inactive EECP in all HR-QoL parameters ( $p < 0.05$ )
Kumar <i>et al.</i> [66]	2009	Effect of enhanced external counterpulsation on clinical symptoms, quality of life, 6-minute walking distance, and echocardiographic measurements of left ventricular systolic and diastolic function after 35 days of treatment and at 1-year follow up in 47 patients with chronic refractory angina pectoris	47	Significant improvement in QoL and walking capacity
Wu <i>et al.</i> [67]	2012	Enhanced external counterpulsation in patients with refractory angina pectoris: a pilot study with six months follow-up regarding physical capacity and health-related quality of life	34	Improvement in physical and functional capacity with HR-QoL improvement
Ziaeirad <i>et al.</i> [68]	2012	The effects of enhanced external counterpulsation on health-related quality of life in patients with angina pectoris	64	Angina & QoL improvement

**Table 4. cont.** EECP effectiveness on health-related the fuality of life in coronary heart disease patients

Author	Study (year)	Title of study	Sample size	Findings & conclusion
Jorgensen et al. [69]	2013	Improvement of angina, quality of life, and working capacity after enhanced external counterpulsation	One special case	QoL & Angina improvement
May et al. [70]	2015	Enhanced external counterpulsation — effect on angina pectoris, QoL and exercise capacity after 1 year	50	Improvement in exercise capacity with generic and disease specific QoL improvement
Shakouri [71]	2015	Effect of enhanced external counterpulsation and cardiac rehabilitation on quality of life, plasma nitric oxide, endothelin and high sensitive crp in patients with coronary artery disease: a pilot study	42	Mean change in quality of life and endothelial functioning has been observed in CAD patients

## Discussion

Above discussed EECP studies validates the significant improvement in CCS and NYHA angina classification, angina episodes, left ventricle ejection fraction functioning, exercise tolerance and HRQoL with reduction of nitroglycerine use & decrease hospitalization rate in coronary heart disease patients. EECP used for angina and heart failure for the past two decades, but still, more research required filling the gaps in research. There are very few or rare study conducted to assess EECP effectiveness on BMI, Heart Rate, Cholesterol, Triglyceride, High-Density Lipoprotein (HDL), Low-Density Lipoprotein (LDL), HbA1C, SpO<sub>2</sub>, Vo<sub>2</sub>max, 12-minute walk or run test and comparative prospective randomized trials on cardiac and non-cardiac metabolic markers.

## Conclusion

Further clinical research is required to evaluate EECP effectiveness on obese, diabetic, hypertension and other metabolic disease patients with CHD and multi-centric randomized controlled trials are required for further modifications in EECP device to cure, prevent, and treat chronic diseases such as obesity, hypertension, diabetes, and neurological disorders by the non-invasive procedure.

## Conflict of interest

None.

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## A SYSTEMATIC REVIEW OF RISK FACTORS OF ADVERSE DRUG REACTIONS IN HOSPITALIZED PATIENTS

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### ABSTRACT

Adverse drug reactions (ADRs) pose both financial and health encumbrances for patients. Although prevalence and risk factors associated with ADRs have been published in many studies, most of them lack the statistical evidence for predictors. The aim of this study was to review the published literature to determine the risk factors in the adult and elderly population for ADRs. An electronic search of articles published in English language in databases such as Cochrane Database of Systematic Reviews, MEDLINE, EMBASE, Scopus, and Google Scholar was conducted in between January 2001 and April 2018. The search terms used were: "ADRs," "drug-related problems," "risk factors," "general adult population," "elderly patients," and "hospital admission." For inclusion in the review, studies had to include an explicit definition of what was considered an ADR and/or an explicit assessment of causality, as well as a clear description of the method used for ADR identification. Polypharmacy was the major risk factor of ADR followed by comorbidities and length of hospital stay.

**Keywords:** Adverse drug reactions, Risk factors, Elderly patients, Adult patients, Logistic regression.

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### INTRODUCTION

Patient safety is one of the most essential elements of modern-day health-care systems [1]. With the mounting reliance on medication therapy as the primary intervention for most illnesses, medications may also cause either non-preventable adverse effects or potentially preventable medication errors [1,2]. Adverse drug reactions (ADRs) are common causes of mortality and morbidity worldwide, and its occurrence in real-world medical practice cannot always be predicted by pre-marketing data given that a limited number of selected patients are enrolled in clinical trials for specific indications and monitored for a limited period of time [3]. Various studies in general adult populations have quantified that 5%–7% of all hospitalizations are due to ADRs, with over half of these arbitrated to be preventable, and that 3%–6% of ADRs are fatal or have serious health consequences [4-6]. Health-care costs attributable to ADRs have been estimated to be 5%–9% of total inpatient costs per annum [7]. Older people experience greater morbidity with a corresponding increase in medication utilization, resulting in a higher risk of ADRs. The relative physiological change that occurs with aging affects the pharmacokinetics and pharmacodynamics of medications, which may increase the potential for drug toxicity and ADRs [8]. Various definitions are being identified by researchers for ADR, for instance, the US FDA definition described it as "any adverse event for which there is a reasonable possibility that the drug caused the adverse event, 'reasonable possibility' suggesting a causal relationship between the drug and the adverse event"[9], the World Health Organization (WHO) defines it as "a response to a medicine which is noxious and unintended, and which occurs at doses normally used in man" [10], and as per Edwards and Aronson definition, "ADR is an appreciably harmful or unpleasant reaction, resulting from an intervention related to the use of a medicinal product, which predicts hazard from future administration and warrants prevention or specific treatment, or alteration of the dosage regimen, or withdrawal of the product"[11].

There are various factors that predispose patients to ADRs such as polypharmacy, age, intercurrent diseases, comorbidity, gender, history

of ADRs, and length of hospital stays [12]. Although few authors have explored the relationship between the risk factors and ADRs [13-15], there exists a controversial corroboration due to differences in definitions, study settings, study designs, study population, statistical methods, race, and ethnicity [16]. Few studies explored that female gender is the major predictor of adverse reactions [17-20], while other findings documented that patients with age above 65 years had more than 50% of hospitalizations due to ADRs [5,21].

Even though a large number of studies have identified and assessed ADRs, little has been focused on the associated risk factors with appropriate statistical analysis in adult and elderly population. This review was conducted with the aim to determine potential significant risk factors of ADRs during hospitalization in the adult and elderly population.

This review was conducted and reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines. An electronic search of articles published in English language in databases such as Cochrane database of systematic reviews, MEDLINE, EMBASE, Scopus, and Google Scholar in between January 2001 and April 2018 was conducted. Medical subject heading terminology and other keywords were used for studies published in different databases. The search terms used were: "Adverse reactions," "ADRs," "adverse effects," "drug-related problems," "risk factors," "predictive factors," "general adult population," "elderly patients," and "hospital admission." The auxiliary search terms used included: "Drug adverse effects," "drug therapy," "geriatric," "hospitalization," and "emergency admissions." All the titles and abstracts of identified studies were examined critically for potential relevance. The reference lists of all eligible full-text articles were hand searched and reviewed to locate other relevant original studies. Two reviewers undertook searches independently and assessed and discussed study findings, and the final consensus was reached to ensure the search strategy was accurate and reproducible.

All studies that were peer-reviewed, highly citation, available in English language, and full-text articles were included. Those studies that

reported ADRs either prospectively or retrospectively in hospitalized adult and elderly patients were included, irrespective of hospital department or specialty. For inclusion in the review, studies had to include an explicit definition of what was considered an ADR and/or an explicit assessment of causality, as well as a clear description of the method used for ADR identification. In particular, studies also had to explore factors associated with an increased risk of an ADR statistically through logistic regression (univariate and multivariate).

Studies that looked at ADR-related hospital readmissions were excluded from the review. Those studies with only abstracts were excluded if the full-text article could not be found, as it restricts meaningful evaluation and quality appraisal provided in abstracts. Studies and/or clinical trials that reported adverse reactions in special population such as pediatric and pregnant women and lactating mothers were excluded. Those studies that reported ADRs associated with off-labeled drug usage were also excluded from the study.

All the titles and abstracts that fulfilled inclusion criteria were assessed critically for relevance of title, year of publication, first author, country of origin, study sample size, study population, study design, and subject age groups. Data were extracted including explicit ADR definition, identification method, risk factors, statistical method and prevalence, and causality assessment using a custom-designed data extraction form. In those studies, where the prevalence was not directly reported, it was calculated by dividing the number of patients identified with an ADR of all included patients. Extracted data were entered into Microsoft Excel 365 for descriptive data analysis. Overall mean±standard deviation of ADR prevalence was calculated at 95% confidence intervals (CIs).

#### ADR ASSOCIATED RISK FACTORS - ADULT POPULATION

The risk factors were categorized as patient-related and medication-related risk factors. Univariate analysis identified very few significant medication-related risk factors such as polypharmacy [1,15,22,23], non-adherence [1], anti-tuberculosis drugs [23], and ART drugs [23]. Whereas results of multivariate analysis concluded that polypharmacy [1,15,22,23] was the highly influential independent predictor of ADR. Patient-related risk factors such as comorbidities, female gender, body mass index, h/o ADR, length of hospital stay, impaired renal function, number of diagnoses, and dependent living situation were significant [1,15,22,23]. Among these, comorbidity was evidenced as independent predictor in four studies, followed by h/o ADR and length of hospital stay.

#### ADR-ASSOCIATED RISK FACTORS - ELDERLY POPULATION

In this assessment of the effect of predictors in the development of ADRs, under univariate analysis, patient-related determinants were age, female gender, comorbidities, length of hospital stay, renal failure, liver disease, dementia, IHD, heart failure, depression, hyperlipidemia, and increased serum concentration and the medication-related predictors were polypharmacy, number of doses, narrow therapeutic drugs, anticholinergic drugs, antiarrhythmics, and antihyperglycemic drugs, and inappropriate prescription was significant [25-30]. While in the multivariate analysis, age ≥85 years [27], female gender [26], and length of hospital stay [29] were patient-related independent predictors and polypharmacy was the only one medication-related independent predictor identified in four studies, in which polypharmacy with ≥8 drugs was observed as the highly influential predictor in two studies [28,29] and ≥5 drugs was evidenced in a single study [26].

To the best of our knowledge, this is the first kind of systematic review that appraised univariate and multivariate logistic regression in the identification of significant risk factors for ADRs. This search found only 11 studies that met the inclusion criteria, and nearly half of the studies were done in adult population. Studies showed explaining the variations in prevalence rates and risk factors of ADRs.

An overall up to 13.7% of patients admitted to hospital experience an ADR during their hospitalization, while previously conducted

systematic review [31] projected that up to 4% of all adult patients admitted to hospital experience an ADR either leading to or during their hospital admission. However, a meta-analysis conducted by Oscanoal *et al.* [32], in the year 2017, reported that the prevalence of ADR among elderly patients that led to hospital admissions accurately to be 8.7% (95% CI, 7.6%–9.8%).

In our review, three unambiguous definitions were being utilized in the studies for ADR identification which might explain the differences in ADR prevalence rate reported. Previous literatures [33] have sufficiently elaborated on the contribution of different fundamental criteria adopted in various setting in the identification of ADR between reported studies with respect to prevalence. Although one study used USFDA definition, there was no significant change in prevalence rate reported owing to the slenderest difference compared to the WHO definition.

#### RISK FACTORS OF ADRs

In our review, overall 80 risk factors were studied among the total population of 20,974, wherein 30 significant risk factors were recognized as potential and 18 as independent predictors of ADRs based on univariate and multivariate logistic regression analysis (Table 1).

##### Polypharmacy

Polypharmacy was the most consistent and highly acknowledged predictor witnessed in almost all the literature to quantify the risk associated with ADR [1,15,24,26-29,34]. In continuation, few studies quoted that polypharmacy is chosen when a patient presents with multiple comorbidities in order to augment the initial therapy and advanced age of patients who may require drugs with varied mechanisms of action [35]. However, polypharmacy intensifies the possibility of ADRs due to drug-drug interactions from 2% to 5% [36-40] and may heighten it up to 9% with each additional prescribed drug thereafter [27]. And also, it can increase the risk of multiple ADRs than single ADR [41]. It is important for the prescribers to ponder on this risk factor, take imperative steps to reduce the risk through usage of combinational drugs, or discontinuation of unnecessary drugs through reevaluating the disease condition of the patients specifically in older adults. Reducing the number of drugs in the prescription is the simplest way of reducing the ADRs [42]. Furthermore, the total number of drugs along with the individual drug's risk could be incorporated into an electronic algorithm and determining the benefit-to-risk ratio of individual drug therapy is essential to minimize polypharmacy.

##### Comorbidities

Comorbidity was the second most frequently reported significant risk factor for ADR in the adult and elderly patients [1,22,23,25,26,28,30]. However, three studies particularized through the application of multivariate logistic regression to identify it as an independent predictor of ADR but then only in adult patients [1,22,23]. Two authors expressed renal dysfunction and limited sample size as the possible cause of refuting comorbidity as a significant risk factor. Patients with polymorbidity may have altered pharmacodynamic and pharmacokinetic mechanisms due to drug-disease interaction predisposing them to ADRs and other explanations that require further research in this area.

##### Length of hospital stay

ADRs are considered as serious health hazard in hospitalized patients. From the findings of the review, significant association was built up between the length of hospital stay and ADRs [24,29]. Findings clarified that the length of stay is the proxy measure of comorbidity and chronic illness with an increased number of prescribed drugs at higher doses, reflecting an increased risk of ADR. The probability of adverse reactions increases 6% for every additional day of hospitalization [43], and every 2.2 hospital bed day of patient was due to ADRs [26]. Length of hospital stays ≥12 days was 2.3 times of the risk for ADR [33], and it has more importance than patient characteristics in the explanation of ADR [44]. To back up this, literature witnessed that about 5% of all hospital

**Table 1: Significant predictors of ADRs in univariate and multivariate logistic regression model**

Identified risk factors associated with ADRs	Univariate analysis p<0.05	Multivariate analysis p<0.05
Patient-related factors		
Female gender	Yes	Yes
Comorbidity	Yes	No
Length of hospital stay	Yes	Yes
H/o allergy to the drugs	Yes	No
Renal failure	Yes	Yes
Liver disease	Yes	No
Age	Yes	Yes
Dementia	Yes	Yes
Heart failure	Yes	Yes
Hyperlipidemia	Yes	Yes
High WBC count on admission	Yes	No
Non-adherence to the medication regimen	Yes	Yes
H/o ADR	Yes	Yes
BMI	Yes	Yes
Ischemic heart disease	Yes	Yes
Depression	Yes	Yes
Medication-related factors		
Inappropriate prescription/STOPP medication	Yes	Yes
Drug changes in the preceding 3 months	Yes	Yes
Anticholinergics	Yes	Yes
Antiarrhythmics	Yes	No
Polypharmacy	Yes	Yes
Number of doses	Yes	No
Drugs of NTI	Yes	No
Anti-hypertensives	Yes	Yes
ACE inhibitors	Yes	No
Beta-blockers	Yes	No
Diuretics	Yes	No
Antidiabetic agents	Yes	Yes
Anti-TB drugs	Yes	No
ART drugs	Yes	No

ART: Antiretroviral therapy, WBC: White blood cell, ACE: Angiotensin-converting enzyme, TB: Tuberculosis

admissions were due to ADR with an average length of hospital stay of 1.8-8.5 days per patient per ADR. [45-48].

#### Age

Older age was reported as an independent predictor of ADR, evidenced only in one study [27], while other studies reported that age was not an independent predictor of ADR. This mismatch may be due to dissimilarities in matching criteria and demonstration of the significance of age as a risk factor only in univariate analysis. However, the incidence of ADRs was significantly higher in the elderly patients compared to other age groups [22,34,49,50], owing to increased age, deteriorating organ function, reduced hepatic and renal clearance, polymorbidity, polypharmacy, usage of over the counter drugs, and alternative medicine [34,51,52].

#### Renal impairment

It is widely accepted that renal impairment has a direct effect on a number of ADRs, and it was recognized first time in the year 1966 by the Smith *et al.* [53]. However, our review findings identified that it was an independent predictor of ADR in both adult patients and elderly patients [1,23,27,30]. The patients with renal impairment display altered drug clearance results that may ensue either drug toxicity or subtherapeutic effect. Hence, it is pretty much important for early estimation of creatinine clearance to identify the renal function, before prescription of such drugs having higher risk ADRs, particularly in

elderly patients.

#### History of ADR

This review highlighted that history of ADR as a significant predictor in adult population which may be because of their active immunity compared to elderly patients. Two studies stated that patients with previously experienced ADRs were having 17.46 times odds of ADR in tuberculosis and 28.94 times odds in HIV/AIDs positive [22,23]. Prescriber's attention toward medication and ADR history taking may reduce the recurrence of ADR in such vulnerable population.

#### Gender

Female gender was identified to be an independent predictor of ADR in the two articles [22,26], while one study revealed significance only through univariate logistic regression analysis [15]. However, further detailed research is required for a definite relationship. Few explanations behind the predisposition of women for ADR were attributed to them having lower lean body mass, reduction in hepatic clearance, differences in activity of cytochrome P450 (CYP) enzymes, and metabolization of drugs at different rates compared with men [54]. Moreover, females are known to use oral contraceptives, hormonal supplements adding on to increased number of drugs, especially in their reproductive years, and vitamin and mineral supplements during pre and postmenopausal periods that may predispose them for ADRs [55]. However, few studies recommended that it was not a significant risk factor of ADR through their observations [35,56].

#### Strengths and limitations

Strength of the present review was strict inclusion criteria mandating assessment of risk factor with fitting statistical method and usage explicit definitions of ADR. The number of studies selected was low, as many studies did not mention true sample sizes had to be excluded. Many studies failed to give the appropriate explanation for their insignificance of risk factors. However, our quality assessment of each study was subjected to affirm the independent predictors of ADRs.

#### CONCLUSION

Review of literature found eleven papers that detailed the following measurable risk factors polypharmacy, comorbidities, length of stay, age, renal impairment, history of ADR, and gender linked with ADRs. Multiple drug regimen is the most frequently documented independent medication-related risk factor of ADR. Renal impairment had non-discrimination in both adult and elderly patients with respect to their risk. Gender is an independent predictor of ADR evidenced in a negligible amount of studies; further, more research is required to find its definite relationship with ADR. Aging increases the risk of ADR in association with multiple diseases and number of drugs. There is a great significance for reevaluation of pharmacotherapy in the elderly patients to reduce the risk of drug-related issues. Researchers and health-care professionals should consider all the factors of drug-related issues for the rationale of treatment.

#### AUTHOR'S CONTRIBUTION

Manoj Kumar Mudigubba: Conceptualized the article, compiled full literature search, and drafted the manuscript. Mamatha Krishna Murthy: Developed the standards of manuscript. Ann Mary Swaroop: Reviewed and edited the manuscript. Nayantara M: Compiled literature search and evaluated. Saurabh Dahiya: Supervisor of the research work, provided guidance in the preparation of a standard paper.

#### CONFLICTS OF INTEREST

Authors declared no conflict of interest.

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**ASSESSMENT OF NOISE IN INDUSTRIAL AND COMMERCIAL ZONES OF AN URBAN SETTING****Faiza khaliil***Assistant Professor, Lingayas Vidyapeeth, Faridabad, Haryana, India*

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**Abstract** - Urban zones with fast modernisations are influenced by noise related medical problems. This problem originating from the street activity noise, rail movement noise, air movement noise, mechanical noise, group commotion and different random sources influences people in everyday life. Sound Level meter (Larson & Davis) type1 integrating with free field microphone was utilized to make the noise monitoring at different areas on the roadway of concerned zones of Delhi. The primary objective is to monitor noise level in the Commercial and Industrial zones of Delhi. The main objective is to compare the noise levels with the limits prescribed by Central Pollution Control Board (CPCB). To find out noise levels which people encounter in their daily life, sampling was carried on the roadside from 08 hrs to 20 hrs a day in the month of January 2017 on the selected locations. The results indicate high noise levels, surpassing on many occasions to the prescribed levels.

**Key Words:** Industrial, commercial, decibels, noise levels, sound level meter

**1. INTRODUCTION**

The complex urban soundscape comprises of environmental noise from transit systems, the built environment, road traffic, construction, industry, population density etc. These sources are additive to any other sources of noise that individuals may be exposed to. Noise pollution is a significant environmental problem in many urban areas. Noise pollution has been stated as a serious health hazard (Bies and Hansen, 1996; Yilmaz and Ozer, 2005), with noise-related damage to humans ranging from annoyance to insanity and death (Mato and Mufuruki, 1999). The influences of noise on human health may be physical or psychological. Nelson (1987) reported that long term exposure to high occupational noise can result in permanent hearing loss. Additionally, commonly experienced noise effects may include annoyance, deterioration of sleep quality, and stress-related various type of heart disease (Anonymous, 1997; Morrell et al., 1997). According to World health organization (WHO) noise is Considered as third most hazardous type of pollution, right after air and water pollution (WHO, 2005).

Major cities like Mumbai, Delhi, Kolkata and Chennai are listed among the noisiest cities in India (Shastri et al., 1996). Many surveys addressing the noise pollution problems has been conducted for several cities of the world (Alberola et al., 2005; Bhosale et al., 2010) and have clearly shown the scale of discomfort that noise causes in people's lives (Vidyasagar and Rao, 2006).

Delhi (28.7041° N, 77.1025° E) capital territory of India, situated on the bank of river Yamuna, is a massive metropolitan city in the country's north. Delhi is amongst the

most populous cities of India having population 28 million (2017) and total area of 1484 km<sup>2</sup>. Traffic noise is a major environmental concern in Delhi. Various types of vehicle, automobile, cycle, rickshaw etc. create tremendous noise at various points of this city. Vehicular noise depends on the quality of the engine and exhaust system, traffic flow, interaction with road surface, tire and honking of horns. In this study noise monitoring is done at some pre-selected locations of Industrial, Commercial zones of Delhi. Data recorded is presented in the form of charts. Noise levels were exceeding the limits prescribed by Central pollution control board (CPCB) in all zones.

**1.1 Scope & Objectives**

Scope of this study is comparative assessment of noise levels at the selected road stretches of Industrial, Commercial, Residential and Institutional area of Delhi. The continuous monitoring of noise at various locations will give clear picture about the variation of the noise intensity. The noise parameters recorded at these areas will be compared by the standards prescribed by Central Pollution Control Board. The study will be valuable contribution in the area of noise management/abatement, especially at planning stage and redevelopment of urban areas. The study will be helpful in traffic planning, development of realistic objectives for noise management. It will be supportive tool for the identification of areas with high potential of reduction measures. It will also provide more effective use of local, regional and national planning procedures to control and reduce noise. Besides, it will be useful in monitoring the effectiveness of action plans and other planning procedures. Besides, the present study will provide an extended spatial database, spatial tools and computation force to quantify and visualize noise effects.

**1.2 Aim**

The aim of this study is comparative noise assessment in industrial and commercial zones of Delhi City. The specific objectives of this study are:

- i. Extensive field survey for sampling locations as per norms
- ii. Identification of sampling location for Industrial and Commercial area
- iii. Noise monitoring at selected locations

Comparative Assessment of noise with standards prescribed by Central pollution control board (CPCB).

**2. METHODOLOGY**

In order to assess noise pollution, major noisy area has been identified in respect of commercial, residential, Industrial

and silent zones. Accordingly, noise levels have been measured in each identified station. The study was conducted during the month of January 2017. Noise levels were measured using sound level meter. Ambient sound levels are being compared with the prescribed standards of CPCB (Central Pollution Control Board), India.

**Data Collection**

The desired data in terms of noise levels have been recorded and collected from different sites selected for noise monitoring in Institutional, commercial, residential and Industrial zone of Delhi. During monitoring of noise levels at various zones international guidelines will be followed. Monitoring was carried out with instrument at a height of 1.2 to 1.5m and 1m away from the chest. Noise monitoring is done for a period of 12 hours from 8 a.m. in the morning to 8 p.m. in the evening in the month of January 2017.

**Site selection**

Lajpat nagar is a residential and Commercial neighbourhood of the South Delhi. It is today most known for its Central market.

Okhla Industrial area is divided into 3 phase, where phase 2 is taken as study area. Okhla Industrial phase –II is an industrial suburb of New Delhi in South Delhi. Okhla Industrial Phase I and Phase II is one of the 28 notified industrial areas of Delhi, as per the Master plan of 2001.

Locations in each zone are selected as per the Table 1.

**Table -1:** Site selection

S.NO	ZONES	LOCATION	LATITUDE	LONGITUDE
1.	<b>COMMERCIAL LAJPAT NAGAR</b>	Central market	28.569229°N	77.241735°E
2.		Alankar cinema road	28.568859°N	77.240874°E
3.		Veer sawarkarmarg	28.569566°N	77.242296°E
4.	<b>INDUSTRIAL OKHLA INDUSTRIAL PHASE II</b>	Honda motors	28.536933°N	77.267864°E
5.		Brinco sales pvt ltd	28.538649°N	77.271308°E

**Noise monitoring instrument**

Noise monitoring is done with type1 integrating sound level meter shown in figure 2.6 with free field microphone. Larson & Davis Model 831IEC 61672-1:2002, ANSI S1.4, ANSI S1.43 Class 1 integrating sound level meter is used.



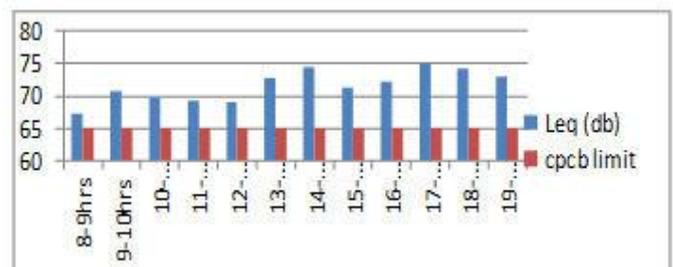
**Noise monitoring**

Noise monitoring is done in the month of January from Monday to Saturday. Monitoring is done for a period of 12 hours from 8 a.m. to 8 p.m.

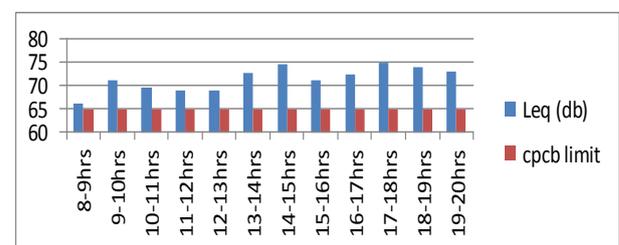
**3.RESULTS AND DISCUSSIONS**

The study is conducted on 5 different locations situated in different parts of Delhi. Comparative assessment of noise levels with the limits prescribed by Central pollution Control Board for different zones is presented graphically.

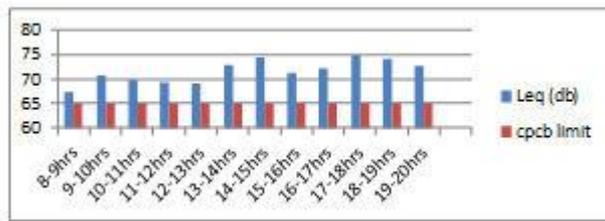
**3.1 Results of Commercial area Lajpatnagar**



**Chart 1:** Comparison of noise levels with standards prescribed by Central Pollution Control Board 28<sup>th</sup> January 2017



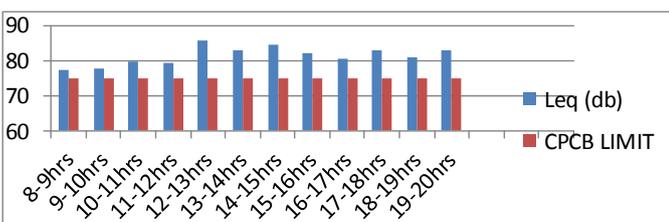
**Chart 2:** Comparison of noise levels with standards prescribed by Central Pollution Control Board 30<sup>th</sup> January 2017



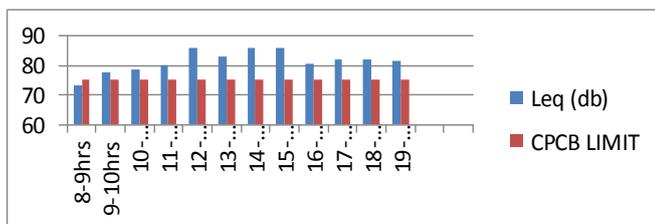
**Chart 3:** Comparison of noise levels with standards prescribed by Central Pollution Control Board 31<sup>st</sup> January 2017.

The observations show that noise levels are in the range of 63.5 to 87.1. Noise levels are higher after 10 a.m. in morning with highest noise levels recorded between 14-15 hrs and 17-19 hrs. The CPCB standards of noise in commercial area are 65 dB in day time and 55 dB in night time. Huge crowd, shouting of hawkers, shouting of sales men, are the main reason of noise in this area.

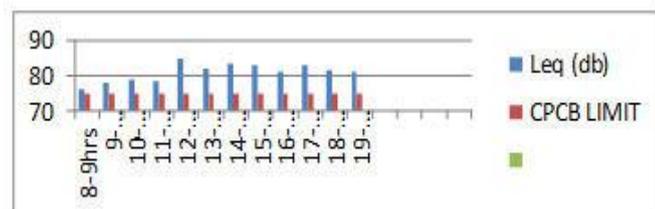
### 3.2 Results of Industrial area



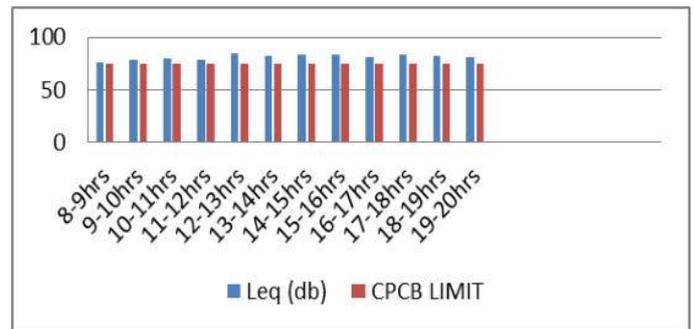
**Chart 4:** Comparison of noise levels with standards prescribed by Central Pollution Control Board 23<sup>rd</sup> January 2017



**Chart 5:** Comparison of noise levels with standards prescribed by Central Pollution Control Board 24<sup>th</sup> January 2017



**Chart 6:** Comparison of noise levels with standards prescribed by Central Pollution Control Board 25<sup>th</sup> January 2017



**Chart 7:** Comparison of noise levels with standards prescribed by Central Pollution Control Board 27<sup>th</sup> January 2017.

The observations show that the noise levels are in the range of 68 dBA (Lmin) to 94.5 dBA (Lmax).The Standards prescribed by Central Pollution Control Board for Industrial area are 75 dba in day time and 70 dba in night time .Lmin values are close to the Standards prescribed by CPCB. Honking of horns of vehicles is the main reason of noise.

### 4. CONCLUSIONS

This study elucidates the levels of noise pollution in different zones in Delhi city, capital of India. From the present study it is clear that the noise levels in all zones of Delhi city were higher than the prescribed limit by Central Pollution Control Board.

#### CONCLUSIONS FOR COMMERCIAL AREA

In commercial area hawkers, peddlers, customers, vendors all contribute towards increasing noise levels. Noise levels are in the range of 63.5 dB to 87.1 dB. Noise levels are higher after 10 a.m. in morning with highest noise levels recorded between 14-15 hrs and 17-19 hrs. The CPCB standards of noise in commercial area are 65 dB in day time and 55 dB in night time. Apart from noise due to commercial activities, there is traffic noise from vehicle horns, engines, and traffic volume. Lajpat Nagar is exposed to intracity road traffic noise every day; the most affected being the traders, pedestrians, commercial vehicle drivers and school children having their schools close to the main road.

#### CONCLUSIONS FOR INDUSTRIAL AREA

In Industrial area noise levels are in the range of 68 dBA (Lmin) to 94.5 dBA (Lmax). The Standards prescribed by Central Pollution Control Board for Industrial area are 75 dBA in day time and 70 dBA in night time .In Industrial area heavy vehicles like trucks carrying machines or other items contribute towards noise pollution. In some places industrial operations also contribute towards noise pollution.

### 6.SCOPE FOR FUTURE WORK

The main reason of noise pollution in the City are rapid urbanization and rapid increase of vehicular population,

congested traffic area, unplanned road network, construction of silence zone in the main area of the city, unplanned urban sprawl etc.

Necessary preventive measures must be taken by the authority to implement the Noise Pollution (Regulation and Control) Rules, 2000. At the same time plantations of greenery near the road will help in absorbing the noise. Prohibition of honking of horns near the silent zone, use of noise barriers, limitation of vehicle speeds, alteration of roadway surface texture, limitation of heavy duty vehicles, use of traffic controls that smooth vehicle flow, innovative tire design methods etc. should be adopted for controlling noise pollution.

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# A Comparative Assessment to Evaluate Enhanced External Counter Pulsation Effect on Physical Profile and Quality of Life in Diabetic and Nondiabetic Coronary Heart Disease Patients

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## ABSTRACT

This study was conducted to assess the effect of Enhanced External Counter Pulsation (EECP) on physical profile and Health-Related Quality of Life (HRQoL) in diabetic and nondiabetic Coronary Heart Disease (CHD) patients. This pretest-posttest designed prospective study was conducted among 163 diabetic and nondiabetic coronary heart disease patients in the SAAOL Heart Center, New Delhi. The physical profile of study subjects was assessed through Cooper's 12 minutes' walk test, Canadian Cardiovascular Society (CCS) angina scale and Medical Research Council (MRC) dyspnea scale. The HRQoL of subjects was assessed using SF-36 (short form) and Seattle Angina Questionnaire (SAQ) scale. A significant improvement was observed in blood pressure, heart rate, SpO<sub>2</sub>, VO<sub>2</sub> max, CCS angina and MRC score in both the groups from baseline to 12 months. Significant improvement was also observed in both the scales of HRQoL after EECP treatment at 12 months follow up in all the health domains of SF-36 & SAQ scale with special reference to angina severity and angina stability improvement. In conclusion, EECP is an effective non-invasive therapy to treat diabetic and nondiabetic CHD patients. This non-invasive procedure may improve the physical functional capacity, angina, dyspnea and overall HRQoL of diabetic and nondiabetic CHD patients.

## INTRODUCTION

Diabetes mellitus (DM) and coronary heart disease (CHD) has a close relationship with each other. Diabetes mellitus is an independent risk factor for CHD development (WHO, 2014). Patients with a history of diabetes are more likely to suffer from CHD compared to individuals without diabetes (Unnikrishnan *et al.*, 2016). Diabetes mellitus and CHD are a major cause of mortality and morbidity globally (Fuster *et al.*, 2010). CHD with DM patients has higher mortality rate due to uncontrolled diabetes which further causes several dysfunctions such as insulin resistance, atherosclerosis, and myocardial infarction. Indian and international registry data confirmed that 30-40 percent DM patients have CHD in India (Ali *et al.*, 2010). It is documented that

more than 65 percent of cardiac deaths are due to diabetes mellitus in which 75-80 percent were especially due to CHD (Xavier *et al.*, 2008; Moss *et al.*, 1991).

Coronary heart disease can be treated by pharmacotherapy, Percutaneous Transluminal Coronary Angioplasty (PTCA), Coronary Artery Bypass Grafting (CABG), lifestyle management and non-invasive therapy known as Enhanced External Counter Pulsation (EECP) (Antman *et al.*, 2008). Enhanced external counterpulsation is US-FDA approved non-invasive therapy for treatment of CHD patients, which are not suitable, unresponsive, and unwilling for PTCA and CABG procedures. Enhanced external counterpulsation therapy increases retrograde aortic blood flow during the diastolic phase of heart pumping. The mechanical device called EECP comprises sequential compression over legs, thighs, and buttocks to direct blood flow towards the heart when it is in the resting position. This treatment is recommended for 35 hours, one hour per day for 7 weeks (5 days in a week) (Arora *et al.*, 1999; Kumar *et al.*, 2017).

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Coronary heart disease and DM comorbidity deteriorate physical functional capacity and Health-Related Quality of Life (HR-QoL) of patients (Taghadosi *et al.*, 2014). Bozorgi *et al.* and Singh *et al.* studies demonstrate that EECF may significantly improve health-related quality of life and exercise tolerance in diabetic and nondiabetic coronary heart disease patients (Bozorgi *et al.*, 2014; Singh *et al.*, 2018). The 12 minutes run or walk test was developed by Kenneth H. Cooper in 1968 to assess physical functioning capacity and to estimate VO<sub>2</sub> max (maximum oxygen uptake). VO<sub>2</sub> max is the maximum volume of oxygen consumption during an intense walk or exercise. The maximal aerobic or functional capacity is defined at the point at which oxygen consumption is high (Bandyopadhyay *et al.*, 2015). Canadian Cardiovascular Society (CCS) angina scale is widely used to assess angina severity in coronary heart disease patients. This is a valid and reliable tool to evaluate angina severity, ranging from class I to class IV in CHD patients (Kaul *et al.*, 2009). Medical Research Council (MRC) scale is widely used to assess breathlessness or dyspnea status in CHD patients. This scale comprises five segments that define the entire range of respiratory infirmity from none (Grade 1) to almost a complete incapacity (Grade 5) (Bestall *et al.*, 1999).

The quality of life assessment of an individual is the status of well-being and feeling about their health and body functioning. SF-36 and SAQ are standard tools, which are used to assess general and disease specific health-related quality of life of CHD patients (Brazier *et al.*, 1992). Thompson *et al.* study provides evidence for reliability and validity of SF-36 scale used to assess the quality of life in CHD patients (Thompson *et al.*, 2003). Seattle angina questionnaire (SAQ) is a disease-specific quality of life assessment tool which has been shown to be a valid, reproducible and reliable tool to evaluate the treatment or intervention effectiveness in CHD patients (Dempster *et al.*, 2000). The SAQ scale is widely used and its validity and reliability towards health status are demonstrated (Spertus *et al.*, 1995). Enhanced external counterpulsation treatment helps in glycemic control which ultimately improve the health-related quality of life of diabetic patients and studies done by Linnemeier *et al.* and Ramasamy *et al.* validates the effectiveness of EECF in diabetes patients (Linnemeier *et al.*, 2003; Ramasamy *et al.*, 2015).

Our study was designed to assess the physical functioning profile and health-related quality of life of DM and CHD comorbidity patients and Non-DM CHD patients treated with EECF therapy.

## MATERIALS AND METHODS

A pretest-posttest designed prospective study was done at Science and Art of Living (SAAOL) Heart Center, New Delhi among diabetic and nondiabetic CHD patients. A total of 212 subjects were enrolled in the study using consecutive sampling techniques from April 2016 to May 2017. The study subjects were divided into two groups. The first group was CHD patients with DM while the second group subjects were CHD patients without DM.

### Inclusion criteria

Coronary heart disease patients with and without DM (patients having diabetes duration maximum 5 years) aged between

30 to 75 years, who did not willingly go for invasive treatments (Coronary Artery Bypass Grafting [CABG] and Percutaneous Trans Coronary Angioplasty [PTCA]) and agreed to participate in the study with valid written informed consent were enrolled.

### Exclusion criteria

Patients having cardiac arrhythmia, coagulation disorder, deep vein thrombosis, vaso-occlusive disease, abnormal aortic aneurysm, cardiac valvular disorder, pregnancy, high blood pressure (higher than 180/110 mmHg), foot wounds, dialysis history and unable to give valid written consent were excluded from the study.

### Study procedure

The study was initiated with the screening of diabetic and nondiabetic CHD patients from the SAAOL Heart Center, New Delhi. A total of 300 subjects were screened. Out of 300 subjects, 88 were excluded from the study because they refused to participate, refused to give written consent and not willing to adhere 12 months study follow up. Finally, 212 study subjects were enrolled as they fulfilled all study eligibility criteria and agreed to 12 months of the study follow-up. After enrollment, the study subjects were allocated in CHD patient with DM (CHD + DM group) and CHD patients without DM (CHD group). After this, the demographic profile (age, gender, etc.), clinical history and physiological (systolic blood pressure, diastolic blood pressure, heart rate) profile, was done at baseline of all study subjects. Physical functioning capacity, SpO<sub>2</sub> level, VO<sub>2</sub> max, CCS angina status, and MRC dyspnea score assessed at baseline and followed at 6 and 12 months of study. Health-related quality of life of the study subjects was also assessed at baseline and followed at 6 and 12 months through SF-36 and Seattle Angina Questionnaire (SAQ).

### Measurements

#### *Physiological profile assessment*

Systolic and diastolic blood pressure were measured at baseline, 6 and 12 months. Systolic blood pressure (SBP) and diastolic blood pressure (DBP) were recorded by qualified personnel through Diamond Clock Model blood pressure monitor. Heart rate & SpO<sub>2</sub> of all study subjects were assessed through pulse oximeter (ChoiceM Med MD300C2D) at baseline, 6 months, and 12 months.

#### *Physical functioning assessment*

Physical functional capacity was assessed through Cooper 12-minute walk test and VO<sub>2</sub> max. In the Cooper 12-minute walk the study subjects were allowed to walk for 12 minutes on a flat track and a pedometer was used to measure the distance they covered within 12 minutes. VO<sub>2</sub> max was used to assess the aerobic capacity of study subjects. It was calculated with the standard formula:

$$\text{VO}_2 \text{ max (ml/kg/min)} = (22.351 \times \text{distances covered in kilometers}) - 11.288.$$

Angina status was assessed through the Canadian Cardiovascular Society (CCS) grading of angina pectoris. Breathlessness or dyspnea status was assessed by the Medical Research Council (MRC) scale.

### Health-related quality of life (HRQoL) assessment

The HRQoL of study subjects was assessed by using SF-36 and SAQ. HRQoL of CHD patients with and without DM was assessed through face to face interview and subjects were responding as they experienced problems related to mobility, normal working at work, study, personal care, leisure activities, family, pain, and depression/anxiety. Answers of the patients were recorded. Short Form-36 (SF-36) a multi-item scale comprising 36 questions was used to assess the general health-related quality of life of CHD patients with and without DM in eight health domains, namely; physical functioning, physical health problems, emotional problems, energy status, emotional well-being, body pain and general health status. The score generated for each health variable was from 0 to 100, with 0 denoting the worst and 100 the best possible health outcomes. Seattle angina questionnaire was used to assess disease-specific quality of life and it measures 5 domains to assess EECF effectiveness in diabetic and nondiabetic CHD patients. SAQ domains were the physical constraint, angina stability, angina severity, treatment satisfaction, and perceived disease.

### EECP treatment

The EECF, an electro-mechanical device, consists of three paired pneumatic cuffs applied to the lower leg, upper leg and buttocks. The cuffs of the device were inflated sequentially during diastole with maximum pressure 300 mmHg and returning blood from the legs to the central circulation and producing aortic diastolic augmentation. This increases both venous return and cardiac output in coronary heart disease patients. In the next step, cuffs are deflated at end-diastole with reducing peripheral resistance and providing left ventricular supply.

The ECP PSK machine having the model; P-ECP/TI was used for the treatment of diabetic and nondiabetic coronary heart disease patients. Each subject underwent one hour per day EECF treatment for 35 days for 7 weeks (5 days in a week) with 280 mmHg pressure. All study subjects were followed up for 12 months after completion of EECF therapy. Physical functional capacity through Cooper 12-minutes' walk test, SpO<sub>2</sub> status, VO<sub>2</sub> max, CCS angina severity and dyspnea score with health-related quality of life (SF-36, SAQ) were assessed at 6th and 12th months of study follow up (Bestall *et al.*, 1999; Bandyopadhyay *et al.*, 2015; Kaul *et al.*, 2009).

### Ethical approval and consent

Ethical permission for this study was obtained from the Institutional Ethics Committee of SAAOL Heart Center (Ref. No-IEC/SHRF/PhD/P-02/01.05.2016), New Delhi. Written informed consent was also taken from all study subjects before initiation of the study.

### Statistical analysis

A senior Biostatistician analyzed the collected data using statistical package for the social sciences (SPSS) software version 21. Demographic and socioeconomic profile of the study subjects were compared using independent t-test. Descriptive analysis of mean, SD, independent t-test and paired sample t-test with 95% confidence interval and p-value <0.05 was considered statistically significant.

## RESULTS

### Recruitment and response rates of the study subjects

The study was initiated with the screening of total 300 diabetic and nondiabetic coronary heart disease patients from the study site. Out of 300 patients, 88 patients were excluded from the study because 26 patients refused to participate, 33 patients refused to give written consent and 19 patients did not agree to 12 months follow up. Finally, 212 study subjects were enrolled as they fulfilled all study eligibility criteria and agreed to 12 months of study follow up. After enrollment, the study subjects were allocated to coronary heart disease patients with diabetes mellitus and coronary heart disease patients without diabetes mellitus. Total 163 patients had completed the whole study with 12 months follow up, 49 patients did not complete whole study and follow up, so they were excluded from the final data analysis because of missing and incomplete data. Out of 49 patients, 24 patients were excluded from the CHD + DM group (13 patients left the treatment and migrated to abroad and 11 patients did not complete 12 months follow up) and 25 from the CHD group (9 patients migrated to different places, 16 patients did not complete 12 months follow up). Finally, the data of 163 patients were analyzed. Study outlines and response rates of the study subjects are summarized in the consort diagram (Table 1).

### Baseline demographic details with the medical history of diabetic and nondiabetic CHD groups

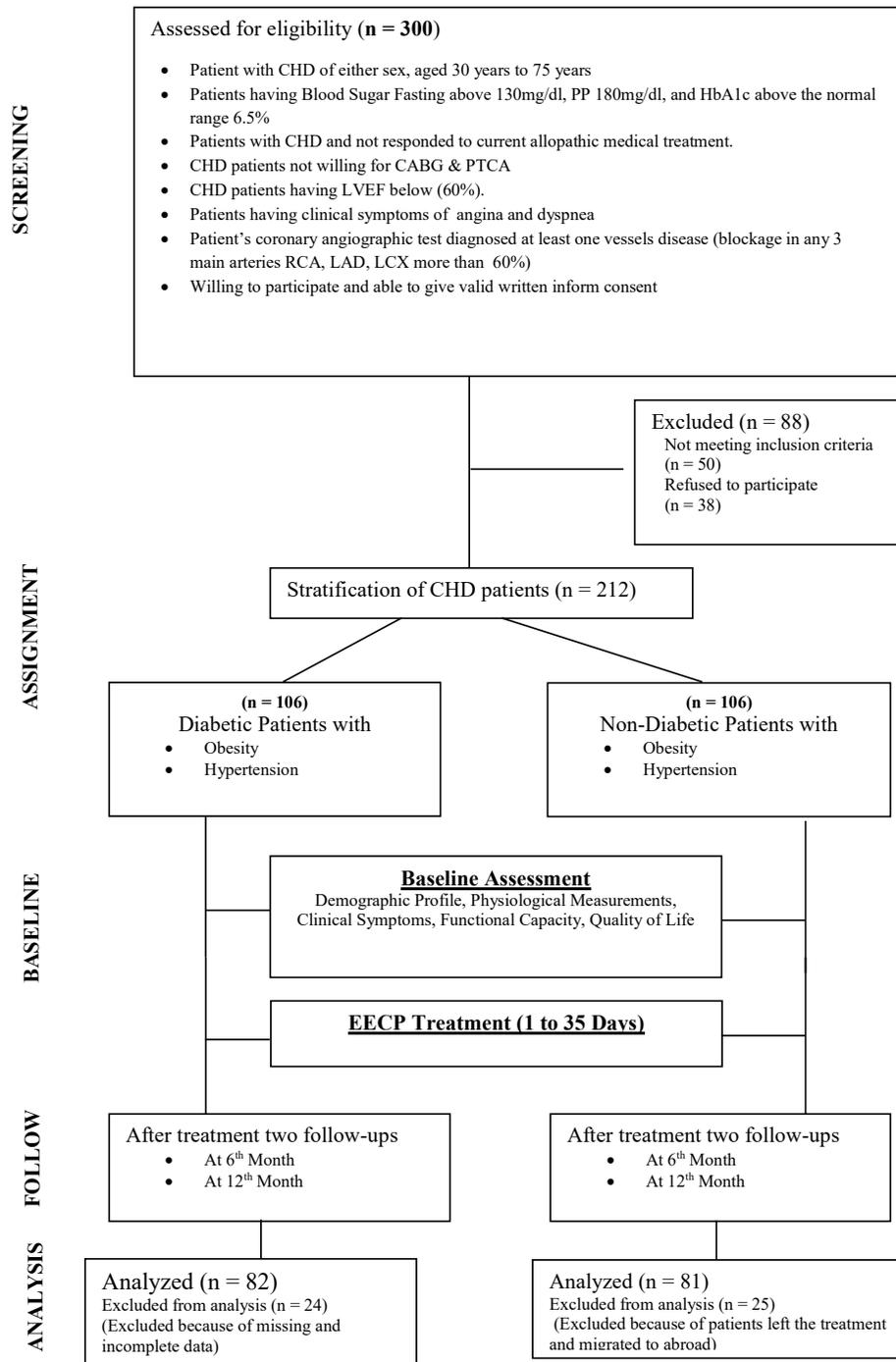
A total of 163 diabetic and nondiabetic CHD patients completed the study (12 months follow up). Out of total 163 subjects; n = 82 subjects were in the diabetic CHD group (first group) and n = 81 subjects were in the nondiabetic CHD group (second group). The total mean age of both the group was 59.6 ± 9.5 (mean ± SD) years in which mean age of diabetic CHD subjects were 60.5 ± 9.5 (mean ± SD) and nondiabetic CHD subjects were 58.6 ± 9.6 (mean ± SD) years. The male subjects were 50.4% in diabetic CHD and 49.6% in nondiabetic CHD group. Females were much higher (53.3%) in nondiabetic CHD as compared to diabetic CHD group (46.7%). In this study, urban subjects were higher (56.4%) in the diabetic CHD group and rural subjects were higher (55.3%) in nondiabetic CHD group. A number of subjects have obesity (63.1%) in nondiabetic CHD group as compared to diabetic CHD group (36.9%). There were more hypertensive (51.6%) patients in the diabetic CHD group as compared to nondiabetic CHD group (48.4%).

The family history of heart disease (62.5%) was higher in the diabetic CHD group as compared to nondiabetic CHD group (37.5%), similarly, the family history diabetes (83.3%) was also higher in the diabetic CHD group as compared to nondiabetic CHD subjects (16.7%). The average diabetes duration in diabetic CHD group subjects was 4 years. Smoker patients were higher (51.9%) in nondiabetic CHD group as compared to diabetic CHD group (48.1%) and similarly, tobacco user was higher (83%) in nondiabetic CHD group as compared to diabetic CHD group (17%). Physical activity was higher (53.2%) in nondiabetic CHD group as compared to diabetic CHD group (46.8%). The non-vegetarian subjects were higher (53.1%) in nondiabetic CHD group

as compared to the diabetic CHD group (46.9%). Medical history, such as myocardial infarction was higher in diabetes CHD group (54.9%), similarly, the rate of PCI (62.9%) and CABG (58.7%) was also higher in diabetic CHD subjects. The history of single vessel CHD was similar in both the groups, but double vessel CHD patients were higher (62.8%) in

nondiabetic CHD subjects while triple vessel CHD was higher (60%) in diabetic CHD subjects as compared to nondiabetic CHD subjects (40%). The detail of the demographic profile and medical history of diabetic and nondiabetic CHD groups is described in [Table 2](#).

**Table 1:** A systematic overview of the study.



**Table 2:** Baseline demographic characteristics with medical history of diabetic & nondiabetic CHD patients.

Characteristics	Total (n = 163)	Diabetic CHD (n = 82)	Nondiabetic CHD (n = 81)	p-value
Age (in years)	59.6 ± 9.5	60.5 ± 9.5	58.6 ± 9.6	0.183
<b>Gender</b>				
Male (n)	133	67 (50.4%)	66 (49.6%)	0.714
Female (n)	30	14 (46.7%)	16 (53.3%)	
<b>Locality</b>				
Rural	85	38 (44.7%)	47 (55.3%)	0.135
Urban	78	44 (56.4%)	34 (43.6%)	
<b>Obesity</b>				
No	38	21 (55.3%)	17 (44.7%)	0.485
Yes	125	46 (36.9%)	79 (63.1%)	
<b>Hypertension</b>				
No	72	35 (48.6%)	37 (51.4%)	0.753
Yes	91	47 (51.6%)	44 (48.4%)	
<b>Family History of Heart Disease</b>				
No	115	52 (45.2%)	63 (54.8%)	0.733
Yes	48	30 (62.5%)	18 (37.5%)	
<b>Family History of Diabetes</b>				
No	127	52 (40.9%)	75 (59.1%)	0.973
Yes	36	30 (83.3%)	6 (16.7%)	
<b>Smoking</b>				
No	86	44 (51.7%)	42 (48.3%)	0.586
Yes	77	37 (48.1%)	40 (51.9%)	
<b>Tobacco</b>				
No	138	78 (56.5%)	60 (43.5%)	<0.0001
Yes	25	4 (17.0%)	21 (83.0%)	
<b>Physical Activity</b>				
No	101	53 (52.5%)	48 (47.5%)	0.480
Yes	62	29 (46.8%)	33 (53.2%)	
<b>Stress</b>				
Less	61	31 (50.8%)	30 (49.2%)	0.919
More	102	51 (50.0%)	51 (50.0%)	
<b>Diet</b>				
Veg	99	52 (52.5%)	47 (47.5%)	0.481
Non-Veg	64	30 (46.9%)	34 (53.1%)	
<b>Acute Myocardial Infarction (MI)</b>				
No	92	43 (46.7%)	49 (53.3%)	0.300
Yes	71	39 (54.9%)	32 (45.1%)	
<b>Percutaneous Coronary Intervention (PCI)</b>				
No	128	60 (46.9%)	68 (53.1%)	0.094
Yes	35	22 (62.9%)	13 (37.1%)	
<b>Coronary Artery Bypass Graft (CABG)</b>				
No	88	38 (43.2%)	50 (56.8%)	0.049
Yes	75	44 (58.7%)	31 (41.3%)	
<b>Type (Vessel) of CHD</b>				
Single	70	35 (50%)	35 (50%)	0.058
Double	43	16 (37.2%)	27 (62.8%)	
Triple	50	30 (60%)	20 (40%)	

**Table 3:** Baseline & follow up results of a physiological profile in diabetic & nondiabetic CHD patients.

Variables	Diabetic CHD		Nondiabetic CHD		p-value
	Mean	SD	Mean	SD	
<b>SBP</b>					
Baseline	131.2	15.1	132.6	16.1	0.575
6 Month	124.3	10.4	125.6	12.2	0.43
12 Month	128	12.2	129.3	14.0	0.558
p-value	Baseline - 6 Month	<0.001		<0.001	
	Baseline - 12 Month	<0.001		<0.001	
<b>DBP</b>					
Baseline	84.1	7.7	83.8	7.8	0.793
6 Month	79.1	6.1	78.6	6.8	0.621
12 Month	81.9	6.5	83.5	6.9	0.126
p-value	Baseline - 6 Month	<0.001		<0.001	
	Baseline - 12 Month	0.041		0.658	
<b>Heart Rate</b>					
Baseline	79.3	6.1	78.4	6.3	0.263
6 Month	76.7	5.0	75.5	5.1	0.257
12 Month	76.9	3.9	78.1	5.3	0.057
p-value	Baseline - 6 Month	<0.001		<0.001	
	Baseline - 12 Month	<0.001		0.934	
<b>SpO<sub>2</sub> status</b>					
Baseline	96.0	1.5	96.5	1.6	0.343
6 Month	98.2	1.7	98.4	1.8	0.938
12 Month	99.1	1.0	98.9	1.1	0.157
p-value	Baseline - 6 Month	<0.0001		<0.0001	
	Baseline - 12 Month	<0.0001		<0.0001	

### Effect of EECp on physiological parameters and physical capacity in diabetic and nondiabetic CHD patients

The physiological parameters consist systolic blood pressure, diastolic blood pressure, heart rate and SpO<sub>2</sub> did not show any significant change between the groups from baseline to 12 months using independent t-test. A significant change has been observed in systolic blood pressure, diastolic blood pressure, heart rate and SpO<sub>2</sub> level from baseline to 6 months in diabetic CHD patients and similar outcomes sustained till 12 months in systolic blood pressure and SpO<sub>2</sub> level in both the groups. The detailed information has been given in Table 3.

A significant change was observed in dyspnea score at baseline in male using MRC scale but at 6 months and 12 months follow up no statistical change was observed. There was no significant change between the group in Cooper 12 minute walk test (walking distance), VO<sub>2</sub> max and CCS angina classifications were observed in diabetic and nondiabetic CHD group patients. The details of findings have been given in Table 4.

### Effect of EECp on health-related quality of life (HRQoL) in diabetic and nondiabetic CHD patients

A significant improvement was observed in all SF-36 scale domains from baseline to 12 months with significant p-values <0.001. The significant changes were also observed in, energy level, social functioning, and general health after 6 months of EECp treatment between the groups but these differences did

not maintain until 12 months. The difference between the groups was assessed using independent t-test. The details of SF-36 study outcomes have been given in Table 5.

All domains of SAQ scale yielded significant improvement within both (diabetic & nondiabetic CHD) groups from baseline to 12 months as assessed through paired sample t-test. Significant improvement in treatment satisfaction and disease perception after the 12 months of EECp treatment has been observed in both diabetic and nondiabetic CHD groups. There was no significant difference observed between both the groups from baseline to 6th months and 12th months of EECp treatment, assessed through the independent t-test. The details of SAQ results have been given in Table 6.

## DISCUSSION

The aim of the present study was to assess the effect of EECp therapy on the physical functional status and health-related quality of life in diabetic and nondiabetic CHD patients. Our study demonstrates significant improvement in blood pressure, heart rate, and SpO<sub>2</sub> level after EECp treatment in both groups. Beck *et al.* and Casey *et al.* study also indicated that EECp may be useful as an adjuvant therapy for improving functional capacity in coronary heart disease patients through reductions in blood pressure and improvement in myocardial oxygen demand for better physical functioning (Beck *et al.*, 2015; Casey *et al.*, 2011). Diabetic and nondiabetic CHD patients demonstrate significant improvement

in walking status, exercise tolerance with increment in VO<sub>2</sub> max levels after EECF therapy. Similarly, studies done by Feldman *et al.*

and Urano *et al.* have supported the findings of the present study (Feldman *et al.*, 2006; Urano *et al.*, 2001).

**Table 4:** EECF Treatment effect on Cooper's 12-Minutes' walk test with VO<sub>2</sub> max, Angina & Dyspnea status at Baseline, 6th month and 12th month in CHD & DM with CHD patients.

Time	Variables	CHD (n = 81)	DM + CHD (n = 82)	p-value
	Male	n = 67	n = 66	
Baseline	12 Minute test (Distance)	1449.7 ± 124.51	1491.2 ± 173.63	0.115
	VO <sub>2</sub> max	21.12 ± 2.72	22.05 ± 3.83	0.117
	CCS Class	2.8 ± 0.24	2.9 ± 0.16	0.678
	Dyspnea	2.8 ± 0.15	3.2 ± 0.21	0.042
6 Month	12 Minute test (Distance)	2103.2 ± 222.1	2116.9 ± 224.8	0.725
	VO <sub>2</sub> max	35.73 ± 4.9	36.04 ± 5.02652	0.727
	CCS Class	2.1 ± 0.12	2.2 ± 0.23	0.326
	Dyspnea	2.6 ± 0.14	2.7 ± 0.28	0.468
12 Month	12 Minute test (Distance)	2100.4 ± 384.3	2050.6 ± 413.0	0.472
	VO <sub>2</sub> max	35.67 ± 8.5	34.56 ± 9.2	0.474
	CCS Class	2.3 ± 0.25	2.2 ± 0.23	0.185
	Dyspnea	2.2 ± 0.23	2.1 ± 0.12	0.325
	Female	n = 14	n = 16	
Baseline	12 Minute test (Distance)	1261.4 ± 107.12	1237.5 ± 57.44	0.444
	VO <sub>2</sub> max	16.91 ± 2.39	16.38 ± 1.28	0.464
	CCS Class	3.0 ± 0.01	2.9 ± 0.14	0.423
	Dyspnea	2.8 ± 0.14	2.9 ± 0.07	0.712
6 Month	12 Minute test (Distance)	1682.8 ± 261.45	1654.3 ± 208.29	0.742
	VO <sub>2</sub> max	26.33 ± 5.84	25.7 ± 4.65	0.746
	CCS Class	2.4 ± 0.28	2.1 ± 0.14	0.312
	Dyspnea	2.4 ± 0.21	2.3 ± 0.42	0.698
12 Month	12 Minute test (Distance)	1679.2 ± 389.01	1893.7 ± 367.60	0.132
	VO <sub>2</sub> max	26.25 ± 8.69	31.05 ± 8.21	0.134
	CCS Class	2.1 ± 0.29	2.0 ± 0.10	0.667
	Dyspnea	1.9 ± 0.05	1.5 ± 0.70	0.059

In the present study, a significant improvement was observed in the physical functional capacity in coronary heart disease patients after EECF therapy and similar findings have been reported by Rampengan *et al.* and May *et al.* in their study (Rampengan *et al.*, 2015; May *et al.*, 2015). Before EECF treatment our study subjects were mostly poor in physical functional capacity but after EECF treatment they significantly improved. A significant effect of EECF treatment on CCS angina class and dyspnea improvement has been observed in this study in diabetic and nondiabetic coronary heart disease patients. Studies done by Chung-Kuan *et al.* & Ziaeirad *et al.* (Chung-Kuan *et al.*, 2014; Ziaeirad *et al.*, 2012) have shown similar findings. The results of our study are in agreement with Petterson *et al.* and Loh *et al.* studies which have shown significant results on the effectiveness of EECF in patients with angina (Petterson *et al.*, 2006; Loh *et al.*, 2006). Soran *et al.* study also reported similar findings in the present study (Soran *et al.*, 2006).

A significant improvement has been observed in health-related quality of life using SF-36 and SAQ scale and Arora *et al.* have reported similar findings (Arora, 1999). A significant improvement has been observed in all SAQ domains using the paired t-test to assess differences within groups from baseline to

12 months showed significant changes in both groups after EECF treatment. These results demonstrate similar outcomes in diabetic and nondiabetic CHD patients treated with EECF therapy. Our study shows improvement in the quality of life in diabetic and nondiabetic CHD patients and supported by the research done by Linnermeier *et al.* and Michaels *et al.* (Linnemeier *et al.*, 2003; Michaels *et al.*, 2004).

A significant improvement was observed in the quality of life with similar clinical outcomes of Ziaeirad *et al.* in diabetic and nondiabetic coronary heart disease patients. The author reported significant improvements in quality of life of coronary heart patients in all domains of SF-36, a standard questionnaire of quality of life assessment (Ziaeirad *et al.*, 2012). SF-36 tool used by Arora *et al.* showed significant results on physical activity, general health with reduction of bodily pain and similarly Manchanda *et al.* indicated good results of EECF in respect of the improvement in the quality of life for heart patients (Manchanda *et al.*, 2007). In the present study, overall, general health status had improved, and it is supported with the data of earlier studies to demonstrate the clinical significance of EECF health-related quality of life of coronary heart disease patients (Wu *et al.*, 2012).

**Table 5:** SF-36 Baseline & follow up results of diabetic & nondiabetic CHD patients.

Variables		Nondiabetic CHD	Diabetic CHD	p-value
<b>Physical Functioning</b>				
Baseline		59.5 ± 9.6	60.1 ± 7.8	0.694
6 Month		63.3 ± 8.6	60.6 ± 10.3	0.082
12 Month		82.9 ± 6.0	82.7 ± 6.4	0.774
p-value	Baseline - 6 Month	0.020	0.702	
	Baseline - 12 Month	<0.0001	<0.0001	
<b>Role Limitation due to physical health</b>				
Baseline		34.8 ± 23.6	38.1 ± 26.4	0.409
6 Month		50.6 ± 27.1	43.9 ± 21.7	0.083
12 Month		62.9 ± 24.9	60.7 ± 24.1	0.543
p-value	Baseline - 6 Month	<0.0001	0.147	
	Baseline - 12 Month	<0.0001	<0.0001	
<b>Role Limitation due to emotional problems</b>				
Baseline		37.0 ± 29.3	37.4 ± 29.1	0.938
6 Month		44.4 ± 29.8	52.0 ± 27.7	0.095
12 Month		59.3 ± 27.9	60.2 ± 31.2	0.848
p-value	Baseline - 6 Month	0.121	0.001	
	Baseline - 12 Month	<0.0001	<0.0001	
<b>Energy/Fatigue</b>				
Baseline		51.2 ± 12.1	45.5 ± 9.1	0.001
6 Month		57.0 ± 12.9	52.1 ± 12.3	0.012
12 Month		65.7 ± 16.1	67.9 ± 16.8	0.393
p-value	Baseline - 6 Month	0.004	<0.0001	
	Baseline - 12 Month	<0.0001	<0.0001	
<b>Emotional Wellbeing</b>				
Baseline		64.6 ± 12.1	63.8 ± 11.7	0.676
6 Month		72.2 ± 20.3	68.1 ± 10.3	0.106
12 Month		73.3 ± 22.4	72.9 ± 21.6	0.875
p-value	Baseline - 6 Month	0.002	0.010	
	Baseline - 12 Month	<0.0001	0.001	
<b>Social Functioning</b>				
Baseline		41.7 ± 19.6	42.4 ± 13.9	0.790
6 Month		50.3 ± 15.7	44.4 ± 20.9	0.042
12 Month		84.4 ± 8.9	84.6 ± 9.1	0.979
p-value	Baseline - 6 Month	0.005	0.485	
	Baseline - 12 Month	<0.0001	<0.0001	
<b>Bodily pain</b>				
Baseline		66.5 ± 15.9	66.2 ± 16.7	0.909
6 Month		74.2 ± 13.4	76.4 ± 16.1	0.343
12 Month		78.5 ± 19.3	77.0 ± 12.7	0.589
p-value	Baseline - 6 Month	<0.0001	<0.0001	
	Baseline - 12 Month	<0.0001	<0.0001	
<b>General Health</b>				
Baseline		55.1 ± 10.4	55.3 ± 12.1	0.919
6 Month		63.8 ± 9.9	57.3 ± 9.2	<0.0001
12 Month		88.1 ± 7.3	88.3 ± 7.1	0.899
p-value	Baseline - 6 Month	<0.0001	0.257	
	Baseline - 12 Month	<0.0001	<0.0001	

**Table 6:** SAQ – Baseline & follow up results of diabetic & nondiabetic CHD patients.

Variables		Nondiabetic CHD	Diabetic CHD	p-value
<b>Physical Limitation</b>				
	Baseline	23.9 ± 11.1	23.7 ± 12.7	0.911
	6 Month	39.1 ± 10.7	38.4 ± 12.6	0.729
	12 Month	56.2 ± 10.1	54.3 ± 10.9	0.269
p-value	Baseline - 6 Month	<0.0001	<0.0001	
	Baseline - 12 Month	<0.0001	<0.0001	
<b>Angina Stability</b>				
	Baseline	26.4 ± 18.4	27.8 ± 20.1	0.647
	6 Month	51.1 ± 18.1	52.2 ± 18.9	0.704
	12 Month	74.8 ± 16.9	74.1 ± 17.2	0.807
p-value	Baseline - 6 Month	<0.0001	<0.0001	
	Baseline - 12 Month	<0.0001	<0.0001	
<b>Angina Severity</b>				
	Baseline	25.4 ± 13.4	24.4 ± 12.2	0.604
	6 Month	36.5 ± 14.4	33.6 ± 12.1	0.169
	12 Month	54.8 ± 13.3	54.6 ± 13.7	0.932
p-value	Baseline - 6 Month	<0.0001	<0.0001	
	Baseline - 12 Month	<0.0001	<0.0001	
<b>Treatment Satisfaction</b>				
	Baseline	49.7 ± 30.7	51.5 ± 23.0	0.667
	6 Month	55.2 ± 26.5	52.1 ± 29.4	0.395
	12 Month	76.8 ± 23.6	76.2 ± 22.5	0.861
p-value	Baseline - 6 Month	0.210	0.846	
	Baseline - 12 Month	<0.0001	<0.0001	
<b>Disease Perception</b>				
	Baseline	51.8 ± 34.1	50.6 ± 33.7	0.816
	6 Month	58.3 ± 23.9	54.2 ± 24.8	0.293
	12 Month	76.5 ± 25.2	74.3 ± 26.5	0.590
p-value	Baseline - 6 Month	0.170	0.409	
	Baseline - 12 Month	<0.0001	<0.0001	

Our study showed similar results in diabetic and nondiabetic CHD patients and no major significant difference has been observed in diabetic and nondiabetic CHD group using independent t-test in physical functional capacity and health-related quality of life. Eslamian *et al.* concluded that EECF therapy can improve the angina pectoris stability and severity of disease perception (Eslamian *et al.*, 2013). Similarly, our study demonstrates that both diabetic and nondiabetic coronary heart disease patients get good results in almost all domains of SAQ quality of life assessment scale.

Enhanced external counterpulsation is an effective treatment method for diabetes management and diabetes complication including CHD. It helps in lowering blood glucose level of alerting transport of insulin into skeletal muscle and thereby

help in the glyceamic control and ultimately improve the health-related quality of life of diabetic CHD patients. Linnemeier *et al.*, Martin *et al.*, and Ramasamy *et al.* studies validate the effectiveness of EECF towards glyceamic control in DM patients (Linnemeier *et al.*, 2003; Martin *et al.*, 2012; Ramasamy *et al.*, 2015).

Our study reveals that EECF significantly improves the health-related quality of life and remained high for the following one year in diabetic and nondiabetic CHD patients. Jorgensen *et al.* study demonstrated that the effect of EECF on quality of life sustained for three years in CHD patients (Jorgensen *et al.*, 2013). Hence, there is further need to conduct a multicentric randomized controlled trial to assess long-term effects of enhanced external counterpulsation on health-related quality of life in diabetic CHD patients.

## CONCLUSIONS

The results of the present study conclude that enhanced external counterpulsation therapy may improve walking capacity, maximal oxygen uptake and peripheral capillary oxygen saturation of diabetic and nondiabetic CHD patients. This non-invasive procedure also significantly improves the clinical symptoms (angina & dyspnea) of CHD patients with and without DM. Enhanced external counterpulsation therapy may also improve overall health-related quality of life of diabetic and nondiabetic CHD patients, including angina severity, angina stability, and general health. In the summary, enhanced external counterpulsation therapy is safe, well tolerated and proved to be an effective, non-invasive therapy to treat diabetic and nondiabetic CHD patients. It may improve the physical profile and quality of life in both diabetic and nondiabetic CHD patients equally. There is further need of multicentric randomized controlled trials to assess long-term effects of enhanced external counterpulsation on health-related quality of life in a larger population of CHD with DM patients.

## CONFLICT OF INTEREST

The authors of this study have no conflict of interest associated with material presented in this paper.

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## Evaluation of Predisposing Factors Associated with Suspected Adverse Drug Reactions of Hospitalized Patients

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### Abstract:

**Objectives:** To study the incidence and to evaluate the risk factors of suspected adverse drug reactions developed in the hospitalized patients of various departments and to assess the causality and severity of adverse drug reactions (ADRs). **Methods:** It was a retrospective-prospective study conducted in a tertiary care hospital for a period of two years two months, with a specific predefined criterion. A total of 254 subjects with ADRs were identified during the period of study for which 1:1 ratio of subjects with non-ADRs were taken. Subjects of all age groups and of either sex were enrolled. Risk factors included subjects' age group, gender, polypharmacy, comorbidity, intercurrent diseases and concurrent interactive drugs. **Statistical analysis used:** Multiple logistic regression analysis was performed to find the association of risk factors with adverse drug reactions. **Results:** The incidence of suspected adverse drug reactions in hospitalized patients was 13% (254/1952, 95%CI). Polypharmacy was the most significant predictor of adverse drug reactions (OR=55.952; 95%CI). Elderly population with multidrug therapy had developed the higher rate of ADRs. Cephalosporin's 27.6%, fluoroquinolones 15.5%, penicillamines 12.1%, anti-hypertensive 8.7%, NSAIDs 8.3% were more frequently implicated. Risk factors for suspected ADRs were: age (more than 60 years) (OR=1.033; 95% CI), gender [Male (OR=55.952; 95% CI)], comorbidity (OR=1.008; 95% CI), intercurrent diseases (OR=19.27; 95% CI). **Conclusion:** Polypharmacy, history of ADR, concurrent interactive drugs and inter current disease were the significant risk factors of adverse drug reactions. The elderly population was the vulnerable age group for ADRs. Multidrug therapy and comorbidity resulted in higher risk of ADRs in an older population. The Higher rate of suspected ADRs were probable and very less severe.

**Key words:** Adverse drug reaction, Age, Comorbidity, Polypharmacy, Risk factor.

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Home » Effectiveness of Lifestyle Modification Counseling on Glycemic Control in Type 2 Diabetes Mellitus Patients

## Effectiveness of Lifestyle Modification Counseling on Glycemic Control in Type 2 Diabetes Mellitus Patients

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### Abstract:

This study was carried out to assess the effectiveness of lifestyle modification counseling using lifestyle intervention holistic model and its adherence towards glycemic control in type 2 diabetes mellitus patients.

This quasi-experimental prospective study was conducted among 224 type 2 diabetes mellitus patients in Delhi Diabetes Research Center, New Delhi. The study participants were allocated to lifestyle modification counseling group (intervention) and usual care (control) group based on receiving or not receiving lifestyle modification counseling using lifestyle intervention holistic model. Effect of counseling on glycemic control was assessed at baseline and follow up of both the groups at 3rd, 6th and 12th months after receiving lifestyle modification counseling. The collected data was analyzed for percentage, mean, median, standard deviation, chi-squared, t-test and Wilcoxon test.

In this study, the lifestyle modification counseling proved to be effective and showed significant improvement in fasting blood sugar (175.5±32.3 to 144.7±17.6), postprandial blood sugar (275.5±61. to 199.0±48.3), hemoglobin A1c by 9.3±1.5 to 8.4±1.3. Significant improvement was observed in diastolic blood pressure (82.6±7.0 to 79.4±6.1) and high-density lipoproteins cholesterol (47.3±10.5 to 58.8±5.6) from 3rd to 12th months follow up with significant p value 0.001 in the intervention group. The study showed good adherence to balanced diet, physical activity, and tobacco and alcohol cessation but less adherence was observed towards meditation for stress management, regular checkups, and medicine adherence.

Lifestyle modification counseling is an effective, noninvasive approach towards glycemic control in type 2 diabetes mellitus patients. Lifestyle intervention holistic model used in this counseling may be helpful for type 2 diabetes mellitus patients to improve adherence and self-care behavior towards the management of their diabetes.

### Keywords:

Lifestyle Modification Counseling (LMC); Lifestyle Intervention Holistic Model (LIHM); Type 2 Diabetes Mellitus, Glycemic control; Delhi Diabetes Research Center (DDRC)



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**Introduction**

Type 2 diabetes mellitus is a complex and multifactorial metabolic disorder, occurring mainly due to insulin resistance in the peripheral tissue<sup>1</sup> and associated with various co-morbidities (obesity, hypertension, dyslipidemia and heart disease), which increase the rate of morbidity and premature deaths due to micro and macro vascular complications.<sup>2,3</sup> Diabetes mellitus is recognized as the epidemic disease of the 21<sup>st</sup> century affecting millions of people worldwide. The prevalence of diabetes has been increased dramatically from last twenty years and the disease is now a global public health problem. International Diabetes Federation, reports that 8.8% or 415 million are suffering from diabetes around the world and this number is expected to rise to 642 million by 2040.<sup>3</sup> According to IDF, India has a burden of 69.1 million cases of diabetes and this number is estimated to increase 123 million by 2040 and it is also estimated that India has the second highest cases of diabetes in the world after China.<sup>4,5</sup> Complications of T2DM can be costly due to its chronic nature and multi-organ involvement. These may include kidney failure, blindness, foot amputations and heart disease. The condition is also associated with an economic burden at patient and national level because of the frequent visits to the doctor and admissions to hospitals. There are several lifestyle factors such as sedentary lifestyle, changes in dietary habits, obesity, stress, physical inactivity, smoking, consumption of tobacco and alcohol which are associated with the development of type 2 diabetes mellitus (T2DM).<sup>6-8</sup>

Glycemic control is the main treatment goal in diabetes management, because it is associated with improved health outcomes and reduces the rate of severe complications and co-morbidities.<sup>9</sup> Along with the pharmacological treatment, management of diabetes requires patient commitment to comply with medical check-ups, blood glucose monitoring and regular medication therapy.<sup>10-17</sup> Adherence to the lifestyle interventions and self-care behaviors of the patients plays an important role in the management of T2DM and improves glycemic control, lipid profile, BMI and blood pressure, and reduces diabetes-related complications.<sup>18</sup> Non-adherence to medication and self-care may result in increased disease burden, worsen clinical outcomes, increased health care needs, frequent hospitalizations and increased health care costs.<sup>19</sup>

Several studies indicated that a poor knowledge of diabetes and its management in T2DM patients is associated with a higher BMI, poor glycemic control, prolonged use of pharmacological treatment, and more complications and co-morbidities.<sup>20</sup> Hence repeated health education and lifestyle modifying interventions provided by physicians and other health educators are required.<sup>21</sup> The results of two randomized controlled trials showed a significant improvement in glycemic control and physiological parameters in T2DM patients following a six-month lifestyle intervention program.<sup>22-23</sup>

Lifestyle intervention is an effective, non-invasive way to manage weight, glycemic control, blood pressure and to reduce the risk of fatal complications in T2DM patients.<sup>24-25</sup>

There are only few studies in India, which have attempted to establish a comprehensive lifestyle intervention counseling program. We aimed to introduce such intervention and hypothesized that lifestyle counseling will be more effective than usual care and will improve glycemic control in T2DM patients.

**Material and Methods****Study design and setting**

This was a quasi-experimental prospective study conducted among 224 T2DM patients in Delhi Diabetes Research Center (DDRC), New Delhi, India. The study participants were allocated to lifestyle modification counseling (LMC) group or usual care (UC) group through consecutive sampling procedure. Delhi Diabetes Research Center is the health care organization, which provides treatment facilities to diabetes mellitus patients. This study was conducted in two phases in DDRC, New Delhi.

**Eligibility criteria**

Participants were eligible if they were clinically and diagnostically confirmed to have T2DM for one year or longer, were of either sex, aged between 35 to 70 years with fasting blood sugar more than 120 mg/dl, postprandial blood sugar more than 180 mg/dl, and HbA1c above 7%. WHO and American Diabetes Association (ADA) set a target of HbA1c 7% to control diabetes, hence this figure considered in this account. Patients presenting with at least one co-morbidity (obesity, hypertension, coronary heart disease) with T2DM were included in this study.

Excluded were the patients who were not willing to participate or unable to give valid written consent, hospitalized at the time of recruitment, those with Type 1 and Gestational Diabetes, or patients with severe heart, liver or kidney failure as well as patients with severe complications of foot or unable to do physical activities. Additionally, patients who received multiple lifestyle intervention counseling within the last year and patients with a history of mental disorder, visual or, hearing problem were also excluded.

#### Sample size

Patients were recruited using consecutive sampling technique. The sample size (n=224) was considered to be statistical significant, 112 per group by taking 20 % lost to follow-up into the account. The following formula was used:

$$n = \frac{(z_{1-\alpha/2}\sqrt{2p(1-p)} + z_{1-\beta}\sqrt{p_s(1-p_s) + p_t(1-p_t)})^2}{(p_t - p_s)^2}$$

Where  $p = \frac{p_t + p_s}{2}$ ,  $p_t$  is the proportion in LMC group and  $p_s$  is the proportion in UC group.

#### Interventions

The intervention was conducted in two phases. The first six months were an active period where counseling was provided once a month. The second phase was the maintenance period where the participants were followed up for another six months. A comprehensive LMC program was consist of Lifestyle Intervention Holistic Model (LIHM) and used as a tool for counseling of participants to control T2DM. An experienced dietician, diabetes educator, physical trainer and diabetologist gave the lifestyle modification counseling sessions in DDR, New Delhi. The counseling sessions were repeated at every month for 6 months and follow up and measurement of the study participants was done at baseline, 3<sup>rd</sup>, 6<sup>th</sup> and 12<sup>th</sup> month. All lifestyle intervention components were explained through counseling in the local language, supported by pictures, videos and face to face interviews and discussions with individual or group of individuals. Each session of lifestyle modification counseling took approximately 10-15 min. There were five key components of counseling session, which are described in Table 1.

**Table 1: Five key components of Lifestyle Intervention Holistic Model (LIHM) used for Lifestyle Modification Counseling (LMC)**

Intervention	Sessions Conducted by	Description of the Intervention	Rationale
1. Balanced diet	Dietician	Participants were motivated to follow diet chart strictly. They were also encouraged to reduce the intake of fatty, salty, and sugary food products and increase the intake of fibrous diet such as whole grain, green vegetables, and fruits.	Balanced diet help in glycemic control, weight & blood pressure management. Fibrous diet fruits reduce the blood sugar and cholesterol level.
2. Physical Activity	Physical trainer	Participants were motivated to adhere to the regular brisk walk for at least 30 minutes per day. Training of Mudrasana, Balasana, Vajrasana, Paschimottanasana, Ardha Matsyendrasana, Supta Vajrasana, Dhanurasana, Shavasana) yogic exercise was given and advised to adhere the practice for 30 minutes per day.	Physical activity reduces the blood glucose level, cholesterol and triglycerides, blood pressure, and improves the response of the anti-diabetic drugs. It also helps in stress management and improvement in health-related quality of life.
3. Tobacco & Alcohol Cessation	Health counselor	Motivational counseling was provided to the participants to quit Tobacco (smoking and chewing tobacco) and	Cessation of tobacco and alcohol helps in management of diabetes and associated risk

		excess intake of alcohol.	factors, coronary heart disease.
<b>4. Stress Management</b>	Diabetes educator and physical trainer	Psychological technique, counseling and breathing exercise advised for at least 15 minutes per day to control stress and advised to take proper sleep.	During meditation the level of stress hormone (adrenaline and cortisol) reduced which further help in glycemic control.
<b>5. Adherence to Routine Check-ups &amp; Medication</b>	Diabetologist	Participants were encouraged for routine medical check-ups (blood sugar fasting, PP, HbA1c, lipid profile) at appropriate time. They were also instructed to take their medicine regularly at the proper time without skipping.	Routine medical check-ups are necessary in order to obtain better diabetes management and make patients aware about complications. Medication adherence with lifestyle modification controls blood glucose more rapidly.

#### Control group

Participants in the usual care group received standard care, which consisted of pharmacological and provision of pamphlets and booklets about various health topics.

#### Data Collection

The total data collection process was completed in one year and three months (three months for enrollment of the study participant and, one year for intervention and follow-up). Data on demographic, physiological and anthropometric measurements were collected from all participants at baseline data as well as at 3, 6 and 12 months from the beginning of the intervention. Adherence to the lifestyle intervention was assessed in the participants of the intervention group via the questionnaire at 3<sup>rd</sup>, 6<sup>th</sup> and 12<sup>th</sup> months.

#### Measurements

The primary outcome measures for this study was blood sugar fasting, blood sugar PP, and HbA1C. Fasting and PP blood glucose tests were analyzed using 'Contour Plus One' blood glucose monitoring system. HbA1c was assessed using an 'Alere Afinion AS100 analyzer'. Secondary outcome measures included weight, BMI, body fat, systolic and diastolic blood pressure, total cholesterol, triglyceride, LDL cholesterol, HDL cholesterol, and adherence to counseling. At baseline, the anthropometric measurements (weight, height, BMI, and body fat) were assessed in all study subjects. Height and weight of the participants were observed using a 'Stadiometer' and 'SECA' digital scale, and BMI was calculated using the formula of weight in kg divided by height in m<sup>2</sup> (kg/m<sup>2</sup>). Body fat was measured with body fat caliper. Trained personnel assessed the blood pressure using 'Pagoda (mercury) B.P' instrument. Cholesterol was assessed by the CHOD-PAP method, triglyceride by GPO method, HDL- cholesterol by immune inhibition method and LDL was calculated using standard formula [LDL = Total Cholesterol - HDL - (Triglycerides/5)]. Adherence to lifestyle intervention (LIHM) among T2DM patients were assessed through lifestyle intervention adherence questionnaire. These questionnaires have 20 questions covering all key components of LIHM ; Balanced diet, Physical activity, Tobacco and Alcohol cessation, Stress management, Routine medical check-ups & Medication adherence. The response of the participants was based on a weekly time frame in seven-point Likert scale to answer the question expressed as "On how many of the last 7 days did you...?".<sup>26</sup> For these items, the higher scores reflect higher adherence rate except for items in questions: 3, 4, 9,10,11,12,16,17 and 18, which reflect unwholesome choices (such as foods high in sugar or fat etc.) and for these items, higher scores reproduce lower adherence.

#### Statistical analysis

Statistical package for the social sciences (SPSS) software version 21 was used for all statistical analyses. In this study percentage and chi-squared test was used in the assessment of baseline demographic characteristics of the subjects. Mean, SD, sample paired & independent t- test was used for glycemic assessment, physiological and lipid profile assessment. LMC adherence in intervention group was assessed using median and Wilcoxon test.

#### Ethical approval and consent

Prior permission has been obtained from the concerned authorities of DDRC, New Delhi and Ethical approval was granted by SAAOL Heart Center (Ref. No. IEC/SHRF/Ph.D/P-01/29.04.2016) New Delhi. Informed consent has been obtained from all enrolled study participants.

## Results

### Recruitment and response rate of participants

A total 312 T2DM patients were screened from DDRC of which 88 patients were excluded due to following reasons: 12 patients having diabetes less than one year, 27 refused to give written consent, 33 refused to participate at follow ups, and 16 patients, having timing difficulties. A total of, 224 patients were enrolled. Ten patients from LMC group and twelve patients from the usual care group lost to follow up and were excluded from the analysis.

### Baseline characteristics of the participants

The mean age was 51.4±9.3 in LMC group and 54.0±8.6 in the UC group. This study data has 118 (58.4%) males and 84 (41.6%) females. The majority of patients have co-morbidity of obesity (127), hypertension (150), and heart disease (68). In this study, 38.1% patients were having the family history of diabetes and more than half of (55.4%) patients were found non-vegetarian. Total number of smokers was 31, tobacco chewing history was 24 and excessive alcohol users were 51 in this study. The baseline characteristics of the study subjects are presented in Table. 2

Table 2: Baseline demographic characteristics of participants

Characteristics	Totaln=202	Interventionn=102	Controln =100	p-value
Age (in years)	52.7±9.1	51.4±9.3	54.0±8.6	0.336
<b>Gender</b>				
Male (n)	118	48.3%	51.7%	0.276
Female (n)	84	53.8%	46.4%	
<b>Locality</b>				
Rural	42	76.2%	23.8%	<0.001
Urban	111	50.5	49.5%	
Semi-Urban	49	28.6%	71.4%	
Duration of Diabetes (in years)	7.9±6.2	7.93±6.4	7.93±5.9	0.797
<b>Family History of Diabetes</b>				
Yes	77	50.6%	49.4%	0.973
No	125	50.4%	49.6%	
<b>Food Habits</b>				
Vegetarian	89	50.6%	49.4%	0.609
Non-vegetarian	112	50.0%	50.0%	
Vegan	1	100.0%	0.0%	
<b>Co-morbidities</b>				
Obesity	127	66.67%	59%	0.510
Hypertension	150	74.51%	74%	
Heart Disease	68	37.25%	30%	
<b>Risk Factors</b>				
Smoking	31	9.8%	21%	0.155
Tobacco chewing	24	10.78%	13%	
Alcohol	51	20.59%	30%	

### Glycemic control

There was a significant improvement in blood sugar fasting (175.5±32.3 to 144.7±17.6), blood sugar PP (275.5±61.3 to 199.0±48.3), HbA1c % (9.3±1.5 to 8.4±1.3) within the LMC group from baseline to 12 months follow up. If we compare both LMC and UC group, there was a significant change observed in blood sugar PP, and HbA1c with p<0.001. The details of results are given in Table. 3

Table 3: Changes in glycemic control of participant's measurements from baseline to 3<sup>rd</sup>, 6<sup>th</sup> and 12<sup>th</sup> month follow-up with differences within and between groups over time

Variables	Treatment	Control	Difference between the group (p-value)
Blood sugar Fasting	175.5±32.3158.6±26.7142.0±26.3144.7±17.6	154.2±28.5150.9±24.8142.8±29.7144.3±16.2	0.0000.0360.8510.846

Baseline 3 Month 6 Month 12 Month				
Difference within group (p-value)	B-3MB-	<0.0001		0.228
	6MB-12M	<0.0001		<0.0001
		<0.0001		0.002
Blood sugar PP Baseline 3 Month 6 Month 12 Month		275.5±61.3239.6±58.2200.4±52.1199.0±48.3	300.8±64.2280.3±54.9260.1±56.3269.6±53.3	0.0050.0000.0000.000
Difference within group (p-value)	B-3MB-	<0.0001		<0.0001
	6MB-12M	<0.0001		<0.0001
		<0.0001		<0.0001
HbA1c % Baseline 3 Month 6 Month 12 Month		9.3±1.58.8±1.48.4±1.38.4±1.3	9.9±1.99.7±1.69.7±1.610.0±1.7	0.0250.0000.0000.000
Difference within group (p-value)	B-3MB-	<0.0001		0.085
	6MB-12M	<0.0001		0.035
		<0.0001		0.267

### Physiological parameters

Significant changes was observed in body fat% and diastolic blood pressure from 3<sup>rd</sup> to 12<sup>th</sup> month follow-up between LMC and UC group with p<0.001. A significant change was observed in systolic B.P and pulse rate between LMC and UC group at 6<sup>th</sup> and 12<sup>th</sup> months. There was no significant change in weight and BMI throughout the follow-up. If we see within LMC, there was a significant improvement as being observed in Weight (74.4±14.5 to 72.6±12.3) Body fat % (30.7±5.5 to 29.2±3.8), Systolic B.P mmHg (134.9±16.0 to 124.7±9.5), Diastolic B.P (82.6±7.079.4±6.1), Pulse (76.6±3.774.9±2.5) from baseline to 12<sup>th</sup> months follow-up. The details of results are enclosed in appendix (Table 5).

### Lipid profile

There were significant changes being observed in HDL cholesterol between LMC and UC group from 3 to 12 month with p<0.001. There was a significant change, observed in LDL and total cholesterol at 6<sup>th</sup> and 12<sup>th</sup>. Significant reduction within the group was observed in total cholesterol (286.4±103.2 to 205.8±56.9), triglyceride (235.6±114.0 to 175.0±41.1), HDL cholesterol (47.3±10.5 to 58.8±5.6), and LDL cholesterol (192.1±91.2 to 111.9±54.8) from baseline to 12 months follow up. The details of results are given in appendix (Table. 5).

### LIHM adherence status

After lifestyle modification counseling the adherence was assessed through seven point liker scale which showed the significant improvement in diet chart(Q1), eat generous amount of fibrous diet(Q2), reduce to take sugar rich products(Q 3), reduce to eat junk foods(Q4), walk for 30 minutes (Q5), take stairs instead of using lift or elevator (Q7), walk by feet to market or office (Q8), consume tobacco (Q9), leave tobacco even you had strong feeling to consume it (Q10), drink alcohol (Q11), leave alcohol even you had strong feeling to drink it (Q12), get proper sleep(Q14), feel relax and happy (Q15), check your feet for any symptom of diabetes complication(Q20). The adherence was increased from 3<sup>rd</sup> month to 6<sup>th</sup> month follow-up but not sustained till 12<sup>th</sup> month except tobacco and alcohol cessation. In short, this study results demonstrates good adherence to diet, physical activity, and tobacco and alcohol cessation but lower the adherence to meditation for stress management, regular checkups and medicine adherence. Detail of LIHM adherence is given in Table. 4.

Table. 4: LIHM adherence outcomes based on a weekly time frame in seven points Likert scale

S.No	Adherence to LIHM	After 3 months(Median)	After 6 months(Median)	After 12 months(Median)	3M-6Mp-value	3M-12Mp-value
1	Diet Chart	5	6	5	<0.0001	0.148
2	Eat fibrous diet	5	7	5	<0.0001	0.039
3	Eat sugar rich products	2	1	2	<0.0001	0.218
4	Eat junk food	2	1	2	<0.0001	0.153
5	Walk for at least 30 Minutes	5	6	5	<0.0001	0.641
6	Yogic Exercise	4	4	4	0.736	0.244
7	Take stairs instead of using lift or elevator	4	5	4	0.004	0.877

8	Walk by feet to your office or market	3	4	3	<0.0001	0.878
9	Consume tobacco (Smoking/Chewing)	0	0	0	<0.0001	<0.0001
10	Leave tobacco even you had strong feeling to consume it	0	0	0	<0.0001	<0.0001
11	Drink Alcohol	0	0	0	<0.0001	<0.0001
12	Leave alcohol even you had strong feeling to drink it	0	0	0	<0.0001	<0.0001
13	Meditate to control stress	3	3	3	0.262	0.193
14	Get proper sleep	6	6	6	0.019	0.750
15	Feel relax and happy	5	6	5	<0.0001	0.617
16	Feel much stressed	4	4	4	0.714	0.596
17	Forget to take your regular medicines	1	1	1	0.901	0.499
18	Left your medicine when you feel better	1	1	1	0.641	0.869
19	Check your glucose level	2	1	1	0.849	0.878
20	Check your feet for any symptom of diabetes complication	5	6	5	<0.0001	0.882

Table 5: Changes in Physiological and Biochemical parameters of participant's measurements from baseline to 3<sup>rd</sup>, 6<sup>th</sup> and 12<sup>th</sup> month follow-up with differences in within and between groups over time

Variables		Treatment(n=102)	Control(n=100)	Difference between the group (p-value)
BMI Baseline 3 Month 6 Month 12 Month		27.8±5.627.3±4.927.0±4.827.9±5.3	27.8± 5.627.8±5.527.7±5.428.4±5.2	0.8910.4310.3270.476
Difference within group (p-value)	B-3MB-	<0.0001	0.300	
	6MB-12M	<0.0001	0.814	
	6MB-12M	0.176	0.001	
Body fat Baseline 3 Month 6 Month 12 Month		30.7±5.529.9±5.129.4±4.429.2±3.8	32.1±6.431.9±5.931.6±5.531.4±5.0	0.0970.0150.0020.000
Difference within group (p-value)	B-3MB-	<0.0001	0.282	
	6MB-12M	<0.0001	0.033	
	6MB-12M	<0.0001	0.016	
Systolic B.P Baseline 3 Month 6 Month 12 Month		134.9±16.0129.5±13.1125.5±9.7124.7±9.5	134.1±13.3131.1±11.9130.9±11.3131.1±12.3	0.6990.3670.0000.000
Difference within group (p-value)	B-3MB-	<0.0001	0.009	
	6MB-12M	<0.0001	0.003	
	6MB-12M	<0.0001	0.012	
Diastolic B.P Baseline 3 Month 6 Month 12 Month		82.6±7.080.3±6.0478.9±4.879.4±6.1	84.6±6.583.7±6.683.5±6.184.0±7.2	0.0430.0000.0000.000
Difference within group (p-value)	B-3MB-	0.001	0.281	
	6MB-12M	<0.0001	0.167	
	6MB-12M	<0.0001	0.222	
Pulse Baseline 3 Month 6 Month 12 Month		76.6±3.775.1±2.673.4±2.774.9±2.5	76.0±3.175.6±2.975.1±2.876.3±3.1	0.2380.1900.0000.001
Difference within group (p-value)	B-3MB-	<0.0001	0.172	
	6MB-12M	<0.0001	0.008	
	6MB-12M	<0.0001	0.581	
Total cholesterol Baseline 3 Month 6 Month 12 Month		286.4±103.2247.1±80.1213.2±83.9205.8±56.9	263.9±105.7255.9±100.8271.2±99.9237.5±77.1	0.2790.6210.0020.019
Difference within	B-	<0.000	0.252	

group (p-value)	3MB-	<0.000	0.448	
	6MB-12M	<0.000	0.010	
Triglyceride Baseline 3 Month 6 Month 12 Month		235.6±114.0203.2±87.3172.9±62.7175.0±41.1	194.5±63.2191.1±64.1185.3±70.7193.7±59.4	0.0310.4320.3520.063
Difference within group (p-value)	B-	<0.000	0.466	
	3MB-	<0.000	0.112	
	6MB-12M	<0.000	0.913	
HDL cholesterol Baseline 3 Month 6 Month 12 Month		47.3±10.554.0±8.359.1±6.958.8±5.6	48.5±9.949.1±10.550.4±10.747.2±8.5	0.5720.0110.0000.000
Difference within group (p-value)	B-	<0.000	0.184	
	3MB-	<0.000	0.014	
	6MB-12M	<0.000	0.164	
LDL cholesterol Baseline 3 Month 6 Month 12 Month		192.1±91.2152.4±72.2119.5±80.7111.9±54.8	170.0±97.1168.6±98.9183.7±96.5151.5±77.4	0.2410.3440.0010.003
Difference within group (p-value)	B-	<0.000	0.795	
	3MB-	<0.000	0.099	
	6MB-12M	<0.000	0.033	

## Discussion

The purpose of this study was to determine the effectiveness of life style modification counseling and its adherence of intervention holistic model on glycemic control and physiological parameters among type 2 diabetes mellitus patients at the 3<sup>rd</sup>, 6<sup>th</sup>, and 12<sup>th</sup> month follow-ups. The results of our study indicate significant reductions in body fat, systolic and diastolic blood pressure, pulse rate, blood sugar F and PP, HbA1C, and an increase in HDL-cholesterol was achieved during follow-ups as compared to the usual care group. Additionally, the adherence of intervention holistic model was increased. This study also shows significant improvement in adherence towards diet chart, fibrous diet, reduce intake of sugar rich products, junk foods, physical activity, stress management, checking glucose level and daily monitoring of feet for diabetes complications and it was enhanced from 3<sup>rd</sup> month to 6<sup>th</sup> month of follow-up but not sustained till 12 months. The study results conclude that life style modification counseling and its adherence can give significant and beneficial impact on diabetes control and management.

The studies done by Oldroyd et al., and Norliza Ibrahim et al.,<sup>27-28</sup> assessed the impact of lifestyle interventions reported a decrease in the blood sugar PP in intervention group participants at 12 month follow up. In the present study, we found similar results, i.e. decrease in blood sugar PP (275.5±61.3 to199±48.2) in LMC group as compared to usual care group (300.8±64.2 to 269.5±53.2) participants that was statistically significant at 12-month follow up ( $p>0.05$ ). Similar studies by Adachi et al., and Spencer et al.,<sup>22-23</sup> demonstrated a significant decrease in HbA1c levels 0.7% and 0.8% respectively after lifestyle intervention. Our study showed a significant decrease in HbA1c levels (1.2%,  $P<0.01$ ) after 12 months follow up. Studies were done by Greaves et al., and Malkawi, et al., found significant improvements in blood sugar levels, body weight and insulin resistance in the intervention group through diet and diet plus physical activity interventions with lesser use of anti-diabetic medicines compared to a control group.<sup>29-30</sup> Decrease in the body fat and improvement in glucose metabolism<sup>31</sup> is due to adherence of diet chart and increasing physical activity adherence in the LMC group that induced the decrease in total cholesterol, triglyceride, LDL and increase in HDL, as there were dose-response relationships between level of physical activity, HDL-cholesterol, and triglycerides.<sup>32</sup>

In the present study, there was a significant reduction in body fat but no statistical significance was observed in body weight and BMI between groups but the mean weight loss in the LMC group (-2.12 kg) was similar to the mean weight loss demonstrated in the systematic review and meta-analysis by Dunkley et al.,<sup>33</sup> of -2.32 kg. Finnish diabetes prevention study and US Diabetes Prevention Program (DPP) validates that lifestyle intervention helped in weight reduction; maintain blood pressure, glycemic control and improved HDL cholesterol of T2DM patients.<sup>34-35</sup> A review of 11 studies on group-based education have shown significant improvement in HbA1c%, reduction in body weight and systolic blood pressure, and reduces the requirement for diabetes medication.<sup>36</sup> Studies done by Ghada Asaad et al., Samah et al., and Takuya et al., have shown a significant improvement in glycemic control (fasting, PP and HbA1c) and diet adherence in the intervention group participant after lifestyle based intervention counseling similar to the present study.<sup>37-39</sup>

In this study, there was significant increment in adherence at 6<sup>th</sup> month follow up, but that was not sustained till 12 month follow up, hence there is need of continuous counseling. The results of present study demonstrates significantly good adherence to diet, physical activity, and

tobacco & alcohol cessation but showed significantly lower adherence to regular medication, stress management. Lin EH and Katon W et al., in their study demonstrated that adherence to lifestyle practice minimize the burden of diabetes and improve clinical and physiological parameters which further reduce the hospitalization rate and economic burden.<sup>19</sup> The result of our study tries to establish significant improvement in sugar profile, systolic and diastolic blood pressure, pulse rate, lipid profile, HDL cholesterol and body fat. Greaves et al., also found that Intervention is more effective with adherence, follow-up, behavior change self-monitoring and social support.<sup>29</sup> A study done by Tuomilehto J et al., have been shown adherence to prescribed lifestyle modification similar to our study improve blood sugar levels and blood pressure and also reduce the risk of micro and macro-vascular complications of diabetes.<sup>40</sup> Similar studies done by Figueira et al., and Shareef et al., revealed the significant improvements in glycemic levels and medication adherence in the intervention group participants after educational counseling which support the results of our study.<sup>41-42</sup> Studies done by Fadare et al., and Farzana Saleh et al., observed a significant improvement in glycemic control, quality of life, reduction in medical treatment cost and short and long-term diabetes related complications of those patients who showed adherence to anti-diabetic medicines and self-management practice.<sup>43-44</sup>

#### Limitations of the study

Diabetes patients were selected from only one hospital of Delhi (DDRC) and hence the study findings may not be applicable to the entire diabetic population. There is no standard published tool to evaluate the adherence of the participants besides only self-developed questionnaires, adherence questionnaires were used. The participants responding to questions based on what they supposed to be the correct answer, and not necessarily what was true in their case. Furthermore, there was variability in some of the parameters related to glycemic control, as well as demographic profile at baseline. Also, the adherence of the control group was not measured and while it is assumed that there would have been no statistically significant change, it would have been beneficial to test them. These are most certainly areas that require further multi-centric randomized control study with larger population in different groups.

#### Conclusion

This study concludes that lifestyle modification counseling through lifestyle intervention holistic model (LIHM) and its adherence among T2DM patients was effective in improving both glycemic control, physiological and lipid profile of LMC group as compared to usual care group of type 2 diabetes mellitus patients. Adherence behavior of the patients improved and enhanced diabetes management and control skills of LMC group patients. Further multi-centric randomized control trials are required to assess the effectiveness of this tool in larger population for long-term effectiveness.

#### Conflict of Interest

The authors have no conflicts of interest related to the material presented in this original research paper.

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## Effect of Lifestyle Intervention on Medical Treatment Cost and Health-Related Quality of Life in Type 2 Diabetes Mellitus Patients



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### Abstract

Diabetes is a costly, lifestyle disorder which increases the burden of disease and deteriorates the Health-Related Quality of Life (HRQOL) of diabetes patients and this study was conducted to assess the effect of lifestyle intervention on medical treatment cost and HRQOL in type 2 diabetes mellitus (T2DM) patients. This quasi-experimental prospective study was conducted in Delhi Diabetes Research Center, New Delhi and included 224 T2DM patients. Patients were divided into LMC and usual care group on the basis of receiving or not receiving lifestyle modification counseling. The follow-up of both groups was done at 6<sup>th</sup> and 12<sup>th</sup> months. Collected data were analyzed through IBM, SPSS software v 21 for mean, median (min-max), SD, t-test and Wilcoxon scores (rank sums) test. The results of this study showed a statistically significant reduction in diabetes medication costs, hospitalization and surgery costs in the LMC group as compared to the usual care group. The significant improvement was also observed in HRQOL domains which includes - physical functioning (62.40±6.738 to 83.67 ± 5.4920), physical health (35.30±22.069 to 64.50±13.62), emotional problem (37.90±28.93 to 71.46±16.75), energy (54.31±11.858 to

80.75 ± 15.52), emotional well-being (63.06± 9.828 to 85.79±6.36), social functioning (38.848±20.805 to 65.54±8.39) and general health (54.51±11.679 to 82.398± 11.7) at 12<sup>th</sup> month follow up in LMC group. The ADS score also showed significant improvement in overall HRQOL of LMC group. This study concludes that lifestyle intervention may improve HRQOL and reduce medical treatment cost of T2DM patients.

## Keywords

Lifestyle Intervention; Health-Related Quality of Life; Type 2 Diabetes Mellitus; Appraisal Scale of Diabetes; Treatment Cost; SF-36

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## Introduction

Diabetes mellitus (DM) is a non-infectious, silent, metabolic disorder, develops due to increasing age, obesity, unhealthy diet, physical inactivity, stress and consumption of tobacco.<sup>1,4</sup> Presently, more than 415 million people are diabetic globally as per International Diabetes Federation (IDF) and this number is expected to increase to 642 million by 2040. Due to increasing prevalence and, the high population, India has become the ‘Diabetic Capital’ of the world and having the second highest number (69.1 million) of diabetes patients after China.<sup>2,4</sup> Diabetes is a costly lifestyle disorder associated with various long-term, macro (cardiovascular diseases) and microvascular (retinopathy, nephropathy, and neuropathy) complications. These complications, lower the quality of life of T2DM patients and increase the rate of morbidity and mortality.<sup>3,4</sup> The cost of diabetes treatment is increased due to long-term complications and co-morbidities, which exert enormous economic burden, both for the individual and the nation.<sup>5</sup> Diabetes is the most common cause of death and disability around the world, caused due to secondary lifestyle and rapid globalization. Around 75% T2DM patients live in low and

middle-income countries.<sup>4</sup> India is a low and middle income developing country, where diabetes treatment cost is increasing day by day and patients faced the huge cost burden due to out of their pocket expenditure.<sup>1,5</sup> The global economic burden of diabetes is huge with an estimated approximately 673 billion US dollars annually in 2015, which constituted 12% of total expenditure for that year.<sup>1,4</sup> The public health expenditure on diabetes is expected to rise to the US \$ 595 billion in 2030 and the disease can be considered a risk for the world.<sup>6,7</sup>

WHO defined that health is not only the absence of disease and frailty in the body but also physical, mental and social well-being, must be present in a healthy person. The HRQOL is an important health outcome and used to assess the physical and mental health status of a person.<sup>8</sup> The relationship between HRQOL and the number of chronic complications found a trend towards poorer HRQOL if co-morbidities increased.<sup>9,10</sup> Poor QOL of patients occurred due to non-adherence to medication and self-management, which leads to uncontrolled diabetes and increased the risk of fetal complications.<sup>11</sup> A study demonstrated that diabetes can affect QOL in many ways: psychologically, physically, financially and socially.<sup>7</sup>

Medical treatment costs and HRQOL have shown a direct relationship. Diabetes treatment cost will be higher if the duration and number of complications due to diabetes increased, HRQOL of patients deteriorates.<sup>12,13</sup> A survey done by Piette et al found that 30% of patients had difficulties in paying diabetes medication costs due to out-of-pocket money<sup>14</sup> and other study revealed that out-of-pocket costs were due to diabetes-related complications and co-morbidities and experienced worse diabetes outcomes with poor QOL.<sup>15</sup> Lifestyle modification counseling (LMC) is the key component to achieve better glycemic control, improve HRQOL and reduce diabetes treatment cost due to the reduction of complications.<sup>16</sup> Educated diabetic patients can develop the skills that allow them to cope with diabetes and its related complications.<sup>17</sup> Hence, Lifestyle modification counseling generally used as an intervention is a novel, cost-effective, non-invasive method to manage T2DM and decrease the rate of complications. LMC includes- education about self-management, healthy diet, physical activity, tobacco and smoking cessation, stress management counseling with routine medical checkups and medication adherence counseling. The purpose of this study was to assess the effect of lifestyle intervention on medical treatment cost and health-related quality of life in T2DM patients.

## Materials and Methods

This hospital-based quasi-experimental, prospective study was conducted in DDRC New Delhi. In this study, total 224 T2DM patients were enrolled based on consecutive sampling technique. The study participants were allocated to LMC group and the usual care group

on the basis of patients receiving or not receiving lifestyle modification counseling. LMC group received lifestyle modification counseling with standard care (pharmacological treatment) while usual care group received only pharmacological treatment. The study was conducted in two phases. In the first phase planning, preparation for counseling components and recruitment of participants was done and in the second phase the implementation of counseling, data collection, follow-ups, and data analyses.

## Eligibility Criteria

The patients who included in this study were clinically and diagnostically confirmed T2DM, either sex, aged between 35 to 70 years, having blood sugar fasting more than 120 mg/dl, blood sugar PP more than 180 mg/dl, and HbA1c above 7%. Patients having at least one co-morbidity (obesity, hypertension, coronary heart disease) with T2DM and having diabetes more than 1 year, willing to participate and able to give valid written consent. The patients who excluded were newly diagnosed, having Type 1 and gestational diabetes, kidney failure, hospitalized, received more than one-time lifestyle intervention counseling within 1 year and having the mental disorder, visual, hearing problems and unwilling to give written consent.

## Recruitment of study Participants

Total 224 T2DM patients were enrolled as they fulfilled study eligibility criteria. The total duration of the study was 2 years (2015 to 2017) with one-year follow-up. The sample size (n=224) was calculated with an allowable error of 20% and 5% level of significance using below given standard formula.

### formula

Where  $p = (p_t \pm p_s) / 2$ ,  $p_t$  is the proportion of LMC group and  $p_s$  is the proportion of usual care group.

## Lifestyle Intervention

Lifestyle modification counseling was used as an intervention tool for participants to prevent and control T2DM. The counseling program was initiated in two phases. The first six months of the study were active period and next six months of the maintenance period, i.e. Interventional counseling was provided to the participants for previous 6 months. The LMC sessions were provided by an experienced and qualified dietitian, physical trainer and diabetes educator, under the supervision of senior diabetologist. The following five-lifestyle components were explained in local language, with the help of pictures, videos and discuss with participants and the group of the participant. Lifestyle

modification counseling (intervention) was repeated at every month for 6 months and follow up with the participants were done at 6th and 12th month.

## Key Components of the Intervention

### Balanced Diet

A qualified and experienced dietician encouraged participants to cut down high-calorie foods and advised to increase the number of fibrous foods (whole grain, green vegetables, and fruits). Participants were advised to adhere to the diet chart prescribed by the dietitian.

### Physical Activity

Participants were motivated by a physical trainer to increase their physical activities, i.e. brisk walk for at least 30 minutes per day and to do daily yogic exercises for at least 30 minutes (Yoga- Mudrasana, Balasana, Vajrasana, Paschimottanasana, Ardha Matsyendrasana, Supta Vajrasana, Dhanurasana, Shavasana).

### Tobacco and Alcohol Cessation

Participants were motivated to quit tobacco (smoking and chewing tobacco) and alcohol at every counseling session. They were educated about the harmful effects of tobacco and alcohol.

### Stress Management

Participants were encouraged to do daily meditation and breathing exercise at least for 15 minutes to control stress and advice were given to take proper sleep.

### Adherence to Routine Medical Checkups and Medications

Diabetologist advised the participants to adhere on routine medical checkups (the clinical assessment with blood sugar fasting, PP, HbA1c, lipid profile) and regular medications without skipping.

### Usual Care Group

Participants in the usual care group received only standard treatment. In addition, they were also provided the pamphlets and booklets for self-management of diabetes. A diary was provided to record their weight, diets, physical activities and other blood test results as it was also provided to LMC group.

### Measurements

Demographic and socioeconomic details (Age, sex, locality, medical history, education, occupation, monthly income and socioeconomic status) of both the groups had been done at baseline.

### Treatment cost Assessment

The cost of medical treatment for diabetes and its related complications was analyzed through diabetes and its related complications questionnaire.

### Health-Related Quality of Life (HRQOL)

The HRQOL of our study participants of both the group was measured through short-form health survey (SF-36) questionnaire and a disease-specific questionnaire, appraisal of diabetes scale (ADS). Quality of life of T2DM patients was assessed by asking questions to participants, whether they experienced problems related to life, such as mobility, personal care, housework, family, study, leisure activities, pain, discomfort and anxiety/depression. Responses were recorded as the answers. SF-36 contains 36 questions of eight health domains; physical functioning, physical limitation, emotional limitation, vitality, emotional well-being, social functioning, body pain and general health.<sup>18</sup> The eight domains were scored from 0 to 100 indicating worst to best possible health.

ADS is a diabetes-specific scale to assess QoL of diabetes patients have 7 items covering domains; stress due to diabetes, uncertainty, control over diabetes (2 questions), predictable future deterioration, coping skill and diabetes effect on life goals. The total score can range from 0 to 35. Thus, the lower score on ADS scale suggests better QOL.<sup>19</sup>

### Statistical Analysis

Statistical package for the social sciences (SPSS) software version 21 was used for all statistical analyses. Participants' demographic and socioeconomic measurements were compared between groups using independent t-test. Descriptive analysis (Mean, Median (Min-Max), SD), Chi-square, sample paired and independent t-test was used to analyze data with 95 % confidence interval and a significant p-value less than 0.05. Medical treatment cost was assessed through Wilcoxon scores (rank sum) test to calculate p-value as data was not normally distributed.

### Ethical Approval and Consent

Ethical clearance for this study was obtained from DDRC, New Delhi, and SAAOL Heart Center (Ref. No. IEC/SHRF/PhD/P-01/29.04.2016), New Delhi. Written informed consent was obtained from all study participants before initiation of the study.

### Results



Characteristics	Total (n=202)	Usual Care Group (n=100)	LMC group (n=102)	p-value
Age (in years)	52.7±9.1	54.0±8.6	51.4±9.3	0.336
<b>Gender</b>				
Male (n)	118	61 (51.7%)	57 (48.3%)	0.276
Female (n)	84	39 (46.4%)	45 (53.8%)	
<b>Locality</b>				
Rural	42	10 (23.8%)	32 (76.2%)	0.001
Urban	111	55 (49.5%)	56 (50.5%)	
Semi-Urban	49	35 (71.4%)	14 (28.6%)	
<b>Present Status of Health</b>				
Obesity	127	59 (59%)	68 (66.67%)	0.757
Hypertension	150	75 (75%)	75 (73.53%)	0.973
Heart Disease	68	30 (30%)	38(37.25%)	0.489
<b>Family History of Diabetes</b>				
Yes	77	38 (49.4%)	39 (50.6%)	0.973
No	125	62 (49.6%)	63 (50.4%)	
<b>Risk Factors</b>				
Smoking	31	21(21%)	10 (9.8%)	0.257
Tobacco chewing	24	13 (13%)	11 (10.78%)	0.814
Alcohol	51	30 (30%)	21 (20.58%)	0.649
None	114	47 (47%)	67 (65.68%)	0.290
<b>Food Habits</b>				
Vegetarian	90	45 (50.0%)	45 (50.0%)	0.609
Non-	112	56 (50.0%)	56 (50.0%)	

vegetarian							
Duration of Diabetes (years)	Mean±SD	Median (Min-Max)	Mean±SD	Median (Min-Max)	Mean±SD	Median (Min-Max)	p-value
	7.9±6.2	7 (1-27)	7.9±6.4	7 (1-27)	7.93 (1-27)	7(1-27)	0.797

Table 2: Baseline socioeconomic profile of study participants

Education Total		LMC Group (n=102)		UC Group (n=100)		p-value
		Number	Percentage %	Number	Percentage %	
Illiterate	2	2	100.0	0	0.0	0.471
Upto class 5	10	6	60.0	4	40.0	
Upto class 8	11	7	63.6	4	36.4	
Upto class 10	45	26	57.8	19	42.2	
12th or diploma	69	35	50.7	34	49.3	
Graduate/Post-graduate	63	33	52.9	30	47.1	
PhD/Doctorate	2	1	50.0	1	50.0	
Occupation						
Unemployed	70	34	48.6	36	51.4	0.003
Unskilled worker	18	17	94.4	1	5.6	
Semi-Skilled worker	13	7	53.8	6	46.2	
Skilled worker	21	12	57.1	9	42.9	

Clerical, Shop owner	41	18	43.9	23	56.1	
Semi professional	36	12	33.3	24	66.7	
Professional	3	2	66.7	1	33.3	
<b>Monthly income</b>						
>38,600	61	29	47.5	32	52.5	0.001
19291-38599	75	35	46.7	40	53.3	
14463-19290	25	22	88.0	3	12.0	
9634-14462	3	3	100.0	0	0.0	
5773-9633	4	3	75.0	1	25.0	
1933-5772	2	2	100.0	2	0.0	
<1932	32	8	25.0	24	75.0	
<b>Socio-economic status</b>						
Upper Class	77	32	41.6	45	58.4	0.001
Upper Middle	96	43	44.8	53	55.2	
Lower Middle	25	24	96.0	1	4.0	
Upper Lower	3	3	100.0	0	0.0	
Lower	1	0	0.0	1	100.0	

### Cost Analysis of Various Expenditures of Diabetes and Diabetic Complications

At 12 month follow up, the result of the present study reveals that the LMC group ( $9627.5 \pm 1938.4$ ) spends less money on diabetes medicine as compared to the usual care group ( $10534.0 \pm 2169.4$ ) with significant p-value 0.0038. The surgery cost of usual care group ( $9212.0 \pm 17464$ ) was higher due to diabetes complications as compared to the surgery cost of LMC group patients ( $3186.3 \pm 10595$ ) with significant difference p 0.0046. The average hospitalization cost of usual care group (39580 INR) was approximately four times higher as compared to LMC group (10569 INR). The average mean (SD) of some variables including; other expenses for diabetes ( $340.0 \pm 573.7$  vs  $173.5 \pm 359.0$ ), diabetes neuropathy expenses ( $307.0 \pm 1031.0$  vs  $184.3 \pm 569.6$ ), hypertension medicines cost (257.8

$\pm 429.6$  vs  $173.8 \pm 267.2$ ), diabetes retinopathy expenses ( $39.0 \pm 390.0$  vs  $14.7 \pm 106.6$ ), foot complication related treatment cost ( $305.5 \pm 976.1$  vs  $137.8 \pm 483.2$ ) showed mean change, but that did not reach to the statistically significant level. Whereas LMC group spend more money on doctor's consultation fees for diabetic complications because of the LMC group participants have more diabetic complications. Travel cost, laboratory cost, diabetes complications diagnostics cost and heart disease medicines cost were slightly higher in the LMC group because of the higher number of heart disease patients present in the LMC group as compared to the usual care group. Details of the results are given in Table 3.

**Table 3: Medical Treatment cost assessment at 12 months of usual care & LMC group of T2DM patients**

Expenditure (INR)	UC Group (n=100)		LMC Group (n=102)		p-value*
	Mean $\pm$ SD	Median (Min-Max)	Mean $\pm$ SD	Median (Min-Max)	
Travel Cost	1146.7 $\pm$ 520.5	875 (420-2170)	1200.39 $\pm$ 537.59	1455 (600-2350)	0.822
Laboratory cost	1099.2 $\pm$ 260.93	1120 (640-1920)	1112.16 $\pm$ 291.28	1120 (620-1920)	0.739
Medicine cost	10534.0 $\pm$ 2169.35	10050 (6850-17200)	9627.45 $\pm$ 1938.42	9400 (5890-15400)	<b>0.004</b>
Hospitalization cost	80727.27 $\pm$ 85023.63	38000 (21000-42000)	43120 $\pm$ 55805.7	25000 (18500-48600)	<b>0.011</b>
Surgery Cost	41900 $\pm$ 14237.57	42500 (28500-45800)	36111.11 $\pm$ 8922.5	38000 (26200-44700)	<b>0.005</b>
Other expenses for diabetes	880 $\pm$ 482.58	750 (560-1020)	737.5 $\pm$ 363.3	500 (400-1210)	0.104
Diabetes	3432.25 $\pm$	2400	4054.9 $\pm$	4000	0.087

Complication – Doctor fees	1779.21	(2200-6400)	1755.81	(1820-7000)	
Diabetes Neuropathy expenses	1650 ± 1369.91	1200 (800-2200)	1880 ± 315.52	1900 (820-2400)	0.882
Hypertension medicines cost	950 ± 117.59	950 (840-1060)	537.27 ± 155.04	540 (310-1170)	0.632
Heart disease medicines cost	7593.75 ± 216.19	7550 (6900-8100)	6918.18 ± 144.59	7000 (6750-8000)	0.653
Diabetes Retinopathy expenses	900± 141.42	900 (720-1080)	750 ±212.13	750 (500-1120)	0.504
Foot complication related treatment cost	3300 ± 141.42	3300 (3100-3820)	1756.25 ±345.82	1750 (1210-3600)	0.635
Diabetes Complications Diagnostics cost	1923.81 ± 871.15	1300 (1080-2040)	1894.54 ± 807.01	2100 (1250-2800)	0.551

\*Wilcoxon scores (rank sums) test was used to calculate p-value as cost data was not normally distributed.

### Effects of lifestyle intervention on health-related quality of life

On the assessment of the SF-36 questionnaire after 6 months, the LMC group participants showed significant improvement in the physical functioning, role limitation due to emotional problems, energy/fatigue, emotional well-being, and social functioning after 6 months with all significant p-values 0.0001 as compared to the usual care group. There was no statistically significant improvement observed in body pain, role limitation due to physical health and general health at 6-month follow up. At 12 month LMC group achieved significant improvement in physical functioning (62.402±6.7388 to 83.676 ± 5.4920), Role limitation due to physical health (35.30±22.069 to 64.50±13.62 ), role limitation due to

emotional problem (37.90±28.93 to 71.46±16.75), energy/fatigue (54.31±11.858 to 80.75±15.527), emotional well-being (63.06±9.828 to 85.79±6.36), social functioning (38.848±20.8058 to 65.54±8.39) and general health (54.51±11.679 to 82.398± 11.7) from baseline to 12 months with significant outcomes (p-value less than 0.05) as compared to the usual care group. There was no significant improvement has been observed in bodily pain (68.701±14.5295 to 75.123±13.35) at 12 months follow up. Details are given in Table 4.

**Table 4: Changes in SF-36 QoL of participant’s measurements from baseline to 6<sup>th</sup> and 12<sup>th</sup> month follow-up with differences in within and between groups over time**

Variables		UC Group (n=100)		LMC group (n=102)		Difference between the group (p-value)
		Mean±SD	Median (Min-Max)	Mean±SD	Median (Min-Max)	
Physical Functioning		61.15±9.66	60 (45-75)	62.40±6.73	62 (40-80)	0.288
Baseline		69.52±9.97	70 (30-90)	65.53±8.38	66 (32-85)	0.002
6 Month		58.20±9.035	60 (35-80)	83.67± 5.49	83 (30-90)	0.0001
Difference within group (p-value)	B-6M	0.0001		0.003		
	B-12M	0.027		0.0001		
Role Limitation due to Physical Health		35.25 ±24.12	32 (30-68)	35.30±22.06	35 (25-75)	0.989
Baseline		44.90±25.88	42 (35-70)	44.36±22.50	44 (35-70)	0.894
6 Month		35.77±23.62	35 (30-80)	64.50±13.62	64 (40-80)	0.0001
12 Month						

Difference within group (p-value)	B-6M	0.008		0.005		
	B-12M	0.877		0.0001		
Role Limitation due to Emotional Problem		37.33±30.80	36 (30-70)	37.90±28.93	36 (30-70)	0.891
Baseline		38.00 ±29.21	38 (30-80)	54.24±26.91	52 (30-90)	0.0001
6 Month		42.66±30.36	40 (35-85)	71.46±16.75	71 (40-95)	0.0001
12 Month						
Difference within group (p-value)	B-6M	0.882		0.0001		
	B-12M	0.222		0.0001		
Energy / Fatigue		53.00±11.76	55 (25-80)	54.31±11.85	54 (20-80)	0.430
Baseline		57.00±11.43	57 (30-85)	60.34±12.55	60 (30-85)	0.049
6 Month		60.15±12.60	59 (30-80)	80.75±15.52	80 (30-90)	0.0001
12 Month						
Difference within group (p-value)	B-6M	0.007		0.001		
	B-12M	0.0001		0.0001		
Emotional Well being		64.48±13.62	66 (45-100)	63.06±9.82	64 (40-100)	0.413
		68.24± 9.82				0.0001

Baseline		69.52±9.98	67 (30-90)	82.40±11.78	80 (30-100)	0.0001
6 Month						
12 Month			69 (30-85)	85.79±6.36	84 (20-100)	
Difference within group (p-value)	B-6M	0.035		0.0001		
	B-12M	0.0001		0.0001		
Social Functioning		43.875±19.98	43 (12-87)	38.84±20.80	40 (12-90)	0.082
Baseline		49.250±18.87	49 (15-82)	42.52±11.96	42 (20-92)	0.003
6 Month		51.125±16.77				
12 Month			51 (12-90)	65.54±8.39	67 (20-90)	0.0001
Difference within group (p-value)	B-6M	0.036		0.095		
	B-12M	0.002		0.0001		
Bodily Pain		68.250±14.50	68 (45-95)	68.70±14.52	68 (40-95)	0.826
Baseline		68.800±17.18	69 (45-90)	71.17±16.69	71(30-100)	0.320
6 Month						
12 Month		71.450±16.74	71 (45-95)	75.12±13.35	76 (40-100)	0.087
Difference within group (p-value)	B-6M	0.801		0.262		
	B-12M	0.172		0.001		

(p-value)					
General Health		55.30±13.87	55 (30-85)	54.51±11.67	54 (30-80)
Baseline		57.10±11.39	57 (25-85)	59.56±10.88	59 (25-85)
6 Month		59.15±9.21	60 (30-80)	82.39± 11.7	82(30-90)
12 Month					
Difference within group (p-value)	B-6M	0.265		0.001	
	B-12M	0.021		0.0001	

As per as ADS score, patients of the LMC group showed statistically significant improvement at 6 months in all variables except in the first parameter (distress caused by diabetes). At 12 month follow up after lifestyle modification counseling most of the patients of LMC group showed significant improvement in all domains including distress caused by diabetes, uncertainty due to diabetes, control over diabetes, anticipated future deterioration, copying and effect of diabetes on life goals with statistically significant p values 0.05. Details of ADS are given in Table 5.

Table 5: ADS assessment at Baseline, 6<sup>th</sup> and 12<sup>th</sup> Months with significant differences within and between groups over study time in usual care and LMC group of T2DM patients

Q1 How upsetting is having diabetes for you?	Usual Care Group	LMC Group	p-value between group
Baseline	(n=100)	(n=102)	
6 Month	Mean±SD	Mean±SD	0.499
12 Month	Median	Median	0.075
	(Min-Max)	(Min-Max)	0.0001
	3.84±0.87	3 (1-5)	
		3.90±0.29	3 (1-

		2.89±1.01	2 (1-5)	3.07±0.27	5)	
		3.78±0.90	3 (1-5)	2.80±0.67	3 (1-5)	
					2 (1-5)	
Difference within group (p-value)	B-6M	0.0001		0.0001		
	B-12M	0.652		0.0001		
Q2 How much control over your diabetes do you have?	Baseline	2.52±0.67	2(1-4)	2.37±0.50	2 (1-4)	0.80
	6 Month	2.28±0.53	2 (1-4)	1.87±0.33	1 (1-3)	0.0001
	12 Month	1.89±0.31	1 (1-3)	1.57±0.49	1 (1-3)	0.0001
Difference within group (p-value)	B-3M	0.002		0.0001		
	B-6M					
	B-12M	0.0001		0.0001		
Q3 How much uncertainty do you currently experience in your life as a result of being diabetic?	Baseline	4.86±0.44	4 (1-5)	4.83±0.4	4 (1-5)	0.657
	6 Month	3.22±0.56	3 (1-5)	4.0±0.34	4 (1-5)	0.0001
	12 Month	4.11±0.31	4(1-5)	3.18±0.54	4 (1-5)	0.0001

					3 (1-5)	
Difference within group (p-value)	B-6M	0.0001		0.0001		
	B-12M	0.0001		0.0001		
Q4 How likely is your diabetes to worsen over the next several years?			3 (1-5)	3.91±0.32	3.74±0.79	0.55
	Baseline	3.14±0.41	3 (1-5)	2.91±0.28	2 (1-4)	0.0001
	6 Month	3.66±0.47	3 (1-5)	1.90±0.49	1 (1-3)	0.0001
	12 Month					
Difference within group (p-value)	B-6M	0.0001		0.0001		
	B-12M	0.0001		0.0001		
Q5 Do you believe that achieving good diabetic control is due to your efforts as compared to factors which are beyond your control?			4 (1-5)	4.58±0.53	4.62±0.50	0.518
	Baseline	3.89±0.39	3 (1-5)	2.12±0.33	2 (1-4)	0.0001
	6 Month	4.60±0.60	4 (1-5)	2.09±0.29	2 (1-4)	0.0001
	12 Month					
Difference	B-6M	0.0001		0.0001		

within group (p-value)	B-12M	0.783		0.0001		
Q6 How effective are you in coping with your diabetes?			2 (1-5)		2 (1-5)	0.140
	Baseline	2.84±0.39	2 (1-5)	2.91±0.28	2 (1-5)	0.0001
	6 Month	2.34±0.60	2 (1-5)	2.09±0.29	2 (1-5)	0.0001
	12 Month	2.11±0.44	2 (1-5)	2.90±0.29	2 (1-5)	0.0001
Difference within group (p-value)	B-6M	0.0001		0.0001		
	B-12M	0.0001		0.798		
Q7. To what degree does your diabetes get in the way of your developing life goals?			3 (1-5)		3 (1-5)	0.900
	Baseline	3.24±0.62	3 (1-5)	3.38±0.56	2 (1-5)	0.002
	6 Month	3.03±0.33	3 (1-5)	2.88±0.32	2 (1-5)	0.015
	12 Month	2.37±0.67	2 (1-5)	2.16±0.48	2 (1-5)	
Difference within group (p-value)	B-6M	0.006		0.0001		
	B-12M	0.0001		0.0001		

## Discussion

### Effect of Lifestyle Intervention on Diabetes Medical Treatment Cost

Present study observed that patients in the usual care group who did not receive lifestyle modification counseling, spent more money on diabetes medicines as compared to LMC group and a significant difference has been observed with significant p-value 0.0038, similar finding of hospitalization cost with significant difference p-value 0.0111 and surgery cost due to diabetes complications was higher in the usual care group with significant difference p-value 0.0046 as compared to LMC group. The average hospitalization cost of usual care group (39580 INR) was approximately four times higher as compared to LMC group (10569 INR). As per our study diabetes treatment cost assessment, it can be concluded that lifestyle modification counseling used as the intervention was cost-effective therapy. Other similar lifestyle intervention studies done by Sevick et al, Upadhyay et al and Odnoletkova et al showed same evidence that lifestyle interventions were cost-effective among diabetes patients.<sup>20,22</sup> Studies done by Anne M et al and Wolf RD et al provided the evidence that lifestyle intervention reduces the risk of diabetes complications, improves quality of life and did so without increasing health care costs, similar to present study.<sup>23,24</sup> A study by Png et al revealed that lifestyle intervention is cost-effective and can delay the risk of complications,<sup>25</sup> and Katon et al demonstrated that adherence to self-management decrease disease burden, health care cost and frequent hospitalizations.<sup>26</sup>

### Effect of lifestyle intervention on Health-Related Quality of Life (HR-QoL)

The results of our study did not show any significant difference at baseline in SF-36 domain scores. At the 6<sup>th</sup> month after lifestyle modification counseling, the participants of LMC group showed statistically significant improvement in the physical functioning, bodily pain, general health, and vitality from baseline to 6 months with all significant p-value less than 0.001 as compared to the usual care group. After 12 months of study follow up, the LMC group achieved significant improvement in all the domains, including physical functioning, role physical, bodily pain, general health, vitality, social functioning and mental health with significant p-values less than 0.001 as compared to the usual care group. As per ADS score, present study results did not show a statistically significant difference between LMC group and usual care group at baseline. After 6 months follow up the LMC group patients showed statistically significant improvement in all parameters except in one variable (distress caused by diabetes). At 12 months most of the patients of LMC group showed significant improvement in all domains with the significance p-value less than 0.05. Studies done by Norliza et al, Rajeshwari et al, and Kaskurthy et al studies have shown statistically significant improvement in glycemetic control and overall QoL in

T2DM patients after lifestyle modifications counseling provided by the pharmacist-patient counseling.<sup>27,29</sup> Similar studies by Testa et al, Shareef et al, and Sriram et al have shown significant improvement in the quality of life and significantly improved economic benefits after intervention.<sup>30,32</sup> Studies done by Reza et al and Adepu et al observed significant improvement in all domains of HRQOL in diabetes patients after educational counseling in test group participants.<sup>33,34</sup> Studies conducted by Carvalho et al, Marzieh et al, and Alireza et al verified the influence of educational counseling and shown significant improvement in the overall QoL and HbA1c scores after counseling.<sup>35,37</sup> Similar studies by Ramune et al and Adibe et al showed significant improvements in HRQOL, and glycemic control, in T2DM patients.<sup>38,39</sup> In summary, our study concludes that LMC may improve overall HRQoL of T2DM patients and supported by above-discussed studies.

### Study limitations

Due to limited resources and facilities, this study was not randomized designs, but a quasi-experimental study was designed in a standardized manner. There is need of multi-centric randomized trials to solve diabetes management queries.

### Conclusion

Results of present study conclude that LMC is effective towards diabetes management and control and can reduce the medical treatment cost, improve HRQOL and coping skills of T2DM patients. Further multi-centric randomized control trials with the large population are required, to assess the effectiveness of lifestyle intervention on medical treatment cost and HRQOL in T2DM patients.

### Conflict of Interest

The authors have no conflicts of interest related to the material presented in the present original manuscript.

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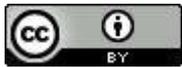
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# Effectiveness of enhanced external counter pulsation on clinical profile and health-related quality of life in patients with coronary heart disease: a systematic review

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## Abstract

**Introduction.** *Enhanced External Counter Pulsation (EECP) is a non-invasive United States Food and Drug Administration (FDA) approved outpatient treatment option for the complex problem of angina, a common symptom of coronary heart disease. A systematic review of the literature searched to assess the effect of EECP on the clinical profile that comprised physiological measurements, biochemical assessments, cardiac clinical symptoms, physical functional status, and Health-Related Quality of Life (HRQoL) in Coronary Heart Disease (CHD) patients.*

**Material and methods.** *Total 258 EECP research articles from the early stage of EECP development to till date screened. Out of 258 EECP articles, total 60 articles (53 EECP articles for clinical profile and 7 article for HRQoL matched the inclusion criteria and other (n = 198) articles excluded due to irrelevant to study objectives.*

**Results.** *All enrolled studies showed a significant improvement in angina pectoris and HRQoL with reduction of nitroglycerine use and exercise tolerance. There are several gaps in research has been found for further research to evaluate the EECP effectiveness on Body Mass Index (BMI), Heart Rate, Cholesterol, Triglyceride, High Density Lipoprotein (HDL), Low Density Lipoprotein (LDL), HbA1C, SpO<sub>2</sub>, Vo<sub>2</sub>max level with a comparative assessment of cardiac and non-cardiac metabolic markers including blood glucose.*

**Conclusions.** *There is further need of multi-centric randomize controlled trial studies to evaluate the effect of EECP on obese, diabetic, hypertension and other metabolic disease patients and more research required for further modifications in EECP device to cure, prevent and treat chronic diseases by the non-invasive procedure.*

**Key words:** enhanced external counter pulsation, angina pectoris, health-related quality of life, coronary heart disease

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## Introduction

Cardiovascular disease, especially Coronary Heart disease (CHD) is the number one killer and foremost

cause of deaths around the world [1]. Angina pectoris, the prime symptom of coronary heart disease ranked first among causes of mortality [2]. The current non-pharmacological and non-invasive therapy available

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for chronic stable angina (a typical symptom of coronary heart disease) and heart failure is Enhanced External Counter Pulsation (EECP). EECP is USA-FDA approved therapy for coronary heart disease patient [3]. EECP, an electro-mechanical system is a registered trademark of Vasomedical, Inc, New York, USA and PSK (Chinese Company) is the exclusive distributor of Vasomedical's devices all over the world [4–8]. CHD patients usually undergo EECP treatment of 35 consecutive 1-hour sessions over 5–7 weeks. Treatment patient is continuously monitored for cardiac outputs, heart rate and spo2 using ECG and finger plethysmogram, which are connected to the EECP device [9–11]. This study designed to evaluate the effect of EECP in Clinical profile and HRQoL in CHD patients.

### Material and methods

#### Searching methods

A systemic review of the literature of EECP on clinical profile and HRQoL in coronary heart disease patients was search through PubMed, Medline, Vasomedical EECP manufacturer web-link, and Google scholar sources. Searching for the articles done as per the inclusion and exclusion criteria of the study and the studies summarized in Figure 1.

#### Inclusion criteria

EECP article of Randomized Control Trial (RCT), case studies, prospective and retrospective studies on clinical profile and HRQoL in coronary heart disease patients were included.

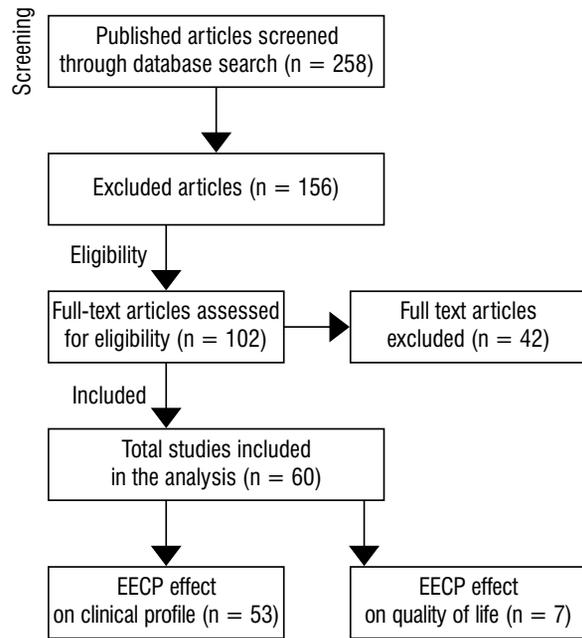


Figure 1. Flowchart of screened and included studies

#### Exclusion criteria

Heart Failure studies, Non-cardiac EECP studies with RCT, Case studies, Prospective and Retrospective and reviews of EECP papers excluded from the study.

#### Quality assessment

Study quality was assessed through two authors independently. Newcastle-Ottawa scale (NOS) was used to assess the quality of studies. Detail of assessment is given in Tables 1, 2.

Table 1. Newcastle-Ottawa scale in the assessment of clinical profile included studies

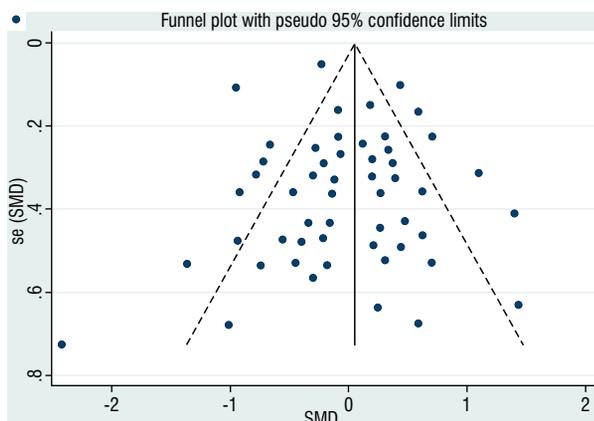
Study	Is the case definition adequate? (one point)	Representativeness of cases (one point)	Selection of controls (one point)	Definition of controls (one point)	Assessment of outcome (one point)	Adequacy of cohort follow-up (one point)	Was follow-up long enough for outcomes to occur? (one point)	Comparability of cases and controls on basis of design or analysis (two points)	Total score (nine points)
Lawson et al. 1992	1	1	1	1	1	1	1	2	9
Sjukri et al. 1995	1	1	1	1	1	1	1	2	9
Arora et al. 1999	1	1	1	1	1	1	1	2	9
Lawson et al. 2000	1	1	1	1	1	1	1	2	9
Lawson et al. 2000	1	1	1	1	1	1	1	2	9
Urano et al. 2001	1	1	1	1	1	1	1	2	9
Stys et al. 2001	1	1	1	1	1	1	1	2	9
Barsness et al. 2001	1	1	1	1	1	1	1	2	9
Springer S et al. 2001	1	1	1	1	1	1	1	2	9
Lakshmi et al. 2002	1	1	1	1	1	1	1	2	9
Stys et al. 2002	1	1	1	1	1	1	1	2	9
Michaels et al. 2002	1	1	1	1	1	1	0	2	8

**Table 1. cont.** Newcastle-Ottawa scale in the assessment of clinical profile included studies

Study	Is the case definition adequate? (one point)	Representativeness of cases (one point)	Selection of controls (one point)	Definition of controls (one point)	Assessment of outcome (one point)	Adequacy of cohort follow-up (one point)	Was follow-up long enough for outcomes to occur? (one point)	Comparability of cases and controls on basis of design or analysis (two points)	Total score (nine points)
Soran et al. 2002								2	9
Fitzgerald et al. 2003								2	9
Bonetti et al. 2003								2	9
Schechter et al. 2003								2	9
Tartaglia et al. 2003								2	9
Werner et al. 2003								2	9
Lawson et al. 2003								2	9
Linnemeier et al. 2003								2	9
Linnemeier et al. 2003								2	9
Bagger et al. 2004							0	2	8
Michaels et al. 2004								2	9
Lawson et al. 2004								2	9
Masuda et al. 2004								2	9
Henrikson et al. 2004								2	9
Taguchi et al. 2004								2	9
Lawson et al. 2005								2	9
Michaels et al. 2005								2	9
Arora et al. 2005								2	9
McCullough et al. 2006								2	9
Soran et al. 2006								2	9
Akhtar et al. 2006								2	9
Nichols et al. 2006								2	9
Lawson et al. 2006								2	9
Novo et al. 2006								2	9
Loh et al. 2006								2	9
Arora et al. 2007								2	9
Michaels et al. 2007								2	9
McCullough et al. 2007								2	9
Yavari et al. 2007								2	9
Loh et al. 2008								2	9
Erdling et al. 2008								2	9
Buschmann et al. 2009								2	9
Esmailzadeh et al. 2009								2	9
Soran et al. 2012								2	9
Eslamian et al. 2013								2	9
Bozorgi et al. 2014								2	9
Beck et al. 2014								2	9
Tabary et al. 2015								2	9
Subramanian et al. 2016							0	2	8
Beck et al. 2016								2	9

**Table 2.** Newcastle-Ottawa scale health related quality assessment of included studies

Study	Is the case definition adequate? (one point)	Representativeness of cases (one point)	Selection of controls (one point)	Definition of controls (one point)	Assessment of outcome (one point)	Adequacy of cohort follow-up (one point)	Was follow-up long enough for outcomes to occur? (one point)	Comparability of cases and controls on basis of design or analysis (two points)	Total score (nine points)
Arora et al. 2002								2	9
Kumar et al. 2009								2	9
Wu et al. 2012							0	2	8
Ziaeirad et al. 2012								2	9
Jorgensen et al. 2013								2	9
May et al. 2015							0	2	8
Shakouri 2015								2	9



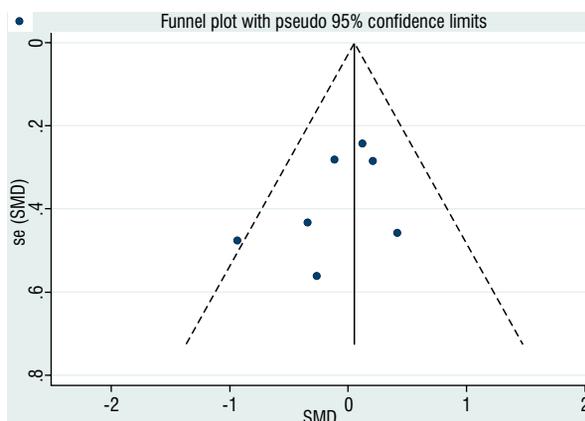
**Figure 2.** Funnel plot of included studies in clinical profile — EECP

**Statistical analysis**

Statistical analyses were performed using RevMan 5.0 (Cochrane Collaboration). A random-effects model was used with weighted mean difference (WMD) in clinical profile and HRQoL from pre-EECP to post-EECP. Bias in studies was assessed through visual inspection of the funnel plot as well as Begg’s and Egger’s testing. Detail of analysis is given in Figures 2 to 5.

**EFFECT OF EECP ON CLINICAL PROFILE IN CORONARY HEART DISEASE PATIENTS**

Lawson et al. [12] conducted a study on 18 patients with chronic angina treated with an improved system of enhanced external counter pulsation (EECP) and found that all patients improved in angina symptoms and generally decreased anti-angina medications. A decrease in myocardial ischemia observed in 67% patients and 89% of patients were symptom-free. Sjukri et al. [13] carried out a study on 201 coronary heart disease



**Figure 3.** Funnel plot of included studies in HRQoL — EECP

patients. The results of the study showed significant improvement in coronary perfusion by 86.8% and exercise tolerance by 94.2%. Arora et al. [14] performed a multi centric prospective randomized control study to assess the safety and efficacy of enhanced external counterpulsation (EECP). A significant improvement in angina severity and exercise tolerance and timing was reported. EECP showed well tolerated and safe therapy for CHD patients. Lawson et al. [15] carried out a study on 33 patients to evaluate the effect of EECP on long-term prognosis in CHD patients. The study suggests that particularly for the majority of patients demonstrating improvement by 64% in radionuclide stress perfusion post-treatment and EECP may be an effective long-term therapy. Lawson et al. [16] conducted a cohort study in 2,289 CHD patients to evaluate EECP safety and efficacy. EECP was found to be safe and well-tolerated therapy with improvement in angina class by 74% with significant p-value ( $p < 0.001$ ). Urano et al. [17] performed a study on 512 CHD patients to examined EECP efficacy in myocardial ischemia, exercise tolerance and cardiac

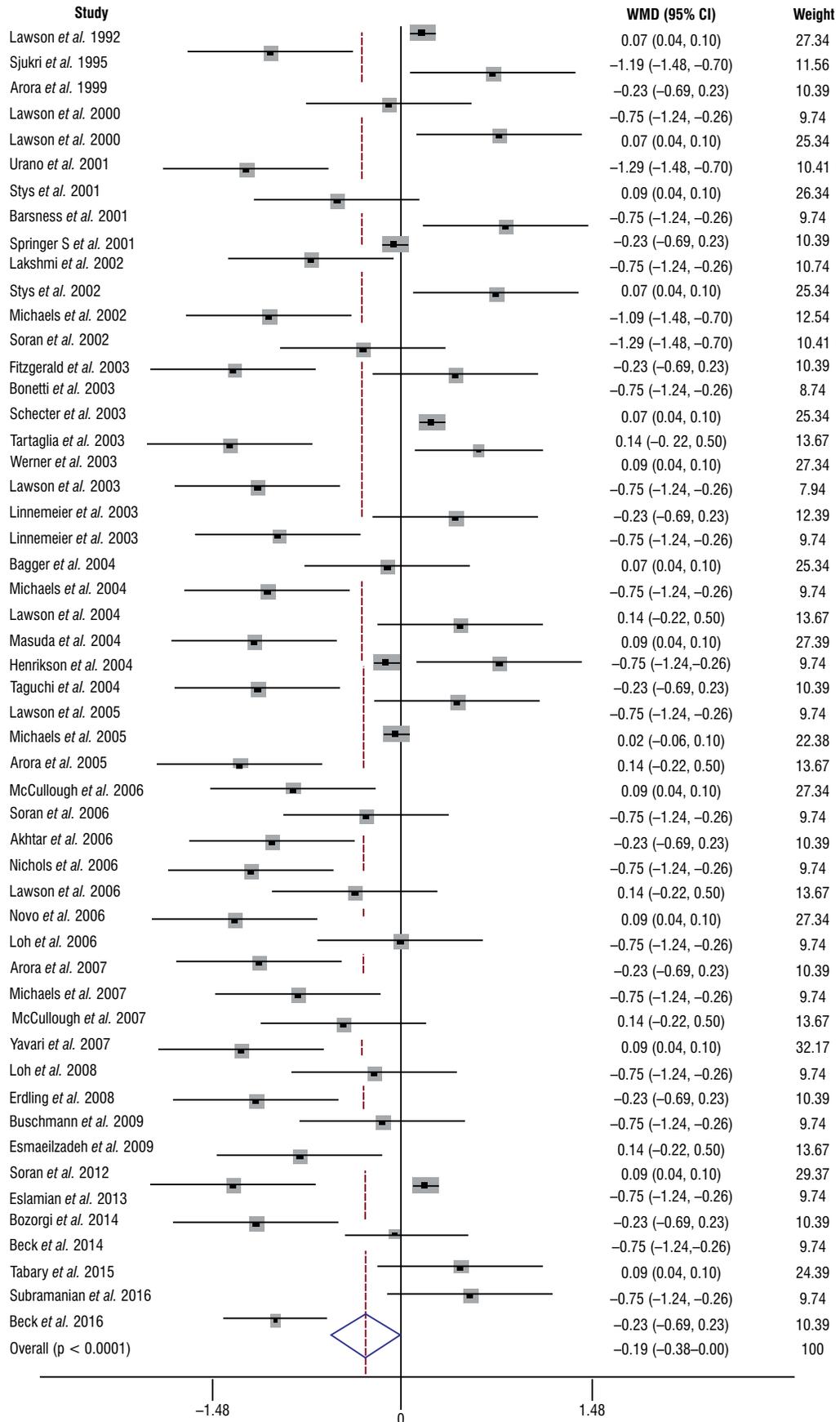
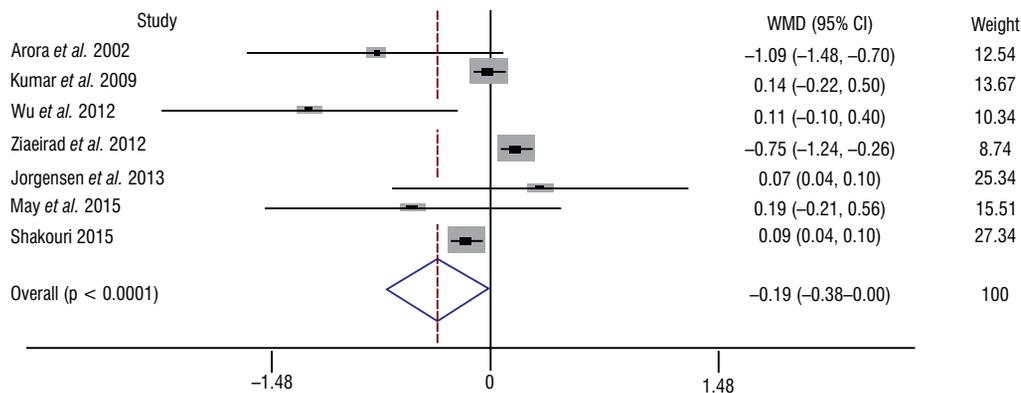


Figure 4. Forest plot of weighted mean differences in clinical profile in pre- and post-EECF



**Figure 5.** Forest plot of weighted mean differences in HRQoL in pre- and post-EECP

function. The result of the study reveals the improvement in exercise test parameters reduced myocardial ischemia by thallium scintigraphy in association with improved LV diastolic filling in patients with stable CAD. Stys *et al.* [18] carried out a clinical registry of 37 centers with the enrollment of 395 chronic stable angina patients to examine the relation of the ER to post treatment improvement in Canadian Cardiovascular Society (CCS) angina class. After EECp, CCS improved by at least 1 class in 88% of patients, 87% of men and 92% of women. EECp is effective in improving CCS in chronic stable angina patients. Barsness *et al.* [19] performed a study on 1246 CHD patients to determine whether EECp is a safe and effective treatment for patients with angina pectoris. The results demonstrated significant improvement in angina and reduction in nitroglycerine anti-angina drugs by 61.7%. Springer *et al.* [20] conducted a study on 28 CHD patients to assess psychological function and well-being status and observed significant improvement in psychological and well-being status. Lakshmi *et al.* [21] carried out a study on 2486 patients those were enrolled in the IEPR. The study revealed a significant improvement in angina class in patients whose DA ratio was increased and results sustained for 6 months. Stys *et al.* [22] performed a study on 175 CHD patients and found a significant improvement in angina class in 85% of patients. This study results showed the EECp effectiveness in improving stress myocardial perfusion with exercise tolerance in CAD patients.

Michaels *et al.* [23] conducted a study on 10 CHD patients and found the significant improvement in diastolic and mean pressures with reduction of systolic pressure in the central aorta and the coronary artery of CAD patients. The study concludes that EECp may serve as a potential mechanical assistant device for CAD patients. Holubkov *et al.* [24] carried out a study on 771 CHD patients treated with EECp and the results of this study conclude that EECp may be a safe treatment option for

CAD patients. Soran *et al.* [25] performed a study on 1402 CHD patients and the results showed that angina decreased by at least one class in 67% of patients with LV dysfunction just after completion of EECp treatment. Fitzgerald *et al.* [26] conducted a cohort study on 4669 CHD patients and found decreased angina episodes and nitroglycerin use and 74.8% reduction in Canadian Cardiovascular Society (CCS) functional class and improvement in angina sustained for 6 months. Bonetti *et al.* [27] performed a study on 23 CHD patients to examine the effect of enhanced external counter pulsation (EECP) on endothelial function and found that 70% patients get symptomatic relief by EECp treatment. The author revealed that significant improvement in endothelial function by EECp may benefit to the clinical status of CHD patients.

Schechter *et al.* [28] carried out a study of 20 CHD patients to investigate the influence of short-term external counterpulsation (ECP) therapy on flow-mediated dilation (FMD) in patients with coronary artery disease (CAD). The author revealed that external counter pulsation may improve vascular endothelial function and refractory angina pectoris in CHD patients. Tartaglia *et al.* [29] conducted a study on 25 CHD patients to determine the effect of EECp on exercise capacity and myocardial perfusion by comparing results of maximal exercise radionuclide testing pre- and post-EECP treatment. A significant improvement in treadmill times has been reported and radionuclide perfusion scores also showed a significant reduction in ischemic segments. Werner *et al.* [30] performed a study on 48 CHD patients and weekly angina episodes were reduced by 48%, nitroglycerin puffs were reduced by 51%, work capacity was improved by 22%. Study validates the reduction of angina with significant improvement of work capacity after EECp.

Lawson *et al.* [31] carried out a study on 4592 CHD patients and his collected data from international enhanced external counter pulsation (EECP) patient regis-

try showed significant improvement in angina by 73% in at least 1 class and 2 classes by 35.2% and 3 classes by 17.3%. The mean angina episodes per week decrease to 2.5 per week after EECP treatment and nitroglycerine uses per week after EECP was 2.5 times per week and improvement in functional status also observed in the study. Linnemeier *et al.* [32] conducted a study on 3037 CHD patients to determine whether enhanced external counterpulsation is a safe and effective treatment for angina in octogenarians. At 6-month follow-up, 81% of patients sustained angina improvement. This study concludes that enhanced external counterpulsation is effective and well tolerable non-invasive treatment. Linnemeier *et al.* [33] performed another study on 1532 IEPR patients. The author demonstrated that after 1 year, maintenance of angina rate was reduced in 86% of patients with diabetes. This study also suggests that in diabetes patients, EECP can be a safe, effective, well-tolerated treatment option for the relief of angina. Bagger *et al.* [34] carried out a study on 23 patients with angina pectoris with positive dobutamine stress echocardiogram. This study was done to evaluate EECP effectiveness on dobutamine stress-induced wall motion score among angina patients. The reduction in dobutamine-induced wall motion abnormalities after EECP therapy was reported.

Michaels *et al.* [35] conducted the long-term outcomes of enhanced external counterpulsation in 1097 CHD patients to relieve angina and improving the quality of life in a large cohort of patients with chronic angina pectoris. 73% patients had a reduction by at least 1 angina class at the end of treatment, and 50% reported an improvement in the quality-of-life assessment after enhanced external counterpulsation was; these results were sustained at 2-year follow-up. Lawson *et al.* [36] performed a study on 2861 CHD patients to examine the safety and effectiveness of EECP therapy. Post-EECP, patients had improved their CCS angina by at least one class. At 6-month follow-up, the CCS-class improved reduction in angina episodes and nitroglycerin use. Enhanced external counterpulsation was proved an effective therapy in relieving angina in patient's angina patients. Masuda *et al.* [37] carried out a study on total 18 CHD patients. Out of 18 patients, 11 were treated with EECP and 7 were treated 5000 IU heparin pretreatment along with EECP. The study was done to evaluate EECP and intravenous heparin injection therapy effectiveness in angina pectoris patients and the results of the study showed significant improvement in exercise capacity and oxygen metabolism of coronary heart disease patients treated with combination therapy of EECP and heparin.

Henrikson *et al.* [38] conducted a study on 28 CHD patients and found that post EECP most patients (82%)

had at least one full class improvement in their angina pattern. EECP remains an effective treatment for severe CAD. Taguchi *et al.* [39] performed study on 24 patients with myocardial infarction. This study was done to assess the haemodynamic effects of EECP and its mechanism with special reference to neurohumoral factors. The finding of this study suggests that an increase in ANP without an increase in BNP is an important mechanism for the effects of EECP therapy. Lawson *et al.* [40] carried out a study on 2007 CHD patients and demonstrated the angina reduction by 83% at least one CCS angina class and improvement in weekly angina episodes and their frequency of nitroglycerine use decreased with improvement in well-being status by 63%. Michaels *et al.* [41] conducted a study on 1192 CHD patients to assess the frequency, efficacy, predictors, and long-term success of repeat enhanced external counter pulsation (EECP) therapy in relieving angina in a large cohort of angina patients. After 2 years of EECP therapy, 70% of patients reported the significant decrease in angina and nitroglycerine consumption. Arora *et al.* [42] performed a study on 30 patients with stable angina pectoris having class II-IV. This study was done to assess the effect of EECP on vascular cell release of coagulation factors. The author reveals that EECP may not play a significant role in controlling coagulation factors in CHD patients.

McCullough *et al.* [43] carried out a study on 2730 obese heart patients to evaluate the association of baseline body mass index (BMI) on the outcomes of enhanced external counterpulsation (EECP) therapy for chronic stable angina. A greater reduction in weekly angina episodes from baseline to follow up observed and study conclude that reduction of angina is directly proportional to BMI value. Akhtar *et al.* [44] conducted a study on 13 CHD patients to evaluate the effect of EECP treatment on plasma nitric oxide and endothelin-1 level. This study concludes that EECP may increase nitric oxide and decreases endothelin-1 levels.

Soran *et al.* [45] carried out a cohort study on 363 CHD patients and post EECP treatment, there was a significant decrease in severity of angina class ( $p < 0.001$ ), and 72% patients were improved from severe angina and 52% of patients discontinued nitroglycerin use. At 2 years of follow up 55%, patients showed improvement in angina and prove that EECP is effective and durable therapy approach for CAD patients and 52% CHD patients discontinued nitroglycerin use. Nichols *et al.* [46] performed a study on 20 angina patients to prove the hypothesis of arterial properties and wave reflection characteristics favourably altered after EECP. The study revealed that EECP treatment may reduce arterial stiffness and can improve wave reflection characteristics in patients with angina.

Lawson *et al.* [47] conducted a study on 1458 CHD patients and found that EECP significantly reduced angina frequency, nitroglycerin use. Significant improvements in angina by 70–74% with reduction of nitroglycerine use by 52% with better well-being persist until 2 years of follow up. Novo *et al.* [48] carried out a study on 25 CHD patients to evaluate the efficacy of EECP on clinical symptoms, myocardial ischemia and cardiac perfusion in intractable angina patients. 84 per cent of patients showed an increment in at least one functional angina class and reduced inducible ischemia and maximal benefits observed in patients with worst systolic failure had been observed.

Loh *et al.* [49] did a study on 58 CHD patients to assess EECP immediate and long-term effectiveness in chronic stable refractory angina patients. This study results showed that angina improved at least one class CCS angina improvement by 78% after 1 year and increase exercise capacity with the reduction in nitroglycerine use. Arora *et al.* [50] conducted a study on 11 CHD patients to assess the effect of EECP on myocardial perfusion. In this study no significant effect on myocardial perfusion seen due to very less sample size and highly variable clinical responses. Michaels *et al.* [51] performed a study on 27 patients and significant improvement in heart rate variability in diabetic CHD patients and associated with reduced mortality rate had been reported. McCullough *et al.* [52] did a study on 902 patients from the IEPR. This study was done to evaluate the degree of residual angina on the clinical outcomes of EECP and conclude that residual high-grade angina pectoris occurs after post EECP in those patients who had the history of severe angina and multi-vessel disease.

Yavari *et al.* [53] conducted a study on 67 CHD patients to assess EECP efficacy in relieving angina and improving myocardial ischemia. The results of this study conclude that EECP is safe, effective and well-tolerated therapy for angina pectoris treatment. Loh *et al.* [54] did a study on 1477 CHD patients to evaluate EECP effectiveness. Immediately after EECP, angina reduction has been seen with  $p < 0.001$ . The improvement in CCS class was improved by at least 1 class in 78% of the patients and by at least 2 classes in 38% and sustained in 74% of the patients during follow-up for 3 years. Erdling *et al.* [55] carried out a study on 86 CHD patients and conclude that after EECP treatment 79% of patients showed improvement in CCS class immediately and 61.5% of patients sustained these benefits till 12 months and 29% at 2 years follow up. The author concludes that EECP is safe & effective for CAD with angina pectoris patients and patients with CCS angina class III & IV reported maximum improvement. Buschmann *et al.* [56] conducted a study on 23 CHD patients and found

improvement in CCS and NYHA class in CAD patients with significant improvement in pressure derived collateral flow index and fractional flow, which also increased. Esmailzadeh *et al.* [57] performed a study on 20 CHD patients to assess the effects of EECP on cardiac functions and found a reduction in NYHA angina class. Significant improvement was observed in LV systolic, diastolic function in angina patient. Soran *et al.* [58] conducted a study on 2072 patients and treated with EECP. Significant reduction by 76–84% in the severity of angina in CAD patients at 1 year of follow up was reported and both US and turkey group got good results. Eslamian *et al.* [59] performed a study on 50 CHD patients to assess Enhanced External Counter Pulsation (EECP) effectiveness on clinical symptoms, echocardiographic measurements, and perfusion scan parameters and exercise tolerancetest. A significant improvement was observed in angina severity and well-being status. Bozorgi *et al.* [60] did a study on 20 CHD patients with refractory angina. A significant reduction in angina classes III and IV was reported with sustained results for 6 months. The author concludes that EECP decreased symptoms and increased total exercise time and sustained these results for 6 months.

Beck *et al.* [61] conducted a study on 24 CHD patients and significant improvement in plasma level of nitrates, improved peak VO<sub>2</sub>, and reduced LV function with significant improvement in peripheral vascular function and functional capacity had been reported. Tabary *et al.* [62] performed a study on 48 CHD patients to assess clinical and para-clinical effects of enhanced external counterpulsation (EECP) effectiveness. Significant improvement in hemoglobin, LVEF, diastolic and systolic B.P, Chest pain, dyspnea and improvement in clinical conditions had been reported. Subramanian *et al.* [63] did a study on 72 CHD patients and found significant improvement in central systolic pressure, brachial systolic pressure, aortic pulse pressure, and augmentation pressure and augmentation index. Beck *et al.* [64] conducted the study on 17 CHD patients. The author concludes that EECP may be useful as an adjuvant therapy for improving functional classification and improve central blood pressure, aortic pulse pressure, wasted left ventricular energy, and myocardial oxygen demand in CHD patients.

## EFFECT OF EECP ON HR-QoL IN CORONARY HEART DISEASE PATIENTS

Arora *et al.* [65] conducted a study to assess EECP effectiveness on HRQoL. A significant improvement in HRQoL was observed at 12 months of follow up. The result shows improvements in HRQoL changes after EECP treatment. Kumar *et al.* [66] did a prospective

study and found that EECP significantly improved angina symptoms, dyspnea on exertion, and quality of life after 35 days of treatment and at 1 year follow up. EECP also improved the 6-minute walking capacity. Wu *et al.* [67] performed a study to evaluate EECP after six months regarding physical capacity and HRQoL in patients with refractory AP. Patients enhanced walking distance on average by 29 m after EECP. CCS class also improved and persisted at six months follow-up. HRQoL improved significantly and the effects maintained at follow-up after the treatment.

Ziaeirad *et al.* [68] did a quasi-experimental study on 64 patients to evaluate the QoL of patients with angina pectoris after treatment with enhanced external counterpulsation. The author reveals that EECP is an

effective noninvasive method in treating patients with angina pectoris and in developing their HRQoL. Jorgensen *et al.* [69] conducted a special case study of the 43-year-old woman who had 15 hospital admissions in six years due to angina. The case study proves the EECP effectiveness towards angina recovery and significant improvement in HRQoL. May *et al.* [70] performed a study to assess the effect of EECP on QoL and exercise capacity in CAD patients. Author of this concludes that quality of life and exercise capacity was improved after EECP. Shakouri *et al.* [71] conducted a study to investigate the effect of EECP on plasma nitric oxide (NO) and HRQoL in CAD patients. The author revealed that HRQoL and NO level increased after EECP treatment in CHD patients. Summary of studies given in Tables 3, 4.

**Table 3.** EECP effectiveness on clinical profile in coronary heart disease patients

Author	Study (year)	Title of study	Sample size	Findings & conclusion
Lawson <i>et al.</i> [12]	1992	Efficacy of enhanced external counterpulsation in the treatment of angina pectoris	18	Myocardial ischemia 67% decrease, exercise duration increased, reduction in anti-anginal medicines and 89% patients were symptom-free
Sjukri <i>et al.</i> [13]	1995	EECP in the treatment and rehabilitation of coronary patients in Indonesia	201	Exercise tolerance 94.2%, improvement in CCS angina class
Arora <i>et al.</i> [14]	1999	The multicenter study of enhanced external counterpulsation (MUST-EECP): effect of EECP on exercise-induced myocardial ischemia and anginal episodes	139	Exercise duration increase, angina severity reduced, extends times to exercise-induced ischemia, Nitroglycerine usage decrease
Lawson <i>et al.</i> [15]	2000	Long-term prognosis of patients with angina treated with enhanced external counterpulsation: five-year follow-up study	33	Improvement in stress perfusion after EECP, 64% did not suffer any major adverse cardiovascular event due to the effect of EECP at 5 year of study follow up
Lawson <i>et al.</i> [16]	2000	Treatment benefit in the enhanced external counterpulsation consortium	2289	74% angina pectoris patients improved in CCS angina class III & IV with significant p-value ( $p < 0.001$ )
Urano <i>et al.</i> [17]	2001	Enhanced external counterpulsation improves exercise tolerance, reduces exercise-induced myocardial ischemia, and improves left ventricular diastolic filling in patients with coronary artery disease	512	Improvement in Exercise duration and tolerance with improvement in LV function. Improvement in diastolic filling and diastolic function
Stys <i>et al.</i> [18]	2001	Acute hemodynamic effects and angina improvement with enhanced external counterpulsation	395	CCS angina class improvement by at least I class in 88% of patients
Barsness <i>et al.</i> [19]	2001	The International EECP Patient Registry (IEPR): design, methods, baseline characteristics and acute results	1246	Decrease in at least I anginal class by 81% and mean change decrease in anginal episodes per week ( $6.4 \pm 12.6$ ) with reduction of nitroglycerine use by 61.7%
Springer <i>et al.</i> [20]	2001	Psychosocial effects of EECP in the angina patient: A second study	28	Improvement in physical functioning and mental health with special reference to stress and QoL

**Table 3. cont.** EECP effectiveness on clinical profile in coronary heart disease patients

Author	Study (year)	Title of study	Sample size	Findings & conclusion
Lakshmi <i>et al.</i> [21]	2002	Relation of the Pattern of Diastolic Augmentation During a Course of Enhanced External Counterpulsation (EECP) to Clinical Benefit (from the International EECP Patient Registry [IEPR])	2486	At 6 months of follow up, the patients showed a higher reduction in angina class who had the greatest increase in the DA ratio as compared to those who had a decrease in the DA ratio
Stys <i>et al.</i> [22]	2002	Effects of enhanced external counterpulsation on stress radionuclide coronary perfusion and exercise capacity in chronic stable angina pectoris	175	85% angina improvement, improvement in stress myocardial perfusion and maximize exercise functions
Michaels <i>et al.</i> [23]	2002	Left ventricular systolic unloading and augmentation of intracoronary pressure and Doppler flow during enhanced external counterpulsation	10	Diastolic BP increase, Systolic B.P decrease and increment in coronary flow by 28% during EECP treatment
Holubkov <i>et al.</i> [24]	2002	Comparison of patients undergoing enhanced external counterpulsation and percutaneous coronary intervention for stable angina pectoris	771	Angina improvement in CCS class higher who received EECP therapy as compared to PCI group
Soran <i>et al.</i> [25]	2002	Enhanced external counterpulsation as treatment for chronic angina in patients with left ventricular dysfunction: a report from the International EECP Patient Registry (IEPR)	1402	Improvement in angina at least one class in 67% of patients with LV dysfunction 70.6% after 6 months of follow up
Fitzgerald <i>et al.</i> [26]	2003	Enhanced external counterpulsation as initial revascularization treatment for angina refractory to medical therapy	4,669	The decrease in anginal episode per week with significant value $p < 0.001$ , reduced nitroglycerine uses and CCS angina class reduction in 74.8 patients
Bonetti <i>et al.</i> [27]	2003	Enhanced external counterpulsation improves endothelial function in patients with symptomatic CAD	23	Enhanced peripheral endothelial function immediately after EECP treatment with a contribution to the clinical benefit of EECP
Schechter <i>et al.</i> [28]	2003	External counterpulsation therapy improves endothelial function in patients with refractory angina pectoris	20	Significant improvement in angina class ( $p < 0.001$ ), nitrate consumption decrease ( $p < 0.001$ ) with improvement in endothelial functions
Tartaglia <i>et al.</i> [29]	2003	Exercise capability and myocardial perfusion in chronic angina patients treated with enhanced external counterpulsation	25	96% patients improved by at least one functional angina class and exercise duration increased in treadmill exercise testing and reduction in ischemic segments
Werner <i>et al.</i> [30]	2003	Practicability and limitations of enhanced external counterpulsation as an additional treatment for angina	48	Anginal episode reduced by 48%, Nitroglycerine reduction by 51% and work capacity increase by 22%

**Table 3. cont.** EECp effectiveness on clinical profile in coronary heart disease patients

Author	Study (year)	Title of study	Sample size	Findings & conclusion
Lawson <i>et al.</i> [31]	2003	Analysis of baseline factors associated with a reduction in chest pain in patients with angina pectoris treated by enhanced external counterpulsation	4592	Significant improvement in angina by 73% in at least 1 class and 2 classes by 35.2% and 3 classes by 17.3%. Mean angina episodes per week decrease to 2.5 per week after EECp treatment and nitroglycerine uses per week after EECp was 2.5 times per week and improvement in functional status also observed
Linnemeier <i>et al.</i> [32]	2003	Enhanced external counterpulsation in the management of angina in the elderly	3037	Angina improvement in 81% at 6 months with a reduction in nitroglycerine use and improvement in well-being status with decrease rate of cardiac hospitalization has been observed
Linnemeier <i>et al.</i> [33]	2003	Enhanced External Counterpulsation for the relief of angina in patients with diabetes: safety, efficacy and 1- year clinical outcomes	1532	Significant improvement in CCS angina class by 69% in diabetes mellitus immediately after EECp and 86% at 1 year follow up, reduction in nitroglycerine use and improvement in well-being status has been observed and confirm that EECp is safe, effective and well tolerable treatment
Bagger <i>et al.</i> [34]	2004	Effect of enhanced external counterpulsation on dobutamine-induced left ventricular wall motion abnormalities in severe chronic angina pectoris	23	Reduction in dobutamine-induced wall motion abnormalities observed after EECp treatment
Michaels <i>et al.</i> [35]	2004	Two-year outcomes after enhanced external counterpulsation for stable angina pectoris (from the International EECp patient registry [IEPR])	1097	Significant improvement by 73% angina improvement, 50% improvement in well-being of CAD patients at 2 years of follow up
Lawson <i>et al.</i> [36]	2004	The effectiveness of enhanced external counterpulsation in patients with left main disease and angina.	2861	Significant improvement in angina pectoris and reduction in nitroglycerine use and reduction in weekly angina episodes observed
Masuda <i>et al.</i> [37]	2004	Improvement of oxygen metabolism in ischemic myocardium as a result of enhanced external counterpulsation with heparin pretreatment for patients with stable angina	18	Significant improvement in exercise capacity and oxygen metabolism of CHD patients treated with EECp and intravenous heparin infusion combined therapy was observed
Henrikson <i>et al.</i> [38]	2004	Enhanced external counterpulsation therapy: significant clinical improvement without electrophysiologic remodelling	28	Significant improvement in angina by 82% and effective treatment for CAD patients
Taguchi <i>et al.</i> [39]	2004	Effects of enhanced external counterpulsation on hemodynamics and its mechanism relation to neurohumoral factors	24	Study concludes that increments in ANP without enhancement in BNP was an important mechanism for EECp effectiveness
Lawson <i>et al.</i> [40]	2005	Predictors of benefit in angina patients one year after completing enhanced external counterpulsation: initial responders to treatment versus non responders	2,007	Angina reduced by at least 83% immediately, and improvement in weekly anginal episodes, the frequency of nitroglycerine use decreased and well-being status improved by 63%

**Table 3. cont.** EECP effectiveness on clinical profile in coronary heart disease patients

Author	Study (year)	Title of study	Sample size	Findings & conclusion
Michaels <i>et al.</i> [41]	2005	Frequency and efficacy of repeat enhanced external counterpulsation for stable angina pectoris (from the International EECP Patient Registry)	1192	After EECP treatment 86% reported decrease in angina CCS class by at least one and 57% patients discontinued nitroglycerine use  After 2 years 70% patients reported significant decrease in angina and nitroglycerine consumption
Arora <i>et al.</i> [42]	2005	Effects of enhanced counterpulsation on vascular cell release of coagulation factors	30	The study suggests that EECP may not play a vital role in controlling coagulation factors in coronary heart disease patients, further research required
McCullough <i>et al.</i> [43]	2006	Impact of body mass index on outcomes of enhanced external counterpulsation therapy	2730	Changes in angina and duke activity status have been observed in all BMI patients. Greater reduction of angina is directly proportional to BMI value
Soran <i>et al.</i> [44]	2006	Two-year outcomes after enhanced external counterpulsation (EECP) therapy in patients with refractory angina pectoris and left ventricular dysfunction (report from the International EECP Patient Registry)	363	At 2 years of follow up 55% of patients showed improvement in angina and prove that EECP is effective and durable therapy approach for CAD patients and 52% CHD patients discontinued nitroglycerin use
Akhtar <i>et al.</i> [45]	2006	Effect of external counterpulsation on plasma nitric oxide and endothelin-1 levels	13	EECP increases nitric oxide and decreases endothelin-1 level and changes sustained for 3 months in CHD patients
Nichols <i>et al.</i> [46]	2006	Enhanced external counterpulsation treatment improves arterial wall properties and wave reflection characteristics in patients with refractory angina	20	The study suggests that EECP can reduce arterial stiffness and may improve wave reflection characteristics in CHD patients and these changes decrease left ventricular afterload, myocardial oxygen demand and can reduce anginal episodes
Lawson <i>et al.</i> [47]	2006	Two-year outcomes in patients with mild refractory angina treated with enhanced external counterpulsation	1458	Improvement in angina by 70–74% with reduction of nitroglycerine use by 52% with better well-being persist till 2 years of follow up
Novo <i>et al.</i> [48]	2006	Enhanced external counterpulsation for treatment of refractory angina pectoris	25	Significant improvement in angina by 84% and reduced inducible ischemia and maximal benefits observed in patients with the worst systolic failure
Loh <i>et al.</i> [49]	2006	The immediate and long-term outcome of enhanced external counterpulsation in treatment of chronic stable refractory angina	58	At least one class CCS angina improvement by 78% after 1 year and increase exercise capacity with a reduction in nitroglycerine use
Arora <i>et al.</i> [50]	2007	Effect of enhanced external counterpulsation on myocardial perfusion in patients with stable angina: A multicenter radionuclide study	11	No significant effect on myocardial perfusion has been observed due to very less number of sample size and highly variable clinical responses and study suggest for further research to assess EECP effectiveness on myocardial perfusion
Michaels <i>et al.</i> [51]	2007	The effects of enhanced external counterpulsation on time- and frequency-domain measures of heart rate variability	27	Improvement in heart rate variability in diabetic CHD patients and associated with reduced with reduced mortality rate

**Table 3. cont.** EECP effectiveness on clinical profile in coronary heart disease patients

Author	Study (year)	Title of study	Sample size	Findings & conclusion
McCullough [52]	2007	Residual high-grade angina after enhanced external counterpulsation therapy	902	The researcher observed high residual grade angina after EECP in those patients who had severe angina and multivessel diseases
Yavari <i>et al.</i> [53]	2007	Effects of enhanced external counterpulsation on anginal symptoms and improvements in objective measures of myocardial ischaemia	67	The study concludes that EECP is a safe, well tolerated and effective non-invasive therapy for CHD patients
Loh <i>et al.</i> [54]	2008	Enhanced external counterpulsation in the treatment of chronic refractory angina: a long-term follow-up outcome from the International Enhanced External Counterpulsation Patient Registry	1477	After 1-year EECP treatment 78% patients reported reduction in CCS angina class and 74% of patients sustained improvement at 3-years follow
Erdling <i>et al.</i> [55]	2008	Enhanced external counterpulsation in treatment of refractory angina pectoris: two-year outcome and baseline factors associated with treatment failure	86	After EECP treatment 79% of patients showed improvement in CCS class immediately and 61.5% of patients sustained these benefits till 12 months and 29% at 2 years follow up and study conclude that EECP is safe & effective for CAD with angina pectoris patients and patients with CCS angina class III & IV reported maximum improvement
Buschmann <i>et al.</i> [56]	2009	Improvement of fractional flow reserve and collateral flow by treatment with external counterpulsation.	23	Improvement in CCS and NYHA class in CAD patients with significant improvement in pressure derived collateral flow index and fractional flow also increased
Esmailzadeh <i>et al.</i> [57]	2009	Evaluation of left ventricular systolic and diastolic regional function after enhanced external counterpulsation therapy using strain rate imaging	20	Reduction in NYHA angina class & improvement in LV systolic and diastolic function in patients with chronic angina with increment in LVEF from 40.25–46.25% with significant p-value ( $p < 0.001$ )
Soran <i>et al.</i> [58]	2012	Comparison of long-term clinical outcomes, event-free survival rates of patients undergoing enhanced external counterpulsation for coronary artery disease in the united states and turkey	2072	Significant reduction in the severity of angina in CAD patients at 1-year of follow up
Eslamian <i>et al.</i> [59]	2013	Therapeutic effects of enhanced external counterpulsation on clinical symptoms, echocardiographic measurements, perfusion scan parameters and exercise tolerance test in CAD patients with refractory angina	50	Significant improvement in angina severity ( $p < 0.001$ ), wellbeing status and ischemia severity ( $p = 0.044$ ) and demonstrated useful safe and effective treatment method for angina pectoris in CHD patients
Bozorgi <i>et al.</i> [60]	2014	Effect of enhanced external counterpulsation (EECP) on exercise time duration and functional capacity in patients with refractory angina pectoris	20	Significant reduction in the severity of angina and physical functioning sustained for 6 months

**Table 3. cont.** EECP effectiveness on clinical profile in coronary heart disease patients

Author	Study (year)	Title of study	Sample size	Findings & conclusion
Beck <i>et al.</i> [61]	2014	Enhanced external counterpulsation improves endothelial function and exercise capacity in patients with ischaemic left ventricular dysfunction	24	Significant improvement in plasma level of nitrates and improved peak VO <sub>2</sub> and reduce LV function with significant improvement in peripheral vascular function and functional capacity
Tabary <i>et al.</i> [62]	2015	The assessment of the clinical and paraclinical effects of enhanced external counterpulsation therapy in patients with coronary artery disease	48	Improvement in Hemoglobin, LVEF, Diastolic and systolic B.P, Chest pain, dyspnea and improve clinical conditions
Subramanian <i>et al.</i> [63]	2016	Effect of enhanced external counterpulsation treatment on aortic blood pressure, arterial stiffness and ejection fraction in patients with coronary artery disease	72	Central B.P significantly decrease with improvement in LV function in CAD patients
Beck <i>et al.</i> [64]	2016	Enhanced external counterpulsation reduces indices of central blood pressure and myocardial oxygen demand in patients with left ventricular dysfunction	17	EECP worked as adjuvant therapy and improvement in functional status, central B.P and myocardial oxygen demand in CAD patients

**Table 4.** EECP effectiveness on health-related the quality of life in coronary heart disease patients

Author	Study (year)	Title of study	Sample size	Findings & conclusion
Arora <i>et al.</i> [65]	2002	Effects of enhanced external counterpulsation on health-related quality of life continue 12 months after treatment: a substudy of the multicenter study of enhanced external counterpulsation	139	Significant improvement in Health-related QoL in patients who had active EECP as compare to those having inactive EECP in all HR-QoL parameters ( $p < 0.05$ )
Kumar <i>et al.</i> [66]	2009	Effect of enhanced external counterpulsation on clinical symptoms, quality of life, 6-minute walking distance, and echocardiographic measurements of left ventricular systolic and diastolic function after 35 days of treatment and at 1-year follow up in 47 patients with chronic refractory angina pectoris	47	Significant improvement in QoL and walking capacity
Wu <i>et al.</i> [67]	2012	Enhanced external counterpulsation in patients with refractory angina pectoris: a pilot study with six months follow-up regarding physical capacity and health-related quality of life	34	Improvement in physical and functional capacity with HR-QoL improvement
Ziaeirad <i>et al.</i> [68]	2012	The effects of enhanced external counterpulsation on health-related quality of life in patients with angina pectoris	64	Angina & QoL improvement

**Table 4. cont.** EECP effectiveness on health-related the fuality of life in coronary heart disease patients

Author	Study (year)	Title of study	Sample size	Findings & conclusion
Jorgensen et al. [69]	2013	Improvement of angina, quality of life, and working capacity after enhanced external counterpulsation	One special case	QoL & Angina improvement
May et al. [70]	2015	Enhanced external counterpulsation — effect on angina pectoris, QoL and exercise capacity after 1 year	50	Improvement in exercise capacity with generic and disease specific QoL improvement
Shakouri [71]	2015	Effect of enhanced external counterpulsation and cardiac rehabilitation on quality of life, plasma nitric oxide, endothelin and high sensitive crp in patients with coronary artery disease: a pilot study	42	Mean change in quality of life and endothelial functioning has been observed in CAD patients

## Discussion

Above discussed EECP studies validates the significant improvement in CCS and NYHA angina classification, angina episodes, left ventricle ejection fraction functioning, exercise tolerance and HRQoL with reduction of nitroglycerine use & decrease hospitalization rate in coronary heart disease patients. EECP used for angina and heart failure for the past two decades, but still, more research required filling the gaps in research. There are very few or rare study conducted to assess EECP effectiveness on BMI, Heart Rate, Cholesterol, Triglyceride, High-Density Lipoprotein (HDL), Low-Density Lipoprotein (LDL), HbA1C, SpO<sub>2</sub>, Vo<sub>2</sub>max, 12-minute walk or run test and comparative prospective randomized trials on cardiac and non-cardiac metabolic markers.

## Conclusion

Further clinical research is required to evaluate EECP effectiveness on obese, diabetic, hypertension and other metabolic disease patients with CHD and multi-centric randomized controlled trials are required for further modifications in EECP device to cure, prevent, and treat chronic diseases such as obesity, hypertension, diabetes, and neurological disorders by the non-invasive procedure.

## Conflict of interest

None.

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## **Pragmatic and Innovative Learning Strategies for Effective Learning**

**Ms. Jugnu Khatter\***

**Dr. Sushma Rani\*\***

The conventional methods of learning call for drastic changes in the modern age through improvised technology and innovations in curriculum and assessment. The expectations and demand of modern age is to have pragmatic and innovative techniques so as to equip learners with necessary skills through their active engagement and participation in teaching and learning process.

**Key Words:** Active Participation, Innovative teaching Techniques

*"Innovation is not about timing. it is about creating something that fulfils an unmet need."*  
**-Jeremy Gutsche**

In education process, learner active participation refers to the extent of attention, curiosity, interest, optimism, motivation and passion that learners show in teaching leaning process. When learners are actively engaged with the content being taught, they learn more rapidly and retain more. Learners who are actively engaged in the work tend to persist more and find more joy in completing the work. The biggest challenge for any teacher in learning process is capturing each learner's attention, and conveying ideas effectively enough to create a long lasting impression. Innovative Learning Strategies can empower learners to think critically, access and analyze information, creatively problem solving, work collaboratively and communicate with clarity and impact.

In this research article, few innovative teaching strategies are discussed that engage learners: (1) inquiry-based learning, (2) problem-based learning (3) Review Learning (4) Jigsaws Learning (5). Smart classroom technology (6) Heuristic learning .These innovative teaching strategies encourage learners to use their imagination to dig deep when engaging with the content in the teaching learning process. The learners are actively involved with the learning and can work with their peer group in collaborative groups to showcase their learning achievements.

### **Inquiry-Based Learning**

Inquiry-based learning is one of the effective teaching strategies in the classroom because learners learn best when they construct their own meaning with the help of their abilities, capacities and interests. Inquiry-based learning helps in generating learner curiosity. Teachers act as a guide and facilitators during the inquiry-based learning process.

There are mainly three steps in the process:

1. To prepare questions and arrange them in a sequence.
2. To present the questions in appropriate way so that curiosity may be created among the learners.
3. To ask new questions by liking with learner's responses. Teacher is able to recognize the intention of learners and provides motivation accordingly.

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Inquiry-based learning allows learners to pose the questions and convert that information into useful knowledge, thus increase the level of learner engagement.

### **Project-Based Learning**

*"A problem well defined is a problem half-solved."*

*–John Dewey*

Project-based learning is an effective and enjoyable way to learn. It also develops deeper learning competencies required for success in real life situations. The main focus of this is to socialize a child as it provides an opportunity for work experience, divergent thinking and social efficiency.

There are six steps in the process:

1. To identify a problem related to life situation of the learner.
2. To select and define the problem.
3. To prepare a plan for finding out the solution of the problem.
4. To implement the plan.
5. To evaluate the workability of the project plan.
6. To prepare of record of the project.

Project-based learning uses real-world scenarios, challenges, and problems to engage learners in critical and creative thinking, problem solving, teamwork, and self-management. The teacher's work is to provide proper guidance. It uses collaboration, digital tools, and problem solving skills to come up with a solution to the problem presented.

### **Review Learning**

Review learning develops the ability of critical thinking among learners. The learners are assigned to review an independent topic or one topic is assigned to a group of learners. This type of learning requires self-motivation and involvement in the subject matter.

This mainly involves four steps:

1. A topic, problem or area is selected to review critically.
2. A list of relevant literature and sources is prepared by pupils with the guidance of a teacher
3. To go through the available material to collect relevant information or material.
4. On the basis of relevant literature, the pupils prepare a review of the topic or idea or problem assigned to him.

In this type of learning, learners have to perform much of library and historical work. The learners should have the patience consulting the topic from available literature and should have the feeling of cooperation to help each other in this regard, if working in a group.

### **Jigsaws Learning**

The jigsaw learning technique is a "tried and true" i.e. co-operative learning technique that helps learners to create their own learning. Learners are arranged in groups and assigned a different piece of information. In their own groups, learners learn and understand the piece of information well enough to be able to teach it to another group of learners.

Through this learning technique, learners become experts on the learning as they teach their peer group. Once all groups have learned their information, they are placed into new groups with members from each of the small groups. Each group member shares the information and knowledge they gained in their informational group. This learning technique brings lessons to life and challenges learners to create their own learning. This challenge engages learners and motivates them to share their learning with others learners.

### **Smart Classroom Technology**

Many schools have become one-to-one schools, i.e., each Learner has his/her own technology device (a tablet or Laptop) to work with each day. Learners can take the technology device home to complete their homework.

Teachers must use technology in a smart managed way and with a wide variety of activities. Several activities that lead to learner engagement are Google Docs, YouTube videos, Quizlet, Kahoot!, and the Remind app. These innovative apps and websites can help teachers engage the learners, remind them and encourage them about upcoming assignments and homework, provide visual learning through videos, organize their learning, provide group collaboration, and provide check-ups on learning through games and online quizzes.

### **Heuristics Learning**

*"Heuristic Method is a method of teaching which involves our placing the learners as far as possible in the attitude of a discoverer"*- **Armstrong**

It is based upon the assumption of Herbert Spencer that the learner should be told as little as possible and he should be encouraged to learn himself as much as possible.

This learning technique involves 'trial and error' and invention technique. It requires more logical and imaginative thinking in formulating the number of tentative solutions for the problem. It helps in developing scientific attitude towards the problem.

Main steps of this type of learning are:

1. Define objectives and opportunities.
2. Map the process or constituent elements of system.
3. Express impact of each step or element.
4. Link each impact back to each objective.
5. Organize and consolidate generated statements.

This is a psychological method as the learner learns and experience by self-practice. It inculcates in the learner the interest for the subject and also develops willingness in them.

### **Brain Storming Learning**

This type of learning consists of a problem solving situation in which learners have to analyze and evaluate the workability of their own suggestions of the problem. It is based on an assumption that learners can learn better in a group rather than in individual study. It encourages for the original ideas and more creative strategy of learning.

This learning technique involves following steps:

1. Plan all phases of the problem and think about the sub-problems which may emerge.
2. Select sub-problems to be attached.
3. Think about the data or differences which may help involving them.
4. Select the probable sources of data and collect most relevant data.
5. Decide and select ideas most likely lead to the situation.
6. Consider the possible ways to test these ideas and test them in terms of relevance, adequacy and sufficiency.
7. Imagine all possible contingencies and ways of meeting them.
8. Take decision about the final solution of the problem.

This learning technique provides more ideas of good quality.

Each of the above discussed learning techniques provide an opportunity to learners for questioning, research, use of smart technology, and create meaning from provided materials and research. These techniques also allow learners to solve problems, challenge

themselves, and present their findings to others. Learner's engagement builds on curiosity, interest, passion, abilities, aptitude and attention.

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# CYBER SECURITY: TYPES AND CONSTITUTIONAL PROVISIONS

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## Abstract

Cyber crimes are similar to any crime, but it involves computers and networks. In some cases, computers can be used to commit crimes, and in other cases, computer crime may be the target. It includes everything from stealing millions of dollars from online bank accounts to downloading illegal music files. Cyber crime also involves transactions involving non-money transactions, such as spreading viruses on other computers or posting a private information of any business on the Internet. Cyber Criminals can use computer technology to access your personal information, to know the secret of the any trade or use the Internet for other malicious purposes. Criminals who do such illegal acts are often called hackers. This paper deals with the various types of Cyber-Crime and their influence on the society and masses.

**Keywords:** *Cyber Crime, Cyber Security, Hacking, Phishing, Logic Bomb*

## Introduction

There are hundreds of ways to cybercrime, in which cyber crime can be explained, and you have to know what they are.

Since, cybercrime is a crime that is done by the help of a computer and a network by a person using computer internet software etc. Using any of the techniques, causing any kind of harm to another person, company etc. is called cybercrime.

That is, the weapon to commit a crime is not a gun knife or a bomb, but this weapon is the computer internet through which people commit crimes under which it is to steal information from someone's computer, by deleting someone's information. Using such crime, these can be obtained in a variety of ways like sending spam emails and hacking by inserting viruses etc.

## Types of Cyber Crime

**Spam-Email:** There are many types of emails coming in our email account, which also include emails which not only harm the computer but also wastes user's time. Spam is the kind of e-mail that comes without asking, in which the advertisements are usually filled, thus it proves to be a problem since email has evolved. A study from April 2008, revealed that atleast 100 billion spam is sent everyday, for sending

spam, the information to be sent to spam emails are collected from the chat rooms, websites or several viruses. The example of spam is shown as below in the fig no -1

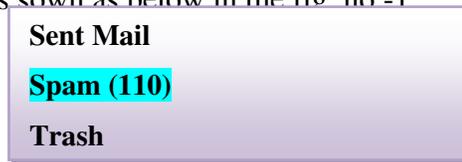


Fig. No.-1 (Spam E-mail)

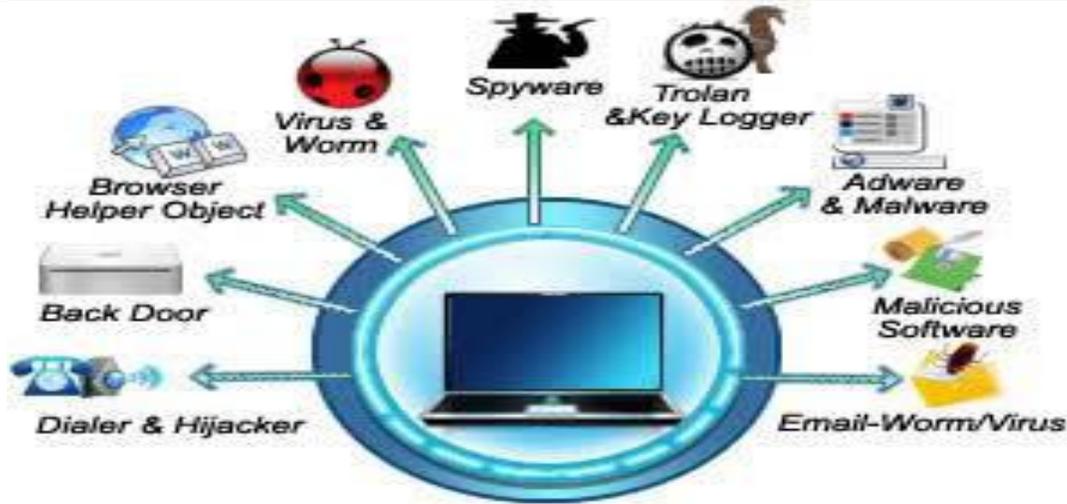
**Hacking:** Hacking any personal information such as a user's name or password and then manipulating it is known as computer hacking. Hacking means unauthorized infiltration and manipulating data in network software a computer device information system. In simple words, hacking is a task in which a hackers access your computer or server without your permission. Hackers (people who 'hacking') are basically computer programmers who understand the computer's advance and generally abuse this knowledge for a variety of reasons. Those hacking people call them hackers, this hacking system can also be done through physical access or even through remote access, it is not necessary that the hacking result should be harmed with an aim of destroying one's computer or personal information. But in case if the hacker still checking the information also comes under the cyber crime. Even infiltration comes under cyber crime, there is a provision for punishment. They typically have expert-level skeletons in special software programs or languages. There may be many previous intentions of hacking, but the most common are - greed, fame, power etc. Learn the Truth About Hacking In The Next 10 Minutes. The example of hacking is shown as below in the fig. no.-2.



Fig. No.-2 (Hacking)

**Sources:** Adapted from <https://www.cnet.com/news/global-hacking-campaign-targets-critical-infrastructure/> on 13Januray,2019.

**Spreading Computer Virus:** Cyber criminals send some software to your computer where viruses can be hidden, they contain virus plural such as virus, worms, logic horse, Trojan horse etc. can be harmful to the computer here, when you open someone's site or inappropriate site etc. From an unregistered site or download something, through this the computer gets viruses which results in deleting the data. Also, screwed some programs on the virus takes your line that you do not want as shown in the fig. no.3.



**Fig. No.3 (Spreading Computer Virus)**

Sources: <http://files-recovery.blogspot.com/2011/04/27-malware-types-and-their.html> accessed on 13January, 2019.

**Theft of FTP Passwords:** FTP password theft: This is another common way to tamper with web sites. FTP password hackers take advantage of the fact that many webmasters store their login information on a well-protected PC. Hackers search Victim's system for FTP login details, and then sends them to their remote computer. He then logs on to his web site through his remote PC and modifies the web pages as they like. Virus can be spread in many ways like as shown in the fig. no.4.



**Fig. No.4 (Theft of FTP Passwords)**

Sources: Adapted from <https://www.google.com/search>, accessed on 13January, 2019

**Virus Dissemination:** Virus spread: Computer viruses are a program that infects a system or file. These tend to be broadcast by other networks on the network. They disrupt computer operations and affect store data - either modify it or delete it altogether. The most common reason why one's PC may be infected with viruses or malware Unlike the virus, "Worms" does not need a host. They are still replicated when they do not eat all the available memory in the system. Computer viruses are typically spread through removable media or the

Internet, a flash drive, CD-ROM, magnetic tape or other storage device that is already infected with the virus. Along with this, email attachments, websites or infected software are also vulnerable to viruses. How do you know if your computer is infected with virus or not? When a virus arrives on a PC, then it spreads on all PCs by the network. All computer viruses are due to direct or indirect economic damage. Based on this, two categories of viruses have been created: Those that are only spread and do not cause the intentional damage Those who are programmed to cause the loss. You should use the best anti-spyware and malware software for your PC's security.



Fig. No. 5 (Virus Dissemination)

Sources: Adapted from <https://www.google.com/search>, accessed on 13January, 2019

**Logic Bomb:** A logic bomb, also called "slag code", is a malicious code, which is deliberately inserted in software to excel the Málcio Tasc when triggered by a special event. It is not a virus, yet it usually behaves like a virus. It is secretly inserted into a program and it remains inactive until it has a specific condition. They become active in a specific condition. For example, the infamous "Friday the 13th" virus only attacked specific dates; It used to attack the day on which the 13th of the day came on Friday and slow the system down.

**Phishing:** Phishing is usually done by email spoofing. It looks like this email has come from your back but in fact they are fake. Clicking the link contained in the user is taken to the fake website. Here, whatever information they fill, they go to hackers. How to find out which e-mail is Fake, Spoofed or Spam? Make sure to check whether it is safe before clicking any link included in the e-mail. If you do not check the safety before clicking the link, then you can get into trouble.

**Cyber Law In India:** For different crimes up to Section 65, 66, 66B, 66C, 66D, 66E, 66F, 67, 67A, 67B, 67C, 68, 69, 70 and Section 71 of 'Information Technology Act, 2000' There is a penalty for up to three to five years of imprisonment.

## Constitutional Provisions

- According to the jurisdictional provisions in cyberspace under Information Technology Act, 2000: The discovery of information and communication techniques can be considered as the most important invention of the twentieth century from the point of view of the development of human society. The importance of its use in different areas of social development, especially in the judicial process, cannot be underestimated, because of its judicial process due to its high speed, redemption of many

minor problems, lack of human mistakes, less expensive Can play a key role in making trustworthy Not only this, in the execution of such cases, where the physical presence of all the relevant parties is not mandatory, this can be the best option. The list of charges mentioned under the information technology law is as follows:

- Trying to tamper with computer resources - Section 65
- Trying to hack into the data stored in the computer - Section 66
- Penalty for sending restricted information through communication services - Section 66A
- Provision of penalties for misappropriating information stolen from computer or any other electronic gadget - Section 66b
- Provision of penalties for stealing someone's identity - Section 66
- The provision of penalties for accessing personal data of someone with the help of computer by concealing their identity- Section 66
- The provision of penalties for breaking anybody's privacy - Section 66
- Provision of penalties for cyber terrorism - Section 66F
- Provisions related to the publication of objectionable information- Section 67
- Penalty for publishing or circulating sex or obscene information through electronic means- Section 67A
- Publication or broadcast of such objectionable content from electronic means, in which children are shown in obscene mode - Section 67b
- The provision of penalties for interference or interference by the arbitrators - Section 67C
- Provision regarding making objectionable access to a secure computer-section 70
- Misrepresenting data or data - Section 71
- Provisions related to dissolution of mutual trust and privacy - Section 72A
- The provisions relating to making public the information in violation of contract terms - Section 72A
- Publishing of False Digital Signature-Section 73
- Inspector level police officer in the Information Technology Act of section 78 has the right to investigate these cases.
- Provisions related to cyber crimes in the Indian Penal Code (IPC)
  - Send threatening messages through email
  - Section 503 of IPC Sending such messages through email, which leads to libel
  - Section 499 of IPC Use of False Electronic Records
  - Section 463 of IPC Fraudulent Websites or Cyber Fraud-IPC
  - Section 420 Keep an eye on someone's stolen email
  - Section 463 of IPC Web Jacking
  - Section 383 of IPC Incorrect use of email

-Section 500 of IPC selling Medicines Online

-NDPS Act Online Arms Weapons-Sales Arms Act66-F:

- Penalties for Cyber Terrorism: In the cases of cyber terrorism, Section 66-F has been replaced in the Information Technology Act, 2000 for the penal code. If any-

(A) To dissolve India's unity, integrity, security or sovereignty or terrorize its inhabitants-

(A). Prevents any authorized person from using the computer or the reason for the stoppage.

(B) Forcibly attempting to use any computer without encroachment of authority or its authority.

(C) puts a thing like a virus in the computer or tries to put it down, that there is a danger of a danger to the lives of people or the danger of property damage or deliberately disturb the services required for life Whether or not there is a possibility of a bad effect on sensitive information under section 70-(II)

Inadvertence of rights or rights, deliberately managed to obtain such information from a computer, which is sensitive to the security of the country or the view of its relations with other countries or any confidential information obtained with this intention Does it have a bad effect on India's security, unity, integrity and sovereignty, its relationship with other countries, public life or ethics, or the like If there is a possibility of contempt or defamation of the courts of the country or it is feared to happen, if any crime is promoted or it is feared, if any foreign nation or group of persons or any other person benefits from such information He can be regarded as an accused of cyber terrorism.

(2) If a person is involved in a conspiracy to spread cyber terrorism or to do so, he can be sentenced to life imprisonment. In the third edition of the Advanced Law Lexicon published in 2005, the word Cyberspace is also defined on the same pattern. There is a lot of emphasis on the floating word in electronic means, as it can be accessed from any part of the world. The author further defines the term cyber-theft (cyber theft) in terms of the use of online computer services. In this dictionary, cyber laws have been interpreted in such a way that the area of law, which is related to computers and the Internet, and within its realm comes the intelligible property rights, freedom of speech and uninterrupted access to information.

## Suggestions

How to Stop Cyber Crime? Computer users can adopt various techniques to prevent cyber crime

- Computer users should use a firewall to protect their computer from hackers.
- Computer users should install anti-virus software such as McAfee or Norton Anti-Virus.
- Cyber experts have advised that users should purchase only on secure websites. They never give their credit card information to suspicious or strangers.
- Users should develop strong passwords on their accounts, ie, include letters and numbers in a password, and constantly update password and login details.
- Keep track of children and limit their use of the Internet.

- Check the security settings of Facebook, Twitter, YouTube and be careful.
- Keep information safe to avoid hacking. Use encryption for most sensitive files or financial records, create regular back-ups for all important information, and store it in another location.
- Users should be careful when using public Wi-Fi hotspots Avoid operating financial transactions on these networks.
- Users should be careful when giving personal information such as name, address, phone number or financial information on the Internet. Make sure websites are safe.
- Before clicking on a link or an unknown root file, all things should be intelligently analyzed.
- Do not open any email in Inbox. Check the source of the message. If there is any doubt, verify the source. Never reply to emails that give information to them

Since various laws and constitutional provisions have been made in regard to social media. A law has been made to deal with these crimes, but by doing some paddy grains on their behalf, women can avoid these problems and remain active on social media without worry. In this regard, Cyber Security expert Jiten Jain advised “to take care of certain things while on active social media. Here we are talking about: What to do, do not First of all, avoid putting your personal photos on social media”. Any one of them can use. If you still want to upload photos, do not publicize your privacy settings on your Facebook account. Keep settings so that your friends can see only your friends or people connected with you. Unaware people did not reach them.

Do not say if cyber attacker asks for money.

Adolescents in cyber crime Image Copywrite iStock

Always keep searching on Google about your name so that you know where your name is coming and what website is coming up.

If you see a name in a wrong place or at such a place you have not given permission, then you can ask to remove it immediately. Do not add strangers to Facebook. There may be disadvantages from doing so many times. Add professional people on LinkedIn, do not join them on Facebook. At the same time, do not put personal photos on Twitter at all. This is not a social networking site, it is a tweeting platform. Such settings can be made on Twitter that people can not follow you without your permission. But, people usually do not do this. By making the settings more private, your account can be more secure. Image Copywrite iStock. Many times you block or block someone's account. The blocked person can not access your account after this, but keep in mind that they can reach you from the second account.

In such a way, before accepting the friend request of another unknown profile, keep this thing in mind. If you get stuck in any problem, do not panic, but let the police know about it. How to know fake account It often happens that a Facebook account is used to photograph a girl, but that account is made by a boy. Similarly, Facebook account is also created with fake names and pictures. Thus, people should focus on

real life more than virtual. But, if it cannot be left entirely, then adopt new approaches to safety. If there is a problem, then you should take legal support.

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# Role of Yoga in Maintaining Hale Body and Healthy Mind

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**Abstract:** Yoga is the very foundation and basis of our life and Viyoga (Non-doing of Yoga) is the escape and sign of ruining one's life. Yoga as a science of Human Development, offers various techniques for the harmonization and mastery of the body, bio-energy, senses and the mind. It works as a system for the development of the inherent mental and super natural powers at present lying dormant in us. It is a path to self-knowledge helps us to travel beyond the changing reality of our bodies and personalities.



“Yoga is the method by which the restless mind is calmed and the energy directed into constructive channels. As a mighty river which when properly harnessed by dams and canals, creates a vast reservoir of water, prevents famine and provides abundant power for industry; so also the mind, when controlled, provides a reservoir of peace and generates abundant energy for human upliftment.” – B.K. Iyengar

Yoga is an ancient science of India, which has an objective to develop perfect health of the body and mind, so as to reach the ultimate state of spiritual enlightenment. Yoga has its origin in Vedas and Upanishads. For more than 5000 years Yoga has been practiced and propagated in India. In the modern times Yoga has become a worldwide phenomenon. Yoga is credited with teaching the art of living the life in its full volume and versatility in perfect harmony with the self and others. The yogic activities provide immense help in assisting an individual to seek his all-round growth and development in all the dimensions of one's personality including the union of his self with the greater inner soul.

Regular Yoga Practice can lead to a healthy life without any physical and mental diseases. Yoga prevents and also cures various diseases of human being whether it is physical, mental, psychological and social levels. Regular practice of Yoga is proven to be effective in prevention of most of the modern and common health problems such as High Blood Pressure, Diabetes, Obesity, Constipation, Skin diseases, Asthma, Cold, Headache, Migraine, Eye defects, Arthritis, Rheumatism, Indigestion, Gastritis and any other health problem including Cancer and AIDS with appropriate individualized and customized therapy techniques.

Yoga is the only methodology of preventive and curative procedures for any health problems without the usage of drugs of any kind. Yoga is being taught in schools, colleges, offices and institutions all over the world. Yoga therapy is being practiced by not only individual Yoga teachers and practitioners but also by many health centers and hospitals all over the world. Therefore, Yoga should be practiced by one and all with some restrictions of diet, timings, duration and other appropriate environmental conditions such as good air quality and peaceful conducive environment.

Yoga can work effectively in all conditions of health with the necessary requirement being that the patient should be able to physically practice various aspects of Yoga. It is possible to recover successfully from conditions which require medication and rest by appropriate aspects of Yoga being accordingly practiced.

Yoga works as a curative and preventive mechanism by virtue of its various methodologies and processes such as cleaning of the internal parts of the body or the Kriyas, Yogic subtle exercises, Yogic postures or Asanas, Pranayama, meditation or Dhyana. These different aspects or subjects within the Yoga system address different levels of the origin of disease of the health of the body and mind.

The internal cleaning processes i.e. Kriyas ensure thorough cleansing and elimination of unwanted waste matter in different parts of the body such as the eyes, nose, stomach and the intestines. It is well known that the root cause of all diseases is the harmful and unwanted waste matter which the body releases in different organs when it is not cleansed in the natural process but remains throughout in the body for longer times. For example, Regular Constipation can lead to complicated health problems right up to severe headache or other serious problems. Similarly, indigested or acidic food tract can lead to Gastritis and acidity. A regular and frequent cleansing of all the organs of the body by Yogic Shat Kriyas such as Neti (nose cleaning), Dhouti (stomach cleaning) and Shankhprakashalana (intestine cleaning) will lead to the complete purification of the

various categories of unwanted waste matter in the body, which finally lead to various types of diseases. This is one of the central principles of yogic therapy and curative practices of Yoga.

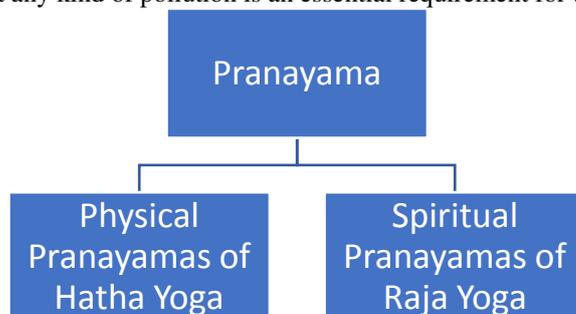
The other aspects of yogic therapy deal with exercises for various parts of the body such as joints, muscles and nerve centers. This is achieved through yogic subtle exercises or Sukshma Vyayama which covers all parts of the body including all joints and organs right from the head to the toes, through a set of different exercises which include physical motion, muscular control, breath control and concentration. It is generally regarded by scientific research that the Yogic Sukshma Vyayama is one of the most effective and powerful exercise for the entire body and can be practiced easily by one and all from the age of 10 to the age of 100. This will ensure mobility and flexibility of various joints and muscles in addition to preventing and curing various physical disabilities. It will also result in strengthening various parts of the body so as to produce greater capabilities or strength for performing different activities.

Another popular aspect of the science of Yoga is the science of yogic postures or Yoga Asanas. Yoga asanas help to control the mind and body which become healthy. One becomes active, flexible, strong, competent, capable and efficient. The Yoga Asanas have been designed and developed by the ancient Yogis and Rishis of India who have learnt from Nature. The different Asanas are named and modelled after various animals in Nature.

Mayurasana is the ultimate posture of enhancing the digestive power and appetite. Every Asana or Posture involves a specific breathing methodology without which the posture can become ineffective and even harmful. Different Asanas act on the different organs of the human body and produce different results which vary from person to person. If the Asanas are practiced wrongly without a personal teacher or just based on a book or any kind of visual means then the practitioner runs the great risk of causing severe damage to himself or herself. Therefore, it is essential to learn and practice Yoga through a proper, experienced and qualified teacher. Most of the Asanas are capable of producing beneficial effects for the whole personality of the practitioner at the physical, mental, emotional and spiritual levels.

The Seershasana are capable of bestowing upon the practitioner a large number of beneficial effects including enhanced physical and mental health, superior mental and intellectual faculties and capabilities such as deep concentration, better memory and also spiritual results such as peace and happiness.

The Padmasana, the most popular of all Asanas is the foundation for all practices of breath control or Pranayama and mind control such as concentration and meditation. The Pranayama is the next higher aspect of Yoga after the above mentioned three stages, i.e. internal cleaning or Shat Kriyas, yogic subtle exercises or Sukshma Vyayama and yogic postures or Asanas. Pranayama deals with the breath, its regulation and control so as to lead to beneficial results. Correct practice of Pranayama can lead to prevention and cure of all the possible diseases but incorrect practice of Pranayama can lead to formation of many new diseases. Therefore, it is most important that the practitioner of Pranayama should learn it from an experienced and qualified teacher. Good quality of fresh air without any kind of pollution is an essential requirement for the practice of Pranayama.



**1. Physical Pranayamas of Hatha Yoga:** Hatha means forceful in Sanskrit. Hatha simply refers to the practice of physical yoga postures. Hatha practices are designed to align and calm your body, mind, and spirit in preparation for meditation. Hatha Yoga system includes Asanas along with the six Shatkarmas (Physical and mental purification techniques), Mudras and Bandhas (Psycho-physiology energy release techniques) and Pranayama (pranic awakening practices).

**2. Spiritual Pranayamas of Raja Yoga:** Raja Yoga is the royal path of self-discipline and practice. Raja Yoga is also known as Ashtanga Yoga (Eight Steps of Yoga), because it is organised in eight parts. The eight steps of Raja Yoga provide systematic instruction to attain inner peace, clarity, self-control and Realisation.

1. Yama - Self-control
2. Niyama- Discipline
3. Asana - Physical exercises
4. Pranayama - Breath exercises
5. Pratyahara - Withdrawal of the senses from external objects
6. Dharana - Concentration

7. Dhyana - Meditation

8. Samadhi - Complete Realisation

Meditation or Dhyana is the higher step of Yoga which aims at calming down and relaxing the mind to such an extent that there are no thoughts at all but only a relaxed state of mind which finally leads to unconditioned pure consciousness and bliss or Ananda. It is the ultimate goal of Yoga. In such a state of relaxation, the practitioner can experience bliss which is transcendental and divine. The practitioner can experience deep relaxation and unconditioned pure consciousness which is also called Samadhi in Sanskrit. Experience of Samadhi leads to detachment and finally to liberation or Moksha. At initial levels also, Meditation has been recognized world over to bestow beneficial results as peace, happiness and positive state of mind by overcoming many stress related maladies such as hypertension, high blood pressure, heart diseases and diabetes mellitus. All the ailments of health which originate in the mind can be prevented and cured by the practice of Meditation.

Yoga can be practiced by anyone in any age group. Keeping in mind, it is not be practiced by anyone in the condition of high fever or sickness or bed ridden status or during menstrual cycles, etc. Yoga cannot be practiced in the open area with direct exposure to extreme weather conditions such as snow, rain or high heat or cold. It can also be practiced indoors with well-ventilated rooms wherein fresh air flows without any pollution or noise. Yoga cannot be practiced in polluted environment as it can lead to negative and harmful results. Yoga should be practiced only with an empty stomach, with water as the only exception in the early mornings or in the evening only after more than 4 hours' time gap after taking lunch. However, some of the yogic techniques such as internal cleaning can be practiced only on empty stomach in the early morning. Appropriate and comfortable dress code also is essential during the practice of Yoga.

It is believed that the purity of food follows the purification of the inner nature, by the purification of the nature, memory becomes firm and on strengthening the memory, follows the loosening of all ties and the wise get Moksha thereby. Reasonable diet restrictions are also recommended for practicing Yoga. Only fresh food and balanced diet should be taken at regular intervals with thorough chewing and avoiding drinking water while eating. A diet that offers your body a great basis for practice—or encourages the same effects as practice—makes for a great yogic diet. Fruits, green salads, honey and milk are encouraged to be used in addition to normal vegetarian diet for good results in Yoga practice. Balanced diet is the one that does as little harm as possible, builds your prana and sattva, and makes you feel good physically and emotionally. "Eating is perhaps the single most important act for one's yoga practice," Blossom says, "because nourishment of the body's tissues forms a foundation for nourishment of the mind and emotions."

Charak Samhita, one of the classic text books on Ayurveda, has concluded that , “ The persons having the sattvic essence are endowed with memory, devotion, are grateful, learned, pure, courageous, skillful, resolute, free from anxiety, having well-directed and serious intellect and activities and are engaged in virtuous acts.”

Finally, it is to be understood that by correct practice of Hatha Yoga or the Yoga of the physical body, one can achieve perfect health as described in the following sloka from the Hatha Yoga Pradeepika, a classic yogic text in Sanskrit written a thousand years ago.

*“Slender body, pleasant expression on the face, clear voice, pure eye sight, disease-free health, sexual strength, good appetite, strong nervous system – these are the qualities of a Yoga practitioner”.*

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**THE ROLE OF DIGITAL MEDIA IN THE ACADEMIC DEVELOPMENT OF JOURNALISM AND MASS COMMUNICATION STUDENTS, DELHI**

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**ABSTRACT**

*In the millennial days, the digital media has gained its credibility in different fields like development, business, education etc. There is no doubt that digital media plays an important role in student's life. Digital media is a boon in this era as it continuously grows and made the things easier for everyone. Students from every field rely on digital media and spend their maximum time on it. The digital media is witnessing a change from traditional talk and chalk method to newly invented concepts. This study mainly focused on the students of journalism and mass communication and their academic development in the wide presence of digital media. This research assesses the impact of digital media on the academic development of journalism and mass communication students. The first objective of this research is to study the awareness level of digital media amongst journalism and mass communication students. Second objective is to identify for which reason journalism and mass communication students use digital media. Third objective is to study how the students use digital media for educational purposes and fourth objective is to study why they using digital media to develop and showcase their skills. The quantitative research method used in this study with the help of questionnaire tool for finding the above objectives.*

*Keywords: Digital media, Academic, Development, Journalism, Mass communication, Student*

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**INTRODUCTION**

Now-a-days the significance of digital, Internet-based information and communication systems in education and training is increasing rapidly. The digital media platforms are increasingly used in all the areas of education and have requirements and consequences for the individual and society as a whole. Digital media is becoming the need of the hour with more and more businesses whether educational or non-educational ones entering into the world rapidly. It plays a very important role in today's scenario where everything is technology based, digital media gives us the assurance of instant information, less amount of time and it is easily available for everyone.

The academic sector for students has seen changes over the years, but in the last few decades, the digital technology has completely transform the way students learn in the classroom and it even introduced the learning method beyond the classrooms. All the way from primary school up to university, students are introduced computing skills and are encouraged to have their own laptops, giving them instant access to all sorts of information. In simple words, digital media developed a world where everything is easily available whether it is entertainment or education. Especially the youth which is known as the internet generation is too much into the digitalization and adapt the new technology very quickly. Hence, the contribution of digital media in the academic development for the students of every field is absolutely commendable.

The students of journalism and mass communication are using the digital media for every possible purpose which directly helps them to develop in their academics as well as enhance their skills and talent. Now their worldwide future is developing through the communication, collaboration and innovation, all of which are dependent on the digital media.

**OBJECTIVES OF STUDY**

- To study the awareness level of digital media among journalism and mass communication students.
- To identify for which reason journalism and mass communication students use digital media.
- To study how the students use digital media for educational purposes.
- To study why students using digital media to develop and showcase their skills.

**RESEARCH QUESTIONS**

On the basis of objectives, there are the following Research questions:-

- What is the awareness level of digital media among the students of journalism and mass communication?
  - Why do the students of journalism and mass communication use digital media?
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- What are the reasons for using digital media for educational purpose?
- Why are the students using digital media to develop and showcase their skills?

### REVIEW OF LITERATURE

Glhan Wikramanyake (2005) stated in his research study digital media is a “key component” of education. He found that students show keen interest in learning through digital media and enhanced their skills by their effective effort in the new form of learning. He highlighted that the technology will engross the whole world very soon in a way that become the most used problem solving medium.

Professor Dr. Linda Steiner (2012) wrote his thesis on topic “Social media instruction in journalism and mass communications higher education”. He examined that in what ways social media is being utilising at university level journalism program throughout the country. This research largely concludes that many journalism programs are lacking in social media instruction, use and implementation. Main findings are categorized by curriculum changes at the undergraduate and graduate levels, social media presence of journalism programs throughout the country, top ten journalism programs and their instruction and utilization of social media, best educational practices in social media. He also suggested that the programme should pay more focus on new technologies and skills.

Aisar Salihu Musa, Mohd Nazri Latiff and Nur Salina Ismail (2015) according to their study the usage of social media has been increased at a great speed in the higher institutions. The popularity of social networks changed the way of communication, interaction, investigation and socialisation. Their study was based on the student’s awareness and the usage of social networks among the students of mass communication. Their study claimed that the majority of using the social networks for the collection of data and information and also for the interpersonal communication. According to their study, “Nowadays the students are too much into the social networking and it is really difficult to find the student who is not aware of social media and have at least using one social networking site”. Social media plays an important role in the life of students and their day to day activities revolve around the social media platforms. It also stated that social networks can be used in a beneficial way as the respondents also used it to support their academic activities and also to make friends from far places, report and share information, conduct researches and socialize themselves in the learning aspect. The study stated that the educators of mass communication should introduce the courses of social media in the same field for the mass communication students so that they can devote their most of the time for the study purpose instead of other activities which can be more beneficial for their development in education sector. So that’s how the role of digital media in the development of mass communication students has the great impact.

Raymond Owusu Boateng and Afua Amankwaa (2016) in their research paper stated that the rapidly rising of social media is significantly influencing the academic life of students. The title of their research is “The impact of social media on student academic life in higher education” in which they found out that at least every student makes use of one social media or in other words students are more inclined towards their social media appearance. Their study revealed that the participants are in support of the idea of social media and also agree that it creates a great impact in their academic performance. They also highlighted that social media has been accepted by higher institutions making it a platform where students connects with teachers, fellow students and other higher authorities.

Norazilah Saubari and Mohammad Fazli Baharuddin(2016) conducted the research on the digital literacy awareness among the students in which they stressed on the ways of developing the knowledge performance towards by practicing good skills to deal with appropriate digital tools and also aware with different digital tools which can be used in digital literacy. They highlighted in their study that digital literacy is generally used in the real life for knowledge seeking purpose. The main advantage of digital literacy is that students gain knowledge, information and develop skills even without getting bore which simply indicates that monotony cannot be the barrier in the digital literacy. Students find it more interesting and willingly want to participate in the internet based activities because of the video, animation and sound provided. They also emphasised on the other tools of digital technology like it provides good search engines and other digital platform which is beneficial for both academic and other skills aspects. Their study mainly highlighted that the digital literacy made the things interesting for the students to seek knowledge which can less the burden and increase the willingness to participate in the new technology learning method.

Mohammad Faizil Baharuddin (2016) wrote in his research that digital media especially online surfing, social media develop the various skills, increase the knowledge practice, boost the good communication skill and also disseminate and practicing real information seeking method without having monotony. From the internet based tasks students indulged more because of the video, animation and sound provided. Digital technology also

facilitates good search engines which student can explore, like Google translator, wikis, online dictionaries and even more. However, to fully utilize the digital literacy, the student must master the technology skills. Students must put an effort to explore the digital content sites to gain information for a specific purpose. Students need to know the right way to use the technology, such as skills of writing, knowing a little bit about the interface search engine, ways to use the systems and using the social media. Thus, this study has highlighted the on-going and growing concern for students to aware about the digital literacy which can less your burden for knowledge seeking approach and the new technologies learning method.

Apoorva Trivedi and Rajshree Srivastava (2018) in their research article “An impact of digital technology on academic sector” stated that at a very large scale technology made the various things easier and reduce the hard work which was contributed by the students to gather unlimited written books and journals for acquiring knowledge .They also stated that new technology provides the huge amount of information and helps in learning the new things with the innovative way especially on handy devices and cell phones which means new technology has the easy accessibility. In the article, they also highlighted the teacher’s performance based on technology thus, not only for students but technology plays an important role in teacher’s job also. Students who want to achieve master’s degree and higher education but facing physical and geographical barrier, advance technology made it possible for them to achieve it easily.

**RESEARCH METHODOLOGY**

Quantitative method is chosen for this research. Data was collected using primary data set through the distribution of questionnaire through Google forms among the journalism and mass communication students.

**DATA COLLECTION**

The research made a comprehensive study of various secondary data available which described the digital media academic growth in mass communication field especially in education. The study also employed primary research method and a survey has been conducted on Delhi journalism and mass communication students by employing Questionnaire.

**SAMPLE DESIGN**

The study employed Survey methodology in the form of questionnaire distributed through snow ball sampling method. Google forms were sending to 250 respondents but only 205 responses received through Google forms.

**RESULTS AND FINDINGS**

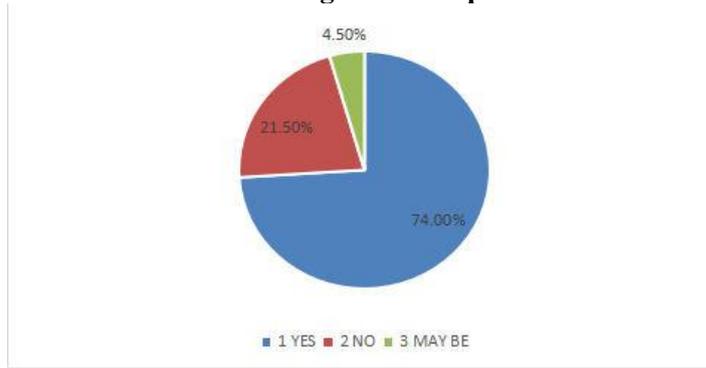
The questionnaire have distributed among 250 students of journalism and mass communication, out of them researcher have received 205 responses and in which 2 respondents skipped some questions so the researcher got 203 responses from the respondents. The demographics were 50.7% (n=103) females and 49.2%(n=100) males. The majority of the respondents were varied from 20 and 22 years old and 33.3% (n=67) respondents were in the range of 21 years old.

**Question 1: Do you use digital media?**



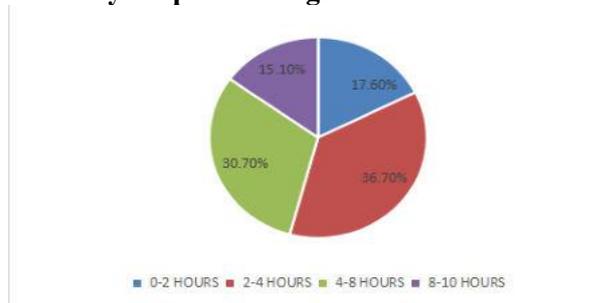
The above data reveals that, 98.5% of the respondents use the digital media while only 1.5% does not use digital media. This clearly shows that the majority of the respondents use the digital media.

**Question 2: Are you well aware of different digital media platforms?**



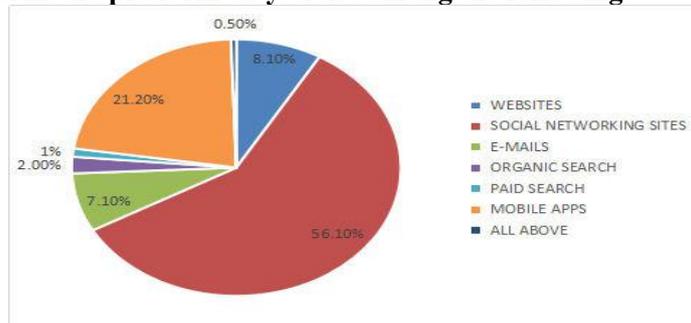
The above data reveals that 74% of the respondents are well aware of different digital media platforms while 21.5 % of the respondents are still in doubt and 4.5% of the respondents are not aware of different digital media platforms. So this shows that the majority is well aware of different digital media platforms.

**Question 3: How many hours do you spend on digital media?**



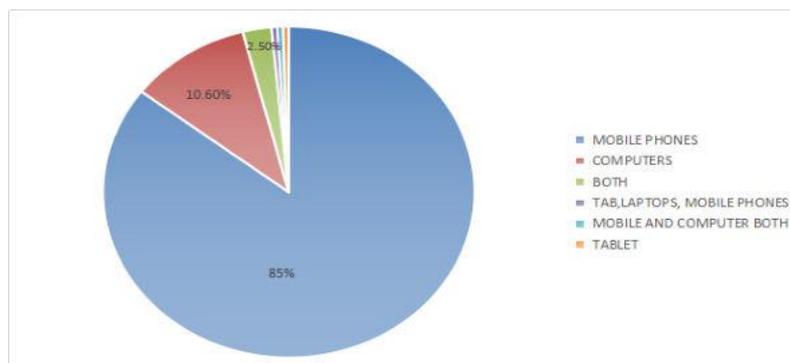
The above data shows that 36.7% of the respondents spend 2-4 hours on digital media , 30.7 % of the respondents spend 4-8 hours , 17.6 % of the respondents spend 0-2 hours and 15.1% of the respondents spend 8-10 hours on digital media. So the majority of the respondents spend 2-4 and 4-8 hours on digital media.

**Question 4: Which digital media platform do you use among the following?**



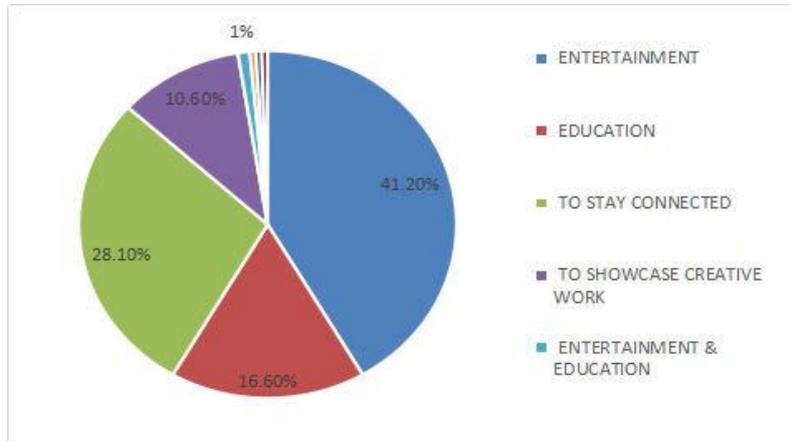
This data reveals that, 56.1% of the respondents use social networking sites while 21.2% of the respondents use mobile apps and 7.1 % of the respondents use E-mails. This data clearly demonstrates that social networking sites are most used platform among the other digital media platforms.

**Question 5: How do you access digital media?**



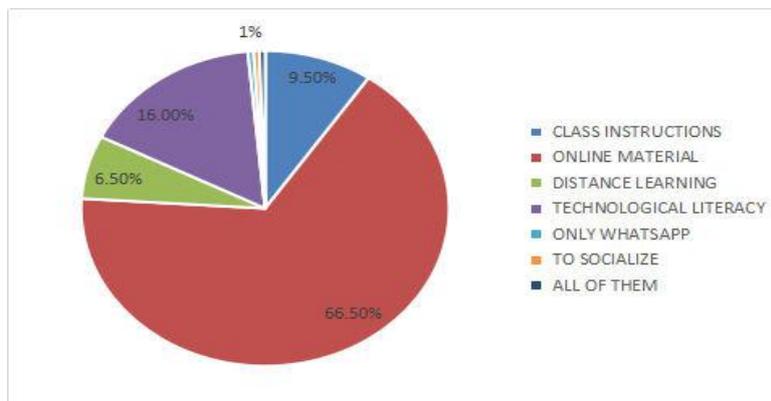
The above data indicates that 85.4% of the respondents access the digital media through mobile phones whereas 10.6 % of the respondents access the digital media through computers and 5% of the respondents access the digital media through both the devices so the study indicates that the majority of the respondents access the digital media through Mobile phones.

**Question 6: Why do you use digital media?**



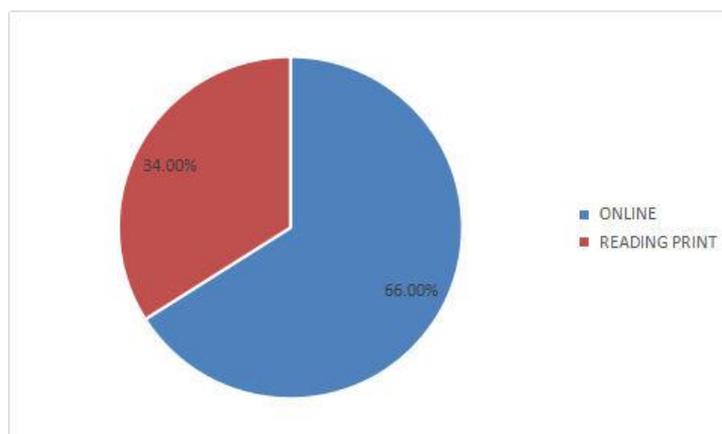
The above data indicates that 41.2% of the respondents use digital media for the Entertainment, 28.1% of the respondents use digital media to stay connected, 16.6% of the respondents use digital media for the Education and 10 % of the respondents use digital media to showcase their creative work So that reveals the majority used digital media for the entertainment purpose and also to stay connected.

**Question 7 : How do you use digital media for educational purposes?**



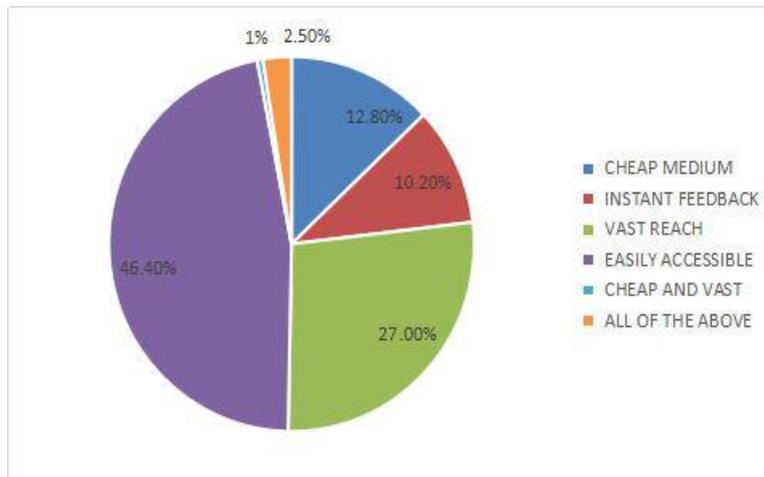
The above data shows that 66.5% of the respondents use digital media for educational purpose to gather online material, 16% of the respondents use digital media to get aware with technological literacy, 9.5% of the respondents use digital media to socialize and 6.5% of the respondents use digital media for distance learning. So this data shows that majority of the respondents for educational purpose to gather the online material.

**Question 8: According to you, from which medium students learn better?**



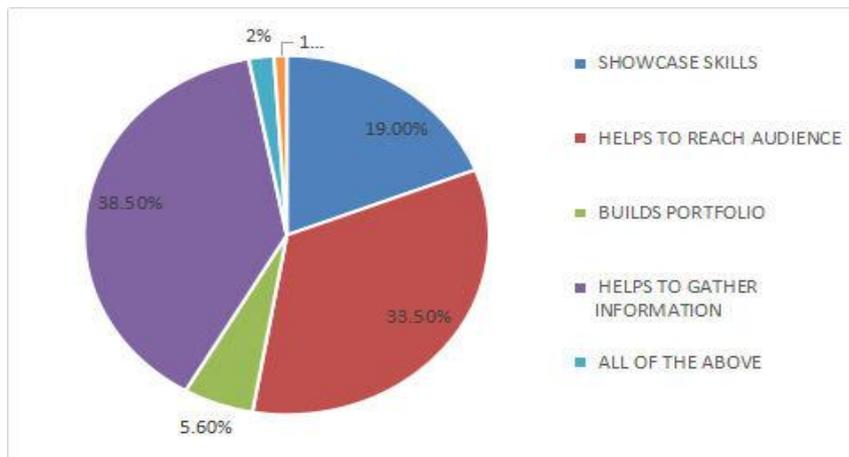
According to the data 66% of them think that students learn better from online whereas 34% of the respondents think that students learn better from reading print. So this clearly shows that according to the majority of respondents, students learn better from online.

**Question 9: Why do you use digital media to develop and showcase your skills?**



The above data reveals that 46.4% of them use digital media to develop and showcase their skills because of easy accessibility, 27% of them use it because it has the vast reach, 12.8% of the respondents use it because it is a cheap medium and 10.2% of the respondents use it because of the instant feedback. So the majority use digital media to develop and showcase their skills because of the easy accessibility.

**Question 10: Why, it is important to you as a mass communication student to have digital media presence?**



The above data reveals that out of 195 of the respondents, 38.5% of them as a mass communication student think that digital media presence is important because it helps to gather information, 33.8% of them think that digital media presence is important because it helps to reach audience and 19% of them think that it is important because it gives the platform to showcase the skills. But the majority of mass media students think that digital media presence is important because it helps to get information as well as it helps to reach audience.

**Question 11: Why do you think as a journalist and mass communication student that digital media has an important role in development?**

The main purpose of this question was to give the respondents an opportunity to explain the reasons deeply that why they think as a journalism and mass communication students that digital media has an important role in development. The data shows that out of 203 respondents, 109 responded to this question and the majority of the respondents point out the main reasons i.e. information, education, entertainment, easy accessibility and take less time. Some respondents gave these following responses:-

“Due to its accessibility and variety of options to use it for, a lot of people are connected to digital media and so to make a change or development everything is just one click away.”

“We as a journalist have the responsibility of informing the masses be it good or bad so the information

“We give as a bigger stake on the field of development and that is why it is our moral duty to safeguard it.”

“Through digital media we can showcase our skills to the vast audience and also gain knowledge in very cheap cost.”

“Because digital media helps in every aspects whether it is education or entertainment. It is more easy, convenient and affordable medium for getting updated and also helps in learning the things in a very effective and interesting manner.”

“Well I think that digital media has very important role in development especially in a country like India as it provides a great reach and a greater audience than other mediums which is very crucial in the terms of communication and thus through digital media people can be educated and made aware about various development policies and processes. Also it plays vital role in a person's individual development as regular interaction with people from all around the globe and regular exchange of cultural knowledge through various shows, conversations platforms and programs, grooms an individual for the outer world”

### CONCLUSION

The digital media plays a crucial role in the development of every aspect. It portrays the great impact in the academic development of journalism and mass communication students. The aim of this study was to demonstrate the role of digital media in the academical development.

The study concluded that the students of journalism and mass communication use digital media on daily basis and also well aware of different digital media platforms so these findings clearly indicate that the awareness level among these students are quite high. The findings also indicate that most of the student use social networking sites among various different digital platform and also this study shows that the main reasons behind using the digital media are entertainment, education and to stay connected. So this concluded that digital media has been considered as the major source of entertainment, education and connectivity. According to this survey, most of the student use digital media for educational purpose in order to gather online material and also for technology literacy. This study has highlighted that students learn better from online and the growing concern for using the digital to develop and showcase their skills as it has the easy accessibility and also the vast reach.

The conclusions show that digital media is the need of an hour and it has the great influence on the student's life. According to the students of journalism and mass communication, they are using these platforms for the wide variety of reasons which include not only learning but also showcase the creativity and talent on the digital media platform. So digital media has the outstanding role in creating and shaping the life of students.

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**POST LIBERALISATION SCENARIO OF INDIAN BANKING AND REGULATIONS FROM CUSTOMER SERVICES PRESPECTIVE: A CRITICAL REVIEW**

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**ABSTRACT**

*In 1991-1992 Liberalisation has been initiated in Indian economy, and liberalisation is incomplete without Globalisation and Privatisation (LPG). All these initiatives have opened the doors for the private and foreign parties, who were interested in banking business. LPG has fastened the pace of growth in Indian Economy, mobilizing the funds, immense infrastructure development, investment churning etc. From the customer perspective, services have been improved drastically, transaction time has been reduced, customers are empowered by technology driven banking. Earlier customers had to choose Public sector banks as an only option, to avail the banking services but after LPG there are many options to get banking services. Although private sector banks has given a intense competition to the PSU banks but they joined the banking industry with a motive of profitability and wealth maximisation, a large number of complex products are introduced to meet the different requirements of the customer, but these products are not easily understood by the customers and leads to misselllling. In the name of the superior services, multiple and exorbitant charges are levied on the customers and erode the customer money. By arranging the modern looking facilities and maintaining physical appearance of the branch premises, higher Average balance is demanded from the customers. The services are provided on the basis of the financial health of the customer. In this paper we briefly elaborate the post liberalization scenario and the bank practices with the provisions of the Banking code and standard board of India (Autonomous body established by Reserve Bank of India to take care of the customer interest by monitoring the customer services practices in banks). In this research we found that banks are lacking in providing services as per the commitments made by BCSBI code and certain issues are raised by the customers regarding insufficiency in the services.*

*Keywords: Liberalization, BCSBI code, Bank Practice, Customer Services*

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**1. INTRODUCTION**

Banking industry is a symbol of trust in any economy and regulator works as a watchdog, to safeguard that trust from erosion by regular monitoring and by setting up rules, regulations and standards. After independence in 1947 Indian banking industry was in miserable state but gradually various steps were taken by the government for the overall development of the country including banks. But the turning point was the introduction of Liberalisation, due to which norms were relaxed for the private banks to enter in the market. Private Banks were very aggressive in grabbing the market share and hence provided good physical facilities, ambiance and excellent customer service, where the PSU banks were lacking. Private Banks also introduced the computers in banking, which created a great difference in transaction timing in private and PSU banks. PSU banks have also undertaken all these changes to retain the customer from losing to private banks. Private Banks also make use of liberalized interest rates and provide higher interest to the customers on their deposits with the banks but same time charges a higher rate of interest from the loan customers. When private banks started to establish their selves they used penetration strategy to grab the market share by opening zero balance accounts and the basic accounts for the general masses, but gradually the strategy has been changed from penetration to skim the cream. In this skimming strategy private banks has started concentrating on wealthy individuals, corporate, wholesale customers etc, which is called as a creamy layer of the society. In short, the actual image of the private banks appears after some time that these banks are meant for the customers who are not poor and above an average class, if a customer is having adequate amount to fulfill the average balance criterion of the private banks only then they are welcomed. In this case poor is still excluded from getting good financial services and they have to stand in the long waiting queues for hours, where no customer is entertained by the staff during the long lunch and tea hours. Can we assume this practice as Financial Exclusion of the disadvantage group?

Not only poor public but rich and wealthy customers are also exploited on the name of service. Such a wide range of products are documented by banks that neither the bankers nor the customers are able to remember or gain knowledge about all the products/services. Only those product/services are sold to the customers which are target based or earn revenue for the bank and incentive for the employees, customer need identification is just an eye wash or as a formality for the sake of adherence of regulations. Not only in Indian Banking but all over the world banking history has seen scandals for the wealth maximisation like LIBOR scandal, Financial crisis in 2008, Deutsche Bank's \$10 billion scam, Lehman brothers collapse etc. in the core of all these scam activities

making easy money was the motive. Generally in international frauds poorer countries become more poor and rich become richer.

In this paper we have elaborated those services which are mentioned in the BCSBI code's commitments and all the member banks are bind to follow the same. We have recorded customer's perception regarding the fulfillment of these services and done a bank wise comparison of the adherence of the regulations.

## 2. LITERATURE REVIEW

To check the service quality of the bank (*Valarie A. Zeithaml, A. Parsuraman, Leonard L. Berry 1985,1988*) has developed a scale named SERVQUAL having five dimension of service quality named as Reliability, assurance, tangibility, empathy and responsiveness and that create the acronym RATER. Although private banks are providing good services but still there is a huge gap in resolving customer issues emphatically by the bankers, they have modern looking facilities, good ambiance and mannered staff but still lacks in understanding the customer (*A. Anant, R. Ramesh, B. Prabakaran 2010*). Various researches has found that banks concentrate on other facilities but do not work on their human resource, it's the personal touch of the banker that makes a difference, because services are available in all the banks (*Dr. S. Saraswathi 2012*). Researchers have also found that bank branches are skewed distributed, the average density in urban branches are 6000 population and in rural area this average density is 24000 population per branch. It also states that as per census of 2011, 9% of the deposit and 8% of the advances are contributed by the rural population and India's rural population is 68% of the total population. Urban population contribute 32% of the total population and approximately 91-92% of the deposit and advances come from urban population and moreover in this urban contribution 92% of the total contribution comes from some affluent business families. This shows the changing mind set of the banking industry, that discrimination exists on the basis of the location and in the core its financial difference (*R.K. Dubey 2014*). Since the inception of the banking industry the focus has been shifted a lot in terms of services to marketing activities. Nowadays banking marketing strategies are only concentrating on those persons who are getting rich income through agriculture, industry, business sector and neglecting the rural masses and the retail customer segment that is actually creating the wealth for the nation by working in these industries and business. Banks are unwilling to market those products that are pushed by the government and basically meant for poor and rural masses (*Boruggadda Subbaiah 2012*). Not only this but sometimes the basic products like Lockers are given to the customers only after getting a big amount in their accounts or a handsome amount of investment policies purchased by the customers. Nowadays bank uses locker as a product for completing their third party product targets (*Why it is difficult to get a locker 2011*). [24]

Regulators also keeps an eye on the banking activities and levies fine if the regulations are not obeyed by, in 2013 The Reserve bank of India has imposed penalty on 22 banks amounting Rs. 50 lacs to 3 crores. All the big banks were included in it like State bank of India, ICICI, HDFC and others for violating the KYC norms, procedures and compliance system in April 2013. Money laundering charges have been levied on various banks including ICICI, HDFC, INDUSIND, AXIS etc. (*RBI fines 22 banks for violating KYC norms 2013*). [22]

It is not only the banks but customer's orientation has also changed in terms of getting services, they have high expectation but their perceived quality is quite low particularly across the public sector banks. Continuous feedback from the customer is required to improve the service quality and reliability of the bank (*Dr. T. Meharajan, Dr. P.S. Venkateswaran, S. Arvind, 2015*). There are seven reasons which are identified by the researches which are responsible for customer bank switching nature these are price, reputation, service quality, advertising, involuntary action, distance, cost and other factors. Among all these factors reputation and pricing are main factors to influence the customer decision of switching the bank (*Dr. Ramaiyer Subramaniam, Dr. Jayalakshmy Ramachandran 2012*). Last 5 years report of banking ombudsman shows that they used to receive approximately 70-80 thousand complaints every year from the customers and approximately 25-30% of the complaints are related to non fulfillment of BCSBI code/ unfair banking practices. One more thing which was highlighted that approximately two third of the complaints are received by urban area, it shows the level of awareness among the customers (*Reserve Bank of India-Banking Ombudsman reports from 2010-2011 to 2015-2016*).

We have tried to check the level of services provided to the customer while keeping the BCSBI code as a standard for comparison and developed a questionnaire on the basis of code and evaluated the bank wise services provided to the customers.

## 3. SCOPE OF THE STUDY

In our study BCSBI (Banking Code And Standard Board of India) has been taken as the regulatory standard for comparing the actual banking practices. BCSBI code is having two parts one is for retail customer and another

is for MSME (Micro, Small and Medium Enterprises), in this study we have taken Retail customers for our study.

**4. CONCEPTUAL FRAMEWORK**

In 2006 Banking Code and Standard Board of India was established by Reserve Bank of India to safeguard the interest of common bank customer, BCSBI code is established to maintain and monitor the bank services as per the provisions of the code. Code made provisions for the fair and equal treatment of the bank customers and time to time monitor the bank practices who become member of this code. This code is revised time to time in this study we are working on latest i.e. Code of Bank’s Commitment to Customers – January 2014

**Key Commitments of the code**

- To act fairly and reasonably in all our dealings with Customers
- To help customer to understand how our financial products and services work
- To help you use your account or service
- To deal quickly and sympathetically with things that go wrong
- To treat all your personal information as private and confidential
- To publicise the Code
- To adopt and practice a non - discrimination policy

**Initiative taken by Regulators to improve the customer services**

- *Committee on Capacity Building 2014, Purpose- Human Resource development in Financial sector*
- *Goiporia Committee 1990, Purpose- Improvement in Customer service*
- *Damodaran Committee 2011, Purpose-Improvement in Customer service*
- *R. Jilani Committee 2016, Purpose-for Audit/inspection soundness and accountability*

**5. Objective and Hypothesis of the Study**

**OBJECTIVES**

1. To check the overall score of bank practices with the commitments of BCSBI code.
2. To do a bank wise comparative analysis of the dimensions of the bank practices.

**HYPOTHESIS**

**1<sup>st</sup> Objective- H0-** Customers are satisfied by the bank practices.  $\mu \geq 4$

**H1-** Customers are not satisfied by the bank practices.  $\mu < 4$

**2<sup>nd</sup> Objective- H0-** There is no significant difference in the bank practice of different banks.

**H1-** There is a significant difference in the bank practice of different banks.

**6. RESEARCH METHODOLOGY**

**Research type-** Exploratory, Descriptive and Explanatory

**Sampling Technique-** Banks are chosen randomly and customer are chosen by Stratified sampling technique.

**Sample Size-** 570 customers have been chosen for the study from 8 banks, among which 4 are private banks and 4 are Public sector banks. The banks are selected Randomly on the basis of the highest number of branches in Faridabad region (Data about the number of branches has been collected from the lead bank i.e. Syndicate Bank).

**Table-1: Bank wise Number of respondents**

Private Banks	No. of Actual Respondents
Axis Bank	71
HDFC Bank	74
ICICI Bank	72
Kotak Mahindra Bank	69
Public Banks	
Syndicate Bank	71

Canara Bank	71
Punjab National Bank	72
State Bank of India	70
Total	570

**Questionnaire Design and Data Collection**

Questionnaire is designed by using the commitment of BCSBI code and data is collected by the researcher only. Questionnaire is having 35 statements related to below mention 7 dimensions.

**Table-2: Instrument design and variable identification**

Sr. No.	Commitments	Variable
1.	<ul style="list-style-type: none"> <li>To provide fair, reasonable and adequate services to the customers</li> <li>Maintain a efficient payment system</li> </ul>	<ul style="list-style-type: none"> <li>Duty Deliverance</li> <li>Transactional Efficiency</li> </ul>
2.	<ul style="list-style-type: none"> <li>To help the customer to get knowledge about the banking products and services.</li> <li>Marketing material should be in local language and clear</li> <li>Pricing and terms related to product/service should be clear to the customer</li> </ul>	<ul style="list-style-type: none"> <li>Sales Conduct</li> </ul>
3.	<ul style="list-style-type: none"> <li>To advice the customer in using their financial product/ services</li> <li>Inform the customer about the change in fee/ charges structure and change in interest rates.</li> </ul>	<ul style="list-style-type: none"> <li>Communication</li> </ul>
4.	<ul style="list-style-type: none"> <li>Resolve the customer complaints emphatically and satisfy the customer</li> </ul>	<ul style="list-style-type: none"> <li>Empathy</li> </ul>
5.	<ul style="list-style-type: none"> <li>Treat the personal and financial information as important and secret.</li> </ul>	<ul style="list-style-type: none"> <li>Merged with Transactional Efficiency</li> </ul>
6.	<ul style="list-style-type: none"> <li>To spread awareness about the code and its provisions among the customers and bank staff.</li> </ul>	<ul style="list-style-type: none"> <li>Awareness</li> </ul>
7.	<ul style="list-style-type: none"> <li>Do not discriminate with the customer on the basis of their race, religion, financial status etc.</li> </ul>	<ul style="list-style-type: none"> <li>Discrimination</li> </ul>

**Duty Deliverance-** includes statements related to day to day dealing with the customers

**Transactional efficiency-** includes statements related to transactional efficiency of the bank staff

**Sales Conduct-** includes statements related to sales practice, need identification and disclosure norms

**Communication-** includes statements related to updating the customer about the change in bank rates and fee structure

**Empathy-** includes statements related to resolving the customer complaints empathetically

**Awareness-** includes statements related to awareness about the various provisions of the code

**Discrimination-** includes statements related to check the discrimination on the basis of location or financial position of the customer.

**7. ANALYSIS AND INTERPRETATION RELIABILITY**

Table-3: Reliability Statistics	
Cronbach's Alpha	N of Items
.867	35

Cronbach’s Alpha should be more than .7 for considering the responses as reliable. []

**1<sup>ST</sup> OBJECTIVE ANALYSIS**

1. To check the overall score of bank practices with the commitments of BCSBI code.

**Technique-** Frequency Distribution, one sample T test

**Confidence Interval-** Alpha ( $\alpha$ )- 95%

**Table-4: Statement wise analysis (Mean Values)**

Sr No.	Statement	Mean Value	Comment
1.	Bank Provides minimum banking facilities of receipt and payment of cash/ cheques, etc. at the bank's counter.	3.65	Moderate to agree
2.	Bank employees are friendly in their attitude towards customers.	2.96	Disagree to moderate
3.	All the transactions are fulfilled in the minimum required time.	2.83	Disagree to moderate
4.	It happens that work got delayed due to staff shortage/ server problem.	2.31	Agree to moderate
5.	Employees are willing to help the customers.	3.02	Moderate
6.	Special services are provided for senior citizens and disabled.	3.02	Moderate
7.	Bank employees always treat the customer with respect.	2.87	Disagree to moderate
8.	Misbehaviour by employees is a major reason of customer complaints.	3.29	Agree
9.	Bank services are provided at a reasonable cost.	2.96	Disagree to moderate
10.	Transacting with bank provides a feeling of safety and security.	3.59	Agree
11.	Bank treats your personal/ financial/transactional information as important and maintains secrecy.	3.98	Agree
12.	Bank insists on doing error free transaction.	2.97	Disagree to moderate
13.	Advertising and promotional literature is clear and not misleading	2.38	Disagree to moderate
14.	Term & conditions of the products are fully explained to the consumers By banker /agents/sub agents.	2.20	Disagree
15.	Banking products/documents are easily understandable by common people.	2.08	Agree
16.	Agents or bank officials do not disclose the negative features of the schemes/ policies to the consumer while selling the same.	2.25	Agree
17.	Bank staff/ agents sometime fails to understand/identify the customer's need and recommend the product.	2.02	Agree
18.	Sometimes bank staff/agent sell the products to the customer to complete their targets.	2.09	Agree
19.	Bank employees work undue pressure to bring maximum business for the company.	2.07	Agree
20.	Sometimes customers have to bear loss due to wrong/ inadequate information provided by bank officials/agents.	2.00	Agree
21.	Employees/agents have sufficient knowledge to resolve the customer questions.	3.56	Moderate to agree
22.	Malpractices in sales is a major reason of customer complaints	2.47	Agree to moderate
23.	Bank provides information for all the newly introduced services.	2.02	Disagree
24.	Timely information about changes in charges and interest rates are provided by banks.	2.10	Disagree
25.	All the marketing/informational material is available in the local language	2.32	Disagree
26.	Marketing material (pamphlets, brochures) are visually appealing in the bank premises.	2.69	Disagree to moderate
27.	Employees are capable to resolve the complaints satisfactorily.	2.58	Moderate
28.	Bank staff shows sincere interest to resolve the customer complaints.	2.69	Disagree to moderate
29.	Provide your agreement regarding the awareness of the	1.55	Disagree

	BCSBI code.		
30.	Complaints escalation is very well known by the customers.	1.58	Disagree
31.	Provide your agreement regarding the awareness of the Informational portal/ Booklet.	1.63	Disagree
32.	Provide your agreement regarding the awareness of the Citizen Charter.	1.57	Disagree
33.	Location of bank branches are convenient to all the sections of the society (e.g. villages, backward areas etc.)	1.61	Disagree
34.	Difference on the basis of financial status is common in banking.	1.59	Agree
35.	Economically weaker and socially oppressed people can get the loan easily and on easy credit term.	1.72	Disagree

Table No. 4 shows that non of the statement is having score close to 5, hence there is a need of drastic improvement.

**One Sample T Test is done of overall dimension**

	N	Mean	Std. Deviation	Std. Error Mean
Duty Deliverance	570	2.9968	.85064	.03563
Transactional Efficiency	570	3.3759	1.03022	.04315
Sales conduct	570	2.3111	.82471	.03454
Communication	570	2.2829	.80986	.03392
Empathy	570	2.6377	1.25622	.05262
Awareness	570	1.5838	.70594	.02957
Discrimination	570	1.6116	.60799	.02547

Source: SPSS output

	Test Value = 4					
	T	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Duty Deliverance	-28.157	569	.000	-1.00323	-1.0732	-.9332
Transactional Efficiency	-14.464	569	.000	-.62412	-.7089	-.5394
Sales conduct	-48.894	569	.000	-1.68895	-1.7568	-1.6211
Communication	-50.620	569	.000	-1.71711	-1.7837	-1.6505
Empathy	-25.890	569	.000	-1.36228	-1.4656	-1.2589
Awareness	-81.716	569	.000	-2.41623	-2.4743	-2.3582
Discrimination	-93.786	569	.000	-2.38835	-2.4384	-2.3383

Source: SPSS output

Table no. 6 shows that all the dimensions of the BCSBI code is significantly different from score 4, but table no.5 shows that the overall mean value of the dimension is exceeding the customer expectation or lower from customer expectation. All the values of the dimensions are low from 4, actual values are ranging between 1.5 to 3.3, hence customers are not at all satisfied with the quality of service provided by banks.

**Hypothesis Testing**

**1<sup>st</sup> Objective- H0-** Customers are satisfied by the bank practices.  $\mu \geq 4$

**H1-** Customers are not satisfied by the bank practices.  $\mu < 4$

To check the above mentioned hypothesis we have to use 7 sub hypothesis, as we have seven dimensions.

**Table: 7.1<sup>st</sup>objective , Hypothesis results**

Null Hypothesis	Sig. Value	Result
1.1 Customers are satisfied by the Duty Deliverance practices of the banks. $\mu \geq 4$	.000***	Alternate Hypothesis Accepted
1.2Customers are satisfied by the Transactional efficiency of	.000***	Alternate Hypothesis

the banks. $\mu \geq 4$		Accepted
1.3 Customers are satisfied by the Sales Conduct practices of the banks. $\mu \geq 4$	.000***	Alternate Hypothesis Accepted
1.4 Customers are satisfied by the Communication practices of the banks. $\mu \geq 4$	.000***	Alternate Hypothesis Accepted
1.5 Customers are satisfied by the Empathy practices of the bank. $\mu \geq 4$	.000***	Alternate Hypothesis Accepted
1.6 Customers are satisfied by the Spreading Awareness practices of the bank. $\mu \geq 4$	.000***	Alternate Hypothesis Accepted
1.7 Customers are satisfied by the Discrimination practices of the bank. $\mu \geq 4$	.000***	Alternate Hypothesis Accepted

Sig. Value-\*\*\* significant at 1% level, \*\* significant at 5%, \* significant at 10%

**2<sup>nd</sup> Objective**

1. To do a bank wise comparative analysis of the dimensions of the bank practices.

**Technique-** MANOVA (Multivariate Analysis of Variance)

**Confidence Interval-** Alpha ( $\alpha$ )- 95%

		Value Label	N
bankname	1.00	Axis Bank	71
	2.00	HDFC Bank	73
	3.00	ICICI Bank	72
	4.00	Kotak Mahindra Bank	70
	5.00	Syndicate Bank	71
	6.00	Canara Bank	72
	7.00	Punjab National Bank	71
	8.00	State Bank of India	70

Source: SPSS output

Table-8 shows the number of respondents from each bank which are used for the analysis.

Bank name	Duty Deliverance	Transactional Efficiency	Sales conduct	Communication	Empathy	Awareness	Discrimination
1.00 Axis Bank	3.3032	3.7641	2.4028	2.4437	3.1268	1.6796	1.5632
2.00 HDFC Bank	3.1286	3.5890	2.1164	2.3356	3.0616	1.6027	1.5936
3.00 ICICI Bank	3.4157	3.3889	2.0611	2.5278	3.1667	1.4618	1.6806
4.00 Kotak Mahindra Bank	3.0776	3.5750	2.2443	2.2786	3.3071	1.7214	1.6477
5.00 Syndicate Bank	2.9635	3.4472	2.7606	2.1655	2.5141	1.4648	1.8121
6.00 Canara Bank	2.6878	3.1563	2.5667	2.3646	1.9028	1.6181	1.5232
7.00 Punjab National Bank	2.6717	2.9437	2.0775	2.0528	1.7606	1.5070	1.5539
8.00 State Bank of India	2.7180	3.1393	2.2629	2.0857	2.2571	1.6179	1.5189
Total	2.9968	3.3759	2.3111	2.2829	2.6377	1.5838	1.6116

**Table-10: Tests of Between-Subjects Effects**

Source		Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power <sup>h</sup>
bank name	Duty Deliverance	40.926	7	5.847	8.862	.000	.099	62.031	1.000
	Transactional Efficiency	37.821	7	5.403	5.364	.000	.063	37.548	.998
	Sales conduct	31.260	7	4.466	7.055	.000	.081	49.384	1.000
	Communication	14.296	7	2.042	3.198	.002	.038	22.386	.953
	Empathy	186.354	7	26.622	21.026	.000	.208	147.180	1.000
	Awareness	4.665	7	.666	1.343	.228	.016	9.399	.576
	Discrimination	4.879	7	.697	1.907	.066	.023	13.346	.758

Table no. 10 shows that all the banks are significantly different in providing services to the customers in all the dimensions except spreading awareness among the customers, but the table no. 9 of mean value shows that which banks are last in the comparison and which banks are doing comparatively good.

**HYPOTHESIS TESTING**

**2<sup>nd</sup> Objective-H0-** There is no significant difference in the bank practice of different banks.

**H1-** There is a significant difference in the bank practice of different banks.

To check the above mentioned hypothesis we have to use 7 sub hypothesis, as we have seven dimensions.

**Table: 11 2<sup>nd</sup> objective, Hypothesis results**

Null Hypothesis	Sig. Value	Result
There is no significant difference in the Duty Deliverance practices of different banks.	.000***	Alternate Hypothesis Accepted
There is no significant difference in the Transactional efficiency of different banks.	.000***	Alternate Hypothesis Accepted
There is no significant difference in the Sales conduct practices of different banks.	.000***	Alternate Hypothesis Accepted
There is no significant difference in the Communication practices of different banks.	.002***	Alternate Hypothesis Accepted
There is no significant difference in the Empathy practices of different banks.	.000***	Alternate Hypothesis Accepted
There is no significant difference in the awareness practices of different banks.	.228	Null Hypothesis Accepted
There is no significant difference in the discrimination practices of different banks.	.066*	Alternate Hypothesis Accepted

Sig. Value-\*\*\* significant at 1% level, \*\* significant at 5%, \* significant at 10%

**8. FINDINGS**

**1<sup>st</sup> Objective**

By analyzing the 1<sup>st</sup> objective we have found that in non of the service dimension the bank is providing the satisfactory services to the customers, in fact the level of services are quite poor, the highest mean value was 3.3 in transactional efficiency and rest of the dimensions are less than 3.3, which says that customers are not at all satisfied in duty deliverance, transactional efficiency, communication, sales conduct, empathy, awareness and discrimination practices of the banks. Public and private sector banks both needs to gear up in providing services to the customers up to the level of satisfaction and at an acceptable level.

The result of this objective shows the another side of the coin:

Low score of duty deliverance means- misbehavior is prevailing in the industry

Low score of transaction efficiency means- transactional inefficiency

Low score of Sales Conduct means- Sales misconduct or Misselling is prevailing in the industry

Low score of Communication means- Customer is not updated about the changes

Low score of Empathy means- customer complaints are not resolved properly

Low score of Awareness means- Customers are not aware about their rights

Low score of Discrimination means- Discrimination of financial basis is prevailing in the industry

**2<sup>nd</sup> Objective**

The study depicts that the banks are significantly different in providing services in all the dimensions except awareness, score of awareness is low throughout the banks .

**Table-12: Dimension wise Scoring of banks**

Sr. No.	Dimensions	Highest Score	Lowest score
1.	Duty Deliverance	ICICI Bank	Punjab National Bank
2.	Transactional Efficiency	Axis Bank	Punjab National Bank
3.	Sales Conduct	Syndicate Bank	ICICI Bank
4.	Communication	ICICI Bank	Punjab National Bank
5.	Empathy	Kotak Mahindra Bank	Punjab National Bank
6.	Discrimination	Syndicate Bank	State Bank of India

Table No. 12 shows that Punjab national bank has reflected in 4 dimension in which it scored poorly and Syndicate bank scored highest in two dimensions, ICICI bank has scored highest in 2 dimensions, Kotak Mahindra and Axis score highest in one dimensions. ICICI and SBI bank scored poorly in one dimension.

**9. CONCLUSION**

Private Banks are blindly following the money, hence they are not able to see the mutual benefit of all the stakeholders. Public banks have relaxation in terms of monitoring and supervision, hence they did not bother the customer and their services and behavior is not up to the required standard. In both the cases some sort of action is required on the part of the regulators. In Private Banks auditors or monitoring staff should take necessary care that equal services should be provided to all the section of the society and in public banks they should have strict standards for customer services.

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## Development of an Artificial Intelligence Based Safer Transport System in Mountains

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**Abstract:** Safety in transport systems is the foremost requirement. For which Cognizance is sought in right design initiatives such as thru' artificial intelligence (AI). In this work, using a sensor system and signal processors a tool was used to avoid road accident in hilly area. Sensors used to monitor each vehicle from designed standoff distance and buzzer to alert driver crossing from other side was the forte of development. Design and fabrication of trouble free driving using arduino road tracking was the prime objective of experimental set up. Ultrasonic sensors used to detect up to a distance to an object by at a specific frequency to the target by measuring the time between the emission and reception.

**Keywords:** Artificial Intelligence, Intrusion Detection Systems, Neural Networks (Computer), UTM.

### I. INTRODUCTION

Safety in transport systems is dependent upon the warning distance. In mountaneous terrains the sharp curves give no time [1]. The solutions are available in Design, development and Deployment [2]. Artificial intelligence is the intelligence exhibited by machines or software(1)In present road accident is major problem face all over the world. In Indian accident rate is quit higher as compared to other country. Road accident mostly happen due to bad weather, ruff driving and at sharp turn. Advance intelligence safety system effective to minimize road accident. Transport Systems (ITS) are progressive claims which, without exemplifying intelligence as such, aim to afford road accident with high efficiency. Intelligence transportation system helps to achieve better control on transport and traffic handling safer even at complex transport networks. During the year 2010 EU directive deployment of ITS system was created to control traffic. In this system various advance technique was used to developed intelligence transportation system for improve better transport with low cost and high safety. ITS have been used for various application namely ash tolling, road pricing, public transportation travel information and tracing system, vehicle safety and driver information and guidance. In these fields ITS was developed with high efficiency for pilot study which should be implemented in real field. In developed country like USA, Japan and UK the ITS was adopted. The UTM program is evolving an open structure project description for traffic management applications in urban area. The new requirement will permit better flexibility for attaining and growth of new applications.

In this article aim was to develop trouble shooting intelligence system for minimize road accident in corner and U turn. In this system a trouble shooting system was design to provide information to vehicle coming on other size which are not able to see the vehicle come from opposite size. It is claimed that artificial intelligence is playing an increasing role in the research of management science and operational research areas. Intelligence is commonly considered as the ability to collect knowledge and reason about knowledge to solve complex problems[3]. Such competencies will go a long way in developing and directing the future of cars tomorrow [4,5].The various techniques applied in artificial intelligence are Neural Network, Fuzzy Logic, Evolutionary Computing, and Hybrid Artificial Intelligence[3]

The use of technology, and its development, and the need to develop the alignment has been amply reinforced by Thareja [6], who additionally calls for an implicit need of education [7], because the causes of accidents could be avertable if drivers are more conscious of safety and conscientious of their responsibilities [8]. is imperative

### II. DESIGN & DEVELOPEMENT

In design of trouble shooting intelligence transportation system shooting U-turn mountain area has following steps and selection of components. Set of sensors signalling system, piezoelectric buzzer, battery and LED was used for it. Road traffic accidents (RTA) are responsible for 1.2 million deaths worldwide each year [9]. Ultrasound is defined by the American National Standards Institute as "sound at frequencies greater than 20 kHz." In air at atmospheric pressure ultrasonic waves have wavelengths of 1.9 cm or less. Ultrasound is sound waves with frequencies higher than the upper audible limit of human hearing. Ultrasound is no different from 'normal' (audible) sound in its physical properties, except in that humans cannot hear it. This limit varies from person to person and is approximately 20 kilohertz (20,000 hertz) in healthy, young adults. Ultrasound devices operate with frequencies from 20 kHz up to several gigahertz. A major part of what it means to understand a story is to know how the different events and states described in the text relate to one another temporally.

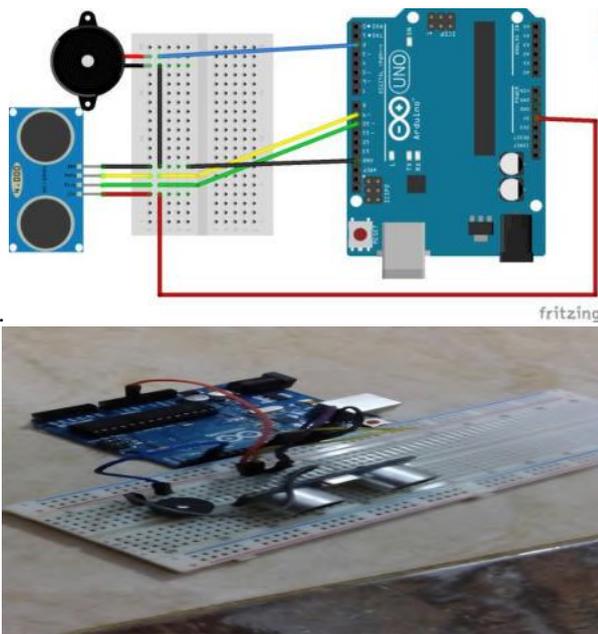


Fig. 1. Ultra Sonic Sensor Setup Used for ITS

Ultrasound is used in many different fields. Ultrasonic devices are used to detect objects and measure distances. Ultrasound imaging is often used in medicine. In the nondestructive testing of products and structures, ultrasound is used to detect invisible flaws. Industrially, ultrasound is used for cleaning, mixing, and to accelerate chemical processes. Animals such as bats and porpoises use ultrasound for locating prey and obstacles.<sup>[1]</sup> Scientist are also studying ultrasound using grapheme diaphragms as a method of communication. A signal as referred to in communication systems, signal processing, and electrical engineering is a function that "conveys information about the behaviour or attributes of some phenomenon". In the physical world, any quantity exhibiting variation in time or variation in space (such as an image) is potentially a signal that might provide information on the status of a physical system, or convey a message between observers, among other possibilities. The IEEE Transactions on Signal Processing states that the term "signal" includes audio, video, speech, image, communication, geophysical, sonar, radar, medical and musical signals.

In nature, signals can take the form of any action by one organism able to be perceived by other organisms, ranging from the release of chemicals by plants to alert nearby plants of the same type of a predator, to sounds or motions made by animals to alert other animals of the presence of danger or of food. Signalling occurs in organisms all the way down to the cellular level, with cell signalling. Signalling, in evolutionary biology, proposes that a substantial driver for evolution is the ability for animals to communicate with each other by developing ways of signalling. In human engineering, signals are typically provided by a sensor, and often the

original form of a signal is converted to another form of energy using a transducer. For example, a microphone converts an acoustic signal to a voltage waveform, and a speaker does the reverse.

The formal study of the information content of signals is the field of information theory. The information in a signal is usually accompanied by noise. The term noise usually means an undesirable random disturbance, but is often extended to include unwanted signals conflicting with the desired signal (such as crosstalk). The prevention of noise is covered in part under the heading of signal integrity. The separation of desired signals from a background is the field of signal recovery, one branch of which is estimation theory, a probabilistic approach to suppressing random disturbances.

Engineering disciplines such as electrical engineering have led the way in the design, study, and implementation of systems involving transmission, storage, and manipulation of information. In the latter half of the 20th century, electrical engineering itself separated into several disciplines, specialising in the design and analysis of systems that manipulate physical signals; electronic engineering and computer engineering as examples; while design engineering developed to deal with functional design of man-machine interfaces.

After sensing the signal by the ultra sonic sensors. It gives the signal to the signal pole and then a red signal is displayed on the signal pole with a buzzer sound to alert the vehicle driver to stop. After the vehicle coming from the opposite direction, when it passes the signal pole it gives the green signal to pass the vehicle freely. This signal system we used in this project .Then it is easy to recognize and there is a chance to control the vehicle. A buzzer or beeper is an audio signalling device, which may be mechanical, electromechanical, or piezoelectric (piezo for short). Typical uses of buzzers and beepers include alarm devices, timers, and confirmation of user input such as a mouse click or keystroke. A piezoelectric buzzer/beeper also depends on acoustic cavity resonance or Helmholtz resonance to produce an audible beep

These are the buzzer we used in this project Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The boards feature serial communications interfaces, including Universal Serial Bus (USB) on some models, which are also used for loading programs from personal computers. The microcontrollers are typically programmed using a dialect of features from the programming languages C and C++. In addition to using traditional compiler tool chains, the Arduino project provides an integrated development

environment (IDE) based on the Processing language project. The Arduino project started in 2003 as a program for students at the Interaction Design Institute Ivrea in Ivrea, Italy, aiming to provide a low-cost and easy way for novices and professionals to create devices that interact with their environment using sensors and actuators. Common examples of such devices intended for beginner hobbyists include simple robots, thermostats, and motion detectors.

The name Arduino comes from a bar in Ivrea, Italy, where some of the founders of the project used to meet. The bar was named after Arduin of Ivrea, who was the margrave of the March of Ivrea and King of Italy from 1002 to 1014.

### III. ROAD TRACK & ARTIFICIAL HILL

- In this aspects we made a wooden sheet for the main base part.
- A thermacol sheet is placed upto certain height.
- For this a artificial hill is placed in the middle of the wooden sheet which is arranged according to the thermacol sheet.
- Road track is made a round the artificial hill.
- Each corner of the artificial hill a signalling pole is placed with red and green signal that appears to the coming vehicles to certain distance.
- Buzzering system is done with a buzzer sound when the vehicle passes the sensors line at the given distance to the signalling system with a sound.

Each battery supply 9 volts we use this battery for power supply to the signals and buzzers. A light-emitting diode (LED) is a two-lead semiconductor light source. It is a p-n junction diode that emits light when activated. When a suitable voltage is applied to the leads, electrons are able to recombine with electron holes within the device, releasing energy in the form of photons. This effect is called electroluminescence, and the colour of the light (corresponding to the energy of the photon) is determined by the energy band gap of the semiconductor. LEDs are typically small (less than 1 mm<sup>2</sup>) and integrated optical components may be used to shape the radiation pattern.

Appearing as practical electronic components in 1962, the earliest LEDs emitted low-intensity infrared light. Infrared LEDs are still frequently used as transmitting elements in remote-control circuits, such as those in remote controls for a wide variety of consumer electronics. The first visible-light LEDs were also of low intensity and limited to red. Modern LEDs are available across the visible, ultraviolet, and infrared wavelengths, with very high brightness.

Early LEDs were often used as indicator lamps for electronic devices, replacing small incandescent bulbs. They were soon packaged into numeric readouts in the form of seven-segment displays and were commonly

seen in digital clocks. Recent developments have produced LEDs suitable for environmental and task lighting. LEDs have led to new displays and sensors, while their high switching rates are useful in advanced communications technology.

LEDs have many advantages over incandescent light sources, including lower energy consumption, longer lifetime, improved physical robustness, smaller size, and faster switching. Light-emitting diodes are used in applications as diverse as aviation lighting, automotive headlamps, advertising, general lighting, traffic signals, camera flashes, and lighted wallpaper. They are also significantly more energy efficient and, arguably, have fewer environmental concerns linked to their disposal.

Unlike a laser, the colour of light emitted from an LED is neither coherent nor monochromatic, but the spectrum is narrow with respect to human vision, and for most purposes the light from a simple diode element can be regarded as functionally monochromatic.

### IV. SENSORS CODING SYSTEM

*Code Explanation:*

First and foremost we have to define the pins for ultrasonic and buzzer in order to retrieve the information from the sensor and to send it to the buzzer.

Void setup() is the inbuilt function in arduino where we layout the initial conditions for the program so that the Arduino knows what kind of work it's going to be doing. pin Mode tells us whether the pin is input or an output.

```
void setup()
{
    pinMode (trigPin, OUTPUT);
    pinMode(echoPin, INPUT);
    pinMode(buzzPin, OUTPUT);
}
```

defined the loop function to run over and over when the obstacle is ahead in order to reduce the complexity in coding. Digital Write() gives value to the trigpin to trigger the sensor for every 1ms by generating a pulse. Initialize the variable duration which will be the input pulse width and variable distance will be the distance to the obstacle in centimeters.

```
void loop()
{
    int duration, distance;
    digitalWrite(trigPin, HIGH);
    delay(1);
    digitalWrite(trigPin, LOW);
```

Defining the variables duration to measure the pulse

input in echo pin and distance is half the duration divided by 29.1(from datasheet).

```
duration = pulseIn(echoPin, HIGH);
distance = (duration/2) / 29.1;
```

Defining if and else condition to make the buzzer ring only when the obstacle is between 0 and 0.5m with a delay of 60ms.

```
if (distance <= 50 && distance >= 0) {
// Buzz
digitalWrite(buzzPin, HIGH);
} else { // Don't buzz
digitalWrite(buzzPin, LOW) }
delay(60);}
```

After sensing the signal by the ultrasonic sensors. It gives the signal to the signal pole and then a red signal is displayed on the signal pole with a buzzer sound to alert the vehicle driver to stop. When the vehicle passes through the arranged sensor then the sensor detects the vehicle moment and gives the information to the control unit. The control unit within fraction of seconds gives the signal to signal pole. It gives the signal whether to stop or go if the vehicle either coming to the opposite direction or no. If the red signal is given it is the indication that there is a vehicle coming from the opposite direction so he has to stop the vehicle. If the green signal is displayed it is the indication the way is free to remove from other side Hence it is the indication that is emerged in this process

#### V. CONCLUSION

Now a days we see many incidents occur due to huge road curves in many parts of India. So in-order to prevent these incidents we are setting a signalling system which gives a signal with a buzzer sound to alert the opposite vehicle driver to slow down his vehicle by these we can reduce such type of accidents. Following are the conclusions drawn on based of present work.

- Road accident can be minimized by using intelligence transportation system.
- Intelligence transportation system also helps to control traffic at complex road network.
- It is effective system which can be used in any weather condition and at any location.

- ITS have low cost and required small space and easily modified signal distance according to available space with fraction of time.

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# **National Conference**

**on**

**Digital Innovation: A Tool for Sustainable Development**

**Organized by**

**Lingaya's Lalita Devi Institute of Management & Sciences (LLDIMS)  
New Delhi**

**30<sup>th</sup> March 2019**



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## **ABOUT LINGAYA'S LALITA DEVI INSTITUTE OF MANAGEMENT & SCIENCES**

Established in 2005, Lingaya's Lalita Devi Institute of Management & Sciences (LLDIMS) is an 'A' Grade National Assessment and Accreditation Council (NAAC) accredited institute. Recognised under 2(f) of UGC, it is affiliated to Guru Gobind Singh Indraprastha University, New Delhi, and approved by the Govt. of NCT of Delhi. LLDIMS is ISO 9001-2015 certified institute and has received consistent top ratings. It was ranked 3rd in Delhi NCR and 38th in all over India by India Today in 2018.

Under the aegis of Lingaya's Group of Institutions, LLDIMS aims at matching its standards with the top most professional colleges of the country. We are committed to provide first level professional cadres in various specialized fields like management, media, education, commerce among others. The institution truly believes in developing analytical ability, critical valuation, creating things and moral values in our students.

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## **ABOUT THE NATIONAL CONFERENCE**

In today's digitization era, digital innovations have a great potential to meet the 2030-agenda for sustainable development. The global blue print for dignified, peaceful and prosperous life for human well being is perhaps the greatest challenge across the economies are facing. To speedily achieve the sustainable development goals, civil societies, private and government sectors are evolving digital ways in translating their vision into national development plans and strategies. The conference calls the scholars, researchers, academicians, students, to come together with their diverse unique digital innovative thoughts that help the nation policy makers to deliver societal goals in a more effectual way. The economies today have to ensure that this growth powered by globalization reaches to the bottom of the pyramid and rests on sustainable practices. This is where governance intersects growth and globalization Also in this highly challenging economic scenario, the future prosperity of India through its industry growth is solely dependent on contemporary adoption to practices and its fruitful outcome. The proposed National Conference outlines the practical utility and factor in the sustainable development of India.

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## Chairman Message



It is with great pleasure that our Lingayas Llaita Devi Institute of Management and Sciences has hosted the “National Conference on **Digital Innovation: A Tool for Sustainable Development**” on the 30<sup>th</sup> March, 2019. Like all our programs international and national, we will receive immense insight through the topics related to Digital Innovation through the participations of faculty members, policy makers, researchers and industry veterans from across India. I believe with this we not only have a further reach but we will have a more transparent, and systemic system that will come into play – advancing all who are invested in making our educational system a sustainable one. I implore you all to take time to read through to all the paper submissions put forth for this conference and would also like to thank all the organisers of this conference for giving each of its participants a platform to voice their thoughts and have ideas not just shared but concerns and vulnerabilities dealt with through this gathering.

**BEST WISHES**

With profound regards

**Dr. Picheshwar Gadde**

Chairman, LLDIMS, New Delhi

## Director Message



The 'National Conference on 'Digital Innovation: A Tool for Sustainable Development' organized by Lingaya's Lalita Devi Institute of Management and Sciences, New Delhi, India on March-30<sup>th</sup> - 2019. In today's digitization era, digital innovations have a great potential to meet the 2030-agenda for sustainable development. The global blue print for dignified, peaceful and prosperous life for human well being is perhaps the greatest challenge across the economies are facing. To speedily achieve the sustainable development goals, civil societies, private and government sectors are evolving digital ways in translating their vision into national development plans and strategies. The conference calls the scholars, researchers, academicians, students, to come together with their diverse unique digital innovative thoughts that help the nation policy makers to deliver societal goals in a more effectual way.

The economies today have to ensure that this growth powered by globalization reaches to the bottom of the pyramid and rests on sustainable practices. This is where governance intersects growth and globalization Also in this highly challenging economic scenario, the future prosperity of India through its industry growth is solely dependent on contemporary adoption to practices and its fruitful outcome. The National Conference outlines the practical utility and factor in the sustainable development of India.

I assure you that the editorial team has taken due care and diligence in selecting the research papers and articles on various topics and will continue to do so in future as well.

**Prof. (Dr.) K. K. Garg**  
Director- LLDIMS, New Delhi

## **Additional Director Message**



On behalf of Lingayas Lalita Devi institute of Management and Sciences, I would like to welcome you to the National Conference on Digital Innovation: A Tool for Sustainable Development. The growing technological advancement with each passing day provides a challenge to people of all walks of life, be it Academicians, Research Scholars, Students industrialists, professionals etc. This Conference was visualised with the objective for providing a common platform to foster exchange of ideas on how best digital technology can be utilised in making India sustainable in all fields.

I am hopeful that the in depth discussions by the distinguished delegates in the conference would be proved to be fruitful and would have a positive and long lasting impact on the field of digital innovations. The overwhelming response to our call-for papers indicates the popularity of this conference and confirms that technology is indeed an inseparable and indispensable part of our life; hence everyone is enthusiastic to voice out their viewpoint on it. I would like to express my thanks to all authors for their outstanding contributions. My heartfelt thanks to the members of the program board for their competent evaluation of the large number of submissions and selecting the best paper. It was not an easy task Likewise I would also like to express my appreciation to the advisory committee for its valuable suggestions as well as to the invited chairs for their careful preparation of the invited sessions. We wish to thank the organizing committee for their hard work in planning the conference.

**Best Wishes**

**Dr. Pranav Mishra**  
Additional Director | IQAC Coordinator

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**ABSTRACT**

*Cities modernization is guided and shaped by human interactions and by the physical infrastructure. Mobility and accessibility are two main part and parcel of the Transport system. The transport sector is showing a transition from a 'hardware-centered' approach (vehicles, roads, general infrastructure, etc.) to a user need-driven 'mobility as a service' approach. But the vehicles we use in order to battle climate change needs incremental improvements. To Develop transport on the track of sustainability, we should work in the direction to make energy efficient changes, transforming to renewable energy and more sustainable modes of mobility, and increase smartness at every level of the system. This paper gives a brief review on understanding sustainable mobility and accessibility, challenges that the environment faces due to fast-growing tertiary sector, transport systems, and urbanization. The paper also thrives to review various initiatives taken by the governments on urban planning towards sustainable urban mobility and outlines a few solutions to have a combination of smart and sustainable mobility.*

*Keywords: Mobility, Accessibility, Sustainable mobility, Urban planning*

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**OBJECTIVE**

This paper gives a brief review and focuses

- To understand sustainable mobility,
- To study the challenges that the environment faces due to fast-growing tertiary sector, transport systems, and urbanization.
- To look upon the initiatives taken by the governments, non-government and other organization on urban planning
- To find out comprehensive solutions of current scenario and innovative technologies to make mobility sustainable in future.

**INTRODUCTION**

Mobility and accessibility are two main part and parcel of the Transport system. In words of Ilan Solomon. and Patrica.L Mokhtarian,1998 Mobility is the demand for activities and travel, where the costs are an integral part of the demand. Travel can be an activity when a person travels for enjoyment and satisfaction whereas travel is derived demand when a purpose is attached to travel i.e. reaching a destination. On the other hand, Accessibility is the ultimate goal of most transportation, it is an activity in itself as it is not just a means to access destination (Litman, 2003).

In the recent global era, urban areas around the world, in both developed and developing countries, have become increasingly automobile-centered and less sustainable. Urbanization and demographic changes, including rapidly aging populations, are just two of the megatrends that will have a significant global impact. Traveling decisions of the population are based on residential, activity locations and their work. It is also a physical outcome of interactions between cultural backgrounds and physical needs of a particular society and the potential of land activity. (Chawla,2012). Today's transport system is quite different from that of a past few decades, these systems are evolving continuously and rapidly. Transport is seen as an enabler for people mobility and logistics. The development of information and communication technologies has supported the shift of standard. The vehicles we use in order to battle climate change needs incremental improvements. Transport system should be renovated and considered as a whole. Efforts should be made in combining smart mobility with low-carbon energy. Cities across the world strive to meet urban sustainable mobility by improving public transport, encouraging non-motorized modes, creating pedestrian zones, limiting the use of private cars, and reduce by automobile dominance. Ideas of automobile restraint that were unthinkable just a few years ago are now being taken into consideration or even is adopted in many urban areas around the globe.

**CHALLENGES**

Michael Thompson (1977) provides a useful breakdown of the ways in which most people are dissatisfied with the transport systems of their cities. He has given seven problems of urban transport that are related with each other. They are Traffic Movement and Congestion, Public Transport Crowding, Off-Peak Inadequacy of Public

Transport, Parking Difficulties, Traffic noise, Difficulties for Pedestrians, Environmental Impact, Atmospheric Pollution. This startle pace of urbanization has been contributing to personal motorization exponentially that drastically adds on to carbon footprints and polluting the environment, which resultingly causes many critical health issues to humans and other living organisms. (Giduthuri, V.K.,2015)

Climate change, urbanization, urban sprawl, security issues, unfavorable demographics (aging, blood pressure, brathing problems etc), open markets and digitalization of the operating environment make utmost to improve the whole transportation senario. The uncontrollable growth of cities increases challenges for city planners and those dealing with transportation. To respond to the said problem in fast-growing cities, investments in sustainable alternatives are essential in achieving socially inclusive, economically efficient and environmentally friendly measures.

### **SOLUTIONS**

Urban planning and management could be an efficient tool both for reducing the overall impact of urbanization on the regional environment and for improving conditions of transport system. National and local governments must work together to create environmentally, economically and financially sustainable urban transport systems (Tsay & Herrmann, 2013). Government extends Central Financial Assistance to Urban local Bodies and includes the improvement and innovation in urban transport planning and management through Mobility Plan , Unified Mass Transit Authority , Dedicated Urban Transport Fund at state and city level, Transit Oriented Development Policy, Parking Policy and Advertisement Policy, city specific Special Purpose Vehicle for managing public transport, Traffic Information and Management Control Centre (TIMCC), etc., Bus prioritization at intersections, dedicated/demarcated lanes for buses, Designate a nodal department for urban transport and Mechanism for periodic revision of public transport fares (Lohia, 2011).

Information and communication technology will play an important role in changing the whole transport system. For ignoring traffic, wi-fi traffic lights also known as smart traffic lights can be used which will intimate the truck drivers way before about when the signals turn red on a certain traffic light so that they can move to adjust their speed limits accordingly and can avoid idling on traffic signals and wasting fuel. These kinds of technologies are already being used in cities like San Jose and Las Vegas (claimed by The University of California; which is a pioneer on climate research, renewable energy, and environmental sustainability). Accordingly, intelligence will be embedded at all levels of the systems like in the vehicle with its subsystems, in the surrounding infrastructure, in the energy supply, in the management systems and in the services delivered by the system. Internet of Things (IoT) will make communication between all components of the system possible, thus enabling a completely new level of optimization and automation. (Nils-Olof Nylund and Kaisa Belloni, June 2014)

Improving and renovating transport system considered as a wiser step to define criteria for performance rather than to indulge for a certain technology. A vehicle can be the mode of future transport say for the battery electric vehicle, the fuel cell vehicle or some other technology. A combination of electric propulsion, renewable fuels and other environment friendly innovation may make a sustainable future. (Nils-Olof Nylund and Kaisa Belloni, June 2014). Improvement in public transport is now increasing characterized by innovative planning combined with the use of modern technology in major metropolitan cities of India. For instance, all modes of public transport, including Bus Rapid Transit system (BRTS) and metro rail are resorting the use of Compressed Natural Gas (CNG). Public service vehicles in the capital run on CNG for over a decade now. This policy introduced in 2002 under the directions of the Supreme Court of India is implemented now effectively and as a result, the capital became relatively free of diesel smoke. The Government of India has launched the Jawaharlal Nehru National Urban Rene Nehru National Urban Renewal Mission (JNNURM) JnNURM strives at creating economically productive, efficient, equitable and responsive Cities by a strategy of updating the social and economic infrastructures in cities. It also aims to provide basic services to Urban Poor and wide-ranging urban sector reforms to strengthen municipal governance. (GoI,2005).

Pardo (2010) had given four measures for sustainable urban transport, namely, 1) public transport, 2) subway and light-rail system, 3) metro and urban light-rail system and 4) non-motorized transport.

### **PUBLIC TRANSPORT**

This measure leads to the development of high-quality public transport systems including mass transit systems. A specific public transport mode called Bus Rapid Transit (BRT) has been popularly implemented in recent years due to its cost-effectiveness, relatively short time consuming and high quality of service along with the increased capacity to move a large number of passengers.

**Subway and light-rail systems:** This is one of rapid, cost-effective and environmentally friendly urban passenger transport. Many megacities in developing countries are also considering the construction, modernization, and expansion of urban light-rail systems.

**Metro and urban light-rail systems:** This system is not very cost effective to construct and maintain but can result in significant long-term economic, social and environmental benefits. Various researches and studies analyzing investment in urban public transport infrastructure and services have given a result that in the long term the sum of public benefits exceeds the investment costs by far. Urban public transport systems are more attractive to commuters and more economically feasible for operators if they offer the option to travel from any point in the city to any other point. This can be done through the expansion of the network and through intermodal connections.

**Non-motorized transport:** It is also referred to as “Active Transport”, it essentially refers to walking and cycling as well as related infrastructure, policies, and education

Fast-moving ways are influencing urban-mobility systems around the world. The distribution of energy systems will make a difference as modes of transportation come to rely more on electricity as a source of energy. (Shannon,2017) suggested some trends which are likely to have a larger impact on the development of smart and sustainable mobility in cities. They have shared mobility, Autonomous driving, vehicle electrification, Connectivity and the internet of things, Public transit, Infrastructure and Regulation of transport system. These trends will have a profound influence and their effects could be reinforced and multiplied.

Truck Platooning is also an increasing trend where two or more trucks in a convoy using technology of connectivity and fully automated driving systems. The trucks or the vehicles arranges them in a set and maintains a close distance between each other. This technique of platoons has a great potential to make mobility more economically efficient, environmentally sustainable and much safer in coming years. Such kinds of truck platoons lower down the fuel consumption and carbon footprints on the environment as driving slower and together reduces the friction and this reduces the air drag by a great amount. The platooning technique make roads safety a bit easier task as the breaks of these platoons are quite automated and immediate in nature as in the platoon truck following the lead truck only takes one-fifth of the time a human would need to react. Platooning increases the efficiency of mobility as it uses roads more effectively in delivering merchandises and services faster and reducing traffic jams.

We have to convince people in general and people in the commercial sector, to make sustainable choices that integrate all stakeholders in the actions that are needed. It can be done by Encouraging individuals, families, and communities to adopt “Green Travel Habits that would make travel less polluting and sustainable. Today, we are at a crossroads for a paradigm shift that will encourage renewable energy, ultra-efficient vehicles, cooperative systems, smart mobility services, and overarching optimization. (Nils-Olof Nylund and Kaisa Belloni, June 2014)

## CONCLUSION

When it is decided to build the new system, it should be considered to switch from the traditional hardware-oriented approach to a system based on user demand and mobility services.

Cities are required to be planned in more concise way to address sustainable urban mobility properly. A strategic plan for sustainable mobility is needed to achieve a better quality of life that builds on existing planning practices and with consideration to urban mobility.

To reach all the goals regarding climate change, energy and service level, we cannot just work on a single element of the system, we need a systemic approach to mobility. We should have to consider the system as a whole. Efforts should be made to spread awareness among the people regarding the importance of existence of sustainable mobility. Green Travel Habits must be inculcated in the behavior of cities

As we all are aware that one size does not fit all, it means that one single vehicle technology, energy carrier or even ICT service platform cannot cover all the mobility needs. It should be accepted that a mix of technologies will help, and accordingly it should be decided which application a certain technology is best suited. Certain combinations of policies can work hand in hand and give rise to synergies, leading to impacts greater than the sum of their individual parts.

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**IMPACT OF SOCIAL MEDIA ON YOUTH**

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**ABSTRACT**

*With the advent of internet life has become easy and convenient now we can send and receive any message within few seconds. Social media has brought the world together making Marshall McLuhan's concept of 'Global Village' true. The exchange of information and the flow of information has become free and over the top. Although social media has brought ease to life yet it has certain reverse effects as well. These days everyone is busy in their social media or in virtual reality rather than being concerned about their surroundings this attitude has resulted in isolation and loneliness of the modern people. This research will focus on studying the negative as well as the positive effects of social media or social networking sites on the youth. To accomplish this study, survey method will be used and data will be analyzed based on the questionnaire filled by the respondent.*

*Keywords: Social media, SNS, Youth and Digital media.*

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**INTRODUCTION**

With the advent of internet, communication has become fast and easy. In India as the access of internet is available with high speed and arrival of pocket friendly smartphones has increased the dependency on global communication than ever before. Gone are those days when use of application was considered as wastage of time. Social Networking Sites are overlapping in all spheres of life. Modern day people rely on SNS from communication to business expansion. The involvement on social media has increased over the decade from email, WhatsApp, Twitter on visiting cards. The users of social media are not restricted to youth only but all age groups. It has eased life in many ways. Now one doesn't need to go to any IST booth to make international calls but can simply use SNS to make calls or video calls. Such platforms are not only for communication but also used for information, education, cultural identity, self identity etc. Peer groups on such platforms are providing a platform to exchange of ideas among like-minded people. With one click, anyone can get to know about the happenings around him which was beyond reach decades back. The involvement on activities on SNS enables one to create cultural identity and exchange of cultural and social values. One person sitting in any part of the world can now read, learn and share any information and ideas with others in the second part of the world. Internet has become an effective tool for advertising and marketing in modern days. Business expansion and communication is taking help from social media to reach to its target audience. Social Media also has great importance in developing relationships as it provided different applications and platforms where people of interest can meet and interact accordingly. On the same time, applications of social networking enables people to utilize the global services for business purposes by online meetings and online education program for the spread of education among the need.

However, every coin has two sides; similarly internet has certain adverse effects on users. As it's an open platform, share of information on social media lacks authentication and verifications. Much of the content to which users are exposed is not checked for facts and user is presented with virtual reality which may vary significantly in real world but such exposure will have similar impact on user. The user often believes to the information shared and acts accordingly. Mob-lynching happening in India has its riots in wrong information made viral on social media and belief of users in the same. Additionally, there is addiction of social media seen among users who spend maximum of the time on SNS than in socializing among people around. According to doctors, excessive use of mobile phone is causing sleeplessness among people along with issues related to cervical and spine. Apart from this, the students often indulge in use of social media so much that they start neglecting their routine life. This study is going to evaluate the adverse effects of social media on Youth as youngsters ate the maximum among the users of social media.

**REVIEW OF LITERATURE**

**Ali, Asad & Iqbal, Anam & Iqbal, Kanwal. (2016).** Social media plays great role in learning and job opportunities. However, teenagers often use social media for the purpose of communication with friends and family. The study discussed that the use of social media causes various health issues among users. Additionally, the users need to be well versed with social and cultural values of the state to communicate effectively.

**Bhardwaj, Akashdeep & Goundar, Sam & Avasthi, Vinay. (2017).** The study finds similar findings to the studies done in the relevant area previously. The researcher found that there is relevance of social media with cultural development, building self-identity, technical skills and developing relationships.

**Juszczyk, Stanislaw. (2015).** The SNS are becoming an integral part of day to day life as we rely on global network for different functions like work, information, communication, and education. . While using the internet, we are exposed to objective reality which occurs in different way but is perceived by the users. Such communication may impact different sectors of life like private life, social, cultural, economic and intellectual. If there is a monitoring of the use of internet, it can contribute in positive growth of the private life. There is a need to get the youth ‘unplugged’ to bring a balance between virtual reality and real world.

**Siddiqui, S. &Singh, T. (2016).**The researchers found that the growth of technology is booming the use of social media by everyone in daily life. It has different impact on different people. As a student, it enables the candidate to increase his knowledge and collaboration and in business, it helps in accomplishing business objectives and increasing sales. However, social media has certain negative impacts on people like wrong information may lead to education failure and wrong advertisement may affect the productivity. Social media can also poke in someone’s privacy along with certain provoking content; it may aggravate the involvement in inappropriate activities.

**Khurana, N. (2015).** The study was objected to study the effectiveness of social media. The SNS offer the youth a platform to study, interact and share ideas. It helps them in getting updated with happenings around them. But SNS has certain adverse effects on youth like excessive use of social media drags them away from studies. The sites which are used are not often credible for information. The users are often involved in virtual reality and activities happening online rather than involvement in events happening around them.

**RESEARCH OBJECTIVES**

The research objectives of the study are as followed:

1. To analyze the impacts of use of social media.
2. To analyze the negative impacts of social media.

**RESEARCH METHODOLOGY**

To accomplish this study, survey method is used. In this study, sample selection is done by random sampling. A questionnaire was served to 200 youths aging 18-30 from Chandigarh. The data is analyzed in percentile form.

**DATA ANALYSIS & FINDINGS**

**1. Do you use social networking sites? Yes/No**

In response of the given situation, all the respondents answered ‘yes’ which signifies the access and use of social media sites by every individual.

**2. How many social networking sites do you use?**

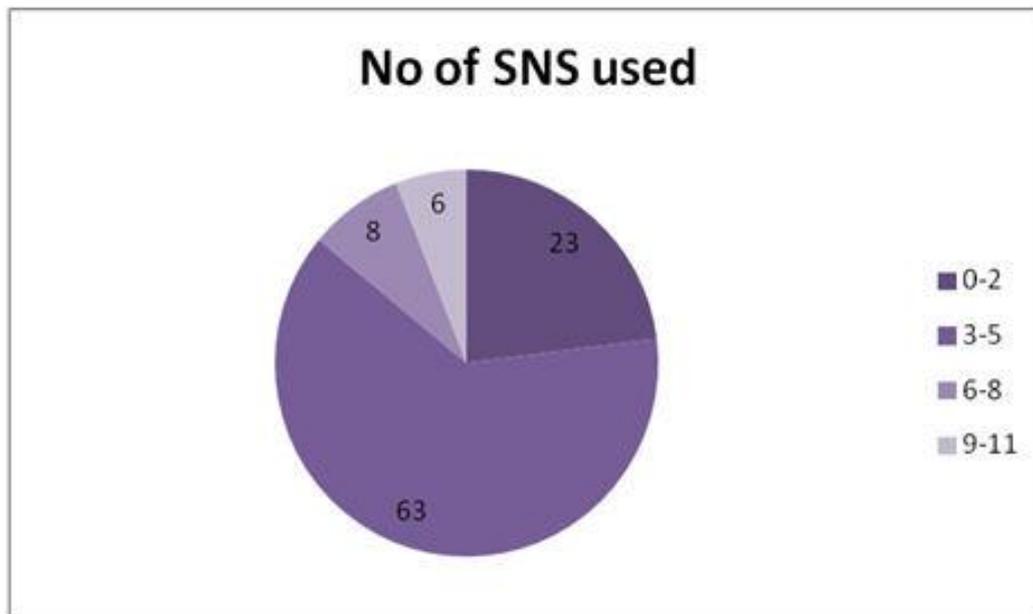


Figure-1: (Number of preferred SNS by respondents)

It becomes clear that 63% of the respondents used 3-5 SNS followed by the users of 0-2. Only 6% of the participants reported using more than 9 social sites. This trend reflects the popularity of various social networks among the users.

3. How many hours do you spend on social networking sites on an average in a da

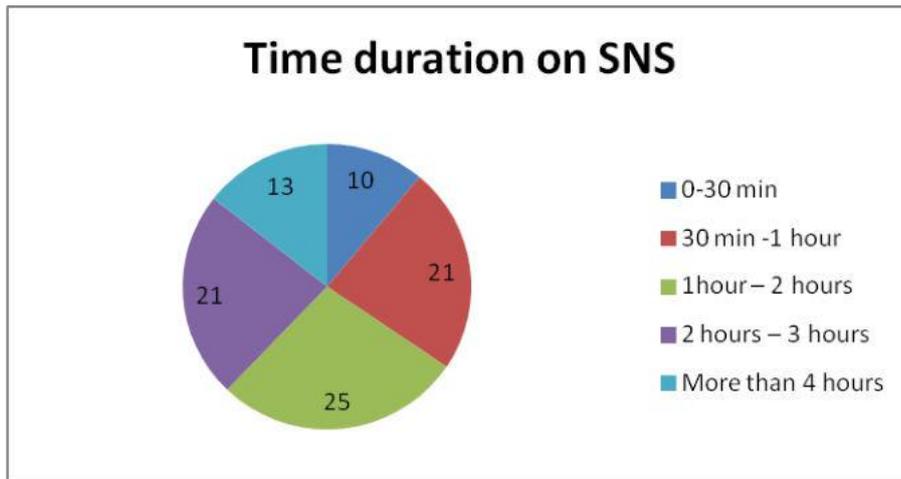


Figure-2: (Time duration spend on SNS by respondents)

25% of the participants reported the use of social site for 1-2 hours daily however users of more than four hours a day were third last in the percentage with 13%. Duration of 2-3 hours is spent by 21% users which is equal to the least time spending users on SNS with 0-30 minutes in a day. It shows that on an average, 3 hours are spent by almost 50% users on daily basis on social media.

4. Why do you use these social networking sites?

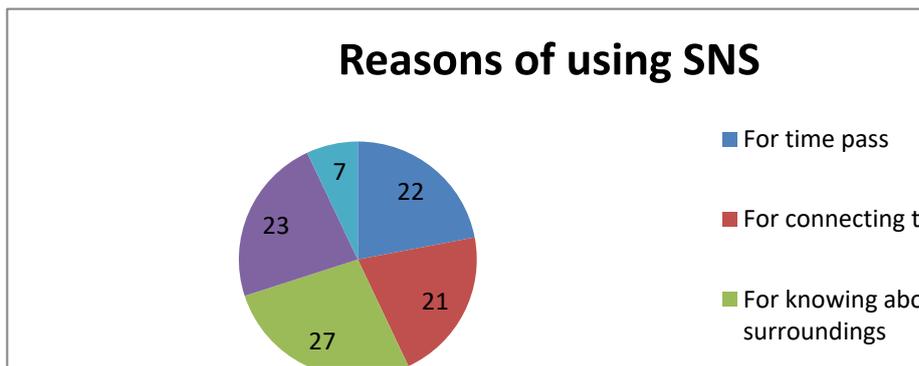


Figure-3: (Reasons of using SNS by respondents)

27% of the respondents reported to use social media for getting to know about the happenings in their surrounding followed by 23% users who refer to SNS for getting latest updates in trends. 22% of the users use social media because they find it a good way to pass time. Only 21% people use SNS for the purpose of communication and least is the use of SNS due peer pressure.

5. What are the personal benefits of using social networking sites?

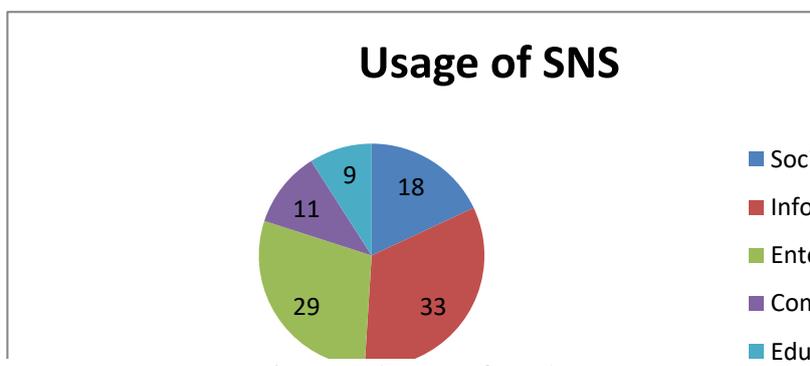


Figure-4: (Usage of SNS)

33% respondents use social media to share information followed by users for entertainment purpose with 29%. Use of social media is at the least with 9% users only. For the communication, only 11% respondents rely on social networks whereas for socializing with others only 18% users use the SNS.

6. Do you check your social networking profiles before going to bed?

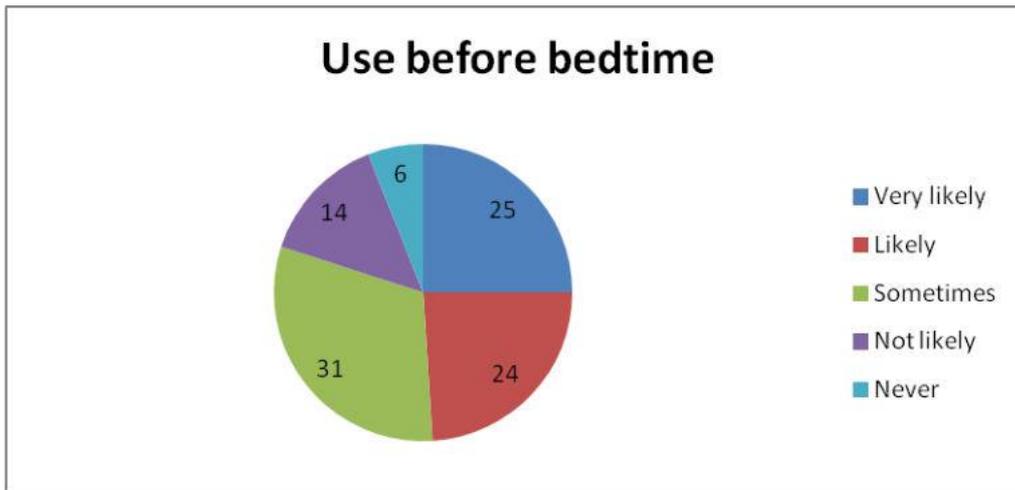


Figure-5: (Use of SNS before bedtime)

In the study, it is found that only 6% are the users who have never used SNS before sleep however 25% users most often use the social media before going to sleep followed by 24% of the users who use it on frequently, 31% are the respondent who reported the use of social media sometimes before sleep. This shows the frequency of being active on social media by the users at the time of relaxing.

7. Do you visit your SNS without any intention for activity?

- a. True
- b. False

In the response, 63% respondents accepted that they visit their social media apps or profile for specific reason whereas only 37% respondents reported to use SNS for an intentional activity. This trend reflects the tendency of addiction of using SNS by the users.

8. Are you surprised with the time duration you spend on SNS daily?

- a. Yes
- b. No

In the response, 40% users were surprised with their time duration spent on social media on daily basis. 60% users showed no surprise on their time utilization on social media.

9. Have you ever ignored your family activity for using SNS?

- a. True
- b. False

In the response, 19% participants accepted to neglect the family time for the sake of using SNS whereas 81% respondents feel that they have never ignored family activity for the use of SNS.

10. Have you ever ignored your study or assignments for using SNS?

- a. Yes
- b. No

In the response, 63% respondents counted not to ignore their studies for social media whereas 37% users accepted the negligence they play in using social sites on the stake of their studies.

**CONCLUSION**

In the nutshell, it can be said that social media has become an integral part of daily life; this study was focused to study the impacts of social media. It is clear from the study that every respondent is active on social media varying in the availability on different social media sites. The use of social media varies for different purposes and duration on an average goes to 3 hours a day by the respondents, Effective use of SNS is not seen as very few respondents reported to use the SNS for education purpose. The majority of users rely on social media for entertainment and communication. It is also seen that sometimes the respondents ignore family and their studies as well due to their deep interest in the global networking. All in all, it is seen that along with positive aspects of

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social media being a platform for sharing information, education it also has certain antagonistic effects on users like negligence in family, education, and excessive use by spending more than four hours a day on using social media.

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**PUBLIC OPINION ON ISSUE OF JAMMU AND KASHMIR AND TERRORISM**

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**ABSTRACT**

*With bilateral talks between India and Pakistan going sore due to border infiltration and government upping its ante against terrorism, a lot has changed in Jammu and Kashmir under current government. While some agree and fully support government for surgical strike and insurgency operations, opposition and many others criticize government for oppressing and harassing the local people. And hence a need arises to study what youth in general think about issues related to Jammu Kashmir such as plebiscite, Article 370, terrorism, separatism and army actions. The study was conducted by gathering primary data from university students through questionnaire using survey method. Also opinions of students on their social media accounts were analyzed for further insights regarding the issue.*

*Keywords: Jammu & Kashmir, Terrorism, Public Opinion, Article 370*

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**INTRODUCTION**

The Kashmir problem came into being almost with the independence of the country. Though 50 years have passed, the problem still remains unsolved. The Kashmir continues to remain a source of friction between India and Pakistan. With history of wars, border infiltrations and ceasefire violations, the relations between the two nations have only gone downhill. The position at the present is that the armies of the two countries still confront each other along the border line. While Pakistan continues to demand Kashmir on one hand, India on other hand continues its fight against infiltration and unrest in Kashmir. Both countries are spending huge amount over their armies in Kashmir. But no solution of the problem seems to be in sight in the near future.

In more recent times, there has been considerable deterioration in the situation in Kashmir. The Pakistan trained subversives have infiltrated into the valley in large numbers. The slogan of "Independent Kashmir" has been used to misguide the people. Pakistan has tried its best to politicize the problem and win international support for its point of view. But violence still continues, life in the state is still insecure and thousands have migrated from the valley into Jammu, Delhi and other parts of the country. With focus on recent developments such as ban on Pakistani Artists, Uri Attack, Surgical Strike, statements on Pakistan occupied Kashmir, unrest due to Article 370 and impasse on Indus Water Treaty, this study was conducted to find out general perception of youth on such critical issues.

**OBJECTIVES**

- To study the views of respondents on interference of Pakistan in Jammu and Kashmir.
- To study the views of respondents on Article 370
- To find out the biggest problem of Jammu and Kashmir according to the viewpoint of respondents.
- To study the views of respondents on India's stand on PoK (Pakistan occupied Kashmir).
- To study the views of respondents on surgical strike.
- To study the views of respondents on recent Pakistan artists ban.
- To study views of respondents on Pakistan importing terrorism.

**RESEARCH METHODOLOGY**

1. Type of sampling- Convenient sampling was used for the study.
  2. Sample size- The number of respondents that were taken for the study were 97. The sample that was selected were students from Makhanlal Chaturvedi University.
  3. Geographical area- The geographical area chosen for the study was campus of Makhanlal Chaturvedi University. The students of various departments of Makhanlal were taken as sample. Following were the departments from where sample was taken-
    - Department of Electronic Media.
    - Department of Computer Science and Applications.
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- Department of Journalism.
  - Department of Management.
  - Department of Mass Communication.
  - Department of New Media Technology.
  - Department of Public Relations and Advertising Studies.
  - Department of Communication Research.
4. Age group- The range of age varied from 17 years to 55 years. The various age groups taken for the study were -
- 17-20
  - 21-24
  - 25 and above
5. Tools of data collection- For the study self designed and standardized tool according to the study were taken. Questionnaire was prepared and later filled by respondents.
6. Statistical techniques- The researcher used SPSS (Statistical package for Social Sciences) to analyze the data. Since it was descriptive study hence descriptive analysis was carried and the required tables were extracted from output yielded by the computer. Accordingly the analysis was carried out.

**PROCEDURE**

The scale was distributed and administered on students of various departments of the university. Each respondent was approached personally and was requested to fill up the questionnaire. Respondents were given the liberty to take their time for completing their questionnaires. The confidentiality of their responses was assured.

**RESULTS**

According to the objectives of the study, the data was collected and is analyzed. On analysis following results were obtained-

**Table-1: Showing Demographic variables**

S. No.	Demographic variables	Frequency	Percentage
	<b>Age(in years)</b>		
1	17-20	24	24.7
2	21-24	63	64.9
3	25 and above	10	10.3
	<b>Gender</b>	Frequency	Percentage
1	Male	42	43.3
2	Female	55	56.7
	<b>Educational Qualification</b>	Frequency	Percentage
1	Graduate	31	32.0
2	Post Graduate	54	55.7
3	M Phil	9	9.3
4	Working	3	3.1

Table 1 shows the data related to demographic variables. 64.9% of the respondents were in the age group 21-24 years. 24.7% were in the age group 17-20 years and 10.3% respondents were in the age group 25 years and above. Out of all the respondents who filled the questionnaire 43.3% were males and 56.7% were females. A staggering 55.7% of the respondents were post graduates, 32.0% were graduates, and 9.3% were M Phil students. Only 3.1% of the respondents were working (Doctor or professor).

**Table-2: Showing Response to statements having dichotomous variable**

S.NO	Questions	Frequency	Percent
1	<b>People blaming terrorism on Pakistan</b>		
	Yes	82	84.5
	No	15	15.5
2	<b>People who think winning trust of J&amp;K people will solve terrorism</b>		
	Yes	44	45.4
	No	53	54.6
3	<b>People who think India should focus on getting back the POK</b>		
	Yes	61	62.9
	No	36	37.1
4	<b>People who think Pakistan will retaliate after surgical strike</b>		
	Yes	73	75.3
	No	24	24.7

Table 2 shows responses to statements having dichotomous variable. On being asked whether they blame Pakistan for terrorism, 84.5% respondents replied in affirmative while only 15.5% felt the other way. When respondents were asked whether they think winning the trust of Jammu and Kashmir people would help solve terrorism issue, 54.6% respondents felt that it wouldn't help and rest 45.4% felt that it would help the cause. 62.9% respondents felt India should focus on getting Pakistan Occupied Kashmir and rest 37.1% felt that India should refrain from such action. 75.3% respondents thought Pakistan would retaliate after Surgical Strike and 24.7% felt that Pakistan won't do so.

**Table-3: showing responses to statements having dichotomous variable**

S.No	Statements	Yes	No	Can't Say
1	Modi has more political willingness than previous politicians in terms of terrorism issue	76(78.4%)	8(8.2%)	13(13.4%)
2	Can Pakistani artists be compared to terrorists	12(12.4%)	80(82.5%)	5(5.2%)
3	Cultural, economic and sports ties should not continue in times of border tensions	47(48.5%)	37(38.1%)	13(13.4%)
4	Pakistani artists should be banned from television and film industry	26(26.8%)	62(63.9%)	9(9.3%)
5	India's 'No first use' policy in terms of nuclear weapons is not correct	40(41.2%)	40(41.2%)	17(17.5%)
6	India's withdrawal from SAARC Summit was successful in isolating Pakistan	68(70.1%)	7(7.2%)	22(22.7%)
7	Snapping economic ties with China would make it retreat from helping Pakistan	63(64.9%)	21(21.6%)	13(13.4%)
8	India should stop the flow of Indus river to Pakistan	50(51.5%)	40(41.2%)	7(7.2%)
9	India is right in raising Baluchistan issue	79(81.4%)	6(6.2%)	12(12.4%)
10	Uri attack has broken the patience of India regarding cross border terrorism	83(85.6%)	8(8.2%)	6(6.2%)
11	Surgical strike have proven that India is intolerant to terrorism	73(75.3%)	15(15.5%)	9(9.3%)
12	India's action has built its negative image on world platform	17(17.5%)	79(81.4%)	1(1.0%)
13	India should neglect Pakistan and focus on development of country	34(35.1%)	56(57.7%)	7(7.2%)
14	Surgical strike is not a correct step of India	13(13.4%)	81(83.5%)	3(3.1%)
15	India's defense action is affecting the GDP growth	35(36.1%)	38(39.2%)	24(24.7%)

Table 3 shows responses to statements having dichotomous variables, 78.4% respondents believed Narendra Modi has more political will than his predecessors and rest 8.2% feel that he doesn't. 12.4%. On being asked whether Pakistani artists be compared to terrorists 82.5% respondents said 'No' while only 12.4% respondents

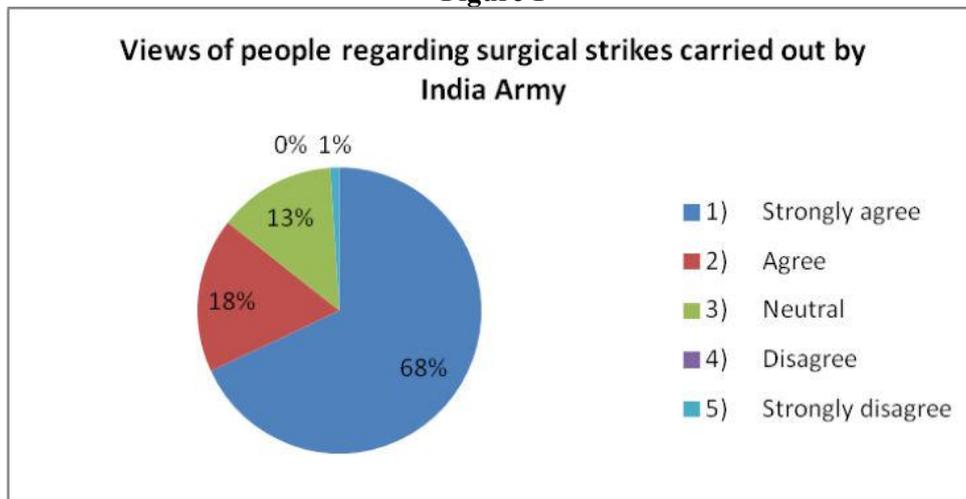
felt that they are comparable to terrorists. 48.5% respondents agreed that cultural, economic and sports activities should not continue in times of border tensions and 38.1% disagreed with the statement. 26.8% respondents agreed that Pakistani artists should be banned from television and film industry and a majority of 63.9% felt that they should not be banned.. 41.2% respondents felt India’s ‘No first use’ policy is wrong and another 42.2% felt that it is correct. 17.5% were not clear in their choice on this policy. 70.1% respondents felt India’s withdrawal from SAARC Summit was successful in isolating Pakistan while 21.6% felt that it wasn’t so 64.9% respondents agreed that snapping economic ties with China would make it retreat from helping Pakistan and 21.6% said it wouldn’t help the cause. 51.5% respondents felt that India should stop the flow of Indus River to Pakistan and 41.2% respondents felt that India shouldn’t do this. 81.4% respondents agreed that India is right in raising Baluchistan issue and only 6.2% felt the other way. 85.6% respondents feel that Uri attack has broken the patience of India regarding cross border terrorism and 8.2% don’t feel that way. 75.3% respondents agreed that surgical strike have proven that India is intolerant to terrorism and 15.5% didn’t agree with the statement. 17.5% respondents agree that India’s action has built its negative image on world platform while 81.4% respondents felt that this was not the case. 35.1% respondents believe that India should neglect Pakistan and focus on development of country and 57.7% think otherwise. 13.4% respondents agree with the statement that surgical strike is not a correct step by India and 83.5% think that surgical strike is a correct step. 36.1% respondents feel that India’s defense action is affecting the GDP growth and another 39.2% feel that it is not affecting the growth.

**Table-4: Showing Views of people regarding surgical strikes carried out by India Army**

Views	Frequency	Percent
1) Strongly agree	66	68.0
2) Agree	17	17.5
3) Neutral	13	13.4
4) Disagree	00	0.0
5) Strongly disagree	1	1.0

Table 4 shows views of people regarding surgical strikes carried out by India Army. 68.0% respondents strongly agree with the action and 17.5% just agree. 13.4% respondents were neutral on the issue. Only 1.0% strongly disagreed and 0.0% disagreed with the action.

**Figure 1**



**Table-5: Showing Views of people regarding whose intervention they wouldn’t prefer**

Intervention	Frequency	Percent
1. Army	4	4.1
2. United Nations	17	17.5
3. United States	14	14.4
4. Pakistan	62	63.9

Table 5 shows views of people regarding whose intervention they wouldn’t prefer. A majority of 63.9% s think there should be no interference from Pakistan in Kashmir issue. 14.4% think United States and 17.5% think United Nations should have no interference in the Kashmir issue. Only 4.1% respondents didn’t agree with the intervention of army.

Figure-2

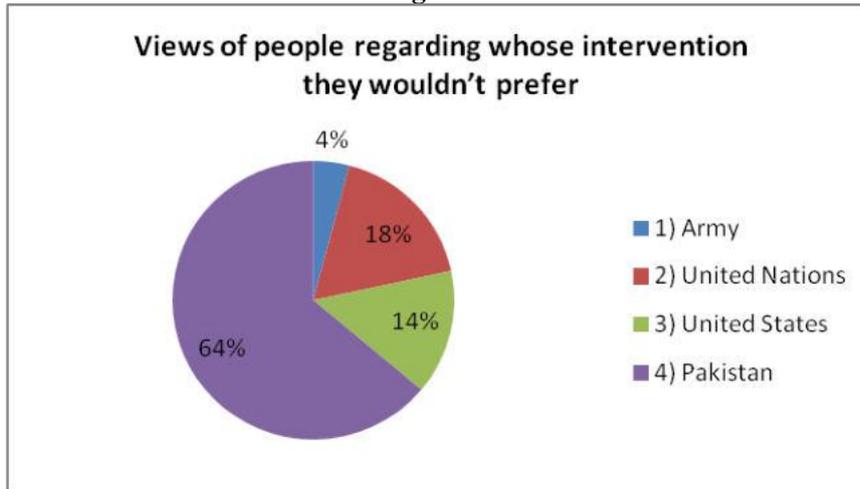


Table-6: Showing Views of respondents regarding strategy of Modi to expose Pakistan in context of Baluchistan

Strategy of Modi to expose Pakistan in context of Baluchistan	Frequency	Percent
1) Stop Pakistan from raising Kashmir issue	32	33.0
2) Stop cross border infiltration	43	44.3
3) It would do nothing	22	22.7

Table 6 shows views of respondents regarding strategy of Modi to expose Pakistan in context of Baluchistan. 33.0% respondents think it would stop Pakistan from raising Kashmir issue, 44.3% respondents feel that this would stop cross border infiltration and 22.7% respondents feel that it would do nothing.

Figure 3

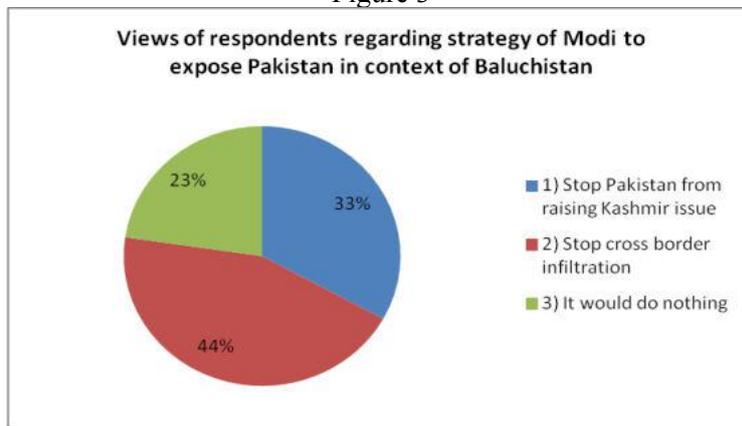


Table:- 7 Showing Biggest issue of Jammu and Kashmir right now

Issues	Frequency	Percent
1) Terrorism	51	52.6
2) Armed Force Special Powers Act	7	7.2
3) Curfew	1	1.0
4) Separatism	8	8.2
5) Ceasefire violation	3	3.1
6) Pakistan Occupied Kashmir	4	4.1
7) Unemployment	3	3.1
8) Misguided youth	17	17.5
9) No trust of people on government	3	3.1

Table 7 shows biggest issue of Jammu and Kashmir right now. 52.6% respondents think terrorism is the main issue of Jammu and Kashmir right now. 7.2% think Armed Force Special Powers Act, 17.5% feel misguided youth and 8.2% feel separatism is a major issue in Jammu and Kashmir. Only 1.0% agree that curfew, 3.1% agree that ceasefire violation and no trust on government and rest 4.1% agree that Pakistan Occupied Kashmir is the biggest issue right now.

Figure-4

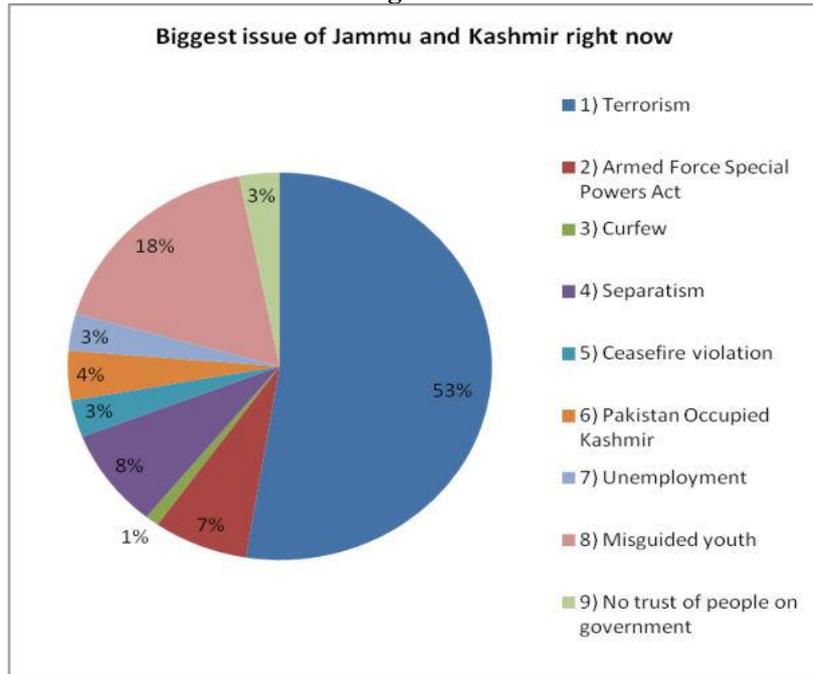


Table:- 8 Showing Consequences of scraping Article 370

Consequences	Frequency	Percent
1) More unrest in valley	27	27.8
2) More movement and settlement ensuring stability in the region	25	25.8
3) Protests by politicians of Jammu and Kashmir	23	23.7
4) Other consequence if any	22	22.7

Table 8 shows consequences of scraping Article 370. 27.8% respondents think that there will be more unrest in valley, 25.8% respondents think it would cause more movement and settlement ensuring stability in the region, 23.7% feel it would lead to protests by politicians of Jammu and Kashmir and rest 22.7% feel there could be other possible consequences.

Figure-5

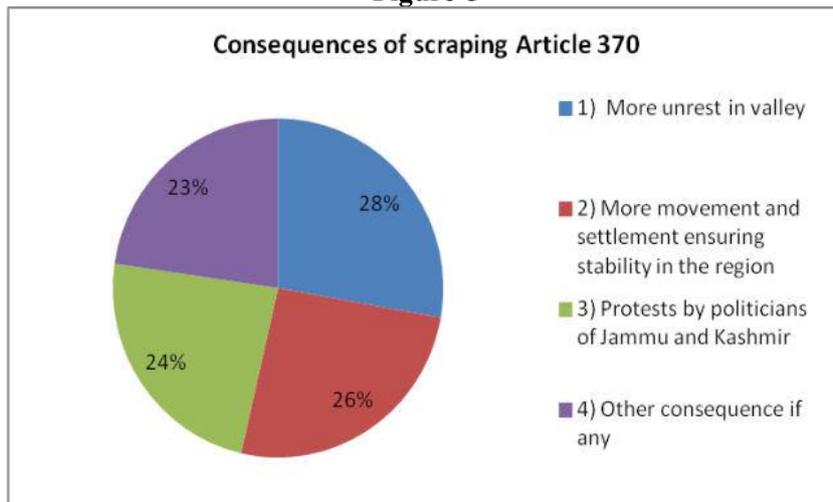
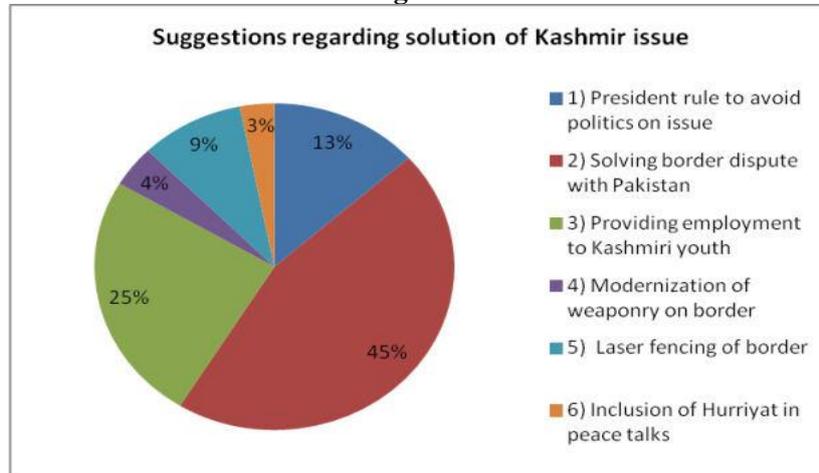


Table:- 9 Showing Suggestions regarding solution of Kashmir issue

Suggestions	Frequency	Percent
1) President rule to avoid politics on issue	13	13.4
2) Solving border dispute with Pakistan	44	45.4
3) Providing employment to Kashmiri youth	24	24.7
4) Modernization of weaponry on border	4	4.1
5) Laser fencing of border	9	9.3
6) Inclusion of Hurriyat in peace talks	3	3.1

Table 9 shows suggestions regarding solution of Kashmir issue. 13.4% respondents agree that there should be President rule to avoid politics on issue. 45.4% feel solving border dispute with Pakistan can do the trick. 24.7% respondents think that providing employment to Kashmiri youth would help. 4.1% respondents believe that modernization of weaponry on border would be the right way. 9.3% respondents think that laser fencing of border would be correct and rest 3.1% respondents believe that inclusion of Hurriyat in peace talks would help.

Figure-6



## INTERPRETATION AND DISCUSSION

For the study, the students of Makhanlal Chaturvedi University were requested to fill the questionnaire. Later the data was entered on SPSS and then analyzed. This gave following interpretations:

- Most of the respondents who filled the questionnaire were females.
- A majority of the respondents blamed Pakistan for terrorism. Only half of the respondents thought winning trust of J&K people will solve terrorism and another half thought that it won't solve the issue. Most respondents feel India should focus on getting back the Pakistan Occupied Kashmir. On being asked whether Pakistan will retaliate after surgical strike majority of respondents thought that Pakistan would do so.
- Most respondents replied in affirmative on being asked whether Modi has more political willingness than previous politicians in terms of terrorism issue or not. Also respondents showed their clarity of mind when most of them said that Pakistani artists can't be compared to terrorists. But respondents were divided in their opinion when they were asked whether cultural, economic and sports ties should continue in times of border tensions or not. Respondents were broad minded as most thought that Pakistani artists shouldn't be banned from television and film industry.
- There was division of opinion when respondents were asked whether India's 'No first use' policy in terms of nuclear weapons is correct or not. Most respondents think India's withdrawal from SAARC Summit was successful in isolating Pakistan. Also they thought snapping economic ties with China would make it retreat from helping Pakistan
- Half of the respondents felt that India should stop the flow of Indus River to Pakistan so as to teach them a lesson. Most respondents felt Uri attack has broken the patience of India regarding cross border terrorism. Not just this most respondents also think surgical strike have proven that India is intolerant to terrorism
- Only a few respondents felt that India's action has built its negative image on world platform. Also there were few takers for the idea that India should neglect Pakistan and focus on development of country which was surprising as most wanted Pakistan Occupied Kashmir back and that India should teach Pakistan a lesson.
- Marginally low number of respondents felt that surgical strike was not a correct step by India and there could be chances of revenge being taken. There was division of opinion when respondents were asked whether India's defense action is affecting the GDP growth or not.
- Respondents were clear in stating that they wanted no interference from Pakistan in terms of Jammu and Kashmir issue. Only few agreed with concept of no intervention from United States and United Nations which shows that they want US and UN to take interest in Kashmir issue and help India solve it. Most were supportive with the idea of Army interference in Kashmir so as to maintain peace there.

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- A majority of respondents felt India is right in raising Baluchistan issue as it would stop cross border infiltration and deter Pakistan from raising Kashmir issue.
  - On being asked about the biggest issue of Jammu and Kashmir in present times, half of the respondents agreed that terrorism is the biggest issue of Jammu and Kashmir right now. And there were few takers for issues like Armed Force Special Powers Act, Pakistan Occupied Kashmir, separatism, unemployment, misguided youth and no trust on government. Surprisingly respondents felt curfew and separatism is not a major issue for Jammu and Kashmir which doesn't match with views of people of the country.
  - There was no clarity in minds of respondents when they were asked about consequences of scraping Article 370. This was expected as most of them had no idea about Article 370 on being asked verbally and just ticked the options as a wild guess.
  - Most of the respondents didn't keep up with the rage of common people regarding Pakistan as half of them felt that only solving border dispute with Pakistan would help. There were few takers for ideas like President's rule, providing employment to Kashmiri youth, modernization of weaponry, laser fencing of border and inclusion of separatists.

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**DIGITAL MEDIA & SUSTAINABLE DEVELOPMENT- A CASE STUDY ON “MOTHER DAIRY”  
WEBSITE COMMUNICATING CSR ACTIVITIES**

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**ABSTRACT**

*Corporate Social Responsibility engagements by Corporations in India is not new now. It is well accepted phenomenon and the acts and regulations envisaged in the Companies Act. 2014 (CSR regulations act.), the Government of India, Ministry of Company Affairs. Almost all big corporate companies are now engaged with many CSR activities in the fields of Education, Health, & Environment Protection by spending their profit share.*

*Objective: - But how these companies are reporting these CSR activities to their stakeholders and consumers is the matter of investigation and this topic of research study will analyse the activities of CSR done by the Corporation “MOTHER DAIRY” based and incorporated in Delhi NCR area and analyse as its engagement of CSR communication with case study method.*

*Companies communicating their CSR activities hesitate to use all mainstream media as it is notion that CSR activities are charity work and doing so would term as advertising and publicity. The literature reviews done for this study have made it clear that CSR communication build up the trust among the stakeholders of the company and finally encourage the company doing CSR for more engagements for not just to their brand image but also it boosts the sustainable development efforts and goals in the collaboration with the government agencies.*

*In India, the companies doing CSR activities do not adopt pro-active approach for the reporting CSR, but they adopt re-active approach i.e., inhibitive approach and it does not help achieving sustainable development goals finally as stakeholder’s involvement not possible without communicating through various media of communication.*

*In the above context it is found in the literature reviews for this study that most Indian companies communicate (report) their CSR engagements on their website and via digital media. The case study of Mother Dairy website has made it clear that all CSR Policy of this company have been described on the website of the company, but its communication of CSR activities have been done through various media but mostly on digital news websites or its own website.*

*Method- Case study is used to find out how digital media and companies’ websites are used to report CSR activities in India by the Corporations.*

*Possible Outcomes: - the study aim to find out whether the CSR activities done by companies are helpful in sustainable development goals. As CSR communication and reporting to the stakeholders are done by companies only via limited media vehicles, the involvement of people, society and stakeholders of the companies is the limited and not much for achieving sustainable development goals. Because, CSR and sustainable development focuses upon three key areas- Health, Education & Environment or in other terms- People, Planet and Profit, and if number of stakeholders of the companies are limited for these goals, it means the corporate companies are not doing responsible business and do not follow business ethics and shy away doing involve more numbers of people or stakeholders and thus try to escape for spending more profit on corporate social responsibility activities to achieve the sustainable development goals.*

*Keywords: Sustainable Development, Stakeholders, CSR activities, CSR communication, Ethical Business, Digital Media, Website of Companies.*

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**INTRODUCTION**

Digital Media has become now a part of lifestyle and necessary tool of communication in our everyday lives. To reach the goals of “Sustainable Development” not only the government but the corporate companies also need to engage in “Corporate Social Responsibility” activities. After making the legislation of CSR in Indian Parliament, CSR Act.2013 & CSR Regulations, 2014, many companies now have engaged themselves in various CSR activities like health awareness, health camps, education schools, charity work, environment protection, renewable energy sources, etc.

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But to sustain these efforts, there is the need of continuous flow of communication among society members or stakeholders of companies and that will give the boost to these companies to make the strategies and invest more fund in CSR activities.

**What is CSR?**

Corporate Social Responsibility is not just a philanthropic or charity work done by the companies but it is also a tool for any corporate company for doing the responsible business and at the same time creating the positive impact on the consumers or society members or stakeholders of the company through its activities on social needs like health, education and environment related necessities and helping the government for these social issues by spending their profit share. In this process, it can work like a catalyst or morale booster for the companies to invest more in social causes and social development and expect the consumers connectedness with their corporate brands. Finally, in this way, CSR engagement create the Sustainability Scenario in all spheres of development process.

Thus, CSR can be defined as the duty of Corporate Companies by doing ethical business for contribution to the society, economic development and improving the quality of lives of their workforce- employees, their families and the whole society at the large. In fact, in this process, companies directly contribute into efforts of the Government for the sustainable development of the society and the nation at large. First time, the term- Corporate Social Responsibility was coined in 1953 in the publication of “Bowen’s Social Responsibility of Businessmen”. The World’s Business Council for Sustainability Development (WBCSD) defined CSR as “the continuous commitment by the business organizations for behaving ethically and contributing to the economic development while improving the quality of life or their workforce as well as their families, local communities and the society at large.”

In fact, corporate social responsibility is a comprehensive set of policies, practices and programs that are integrated into business operations, supply chains and decision making in the entire organization. Indian Parliament in its the Companies Act. 2013, clause 135, promulgates that all companies having an annual turnover of Rs.1000 crore or more or net worth of Rs.500 crore or more; or net profit of Rs.5 crore or more must implement CSR policy. The act enables the government to make it compulsory for the companies for spending 2% of their average net profit in the previous three years on various CSR activities mentioned in CSR regulations act. 2014, like Health, Education and Environment issues pertaining to society and country’s sustainable development process.

In the context of India, CSR policy and its implementation has become necessary but the corporate companies in India are still have to realise that CSR engagements are not only necessary for their business growth but also for building trust among their stakeholders and sustainable relationships with them and in this process, the CSR contributes into sustainable development of the society and the country at large.

**KEY AREAS FOR CSR ACTIVITIES-**

Considering CSR Activities just for charity or donations is the biggest mistake for any company in this highly business competitive environment. In fact, Indian companies should see as the integral part of corporate strategies that enable to enhance the brand image of the company. Now, CSR has been emerging as the valuable strategy for any company to survive in the competitive business environment.

There are several new factors are responsible for promoting CSR like, globalization, advancement in communication, sustainable development, governance, leadership, competitive advantage and ethical culture.

Indian corporate companies are involved these days in many CSR activities like Health issues- Hunger, Malnutrition, healthcare and sanitation ; Day care centres for children for underprivileged sections and specially abled children; Education for underprivileged sections for the society, granting of scholarships, financial assistance for education, Gender equality and empowerment of women, care for senior citizens, environmental protection and sustainability, protection of national heritage , arts and culture, philanthropies, rural development, adopting villages, and in natural calamity and disaster helping the government.

**REPORTING CSR ACTIVITIES AND SUSTAINING THE STAKEHOLDER RELATIONSHIP: -**

The Goals of Sustainability can be achieved when the reporting or communication of CSR activities are done for the consumers or stakeholders. The stakeholders or society members only can be associated or connected to corporate companies when they will communicate through various media about various CSR activities and only then the goals of sustainable development could become much easier. The key of CSR is “To Give Back” to the society, to take care of underprivileged ones by spending out of their profit from responsible and ethical business.

Even, corporate companies in India now have started to report or communicate about their CSR engagements via various media of communication but maximum companies are using one major media, digital media and their websites of companies. They do stay away from using all media like Newspapers, News magazines, T.V. channels, Radio, Films. The main reason behind this is the notion that corporate social responsibility activity belongs to charity or donations, it is not for publicity and communicating openly through various media would term it as publicity. And here the chain of sustainable development process gets broken as the notion behind this prevent to use CSR as a tool for branding and profit, so no more profit share are spent by the companies for CSR activities and thus, efforts for sustainable developments goals get hampered.

**OBJECTIVES OF THIS RESEARCH PAPER: -**

The prime objective of this research study is to find out whether corporate companies in India report or communicate their CSR activities to their stakeholders or consumers on digital media. The following are the key objectives behind this study-

1. To find out to what extent the corporate companies in India report their CSR activities on digital media platforms;
2. To find out, to what extent companies in India use all digital media platforms like News portal, News websites or only their official websites;
3. To find out what kinds of CSR activities are reported in detail on the digital media platforms;

Now, there is a need of clarification that the old perspective on CSR emphasized on Corporate Philanthropy which means charity for Social, Cultural and Religious purposes, while Modern Perspective emphasized on long term interest of stakeholders and sustainable development.

The objective of this paper is also to find out that why and how CSR communication is a necessary tool for any organization in order to achieve the sustainable development goals and for good governance in the society and the country by connecting the stakeholders and consumers to the company.

**METHOD OF THE STUDY**

Corporate companies in India now have realized for reporting their CSR activities in present time. To achieve the objectives of this study, the case study method is adopted here. Almost all corporate companies perceive the same notion for CSR activities, so it was found suitable the case study of one corporate company as a sample to arrive on the conclusions for the companies in India in this research study. "Mother Dairy" company has been selected as One Sample for the study and its region of the sample is Delhi NCR. The Data of this study will be primary as the company has given all data related to its CSR activities on their company websites.

For this study, primary data from the company website and secondary data in the literature reviews have been taken into consideration.

The data related to CSR engagements available on the website of the company, Mother Dairy, have been analysed for deriving the conclusions of this research study. Mother Dairy, the company has made available its all CSR related policy data, program data on the official website. Generally, the companies are supposed to provide the links of all other data of their CSR engagements communicated on other digital platforms on their websites. But what is the general status of all corporate companies in this regard, will be investigated and analysed by analysing the Mother Dairy CSR data on the digital media and on the official website.

**CURRENT SCENARIO OF CSR IN INDIA- A REVIEW**

The need of undertaking Corporate Social Responsibility by companies has been introduced in Section 135 of Companies Act, 2013 (official website MCA, Govt. of India). This section requires to read along with Companies (Corporate Social Responsibility Policy) Rules, 2014 and Schedule VII to the Act. Section 135 (website, MCA, Govt. of India) and it envisions that-

- (1) Those company having net worth of rupees five hundred crore or more, or turnover of rupees one thousand crore or more or a net profit of rupees five crore or more during any financial year shall constitute a Corporate Social Responsibility Committee of the Board consisting of three or more directors, out of which at least one director shall be an independent director.
- (2) The Board's report under sub-section (3) of section 134 shall disclose the composition of the Corporate Social Responsibility Committee.
- (3) The Corporate Social Responsibility Committee shall – a) formulate and recommend to the Board, a Corporate Social Responsibility Policy which shall indicate the activities to be undertaken by the company

as specified in Schedule VII; b) recommend the amount of expenditure to be incurred on the activities referred to in clause (a); and c) monitor the Corporate Social Responsibility Policy of the company from time to time.

- (4) The Board of every company referred to in sub-section (1) shall, – a) after taking into account the recommendations made by the Corporate Social Responsibility Committee, approve the Corporate Social Responsibility Policy for the company and disclose contents of such Policy in its report and also place it on the company’s website, if any, in such manner as may be prescribed; and b) ensure that the activities as are included in Corporate Social Responsibility Policy of the company are undertaken by the company. (5) The Board of every company referred to in sub-section (1), shall ensure that the company spends, in every financial year, at least two percent of the average net profits of the company made during the three immediately preceding financial years, in pursuance of its Corporate Social Responsibility Policy: Provided that the company shall give preference to the local area and areas around it where it operates, for spending the amount earmarked for Corporate Social Responsibility activities. Provided further that if the company fails to spend such amount, the Board shall, in its report made under clause (o) of sub-section (3) of section 134, specify the reasons for not spending the amount. Explanation. – For the purposes of this section “average net profit” shall be calculated in accordance with the provisions of section 198. Accordingly, every company – private company or public company, beyond the thresholds specified below is required to constitute CSR Committee: Net worth of Rs.500 crore or more; or Turnover of Rs.1000 crore or more; or Net profit of Rs. 5 crore or more during any financial year.

The Board of every company referred above shall ensure that the company spends, in every financial year, at least two per cent of the net profits of the company made during the three immediately preceding financial years in pursuance of its CSR policy.

Schedule VII of Companies Act, 2013 describes activities to be undertaken as CSR following:

1. Eradicating hunger, poverty and malnutrition, promoting preventive health care and sanitation and making available safe drinking water;
2. Promoting education, including special education and employment enhancing vocation skills especially among children, women, elderly, and the differently abled and livelihood enhancement projects;
3. Promoting gender equality, empowering women, setting up homes and hostels for women and orphans; setting up old age homes, day care centres and such other facilities for senior citizens and measures for reducing inequalities faced by socially and economically backward groups;
4. Ensuring environmental sustainability, ecological balance, protection of flora and fauna, animal welfare, agro forestry, conservation of natural resources and maintaining quality of soil, air and water;
5. Protection of national heritage, art and culture including restoration of buildings and sites of historical importance and works of art; setting up public libraries; promotion and development of traditional arts and handicrafts;
6. Measures for the benefit of armed forces veterans, war widows and their dependents;
7. Training to promote rural sports, nationally recognised sports, Paralympic sports and Olympic sports;
8. Contribution to the Prime Minister’s National Relief Fund or any other fund set up by the Central Government for socio-economic development and relief and welfare of the Scheduled Castes, the Scheduled Tribes, other backward classes, minorities and women;
9. Contributions or funds provided to technology incubators located within academic institutions
10. Which are approved by the Central Government
11. Rural development projects

Corporate Social Responsibility (CSR) is a concept whereby companies besides their profitability & growth also consider the interest of society and environment, by taking responsibility for the impact of their activities on stakeholders, environment and all other members of the public sphere. CSR is not same as philanthropy/Charity because CSR is not a selfless act of giving and companies derive long term benefits from the CSR initiatives. Globalization, Governments, Inter-Governments bodies (e.g. U.N., OECD, ILO) Advancement of communication technology, Awareness among stakeholders are some of the various factors which affect the CSR policy of companies.

Triple Bottom Line approach developed by John Ellington in 1997 represent the relation among Corporate, Society and Environment and how it works towards corporate sustainability.

### **LIMITATION OF CSR POLICY IN INDIA AT PRESENT**

No incentive if company pays more than 2% of net profit. Carry forward of such a contribution not being mentioned under the provision of CSR. It means if any of the company not able to spend 2% of average profit in any financial year so that expenditure not being carry forward for next year. Company does not have adequate profits or is not in a position to spend prescribed amount on CSR activities, the directors would be required to give suitable disclosure/reasons in their report to the members. It is not clear whether the Section 25 companies or charitable organizations set up by them would be included towards CSR. Contribution to the Prime Minister's National Relief Fund or any other fund set up by the Central Government for socio-economic development and relief and welfare of the Scheduled Castes, the Scheduled Tribes, other backward classes, minorities and women; provides a safe guard for companies which are not taking CSR initiative.

In the above perspectives of CSR guidelines given by Government of India, there is a need of examining how these CSR engagements or activities connect or relate to society members as consumers and stakeholders. Also, how the companies get morale boosting for engaging more themselves in CSR activities.

The answer lies in interactions and communication process among the corporate companies, governments and stakeholders that pave the way of sustainable development. In our research study, how the corporate companies are communicating to their consumers or stakeholders and what media of communication they are using, have been investigated through the case study of one sample company- Mother Dairy.

### **DATA ANALYSIS**

This study has chosen 'Mother Dairy' corporate company in the field of consumer food products as the sample of the universe and the website of this company as the digital media communication has been chosen for the data analysis.

Our study of data analysis given on the website of Mother Dairy has found that 'Mother Dairy' based its corporate office in Delhi NCR, India, has not separate page for CSR & Sustainability on the company's official website. The company states on its website about its CSR Policy statement, vision and mission, CSR scope and objectives. The company has also mentioned how its CSR board committee will implement CSR engagements. Finally, Mother Dairy, also mentioned on the website about reporting of CSR activities by the tool of annual board report in meeting and reveal this report to the public.

The Company, Mother Dairy, has not bothered about the various CSR activities or programs it organized in public for social causes on its official website. Why? The reason is obvious that the CSR policy of Mother Dairy does not assume CSR as the activity for sustainable development process, so CSR communication has not been given any place in the policy of the company.

Although, Mother Dairy has been communicating its various CSR activities- like Green Initiatives taken by the company for saving tons of plastic and using alternate resources through other medium of communication like it published via news report in "Business Standard", an English Daily, 20 July, 2013, but why the company has not posted this event on its official website. It is question marked on the intentions and assumptions of CSR initiatives implemented by Mother Dairy. Here, the company should have done better when it would have adopted CSR communication in the CSR policy.

The company has begun its safe and nutritious food for everyone in the society and its report was posted on the website of FSSAI which government website in the form of report is.

The company implements very few corporate social responsibilities programs occasionally but its report to only government agencies and only few coverages in print media do not make aware the general public about Mother Dairy's CSR engagements. So, here the company, Mother Dairy, lacks the vision in its policy regarding CSR and its communication to all stakeholders.

Mother Dairy website does not describe all CSR engagements and do not disclose what budget they have spent on it in the last three financial years. It is not proper following the regulations of CSR act. 2014.

Clearly, Mother Dairy, do not believe in using CSR activities as their strategic tool and for using in their brand enhancement. Even, the company is not following all rules related the CSR act.

The company has mainly focused on Health-related issues and safe and nutritious food campaigns which gives the way for advertisement for their products. These small camps and outlets when World Food Day organized

by Mother Dairy are very small initiatives of CSR taken by the company. But what about other CSR activities like Health, and Environment, and more?

Sometime company has organized campaigns for traffic awareness programs which was commended in media. But the surprising facts are Mother Dairy do not want to report or communicate all these widely on proper platform. Why? The answer lies in the intention and policy lack of Mother Dairy which prevents it to use CSR as the tool for brand enhancement and the tool for sustainable development process.

Digital media are now so accessible to all sections of society and the company can make its reach to all its stakeholders by using the tool of CSR, communicating CSR activities on various digital media website. But surprisingly, when Mother Dairy has not given on one digital media platform, its own website, enough report, various programs listing, budget spent, then what is the point? Mother Dairy will think of other digital media platforms like news media website, social media website like Facebook, twitter, etc.

There is certain kind of inhibitions the companies like Mother Dairy adopt while reporting or communicating about CSR. In the way, it is the kind of Reactive Approach of CSR communication the companies adopt while reporting their CSR engagements. Mother Dairy has not even bothered to use digital media as the tool for reaching to consumers and stakeholders and connect them for their company brand. The reason is not so simple. It is fear and inhibitions the company has for not communicating openly about CSR activities. But, in fact, it is wrong assumptions, wrong fear, and when Mother Dairy remove this fear and inhibition and do proactive approach CSR communication its stakeholders base will be more strengthened, and they will contribute more towards sustainable development process.

#### **DISCUSSION & CONCLUSION**

This study has focused upon the CSR reporting and communication done by Mother Dairy company in the last two financial years. The annual reports of the company in PDF form were found posted on various government websites, but the company has not dedicated any separate website for CSR engagement. It reflects the inhibitions of the company, Mother Dairy.

The above data analysis reflects that Mother Dairy has posted though the policy of CSR (posted on its website) but did not mentioned regarding the uses of various media platforms to communicate its CSR activities to its consumers, stakeholders and to the society.

This research study has proved that the Sample company- Mother Dairy, has not revealed to the public or society about its expenditure on CSR engagements. The company assume that they have submitted their report of CSR to the ministry of Company affairs in its annual general meeting of board and it is published in newspapers and is enough for stakeholder's connectedness with the company, No, it is wrong assumptions. When the companies do proactive communication on CSR openly among public media platforms the image of the company gets boosted among consumers and they support good causes for which the company engage in CSR programs.

Digital media presently give the opportunity for any company to connect consumers and stakeholders for taking support and spending their profits on CSR actually gives more return in future.

So, our study finds that Mother Dairy, has not conceptualized the CSR communication as a tool, using digital media as a tool for reporting CSR and communicating to consumers and in this way, the company is lagging to contribute towards sustainable development goals of the society and the government.

The objective of this research study- to find out why corporate companies do stay away from communicating their CSR activities in various media to their stakeholders conclude that the companies do hesitate for the public scrutiny and questions from media for their expenditure on CSR programs and details of the CSR engagements among public and to its stakeholders.

The study also gives the conclusion that corporate companies do not have honest intentions while taking on CSR and Sustainability programs in their business policy.

#### **RECOMMENDATIONS**

This case study derives some suggestions for the corporate companies and the governments in order to achieve the goals of sustainable development-

**First**, the Government (ministry of Corporate affairs), corporations, and experts and educationists in CSR field should come on common platform where the notion of CSR as a just charity or philanthropy could be replaced by CSR as "Business strategic tool", as tool for sustainable development goals and the tool for brand enhancement of corporations in India.

**Second**, the Government must come up with more stringent laws and regulations to make sure the corporate companies spend the minimum 2% of their net profit on corporate social responsibility activities and for sustainability programs to achieve goals of sustainable development in India.

**Third**, Corporate leaders and expertise must think over the concept of linkage of CSR and Sustainability programs with brand image of the company and must think the CSR expenditure as the investment for further creating more stakeholders in favour of the company.

**Fourth**, Corporate companies must emphasize upon the CSR communication by using various media channels and platforms and adopt pro-active approach of communication for reaching to all stakeholders and create ethical business environment in order to achieve sustainable development goals.

### LIMITATIONS OF THE STUDY

As the research topic suggest, our study was limited to one aspect of CSR, i.e. digital media communication for CSR activities. For the study, case study method was adopted and there are some limitations in case study method for the research. Only one sample in our research delimit the scope of our study and the results may vary for different segments of corporate companies. But, generally, as far as CSR communication is concerned, our literature reviews suggest that corporate companies do adopt negative and re-active approach and inhibit while reporting and communicating their all details of CSR activities.

This research study can be further investigated using “triangular method” and using two research methods to come arrive on more clear conclusions.

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**FUTURE OF MOBILE JOURNALISM IN INDIA**

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**ABSTRACT**

*Mobile Journalism (MOJO) is new trend in Indian media industry. The term MOJO has been in use since 2005. This term was originated at the fort myers news-press and then gained popularity throughout the Gannett newspaper chain in United States. MOJO is a solid proof that shows how media industry is changing rapidly. Prof. Marie Elisabeth Mueller says, "other media formats will die if they don't change." Basically Mobile journalism is a cheaper tool in comparison to recording by camera. It is very easy to cover stories with mobile phone however sometimes it is very challenging also. This is very small device so it does not attract security attention as a traditional film crew. MOJO made process of working very smooth. Researches reveal that nowadays cost cutting is an important factor in media houses all over the world. So MOJO is becoming very popular in TV Media Industry. In India, NDTV has initiated to cover many stories on mobile phones. Mobile phones are replacing TV also. Young generation is taking information on mobile phones. This a great tool for social media. In Journalism, this is useful because of its portability. Mobile phone is very easy to handle and to operate. This is all in one instrument for TV Journalism. JV journalist believe in MOJO because many things are done easily on mobile phones- recording the event, editing, sending, contact, taking information from internet, watching the news etc. Citizen journalists are also using mobile phones as MOJO. This research paper is focused to know the future of MOJO in India.*

*Keywords: Media industry, MOJO, recording, Fort Myers News-Press*

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**INTRODUCTION**

Now smart phone is not only a device for talking or exchange of messages but this has multi-faces use and MOJO is one of them. This has changed the definition of video production. Video production is time consuming and not so easy. It needs involvement of so many people.

MOJO is very helpful form to make video production at low cost. This is the reason why this is gaining popularity in media. This is faster, flexible and affordable also. This motivates journalists to work with their smart phones. Now mobile phone is very important equipment in media industry. This has changed the entire face of TV media.

The internet has helped media industry too much. Because of internet people are accessed to media easily. In the age of internet, the role of mobile phone has increased.

As per International Journalists Network website, "Mobile journalism (mojo) is a new workflow for media storytelling in which reporters are trained and equipped for being fully mobile and fully autonomous. Journalists, media companies and broadcast corporations are aware that there are several benefits of doing things this way."

**BACKGROUND**

Mobile news publishing involves many means of distribution, from customised news alerts by SMS or MMS to mobile news sites and convergent mobile news applications. Rima Marrouch writes: "Mobile phones are a crucial piece of equipment changing not only the way readers and viewers consume the news today but also sometimes the way the content is being produced. Mobile phone with a camera capacity is a product of the mid-1990s; video capacity came a few years later. Today, there are around six billion phones around the world, many of them smart phones. There was a moment in the recent history of journalism when mobile journalism (also called mojo) seemed to be the next big thing. The use of content recorded with a mobile phone kicked off with the iraqi invasion in 2003. Footage shot on a mobile phone were also important during the madrid bombings and in tsunami coverage. The peak of this type of media production content came during the 2005 london bombing."

**OBJECTIVE**

- To find out the importance of Mobile Journalism in present time.
- To know its role in future
- To know the reasons why it is why it is being adopted in media.
- To know more uses of mobile journalism in India.

LITERATURE REVIEW

MOJO is in early stage in India. Therefore very few researcher are focusing on this topic however research work on MOJO is going on all over the world.

Sajid Umair of National University of Sciences and Technology (Pakistan) has written a very good research paper with the title- ‘Mobile Reporting and Journalism for Media Trends, News Transmission and its Authenticity.’ In his research paper he analyses- “Mobile reporting is defined as generating reports using mobile phone cameras and digital cameras. Most of the mobile reports are citizens generated. Whenever an incident happens, citizens capture live and send it to reporting authorities or share it on social media. Social media i.e. twitter, facebook are the most common and largest means of spreading any news or incident. Before the advent of these platforms, only radio and news channels were the basic source of incident reporting. Nowadays, more content related to any incident can be found on internet rather than TV channels and radio channels. Mobile technology has changed broadcast journalism rapidly.”

Nishant Nayyar has written a write up titled ‘Mobile Journalism – the new trend in Media.’ He analyzed many factors- “MOJO is doing more than just changing how news is gathered, packaged and distributed by professionals. It is also democratising the role of reporter. For example, the video streaming applications make it possible for almost anyone to broadcast an event live, with little or no editorial filter. The whole content is so raw and original that any independent journalist or a blogger has the opportunity to create news. But this journalism threatens the big media houses who are accustomed to vetting and analysing every story before it goes public. Reporting has always been a collaboration between the journalist and their sources. But with the introduction of MOJO, the scope of the sources has been altered altogether.”

A research article- ‘Mobile Journalism as Lifestyle Journalism; Field Theory in the integration of mobile in the newsroom and mobile journalist role conception’ written by Gregory Perreault and Kellie Stanfield has many angles- “Mobile journalism is one of the fastest areas of growth in the modern journalism industry. Yet mobile journalists find themselves in a place of tension, between print, broadcast, and digital journalism and between traditional journalism and lifestyle journalism.”

‘Mobile journalism and the deprofessionalization of television news work’ is a research article written by Justin C. Blankenship. He has pointed out- “Mobile journalism, whereby a single reporter must write, shoot, and edit their own news stories, is a rapidly growing trend among local television news organizations in the United States and around the world. Using qualitative case study methodology, specifically in-depth interviews and observation, this study compares “mobile journalists” with journalists working within a traditional television news crew, in which a reporter concentrates on the writing and interviewing aspects of newsgathering and a videographer concentrates on the audio/video production.”

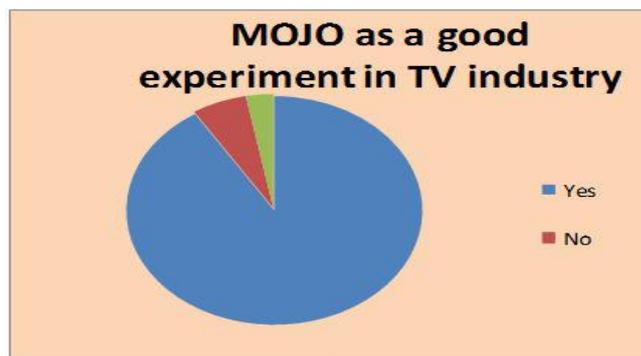
METHODOLOGY

This is an analytical study. As primary data, a survey has been conducted to know why mobile Journalism is becoming popular. Near about 200 TV journalists including MOJO journalist were part of the survey. Apart from this, secondary data from different sources as research papers, articles published in journals, magazines, newspapers, websites have been collected.

Analysis & Discussion

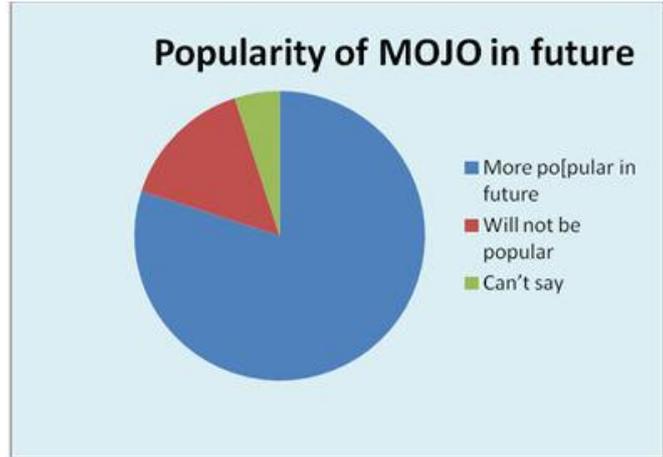
1. Do you think that MOJO is a good experiment in TV industry?

- (i) Yes-----91%
- (ii) No-----06%
- (iii) Can’t say-----03%



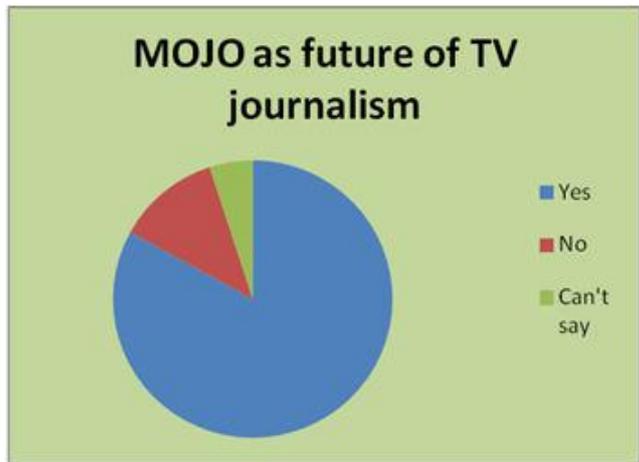
2. What is your opinion about the popularity of MOJO in future?

- (i) This will be more popular-----80%
- (ii) This will not be popular-----15%
- (iii) I can't say-----05%



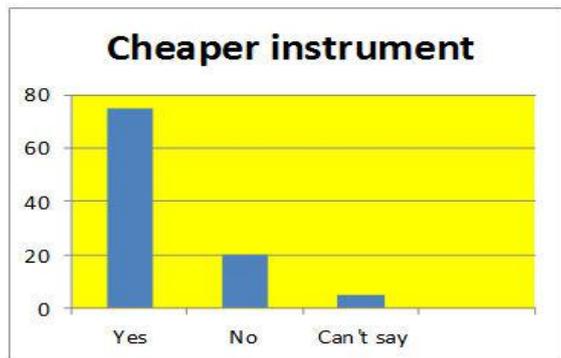
3. Do you agree that MOJO is future of TV journalism?

- (i) Yes-----83%
- (ii) No-----12%
- (iii) Can't say-----5%



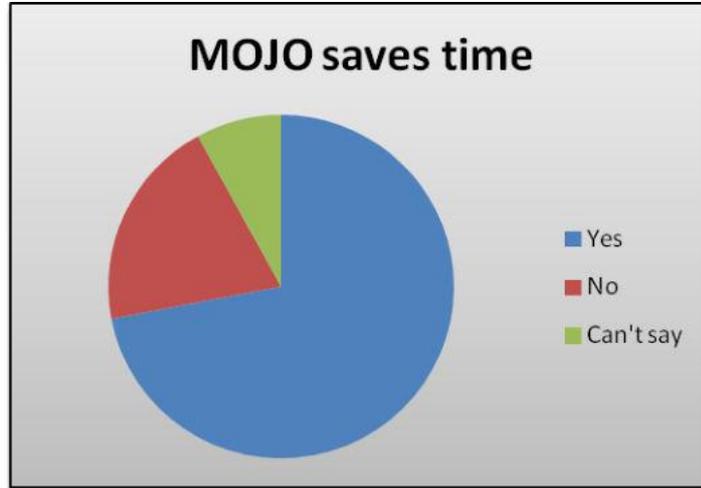
4. Do you think that MOJO is used in TV channels in India because this is cheaper instrument in comparison to heavy video cameras?

- (i) Yes-----75%
- (ii) No-----20%
- (iii) Can't say-----5%



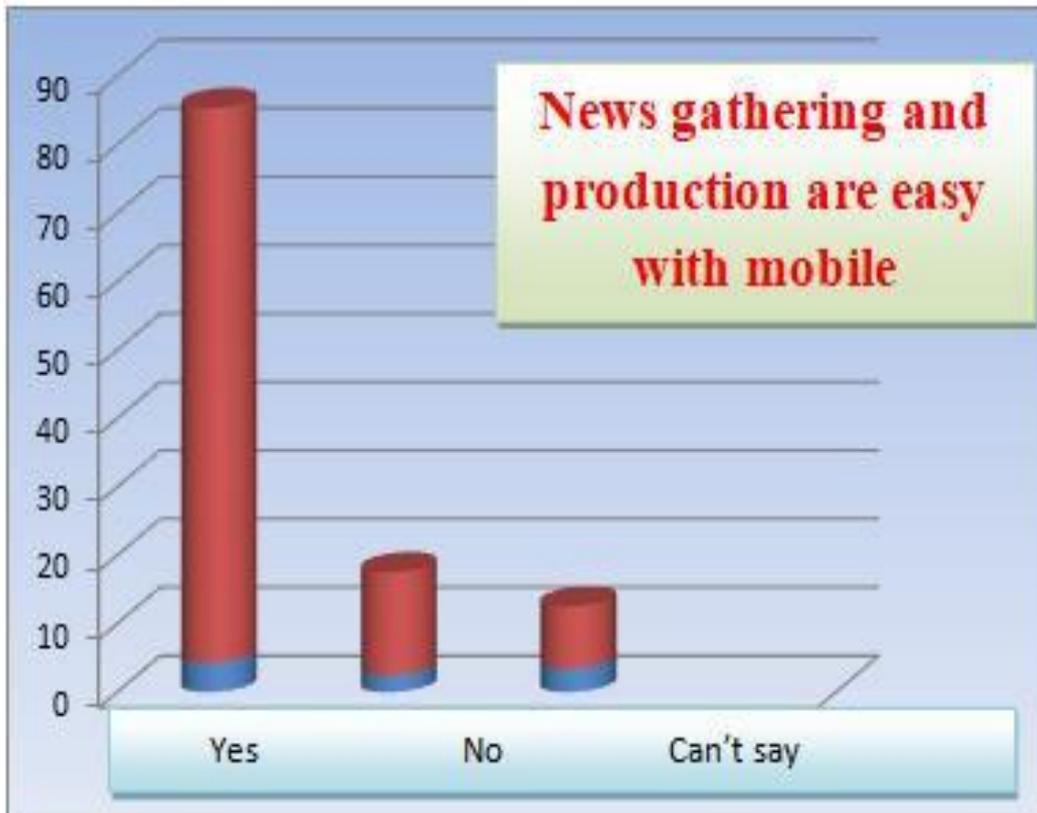
5. MOJO is suitable for TV journalism because this saves time. What is your opinion?

- (i) Yes-----72%
- (ii) No-----20%
- (iii) Can't say-----08%



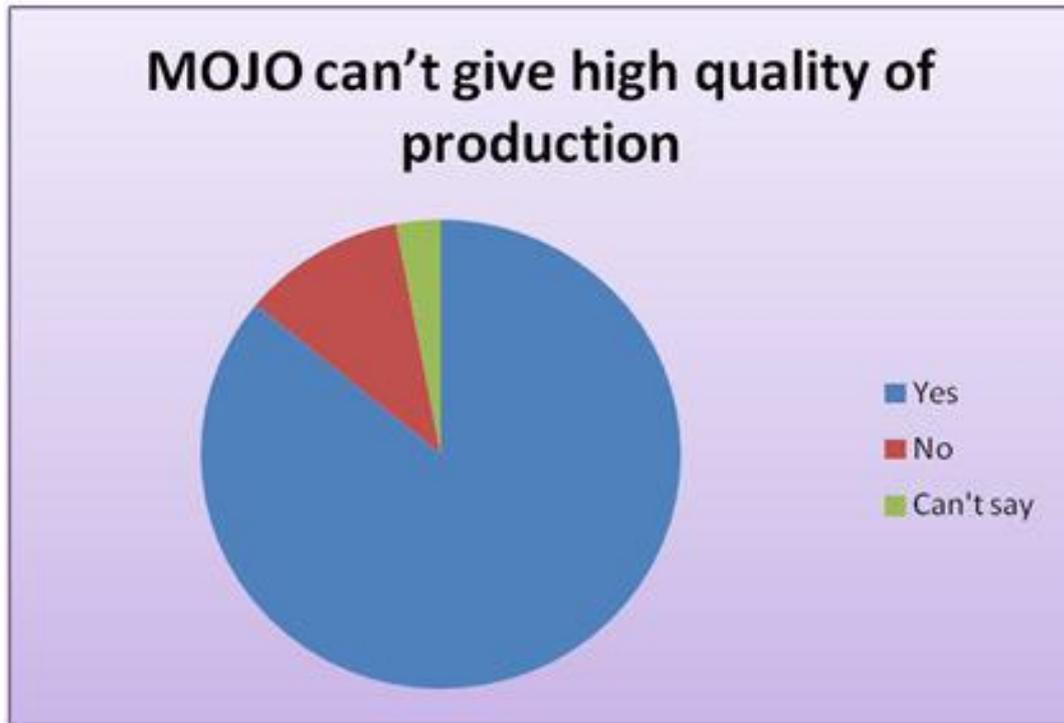
6. Do you agree that news gathering and news production are easy with mobile?

- (iv) Yes-----81%
- (v) No-----15%
- (vi) Can't say-----09%



7. MOJO can't give high quality of production. What is your thinking about this?

- (i) Yes-----86%
- (ii) No-----11%
- (iii) Can't say-----03%



### FINDINGS AND CONCLUSION

A survey was conducted to know many questions about MOJO. TV and mobile journalists participated in the survey. On the basis of analysis of survey report, followings are the results:

- 91% people think that MOJO is a good experiment in TV industry.
- 80% people think that MOJO will be more popular in future.
- 83% journalists agree with the point that MOJO is future of TV journalism.
- 'MOJO is used in TV channels in India because this is cheaper instrument in comparison to heavy video cameras.' This is the opinion of 75% journalists.
- MOJO is suitable for TV journalism because this saves time. 72% journalists think so.
- 81% journalists agree that news gathering and news production are easy with mobile.
- 86% people say that MOJO can't give high quality of production? What is your thinking about this?

MOJO will be more popular in India. This has many features- low cost, easy to handle, time saving, money saving etc. In spite of these all, sometimes it does not maintain quality.

### MANAGERIAL IMPLICATION

Advanced technology of mobile phone will change the working style of journalists and the nature audiences to consume content. This research will be very helpful for media people, reports, video editors and audience also. The media houses can manage their costs after reading this research paper. This study can help citizen journalists also.

### LIMITATIONS AND RECOMMENDATIONS

The video from a mobile phone camera can be almost identical in quality. So this is a problem with MOJO. There are many other challenges to keep in mind:

- Mobile phone quality
- Lens quality
- Steady shots
- Audio
- Light
- Frame.

Another research work can be conducted to know the opinion of audience.

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**INDIAN HINDI CINEMA PROMOTIONS AND MARKETING THROUGH DIGITAL MEDIA**

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**ABSTRACT**

*Advanced media is PC mediated innovation that permits us distinctive manifestations and sharing of thoughts, considerations, data, profession intrigue and numerous different things as articulation through the PC arranges. Its web-based application and encourages the improvement of informal online organisations by associating the client's profile. Facebook, Twitter, and other versatile applications are assuming a critical job in film advancement. Film advancement has been currently considered as essential as real the creation of the film. The film has additionally begun using the capability of new media entirely as far as showcasing and advancements. It has utilised the new press just as web-based life gathering to make individuals mindful of the film and to drive them towards the theatre. It is where a positive meeting are accessible. Presently through electronic media, it's conceivable to make everything likely just in a single tick, and it will reach to the correct target gathering of people. Computerised media creates as an essential piece of the excellent target film going a group of people.*

*Keywords: Four P's of Film Marketing, Digital Media, Film Promotion, YouTube, Facebook, Twitter.*

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**INTRODUCTION**

Computerised media advancement is a procedure for improving digital media like YouTube, Instagram Facebook, Twitter. It is a procedure of picking up consideration through various social locales. For example, Facebook is a social site where anybody can share, as and remark on photographs, recordings though twitter resembles where short messages are distributed. In contemporary time numerous movie producers and promoting organisations are utilising distinctive social locales for the fabulous guarantees of their item. For a similar reason, current movies are going to use these social locales to advance their films at a quick pace. Recordings are intended to influence the gathering of people. Film industry makes a film and needs the group of onlookers to pay and watch them. In contrast to different types of innovativeness, it is hard to anticipate slants in the motion picture industry. As the film business is profoundly unstable, the way toward disseminating and showing film has progressively moved toward becoming as vast as the original film making process. Marketing as a field of training, however combative, is considered continuously as enormous as the real creation of the item. Like each other part, the motion picture industry is likewise holding onto showcasing as its first segment like the original film making process. Advancement is a fundamental piece of any discharge as it includes high budgetary hazard. Without legitimate showcasing of a motion picture, a motion picture with ridiculous plots, characters, sets neglect to draw in a group of people. Showcasing, more or less, is selling and promoting. With time, it has reshaped its fringe to incorporate fulfilling client needs, advancing items productively and making esteem loaded trade with clients. Supporting hence is to put the correct thing at the convenient spot and at the perfect time. The '4 P's' are the components of promoting and most likely the best-known method for concocting a showcasing plan. They are an item, value, advancement, and spot.

**4PS CONCEPT APPLIED TO THE FILM INDUSTRY****I. PRODUCT**

The film is considered as an item that is expected to fulfil its takers, for example, gatherings of people. A fruitful advancement and advertising plan of the motion picture should begin with making the substance, for example making the film. A dynamic content bolstered by an original screenplay is in the core of film advancement as it chooses the last gathering of people who are heading out to watch the motion picture in theatres. Albeit different components are essential in promoting the system, the item film ought to be considered as most noteworthy in illustration the consideration of the crowd.

**II. PRICE**

For a group of people, the estimating structure is the thing that he pays in the performance centre for a ticket. Components too which result in many returns for the maker, the wholesaler, and even the critical, innovative ability. Parts incorporate Theatrical discharge schedules<sup>[1]</sup> Territories and market segments<sup>[2]</sup> Revenue parts, rates and request of instalment Promotion and so on. Promotion spending plans Besides there is a broad scope of valuing structures, for example, showy tickets, aggregate 4-divider rentals, title rentals, title deals, exceptional discharges, membership administrations, celebrations, DVD composes, downloads, postponed communicates, pay-per-see, licenses, packaged arrangements, link stations and now films and recreations on mobile phones, on iPods, on electronic bulletins and so on.

**III. PROMOTION**

- ❖ Advancement for movies takes numerous structures:
- ❖ Print publicising (notices and promotions in papers and magazines)
- ❖ Trailers (screened at films and on Television/radio)
- ❖ Web destinations (counting Facebook 'fan' pages)
- ❖ Marketing — books, shirts, sustenance, soundtrack <sup>[L]</sup><sub>SEP</sub>CDs, PC amusements, toys, vehicles, cell phones, whatever can be related to the brand of the film.
- ❖ Viral Videos

**IV. PLACE**

With the appearance of innovation, the 'Spot' isn't constrained to the theatre or conventional transmission. Presently it is open effectively through an assortment of modes like pay per see through direct-to-home communicate, over the web, through person to person communication destinations, mobile phones and other handheld gadgets, co-marking and marketing, music CDs and DVDs, etc. The computerised renaissance has opened plenty of stages, systems and organisations than any time in recent memory as RSS channels, Blogs, devoted sites, diversion destinations, portable applications and so on to get the motion picture 'Item' as and when required.

**YOUTUBE IS THE BIGGEST PLATFORM FOR FILM PROMOTIONS**

A short time later, the motion picture is made, the maker of the film sees how to advance the, so it gets along nicely in the cinema world. YouTube is the most noteworthy computerised media stage that connects with a large number of a gathering of people who watch recordings every day. A YouTube crusade is a savvy method for elevating the motion picture to a focused on a set of a group of people. The promotion that relates the storyline or the in the background features can be shared on YouTube to catch the eye of the watchers. These days different films are being advanced on YouTube before their discharge. The enhanced visualisations, music and the dynamic voice that relates the storyline trap the group of onlookers while viewing the promotions. The public interview recordings where the performers share their encounters while making the motion picture, computer games where the players experience the characters in the film, blame in the movie are different ways one can hold the consideration of its gathering of people. Sharing such substance on YouTube has turned into a primary device for getting a presentation for the new discharge. Promotion of the following motion picture in the performance centres is not adequate to make an imprint in the cinematic world. Computerised media bolsters in alluring the watchers in the film and produces energy around it before it discharges.

**FAMOUS PEOPLE PROMOTION MOVIE ON FACEBOOK & TWITTER**

Crafted by motion picture advancement on Facebook isn't merely restricted to computerised advertisers. Indeed, even big names who are a piece of the motion picture utilise the advanced media stage to interface with their group of onlookers. The watchers of today need to know everything identified with the motion picture performing artists and the creation of the film. Facebook and Twitter help the on-screen characters to draw near to their fans. The fans pursue the VIPs Facebook profiles notwithstanding amid the days the film is being made. Bringing in the group of onlookers amid the creation of the film, uncovering data identifying with shooting areas, looks and outfits is a conventional method to catch their advantage. Famous people's Twitter profiles additionally go far in creating interest and interest in the motion picture. By connecting with the group of onlookers amid the creation of the film, giving them a chance to encounter the story, making inquiries, fun exercises, or by sharing one's very own inclination about the motion picture' the VIPs can help in motion picture advancement on Twitter.

**FILM PRODUCTION FOR PROMOTION**

We turned to Hub Spot for a few statistics to help outline exactly how popular video promotion has become.

- ❖ The Video is projected to claim more than 80% of all web traffic by 2019.
- ❖ Adding a branded video to promotion emails can boost click-through rates by 200-300%.
- ❖ Embedding videos in landing pages can increase conversion rates by 80%.
- ❖ 90% of customers report that product videos help them make purchasing decisions.
- ❖ Digital promotion expert James Mc Quivey estimates that a single minute of video content is the equivalent of 1.8 million words.

- ❖ A third of all the time people spend online is dedicated to watching videos.
- ❖ According to YouTube, mobile video consumption grows by 100% every year.
- ❖ 64% of customers are more likely to buy a product online after watching a video about it.
- ❖ 87% of online marketers are currently using video content in their digital promotion strategies.
- ❖ Video ads now account for more than 35% of all ads spending online.
- ❖ 59% of company decision makers would rather watch a video than read an article or blog post.

### **REASONS FOR FILM PROMOTION TODAY**

The five benefits of video promotion are as follows:

**1. Video content advances brand commonality:-** As per Hub Spot, 80% of clients recall a video they've viewed in the most recent month. Video advancement is very visual and sound-related, which is by all accounts the way to its prosperity – it's simple for most clients to recall than content based substance. A client who recollects your video advancement content perceives your image, which at last means more deals for you. Remember; clients will usually like and share recordings they appreciate, which will extend your online reach. The way to making your recordings as paramount as conceivable is guaranteeing you're keeping them by your image character. Keeping hues, text styles, logos and tone the equivalent in your video advancement as they are in your sites and articles. Even though recordings accomplish things composed substance doesn't, clients should also now be acquainted with the style and organisation of your image's online records.

**2. Video advancement – Boost your site's SEO:-** 65% of organization chiefs visit the source site subsequent to survey a marked video. Along these lines the quality and pertinence of video advancement substance can drastically improve your site's SEO by directing people to your landing page. Video can likewise upgrade your transformation rates: Hub Spot reports that 39% of organization leaders contact the suitable outlet subsequent to review their marked video. The expansion of video to your site and substance will improve your organization's SEO esteem and lift your navigate rates significantly.

**3. Marked Video substance can help support your image message:-** By using branded video in your computerized advancement procedure, you have the ideal apparatus to improve your image's message and make your voice heard. Straightforward highlights like plan and marking, to further developed highlights like voice and substance, video advancement is the ideal method to fortify your image personality and ensure that your clients know your identity.

**4. Marked Video substance can be streamlined for all gadgets:-** A standout amongst the most noteworthy patterns driving the advanced advancement train is a responsive plan. An organization whose content doesn't perform well on a given gadget or program loses traffic and endures diminished transformations accordingly. Luckily, video content is fit for utilization on all gadgets, extending from PCs to cell phones. This grows the video's scope and makes it more easy to understand and purchaser cantered.

**5. Branded video content is just waiting to go viral:-** Ongoing insights propose 92% of individuals who devour portable recordings share them with others. This ramifications of this is stunning, which means video content has a higher offer rate than practically all different kinds of material out there. Figures from Simply Measured demonstrate that video is shared 1,200% more than connections and content joined. Rendering to Diode Digital, 60% of watchers will participate in a video posted before a content post. Since of this, video content is an integral asset for any brand that needs to extend its achieve on the web or appreciate more extensive groups of onlookers. Because of its viral nature, straightforward availability and implicit esteem, marked video generation emerges as the most intelligent approach to approach content advancement in 2018 and past. Customized substance can really affect your gathering of people, and the proof proposes video advancement is the most ideal approach to accomplish this. The capacity to make feeling driven deals is the mystery of its prosperity – clients need to feel directly about their decision and video advancement when done effectively, is the most ideal approach to make this inclination.

### **SIGNIFICANCE OF COMPUTERIZED PROMOTION IN FILM INDUSTRY**

The film business is normally on an articulation out of new and propelled advancement methods to advance a motion picture and focus on a mass gathering of people. Today film advancements have gone past discharging the mysteries and trailers for the film in the theatres. The advancement group spends tremendous endeavours to plan very much organized film advancement procedures with the goal that they can get the gathering of people lining up to purchase the tickets. Advanced advancement in the film business is turning into a successful

method to get the group of onlookers included and build up a solid individual association with them. Computerized advancement scope includes live gushing of music dispatches, Google joint with the group, advanced media challenges, motion picture based amusements, computerized ads on YouTube and so forth. The best advantage of utilizing this medium is that the supportiveness of the system can be easily moderate utilizing execution related measurements. This assists the advanced advancement specialists with making quick choices for the arrangement so they can diminish expenses and increment the viability of the advancement battles.

### CONCLUSION

Online networking, in the ongoing situation, is viewed as a distinct advantage as opposed to passing pattern as a result of its intuitive power. Meeting of various parts of the press is a present pattern in the field of correspondence. Joining alleged customary media with new computerized correspondence gets a progressively viable outcome on the gathering of people. Bollywood big names are currently moving towards computerized media stage for advancing their movies. They post about their up and coming motion pictures from their own Facebook, YouTube, Instagram or Twitter record to get a more and more extensive crowd. Advanced media is currently effectively and logically utilized for the advancement of Hindi film. Bollywood film makers figured it would enough to promote on advertisements, TV and print media. Be that as it may, with the presence of multiplexes, films keep running in theatres for scarcely one to about fourteen days. In this manner an advancement Hindi film through computerized media has anticipated significance. This stage is additionally useful to make advancement increasingly alluring without spending a lot on it; this even the reality why movie producers depend on computerized media stage to advertise their film. Blogging and Twitter is another case of advancing movies by lead performers by Hashtag something what they compose on their divider. The flashed messages over Blog and Twitter make individuals eager to go to the performance centre to watch the motion picture. Executives and makers additionally share their motion picture making encounters and difficulties they needed to experience through computerized media stage; they transferred behind the scene of the film. This was the most energizing method for motion picture advancement in computerized media. The outcome turns out as high ticket deals.

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**THE ROLE OF DIGITAL MEDIA IN THE ACADEMIC DEVELOPMENT OF JOURNALISM AND MASS COMMUNICATION STUDENTS, DELHI**

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**ABSTRACT**

*In the millennial days, the digital media has gained its credibility in different fields like development, business, education etc. There is no doubt that digital media plays an important role in student's life. Digital media is a boon in this era as it continuously grows and made the things easier for everyone. Students from every field rely on digital media and spend their maximum time on it. The digital media is witnessing a change from traditional talk and chalk method to newly invented concepts. This study mainly focused on the students of journalism and mass communication and their academic development in the wide presence of digital media. This research assesses the impact of digital media on the academic development of journalism and mass communication students. The first objective of this research is to study the awareness level of digital media amongst journalism and mass communication students. Second objective is to identify for which reason journalism and mass communication students use digital media. Third objective is to study how the students use digital media for educational purposes and fourth objective is to study why they using digital media to develop and showcase their skills. The quantitative research method used in this study with the help of questionnaire tool for finding the above objectives.*

*Keywords: Digital media, Academic, Development, Journalism, Mass communication, Student*

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**INTRODUCTION**

Now-a-days the significance of digital, Internet-based information and communication systems in education and training is increasing rapidly. The digital media platforms are increasingly used in all the areas of education and have requirements and consequences for the individual and society as a whole. Digital media is becoming the need of the hour with more and more businesses whether educational or non-educational ones entering into the world rapidly. It plays a very important role in today's scenario where everything is technology based, digital media gives us the assurance of instant information, less amount of time and it is easily available for everyone.

The academic sector for students has seen changes over the years, but in the last few decades, the digital technology has completely transform the way students learn in the classroom and it even introduced the learning method beyond the classrooms. All the way from primary school up to university, students are introduced computing skills and are encouraged to have their own laptops, giving them instant access to all sorts of information. In simple words, digital media developed a world where everything is easily available whether it is entertainment or education. Especially the youth which is known as the internet generation is too much into the digitalization and adapt the new technology very quickly. Hence, the contribution of digital media in the academic development for the students of every field is absolutely commendable.

The students of journalism and mass communication are using the digital media for every possible purpose which directly helps them to develop in their academics as well as enhance their skills and talent. Now their worldwide future is developing through the communication, collaboration and innovation, all of which are dependent on the digital media.

**OBJECTIVES OF STUDY**

- To study the awareness level of digital media among journalism and mass communication students.
- To identify for which reason journalism and mass communication students use digital media.
- To study how the students use digital media for educational purposes.
- To study why students using digital media to develop and showcase their skills.

**RESEARCH QUESTIONS**

On the basis of objectives, there are the following Research questions:-

- What is the awareness level of digital media among the students of journalism and mass communication?
  - Why do the students of journalism and mass communication use digital media?
-

- What are the reasons for using digital media for educational purpose?
- Why are the students using digital media to develop and showcase their skills?

### REVIEW OF LITERATURE

Glhan Wikramanyake (2005) stated in his research study digital media is a “key component” of education. He found that students show keen interest in learning through digital media and enhanced their skills by their effective effort in the new form of learning. He highlighted that the technology will engross the whole world very soon in a way that become the most used problem solving medium.

Professor Dr. Linda Steiner (2012) wrote his thesis on topic “Social media instruction in journalism and mass communications higher education”. He examined that in what ways social media is being utilising at university level journalism program throughout the country. This research largely concludes that many journalism programs are lacking in social media instruction, use and implementation. Main findings are categorized by curriculum changes at the undergraduate and graduate levels, social media presence of journalism programs throughout the country, top ten journalism programs and their instruction and utilization of social media, best educational practices in social media. He also suggested that the programme should pay more focus on new technologies and skills.

Aisar Salihu Musa, Mohd Nazri Latiff and Nur Salina Ismail (2015) according to their study the usage of social media has been increased at a great speed in the higher institutions. The popularity of social networks changed the way of communication, interaction, investigation and socialisation. Their study was based on the student’s awareness and the usage of social networks among the students of mass communication. Their study claimed that the majority of using the social networks for the collection of data and information and also for the interpersonal communication. According to their study, “Nowadays the students are too much into the social networking and it is really difficult to find the student who is not aware of social media and have at least using one social networking site”. Social media plays an important role in the life of students and their day to day activities revolve around the social media platforms. It also stated that social networks can be used in a beneficial way as the respondents also used it to support their academic activities and also to make friends from far places, report and share information, conduct researches and socialize themselves in the learning aspect. The study stated that the educators of mass communication should introduce the courses of social media in the same field for the mass communication students so that they can devote their most of the time for the study purpose instead of other activities which can be more beneficial for their development in education sector. So that’s how the role of digital media in the development of mass communication students has the great impact.

Raymond Owusu Boateng and Afua Amankwaa (2016) in their research paper stated that the rapidly rising of social media is significantly influencing the academic life of students. The title of their research is “The impact of social media on student academic life in higher education” in which they found out that at least every student makes use of one social media or in other words students are more inclined towards their social media appearance. Their study revealed that the participants are in support of the idea of social media and also agree that it creates a great impact in their academic performance. They also highlighted that social media has been accepted by higher institutions making it a platform where students connects with teachers, fellow students and other higher authorities.

Norazilah Saubari and Mohammad Fazli Baharuddin(2016) conducted the research on the digital literacy awareness among the students in which they stressed on the ways of developing the knowledge performance towards by practicing good skills to deal with appropriate digital tools and also aware with different digital tools which can be used in digital literacy. They highlighted in their study that digital literacy is generally used in the real life for knowledge seeking purpose. The main advantage of digital literacy is that students gain knowledge, information and develop skills even without getting bore which simply indicates that monotony cannot be the barrier in the digital literacy. Students find it more interesting and willingly want to participate in the internet based activities because of the video, animation and sound provided. They also emphasised on the other tools of digital technology like it provides good search engines and other digital platform which is beneficial for both academic and other skills aspects. Their study mainly highlighted that the digital literacy made the things interesting for the students to seek knowledge which can less the burden and increase the willingness to participate in the new technology learning method.

Mohammad Faizil Baharuddin (2016) wrote in his research that digital media especially online surfing, social media develop the various skills, increase the knowledge practice, boost the good communication skill and also disseminate and practicing real information seeking method without having monotony. From the internet based tasks students indulged more because of the video, animation and sound provided. Digital technology also

facilitates good search engines which student can explore, like Google translator, wikis, online dictionaries and even more. However, to fully utilize the digital literacy, the student must master the technology skills. Students must put an effort to explore the digital content sites to gain information for a specific purpose. Students need to know the right way to use the technology, such as skills of writing, knowing a little bit about the interface search engine, ways to use the systems and using the social media. Thus, this study has highlighted the on-going and growing concern for students to aware about the digital literacy which can less your burden for knowledge seeking approach and the new technologies learning method.

Apoorva Trivedi and Rajshree Srivastava (2018) in their research article “An impact of digital technology on academic sector” stated that at a very large scale technology made the various things easier and reduce the hard work which was contributed by the students to gather unlimited written books and journals for acquiring knowledge .They also stated that new technology provides the huge amount of information and helps in learning the new things with the innovative way especially on handy devices and cell phones which means new technology has the easy accessibility. In the article, they also highlighted the teacher’s performance based on technology thus, not only for students but technology plays an important role in teacher’s job also. Students who want to achieve master’s degree and higher education but facing physical and geographical barrier, advance technology made it possible for them to achieve it easily.

**RESEARCH METHODOLOGY**

Quantitative method is chosen for this research. Data was collected using primary data set through the distribution of questionnaire through Google forms among the journalism and mass communication students.

**DATA COLLECTION**

The research made a comprehensive study of various secondary data available which described the digital media academic growth in mass communication field especially in education. The study also employed primary research method and a survey has been conducted on Delhi journalism and mass communication students by employing Questionnaire.

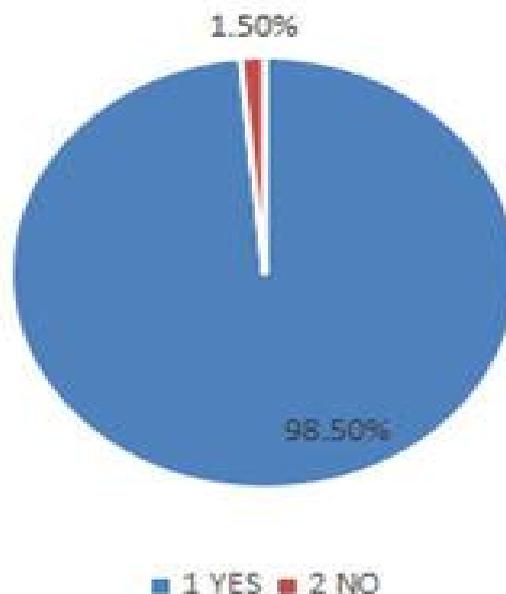
**SAMPLE DESIGN**

The study employed Survey methodology in the form of questionnaire distributed through snow ball sampling method. Google forms were sending to 250 respondents but only 205 responses received through Google forms.

**RESULTS AND FINDINGS**

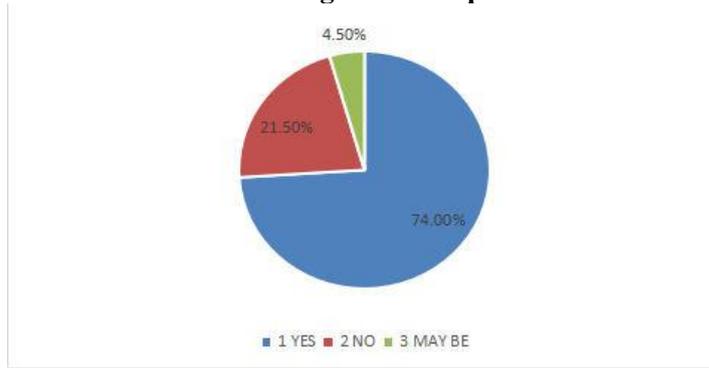
The questionnaire have distributed among 250 students of journalism and mass communication, out of them researcher have received 205 responses and in which 2 respondents skipped some questions so the researcher got 203 responses from the respondents. The demographics were 50.7% (n=103) females and 49.2%(n=100) males. The majority of the respondents were varied from 20 and 22 years old and 33.3% (n=67) respondents were in the range of 21 years old.

**Question 1: Do you use digital media?**



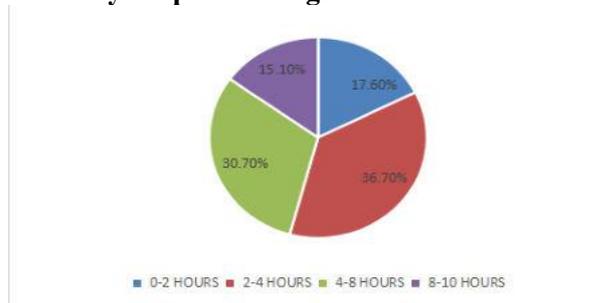
The above data reveals that, 98.5% of the respondents use the digital media while only 1.5% does not use digital media. This clearly shows that the majority of the respondents use the digital media.

**Question 2: Are you well aware of different digital media platforms?**



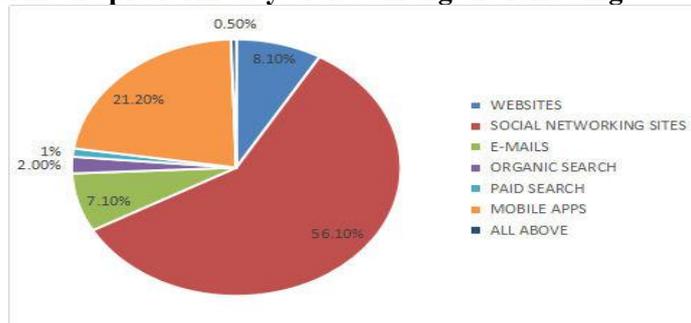
The above data reveals that 74% of the respondents are well aware of different digital media platforms while 21.5 % of the respondents are still in doubt and 4.5% of the respondents are not aware of different digital media platforms. So this shows that the majority is well aware of different digital media platforms.

**Question 3: How many hours do you spend on digital media?**



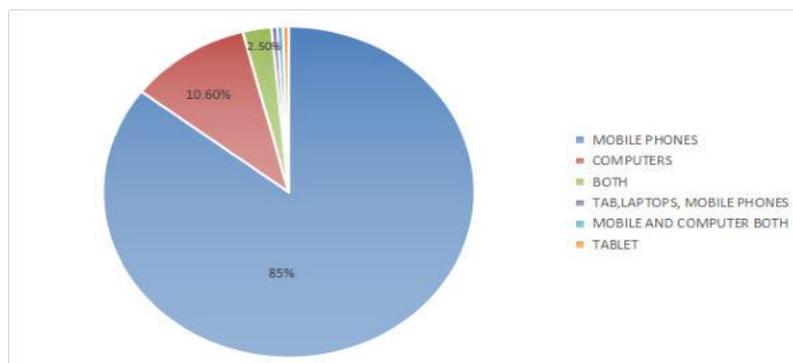
The above data shows that 36.7% of the respondents spend 2-4 hours on digital media , 30.7 % of the respondents spend 4-8 hours , 17.6 % of the respondents spend 0-2 hours and 15.1% of the respondents spend 8-10 hours on digital media. So the majority of the respondents spend 2-4 and 4-8 hours on digital media.

**Question 4: Which digital media platform do you use among the following?**



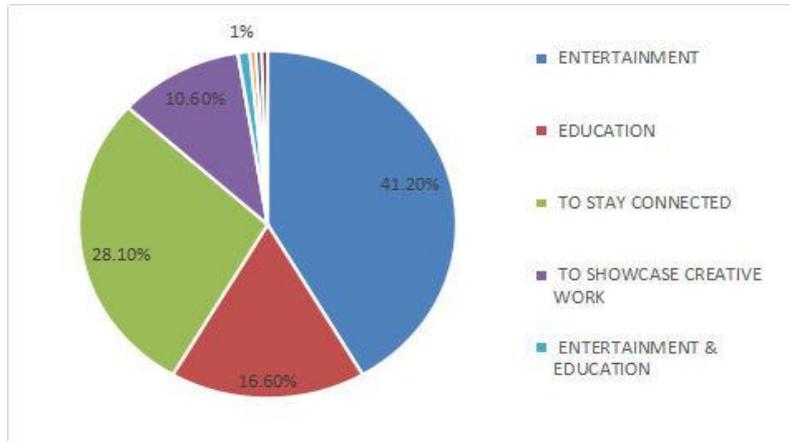
This data reveals that, 56.1% of the respondents use social networking sites while 21.2% of the respondents use mobile apps and 7.1 % of the respondents use E-mails. This data clearly demonstrates that social networking sites are most used platform among the other digital media platforms.

**Question 5: How do you access digital media?**



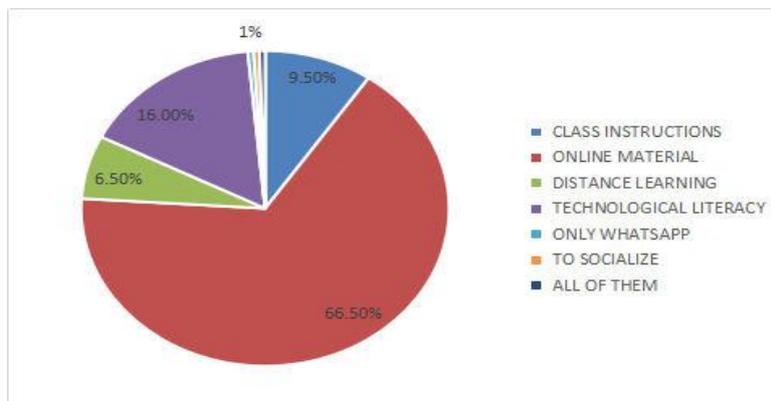
The above data indicates that 85.4% of the respondents access the digital media through mobile phones whereas 10.6 % of the respondents access the digital media through computers and 5% of the respondents access the digital media through both the devices so the study indicates that the majority of the respondents access the digital media through Mobile phones.

**Question 6: Why do you use digital media?**



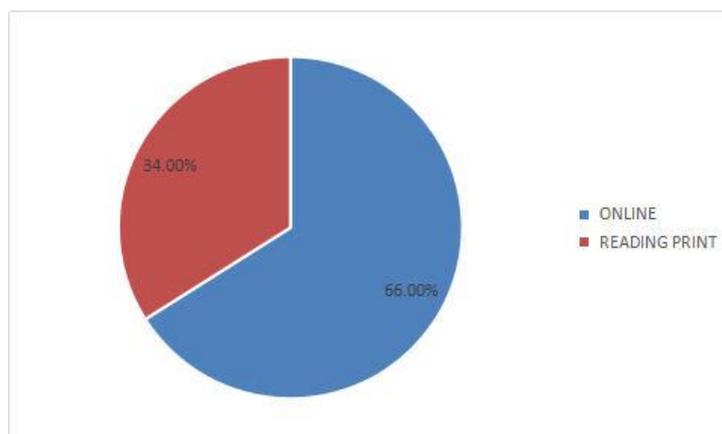
The above data indicates that 41.2% of the respondents use digital media for the Entertainment, 28.1% of the respondents use digital media to stay connected, 16.6% of the respondents use digital media for the Education and 10 % of the respondents use digital media to showcase their creative work So that reveals the majority used digital media for the entertainment purpose and also to stay connected.

**Question 7 : How do you use digital media for educational purposes?**



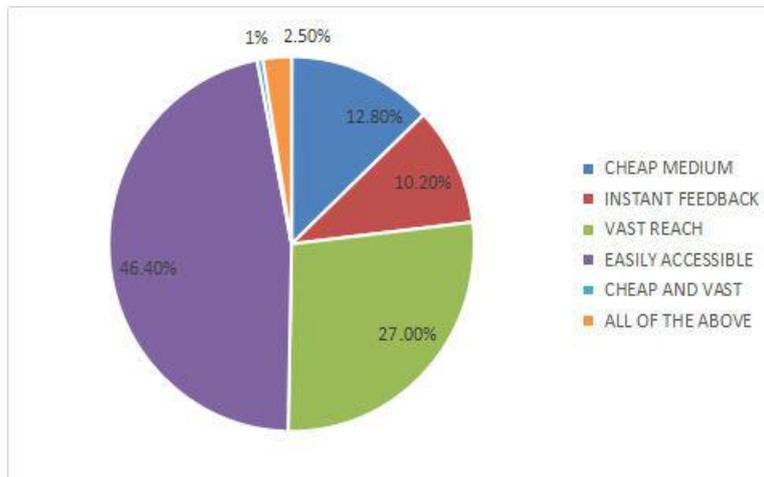
The above data shows that 66.5% of the respondents use digital media for educational purpose to gather online material, 16% of the respondents use digital media to get aware with technological literacy, 9.5% of the respondents use digital media to socialize and 6.5% of the respondents use digital media for distance learning. So this data shows that majority of the respondents for educational purpose to gather the online material.

**Question 8: According to you, from which medium students learn better?**



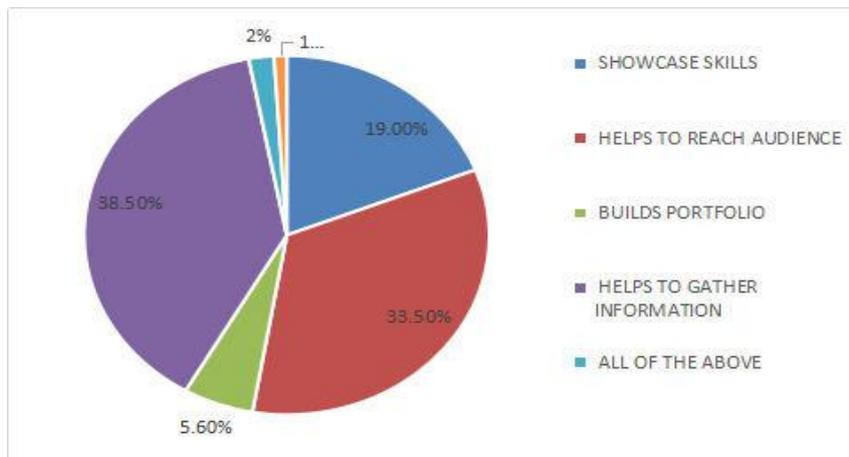
According to the data 66% of them think that students learn better from online whereas 34% of the respondents think that students learn better from reading print. So this clearly shows that according to the majority of respondents, students learn better from online.

**Question 9: Why do you use digital media to develop and showcase your skills?**



The above data reveals that 46.4% of them use digital media to develop and showcase their skills because of easy accessibility, 27% of them use it because it has the vast reach, 12.8% of the respondents use it because it is a cheap medium and 10.2% of the respondents use it because of the instant feedback. So the majority use digital media to develop and showcase their skills because of the easy accessibility.

**Question 10: Why, it is important to you as a mass communication student to have digital media presence?**



The above data reveals that out of 195 of the respondents, 38.5% of them as a mass communication student think that digital media presence is important because it helps to gather information, 33.8% of them think that digital media presence is important because it helps to reach audience and 19% of them think that it is important because it gives the platform to showcase the skills. But the majority of mass media students think that digital media presence is important because it helps to get information as well as it helps to reach audience.

**Question 11: Why do you think as a journalist and mass communication student that digital media has an important role in development?**

The main purpose of this question was to give the respondents an opportunity to explain the reasons deeply that why they think as a journalism and mass communication students that digital media has an important role in development. The data shows that out of 203 respondents, 109 responded to this question and the majority of the respondents point out the main reasons i.e. information, education, entertainment, easy accessibility and take less time. Some respondents gave these following responses:-

“Due to its accessibility and variety of options to use it for, a lot of people are connected to digital media and so to make a change or development everything is just one click away.”

“We as a journalist have the responsibility of informing the masses be it good or bad so the information

“We give as a bigger stake on the field of development and that is why it is our moral duty to safeguard it.”

“Through digital media we can showcase our skills to the vast audience and also gain knowledge in very cheap cost.”

“Because digital media helps in every aspects whether it is education or entertainment. It is more easy, convenient and affordable medium for getting updated and also helps in learning the things in a very effective and interesting manner.”

“Well I think that digital media has very important role in development especially in a country like India as it provides a great reach and a greater audience than other mediums which is very crucial in the terms of communication and thus through digital media people can be educated and made aware about various development policies and processes. Also it plays vital role in a person's individual development as regular interaction with people from all around the globe and regular exchange of cultural knowledge through various shows, conversations platforms and programs, grooms an individual for the outer world”

### CONCLUSION

The digital media plays a crucial role in the development of every aspect. It portrays the great impact in the academic development of journalism and mass communication students. The aim of this study was to demonstrate the role of digital media in the academical development.

The study concluded that the students of journalism and mass communication use digital media on daily basis and also well aware of different digital media platforms so these findings clearly indicate that the awareness level among these students are quite high. The findings also indicate that most of the student use social networking sites among various different digital platform and also this study shows that the main reasons behind using the digital media are entertainment, education and to stay connected. So this concluded that digital media has been considered as the major source of entertainment, education and connectivity. According to this survey, most of the student use digital media for educational purpose in order to gather online material and also for technology literacy. This study has highlighted that students learn better from online and the growing concern for using the digital to develop and showcase their skills as it has the easy accessibility and also the vast reach.

The conclusions show that digital media is the need of an hour and it has the great influence on the student's life. According to the students of journalism and mass communication, they are using these platforms for the wide variety of reasons which include not only learning but also showcase the creativity and talent on the digital media platform. So digital media has the outstanding role in creating and shaping the life of students.

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**A STUDY ABOUT THE ATTITUDE OF WORKING JOURNALISTS TOWARDS MOBILE JOURNALISM (MOJO)**

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**ABSTRACT**

*With the advent of each new technology, major shifts are taking place in the field of Journalism. Mobile Journalism (Mojo) is one of those technologies which are shaping the process of newsgathering and disseminating. This study aims to understand the attitude of working journalists of broadcast and digital media towards the Mobile Journalism in India and its future in the digital era. The objective of the research is to find out whether the Mojo is taken as a serious kind of journalism by working journalists? Does Mojo adversely affect the quality of production? and Is it considered helpful for the future of journalism in the digital era? A review of the available research literature suggests that it is basically an emerging kind of lifestyle journalism, being used by a few journalists. Those journalists who use mobile for news production purposes are never less in expertise. Since these journalists do not use traditional production technique, the question of de-professionalization occurs? This study, therefore, examined whether the Mobile Journalism (MoJo) is considered as a serious news gathering technic by journalists working in electronic and web media outlets in India. And if they find Mojo something that is de-professionalizing the news content, along with its future in mainstream Journalism. To conduct the study, survey method was used as the design of the study, with the sample size of forty (40) journalists from eminent media organizations such as ABP News, India TV, Zee News etc. in India. A google docs questionnaire was sent to the respondents by mail, and responses were collected to find out the attitude and opinion of the journalists about Mobile Journalism in India. The finding of the research suggests that Mojo is moving from lifestyle form of journalism to serious journalism but predominantly it is not a serious kind of journalism practice. Only 20% of journalists think that MoJo is de-professionalizing of TV news work, so it is not only fancy & steady but also dependable. Around 75% journalist consider Mojo as part of their job and they use Mojo as an important and influential tool to gather speedy information and disseminate the same. The study, therefore, finds that the future of mojo is radiant and promising, it is of great help for the journalists, it does not make journalists unskilled and thus according to journalists Mobile journalism will have a prominent effect on the human future as well.*

*Keywords: Mobile Journalism, Journalist, News Production*

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**INTRODUCTION**

How reporting is changing around the world. "why an Indian TV station went all in one smartphone newsgathering?" Although this headline published in an online website "Media shift" put in front of us a question on the Indian newsgathering system and at the same time it is also providing an insight of an Indian newsroom that converted into a smartphone driven newsroom.

Not only in India or Asia region, but across the world, mobile journalists are collecting and reporting news stories with little more than a smartphone in hand. This piece was originally published on IJNET, It is a part of a series that was examining- How people take mobile journalism? How they define mobile journalism? How mobiles are adding to the reporting? How traditional newsrooms are adapting to mobile? How citizen contributions are increasing? And how mobile is improving journalism practice in a more advanced form...?

In fact, the smartphones, which has enabled the modern journalist to cover the story entirely based upon a little device are the result of a major technological shift. This technology has directed many other shifts in Electronic News Gathering process. The headlines and the research on the usage of the mobile phone in the newsroom for electronic news gathering is a kind of mobile revolution in the newsroom. It is a revolution in the way the day to day news is being gathered, processed and disseminated.

Journalism is a field that is entirely related to the communication process, and in the digital era it need rather speedy and instant communication which is possible only through the use of digital technologies which enables the producers to encode the message in seconds and ensure the high speed. It also requires instant transmission without any delay in terms of time, quality and content. For being a mobile journalist, a reporter need not carry a heavy camera, editing crew, and broadcast devices. Just one mobile phone with internet connectivity. That is all which is needed to be a mobile journalist.

Since the beginning of Journalism as a field and as a discipline, whether mission or profession, journalists have been using the then latest available technology at hand, to perform the task of content multiplication and

distribution of message among the various audience groups. Over time, many advanced technologies have brought huge changes and turnovers in the way the message is being collected, produced, encoded, distributed and consumed. Technologies are becoming advance and they are replacing the older one. And today in the digital era smart mobile phones are on the apex of technologies being used by most of the journalists and they are presiding over the old hefty technologies which are in use from last decades. This shift in technology is both spanning and vague. It opens the way for easy communication strategies and techniques and also serves a handy communication outcome. It allows feedback and also felicitates ease of information as soon as possible. It put in front of us the question of the earnestness and solemnity of the brand new modish technology, which is thrilling. At the same time this practice also raises the doubts about the adverse effect of the inexperienced technology as well as, its future perspective in the course of time.

**What is a MoJo?:**In the words of GlenMulcahy Founder of Mojo *"Mobile Journalism is about empowering the individual storyteller to use whatever consumer technology they have available to them to make the best possible visual story that they can. I would like to think that Mobile Journalism definition can be extended to other mobile devices beyond smartphones, like DSLR cameras, laptops, GoPros..."*

A mobile journalist, often abbreviated as Mojo, uses only a mobile phone to gather and distribute news. That news can consist of text, audio, stills or video, or sometimes a combination of all these. Mojoes tend to work alone without any technological assistance from camera crew and edit machine expert. They even do not need Outdoor broadcast van to link the live coverage to the newsroom. Mobile phones are so common that it is easy to blend in with one, and they are so light they can be carried in a handbag or pocket(Quinn 2011). *"One of the things we did early on was to define Mojo: Mojo is editing on mobile phones as well as the shooting,"* Quinn said. *"It's also captioning, putting headlines and credits. Real mojo, true mojo is doing everything with a mobile phone."*

A video journalist, often abbreviated as VJ, sometimes works alone but tends to operate in a small team, often in pairs. Video Journalists tend to have a large amount of equipment and are more obviously journalists with heavy equipment. They stand out in the crowd and their camera person operate the camera for them. They are more noticeable in the crowd. Mojo is more discreet and often goes unnoticed. Although mobile journalism seems to be an attractive world today and is grasping the attention of news organizations as well as individuals working there, starting off it was not particularly easy. It was introduced as a tool of communication. When it entered in the world of technology, no doubt it was taken seriously but it was really far from the imagination of people that it might replace a whole lot of camera and crew from the newsroom & from the field. Nowadays it is an in thing, becoming a trend in the field of Video Journalism. The mobile phone which are now being used for journalism practice with a camera capacity is a product of the mid-1990s; Video capacity came a few years later. According to Statista, In 2019 the number of mobile phone users worldwide is forecast to reach 4.68 billion (Statista 2019). According to the International Communication Union (ICU) Today, there are billions of mobile phones around the world, many of them are smartphones. But there was a moment in the recent history of journalism when Mobile Journalism seemed to be the next big thing. (ICU, 2018)

## REVIEW OF LITERATURE

As mobile phones' cameras and audio recorders got better, the internet saw a gradual increase in the number of amateur videos uploaded to platforms like YouTube because now people have access to the alternative media without many restrictions. But at the same time, in some newsrooms, a few tech-savvy journalists saw the opportunity to use their mobiles as a reporting tool. *An experienced Mojo trainer Stephen Quinn said "I was taken by the technology when at first, I realized it was possible to stream live videos with a mobile phone,"* A convergence of cheap technology, fast broadband, and wireless networks, and a booming interest in citizen involvement in news will see a revolution in the way news is covered over the next decade. It is rare to find a journalist who does not have a mobile phone. Free software can turn most mobile phones into portable broadcast tools. (Quinn 2011)

John D. McHugh, a photojournalist who founded a start-up that gathers and verifies eyewitness media, remembers how mobile phones were being used in serious news collection as well. Björn Staschen, mojo trainer and head of NextNewsLab at German broadcaster NDR, said: "Mobiles could be used to capture a moment anytime and anywhere even during crowded events". The advent of the iPhone along with other mobile brands allowed for better image and sound quality, that were the basic element of any broadcast news coverage. It increased the possibilities for mobiles to be used as professional journalistic tools. However, many journalists who are already there in the profession from long back and has been habitual of using camera and crew for the reporting coverage and dissemination, continue to rely on non-mobile equipment in their daily work. For

example, some still edit on their computers. Mobile journalism is also seen as a broader style of journalism, which covers more areas than the regular journalism used to do.

It is increasingly difficult to think of a national or international news provider that does not distribute media rich news content via mobile (Westlund 2008). Al Jazeera launched its mobile offering in 2006. India news channels such as NDTV and India today are in the field of mojo.

Explaining the shift to mobile journalism ('MoJo'), which means reporters are expected to shoot and file stories on their smartphones, NDTV said,

"Like other news broadcasters around the world, NDTV is reorganising its newsroom and resources to focus on mobile journalism. NDTV has always been an early adopter of new technology and we are the first major network in India whose reporters are all trained in using mobile phones to shoot stories. This is not just about cost-cutting, though that is certainly, for us like any other responsible business an important factor in operations. Mobile journalism means reports are lightning-quick and much more efficiently produced – a priority for any news company. After NDTV's switch to this new model, other news networks in India are now experimenting with similar training." (bestmediainfo.com, 2017)

While some are welcoming the upcoming trending technology, many others are still in confusion about whether it is actually needed or just an adaption for the ease of reporting. Some experts are writing in favor of this technology and others are putting the question on its usage. Some also think that it is the reporting that matters, not the tool that has been used for reporting.

"[It] has very little to do with mobile phones," wrote Nick Garnett, a BBC journalist.

"It's about the reporter being mobile, not the equipment. Mobile journalism involves people realizing that they and the gear they carry are like a Swiss army knife, with lots of attachments. You choose the one you need."

Research also suggest that the mobile journalists study have less specialized expert knowledge. Also, though the mobile journalists felt that working outside a crew gave them greater autonomy, their increased use of work routines suggests they have given up some control to organizational needs. Additionally, there is evidence that these mobile journalists have allowed some encroachment by other professionals, specifically public relations professionals, in order to accomplish their work tasks within specified deadlines with limited time and resources. (Blankenship JC, 2016)

Mojos who are active in the field of journalism with their smartphones around the world see their mobile devices as a very powerful tool to produce quality journalism. Although there is no real consensus on the definition of mobile journalism, a growing community of mojos is experimenting with different applications. They are testing limits of Mobile as a tool of reporting and listening to how their audiences are engaging with this new form of journalism. Mojo is producing short films, documentary as an experiment in addition to mobile reporting. In India as well the mobile journalism entered with a very fast pace. Recently NDTV went all mobile, along with India today also launched its channel mobile task. So one can easily understand how mobile phones are changing journalism practice in the 21<sup>st</sup> century(Mediashift org, 2017).

## **RESEARCH QUESTION**

With the above-cited literature and in the age of digital communication and innovation this paper tries to find out what is the attitude of working Journalists towards Mojo.

The research questions are:

- What is the status of Mojo among working Journalists?
- Is mojo downgrading the quality of news work?
- Is mojo causing any kind of uncertainty in journalism?

## **RESEARCH METHODOLOGY**

**Method:** The study used a survey method to find out the answers to the research questions. The questionnaire was sent to the respondent online and the response was collected.

**Sample:** The sample for the study was 41 respondents. They all were selected by purposive sampling method as they were the people who were working in the field and well aware of the status of mojo. All of them were working journalist in the mainstream Indian media outlets. Most of the respondents were from television newsroom, but the study also covered some of the journalists working for the newspaper and online media.

**Procedure:**The respondents were asked question based upon four sets of information. At first, to find out do working journalist take Mojo as a serious kind of journalism or it is basically lifestyle journalism. Second, is mojo de-professionalizing news that is produced and disseminated.

Third, does Mojo is opening ways for the journalists to be unskilled. Fourth and the last section was about the present and future of mojo in India.

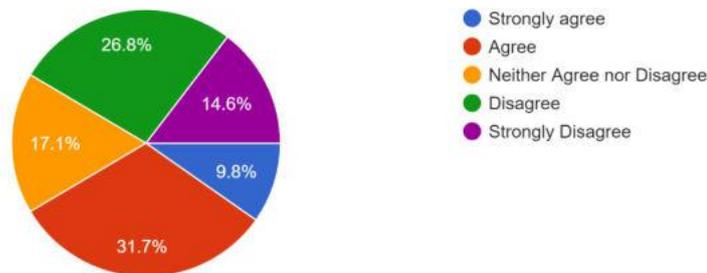
**DATA ANALYSIS AND INTERPRETATION**

**Lifestyle journalism or serious kind of Journalism:** In the first section of the questionnaire respondents were asked about two major things as Do they consider mojo as a serious journalism practice or for them it is a part of light mood lifestyle journalism. Out of 41 respondents, 41% agreed or strongly agree and stated that they find Mojo a lifestyle form of journalism. The % of the journalist who stated it as serious journalism was also 41 %. 17% journalist were neutral to the statement. So it can be concluded that according to the journalist working in news outlets are neither in favor and nor against the Mojo. No strong notion in favor or in against was found. (see- figure1)

**Figure-1**

Do you think that MoJo is a lifestyle journalism (not a serious form of Journalism)?

41 responses

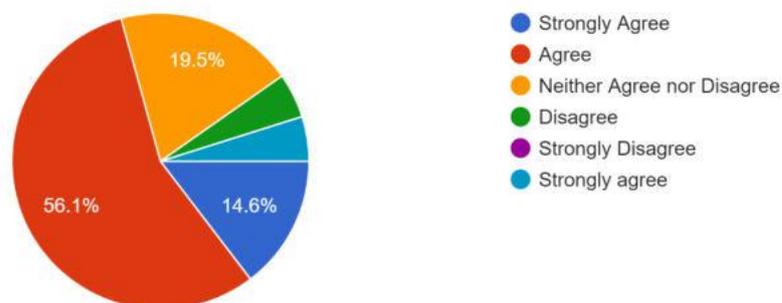


The second question in the first section was about mojo as a part of the journalistic role of the journalists. Do they consider using mobile as part of their day to day reporting techniques? Here only 7% journalist have disagreed and not even a single journalist was strongly disagree. 20 % were neutral about the statement and rest of the 73% journalist stated that they consider mojo as a part of their day to day journalism practice. (see-figure2)

**Figure-2**

Do you think mobile production is a part of your Journalistic role?

41 responses



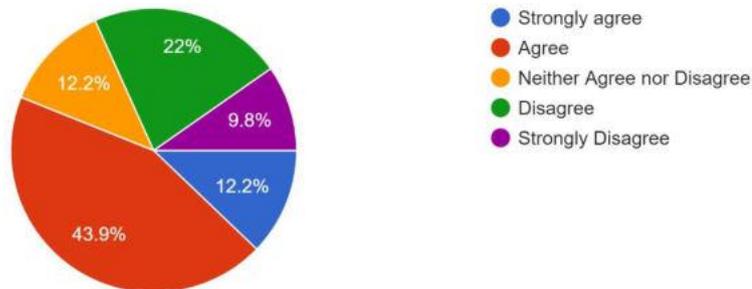
**De-Professionalization of News:** The next section dealt with the Mojo as a technology that is de-professionalizing news work, as handy footages are available through mobile they are being broadcasted. The quality of the work is being affected or is there any deterioration the professional news production techniques.

12.2 % of journalist were strongly agreed with the notion that mojo is affecting the news they produce. 43.9% agreed with the notion. 12.2 % neither agreed nor disagreed. Only a comparatively small percentage of news reporters were disagreed and strongly disagree with the notion. So it can be concluded that not the majority but most of the journalists find that Mojo effects their work. (see- figure3)

Figure-3

Do you think MoJo is affecting the news we see and produce?

41 responses

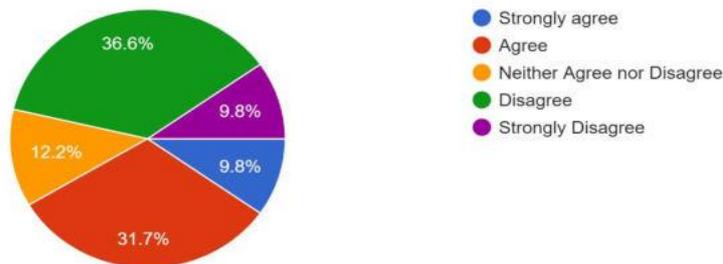


When asked about the Mojo as a reason for de-professionalizing news standard in current time 10% respondent said that they feel that the use of mobile phones in journalism practice is somehow de-professionalizing the TV news work. Many other as much as 32% were also agree with the notion and 12% were neutral. 10% were strong- disagree and 37% disagreed that it is de-professionalizing the news work. So its quite evident that the % of people for and against the notion are somehow near to equal but more of the respondent don't find it to be de-professionalizing news work. (see figure 4)

Figure-4

Do you think Mobile Journalism is de-professionalilzing TV News work?

41 responses

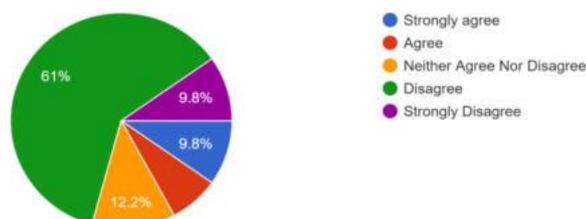


**Making Journalist unskilled and creating uncertainty in the news world:** When the question of the skill of journalists was asked there was strong disagreement with the statement that Mojo is making the journalists unskilled. Total of 71 % journalist said that mojo is not making journalists unskilled with 61% Disagree and 10% strongly disagree. Those who were of the notion that Mojo is making Journalist were comparatively less, as much as 10% agree and 10% strongly agree. Rest of the 12 % of respondents were neutral. So its quite clear that journalist may not use mojo as daily practice but they also don't find it as a means that is making the professionals unskilled. (see- figure 5)

Figure-5

Do you think MoJo is making our journalists unskilled?

41 responses

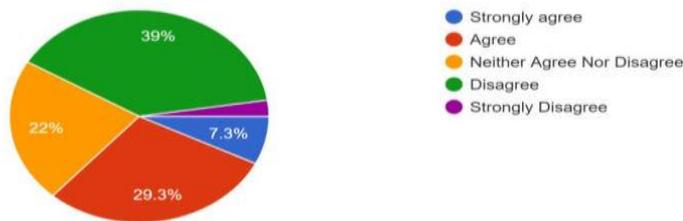


out of 41 respondents, only 7% stated that they feel that mojo is creating uncertainty in the news world. Other 29% agreed with the statement as well. 39% disagreed and very little strongly disagree. The percentage of respondents who were neutral about the statement was quite large with a share of 22%. So we can infer that journalists are not very much clear about its role in creating uncertainty in the news world still through the data majority is against the notion. (see- figure 6)

Figure-6

Do you think MoJo is creating uncertainty in the news world?

41 responses

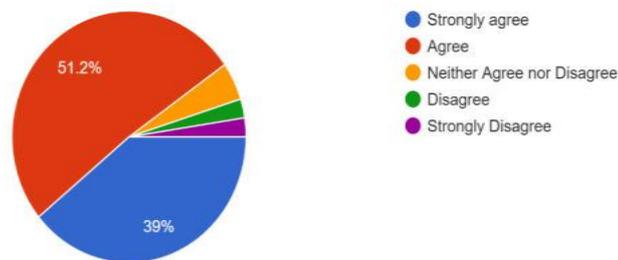


**Helpful for the present & future:** A group of more than 51% clearly mentioned that Mojo is of great use in the present digital scenario. 39% more strongly agreed with the statement. Rest who did not found Mojo helpful in a digital era of reporting was as less as 10% collectively. Now it becomes evident that most people agree that Mojo is really very helpful in the digital era of journalism. (see- figure 7)

Figure-7

Do you find Mojo helpful in the present digital era of Journalism?

41 responses

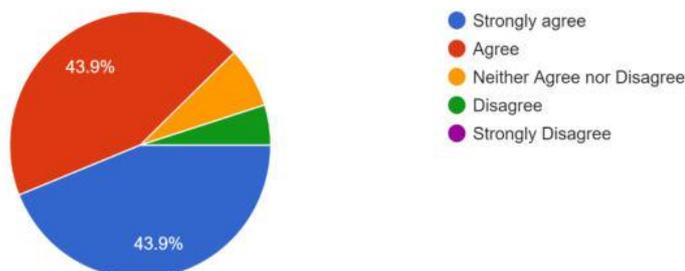


Again there was a strong notion in favor of the statement with as much as 88% were collectively agree and strongly agree that Mojo will be a great help for future journalist and its future as a tool of journalism is bright. A little percentage of journalists were having a doubt about that and were neither agree nor disagree. Not even a single- journalist was strongly disagreed about the role of Mojo as really great for future journalism. So we can say that Mojo is of great help and journalist don't have doubt about its usage in the near future. (see- figure 8)

Figure-8

Will MoJo be of great use in the future of Journalism world?

41 responses



**Findings of the study:** According to the journalist working in India mainstream media industry, and the questionnaire responses it was found that the mobile journalism is a field that is easy and new to the journalist, but they are welcoming this. Many journalists find it a very innovative and attractive technology for the newsgathering process, while others are doubtful about it, as a serious reporting tool. Mojo is no doubt a speedy and instant serving technology that matches its speed with the need of journalism and at the same time it makes the work of a journalist easy and quick, but as per the data somehow equal percentage of people were defending and opposing this technology as a serious journalism practice. Mojo has proven itself to be a trendy, fancy handy, far-reaching and modern technology. What is still left for it to prove itself as a serious, significant, consequential and weighty technology?

It is being used by journalists for speedy and easy communication, they find that it affects the news they report and produce. Some Journalist also said that it needs to be more professional, although it is not de-professionalizing news work still improvements are needed. Findings suggest that there were strong emotions related to the unskilled journalist and Mojo because most of the journalist disagreed that mojo is creating any kind of uncertainty or because of it the reporters are becoming unskilled. It was found that all the respondents were very confident about the future of mojo and its role in present journalism. Whether experienced journalist uses it or not, whether they find it to be lifestyle journalism but they have no doubts regarding its future in the journalism practice.

**Discussion:** Based on the above data interpretation and findings it can be concluded that mobile journalism in India is growing at a rapid pace. In fact, it has made its presence felt in the media industry. It has proved itself as an effective communication tool and that is why major TV station and online media outlets are relying heavily on the mobile for their broadcast. They have given the responsibility to gather, produce and disseminate news to the mojo. Journalists are using it in their daily newsroom practice and serving the masses with the news produced by the small camera and microphones of the smartphones. The small gadgets are making the process of news production quick and speedy and it is imprinting its significance in the mind of working journalists. Traditional media have been slow to respond to the fast pace for the need for the information, Now mobile and other handheld devices are becoming mainstream. Mobile is proving that it can improve media by participating in the news production process. Journalists have also realized that using mobile does not alter the sanctity of journalism.

**Limitation& recommendations:** One of the major limitation of the study was the sample size, as the sampling was purposive and data has to be collected from the working journalists only, in a short duration it was difficult to get better understanding about how they work using mobile in their day to day life. The data analysed here in the paper is based upon questionnaire and not personal interview, that definitely would have given better understanding of the field of mojo.

It is recommended for future researcher in this particular field to get better understanding by in-depth interview and to explore how Mojo actually work in the field, as well as it is also to consider what are the reaction of news-room decision makers on the filing of news produced via mojo.

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- (xii) <https://reutersinstitute.politics.ox.ac.uk/risj-review/how-mobile-phones-are-changing-journalism-practice-21st-century>
- (xiii) <https://schoolofjournalism.co.uk/blog/what-is-mobile-journalism/>

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**EMERGING TRENDS IN SOCIAL MEDIA AND THE SCOPE OF MEDIA LITERACY**

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**ABSTRACT**

*With the emergence of digitalization has basically transformed the ways in which information, knowledge, and entertainment are created, distributed and accessed. The new media is rich with opportunities and jeopardies, particularly for youth. New Media or Digital Media has turned into a major source for millennials who have access to Digital Technology and basic skills to use it. Due to various digital mediums, they are contributing in an array of activities, including social networking, social bookmarking, blogging, vlogging, chatting, downloading music and other content, uploading and sharing their own creations and collaborating it with other users in different ways. As a result of these activities, diversity of ideas and perspectives have been created which is forming a spirit of digitally connected. Socializing digitally have facilitated communication. Although these activities have some positive aspects but apart from this it gave some behavioral changes among youth. Not only this it also effected their social behaviour and approaches. Seeing the present scenario of digital media, its information quality framework and its usage by youth, this review paper tries to find out what are the ways in which youth search for information online, how they assess information as well as their new levels of media literacy. A proper understanding of digital space would allow young users to access, analyze and evaluate the information. As the young generation is a major part of the society hence one should know what the impact of information is, they cater from the digital media. In the present scenario, media is shaping society and also affecting the perception. Exploratory research design has been chosen by the researcher and the research will be based upon secondary data. An analysis of selected literature at the intersection of Digital Media, Youth, Information Quality and their media literacy is done in this research paper, with which the researcher has tried to find out the resultant impact on their social interactions and social behavior.*

*Keywords: Digital Media, Media Literacy, Youth, Blogging, Social Bookmarking, Internet, Youth*

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**INTRODUCTION**

Since the Internet's nascence, there have been lots of technological inventions and upgradations of this medium. Due to these technological advancements many major changes caused in our daily lives, which can be easily felt across numerous areas, which includes education, shopping, entertainment, learning, banking, investing, etc. Not only this in the field of communication too, but many new developments have also been done which have boosted this domain and Social Media is one of them. It is an interpersonal web-based communication technology as per Kent and Taylor. Social Media has been defined in several ways. The definition of social media as a "platform to create profiles, make explicit and traverse relationships" by (Boyd & Ellison, 2008) has been cited over 13,000 times according to google scholar.

Social Media is a free medium and it does not need any specific skills to access. This comfort is also one of the significant factors which are encouraging people to create an account. The recent trends emerged in social media have given various options of communication to the youth. Gradually they are consuming information through these social mediums like WhatsApp, Twitter, LinkedIn, Facebook and Google +, etc to not only for communication but also for sharing ideas, thoughts, etc among each other. Apart from communicating, the young generation is also receiving lots of bits of information, news, etc and are getting updated.

This medium has a great impact on the public minds because not only users absorb the information presented on it but also, they can provide feedback to it directly. Not only this many user can also be influenced by the feedback or reviews which have been given by other users, but this can also affect anyone's individual opinion on various issues. Hence, this medium has its great importance among some groups or communities who are working to set some particular belief on some certain issues amidst the public.

According to the Digital Media and Society report, Digital Media is a type of a product or service which come through media, entertainment and information industry. These industries cover various digital platforms like websites, applications, digital content (e.g. text, audio, video, and images), etc which have access through various devices and from anywhere.

At present, digital media has turned out to be an endless source of every type of information and social media is one of the platforms which is used by youth to receive the data. Hence it is very important for them to become media literate. As literacy is the ability to read and write similarly the ability to access, analyze, evaluate and create media messages of all kinds is known as Media Literacy. The significance of media literacy is so much

that a media literate youth are better able to interpret the complex messages which they receive through various mediums like television, radio, newspapers, magazines, Internet, etc.

Many people observe that media literacy eases a way to understand the communication technology apart from this, media literacy also helps to know how the message is coded, generated, selected, interpreted and impact made on the audience. Besides, media literacy has become a pivotal point, as it has a set of guidelines to understand the sense of the mediated information and hence can also deliver evidence about how to analyse and understand the media and its messages – over here it refers to Social Media. The liberty of uploading posts on social networking sites must be properly filtered in a motto to safeguard the social values, especially for young generations who are still in search of individuality and hence they become a prime or soft target for malicious/terrorist groups through this medium. Media literacy as a tool will possibly aid young social media handlers to better comprehend the messages.

### REVIEW OF LITERATURE

1. Kuppuswamy, Shankar Narayan, P.B and Sunita (2010) quotes in, "The Impact of Social Networking sites on the Education Youth" in comparison to other genres, social network has more effect on education. The research also says that these social networking are very informal and diverts the user minds from their education but on the other hand they are helpful in communication, sharing, etc. It concludes that one – to – one communication sites has both positive and negative effect on youth, it depends on one's mindset the how it should be utilized.
2. K.Ramprathap, Dr.S.Rajaram, Dr.V.P.Sriram, Dr.S.B.Inayath Ahamed (2016), quoted that " Social Media has great importance among students. It has its impact both positive and negative. Some vigilant steps must be taken so that the adverse effect of social media can be contolled."
3. Media Education is very important for the budding generation as it is related with Democracy and participatory citizenship. It has become very vital to promote a knowledgeable, democratic and sustainable society. According to BarbroOxstrand (2009) in "Media Literacy Education- A discussion about Media education in the Western countries, Europe and Sweden" there should more lessons related to media education hence teachers should work on it and enhance the knowledge of students.
4. "The dependency on social media to collect information and getting aware has increased among youth whether it is happening either in their circles, nationally or internationally. Not only they are using in positive aspect but also in the negative sense too" as per Rita Njoroge in "Impacts of Social Media among the youth on behavior change: a case study of university students in selected universities in Nairobi, Kenya"
5. Joshua EbereChukwuere, Precious ChibuikeChukwuere (2017), "The Impact of Social Media on Social Lifestyle: A Case Study of University Female Students" concentrated on the diverse effect of social media use both positive and negative due to advancements in modern technology. It encouraged students to work on various aspects of their lifestyle. But on the other hand, it also wasted their time and caused negative behavioral changes like disrespect to elders, using abusive language, etc.
6. Septyanto Galan Prakoso, Monika Sri Yulianti and Likha Sari Anggreni (2016), "The Importance of Social Media Literacy for Students in Globalization Age" quoted that "There is an information glut on social media which should be prevented. The Internet is providing various sort of content which can have an adverse effect on a youngster's mind easily, certain vigilant steps must be taken to filter all the content and information which is within the reach of youth. Media literacy can become a suitable solution to this issue since it will make youth aware about how to treat an information. By doing Media Literacy awareness programmes, the society will have proper vigilance over the cycle of information from source to receiver and vice - versa and will actively participate in deciding regulations in order to prevent the adulteration of the youth's mind.
7. According to Michael E. Hoffman (2016), In "New Media Literacy and Social Media Usage" Media Literacy gives people a tool to effectively analyze and evaluate the messages that they receive. They perceive the information, understand and evaluate it whether it is correct or not.

### OBJECTIVES

The major objectives of this research paper are:

1. To find out the emerging trends of social media among youth to cater to information.
2. To identify whether the youth is media literate or not.
3. To examine the impact on their social interaction and social behavior.

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**THEORETICAL FRAMEWORK**

The framework of this research paper is based on social impact theory. Ohio State University psychologist Bibb Latané explained that in social impact theory, Social Media provides strength in the form of a social community formed virtually whose opinion and information are important for the users. Social Media provides an enormous opportunity for the number of people in the influencing group. Social Media provides information and centers on the characters of the issue of how individuals should think about it. This research paper is based on this theoretical framework that how social media and its emerging trends are impacting the youth's mind.

**Research Methodology:** This research paper used exploratory research as its research tool. Exploratory research, as the name states, intends merely to explore the research questions and does not intend to offer final and conclusive solutions to existing problems. In exploratory research the main emphasis of research is always on exploring the each and every aspect of the problem which is to be catered by the researcher in their research work, it may or may not be possible that at the end of it researcher can provide a clear conclusion. Exploratory research always has an added advantage due to its nature of flexible and adaptability. To analysis researcher used secondary data.

**Interpretation:** It is clearly visible that social media is having its reach to every class of the society, and up to certain condition it provided a platform to masses to share their views and also to use it as a tool of alternative media but this is also perceived that this media is lacking in terms of authenticity of information and the reasons are also prominent. One cannot control the flow of information on social media and cannot easily check whether the information is fake or not. To understand the concept of media literacy and how it has become a significant entity in the media ecosystem researcher analyzed different researches on a similar base.

**Conclusion:** In this review paper the researcher tried to explore the emerging trends in social media like customizable chat box, more augmented – reality & face filters, social media benefitting business to a large extent, etc. It has become a common platform for information sharing. But there is no well-defined system which can help receivers to trace the authenticity of the information. In the present scenario, the youth is becoming media literate but a major has to be done on this subject as this issue has become vital around the globe. We as a responsible citizen need to take responsibility for checking what we see online. Facebook and Google also initiated to use fact check services and providing consumers an option to verify what they see and read online. Spending much time on social media has also affected the social behavior of youth. Its impact is both positive and negative. This platform has made them aware but has also hampered their attitude of social interaction. Undoubtedly, it's a crucial time, and it's not easy to verify the flow of information but audiences need to be conscious and they need to be participative in the process not only for receiving information but also, they need to verify the information before they share it further. Therefore, media literacy with respect to social media is significant.

In this perspective there are two key points that can be done to develop media literacy keeping Social Media in focus:

**A. Vigilance towards the flow of Information**

Digital Media can be personalized as per the user and their choice. It is understandable that no one is able to withstand the flow of information on the web. In the mainstream media, Social Media stands different in respect to other mediums on one note that users are free to consume and access any type of messages as per their choice and requirement, for example on television the content received by the receivers is according to the channel and programme producers but on the other hand such conditions are not applicable to social media.

**B. Active participation in deciding the guidelines for communication technology to decrease misinformation**

The information flow works very quickly due to easy access to social media. The messages can be easily shared and spread in no time. This is a benefit as well as a drawback too. Some preventions and guidelines should be made to have proper surveillance over the flow of information. Though, we can find out whether the information is correct or not.

More prominently, like all other great movements, media literacy must begin from the initial stage i.e. from parents, teachers, etc. They should begin to see that if that media is a requirement for their children, and hence the children should need to have a way of filtering in receiving messages. Proper education, not just restriction or control, is the path to help the young generation understand their choices and to help question the content presented by the media.

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**THE TREND OF READING NEWSPAPERS AMONG THE YOUTH IN 21<sup>ST</sup> CENTURY  
(A STUDY BASED ON YOUTH AND DAILY HINDI NEWSPAPERS OF VARANASI)**

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**ABSTRACT**

*The 21st century has changed the way of thinking as well as the behavior of the youth. Especially the lifestyle of the youth has been changed now. How the youth thinks, how they react and what their approaching patterns in today's era of internet and technology are a subject of study. This research paper tries the same thing in the field of journalism & mass communication. Especially try to know the trend of reading newspaper among the youth in the 21st century. The 21st century is the century of internet & technology, where youth is too much indulge on using Smartphone. Now everything is on their finger and easily available on one touch. This research tries to find out the solution of many questions related to the youth about daily Hindi newspaper of Varanasi. Like; Do the youth still have a trend to read the newspaper or not? Do they have newspaper readability or not? How much time do they spend on reading the newspaper in a day? Which types of news or content do they like most while reading the newspapers? Which daily Hindi newspapers are the most popular among them in Varanasi? How much they satisfied from the 21st century's daily Hindi Newspaper and their news and content? Etc. The research design of this research paper is exploratory cum quantitative deductive. For data collection, the online survey method has been used. In which the researcher used a Google form questionnaire & picked up a sample via an online survey through various online platforms, such as Facebook, WhatsApp, Messenger, and others. Area of the study is Varanasi, India. The universe of the study is all Youth of Varanasi. Data have been collected from both the source primary as well as secondary and analyzed through simple statistics.*

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**INTRODUCTION**

The fast advance of television a few decades ago and the Internet in the last decade has changed people's media consumption patterns. Different media are in a continuous time battle with each other. This is also true for news media. The traditional medium, like a newspaper, puts into an underdog position. This development earns more detailed research, especially among the future generation (**Wolswinkel, 2008**). This research has its focus on youth newspaper reading time, their favorite newspapers, their subject of interest in various news/content, their newspaper readability in a day, their opinion about daily Hindi newspapers of Varanasi and much more related to the topic. This research discusses the trend of reading newspapers among the youth in the 21st century because the researcher tries to know that today newspaper as a print medium is relevant or not. This is why because as a print medium newspaper played a very important role in history. Even in freedom moment it played a very revolutionary contribution to the country and make people patriotic and revolutionary.

All of the above it also serves us in many ways like by providing necessary information related to a various subject of interests. Newspapers are known for the provision of up-to-date information on local, state, national and international events. Newspapers often contain current and interesting information meant for the reading pleasure of the vast majority of readers of all ages and walks of life. As an important print medium of mass communication, newspapers provide the most current analysis, debate, and criticism of socio-political, economic, health and a host of other issues as information, education, and entertainment to the readers. The newspaper is, no doubt, one of the most widely-read periodicals available and accessible to all on a daily basis in print and electronic versions. As a mass medium, newspapers are useful for education, information, recreation, relaxation and entertainment (**Leo O.N. Edegoh, 2015**). This explains why (**Ojo, 2006**) think that newspapers are important because they carry current information and they keep the readers informed of events and happenings within and outside their immediate environments. (**Okunna, 1999**) reinforces this position by asserting that the newspaper is important in that it serves as a carrier of current information or news. The newspaper is important to everybody, particularly students and youths who are considered as the most active information-seeking group in any population for the obvious reasons of academic and other pursuits. The permanency attributed to print media, including newspaper has made information recall possible, and recall capability frees content from becoming transient and ephemeral (**N. Ezech, 2015**), since the audience of the media like youths remembers them and use them for academic and other purposes. Indeed, youths are supposed to be the most active users of newspapers as they constitute the most important information seekers in society. On the contrary, evidence from a large body of empirical literature seems to suggest that newspaper reading among youths is declining. (**Dominick, 2017**) notes that newspaper readership has been declining over the last couple of years. (**Udie, 2002**) also reports that the frequency of newspaper readership among Nigerian students

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is less than 50%. (Bigai, 2003) states that since the 1970s, the overall number of newspapers has declined due to non-readership. (Business Essay, 2009) has equally reported downward trend, in the past few decades, in newspaper readership in countries of the world including Europe and America.

#### THE HISTORICAL OVERVIEW OF READING

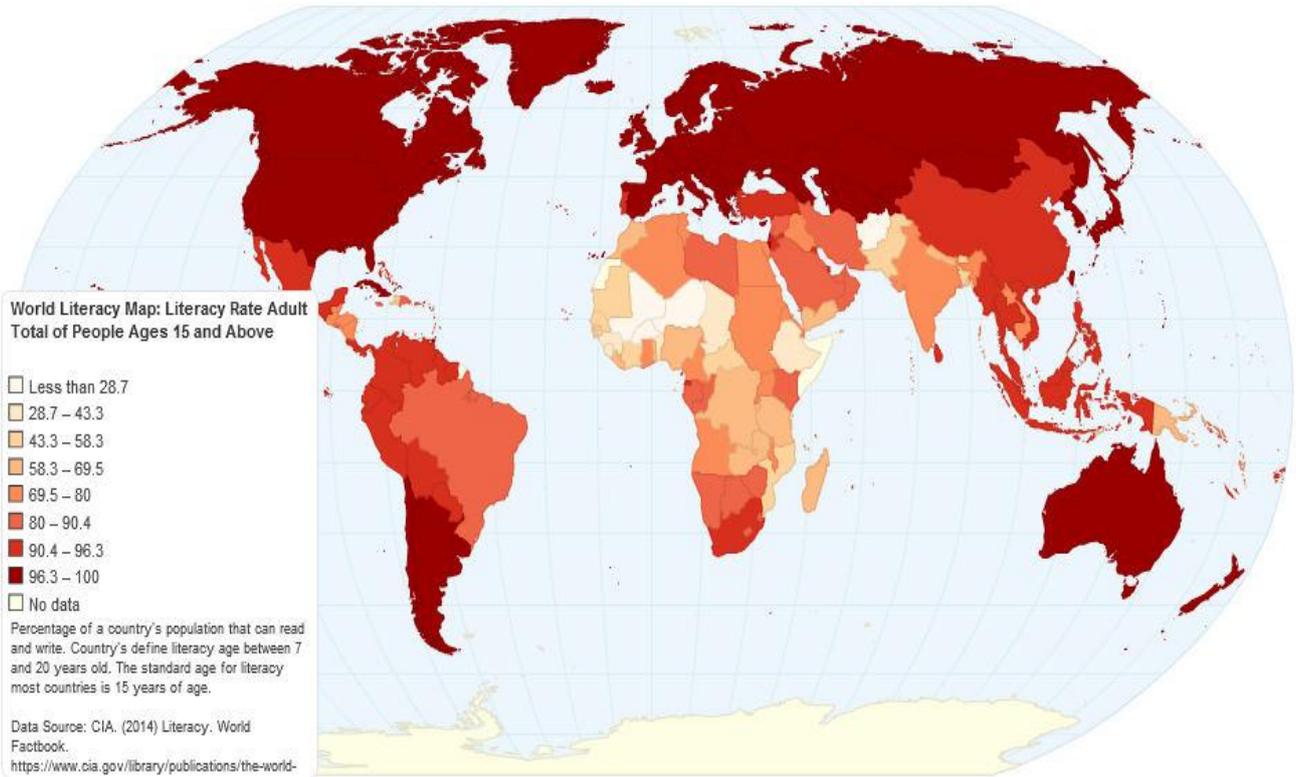
Reading is not a natural act, or as (Walter, 2008) (Wolf, Personal interview with Barry Cull, 2009) (Wolf, Proust and the squid: The story and science of the reading brain, 2008) explained it, there are no reading genes. Rather, reading is a cultural activity that has undergone profound changes since its inception. In the standard history of reading entitled orality and literacy (Walter, Orality and literacy : the technologizing of the word, 2009) pointed out that the earliest basic script dates from only about 6,000 years ago. Furthermore, the first full alphabet did not have its beginning until the Greeks developed their alphabet about 750 B.C. Putting this time frame into an individual perspective, Wolf poetically wrote that “despite the fact that it took our ancestors about 2,000 years to develop an alphabetic code, children are regularly expected to crack this code in about 2,000 days” (Wolf M., 2007). Providing insight into the cultural history of reading, Robert Darnton pointed out that up until the third or fourth century A.D., Europeans “had to unroll a book to read it (Darnton, The library: Three Jeremiads, 2010). Scrolls would eventually evolve into folded pages, which in turn eventually became gathered pages or the codex in which the book as it is recognized today. The popular writer Alberto Manguel has written that early Christians adopted the codex because they found it a convenient format for keeping their spiritual texts hidden from Roman authorities (Manguel, 1998). These early Christians were the forefathers of the men who later read and transcribed their religious texts in monasteries. Interestingly, these early scribes first did their work by reading out loud to themselves. Not until the ninth century did monastic regulations begin requiring silent reading (Manguel, 1998). By the thirteenth century, the practice of men reading silently and alone became commonplace. This shift to silent reading was a profound change, one that Darnton suggested: “involved a greater mental adjustment than the shift to printed text” (Darnton, The kiss of Lamourette: Reflections in cultural history, 1990).

#### IMPORTANCE OF READING

Reading is a cornerstone for success not just in schools, college or University but throughout life. Through reading, we acquire new knowledge and ideas, obtain necessary information, relax the minds, and improve our command of language and vocabulary. It also serves as a good companion and provides pleasure, expand our horizons and enrich our lives. We are fortunate as we can easily find libraries and bookshops throughout the country and we should know how to make good use of them. But sadly, this is not the case as many of our young people only visit the libraries and bookstores during examinations or in times of need. Reading has come to hold the most significant place in education as a means of communication in a highly literate society. The book is still very much part of people's lives in our modern society and in spite of the invention of the latest audio-visual materials, the book in its ordinary conventional form is still the most important means of communication ever invented. Reading is important for acquiring knowledge and information. The enrichment in knowledge would, in turn, enable one to present oneself more confidently. From the very young to the old and the sick, there are books to suit every taste (Inderjit, 2014). In their research with adult readers (Guthrie, 1984), found that reading contributes significantly to job success, career development, and the ability to respond to change. The importance of reading has resulted in much research work conducted to understand the nature of the reading habits of individuals. With the growing amount of digital information available and the increasing amount of time that people spend reading electronic media, the digital environment has begun to affect people's reading behavior.

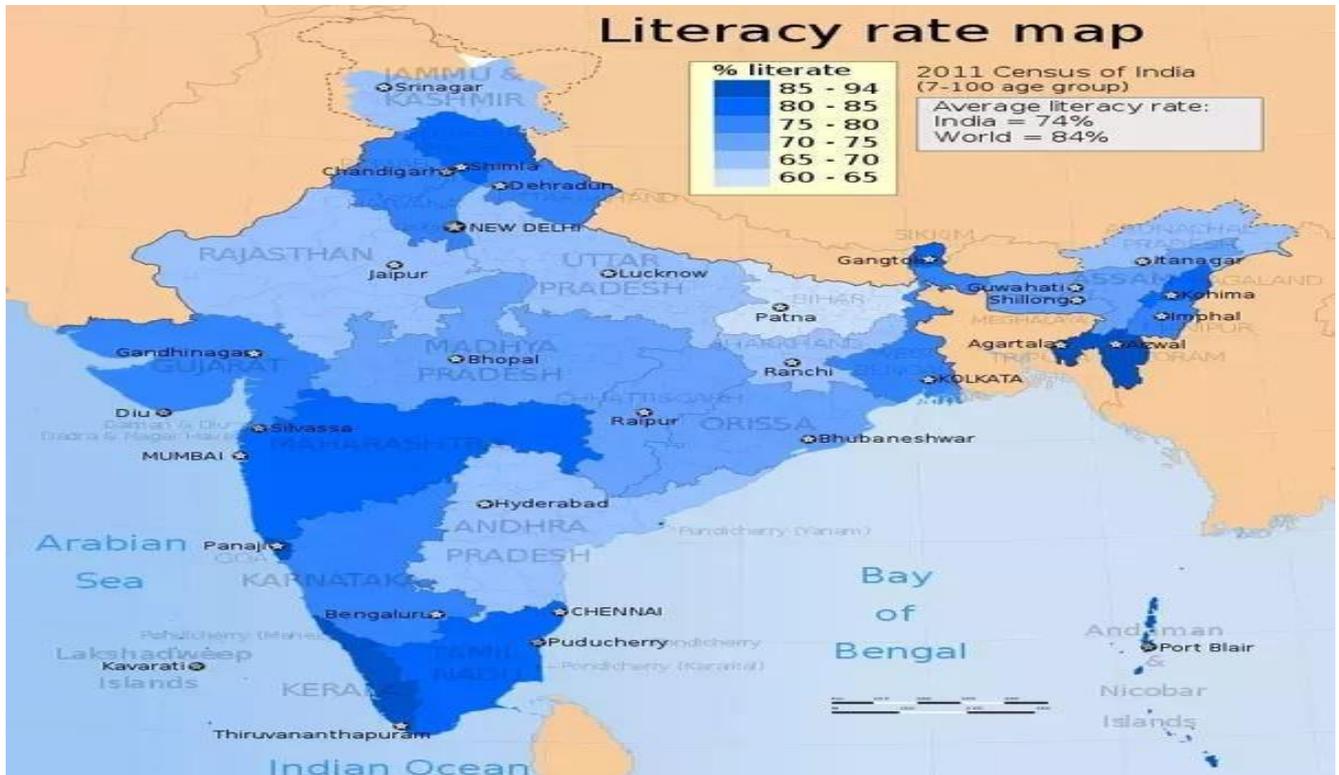
#### WORLD'S LITERACY RATE

If we talk about reading, we must talk about the literacy of the world as well as India. So let's catch up the data who reveals the scenario about the literacy rates. The CIA Worlds literacy map shows the literacy rate adult total of people ages 15 and above. Since this research focuses on the youth between 18 to 35. This data will help to understand the literacy rate of young adults as follows—



(World Literacy Map, 2014) India Literacy Rate

As the 2011 census of India Average literacy rate of India is 74%. This literacy rate shows the literacy of 7-100 age groups as follows—



(India Literacy Map, 2011) Understanding the Title of the Research- 'The Trend of Reading Newspapers among the Youth in 21<sup>st</sup> Century'

**Trend-** According to Merriam-Webster dictionary the word 'Trend' means 'The general movement over time of a statistically detectable change or something that is currently popular or fashionable'. According to Oxford Dictionary the word 'Trend' means 'A general direction in which something is developing or changing; a fashion'. The word 'Trend' is first known use in 1598.

**Read-** According to Merriam-Webster dictionary the word 'Read' means 'to utter aloud the printed or written words of'. According to Oxford Dictionary the word 'Read' means 'Have the ability to look at and comprehend the meaning of written or printed matter'. It is firstly known before 12<sup>th</sup> century.

**Newspaper-** According to Merriam-Webster dictionary the word 'Newspaper' means 'A paper that is printed and distributed usually daily or weekly and that contains news, articles of opinion, features, and advertising'. According to Oxford Dictionary the word 'Newspaper' means 'A printed publication (usually issued daily or weekly) consisting of folded unstapled sheets and containing news, articles, advertisements, and correspondence'. It is firstly known use in 1670.

**Youth-** According to Merriam-Webster dictionary the word 'Youth' means 'the time of life when one is young; especially : the period between childhood and maturity' or 'the early period of existence, growth, or development'. According to oxford dictionary the word 'Youth' means 'The period between childhood and adult age' or 'An early stage in the development of something'.

### **RELEVANCE & NEED OF THE STUDY**

The present era is going towards a digital revolution which affects everyone's life directly and indirectly. human being is now becoming dependent on digital and electronic machines and gadgets. Smartphone is one of them. Youth are getting too much involve with the help of Internet and Smartphone on various social networking platform. Do they have time to read the newspaper or not? is a question on which this research carrying out. The oldest mass communication medium the newspaper is now relevant or not in 21<sup>st</sup> century? This question also encouraged to perform this study. Since India has the world's largest youth population, with 356 million 10-24 year-olds, it becomes necessary to know the trend of reading newspaper among the youth in the present era. With this, it would be known that how much time youth is spending in a day for reading newspaper, which types of news/content are attracting the youth most and it is also that how much reading ability do the youth have?

**Problems of Research-** The problems of the research are mentioned below

- Whether the youth rely on a hard copy of the newspaper or E-paper to read news/content?
- How much time youth spend on reading the newspaper in a day?
- How many newspapers do the youth read in a day?
- Which daily Hindi Newspaper is most popular among the youth?
- Which types of news/content attract the youth most?
- Which types of News/content they are interested to read?
- How much are the youth satisfied with 21<sup>st</sup> century's daily Hindi Newspapers and their content?

**Objectives of the Study-** This research work following these objectives

1. To check whether most of the youth rely on newspaper or E-paper to read news/content.
2. To know the time duration spent by the youth to read newspapers in a day.
3. To check newspapers readability of the youth in a day.
4. To know the Daily Hindi newspaper preferences among the youth in Varanasi.
5. To find out the news/content preferences among the youth while reading the newspapers.
6. To know the interest of youth in various types of news/content while reading the newspapers.
7. To know the opinion of youth on 21<sup>st</sup> century's Daily Hindi Newspapers and their content by rating scale from very poor to very good.

**Hypotheses of the study-** This research study following these hypotheses

1. It appears that in the 21<sup>st</sup> century the youth rely on mostly E-paper for reading News/content.
2. It seems that youth are spending less time for reading newspaper in the 21<sup>st</sup> century.
3. It appears that youth's newspaper readability is very low.
4. It seems that Dainik Jagran is the most popular daily Hindi newspaper among the youth.
5. It appears that educational news/content is popular among the youth while reading newspapers.

## REVIEW OF LITERATURE

(Inderjit, 2014); In his research paper '*Reading Trends and Improving Reading Skills among Students in Malaysia*' published in the International Journal of Research In Social Sciences studied to show the readings trends and relate the importance of reading and conditioning this behavior towards a habitual way of life amongst Malaysian students. S. Inderjit also found that certain past and current research will be used as a platform to provide solutions to improve and increase the intensity of reading amongst Malaysians. The paper concludes that some of the methods of improving reading among students participation in classes, homework to improve reading comprehension developing the survey, question, read, recite and review (SQ3R) method and peer teaching.

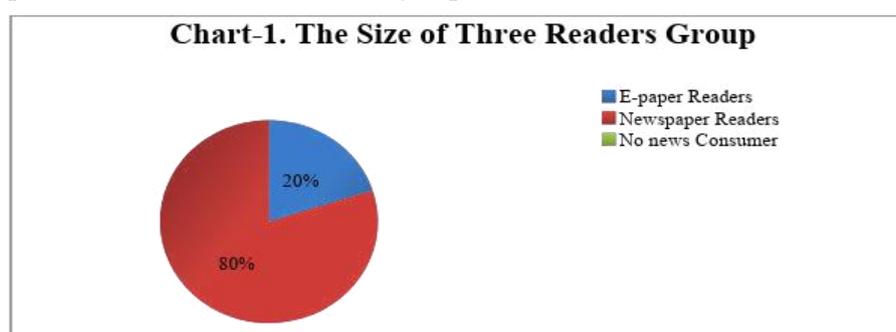
(Wolswinkel, 2008); In their research paper '*New Paper Reading: The Explaining Factors of Newspaper Reading Behavior of Young Adults*', he found out that newspaper reading does not depend on young adult's surveillance needs. Facilitating conditions are very influential in newspaper reading time. He also found that when newspaper reading is made easy to young adults, they tend to read them, regardless of their real interest in the news subjects.

## METHODOLOGY

Research Design of the study is exploratory cum quantitative deductive. For data collection, online survey method has been used. In which researcher used a Google form questionnaire & picked up a sample via an online survey through various online platforms, such as Facebook, WhatsApp, Messenger, and others. Area of the study is Varanasi, India. The universe of the study is all Youth of Varanasi. The homogeneity level of the universe was also seriously studied during the pre-test after study of homogeneous characteristics of the population and keeping in mind objectives and hypotheses of the study, researcher considered this sample size. Data have been collected from both the sources, primary as well as secondary. Data have been analyzed through simple statistics.

## RESPONDENTS

The research focuses on the youth of Varanasi city. In accordance with age categories in other newspaper research, the target group was defined as males and females between the age of 18 and 35 years. For administering the online Google form questionnaire, the respondent group consisted of 100 youth of Varanasi city (Gender: Females 65%, Males 35%; Education: Intermediate 05%, Graduation 45%, Post Graduation 40 %, and Ph.D. 10%). Data have been gathered via a Google form questionnaire. 1000 people of the target group were invited by Whatsapp, Facebook messenger to fill the google form questionnaire. During the two weeks period in February 2019, 100 respondents filled the Google form questionnaire completely (response rate was 10%). On the basis of filled Google form questionnaire by the respondents in news consumption pattern, the respondents were placed in one of the three reader groups, as can be seen in **Chart 1**.



In the above chart, it is clear that 80% of the youth read news through the hard copy of Newspapers while the rest of 20% youth rely on E-paper.

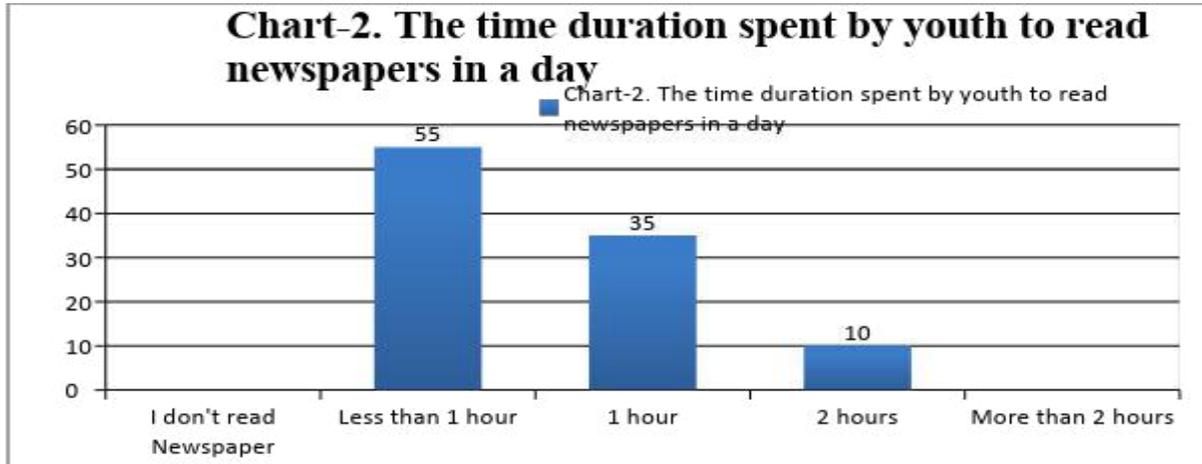
## LIMITATION OF THE STUDY

The limitations of the study are as follows—

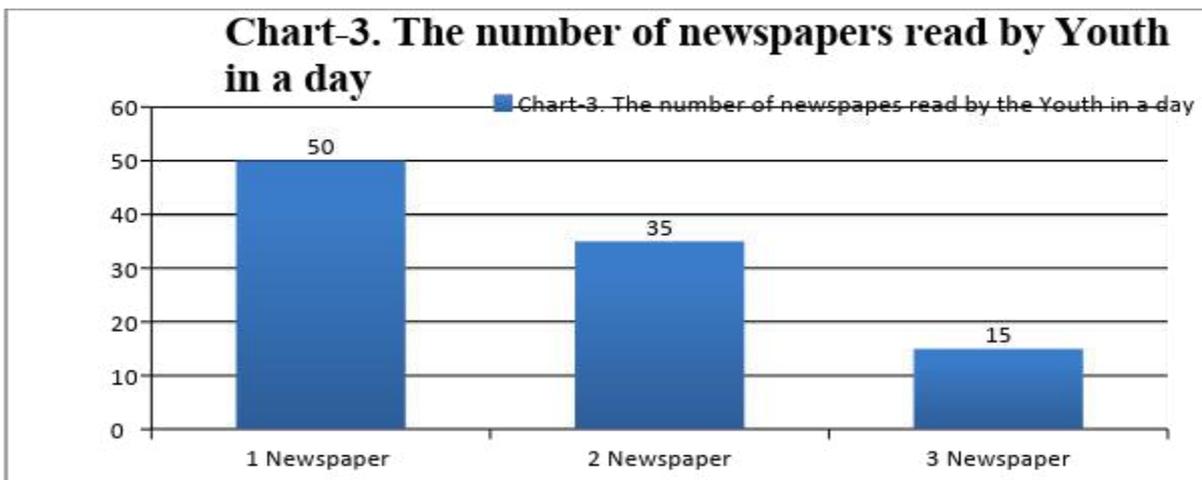
- In this research paper, the youth from 18 to 35 years old have been selected for sampling.
- 100 youth participated from Varanasi, India via an online survey.
- The research studies only about Daily Hindi Newspapers of Varanasi.
- Due to the constraints of time, certain topics have not been touched upon at all during the course of the study while some of them explored in a limited manner. An in-depth analysis may be further taken up on this topic.

**Data Tabulation, Analysis, Discussion & Interpretation**

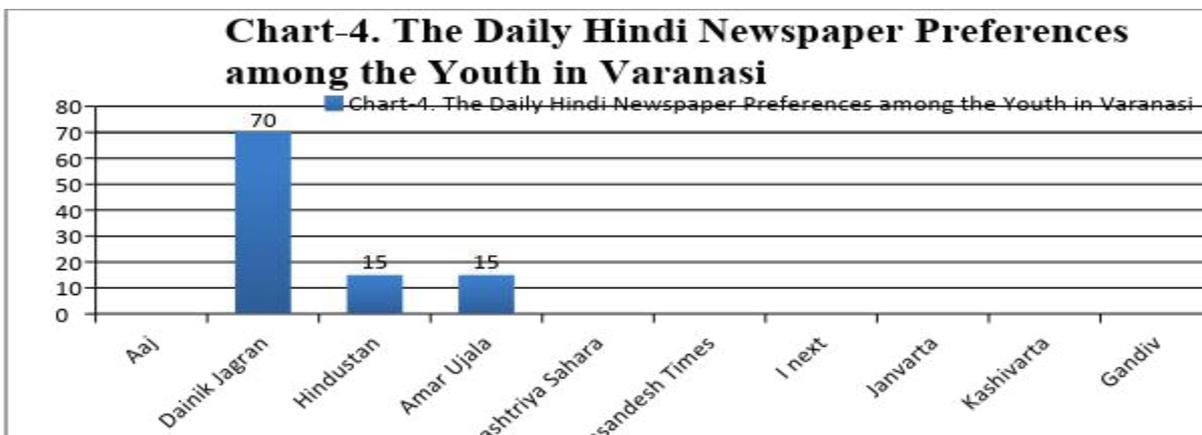
After the gathered data through online survey, there is data tabulation, analysis, discussions & interpretations is described with the help of charts as follows—



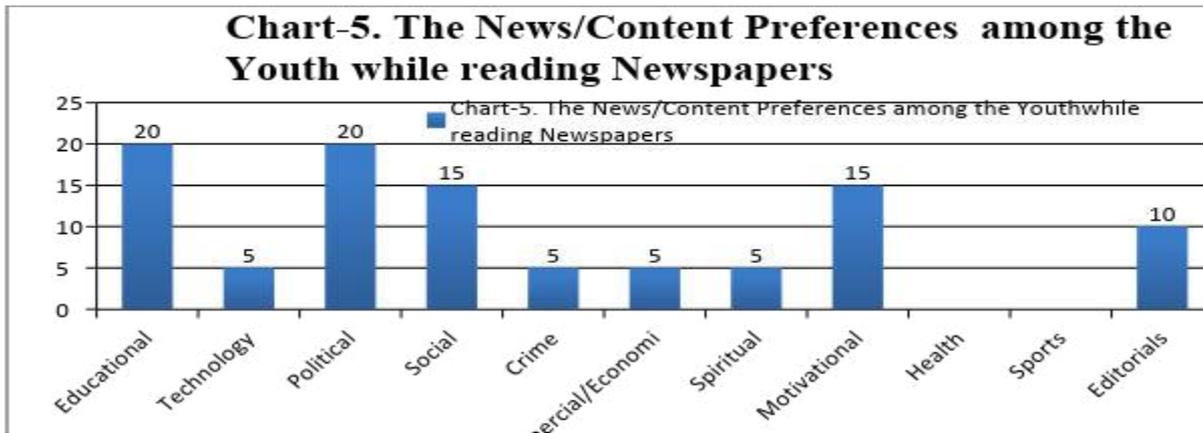
In the above chart it's clear that 55% of the youth read newspapers less than 1 hour, 35% youth read the newspaper 1 hour and only 10% of the youth take 2 hours for reading newspapers. It clearly indicates that youth are trying to spend much time on newspapers but still they're spending less time in about less than 1 hour.



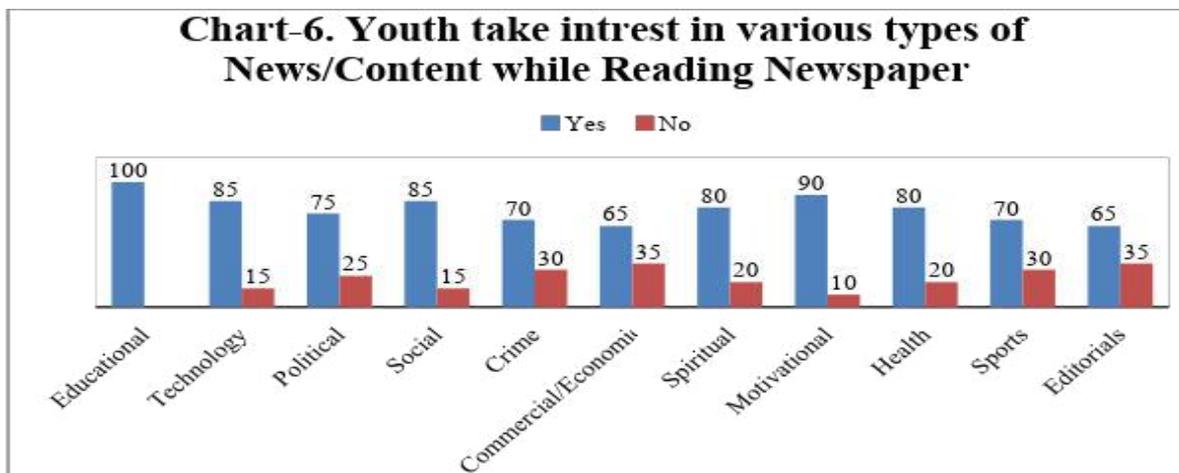
In the above chart, it's clear that 50% of the youth read only 1 newspaper in a day, 35% of youth read 2 newspapers in a day. 15% of the youth take an interest in reading 3 newspapers in a day. It shows youth newspapers readability that 50% of the youth are trying to read 2 or 3 newspaper in a day. It's a good sign of today's youth.



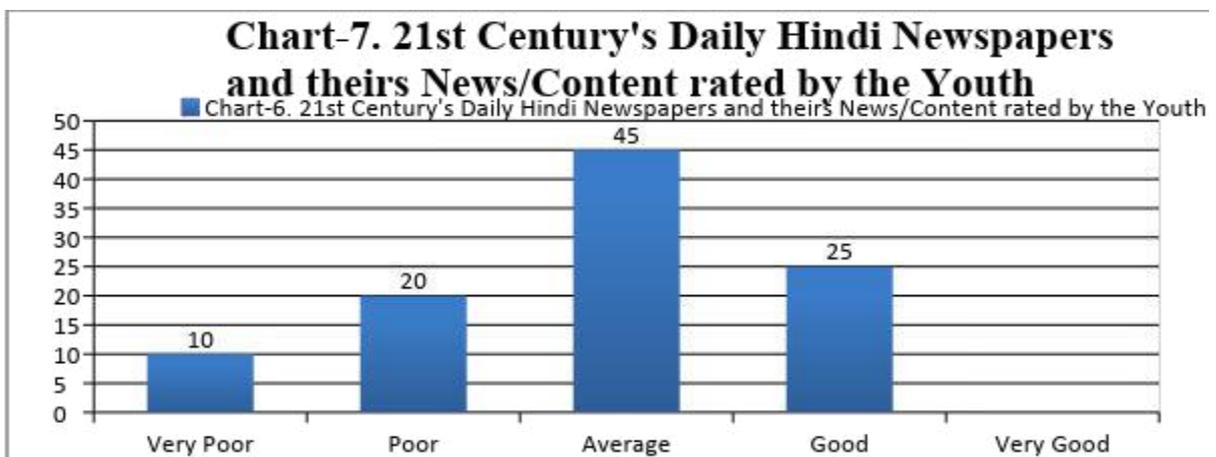
In the above chart, most of the youth (70%) prefer Dainik Jagran newspaper to read while Hindustan & Amar Ujala both are at the second place with the preference among 15% of the youth in Varanasi. No, any youth has given preference to all the other daily Hindi newspapers of Varanasi. It shows that overall Dainik Jagran is the most popular daily Hindi newspaper among the youth.



In the above chart 20% youth prefer Educational and political news/content, 15% youth prefer Social and Motivational News/Content, 10% youth prefer Editorials while 5 % of the youth prefer technology, crime, commercial/Economics, and spiritual news/content while reading newspapers. No, any youth prefer health and sports news/content while reading newspapers. It shows that Educational and political News/Content is most popular among the youth.



In the above chart 100% youth read Educational news/content, 90% of Youth read Motivational News and content, 85% of youth take interest to read Social & technology related News/Content, 80% of youth take interest to read Spiritual & Health related news/content, 75% of youth take interest to read Political news/content, 70% of youth take interest to read Crime & Sports related news, and 65% of youth take interest to read Commercial/Economics related news/content & Editorials. It shows that Educational, Motivational, Social and Technology related news or content attract the youth most.



In the above chart, most (45%) of the youth give an average rating to 21st century’s daily Hindi newspapers and their news/content. 25% rated Good, 20% rated poor while 10% rated very poor to 21st century’s daily Hindi newspapers and their news and content. It shows that Most of the Youth (75%) are not satisfied with today’s daily Hindi newspapers and their news and content.

**RESULTS & FINDINGS**

1. Most of the youth (80%) read news through the hard copy of Newspapers while the rest of 20% youth rely on E-paper. Hence hypothesis1 is proved wrong.
2. Most (55%) of the youth read newspapers for less than 1 hour. It clearly indicates that youth are trying to spend much time on newspapers but still they're spending less time in about less than 1 hour. Hence hypothesis2 is proved.
3. 50% of the youth read only 1 newspaper in a day, 35% youth read 2 newspapers in a day. 15% of the youth take an interest in reading 3 newspapers in a day. It shows youth newspapers readability that 50% of the youth are trying to read 2 or 3 newspaper in a day. Hence hypothesis3 is proved somewhat wrong.
4. Most of the youth (70%) prefer Dainik Jagran newspaper to read. It indicates that Dainik Jagran is the most popular daily Hindi newspaper among the youth. Hence hypothesis4 is proved.
5. 20% of the youth prefer Educational and political news/content, 15% youth prefer Social and Motivational News/Content, 10% youth prefer Editorials while 5 % of the youth prefer technology, crime, commercial/Economics, and spiritual news/content while reading newspapers. It shows that Educational and political News/Content is most popular among the youth.
6. 100% youth read Educational news/content, 90% Youth read Motivational News and content, 85% of youth take interest to read Social & technology related News/Content. It shows that Educational, Motivational, Social and Technology related news or content attract the youth most. Hence hypothesis5 is proved.
7. Most (45%) of the youth give an average rating to 21st century's daily Hindi newspapers and their news/content. 25% rated Good, 20% rated poor while 10% rated very poor to 21st century's daily Hindi newspapers and their news and content. It shows that Most of the Youth (75%) are not satisfied today's daily Hindi newspapers and their news/content.

**CONCLUSIONS**

The whole research states that still in 21st-century youth are rely on a hard copy of the newspaper than E-paper. It shows the relevance of print media even in the internet era. Yes! No doubt youth don't spend much time for reading the newspaper but it's a good sign that at least they try to spend 2 hours for reading newspapers. The newspaper readability of the youth is much appreciable because 50% of the youth are trying to read 2 or 3 newspaper in a day. This is the other matter that rest of the 50% youth read only 1 newspaper in a day. Throughout the research, Dainik Jagran is the most popular daily Hindi Newspaper among the youth of Varanasi. From the research, it is found that most of the youth prefer Educational and political News/Content while reading the newspaper. It also shows that they're inclined towards politics as well as education with the same preference. The research also shows that Educational, Motivational, Social and Technology related news or content attract the youth most. These all are the subject of youth's interests. In this research, youth rated 21st Century's daily Hindi newspapers and their news and content and it's found that they are unsatisfied with it. Most of the students rated it average on a rating scale. No one finds that Today's daily Hindi Newspapers and their news and content are very good. This is the matter of thinking for daily Hindi Newspaper organizations of Varanasi.

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**MEDIA PREFERENCES OF YOUTH IN SPECIAL REFERENCE TO THE UNIVERSITY STUDENTS OF VARANASI**

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**Shikha Singh**Research Scholar, Department of Journalism & Mass Communication, Mahatma Gandhi Kashi Vidyapith, Varanasi

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**ABSTRACT**

*India is one of the largest democracies in the world. And 'Media' is the fourth pillar of this exemplar democratic structure. As India has more than 50% of its population below the age of 25 and more than 65% below the age of 35, a detailed analysis of media preferences of the youth of the country becomes of utmost importance. This research paper studies the background conditions that influence the choices of people(youth in particular) related to media sources.*

*The sample size of the study is 45 students from different educational institutions of Varanasi, belonging to the age group of 15 to 29. The research has been conducted using survey method, using questionnaires. The universe of the study is all the Youth of Varanasi. Data have been and analysed through simple statistics.*

*Keyword: Media preferences, Youth, Democracy, University students, Varanasi*

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**INTRODUCTION**

Media is an essential component of human life. Multiplicity of availability of media sources creates the need of preference/choice/ selection. The traditional print/electronic or new social media are the available choices. The term "MEDIA PREFERENCES" is used to describe how people use the various organs of mass media and interpersonal communication. To further explain this it is necessary to discuss mass communication, which can be defined as "A system of communication where by messages are being dispersed to a heterogeneous audience simultaneously." This communication system uses various media i.e. print/electronic or new social media. According to the National Youth Policy 2014 "the age of YOUTH is between 15 to 29 years." While the United Nations considers youth as people between 15 to 25 years of age.

Media is a tool to acquire information. And like any tool, its use depends on the needs of the consumers. As it does not only entertains the youth but also educates, inform and sensitize the youth about the issues that affect their lives: Human rights, education, health, environment etc. The choices people make, whether to follow traditional or new(social) media is highly dependent on their requirements. While traditional media is more reliable and accessible, the internet is more up-to-date and extensive.

Next comes the economic considerations. For some people it's traditional media that's more affordable, and for others, social media is better within their reach. The rapid growth and expansion of telecom services in all parts of the country, has swayed the preferences of today's youth towards contemporary social media platforms.

The media preferences of present generation are also very much affected by their educational level and technical skills. The traditional media(newspaper and radio) and new media each has their own benefits for different educational fields. Thus the level of education of consumers directly influences their preferences among the available options of media sources.

**PROBLEM/SUBJECT OF STUDY**

The identified problem /subject for the purposed study is Media Preferences of Youth.

**OBJECTIVE OF THE STUDY**

1. To know the preferences/choices/selection of media as far as youth is concerned.
2. To study the youth characteristics and how they influence mass media preferences.
3. To show the youth as a potential active partner in the process of mass communication.
4. To what extent does educational level of youth affect their media preference
5. To what extent youth read newspapers rather than Television.
6. To what extent does youth prefer listening to Radio rather than other Mass Media channels

**REVIEW OF THE LITERATURE**

There have been many studies regarding media preferences among youth throughout the years. However, the reasons behind their preferences have not been studied thoroughly yet

**LOWISZ STEVE(2014)**

1. Today's more than 50% of people learn about breaking news through social media instead of reading a newspaper.
2. 55% of regular news readers say they read newspaper mostly on a computer or smartphone.

**Fayaz Ahmad Loan (2011);** conducted his research on ‘Media preferences of the net generation college students’. In his research he compared students' preferences between reading and electronic media devices, where, reading proved to be one of the top most activities only defeated by watching television and listening music. His work suggests that the electronic media is competing with traditional media on different fronts as social media surfing is also preferred by a good number of net generation students over reading.

**Dr Prabha Sanker Mishra (2016);** concluded that the presence of mass media in the life of present generation is very evident. Amidst various kinds of the mass media, people have the alternatives to choose the media as per their needs. The study suggests that the smartphone is highly preferred medium by the young people(60%). Television is the second most preferred medium(32.5%) and Radio is the least preferred medium.

**HYPOTHESIS OF THE STUDY:**

The Hypothesis of the study is:

1. Media preference is need based.
2. Media preference is based on economic consideration.
3. Media preference is based on educational level of youth.
4. Youth prefer listening to Radio to any other Mass Media channel.
5. Youth do not prefer listening to Radio to any other Mass Media channel.
6. Youth prefer the readership of papers to watching television.
7. Youth do not prefer the readership of papers to watching television.

**DATA TABULATION AND ANALYSIS**

**TABLE:- 1**

Needs	Newspaper(%)	Radio(%)	Television(%)	Smartphones/ Social media(%)
Entertainment	1	4	38	57
Education	23	10	8	59
News	30	12	17	41

Table 1 suggests that youth today selects media source based upon their needs. Though for all purposes, new media is comparatively more preferred.

**TABLE:- 2**

Economic Conditions	Newspaper (%)	Radio (%)	Television (%)	Social media (%)
Below avg	21	23	16	40
Avg	22	15	21	42
Above avg	16	1	20	63

According to Table 2, the economic considerations to the youth have an impact on their media preferences as well. Newspapers and social media has almost same popularity among all economic sections, where social media is always comparatively more popular. While there is a large difference in youth preferring radio and television on the basis of economic conditions.

**TABLE:- 3**

Education	Newspaper (%)	Radio (%)	Television (%)	Social media (%)
UG	33	9	18	40
PG	12	15	19	54
Others	17	15	11	57

Table 3 suggests that the education level of youth also affects their media preferences. New media is prevailing over other media sources in every category.

**RESULT & FINDINGS**

- Most of youth prefers smartphones/social media over other media sources for different needs. Newspaper is mostly preferred for news, while television is more preferred for entertainment purposes.
- The youth belonging to different economic groups, prefer new media over newspaper, television and radio. Radio is mostly popular among youth from below average economic background. While television is mostly preferred by the average category.
- The media preferences of all youth tends towards new media when compared to other options available.

**TESTING OF HYPOTHESES**

H1: The first hypothesis is *affirmed* by Table 1, showing that the media preferences of youth is need based.

H2: The second hypothesis is proved *true* by Table 2, because economic background of the youth is seen to affect their media preferences.

H3: The youth select their media sources as per their education level is proven *true* by the third table.

H4: This hypothesis is proven *wrong*, as radio is never seen to be the most preferred option of the youth in any of the given conditions.

H5: This hypothesis stands *true*.

H6 & H7: Youth prefers reading newspaper over watching television for education and news, while for entertainment purposes television is more preferred than newspaper. Thus in this case both the hypotheses remain *true* in different scenarios.

**CONCLUSION**

Thus we see the media preferences of youth is need based. It depends upon their economic background and education level. Though in each and every condition smartphones/social media is more preferred over all other media sources. Because mass media today, is not just a monologue anymore. With the advent of social media and increasing awareness among youth, media has become more of a discussion platform. The traditional media has either none or very few and tiresome feedback opportunities. While social media provides the option to not only gain information, but also contribute something new or just share their individual view point on a particular matter.

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**STATUS OF WOMEN IN RURAL INDIA****Hemangini Ameta**Assistant Professor, Department of Mass Communication, Pacific University, Udaipur

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**ABSTRACT**

*Women, a girl, a wife, a mother, a grandmother, overall woman is a key of a family. World can never be complete without a woman. Law is the set of rules enforced to govern the behavior of people. From the beginning of this world women is treated as a weaker section of the society and they are the victims of the crimes like rape, eve teasing, female infanticide, dowry, domestic violence, child marriage and acid throwing. They were only allowed to live beneath the shoes of their husbands and fathers. Laws are being made to secure the lives of the women from the violence of their families and societies, and to provide them with their rights of which they are the owners. This paper covers the aspect of women from past history to the present world. It shows how the law of our country has contributed its best to change the lives of women, to make them live with dignity and respect not as a slave.*

*Keywords: Legal status, Women rights, Domestic violence, Child marriage, Dowry, Eve teasing*

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**INTRODUCTION**

Legally a female is known as a woman after she has passed through her childhood and adolescence, i.e. basically after crossing the teenage a girl is a woman. Government of India has made several laws to provide equal status to women in our country and secure their lives from various violence and crimes. Constitution of India provides fundamental rights and fundamental duties to the citizens of India; each and every citizen of this country is equally entitled of these rights and duties. The Constitution of India guarantees to all Indian women equality.

**(1) EQUALITY IN RURAL AREAS**

Tangible proof of the relevance and effectiveness of Indian women's movements, is the fact that the issue of women's rights is today a central tenet of political and development discourse in India. Affirmative action for women's political participation, the implementation of major poverty alleviation programs through women's groups, the review of laws and regulations to ensure women's equality all demonstrate this recognition at the political level and at the level of policy. Nevertheless, there is no denying the facts documented in this report evidence of the huge gaps between Constitutional guarantees and the daily realities of women's lives. It is important to acknowledge these gaps, because the time has never seemed more appropriate to make a huge concerted effort to bridge them to identify and overthrow the barriers that prevent the realization of freedoms and equality for half of India's population. Of course, all women are not equal women belonging to the privileged and dominant classes and castes enjoy many freedoms and opportunities that are denied to men from subordinate and disprivileged groups. Gender inequality is not the only inequality in India women are unfree and unequal, but so are Dalits and Adivasis, members of subordinate castes and communities, landless people, displaced people, migrants, the homeless, disabled people and many other groups. Yet, women are at the bottom of the pile in every one of these groups the last man in Gandhiji's talisman, the poorest and most powerless individual, is actually a woman. Equality of freedoms and opportunities for this last woman can come about only through transformation in all the structures and systems that generate and perpetuate inequalities a transformation that would benefit every other subordinate group in society.

**(2) EDUCATION OF WOMEN**

Eliminating gender differences in access to education and educational attainment are key elements on the path to attaining gender equality and reducing the disempowerment of women. In recognition of the pivotal role of education in development and of persistent gender inequalities in access to education, the elimination of gender disparity in primary education is one of the Millennium Development Goals. The achievement of universal primary education has been a key goal of Indian planning since Independence. However, increasing access to primary schooling still leaves the twin questions of educational quality and school retention unanswered. Continued economic development cannot be sustained with a population that has merely completed primary school; it needs a dependable supply of highly educated and skilled human capital for which a high level of educational attainment of both women and men is necessary. However, ensuring a continued supply of skilled human capital to sustain economic growth is only one objective of reducing gender inequalities in educational attainment: the other is that education, particularly higher education of women, is a key enabler of demographic change, family welfare, and better health and nutrition of women and their families. Higher education has the potential to empower women with knowledge and ways of understanding and manipulating the world around

them. Education of women has been shown to be associated with lower fertility, infant mortality, and better child health and nutrition.

### **(3) MARRIAGE IN RURAL PARTS OF INDIA**

An early age at marriage of women is an indicator of the low status of women in society; at the individual level too, an early age at marriage for a woman is related to lower empowerment and increased risk of adverse reproductive and other health consequences (Mason, 1986; International Center for Research on Women, 2007). An early age at marriage typically curtails women's access to education and cuts short the time needed to develop and mature unhampered by responsibilities of marriage and children. Young brides also tend to be among the youngest members of their husbands' families and, by virtue of their young age and relationship, are unlikely to be accorded much power or independence.

An early age at marriage also has many negative health consequences for women. For one, early ages at marriage typically lead to early childbearing. Having a child when the body is still maturing increases the risk of maternal and child mortality. Further, women married very early are typically sexually immature and inexperienced, but are often married to much older sexually experienced men. This combination of early ages at marriage and large spousal age differences can put women at a higher risk of sexually transmitted infections including HIV (Bruce and Clark, 2004). Specifically, young women married early may be subject to a higher risk of infection because of prior sexual experiences of their older partners combined with their inability to negotiate safe sex due to their own young age and immaturity and, often, the large spousal age difference. This chapter presents the levels of and trends in the age at marriage for women and men and in spousal age difference.

### **(4) HEALTH AND AWARENESS**

The Women's health and nutritional status is inextricably bound up with social, cultural, and economic factors that influence all aspects of their lives, and it has consequences not only for the women themselves but also for the well-being of their children (particularly females), the functioning of households. Since the turn of the century, India's sex ratio has become increasingly favorable to males. This is in contrast to the situation in most countries, where the survival chances of females have improved with increasing economic growth and declining overall mortality. In India, excess female mortality persists up to the age of 30—a symptom of a bias against females. But there are wide disparities in fertility and mortality among states and, within states, between rural and urban areas. The substantially unfavorable levels of these indicators in the northern states of Bihar, Madhya Pradesh, Rajasthan and Uttar Pradesh in relation to most southern states reflects marked social and demographic contrasts between the "Hindi belt" and the rest of India. The southern state of Kerala, for instance, has achieved fertility and mortality levels approaching those of industrial countries (Improving Women's Health in India; 1996). This is the status of women health in India compared other countries in the world.

This son preference, along with high dowry costs for daughters, sometimes results in the mistreatment of daughters. Further, Indian women have low levels of both education and formal labor force participation. They typically have little autonomy, living under the control of first their fathers, then their husbands, and finally their sons. All of these factors exert a negative impact on the health status of Indian women. Poor health has repercussions not only for women but also their families. Women in poor health are more likely to give birth to low weight infants. They also are less likely to be able to provide food and adequate care for their children. Finally, a woman's health affects the household economic well-being, as a woman in poor health will be less productive in the labor force.

### **REVIEW OF LITERATURE**

To make the scheme successful in empowering rural women, it is very necessary that they should participate in large numbers in the Gram Sabha (open rural assembly) and voice their preferences and concerns regarding the implementation of government schemes, including, MGNREGS. The opportunity of right to livelihood should be properly made use of. Indian Constitution had not given the right to work as a justiciable right. But, it was in 2005 that the Indian Parliament passed the law on Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) to provide the right to work to Indian citizens of rural areas. Rural Indian women are stepping out of their private space and making a contribution in building infrastructure in the village, other than empowering themselves. The Government of India has provided an opportunity to rural women to live with dignity and honor and equal footing with the rural man. Earlier, the contribution of the rural women was invisible to the people with patriarchal mindsets. MGNREGS is trying to empower the invisible lifeline of rural community. For making their lives successful and meaningful, Indian rural women have also to put in 100 percent initiative. Otherwise, the scheme may fail as any other government project, with all its loopholes. If implemented successfully, it can become a role model for all developing countries.

Any developmental process is the expansion of assets and capabilities of rural women to participate in, negotiate with, influence, control, and hold the institution accountable that affect their lives. Skill development among rural women is the need of the hour so as to make them confident, self-reliant and to develop in them the ability to be a part of decision making at home and outside. Indeed it may not be wrong to say that still rural women are the most disadvantaged and neglected section of the society for they are economically backward. Therefore there is a need on the part of the government and civil society to enable improvement in the quality of life of such vulnerable sections of the Indian population.

More importantly the developmental process in India should give priority to welfare schemes and programs meant for scheduled castes and scheduled tribes" including women. These are the people who are economically backward; therefore, there is a need for sincere efforts on the part of the government to help improve the quality their life. The Social Assessment for the training and skill development clearly reflected that rural landless (mostly SCs and STs) form an integral part of poverty-ridden and marginalized groups. By empowering rural woman through education can thus enable them to live with dignity and self-reliance cutting across the barriers of customary biases and prejudices, social barrier of caste, class, gender, occupation and institutional barriers that prevent them from taking actions to improve their state both at the individual and collective level. Therefore, free education and necessary and employable skill development programs must be launched for rural students and women so as to make them self-reliant and economically independent. Furthermore, right to vote is meaningless unless rural women are made aware, educated and imparted skills to understand the order of the day and this can bring change in their lives, in the family and lastly transform the holistic tribal landscape of India, through education, legal awareness, and socio economic independence. Thus, there is no doubt that the rural women can acquire any developmental milestones (skills) only through education and thus can change their own destiny.

Today the reflections of modern life styles shown on the Indian rural society along with the rural women. Villages are changing their old look and accepting the new social changes. There are many causes responsible for rural social changes. The social process touch to the different feathers of rural society. May some changes are positive and some are negative. The education flow has been reached towards rural society and affecting on rural women. India is a country of villages as the majority of its population lives in villages and far-flung remote areas.

Women emerged in developmental process from the concept of equality. Any developmental process is the expansion of assets and capabilities of rural women to participate in, negotiate with, influence, control, and hold the institution accountable that affect their lives. Skill development among rural women is the need of the hour so as to make them confident, self-reliant and to develop in them the ability to be a part of decision making at home and outside. Rural women are the most disadvantaged and neglected section of the society for they are economically backward. Therefore there is a need of time for overall development of rural society.

The review of the status of women in India tells the story of a fall in the status of women to an abysmally low position from a relatively high status and nobility of the Vedic times. The fall in status has led to a socio-economic and religious-cultural deprivation of women. From the womb to tomb women are victims of violence and deprivations. The vulnerability of women in rural India and that too in Uttar Pradesh is worse compared to the all India levels. Of course, there are certain initiatives in the country, especially after the Independence towards raising the status of women. However, there are miles to go in order to reach the goal of gender equality. Apart from this general condition of gender inequalities, the situation seems more miserable in case of Dalit women. They are victims of a double deprivation. One, on the gender front, and the other on the caste front.

**Change is on** India is probably the most complex and diverse society, intricately knotted in age-old beliefs and practices. Hence few bold departures or courageous social reforms appear feasible. Yet, a woman's image and fate, which are most constricted in the current milieu, now surprisingly see the dismantling of many a shackle. More and more women are seen in schools and colleges and in more social and professional streams. It has been made possible both through positive discrimination policies and women's grit, along with a ready-to-assume-new roles attitude.

The internet and the social media have fuelled online women activism in a big way. Projects like Digital India promise to provide opportunities for e-learning and to open earning avenues for women. Meanwhile, in the hinterlands there's the real-life version of Gulaab Gang (a 2013 film in which a woman protagonist battles social injustice and creates a platform for abused women), with women in one of the most backward regions of

Uttar Pradesh getting together to build a historic movement to battle multiple forms of social biases and exploitation. It has expanded to include girls' education on its agenda.

### **RESEARCH METHODOLOGY**

This study has been done to analyze the present status of female in India. This research is a qualitative research. For this research, secondary data have used and data collected from some sources like previous research findings, news papers, some blogs and websites.

While it cannot be comprehensive, this report offers a broad picture of relevant development of women in India. The aim is to raise awareness, spark further discussion and stimulate the Media to increase the level of omen in rural parts of India. This report also indicates towards media to keep people's attention for women's status in india and discouraging the negativity in the society.

### **CONCLUSION**

The review of the status of women in India tells the story of a fall in the status of women to an abysmally low position from a relatively high status and nobility of the Vedic times. The fall in status has led to a socio-economic and religious-cultural deprivation of women. From the case study undertaken, it is observed that the present women in rural areas understand the current situation and they are becoming support to the family. But by providing necessary skills, alternative employment opportunities are challenges of women in the rural sector. Also low pay, absence of job security, long working hours are the main reasons for their slow growth in social status. The initiatives by the government will make all the women to stay ahead in all the activities. However, there are miles to go in order to reach the goal of gender equality. It is observed from the present studies that around 68% of the women can read and write at basic level. They are having sufficient freedom to save their earnings and improving their socio-economic status.

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**DIGITAL MEDIA- SHAPING THE FUTURE OF ADVERTISING**

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**ABSTRACT**

*Advertising has always followed the consumers and same is the case with the digital media. Over the past few years, with increased scope of digital media, the advertisers are able to reach much bigger audience. Almost every area of the business has been impacted by the digital media. It is actually changing the traditional marketing communication as consumers are increasingly using the digital media and turning away from traditional media. Even marketers today are changing traditional advertising approaches to keep up with current trends. In fact, advertisers are able to reach a much larger audience through digital media. This study offers the characteristics of digital advertising and why it works. It will also throw some light on consumer's perception towards digital advertising.*

*Keyword: Digital Media, Advertising, Consumers, Impact*

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**1. INTRODUCTION**

Digital advertising is defined as promoting goods, services or ideas to target consumers by using internet as the medium. Digital Media has provided the advertisers new techniques of capturing attention of target audiences with more scope for creativity and effectiveness hereby adding new dimensions to advertising world. 'Measurability is the most important dimension of digital advertising after convenience and spontaneity. It has facilitated the advertiser to determine the productivity of their advertising campaign by measuring the feedback fairly and accurately. Another important dimension is the convenience of modifying the content as and when required without being affected by time and place. Digital advertising has made it easier by creating well defined consumer groups so that the messages can be designed for specific segments of consumers. Moreover, digital advertising methods are quite cost effective. It has led to the reduction of transactions cost between advertisers and consumers. It is because digital advertising enables the advertiser to target the information to those consumers who actually value the information and are most likely to act on it. In Developed countries, digital advertising is attracting consumers as well as advertisers because of its numerous advantages over traditional methods of advertising. This is the reason that it has become a buzz world in marketing. Also, Rupert Murdoch has once said, "The Internet has been the most fundamental change during my lifetime and for hundreds of years."

**2. METHODOLOGY**

The research would be primary and secondary in nature. It would include review of various research papers, articles and websites.

**3. SAMPLING METHOD**

The sample size is 50 age group of 25-35. Samples were randomly selected from different offices as they are the digital media users and decision makers when it comes to making purchases.

**4. DIGITAL ADVERTISING IN INDIA**

Digital advertising has deep roots in other parts of the world. In India also it is spreading its sphere as the number of internet users are growing. Indian advertisers are interested in promoting their products, ideas and services online as they have realised the huge potential of digital world. Mentioned below is some of the statistics about digital media:

"2019 will witness a faster growth in digital and we are expecting digital to be at 20% media mix. As we are witnessing one in every three Indians digitally connected, we can expect the convergence of data, digital and content to deliver seamless and powerful solutions to brands as well as constantly adding inventive practices into the market," said Tushar Vyas, the president of growth and transformation at GroupM South Asia.<sup>1</sup> The Indian advertising industry is expected to touch Rs 776 billion, driven by smart phone penetration and subsequent spends on digital advertising, according to an industry report. The advertising industry is currently estimated to be Rs 559 billion and expected to grow at a compound annual growth rate (CAGR) of 32 per cent to reach Rs 189 billion by 2020, said the Dentsu Aegis Network-e4m Digital Report, which was released here today. According to the report, digital is expected to be the fastest growing medium of the advertising industry

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<sup>1</sup> <https://www.thedrum.com/news/2019/02/13/advertising-spend-india-set-14-growth-2019>

and may account for 24 per cent of the overall industry pie by 2020.<sup>1</sup> Digital advertising is set to grow at 31.96 per cent CAGR, with the market set to expand to Rs 24,920 crore (\$3.52 billion), according to the Dentsu Aegis Network Digital Report 2019. As of 2018, the size of the digital advertising market was around ₹10,819 crore (\$1.3 billion). Pegged at ₹61,878 crore (\$8.76 billion) in 2018, the Indian advertising market is estimated to grow with a CAGR of 10.62 per cent till 2021, to reach a market size of ₹85,250 crore (\$12.06 billion). Television and print media would continue to corner the largest share of media spends at 70 per cent aggregated followed by digital media at 17 per cent. Digital will contribute 29 per cent of the ad market size by 2021.<sup>2</sup>

Many advertisers still feel that though digital ad platforms are effective in increasing the sales; they do not match up to traditional media when it comes to brand building. They feel that brand building is largely happening through traditional ad mediums such as TV, newspapers, radio and outdoor rather than digital. But marketers are moving from purely old platforms to a mix of traditional and digital platforms as the digital media is all pervasive, growing and consumers are increasingly spending time on them. This is further explained by the below mentioned statistics.

Currently, the advertising expenditure on the digital advertising formats is led by social media (29%) followed by search (25%), display (21%) and video (20%). Digital Video is expected to have the fastest growth, with CAGR of 37% that will touch ₹ 5,545 crore by 2021.<sup>3</sup>

As consumers continue to spend more and more time on their smart phones, investments towards digital are rising. In 2017, 70 per cent of India's digital advertising budget was spent on mobile, wherein traditional FMCG and BFSI brands also saw uptake in something as advanced as programmatic spend. According to the 'Mobile Marketing Ecosystem Report 2018' by MMA and GroupM, the global growth of the media ad spends industry in 2017 was 3 per cent, whereas India saw a 13 per cent growth in FY 2018. On the mobile marketing front, 70 per cent of the Indian digital ad spends goes on mobile.<sup>4</sup>

## **5. BENEFITS OF DIGITAL ADVERTISING**

Online media has a great potential as information carrier as compared to other media. It offers higher selectivity among selected consumer group and advertiser is able to get a quick feedback which other traditional media fail to provide. The other benefits are:

- Digital ads reach very large number of potential buyers and even facilitate buyers to target absolute target audience.
- Interested consumers can act on the information online by clicking the pop-ups or banners. Whereas traditional media is usually one way.
- Internet as a medium knows no geographic boundaries and gives the advertisers a huge world wide audience to target at any point of time thereby expanding the company's market globally. Digital advertising works round the clock.
- Interactive nature of digital advertising gives the scope for greater flexibility, effective convergence of text, audio and graphics. Any information uploaded can be updated any time and with very less efforts.
- Digital media has no doubt superiority over other mediums and also enhances the customer company relationships as it facilitates the purchase decision and allows greater feedback than any other medium.
- Production and promotion of advertisements on digital media is cheaper than in traditional media as it doesn't involve printing and postal costs. Hence it saves time and money. Moreover there is also no loss in the quality over a period of time.

<sup>1</sup> [https://www.business-standard.com/article/management/indian-digital-advertising-market-to-grow-32-to-rs-189-billion-by-2020-118011601280\\_1.html](https://www.business-standard.com/article/management/indian-digital-advertising-market-to-grow-32-to-rs-189-billion-by-2020-118011601280_1.html)

<sup>2</sup> <https://www.thehindubusinessline.com/companies/indian-advertising-market-to-cross-10-billion-mark-in-2019/article26013810.ece>

<sup>3</sup> <https://www.livemint.com/Consumer/mNzRMHS1x4klGHKTl0Tb0M/Digital-ad-industry-to-grow-32-to-touch-24920-crore-by-20.html>

<sup>4</sup> <https://www.adgully.com/70-of-india-s-digital-advertising-budget-spent-on-mobile-report-82186.html>

## 6. REASONS FOR THE GROWTH OF DIGITAL ADVERTISING IN INDIA

### Onset of Smart Age

Indian advertising industry has flourished a lot after independence. It has grown from a mini business to a large scale industry employing millions. As of 2018, the Indian advertising market stands at Rs. 61,878 crore (\$8.76 billion) and is estimated to grow with a CAGR of 10.62% till 2021 to reach a market size of Rs. 85,250 crore (\$12.06 billion). The report highlighted that television and print take the largest share of media spends at 70% aggregated followed by digital media at 17%. Digital transformation is being adopted at a substantial scale, which in turn, is increasing the adoption of digital media at a rapid pace.<sup>1</sup>

### A swift change

Undoubtedly, the growth of Internet, social media and mobile users has given an impetus to digital advertising, but there are some other factors also. Digital media offers many advantages over traditional media which has fuelled the growth of digital advertising. Also the interactivity among advertisers and consumers, and the feedback has become a buzz word in today's world. This can only be practiced in digital advertising. Currently, 18% of all digital media is bought programmatically and has grown from 15% last year. The major reason for the growth are technological advancements, improvements in data science & analytics, implementation of algorithm to automate various procedures, better ad fraud detection and improved data policies & regulations. The rapid increase in the penetration of mobile devices and internet has led to 47% of digital media spends on mobile devices and is expected to grow at CAGR of 49% to reach spends share of 67% by 2021.<sup>2</sup>

### Rising interaction

Creativity is the key word in advertising and content is the prime force. But with the growth of digital media content has become the soul of advertising. It is the content only which actually influences the consumers. Along with the content the interaction among marketers and audience is an important factor in the growth of digital media. Consumers these days are too quick to share their feedback on Facebook, Instagram, Twitter and other social media sites. Marketers can more easily connect to the needs and wants of their consumers and get to know their feedback. They can very easily know the success and failure of their campaign and act accordingly.

### Other Factors of Influence

Demonetization slowed down the country and digital ad industry is no exception to it, though telecomm industry continued to grow with increased consumer base and greater customer satisfaction. Increase in the number of mobile phone users and 4G internet services will further attract more customers and will provide consumers with better experiences.

### Policy Matter

NDA Government at the Centre has started the Digital India campaign with full zeal. Under this programme, the government actively supports the digital media, digital advertising industry, and inculcates the digital temperament in the minds of young entrepreneurs for digital growth.

## 7. DATA ANALYSIS AND INTERPRETATION

**Table-1: Digital ads are informative**

	Percentage %
<b>Agree</b>	58.6
<b>Disagree</b>	24
<b>Not sure</b>	17.4
<b>Total</b>	<b>100</b>

58.6% of respondents feel that digital ads are informative whereas 24% don't find them informative and 17.4% are not sure about it. It gives a picture that majority of people feel that digital ads are informative.

<sup>1</sup> <https://bestmediainfo.com/2019/01/digital-advertising-to-reach-rs-25-000-crore-in-india-by-2021-dan-report/>

<sup>2</sup> <https://bestmediainfo.com/2019/01/digital-advertising-to-reach-rs-25-000-crore-in-india-by-2021-dan-report/>

**Table-2: Digital ads giving complete information about the product**

	<b>Percentage %</b>
<b>Agree</b>	41
<b>Disagree</b>	27.3
<b>Not sure</b>	31.7
<b>Total</b>	<b>100</b>

41% respondents feel that digital ads provide complete information about the product and they found them interesting. Whereas 27.3% feel that digital ads are not informative and 31.7% (a good number) are not sure in this regard. They sometimes get complete information and sometimes not. This hints that advertisers need to work on creativity if they want their consumers to be informed.

**Table-3: Digital ads help in finding the right product**

	<b>Percentage %</b>
<b>Agree</b>	40.8
<b>Disagree</b>	29.4
<b>Not sure</b>	29.8
<b>Total</b>	<b>100</b>

40.8% respondents feel that digital ads help in finding the right product for them by informing about the product whereas 29.8 are not sure about it. 29.4% believe that digital ads don't help them in finding right product as they find digital ads less creative and attractive.

**Table-4: Relevancy of digital advertising**

	<b>Percentage %</b>
<b>Relevant</b>	35
<b>Irrelevant</b>	25
<b>Not sure</b>	40
<b>Total</b>	<b>100</b>

As far as relevancy of digital ads is concerned 25% respondents don't find them relevant and 35% find them relevant. Rest is not sure about it. So, here again it shows that consumers are not very convinced about the digital ads.

**Table-5: Digital ads influencing buying decision**

	<b>Percentage %</b>
<b>Agree</b>	38
<b>Disagree</b>	33
<b>Not sure</b>	29
<b>Total</b>	<b>100</b>

On asking about the influence of digital ads on buying behaviour respondents gave a mixed response. 38% feel that digital ads influence buying behaviour whereas 33% are not influenced by the digital ads and 29% are not sure about it. This reflects that buyers are skeptical about the digital ads.

**Table-6: Skeptical about digital ads**

	<b>Percentage %</b>
<b>Agree</b>	39.7
<b>Disagree</b>	26.9
<b>Not sure</b>	33.4
<b>Total</b>	<b>100</b>

This table reflects the reason for not being able to get influenced by digital ads. Almost 40% are being skeptical about the digital ads and 33.4% are not sure about it. Only 26.9% disagree on this. This conveys that majority are being skeptical about digital ads.

**Table-7: Ignoring digital ads**

	<b>Percentage %</b>
<b>Agree</b>	40
<b>Disagree</b>	30.5
<b>Not sure</b>	29.5
<b>Total</b>	<b>100</b>

According to the above table 40% respondents agree on ignoring the digital ads whereas 30.5% don't ignore the digital ads. 29.5% were neutral about it.

**Table-8: Digital ads are distracting**

	<b>Percentage %</b>
<b>Agree</b>	40.3
<b>Disagree</b>	20
<b>Not sure</b>	39.7
<b>Total</b>	<b>100</b>

40.3% found digital ads distracting as they feel that they distract them from the content they are browsing and they avoid clicking them as they feel they might lead them to unknown sites. 20% don't find digital ads distracting whereas 39.7% were not sure about it.

**Table-9: Most trusted medium for advertisements**

	<b>Percentage %</b>
<b>Newspapers</b>	23.2
<b>TV</b>	28.3
<b>Radio</b>	18.2
<b>Outdoor</b>	10.3
<b>Digital</b>	20
<b>Total</b>	<b>100</b>

Above table clearly depicts that newspapers (23.2%) and television (28.3%) are still the preferred medium when advertising is concerned. Third medium is digital advertising with 20% respondents preferring it. Rest is radio (18.2%) and outdoor (10.3%).

**8. FINDINGS**

There is no doubt that digital advertising is growing at a very fast pace in India. It is actually changing the traditional marketing communication as consumers are increasingly using the digital media and turning away from traditional media. It is giving competition to traditional media but as far as consumers are concerned they are still skeptical about digital ads. Majority of viewers find digital advertisements informing and entertaining. They also feel that digital ads help in taking informed buying decisions and inform fully about the product. But somewhere down the line consumers don't trust digital ads completely. They sometime find them irrelevant, intrusive and annoying. Consumers have a view that digital ads many times distract them from the actual content they are watching and they knowingly don't click pop ups as they think it may lead them to some unknown sites. They still prefer newspapers ads and television ads over digital media. However this doesn't mean that digital ads are not trustworthy but it indicates that digital advertisements need to work more on creativity. It will take some time for them to take their place in the mind and heart of Indian consumers.

**9. CONCLUSION**

Advertising industry in India is moving towards digitization and automation. Digital media offers immense advantages over traditional media. There are ample of opportunities in the field of digital advertising along with many obstacles that are needed to be eradicated. India is undoubtedly going digital and so is the media as well advertising industry. It has numerous options available and is growing day by day. Digital media has deep penetration in urban cities and is also making its space in rural areas. It allows interactivity and more scope for creativity when compared with other media. But as far as traditional media is concerned especially newspapers and television, consumers still trust them. Consumers today are sceptical about digital ads. They feel that sometimes digital ads are intrusive, irrelevant and annoying. Though consumers have a feeling that digital ads are informing and entertaining but at times they distract them from the content they are watching. Here, it may be suggested that advertisers have to be more creative in the devising the content as it is the soul of advertisements. It took almost 10 years for television advertisements to make their space in minds of consumers. But today's consumers are highly informed and alert. And it is not an easy task for digital advertising industry to make its space in country like India having a complex demography with varied culture, religions, language and a great urban and rural division. Digital advertising is indeed the future but it will take some time.

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**USE OF RATIONAL, EMOTIONAL AND GREEN APPEAL: AN ADVERTISEMENT STRATEGY OF PATANJALI AYURVEDA LIMITED**

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**INTRODUCTION**

India is a fast growing economy and so its population, the increasing population results in generation of the demand for the fast moving consumer goods for their lively hood. Due to high demand in the Fast moving consumer goods (FMCG), they have been frequently purchased and used by the consumers. These goods are fast in consumption so the periodicity of its purchase is very high and regular and in small quantities. Many big corporate like Hindustan Lever, P&G, Colgate, Nestle, HUG, ITC etc. have the substantial share in the Indian market. Every family irrespective of the income, status, and size has a good consumption of the FMCG products and spends almost one fourth of their incomes in it. FMCG goods are those products that are purchased and consumed frequently, they are non durable and have relatively low price. The FMCG products can be classified into different categories according to the nature of their usage are as follows:

**Food and Beverages:** These are easily perishable items which should be consumed immediately. They have very short life span and shelf life. This category is divided into two parts foods part includes milk products, fruits, vegetables cakes, cookies, sugar, flour, biscuits etc. the beverages part includes tea, coffee, milk, soft drink etc.

**Personal and household category:** They are personal care toiletry daily use products, which are meant for personal hygiene. They are not meant for immediate consumption and their shelf life is more but governed by the expiry date of particular product. These category includes shampoo, toothpaste, soap, detergents, air freshens, mosquitoes repellent creams, matchbox etc. Contribution of the FMCG sector in the economic development is significant and cannot be ignored.

**STATEMENT OF PROBLEM**

India being the country of many religions, cultures, languages and diverse geographical locations has tremendously emerged as the world second largest market in the world. In addition to this, the country has its own domestic requirements and demands to get fulfilled by the manufactures. The growing education level in India with the environmental gained consciousness the consumers are now demanding the healthy and affordable product to meet their requirement. Although the daily FMCG requirement are being fulfilled by the big corporates but the still the product with organic and environmental approach are real expensive to buy and use.

Patanjali has just filled this gap in India by introducing its organic and Desi product in affordable prices. Desi products are the Indian Made products that use the Indian species and herbs as their main ingredients, they have the more of the medicinal importance and usage but safe to use.

In a very short span of time Baba Ramdev established the Patanjali Ayurveda Limited in 2006 along with Acharya Balkrishna. The objective of establishing it was to promote the Ayurveda science in coordination with the scientific technology at the affordable prices.

Patanjali Ayurveda (PA) is the Indian fastest growing manufactures in India with its annual turnover is Rs.9000 crore + and will increase many folds in upcoming years.

The study focuses on the marketing and advertising strategies undertaken by PA, including the unique product mix that company used and the emergence of the new prominent appeal called Desi Appeal to attract the consumers emotionally.

The advent of the different advertising approach using Rational, emotional and Green appeal to attract the consumers has made the Patanjali Ayurveda Limited a big successful story, the big MNC's need to speed up their research and innovations in the Herbal and Ayurvedic studies to counter the competition in India.

**OBJECTIVES OF THE STUDY**

The objectives of the study are as follows:

1. To Study the Patanjali Ayurveda Limited (PA) as an emerging Desi Brand in India and world.
2. To understand the advertising approach of PA.
3. To identify and analyze the factors influencing the Patanjali as the successful brand.

**SIGNIFICANCE OF THE STUDY**

In India, FMCG is the fourth largest sector to contribute in the GDP. Easy access and changing lifestyles is the key to success for growth of this sector. The rising in the education level and environment consciousness leads to the increase in the demand of the Ayurveda products or Green products, As a result the growth of FMCG majorly, Patanjali Ayurveda has increased many fold with revenue of US \$ 1.57 billion in FY17. The company aims to expand globally in the next 5 to 10 years (1). By 2020, the revenue of this sector is expected to reach 2020 US \$ 104 billion.



Sources: IIFL

Keeping in view the growing demand in this sector and its future in India, and the success rate of the Patanjali Ayurveda being an Indian origin company, this study helps in understanding the present market scenario and different advertising approaches that helps in making the Patanjali a successful venture. This study would be relevant for the young entrepreneurs in establishing the new ventures and establishing their business positioning.

**RESEARCH METHODOLOGY**

This study is the part of the social science research that includes understanding and studying the different advertising approaches and their impact on the consumers. This study follows the Triangulation research approach which incorporates both the qualitative and quantitative aspects of the study to reach the conclusion. The qualitative and quantitative data is being collected and analyzed accordingly.

**DATA COLLECTION**

The recent advertising campaigns are used for the case study method, to identify and to understand the approaches, factors and strategies employed by the brand. To understand the influence of those strategies the sales figures and data were being used.

**DATA ANALYSIS**

Observation method is being used to understand and analyses the various factors and approaches that influence the positioning of the brand in the market and made the Patanjali a more accepted brand in India. Observation is done on the following aspects:

1. Product Positioning Strategy
2. Advertisement Appeal Strategy
3. Product Mix Strategy

Data analysis will be done on the data received from the various sources to understand the share of the brand in the FMCG market in India.

**PATANJALI AYURVEDA LIMITED: A CASE STUDY**

Patanjali Ayurveda Limited (PA) was established in 2006 by Baba Ramdev along with AcharyaBalkrishna. Its foundation has started in the year 1995 with the establishment of DivyaYogMandir Trust with the help of AcharyaBalkrishna with the objective to highlight the Ayurveda and Herbal science in the world. From that time Baba Ram Dev started teaching the Yoga through shivirs and camps.

It is noted that AcharyaBalkrishna hold the 92% stake in the company and rest 8% are with a NRI Scotland based couple Mr. Sarwan and SunitaPoddar. By the virtue of this fact Patanjali has the UK Trust of Patanjali in UK. (2)

The company is now the fastest growing FMCG firm in India with its total turnover of Rs.2000 crores in 2018 and estimated that it will touch Rs.10000 crores in the coming years.

It is now a multinational organization with its branch offices in countries like US, UK, Canada etc.

There are other institutions also under the big banner of Patanjali Ayurveda who has contributed by supplying manpower, raw material and technical advancement:

1. Organic Agricultural Farms
2. Patanjali Food & Herbal Park Ltd.
3. Patanjali Yogpeeth Trust
4. Patanjali Ayurvedic College
5. Yog Gram or Gaushala
6. Patanjali Chikitsalaya
7. Patanjali Herbal Botanical Garden

### **PRODUCT POSITIONING STRATEGY**

Company has always highlighted its objectives in the public using the mass media. The use of this strategy has helped them to position and project the company in the desired way. The objectives are:

1. To introduce and educate the consumers about the good effects of Yoga in their life.
2. Healthy approach towards life.
3. Introduction of the Ayurveda and Herbal products in coordination with the scientific approach.
4. Motivate a person to use Desi and Green product that does not affect the environment too.
5. To provide the environmental friendly and healthy product in affordable prices.

Patanjali Ayurveda (PA) has adopted the following approaches to position its brand in the market:

1. Baba Ramdev its own Brand Ambassador: Since the company has started its foundation in 1995 and Baba Ramdev had become the popular known face for the public as the yoga instructor and as the opinion maker. The launch of the product by such known and influential personality had created a credible image of the brand in the market.



2. Holistic Approach: PA had always kept a holistic approach towards the life and influences the same on its customers. These promote the brand as the well-wisher of the consumer with their overall development.



3. "PrakritikaAshirwad"- The slogan raised by PA for its products and ad campaigns means blessing of the Mother Nature. These promote the brand as the chemical free and environmental friendly herbal products.

# पतंजलि

## प्रकृतिको आशीर्वाद

4. Strategy of Fair price with best quality: It is one of the objectives of the company also. They provided the quality product in fair prices to its customers that win the customer's loyalty and increase the brand equity. PA cuts the middlemen and directly purchase the material from farmers has helped them to match the fair prices. Also, its own sister companies which are mentioned earlier like Patanjali Botanical garden, Patanjali Goshala etc. provides the raw material. These all facts are being highlighted by the company time to time.



5. Useful Product Segments: PA has all useful household segments which captures almost the entire range of product, leaving no room for other brands to act upon and to get its share disturbed.

- FMCG Products
- Ayurveda medicinal products
- Home care products

### ADVERTISEMENT APPEALS STRATEGY

Advertisement appeals are that basic approaches which company use to motivate its customers by activating their needs and finally influencing them to buy that product. "Appeal is one of the most important psychological element or device that drives the need and lead to the ultimate purchase" (3). There are many motives to buy the product which are approached by certain appeals, but basically there are three types appeals Rational, Emotional and Green Appeal. PA has successfully implemented the three appeals in perfect combination to promote their products in the market.

- Emotional Appeal: Emotional appeals are based on the emotions, feelings, relations, family and other psychological attributes. It is just opposite to appeals, which are based on logics and facts. (Preston, 1968; McEwen and Leavitt, 1976). PA has used health, emotions, security, and fear as the emotional approaches to influence the consumers.
- Rational Appeal: The concept of Rational appeal as the "utilitarian" or "value-expressive" approach (for convenience or specialty products) (Johar and Sirgy, 1991). This appeal approaches the logical and reasonable attitude of the consumer. PA has used 'Fair price policy and purity' as the capturing slogans in its ad campaigns.

**PATANJALI**  
*Prakriti ka Ashirwad*

### BE A SENSIBLE & SMART HOMEMAKER

Use Patanjali natural products in this sluggish phase of demonetization and save 25 - 50% and take pride in serving your country

**Do not play with lives of your innocent children and family, by falling prey to the glitzy advertisement, false propoganda and temptations**

What is good or bad for your children and family, will this be decided by any brand ambassador? Are these paid brand ambassadors scientists or specialists? Boycott those people who promote products by taking hefty fee of 20 to 25 crores, and use 100% pure and natural, low priced, world class quality Patanjali products.

All Patanjali products are made under my personal supervision. I along with teaching yoga in the early morning, selflessly take full responsibility of entire process from research to raw material to manufacturing. It is an open fact that Patanjali is not a corporate or a business house. Patanjali is not owned by a businessman. 100% profit of Patanjali is meant for service & charity. We have rendered services to the tune of thousands of crores of people and have taken pledge of creating employment for lakhs of people and prosperity to crores of farmers and serving 125 crore country men.

While multinationals take everything from our country, they carry away thousands of crores of rupees in the name of profit and royalty. As East India Company plundered our country for 250 years, likewise these multinationals are exploiting our country by selling their harmful and dangerous chemical products. Beware!

Has any of these companies done any service to our country like Patanjali does.

**Scientific facts about Patanjali's products:** There are more than 200 scientists working in ultra modern research facilities, where we do all kind of research and then make products for you • All our products are 100% pure and natural • Patanjali Atta is high-fiber, natural chakki wheat atta • Patanjali Honey has met more than 100 parameters of purity • Patanjali Ghee is free from any animal fat, vegetable oil or any kind of adulteration and artificial colors and meets more than 20 parameters of purity • Patanjali Kaschi Ghani pure Mustard Oil is free of chemical processing • Patanjali Biscuits have no maida, cholesterol and are trans-fat free • Patanjali Pulses are unpolished and full of protein • Kesh Kanti hair oil does not contain cancer causing Mineral Oil • There is no cancer causing SLS in Dant Kanti Junior meant for children • Dant Kanti Advance has mixture of 26 herbs for protection and long life of your teeth • Kesh Kanti Shampoo is prepared with precious herbs • In Patanjali's Herbal Home-care range, the dishwash contains ingredients like ash, neem and lemon, washing powder and bar has rose, neem etc, that not only cleans the clothes thoroughly but also protects your hand and expensive clothes.

By the end of January 2017, we shall provide you Rice Bran oil, Groundnut oil, Soyabean, Sunflower, Sesame and Coconut oil etc, which would be of physically refined virgin quality and made without any chemical process.

- Green Appeal: From its inception till date PA has positioned its products as the environmental friendly products. They are environmental friendly not only in its ingredients but also in their making too. PA uses their own herbal labs, fertilizers and pesticides free raw material to manufacturer their product. PA has always used this approach in their ad campaigns.

### Nature in Demand

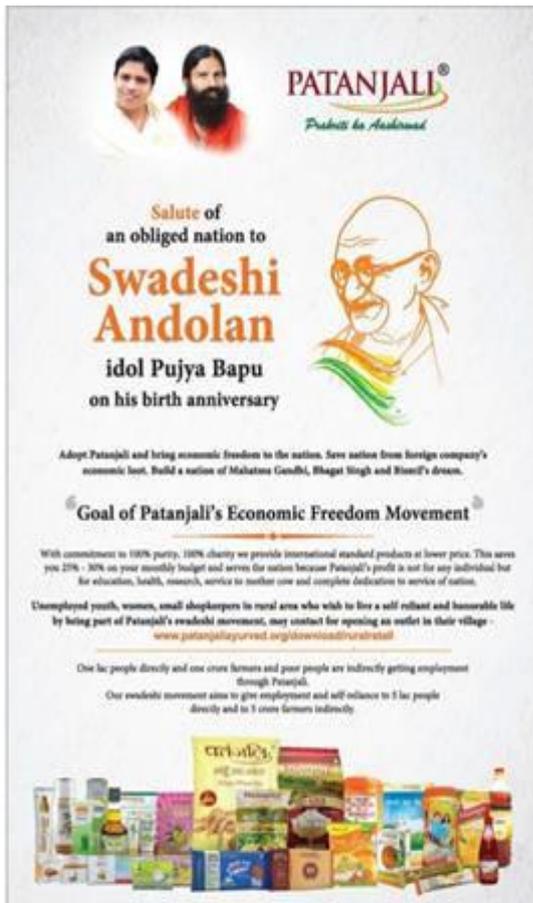
Ayurveda has gone from being treated with suspicion to gaining a wider acceptance, especially by young consumers

The success of yoga globally has given a fillip to all things natural and Indian

Companies have been able to build strong brands using ayurveda and natural ingredients

FMCG leaders like HUL and Patanjali have acquired their way into this market

- Swadeshi Appeal: Born and brought up in India, now progressing with more than Rs.20,000 crores of business in FY18, PA is mainly recognized as the Swadeshi brand. Baba Ramdev has not only used this appeal in very influential way in their ad campaigns but has also organized national level programs and speeches on National festivals like independence and Republic days, Gandhi Jayanti etc. Using the Ayurvedic approach and ingredients with herbal medicinal contents that are grown and widely used by the Indian households it has successfully become the Desi and Swadeshi brand. PA has influenced the people by using patriotic feelings in the consumers.



PA has used all the advertising appeals in an influential combination at the same time to capture the market in few years since its inception.

**PRODUCT MIX STRATEGY**

The traditional product mix includes the different P's of the marketing. PA planned and used all the P's very influentially as follow:

- Product: The purity and chemical free ingredients
- Price: Reasonably fair price as compared to other brands and best quality assured
- Place: Easy availability of the Patanjali products in all small and big cities. Dedicated retail stores under the banner of Patanjali stores had not only helped in the best availability of its product but launching of another segment to Retails outlets in the market.
- Packaging: Competitive packaging and placement
- Promotion: ad campaigns and other professional campaigns all through the country giving an assurance of best quality product without any preservatives with homemaderecipe and herbal medicinal value has mend the void created by the MNC's in India.

**PATANJALI AYURVEDA SALES & REVENUE GRAPH**

Patanjali has shown the tremendous growth since its inception. It has registered it annual turnover of Rs. 10,561 crores.

Year	Sales Turover (in crores)
2011-2012	446
2012-2013	850
2013-2014	1200
2014-2015	2006
2015-2016	5000
2016-2017	10561

Sources: (Business Today, Patanjali Revenue)



Sources: (Business Today, Patanjali Revenue)

The growth rate has steadily increased from 2011 to 2017 with almost 111% profit in FY17. Patanjali Ayurveda has been positioned at rank 4 in the most influential companies in India by Business Today group in FY17. (4)

### CONCLUSION

Patanjali Ayurveda being the Indian company has registered 111% profit during the FY2017-18. Though the company has now facing the decrease in the sales revenue in FY18 due to new tax system and poor distribution system but it has successfully positioned its product and raised its brand equity. Patanjali Ayurveda has not only survived the competition but has given a serious threat to the giant FMCG players of the world.

On the bases of the analysis and finding it has been observed that Patanjali has followed the combination of low prices, 'natural and pure' proposition and 'Swadeshi' positioning. The perfect blend of the three is the reason behind the successful story of Patanjali. It has used its own resources for the production and had influentially disseminated through their ad campaigns to its customers. Cutting the expense of the celebrity endorsement, Baba Ramdev himself has created the brand's credibility.

One of the biggest limitations of PA is that they have not able to match the demand supply factor. There is a huge gap in distribution system, which forced the customers to switch the brands as reported by the customers.

The other MNC's are now looking forward to use the same combination to hack the sales and new innovative ideas using herbal and Ayurveda essence to manufacture the required products in near future.

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**SOCIAL MEDIA EFFECTS ACADEMIC PERFORMANCE OF STUDENTS: A STUDY****Sandhya Sharma and Girish Kumar Singh**

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**INTRODUCTION**

The advent of the internet in the 1990s led to major developments in the world of communication hence the introduction of social networking sites (SNSs). The coming into being of these sites revolutionized the world of communication and today we celebrate its improvements ranging from education to entertainment. The evolution of the internet has led to its usage as the best medium of communication whereby two-third (2/3) of the internet world's population visit social networking sites (SNSs) thus serving as communication and connection tools. These networking sites are referred to as social media (Boyd and Ellison, 2007). Social media exploded as a category of online discourse which enables people to create contents, share them, bookmark them and network at a prodigious rate (Jha and Bhardwaj, 2012). This has breached the gap that existed in communication where people had to rely solely on traditional methods such as letters and phone calls as a mode of getting in touch with friends and relatives. Today, communication is as easy as walking into a neighbor's residence to deliver a piece of information or vice versa through the use of social media. Social media is fast changing the public discourse in the society and is setting trends and agenda in topics that ranges from the environment and politics to technology and the entertainment industry (Asur and Huberman, 2010). The driving factors for adoption of social media are the progressively ubiquitous access, convenience, functionality, and flexibility of social technologies (Brown, 2010; Schroeder, Minocha and Schneider, 2010). These factors have made the adoption of social media very easy and have tremendously improved mankind's life by exposing him to different ways of creating and sharing information. An additional benefit of social technologies provided on the internet is that they are frequently free or require marginal investment, thereby eliminating a potential barrier to adoption (Brown, 2010). As we know, nothing interesting is ever completely one-sided, so it is for social media as it comes with both positive and negative effects. There is a correlation between social media usage and academic performance of students in universities. There have been various views and opinions which recognize four major advantages of social media use in higher education. These include; enhancing relationship, improving learning motivation, offering personalized course material, and developing collaborative abilities (Wheeler, Yeomans and Wheeler, 2008; Rifkin, Longnecker, Leach and Ortia, 2009). Also, Liccardi et al (2007), argued that students are socially connected with one another and therefore share their daily learning experiences and do conversation on various topics through social media whereas Kuppu swamy and Shankar (2010), reviewed that social network websites grab students' attention and then diverts it towards non educational and inappropriate actions including useless chatting. Research has proved the heavy presence of social media usage among students. Wiley and Sisson (2006), for instance argue that previous studies have found that more than 90% percent of tertiary school students use social networks. It is also found out that, students use social networking sites (SNSs) approximately thirty (30) minutes throughout the day as part of their daily routine life (Nicole, Charles, and Cliff, 2007). This shows the level at which students are patronizing these sites and this may bring along both positive and negative effects on students as far as their academic performance is concerned.

**STATEMENT OF THE PROBLEM**

The internet is today the most important source of information and the growing dimensions of the use of social media by students cannot be underestimated. It has been observed that students devote more attention and time to social media than they do for their studies and they cannot pass their examinations well if they do not learn (Osharive, 2015). Also, the study conducted by Maya (2015), revealed that media use contribute to lower academic performance, low self perceptions and less interest in college oriented carriers. Academic excellence plays an important role in an individual's life; be it in the family, at social gatherings, at workplace, in an institution or even among peers. Much emphasis is placed on academic excellence because of the role it plays in an individual's life as far as a successful life and respect is concerned in every part of the world. Due to this, many people are concerned with the ways that they can improve their academic performance (Kyoshaba, 2009). Studies have also revealed that social media affects students' use of English. They tend to use short-handwriting to chat with friends and get used to it thereby replicating the same errors during examinations (Obi, Bulus, Adamu and Sala'at, 2012).

Today students at all levels especially tertiary level have been engaged in the use of social networking sites (SNSs). This research therefore seeks to investigate the level of engagement of students of the different colleges into social networking sites and also determine the effect of their use on the academic work.

**OBJECTIVES OF THE STUDY**

1. To determine the level of exposure of students of Ghaziabad colleges to social media sites
2. To ascertain what students of Ghaziabad colleges use social media for
3. To ascertain how the use of social media has influenced the academic work of students of Ghaziabad colleges

**HYPOTHESIS**

The present study that will assess the effect of social media on students' academic performance presupposes the following:

1. Students use social media to communicate and study.
2. On average, students spend at least an hour a day for social media use.
3. The impact of social media on academic performance could be positive or negative at the same time.

**METHODOLOGY**

This part presents the methodology used. Discussed here are research design, the sources of data that includes the locale of the study and research population, instrumentation and data collection, and tools used for data analysis.

**RESEARCH DESIGN, SOURCES OF DATA, INSTRUMENTATION AND DATA COLLECTION, AND TOOLS FOR DATA ANALYSIS**

The study used the quantitative as well as qualitative methods of research. Descriptive research design was utilized to gain accurate profile of situation [16].

To support the study, information relevant to the study were obtained from both primary and secondary data. Primary data were acquired from the respondents of the study, 100 student respondents. On other hand, secondary data were obtained from previous studies, literatures, books, documents, and electronic materials related to the current study.

The instrument for data collection was the survey questionnaire, observations, review of previous studies and analysis. To gather data for the three research questions, survey, review of literatures and analysis were used. Survey questionnaires were floated to the respondents. It is a tool containing several questions to gather information from the respondents. The survey questionnaire contains clear and simple questions that enable the respondents to provide accurate information. Each item in the survey questionnaires are intended to answer the research subproblems. Google Formwas used to create the questionnaire for the respondents. Google Forms are amazing tool that is free and powerful, it is ideal for anyone who needs to gather information about almost anything. Google Forms is buried within Google Drive right beneath the word processor, spreadsheet and presentation apps [21].

The data that were gathered were collected, tallied and tabulated. These data were presented in graphs were analyzed and interpreted for the readers to understand better the results obtained. To determine the appropriate sample size, Slovin's formula was used [6]. There are 71 students actively using social media that are members of department's WhatsApp group. Slovin's formula is written as:

$$n = N / (1 + N e^2)$$

Where: n = number of samples

N = total population

e = error tolerance (0.05)

thus,

$$n = N / (1 + N e^2)$$

$$= 71 / (1 + (71 \times ((0.05)^2))$$

$$= 71 / 1.1775 = 60.3 \text{ or } 60$$

To answer the three research questions, statistical tools were identified. For first and second research question, aside from literature review, mode was used. For the third research questions, average weighted mean was utilized. The collected data were used to analyze the impact of social media on students' academic performance.

**Sample size**

A total of 100 samples were taken up by the researcher and the respondents belonged to different age group, gender and income class.

**Sampling**

The sampling procedure for data collection for the present study is through simple random sampling technique.

**Instruments**

Tool used for data collection was questionnaire.

**Respondents**

The respondents of the study were the male and female students of college from different age group.

**Procedure of data gathering**

The questionnaires were distributed among the college students of Ghaziabad

**Sources of data**

The present study is based on both primary and secondary data. The main sources of primary data are the people of Delhi, Noida and Ghaziabad City.

**Area of study**

The area of the study is Delhi, Noida and Ghaziabad

**SIGNIFICANCE OF THE STUDY**

Social networks are becoming more popular among university students and are a new way of spending free time and serve as a separate channel for finding the necessary information, both educational and entertaining. Therefore, it is urgent to examine the question of what effect social networks have on their users, in particular, how the use of social networks affects the academic success of students. This study will discover this information, giving the researchers an opportunity to explore and gain new knowledge. Furthermore, it can be used for future studies.

**LITERATURE REVIEW**

The concept of social media Social media continuously keeps changing and as such it is difficult to assign a fixed definition to it as Jacka and Scott (2011), argued that "there is no single recognized definition for social media". However some scholars have defined it in different perspectives over the past years. Kaplan and Haenlein (2010), defined social media as a group of internet- based applications that build on the ideological and technological foundations of Web 2.0 and allow the creation and exchange of user-generated content. The Oxford dictionary (2011), also defined social media as "websites and applications used for social networking". Another definition of social media is that it is a "communication channel which is very popular, extremely fast and broad, has proven to be highly effective, as well as trusted by billions of people , to share and discover content concerning individuals, brands, information, entertainment and knowhow" (Dearborn, 2014). One theme that all these definitions underpin is that social media involves some form of communication between individuals over the internet. Social media began in the late 1990s with the first recognized social media network called "SixDegrees " in 1997 and this technology enabled people to upload a profile and make friends. From 1997 to 2001 a number of community tools; Asian Avenue, blackplanet and MiGente began supporting various combination of profile and publicly articulated friend (Boyd, Danah, Ellison and Nicole, 2007). There has been tremendous improvement since this era and today 6 there exist uncountable social networking sites either developed for local use, specific purpose or international use. Kaplan and Haenlein (2010), classified social media into six (6) different categories as follows;

1. Collaborative project (wikipedia)
2. Blogs and micro blogs (twitter)
3. Content communities (youtube)
4. Social networking sites (FB, 2go, BB chat)
5. Virtual game World (world of war craft)
6. Virtual second world (second life)

This classification of social media into classes has been useful to scholars and individuals for easy identification and study of a particular social media type but today a difficulty may arise due the high proliferation of social media and one may wonder which group a new developed social media type fits into. Social media is considered to be the fastest growing web application in the 21 century and this rapid development is being backed by technological advancement (Heyam, 2014). Mankind has enormously benefited and continues to benefit from it and as such cannot underestimate its importance as far as communication is concerned.

Today, social media has taken a new dimension and has encouraged more participation through the introduction of mobile phones that support social networks applications. The use of mobile phones that are powered by Android applications to social network is termed as Mobile social networking. According to Humphreys (2007), in his study titled “Mobile Social Networks and Social Practices” social network applications have now been migrated from the computer to the 7 mobile phone, network information and communication can be integrated into the public space; and these new services that are developed for mobile phones allow users to create, develop, and strengthen their social ties.

## **MOST POPULAR SOCIAL MEDIA SITES**

### **1. Facebook**

This is the biggest social media network on the Internet, both in terms of total number of users and name recognition. Founded on February 4, 2004, **Facebook** has within 12 years managed to accumulate more than 1.59 billion monthly active users and this automatically makes it one of the best mediums for connecting people from all over the world.

### **2. Twitter**

This social media platform has more than 320 million active monthly users who make use of the 140 character limit to pass on information. Businesses can use Twitter to interact with prospective clients, answer questions, release latest news and at the same time use the targeted ads with specific audiences. Twitter was founded on March 21, 2006, and has its headquarters in San Francisco, California.

### **3. LinkedIn**

Founded on December 14, 2002, and launched On May 5, 2003, LinkedIn is hands-down the most popular social media site for professional networking. The website is available in 24 languages and has over 400 million registered users. LinkedIn is great for people looking to connect with people in similar industries, networking with local professionals and displaying business related information and statistics.

### **4. Google+**

While it's no Twitter, Facebook or LinkedIn, Google+ has its place among the popular social media sites. Its SEO value alone makes it a must-use tool for any small business. Launched on December 15, 2011, Google+ has joined the big leagues registering 418 active million users as of December 2015.

### **5. YouTube**

The largest and most popular video-based social media website — was founded on February 14, 2005, by three former PayPal employees. It was later bought by Google in November 2006 for \$1.65 billion. YouTube has over 1 billion website visitors per month and is the second most popular search engine behind Google.

### **6. Pinterest**

Launched in March 2010, Pinterest is a relatively newcomer in the social media arena. This platform consists of digital bulletin boards where businesses can pin their content. Pinterest announced September 2015 that it had acquired 100 million users. Small businesses whose target audience is mostly made up of women should definitely invest in Pinterest as more than half of its visitors are women.

### **7. Instagram**

Like Pinterest, Instagram is a visual social media platform. The site, launched on October 6, 2010, has more than 400 million active users and is owned by Facebook. Many of its users use it to post information about travel, fashion, food, art and similar subjects. The platform is also distinguished by its unique filters together with video and photo editing features. Almost 95 percent of Instagram users also use Facebook.

### **8. Tumblr**

Tumblr is one of the most difficult to use social networking platforms, but it's also one of the most interesting sites. The platform allows several different post formats, including quote posts, chat posts, video and photo posts as well as audio posts, so you are never limited in the type of content that you can share. Like Twitter, reblogging, which is more like retweeting, is quick and easy. The social networking website was founded by David Karp in February 2007 and currently hosts more than 200 million blogs.

### **9. Flickr**

Flickr, pronounced “Flicker,” is an online image and video hosting platform that was created by the then Vancouver-based Ludicorp on February 10, 2004, and later acquired by Yahoo in 2005. The platform is popular with users who share and embed photographs. As of October last year, Flickr had more than 112 million users and had its footprint in more than 63 countries. An average of a million photos are shared daily on Flickr.

**10. Reddit**

This is a social news and entertainment networking website where registered users can submit content such as direct links and text posts. Users are also able to organize and determine their position on the site's pages by voting submissions up or down. Submissions with the most positive votes appear in the top category or main page. Reddit was founded by University of Virginia roommates Alexis Ohanian and Steve Huffman on June 23, 2005. A decade later, the site boasts more than 36 million registered accounts and 231 million monthly visitors.

**11. Snapchat**

Snapchat is an image messaging application software product that was created by Reggie Brown, Evan Spiegel and Bobby Murphy when they were students at Stanford University. The app was officially released in September 2011, and within a short span of time they have grown immensely registering an average of 100 million daily active users as of May 2015. More than 18 percent of all social media users use Snapchat.

**12. WhatsApp**

WhatsApp Messenger is a cross-platform instant messaging client for smartphones, PCs and tablets. The app relies on the Internet to send images, texts, documents, audio and video messages to other users that have the app installed on their devices. Launched in January 2010, WhatsApp Inc. was acquired by Facebook on February 19, 2014, for about \$19.3 billion. Today, more than 1 billion people use the service to communicate with their friends, loved ones and even customers.

**13. Quora**

Capitalizing upon human curiosity is an ingenious idea that would lead to the creation and launch of Quora in June, 2009. The website, co-founded by two former Facebook employees, Charlie Cheever and Adam D'Angelo now claims that it received more than 80 million monthly unique visitors, with half of them coming from the U.S. So far, the question-and-answer website has managed to raise \$141 million in venture capital funds and while it doesn't look ready to go public yet, it's definitely a company to watch.

**14. Vine**

With over 40 million users, Vine is a rapidly growing video sharing social media app that allows users to share 6-second video clips with their followers. While this looks like a really short time for a video, businesses of all sizes are having tremendous success using the service. Vine was founded in June 2012 and later acquired by Twitter in October 2012, just before its official launch.

**15. Periscope**

Periscope is a live video streaming mobile app that was developed by Joe Bernstein and Kayvon Beykpour. The two started the company in February 2014 and later sold it to Twitter for \$100 million in March 2015. Four months after its March 2015 relaunch, Periscope said that it had surpassed 10 million accounts and in December the same year, Apple announced Periscope as the app of the year.

**16. BizSugar**

BizSugar is a social networking platform and niche resource for small business owners, entrepreneurs and managers. The site was created in 2007 by DBH Communications, Inc., a provider of award-winning business publications, and later acquired by Small Business Trends LLC, in 2009. The platform allows users to share videos, articles, blog posts, podcast among other content. It also allows users to view and vote on submissions by other members.

**17. StumbleUpon**

StumbleUpon is a discovery engine that finds and recommends content for its users. Come June 30, 2018, it will be moving to Mix. More than 25 million people use StumbleUpon for entertainment and information. In addition, more than 80,000 publishers, brands, and other marketers have used StumbleUpon's Paid Discovery platform to promote their businesses. StumbleUpon was owned by eBay from May 2007 to April 2009, when Garrett Camp, Geoff Smith and several investors bought it back. It is now an independent, investor-backed startup once again.

**18. Delicious**

This is a social bookmarking web service for discovering, storing and sharing web bookmarks. The site was founded by Peter Gadjokov and Joshua Schachter in 2003 and acquired in 2005 by Yahoo. By the end of 2008, Delicious claimed that it had bookmarked 180 million URLs and acquired more than 5.3 million users. The service was later sold to AVOS Systems in April 2011 who later sold it to Science Inc. In January this year, Delicious Media said that it had acquired the service.

### 19. Digg

Founded more than a decade ago (November 2004), Digg is a news aggregator with a curated front page that selects stories specifically for the Internet audience. The topics vary widely from trending political issues to science to viral Internet issues and anything in between. Digg supports sharing of content to other social media platforms such as Facebook and Twitter. In 2015, the company claimed that it had about 11 million active monthly users.

### 20. Viber

Viber is a Voice over IP (VoIP) and instant messaging app for mobile devices that was developed and released by Viber Media on December 2, 2010. The app also allows for the exchange of audio, video and images between users. As of April 2014, Viber had accrued close to 600 million registered users and 230 monthly active users.

### POSITIVE EFFECTS OF SOCIAL MEDIA ON STUDENTS' ACADEMIC LIFE

Students' academic life has moved to a different dimension since the introduction of these social media networks and several studies have affirmed that social media plays an important role on students in higher education including the study conducted by Wheeler, Yeomans and Wheeler, (2008); Rifkin, Longnecker, Leach and Ortia, (2009). In their study, they recognized four (4) major advantages of social media usage by students in higher education which included; enhancing relationship, improving learning motivation, offering personalized course material, and developing collaborative abilities. Indeed, social media has contributed greatly to facilitating learning in the 21st century. It is shown that a greater percentage of students including those at the PhD level commonly use social media to ameliorate their studies (Khan, 2010).

The answers to the causes of flexible studies today across the globe might not be far-fetched from the great contribution that social media platforms are providing when used judiciously. Even though, there have been other school of thought that states that social media is a nuisance to students' academic life such as Kuppuswamy and Shankar (2010), who argued in their study that social networks distracts the attention and concentration of the students toward learning and converts it towards non educational activities such as useless and unnecessary chatting, there have been several studies conducted afterwards whose findings are contrary to this claim. For instance, the study conducted by Jain, Verma, Verma and Tiwari (2012), titled "the impact of social networking in promoting education" revealed that students benefit from chatting with other students, teachers and external sources to acquire knowledge. Also, Yunus and Salehi (2012), argued in the same direction that students gained more vocabulary, improved their writing skills and reduced their spelling mistakes through social media usage.

In fact as an educational tool, social media enriches learning by giving both students and teachers the opportunity to connect in new and very exciting ways thereby encouraging flexible mode of learning. It is stated that flexible learning expands the choice on what, when and how people learn. It supports different styles of learning including E-learning which is highly patronized across the globe (Pappas, 2013). Other scholars; O'keeffe and Clake-pearson (2011), in their study also revealed that social media benefits students by connecting them to one another on assignments and class projects.

It is further buttressed in the study of Arquero and Esteban, (2013) and Selwyn, (2007) whose conclusions were that social media undoubtedly generate new opportunities to engage students in higher education as they are remarkably effective at connecting people and facilitating the exchange of information. It is clear and indisputable from these studies that social media usage in the educational sector cannot be underestimated since its introduction.

### NEGATIVE EFFECTS OF SOCIAL MEDIA ON STUDENTS' ACADEMIC LIFE

Davies and Cranston (2008), enumerated some of the risks associated with social media which included criminal activities such as identity theft and fake contacts which is prevalent today, sexual abuse or harassment and unsuitable advertising. On the same subject O'keeffe and Clakepearson (2011), also mentioned cyberbullying, online harassment, sexting, face book depression, and privacy concerns as some of the challenges associated with social networking.

**Cyberbullying:** cyberbullying is a category of bullying that occurs in the digital realm or medium of electronic text. "It is any behavior performed through electronic or digital media by individuals or groups that repeatedly communicates hostile or aggressive messages intended to inflict harm or discomfort on others" (Tokunaga, 2010). Cyberbullying is one the serious threat in the social media environment and has called for a number of studies to determine its causes. The causes of cyberbullying according to Calvete, Orue, Estevez, Villardon and

Padilla (2010), was significantly related with the use of proactive aggression, justification of violence, exposure to violence and less perceived social support of friends.

Privacy concerns: this is another concern that everyone involved in social networking is faced with. The rate at which people post or share fake information calls for alarm and it is difficult to ascertain that, what people say and post are truly who they are. Individuals' private information are publicly displayed on some of these social networks and malicious people take advantage and perpetrate all kinds of harassment. It is also argued that the privacy options offered by most social networking sites (SNSs) do not provide users with the flexibility needed to handle conflicts with individuals who have different conceptions of privacy (Preibusch, Hoser, Gurses and Berendt, 2007). Aside these effects, other studies conducted by scholars have also proved that social media can be detrimental to students' academic life if caution is not taken in its usage. For instance the study conducted by Obi, Bulus, Adamu and Sala'at (2012), titled "The need for safety consciousness among Youths on social Networking Sites" concluded that social media affects students use of English. They use short-handwriting when chatting with friends and unconsciously get used to it thereby replicating same errors during examinations. Even though one may argue that these are minor challenges, it is important to acknowledge the increasing rate at which these errors are replicated in the education sector and if care is not taken future generation may see it as a norm. Indeed a number of studies including but not limited to the 10 study of Kuppuswamy and Shankar (2010), Osharive (2015), Maya (2015), among others have revealed unequivocally that social media can be problematic to students' academic life if caution is not taken in its usage.

### **FINDINGS**

The primary motives for using social networks for them are the search for friends, classmates and communication with them. The time spent on informal organizations enables most respondents to compose their own particular relaxation time, and in addition get ready for exams. Most students spend around 20% of their time using social media. Almost half of those surveyed admit that using the social network helped them in their personal lives and communicating with friends, organizing leisure and in search of interest groups, some argue that social networks did not affect their way of life in any way, and only a few acknowledged that social networks had influenced on their free time, 10% caused addiction. Summing up, it should be noted that social networks, becoming an integral part of the students' full life, took up most of their free time. Having superseded the methods for correspondence, they replaced the understudies' leisure activities and verbal correspondence. The informal organization, and not the course book and the instructor, moved toward becoming for them the main colleague in anticipation of exams. Often the student does not have time to absorb the information received in the lessons. After all, in the phone or tablet screen, there are things much more interesting - correspondence with peers, news tapes, all kinds of social networks, and, of course, YouTube videos. Also, all the free time a student can spend on the Internet. Instead of doing sports, reading a book, chatting with their peers "live," preparing for lessons or just walking, he will spend time on social networks. Of course, this negatively affects their physical and intellectual development. Undoubtedly, in social networks, there are also things useful for the development of the student - a lot of educational groups on Facebook and educational videos from YouTube. In addition, communication with peers through social networks can help a student socialize, find new friends, discuss with them issues related to studies. In addition, in social networks, a child can relax for a while and get distracted from the everyday college routine.

### **CONCLUSION**

It is without doubt that social media is and will remain an important tool in human life as far communication is concerned. Today mankind is harvesting tremendously from its existence not only in mere communication point of view but also in most scholarly activities. Different forms of education including distance education has been widely patronized and facilitated to some degree through these social media networks. Acquiring information both locally and internationally from friends, lectures or experts is no longer a struggle as compared to the olden days and the internet is the ultimate master behind this success. "Social media is a useful servant but a dangerous master" and can also be "described as a two edge sword" and as such, users especially students must be alert about its dangers and be prudent in its utilization. The nature of social media as a useful servant but a dangerous master" and a two edge sword has been revealed in the findings of the study that, despite the benefits that students can harness from social media networks such as sharing of information, building relationship, partaking in group discussions from near and far among others, there is to some extent addiction and distraction of attention caused by the use of social media which could have serious consequences on the academic life of students.

### **RECOMMENDATIONS**

In the light of the findings, the following recommendations are made;

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1. Seminars should be organized in the various schools or faculties to enlighten students more about the possible implications of social media usage on their academic performance.
  2. Students should make sure that they use these social networking sites judiciously to ensure that they do not become detrimental to their academics.
  3. Teachers/lecturers can adopt new strategies by channeling assignments or discussions on social media platforms to help inculcate the habit of using these sites for academic work.
  4. Students must minimize the time they spend on social media to avoid being obsessed by these sites for unnecessary chatting.
  5. The university authority should also restrict access to certain social media sites that may be prone of distracting students' attention during school hours as a means of minimizing their use.

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**ASSERTIVENESS AND SELF-AFFIRMATION: A NEW PATHWAY TO UNDERSTAND  
CONSUMER BEHAVIOR**

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**ABSTRACT**

*The two important constructs borne from different literature in psychology namely self-affirmation and assertiveness could be used to understand and manage the complexity of consumer behavior. Self-affirmation refers to the process by which individuals attempt to cope with one kind of self-threat by affirming an unrelated aspect of the self, whereas assertiveness involves speaking and acting with power while maintaining respect for others. Moreover an assertive individual expresses his or her feelings and behaviors directly and honestly while respecting others. Such behaviors are relevant in several consumption contexts, including seeking information, initiating requests, and expressing dissatisfaction. An assertive consumer is more likely to stand up for his or her consumer rights, initiate and refuse requests and express justified anger and annoyance (Richins, 1983). So, this paper reviews the evidence for the protective benefits of both self-affirmation and assertiveness, describes the mechanisms by which each confers these advantages and considers the boundary conditions of each. We conclude with a call to researchers to explore empirically how and when these important interventions might be differentially beneficial to those who cultivate them and will pave a new way for understanding consumer behavior.*

*Keywords: Assertiveness, self-affirmation, consumer behaviour.*

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**INTRODUCTION**

Today the world is revolving around consumer. The policies, strategies are developed keeping in mind the picture of consumer. Everybody in this world is a consumer. Everyday of our life we are buying and consuming an incredible variety of goods and services. However, we all have different tastes, likes and dislikes and adopt different behaviour patterns while making purchase decisions. Many factors affect how we, as individuals and as societies, live, buy, and consume. External influences such as culture, ethnicity, and social class influence how individual consumers buy and use products, and help explain how groups of consumers behave. Earlier organizations and companies were interested in knowing and understanding the strategies of selling. But now world is witnessing the change in trend. Now organizations and companies are interested in understanding “the buyer” means the consumer. So here comes the role of psychology. The two different constructs borne from different literature of psychology namely assertiveness and self-affirmation could be applied for understanding the consumer behavior.

According to self-affirmation theory, individuals are motivated to maintain a global sense of self-worth by holding on to favorable self-conceptions and positive beliefs that one is a competent, adequate, and stable individual (Steele, 1988). Self-affirmation lead to confidence, and this confidence can increase or decrease persuasion depending on the circumstances. Assertiveness refers to way of communication in which a person expresses his thoughts and feelings without violating the emotions of others. The way a person communicates decides the attainment of goal. These two constructs have importance and relevance in understanding and managing the complexities of consumer behavior. Consumer behavior refers to a study of how individuals make decision to spend their available resources (time, money and effort) or consumption related aspects (What they buy? When they buy?, How they buy? etc.). The heterogeneity among people makes understanding consumer behavior a challenging task to marketers. The basic belief of marketing-oriented organization is that the consumer is the hub around which the business revolves. Therefore, understanding behavior of consumers is a key to the success of business organizations. Marketing personnel are constantly analyzing the patterns of buying behavior and purchase decisions to predict the future trends. Simple observation provides limited insight into the complex nature of consumer choice and researchers have increasingly sought the more sophisticated concepts and methods of investigation provided by behavioral sciences in order to understand, predict, and possibly control consumer behavior more effectively. Psychology, social psychology, and sociology are the disciplines most widely employed in this endeavor which has become a substantial academic industry in its own right. The field of psychology offers great insight on both the natural defenses that people maintain against persuasive messages and threatening information as well as the manner in which these defenses can be attenuated. The basic reason of studying consumer behaviour is to understand buyer and relate a consumer through this understanding, consumer behaviour is relatively a new discipline in the field of marketing and lot

of time and effort is being spent on this exercise. Since the behaviour of consumer is dependent upon psychological, cultural, social, economic, language, regional, religious, political and other factors. Thus study of consumer behaviour is interdisciplinary science. If one wants to study properly and significantly the behaviour of consumers one is required to study serious facts of life about thinking of consumers, his decisions and perceptions which influence his thinking and decisions like his education, culture, Income, climate, social status, society, physiology, psychology, region to which he belongs, his religion and the like. Consumer behaviour itself emerged as a distinct field of study during the 1960s. Consumer behaviour is said to be an applied discipline as some decisions are significantly affected by their behaviour or expected actions. The two perspectives that seek application of its knowledge are micro and societal perspectives. The micro perspectives involve understanding consumer for the purpose of helping a firm or organization to achieve its objectives. The people involved in this field try to understand consumers in order to be more effective at their tasks. Whereas the societal or macro perspective applies knowledge of consumers to aggregate- level faced by mass or society as a whole.

## **DEFINING CHARACTERISTICS**

### **Assertiveness**

Assertiveness is a skill that involves speaking and acting with power while maintaining respect for others. Instead of passively giving up power or aggressively demanding it (Wesley, Mark & Mattaini, 2008). It is the ability to express one's feelings and assert one's rights while respecting the feelings and rights of others. Assertive communication is appropriately direct, open and honest, clarifies one's needs to the other person. Assertiveness comes naturally to some, but it is a skill that can be learned. People who have mastered the skill of assertiveness are able to greatly reduce the level of interpersonal conflict in their lives, thereby reducing a major source of stress (Elizabeth Scott, 2006). It has been defined as "that complex of behaviors emitted by a person in an interpersonal context which express that person's feelings, attitudes, wishes, opinions or rights directly, firmly and honestly while respecting the feelings, attitudes, wishes, opinions, and rights of other persons." (Galassi and Galassi, 1977) According to these writers, assertion does not involve an undue or excessive amount of anxiety or fear. It represents the standing up for one's legitimate rights without violating the rights of others. The four basic components of assertive behavior are the ability to express emotions openly, the capacity to exercise one's rights, the confidence to stand up for oneself, and the freedom to choose when assertive behavior is appropriate. There should be some structured activities to help consumers develop trust in their ability.

Making the transition to a consumer dissatisfaction context, drawing upon the model of assertive behavior developed in Psychology and Mental Health and generalizing from the positive results of assertive training, what can be said about consumer complaining behavior? For one thing, it would be expected that the dissatisfaction experienced by a non-assertive consumer will produce undue anxiety so that the range of available remedy options becomes restricted. Since brand shifting, purchase or patronage termination, or total inaction are responses that do not require intercommunication, one would expect that complaining, which is an intercommunication initiated by the consumer, to be less likely a response of the non-assertive consumer. This is in contrast to the assertive individual who would not let possible unpleasantness prevent him from complaining to a company, if he thought that complaining was the appropriate course of action. According to the assertiveness model and the definitions of assertiveness/aggressiveness, the reactions to frustration would be based on different considerations for different individuals: Response of an assertive individual = (available alternatives and probable outcomes); Response of a non-assertive individual = (the amount of anxiety associated with the alternatives); Response of an aggressive individual = (the magnitude and intensity of frustration).

Only in assertive behavior are the consequences of the action fully considered beforehand. The aggressive person is more apt to consider the consequences after the action is taken, and the non-assertive person's main concern is to find a response with a minimal amount of intercommunication and anxiety. Consequently, one would expect that both assertive and aggressive individuals would be more likely than non-assertive individuals to complain to a company if dissatisfied with the product or service. If this is correct, it suggests some interesting implications for consumer policy.

### **Self-affirmation**

According to Self-Affirmation Theory (Steele, 1988) people are motivated to maintain a self-concept they experience as being "adaptively and morally adequate" (Steele, 1988, p. 262). When this self-perception is threatened, they can bolster or restore this experience of self-adequacy through self-affirmation. People can self-affirm through "explanation, rationalization and/or action" (Steele, 1988, p. 262). For example, they may think about their personal strengths, bring to mind their core values, reflect upon their important relationships, or act

in a way that demonstrates their moral or adaptive adequacy. Consumers attempt to preserve or enhance their self-images by buying products they believe agree with that self-image and avoiding products that do not agree. This is called consumer imagery. Consumers tend to shop in stores that have images that agree with their own self-images. Self-affirmation refers to “an act that demonstrates one's adequacy” (G. L. Cohen & Sherman, 2014, p. 337; D. K. Sherman, 2013) and is the process by which individuals attempt to “cope with one kind of self-threat by affirming an unrelated aspect of the self” (Steele, 1988, p. 263). Further, he argued that when one's self-concept is threatened in some way, individuals might strive to regain or maintain a strong sense of self, sometimes attempting to explain or rationalize their behaviors. This “self-affirmation system” is activated in response to threat and remains engaged until one's positive perception of self is restored. During times of threat, self-affirmation may help to provide a reminder of one's self worth and personal resources (e.g., G. L. Cohen & Sherman, 2014; D. K. Sherman, 2013). Importantly, individuals can regain this positive sense of self even without directly resolving the original threat; people can affirm other importantly held beliefs in contextually unrelated areas of the self and still feel relief. Thus, even if a threat is specific to one domain, self-affirmation can bring relief by reminding an individual of other importantly held beliefs to boost the global sense of self more generally.

### **Boundary conditions**

Consumers who are high in NC (need for cognition) are more likely to be responsive to the part of an advertisement that is rich in product-related information of description. They are also more responsive to cool colors. Consumers who are relatively low in NC are more likely to be attracted to the background or peripheral aspects of an advertisement. They spend more time on print content and have much stronger brand recall. Need for cognition seems to play a role in an individual's use of the Internet. "How do we make the market place work better so that consumers can make better decision about what to buy" If for social purpose has to reduce consumption of Liquor one has to find out through the research why people drink. When in our Country number of states prohibited drinking from time to time it was utter failure because prohibition was imposed without studying the psychology of drinkers. However in case of cigarettes when it is told that smoking is injurious for health and the absolute consumption of cigarettes has started declining. If prohibition was implemented affect the studying how often and what problems are faced by discontinuing drinking alcohol and what have been their response to their problems and their solutions might have been found, the result would have been more encouraging. Psychographic research studies life style of consumers to find out the markets for certain products like items of personal health care, cosmetics, items of family consumption like T.V., furniture in psychographic research consumers are registered to tell their and their house hold reaction about a particular product or service since there is full report on the subjects.

Just as good looks bestow an unconscious “beauty premium” on people, high aesthetics bestows an unrecognized benefit on consumer goods. Specifically, choosing a product with good design affirms the consumer's sense of self. Choice of a highly aesthetic product was compared with choice of products superior on other attributes including function, brand, and hedonics to show that only aesthetics influences a consumer's personal values.

How quickly an innovation spreads through a market depends to a great extent on communications between the marketer and consumers, as well as communication among consumers i.e., word-of-mouth communication. Thus this communication will include two types of communication: a. Communication between marketers and consumers b. Communication among consumers i.e., word of mouth. Consumer, behaviour is affected by a lot of variables ranging from personal, motivation, need, attitude and values, personal characteristics, socio-economic and cultural back ground, age, sex, professional statues to social influences of various kinds exerted by family, friends and society as a whole. Demographic factory like age, sex, incomes etc. of citizens are also having some influence of consumer's behaviour. Therefore, the study of consumer behaviour becomes essential. What factors influence our choices of consumption? How do consumption habits change as societies change? How do material values influence our relationships with other people? What impact does that have on our personal values? Consumer behavior can be explained as the analysis of how, when, what and why people buy. Consumers are looking for manufacturers who have social responsibility, and use packaging that can either be recycled or are made of recycled material. An effective, efficient and fair implementation of the consumer protection act is one of the conditions precedents for promoting the culture of good governance and thereby ensuring the better promotion and protection of the rights of the consumers. The heterogeneity among people makes understanding consumer behaviour a challenging task to marketers. Hence marketers felt the need to obtain an in-depth knowledge of consumers buying behavior. Consumers use mental short-cuts to help speed up decision-making. These what cuts and distort consumer's decisions. Short-cuts can include relying a labels our

brand names that are recognized, and being influenced by the way in which information of presented and the context in which a decision is made.

### CONCLUSION

The field of consumer behaviour covers a lot of ground. It is the study of the processes involved when individuals or groups select, purchase, use or dispose of products, services, ideas or experiences to satisfy needs and desires. It is evinced that consumers clearly weight up all the costs and benefits of their choices. Instead, purchasing decisions may be made automatically or habitually, are heavily influenced by an individual's emotions or the behaviour of others. Every consumer is different in behaviour from others in the sense of needs, wants, habits and income level of the consumers. The Behaviour of Consumer depends upon psychological, cultural, social, economic, religious, political and other factors. Study of consumer psychology is most important part of consumer behaviour research because it helps to know the attitude of consumer, his level of learning, knowledge, perception, personality, his motivation of buying a particular product of service. It helps to understand psychology of different types of consumer based on their age, sex, income level, education etc. The study of consumer's psychology helps marketers to segment the market and product good according to their requirement rather than thrusting same product on all. Most of the free time is spent in the market place, shopping or engaging in other activities. The extra time is usually passed in knowing and thinking about products and services, discussing with friends about them, and watching advertisements related to them. The usage of them significantly reveals our life styles. Since assertiveness constitutes a learned behavior (as demonstrated in the psychiatric and psychological literature), and if non-assertive individuals consciously limit their remedy options by avoiding complaining (as suggested by the assertiveness model and the empirical results reported in this study), it follows that consumers can be taught through assertive training to better handle conflicts with sellers and manufacturers. This applies to the aggressive as well as non-assertive consumers.

### DISCUSSION

It is well known that consumer policy cannot solely rely on consumer information (i.e., factual information about brand and product characteristics). It has to be complemented with consumer education (i.e., instruction on where to get and how to use available information) in order to have some impact. When both these methods fail to accomplish the desired goals, there are often calls for more consumer protection or market regulation. The assertiveness model suggests yet another way of improving the consumer's position in the marketplace. Its implication is that even well-informed, educated consumers may fail to effectively articulate their grievances because of undue aggressiveness or non-assertiveness. In such cases, it is clear that consumer information and education policies do not suffice, and protection and regulation may miss the mark. Since most consumer dissatisfactions are not voiced, and research has shown that about one in every five purchases results in some form of consumer problem (Best and Andreasen, 1977), assertive training for consumers may be a viable addition or alternative to current consumer programs. Assertive training for consumers does not mean expensive psychological counseling. Although there is, to our knowledge, no programs that are specifically tailored to consumers, many universities now offer courses in assertive training in their extension programs.

The persuasive effect of self-affirmation based on the idea that self-affirmation leads to confidence and this confidence can increase or decrease persuasion depending on the circumstances. Confidence can play different roles in consumer persuasion, affecting attitude change by different psychological mechanisms. There are a number of conceptual issues that need to be addressed with future research. Both the constructs offer new insight into the understanding of consumer behavior. The more empirical research is required so as to establish the efficacy of assertiveness and self- affirmation as intervention for understanding of various dynamics of consumer behavior.

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**PLAGIARISM IN BOLLYWOOD MUSIC & LAW**

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Plagiarism can be defined as “the wrongful appropriation, close imitation, or purloining and publication, of another author's language, thoughts, ideas, or expressions, and the representation of them as one's own original work”.

Plagiarism is a moral, ethical, & legal issue. It has been around for centuries, but the Internet and the subsequent proliferation of information have made the problem more serious. Plagiarism is taking someone else's work and passing it off as one's own. Many people think of plagiarism as copy another's intellectual idea or work.

**Dictionary definition is.**

1. To steal and pass off (the ideas or words of another) as one's own
2. To use (another's production) without crediting the source
3. To commit literary theft
4. To present as new and original an idea or product derived from an existing source.

**MUSIC AND LAW**

Music is the creation of human intellectual. It is the major way to convey ideas to the people. The lyrics, and composition of music equally influence human mind and it generate a heavy impulse on conscious and sub-conscious people mind. Almost peoples of the world we can find out the presence and influence of music and its impact. Like other intellectual properties music and all its kinds need legal protection. Therefore, the international as well as civic law gives recognition and protection to the authors and owners of musical works.

**.Definition of Musical work**

As per Sec.2 (p) of the Copyright Act, 1957 “musical work” means a work consisting of music and includes any graphical notation of such work, but does not include any words or any action.

In India copyright is recognized in original musical work under the provisions of Sec.13 (1) (a) of the Copyright Act, 1957. Subject to the provisions of this section and other provisions of this act, copyright of musical works shall subsist throughout India. Article 2(2) of the Berne Convention read with Article 2(1) gives the idea that the Copyright protection to a musical work can be permitted only to the work which has been reduced to material form.

**THE INDIAN FILM AND MUSIC INDUSTRY**

Bollywood had remained and shall remain one of the most popular genres of music in the Indian peninsula. Bollywood industry has also feel the importance of the same with years and hence the production houses are giving more importance to the composition of music of Hindi songs in a film. Bollywood Hindi songs are played back on varied Indian function like marriage, birthday parties, religious festivities, national patriotic festivals and more.

**EARLY DAYS OF MUSIC INDUSTRY**

Many of the negative features associated are the manipulation, monopolization, and homogenization which are the inherent concomitants of the large scale, expensive and centralized music industry. These factors have led to the downfall of the industry

Early days of music industry saw the rise of Gramophone Company of India (GCI) in 1908. The company under the control of EMI was the sole authority in this region with its subsidiaries HMV (His Master's Voice). Later HMV became the largest recording company in the world. GCI enjoyed during this time effective monopoly until the entrance of Polydor in 1960. The absence of effective competition enabled GCI to pay many of its artists poorly, and to pursue conservative and in many ways phlegmatic marketing practices (Joshi 1988, pg 149-151).

GCI also had regional subsidiaries like Marwari and Megaphone producing regional music. During the 1980's Venus record came into existence and a fierce battle started within the industry with the coming up of T-series with its subsidiary Super cassettes. Currently T-series is the market leader with Saregama and Yash Raj music following it. But still the market is controlled by a few players who are paying less to the composers who are also unlawfully not paying them the royalties and also buying their composition from them even though our law

states that the composer has a right over the song. In other countries like the US, all from the music composers, singers and lyrics writer enjoy equal status on the song and earn royalties which is not the scenario in India. Only the music companies and Producers are reaping the benefits. And also as the music companies are limited and have a monopoly over the market, composers have no choice but to create on an average 500 songs a year which is completely opposite of the west where they generally take out an album in 2-5 years and earn a lot through royalty payments and tours, so plagiarism is the only option left for the composers of our industry to create so many songs.

### **REGIONAL MUSIC IN HINDI MOVIES**

Film composers have often employed melodies from their native regions, Hemant Kr, Salil Choudhary, S.D.Burman, R.D.Burman and Anil Biswas all borrowed songs from their native Bengal, While GhulamHaiderpopularised Punjabi style music. In the dominant Bollywood Music, tunes were borrowed generally from folk music and moulded in such way that they shed their regional flavour and thus appeal to the Indian audience. Film composers avoided using melodies that was recognisable as regional. They changed it by adding some element like an instrument or during the sound recording.

Folk songs have been picked from Hariyanvi ragini, Bengali Jatra, Rajasthani Bhopa traditions, Manganhar performances, Nautanki of Western Uttar Pradesh, Gujarati garba music, Rasiya, Lavni and Muslim devotional Qawwali.

### **LAW IN INDIA**

1. Copyright subsists in original musical work and

- a. Includes any combination of melody and harmony, either of them reduced to writing or otherwise graphically produced or reproduced. An original adaptation of a musical work is also entitled to copyright. There is no copyright in a song. A song has its words written by one man and its music by another; its words have a literary copyright, and so has its music. These two copyrights are entirely different and cannot be merged.
- b. In cases where the word and music are written by the same person, or where they are owned by the same person, he would own the copyright in the song.

A copyright gives the right to do and authorize the doing of any of the following acts, namely-

- c. to reproduce the work in any material form;
- d. to publish the work;
- e. to perform the work in public;
- f. to produce, reproduce, perform or publish any translation of the work;
- g. to make any cinematographic film or a record in respect of work;
- h. to communicate the work by broadcast or to communicate to the public by loud-speaker or any other similar instrument the broadcast of the work;

“Musical work” means a work consisting of music and includes any graphical notation of such work but does not include any words or any action intended to be sung, spoken or performed with the music.

### **Term of copyright in published literary, dramatic, musical and artistic works**

Except as otherwise hereinafter provided, copyright shall subsist in any literary, dramatic, musical or artistic work (other than a photograph) published within the lifetime of the author until 62[sixty] years from the beginning of the calendar year next following the year in which the author dies.

*Explanation.* - In this section the reference to the author shall, in the case of a work of joint authorship, be construed as a reference to the author who dies last.

### **Performer’s right**

(1) Where any performer appears or engages in any performance, he shall have a special right to be known as the "performer's right" in relation to such performance.

(2) The performer's right shall subsist until 96A fifty years from the beginning of the calendar year next following the year in which the performance is made.

(3) During the continuance of a performer's right in relation to any performance, any person who, without the consent of the performer, does any of the following acts in respect of the performance or any substantial part thereof, namely :-

- (a) makes a sound recording or visual recording of the performance; or
- (b) reproduces a sound recording or visual recording of the performance, which sound recording or visual recording was-
  - (i) made without the performer's consent; or
  - (ii) made for purposes different from those for which the performer gave his consent; or
  - (iii) made for purposes different from those referred to in section 39 from a sound recording or visual recording which was made in accordance with section 39; or
- (c) broadcasts the performance except where the broadcast is made from a sound recording or visual recording other than one made in accordance with section 39, or is a re-broadcast by the same broadcasting organization of an earlier broadcast which did not infringe the performer's right; or
- (d) Communicates the performance to the public otherwise than by broadcast, except where such communication to the public is made from a sound recording or a visual recording or a broadcast, shall, subject to the provision of section 39, be deemed to have infringed the performer's right.

**39.95 Acts not infringing broadcast reproduction right or performer's right.** – No broadcast reproduction right or performer's right shall be deemed to be infringed by-

- (a) The making of any sound recording or visual recording for the private use of the person making such recording, or solely for purposes of *bona fide* teaching or research; or
- (b) The use, consistent with fair dealing, of excerpts of a performance or of a broadcast in the reporting of current events or for *bona fide* review, teaching or research; or
- (c) Such other acts, with any necessary adaptations and modifications, which do not constitute infringement of copyright under section 52.

#### **Other provisions applying to broadcast reproduction right and performer's right**

Sections 18, 19, 30, 53, 55, 58, 64, 65 and 66 shall, with any necessary adaptations and

Modifications, apply in relation to the broadcast reproduction right in any broadcast and the

Performers' right in any performance as they apply in relation to copyright in a work:

Provided that where copyright or performer's right subsists in respect of any work or performance that has been broadcast, no license to reproduce such broadcast shall take effect without the consent of the owner of rights or performer, as the case maybe, or both of them.

#### **BOLLYWOOD MUSIC/ INDIAN MUSIC INDUSTRY**

1. Peter Manuel (2001) in his book *Cassette Culture* cited that The song *TirchiTopiwale* composed by Kalyanji-Anandji and film maker Vipul Shah for the 1989 film *Tridev*, the song became phenomenally popular, partly for its tuneful melody, but especially for its conspicuous “breaks”. The passage, the essential “hook” of the song as itself plagiarized from a prior Latin rock hit by the Miami Sound Machine entitled “The rythm’sgonna get you.
2. Peter Manuel (2001) in his book *Cassette Culture* mentioned that Copyright law remains singularly lax with regard to cover versions. Western copyright law permits cover version only with the permission of the original copyright holder. Indian Law by contrast merely requires that the original copyright holder be notified of the production of a cover version and a nominal royalty 5 % be paid if more than one and a half minute tunes are employed. If the melody is used the rate is 2.5%.
3. Peter Manuel (2001) in his book *Cassette Culture* reported that an effective “open season” prevails with regard to foreign songs; the 1989 hit “*HawaHawa*” by Pakistani singer Hassan Jahangir, was parodied and covered by many labels like T-series, Venus and Western all claiming to be the copyright owner.
4. AnubheySawhney (2006) cited in his article “*Bollywood music: If it's a hit, it's a rip-off*” in TOI, the views of Intellectual Property Rights lawyer PravinAnand, “There's no difference between an idea and its expression.

If a concept is commercially-viable and somebody is lifting it to suit their purpose, they're liable. In fact, the beauty of the copyright law is that as soon as an original idea is penned, whether registered or not, it automatically comes under the protection of the copyright law.”

5. According to AnubhaySawhney (2006) “Bollywood music: If it's a hit, it's a rip-off” in TOI mentioned that an age-old trend, plagiarism in music has taken on a whole new meaning — if it's popular, it can't be original. Cases in point: Pal, pal (LageRahoMunnabhai), KaisiPaheliHai (Parineeta ), Dil Mein Baji Guitar (ApnaSapna Money Money), KyaMujhePyarHai (WohLamhe), Tu Hi MeriShabHai (Gangster) ...the list is endless.
6. AnubhaySawhney (2006) in his article “Bollywood music: If it's a hit, it's a rip-off” in TOI mentioned that the other new-composer-on-the-block who has the public humming almost everything he makes is PritamChakraborty. Sadly, all of Pritam's seemingly original scores have sources elsewhere. From HalkaHalkaNasha (originally Breeze from Saintes Maries by AbrarulHaque) to the recent KyaMujhePyarHai (originally TakBisakah by Indonesian group Peter Pan), he's guilty of 'sourcing' them all.
7. Hindimoviesong.net (2008) blogged that A.R Rahman has copied some Kenny G's song in his debut film Roja. More examples are- recent films like Shikhar, Chocolate & Aryan have songs copied from Van Halen, Rammstein& Pink Floyd.

Also some of the old songs of R.D Burman are copied from Spanish & Belgian music stuff and they were super-hit.

8. HarpreetOberoi (2009) recorded, “In remix albums the musical composition of the songs, notes and video is so changed that it appears new to the audiences and listeners. According to the copyright act if all the bars of notes are copied, only then it is infringement. This change in remix songs fall within the category of adaptation. So remix songs are eligible for copyright protection”.
9. PriyankaDasgupta (2010) reported that Assamese singer Kumar Bhabesh has alleged that Pritam's “ZorKaJhatka” number is copied from two of his numbers. “The mukhda” of “ZKJ” resembles my composition ‘Dehatilahilahi’ from the album, “Sunpahi”. The tune of the antara is a copy of my song, “Ruksana”, from the album “Roja”.
10. In an article of Hindustan Times (2011) Music composer Anu Malik alleges that PritamChakraborty has lifted the entire tune of his song, *Mohabaatnaamhaikiska...* from *Ajnabee* and used it in the song, *Character dheelahi...*The full tempo and tune has been ripped off.

## CONCLUSION

Bollywood music is mostly referred to as Indian music industry which is often a mistake. Bollywood music is a part of Indian music industry but of course a major part. And because of the changes of taste of the Hindi songs among Indian mass the Bollywood songs have also undergone huge changes. Due to globalization and advent of new technology many cases of plagiarism is coming in spot light in the Indian market, still such composers are getting work and are rewarded by the industry. Person of our country want the law to be stricter, producers of such case be punished severely and provision of royalty be provided in the copyright act, so that stake holder of the song be remunerated. Regional artists should be recognized for their work and be paid when a song made by them is used by the composer of our industry.

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**MEDIA EDUCATION IN INDIA: A QUALITY PERSPECTIVE****Rinku Sethi**

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**ABSTRACT**

*Journalism education in India is framed in the higher education system, comprising of programs in the universities, both government-supported and media-backed private institutions, as well as in-service and short-term courses offered by press associations and other media organizations. They are offered at different levels from certificate to diploma to both undergraduates and postgraduates. Due to requirements of the media industry, there is a constant friction about the need to balance the academic and professional aspects in the curriculum. This has led to skepticism in the past about the relevance of formal media education. However, with globalization and growth of the media sector, there is an enhanced need for professionals. In the absence of practically relevant training the graduates are found in a helpless situation when they join the media organizations. Lack of trained teachers, infrastructural facilities and upgraded syllabus are the major hurdles in the way of sound mass communication teaching. Most of the departments are not getting latest books and professional journals due to financial constraints. They do not have well equipped audio-visual lab, computer lab, photo lab, close circuit television, Internet facility, departmental library and allied facilities.*

*Keywords: Journalism Education, Media Industry, Media Organization*

**INTRODUCTION**

Media education in India is anchored in two dominant systems of media industry and education sector. While the education sector in India is much evolved and is overseen by Ministry of Human Resource Development (MHRD), the media industry per say is yet not very organized. Today, there are over 300 media or journalism schools at the university and non university systems. All these journalism and media schools offer courses at bachelor, master and postgraduate diploma and diploma levels encompassing all media including print, broadcast and internet. Only courses that fall under the University system are under the purview of the UGC (University Grants Commission) and or State Governments who both fund Universities and also lay guidelines on curriculum and systems (including faculty recruitment). Private Universities that have emerged in the last few years in India are also mandated to follow certain set systems and procedures set by the MHRD. Other non-university institutes or courses do not fall under any legal authority or need to follow any set standards. According to a UGC report 2, "Higher Education at a Glance", presenting vital statistics

pertaining to higher education from 1950-2013, there are 700 degree awarding institutions in total in the country. Of these 44 per cent i.e. 306 are state universities, 129 deemed universities (18 per cent), central universities and institutes of national importance are 6 percent and 10 per cent respectively. There are only 154 private universities accounting for 22% share. Out of these, UGC funds 39 central universities, 153 state universities, 24 deemed universities and 5420 colleges. In most of these Universities, the Journalism departments receive only a fraction of the funding from UGC. and Number of Institution Central State Private al

**Key Trends and Quality Issues**

The speedy growth of private institutions in recent times has also made this sector highly competitive. The situation gets further complicated by several uncertified course run by reputed media organizations. Several institutes also started these courses without having enough infrastructures. Teachers have little experience as academics or professionals. The Indian Media industry is expected to grow exponentially at 18.4 per cent. It is yet to create significant number of jobs in the market, also considering the number of students graduating from Indian journalism and media schools every year. The workforce demand for media and entertainment sector currently stands at 4.6 lakh, according to a study conducted by Media and Entertainment Skills Council (MESC) in 2013. It is estimated to grow at a CAGR of 13 per cent to 7.5 lakh by 2017. Given the nature of workforce demand in the industry, the focus of the media education is expected to be more on professional training. In this regard, MESC was formed to skill workforce to meet the growing Media & Entertainment Industry which is projected to grow to INR 1457 billion by 2016. According to the MESC Skills Gap Study report, there is sizable shortage of trained professionals that possess the relevant skills for jobs within each sub sector. "Due to the lack of a standardized knowledge infrastructure and practical training courses, employees in several occupations end up learning technical/ role-specific skills on the job. This leads to time and budget overruns at the employer end, and in one form or another, these organizations end up bearing the cost of training," according to the report. There are 17 regulatory bodies or councils that look into specific disciplines or areas of study such as AICTE, Bar Council, Medical Council of India, State Council of India, State Councils of Higher Education, and

University Grants Commission to name a few. Media education comes under the ambit of UGC as of now. Discourse on the need for a separate body that will provide accreditation to institutes offering journalism courses has been going on for long now.

#### **Necessity of an accrediting body and a network**

Almost Accrediting body that will keep a check on the quality standards of journalism institutes and departments. Some respondents said that the body should have a multi-faceted approach and without any bias look into the quality parameters of any institute/ course. There should be a Journalism Education Council in India similar to bodies such as the ICMR, ICAR, Bar Council and Medical Council. The purpose of the body could be to limit mushrooming of institutes without proper infrastructure and faculty. An accrediting body may not bring any change as similar efforts have been made in the past. There is no media professional body approved by government to regulate and audit the curriculum as well as other benchmarks to maintain the quality in media education. It was also suggested that a media professional body like MCI, ICSI, ICWA, NAAC, etc should be created to audit the curriculum for different courses as well as set quality standards of institutions.

#### **Methodology**

This paper captures the key findings from the study that aimed to document the state of journalism education and its challenges in India, and also to draw critical lessons both for policy and systems to introduce standards and quality parameters in this important education stream. A secondary research was used for this study. The secondary study mapped all the courses available online and on available publications for various courses (including nomenclature use) related to journalism and media studies in India. Information for faculty and facilities available in these institutes were also mapped. A total of 310 universities, institutes, colleges were mapped during this study using a variety of sources including the respective institute websites.

#### **Discussion on Findings**

Journalism education in India is still developing and though it has grown in size and importance, it is still not treated at par with other traditional disciplines of knowledge. This discipline is striving for an identity of its own and unfortunately, there have not been adequate efforts of either the academia, industry nor the policy makers to make gainful efforts towards the same. Issues facing media education in India relate to theory versus practice, the quality of faculty, updating curriculum and syllabus to keep pace with advancements in media technology, lack of research in media institutes and departments, reference books, modules not relevant in Indian contexts such as some of the mass communication theories. Based on the secondary the following findings and observations emerged.

#### **CONCLUSION**

Media education is at cross roads in India and faces very similar challenges as the higher education sector in India. While the controversial issues regarding standards and policy need regular debate, the faculty paucity is one area that can be immediately addressed. While the number of institutes and universities offering media education is increasing, the faculty dilemma is something that is still addressable. Focused attempts like research resources, networks, platforms for interaction with Industry and specialized training programs, can still help improve standards of education in this sector. This study identified skills and capacities that can be developed among faculty which in turn can directly impact media education in the country.

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**FAKE NEWS AND ELECTIONS****Geeta Arora****Assistant Professor, Lalita Devi** institute of Management and Sciences, New Delhi

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**ABSTRACT**

*Today's era is a technology-driven era. Information is shared from one person to another person by social media applications like - Twitter, Facebook, WhatsApp, etc. During the time of elections fake news are spread on social media and became major public concern in India. As Lok Sabha Election - 2019 is just around the corner in India and a billion of new people are registered to vote for first time, along with previously registered voters in the upcoming election fake news is started and spreading among folks like unstoppable fire. Currently, India is a developing country and has a large population base, due to this all web (internet) based companies see a very large and fast growth market, and this is the main reason for popularity of all social media platform and messaging apps in our country. Fake news plays a huge role in manipulating human mind and quickly changes their mindset as well as thought process within short period of time. Fake news is also responsible for creating violence in India and it became a worst nightmare for people, which is not a good sign for world's largest democracy. WhatsApp is one of the most popular and widely used social media platforms among all age group people in India, due to this reason some bad people is spreading fake news and false political message on this social media application. Now days, social media has becoming the part of elections campaigning. According to various media reports in India, WhatsApp is become the most favourite app to spread fake news in various groups and individuals and over 1-2 lakh groups and 50-80 thousand individual accounts are found which are 100% dedicated to spread false political messaging, hateful speeches, etc. to influences the large number of people. Fake news is a part of yellow journalism that consists of disinformation spread online through various social media sites. The biggest factor for successful fake news stories is the large amounts of unaware audiences are attached with various social media platforms. Fake news is generally used for creating a negative impact and fake image of individual or group of people in society.*

*Keywords: democracy, manipulating, social media, campaigning.*

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**INTRODUCTION**

Fake news refers to the false information or propaganda. Fake news is made for manipulating people's mind and to spread it in the whole world by changing people thoughts very easily and so that it becomes popular. Fake news websites and channels put their fake content to mislead the large audience and spread misinformation on various social networking sites like - Facebook, WhatsApp, Twitter etc. Fake news is a report which is creating to gain attention, mislead, deceive or damage a person reputation easily and spread the false information very fast. Sometimes creator or distributors of fake news have some agendas like political, social, etc. Fake news is shaping people's behaviours and opinions. Fake news is the major concern in today's time because they affect people mind and their every day life. Fake news also defines as a news which is design and style as well as real news, but it is false and unauthentic. As, 17<sup>th</sup> Lok-Sabha election in India will held from 11<sup>th</sup> April 2019 to 19<sup>th</sup> May 2019 in all states on different-different schedule date, now every political party is trying to put fake news and false content everywhere to influence the people easily because is easy to spread on social media platforms, during the time of election every parties set an agenda or propaganda to defame or damage opposition party reputation. Fake news also creates conspiracy during the time of elections those benefits various political parties. Fake news effect is widely seen on the election voting because people are easily faith in false content and spread it very fast which makes it popular within short period of time on social networking platforms and websites like - Facebook, Instagram, Twitter, WhatsApp, etc. Fake news attracts more people attention than real news. Recently, Election Commission of India meets all social networking platforms representatives and Internet and Mobile association of India have agree with election commission to conduct the 'Code of Ethics' on social media for the 17<sup>th</sup> Lok-Sabha election polls. Social media platforms play a very important and biggest role in increasing and spreading fake news stories in all over the world during the election time. Fake news tradition was not new, in every election parties spread fake news on social media against their opposition party and manipulate human mind easily for catching their attention.

**Key trends and quality issues**

Fake news is still the biggest concern for social networking platforms as it is reaching to a lot of people and it effects people thinking in short span of time and people easily believe on the content which is not real. In today's world 75% population people use smartphones and connected on social media with various people which are unknown to each other that post forwarded message content and most of times the forwarded message

has the wrong and false information and due to spreading of this kind of messages, fake news becomes very famous and popular. Fake news is very famous at the time of election and sometimes creating violence in the society which is not good thing for the country future and welfares. Increasing of fake news in social media helps it to spread like a fire. India is biggest market for all social media platforms and their growth rate is very high, for example – Facebook, Twitter, WhatsApp, Tik-Tok, etc have very large user- base in India. During the time of election some political parties put fake contents on social media like false information, hateful speeches, comments etc., to defame other political parties and damage their reputation by changing the mindset of large amount of people. Fake news spread negativity around the world and its impact is not good for the society. Fake news is successfully spreading very fast because a lot of people could not identify whether it is true or not and generally put their more trust on the false content and easily believe on the fake news and false stories. In last few studies, it is revealed that WhatsApp is the most common platform for spreading wrong information and false information all over world.

#### **Necessity of an accrediting body and a network**

The Information and Broadcasting Ministry of India has amended the guidelines for the accrediting body of journalists after the increasing and spreading of fake news in social media platforms. Press Council of India (PCI) and News Broadcasters Association (NBA) is selected for review of fake news, firstly they check the news and after confirming it from source, they allow the publication and the telecast of any type of news, the accreditation of journalists who are involved in creating and propagating fake news will be suspended for six months for the first time of violence, if same person or company found for second time violence, the journalists will be suspended for 1 year and in case of third time violence the journalists may lose or permanently cancellation of accreditation. These efforts are come to track and tackle the fake news comes from around the world especially on digital and social media platforms in India.

#### **Methodology**

This paper captures the key findings from the study that aimed to highlight the state of fake news in India. Secondary research was used for this study. The secondary study mapped all the courses available online and on available publications for various courses (including nomenclature use) related to journalism and media studies in India. Information for faculty and facilities available in these institutes were also mapped. For example In India 17<sup>th</sup> Lok-Sabha elections are just going to start so WhatsApp put a lot of efforts to curb the problem of fake news. The messaging platforms launches the campaign to educate the people and its users for not misusing this platform and says that – “Share Joy, Happiness not the Rumours”. Facebook also launch a new Candidate Connect Feature in India that allows the Lok-Sabha candidates to share a 20 seconds long video with their messages to their users in India.

#### **Discussion on findings**

Fake news is still reaching large number of people within a short period of time. Fake news is spreading every day, but during the time of elections the purpose of fake news is different. Fake news has a very negative impact on society, and it is not good for the development of the country. Social media platforms launch education campaign to educate and aware the people: use the social media but do not misuse or spread misinformation. WhatsApp and Facebook launch new campaign and features to curb the problem of fake news spread at the time of election. Apart of this Facebook has partner with Indian Media Organization to check the flag fake news stories in some of the regional languages like Hindi, English, etc.

#### **CONCLUSION**

Fake news spread every time with the different purpose. Fake news easily gains trust of the people and sometimes false information are very eye-catching and it attracts the people very quickly. Social media plays a major role for the success fake news spreading in all over world.

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**FINANCIAL DETERMINANTS OF STOCK PRICES: A STUDY OF BOMBAY STOCK EXCHANGE (BSE)**

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**ABSTRACT**

*The present study is an attempt to identify the financial determinants of stock prices. The study considered the companies listed in Bombay Stock Exchange (BSE). There are various factors which affect the stock prices of the companies like economic, financial, and political and so on. In the present study, only financial factors (determinants) have been taken to identify the factors affecting the stock prices of selected companies. Data was collected for the period of 2014-2018. On the basis of review of past studies, six factors viz. earnings per share, dividend pay-out ratio, PE Ratio, net margin, return on equity and return on assets of 30 companies, were taken into study. Panel data least square regression model was applied to analyse the data. The results indicate that firms' earning per share, net margin and net income are having a significant impact on firm's stock price.*

*Keywords: Bombay Stock Exchange (BSE); Financial Determinants; EPS; Pay-out; Return on Equity; Panel Data Fixed Effect; OLS.*

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**INTRODUCTION**

Security market is assumed to be all about risk in return on investment. Rational investor wants to earn extra return on their investment by investing in security market. The stock prices follow a random walk pattern and can-not be predicted easily to earn extra or abnormal returns. Still an investor wants to analyse the determinants of stock prices and returns to find out the possible positive returns and to minimise the associated risk.

BSE Sensex is one of the most important stock exchanges in India. The index value of Sensex is determined by the share prices of BSE 30 companies. These 30 companies are the representatives of all the listed companies in BSE. Various theories suggest that the share prices are affected by numerous factors viz. Economic, Financial, Political, etc. There are many financial factors which affect the stock prices of securities such as return on assets, earnings per share, dividend pay-out ratio, return on equity, net income, net profit margin, size of the firm, etc.

**LITERATURE REVIEW**

Balan and Srinivasan (2017), in the study of determinants of share price in BSE, using multiple regression, found that DPS and sales are significant variables among various financial variables considered for study.

Sharif, et al. (2015), in the study of factors affecting share price in Bahrain Stock Exchange, during the period of 2010-2016, using regression, found that ROE, Book Value per share, DPS, Dividend Yield, PE and Firm Size are significant determinants of share price in Bahrain stock market.

Almumani (2014), in the study of determinants of share prices of banking stock in Amman Stock Exchange during the period of 2005-2011, by using ratios, correlation, linear multiple regression, found that Book Value, EPS, PE and Firm Size are significant determinants.

Menike and Prabath (2014), conducted a study to measure the impact of accounting variables on stock prices in Colombo Stock Exchange, Sri Lanka during the period of 2008-2012 and found that DPS, EPS, Book Value of share have significant impact.

Tandon and Malhotra, (2013) found that EPS, Book Value per share, P/E Ratio have significant impact in determining the share price in NSE. The study used correlation and multiple regression using the data of 2007-2012.

Gill, et al. (2012), conducted a study on American Firms and found that EPS, DPS, P/E Ratio are found significant in determining the share price of equity shares during 2009-2011.

Khan (2012), conducted a study on Karachi Stock Exchange and found that P/E Ratio, Dividend, GDP have significant relationship with share price during the period of 2000-2009.

Uwugbe and Agu (2012), conducted a study in Nigeria stock market on the determinants of share price during the period of 2006-2010 and found that dividend payout, financial leverage are strongly determine the share price.

Srinivasan (2012), found that DPS negatively affect the share price while EPS, P/E Ratio and firm size are the major determinants of share price in the study using panel data approach during the period of 2006-2011.

Sanju, et al. (2011), found DPS, P/E Ratio and leverage as significant factors affecting the share prices in India during the period of 2002-2009.

Sharma (2011), conducted a study on determinants of share prices in India during the period of 1993-2008 and found that DPS, EPS, Book Value per share significantly determine the share price.

Al-Shubiri (2010), conducted a study on determinants of share price movement in Jordanian Commercial Banks during the period of 2005-2008 and found a positive and significant impact of net assets value per share, Dividend percentage, GDP on market price of shares.

Dehuan and Jin (2008), conducted a study on firm performance and stock returns in Shanghai Stock Exchange during the period of 1996-2000 and found ROE, EPS, Profit margin, ROA, Sales and Total Assets Turnover have significant impact on stock prices.

Irfan and Sharif (2002), conducted a study on Karachi Stock Exchange on key fundamental factors and long run price changes during the period of 1981-2000 and found that payout ratio, size of firm, leverage and dividend yield are significantly affect the price changes.

In the developed nations numerous studies have been embraced to determine the financial determinants of the stock price. However in India few studies have been led on this issue.

After the intensive review of literature an attempt has been made to find out the financial determinants of stock price and following factors have been selected for the study:

### **STOCK PRICE**

A stock price is the price of the shares of an organisation or any derivative or financial asset at which it is traded in the stock exchanges. It is the price, a person is willing to pay to purchase the stock.

### **EARNINGS PER SHARE (EPS)**

Earnings Per Share (EPS) is profit available to equity share holders divided by no. of outstanding equity shares. EPS is one of the various parameters of financial performance. Higher the EPS, higher the growth of a company which results in increased market price.

$EPS = \text{Profit available to equity share holders} / \text{No. of outstanding Equity Shares}$ .

### **DIVIDEND PAYOUT RATIO**

Dividend payout ratio is an estimation of dividend paid out to the shareholders of the company in the relation to the net income. It can be found out by dividing dividend per share and earnings per share.

$\text{Dividend Payout Ratio (DPR)} = (\text{Dividend Per Share} / \text{EPS}) \times 100$

### **NET MARGIN**

Profit margin is also known as net profit margin, net margin or net profit ratio. Net margin is a significant indicator of profitability. It can be estimated by dividing the net profit by total revenue.

$\text{Net margin} = (\text{Net profit} / \text{Total Revenue}) \times 100$

### **PRICE-EARNINGS RATIO**

This ratio is used to find out whether the company is overestimated or underestimated.

$\text{P/E ratio} = \text{Share Price} / \text{Earnings per share}$

### **RETURN ON ASSETS**

This ratio emphasises on the profits that company can generate from its assets. It is a profitability ratio which measures that how efficiently a company's management is using their economic resources or assets in generating earnings.

$\text{ROA} = (\text{Net Income} / \text{Average Total Assets}) \times 100$

### **RETURN ON EQUITY**

ROE is an indicator which shows growth that company has earned using its investment. It is an essential measure of profitability of a business in relation to the equity.

$\text{ROE} = (\text{Net income} / \text{Shareholder's equity}) \times 100$

**RESEARCH METHODOLOGY**

For the purpose of the study, 30 companies of BSE Sensex were selected. The annual data of all the variables was collected from Yahoo Finance and Money Control for the period of 5 years i.e. 2014 to 2018. The Augmented Dickey Fuller (ADF) test was applied to check the unit root in the series and after checking the stationarity of variables, Panel Data Multiple Regression (OLS) was applied to find out the financial determinants of stock prices.

**OBJECTIVE OF THE STUDY**

The objective of the study is to find out the financial determinants of stock price of companies listed on BSE Sensex.

**ANALYSIS AND INTERPRETATION**

**Table-1: (ADF TEST)**

VARIABLES	Unit root test- Augmented Dickey Fuller test			
	<b>Stock Prices</b>	<b>Level</b>	0.0000	<b>1st difference</b>
	<b>t-statistics</b>	-5.242282	<b>t-statistics</b>	-14.444
<b>Dividend pay-out ratio</b>	<b>Level</b>	0.0000	<b>1st difference</b>	0.0000
	<b>t-statistics</b>	-12.11216	<b>t-statistics</b>	-10.3111
<b>Earnings per share</b>	<b>Level</b>	0.0000	<b>1st difference</b>	0.0000
	<b>t-statistics</b>	-5.514272	<b>t-statistics</b>	-14.9723
<b>Return on assets</b>	<b>Level</b>	0.0003	<b>1st difference</b>	0.0000
	<b>t-statistics</b>	-4.545276	<b>t-statistics</b>	-12.1415
<b>Return on equity</b>	<b>Level</b>	0.0000	<b>1st difference</b>	0.0000
	<b>t-statistics</b>	-5.289309	<b>t-statistics</b>	-11.2949
<b>P/E Ratio</b>	<b>Level</b>	0.0000	<b>1st difference</b>	0.0000
	<b>t-statistics</b>	-5.394638	<b>t-statistics</b>	-8.79062
<b>Net Margin</b>	<b>Level</b>	0.0000	<b>1st difference</b>	0.0000
	<b>t-statistics</b>	-5.165342	<b>t-statistics</b>	-12.5029

**INTERPRETATION**

In the above table, the variable were checked for unit root and it was found that all the variables are stationary at level as p-value of all are less than 5% significance level. The data processed for further analysis of multiple regression to find out the financial determinants of stock prices.

**Regression model**

A typical regression equation is as follows:

$$Stock\ price_{it} = \alpha + \beta_1 x_{it1} + \beta_2 x_{it2} + \dots + \beta_k x_{itk} + \epsilon_{it} \dots \dots \dots (1)$$

Where,

Stock price is the dependent variable

i denotes the number of companies and t denotes the time period

$x_1, x_2, \dots, x_k$  are the independent variables.

$\alpha$  s the constant term

$\beta_1, \beta_2, \dots, \beta_k$  are the slope parameters that represent the partial effects of  $x_i$  on y keeping all other factors constant

$\epsilon$  represents the unobserved factors that change over time and affect stock price.

$$S.P = \alpha + \beta_1 DPR + \beta_2 EPS + \beta_3 P.E + \beta_4 N.M. + \beta_5 ROA + \beta_6 ROE + \epsilon$$

Where,

S.P. = Stock Price

$\alpha$ = intercept

$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$  &  $\beta_6$  are regression coefficients

DPR= dividend pay-out ratio

EPS= earnings per share

P.E = Price earnings ratio

N.M= net margin

ROA= return on assets

ROE= return on equity

$\epsilon$ = error term

The study uses Least Square Regression Model to measure the significant impact of dividend pay-out ratio, earnings per share, net margin, price earnings ratio, and return on assets and return equity on stock prices.

Dependent Variable: STOCK PRICES

Method: Panel Least Squares

Table-2: (Regression model fixed effect)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-25.35122	85.50212	-0.296498	0.7673
Dividend pay-out ratio	0.138727	1.21492	0.114186	0.9093
Earnings per share	21.36026	1.135786	18.8066	0.0000
Net Margin	-62.55889	9.226883	-6.780067	0.0000
P/E Ratio	279.6232	42.51818	6.576556	0.0000
Return on assets	-33.00304	13.30781	-2.479975	0.0144
Return on equity	5.394197	4.773243	1.130091	0.2606
<i>R-squared</i>	0.77953	<i>Mean dependent var</i>		841.0835
<i>Adjusted R-squared</i>	0.769195	<i>S.D. dependent var</i>		1172.913
<i>S.E. of regression</i>	563.4928	<i>Akaike info criterion</i>		15.55665
<i>Sum squared resid</i>	40643085	<i>Schwarz criterion</i>		15.70729
<i>Log likelihood</i>	-1043.074	<i>Hannan-Quinn criter.</i>		15.61786
<i>F-statistic</i>	75.42954	<i>Durbin-Watson stat</i>		1.103157
<i>Prob(F-statistic)</i>	0.00000			

S.P. = -25.35122+ 0.138727 DPR+21.36026 EPS+-62.55889 N.M.+279.6232 P.E.+ -33.00304 ROA + 5.394197ROE

**INTERPRETATION**

In the above mentioned model, keeping stock price as dependent variable and dividend pay-out ratio, earnings per share, net margin, price earnings ratio, return on assets and return on equity as independent variables. On the basis of the result, it was found that Earnings per share and price earnings ratio have significant positive impact on stock price as p-value= 0.0000 and 0.0000 which is less than 1% means these are significant at 1% level and Net margin and ROA have significant negative impact on stock price as p- value= 0.000 and 0.0144 respectively which is significant at 1% and 5% respectively. Whereas DPR & ROE has no significant impact on stock price as p-value of these two are greater than the significance level (5%).

Together, all the factors explain 76.91% of stock price and remaining 23.09% is of the error term.

TEST II

Dependent Variable: STOCK PRICES

Method: Panel EGLS (Cross-section random effects)

Table-3: (regression model random effect)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	29.88246	124.927	0.239199	0.811
Dividend pay-out ratio	-0.145004	1.004974	-0.144286	0.885
Earnings per share	18.03344	1.335319	13.50497	0.000
Net Margin_	-42.73732	9.777015	-4.371203	0.000
P/E Ratio	242.5864	51.56166	4.704783	0.000
Return on assets	-19.13564	17.55967	-1.089749	0.277
Return on equity	-1.198739	5.742414	-0.208752	0.83
	Effects Specification			
			S.D.	Rho
Cross-section random			372.6139	0.446
Idiosyncratic random			415.072	0.553
	Weighted Statistics			
<i>R-squared</i>	0.61632	<i>Mean dependent var</i>		375.042
<i>Adjusted R-squared</i>	0.598335	<i>S.D. dependent var</i>		685.079
<i>S.E. of regression</i>	434.1834	<i>Sum squared resid</i>		2412994
<i>F-statistic</i>	34.26853	<i>Durbin-Watson stat</i>		1.46419
<i>Prob(F-statistic)</i>	0.00000			
	<i>Unweighted Statistics</i>			
<i>R-squared</i>	0.758082	<i>Mean dependent var</i>		841.083
<i>Sum squared resid</i>	44596903	<i>Durbin-Watson stat</i>		0.9692

Table 4 (Hausman test)

Correlated Random Effects - Hausman Test				
Equation: Untitled				
Test cross-section random effects				
Test Summary		Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random		18.058507	6	0.0061

### INTERPRETATION

To check whether the preferred model is random effects or fixed effects, Hausman test is applied. From the above table it can be inferred that p-value is 0.0061 which is less than 0.05, therefore the preferred model is fixed effects and not random effects

### LIMITATIONS

The results are limited to the selected stock exchange, selected companies and duration of the study. The results may vary with change in any or all criterion.

### CONCLUSION

On the basis of the objective of the study to find out the financial determinants of the stock prices and the process to analyse the variables with the help of regression method it can be concluded that Earnings per share and price earnings ratio has significant positive impact on stock price and net margin and return on assets have significant negative impact on stock price whereas dividend pay-out ratio and return on equity have no significant impact on stock price.

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**DIGITAL ENTREPRENEURSHIP IN INDIA****Dr. Amit Verma<sup>1</sup> and Dr. Ankita Dhamija Nagpal<sup>2</sup>**Assistant Professor<sup>1</sup>, Department of Commerce, Kalicharan PG College, Lucknow  
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**ABSTRACT**

*Digitalization and the development of information and communication technologies (ICTs) are creating opportunities for new types of entrepreneurial activities in Indian economy. The digitalization takes entrepreneurs towards the Digital Entrepreneurship which is a social, economical and technological phenomenon, it can be considered as the joining of traditional entrepreneurship with an emphasis on leveraging new digital technologies in novel ways, such as social, mobile and analytics, all in order to shift the traditional way of creating and innovative way of doing business in the digital era.*

*The present study reveals about the Nature of Digital Entrepreneurship and Barriers to Digital Entrepreneurship in present globalised market place.*

*Keywords: Digital Entrepreneurship, Entrepreneur, Innovation, Start-up, ICT*

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**I. INTRODUCTION**

Digital Entrepreneurship plays a significant role in the economic development of our country India. It is the most powerful weapon to fight against poverty and unemployment and acts as a catalyst for the economic prosperity of a nation and also contributes in national income, rural development, industrialization and export promotion etc. In Digital Entrepreneurship Entrepreneurs are able to work from remote areas, at different hours, from the home. It promotes gender equality, social and economic inclusion, and contributes to sustainable development, especially when new technologies are combined with the availability of open and public data.

**II. REVIEW OF LITERATURE**

Eric Ries (2011) in his *Lean Start-up Manifesto* stated that a start-up is a human institution designed to create a new product or service under conditions of extreme Uncertainty.

Steve Blank's (2013) famous definition of a start-up as a temporary organization searching for a repeatable and scalable business model. These references advocate a nature of high uncertainty and the quest for a repeatable and scalable business model in the core part of the definition.

The 'digital' component relates to what Parker et al. (2016) refer to as 'digital platforms' that "consummate matches among producers and consumers and facilitate the exchange of goods, services or social currency, enabling value creation for all through the digital landscape". Hence, digital start-ups and scale-ups are ventures that incorporate novel digital technology as a vital component of their business model and which could not feasibly operate without the internet-enabled platforms.

According to Yoo et al. (2010), digital innovation can be defined as the implementation of new combinations of digital and non-digital resources to produce novel products and processes. Because of the limited resources and knowledge available within individual firms, many firms seek to leverage external resources to generate digital innovations (Selander et al., 2010).

Innovation and entrepreneurship are often intertwined since many digital entrepreneurial ventures are based on digital innovation (Bessant and Tidd, 2007).

Digital entrepreneurship is one stream of entrepreneurship. The unique characteristic of digital entrepreneurship as per Davidson et al. (2010) is that digital entrepreneurship consists of three interconnected types of entrepreneurship: business entrepreneurship, knowledge entrepreneurship and institutional entrepreneurship. Digital entrepreneurship is a multi-faceted phenomenon that contains all three types.

Business entrepreneurship is the type of entrepreneurship whereby new ventures are created. This is the most popular type of entrepreneurship in the literature. Knowledge entrepreneurship involves the pursuit of opportunities based on information and knowledge to create a domain-related knowledge base and pursue new ventures related to this knowledge base. Consultants, journalists and academics are examples of knowledge entrepreneurs. Institutional entrepreneurship can be defined as the activities of actors who have interest arrangements and who leverage resources to create new institutions or transform existing ones. For example, the rise of E-commerce platforms, such as Amazon and Alibaba, has created a new form of retail market, which is an institutional entrepreneurship.

These three types of entrepreneurship are not exclusive. Instead, they are reinforcing. Davidson et al. (2010) posit that a successful digital entrepreneurship should combine business, knowledge and institutional opportunities. For example, Alibaba Inc, an Ecommerce company, is first a business enterprise, but at the same time, this enterprise contains important knowledge and institutional implications. Digital entrepreneurship pursues opportunities based on the use of digital technologies, while others pursue opportunities based on business, knowledge or institutions (Davidson and Vaast 2010).

## **II. METHODOLOGY AND OBJECTIVES**

The study is based on the secondary data which has been collected through government reports, books, research paper and websites etc.

The present study is based on following objectives:

- 1) To study the concept of Digital Entrepreneurship
- 2) To study the Barriers to Digital Entrepreneurship.
- 3) To provide the Suggestions to the Government of India

## **III. FINDINGS OF THE STUDY**

### **A) To Study the Concept of Digital Entrepreneurship**

Digital Entrepreneurship most commonly refers to the process of creating a new Internet enabled/delivered business, product or service. This definition includes both startups—bringing a new digital product or service to market—but also the digital transformation of an existing business activity inside a firm or the public sector.

Digital Entrepreneurship is referred as embracing new ventures and the transformation of existing business by creating and using novel digital technologies. Digital Enterprises are characterised by a high intensity of utilisation of new digital technologies (particularly social, mobile, and analytics) to improve business operations, invent new digital business models, sharpen business intelligence, and engage with customers and stakeholders through new digital channels.

### **B) Barriers to Digital Entrepreneurship**

The main barriers to digital entrepreneurship appear to include:

#### **i) Skills**

In many parts of India Entrepreneurs are not digitally skilled they are still on traditional Entrepreneurship. Skills issues are extremely important for digital entrepreneurship. From the ability identify the talent that is required and recruiting that talent, including across borders, to having the skills to identify new technology-enabled business opportunities either as a new venture, or by transforming existing business models, skills issues are key to successful digital entrepreneurship and even the successful conceptualization and implementation of most IT projects (in both the private and public sectors).

#### **ii) Infrastructure**

In many parts of the India, access to affordable, reliable, high-speed broadband infrastructure is still a problem.

#### **iii) Business environment.**

It is also essential to create a dynamic and competitive digital business environment and address concerns about digital entrepreneurship conditions in order to enable the creation of online services and applications. These factors also matter for entrepreneurship more generally, they are even more important in the fast changing and moving digital world, and for digital entrepreneurs in start-ups, smaller companies, and newer companies, in highly innovative sectors.

### **C) Suggestions to the Government of India**

It is vital to strive for consistency and harmonization of the rules governing digital entrepreneurship, while also limiting regulatory change and uncertainty going forward. We would like to provide some suggestions to the Government of India in respect of the Digital Entrepreneurship:

#### **i) Supply of appropriate skills**

Government of India should simplify and speed-up procedures for cross-border recruitment of talent and reduce the associated costs (e.g. related to immigration rules and formalities). Government should promote more interaction between the private sector and educational and vocational training institutions and organizations to ensure the skills supply better matches the skills needs in practice.

ii) *Market integration and demand aggregation*: Government should try Integrate markets for digital and online services by reducing fragmentation and other barriers, and help through the aggregation of demand where necessary to allow an increase in overall demand for ICT goods and services.

iii) *Promoting open standards and open data*: Government should also promote the creation of new digital services by ensuring open access to public data (e.g. weather, traffic, geography, public records, archives) to allow the creation of new and relevant localized digital content, services and applications.

iv) *Business life cycle*: Government should also Simplify and harmonize regulation in doing digital business, including across borders.

v) *Creating the best climate for success*: Government should promote digital entrepreneurship awareness and skills in schools, from early age and at all levels, including through the use of role models, technological skills, and especially combinations of technical and soft skills.

vi) *Enabling access to finance*: Government should promote access to finance for start-ups which is very important.

vii) *Fostering a competitive environment*: Government should reduce barriers to entry, and exit, where necessary is important in fostering a competitive environment and should help the diffusion of technology and reduce the power of incumbents.

viii) *Clarifying the rules for use of data*: Government should make a strict Rules for ‘ethical’ conduct around the collection, storage and use of data. It is also important to create trust in the online environment by providing a balance .

#### IV.CONCLUSION

Digital Entrepreneurship offer tremendous growth opportunities and reduce investment barriers by bringing new digital products and services to market. The greater emphasis must be placed on creating the right environmental conditions—including skills, business cycle regulations, infrastructure and access to capital—that enable digital entrepreneurs to be successful. Enabling digital entrepreneurship in our country is especially important as this allows for the creation of new markets, the exploitation of existing markets and integration into global value chains. The growth of Digital Entrepreneurship that match demand and supply for tasks also providing new avenues for people to offer their services regardless of their location which again helps in Sustainable Development.

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**SUSTAINABLE DEVELOPMENT THROUGH GREEN MARKETING**

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**ABSTRACT**

*Sustainable development can only be achieved when we do not harm our environment. For attaining our goal of sustainable development we can use the tool of green marketing in order to protect the environment from many types of harmful effects. Green marketing basically means the marketing of environment friendly products. Previously many concepts of marketing was there like product concept, production concept, selling concept, marketing concept but now what works is the green marketing concept or the societal marketing concept which means we must market those products which are environment friendly and not harmful to the society. There is no widely used definition of Green Marketing. Green Marketing has been defined differently by different persons as green, sustainable, ecological, environmental, environmentally – friendly marketing, environmental green marketing and sustainable green marketing, while in some cases difference in their content can be hardly find.*

*The Present paper makes an attempt to discuss the evolution and meaning of green marketing, the reasons for adopting green marketing, green marketing strategies, remarkable achievements of green business & India's initiative for green marketing.*

*Keywords: Green Marketing, Sustainable Marketing, Environment, Marketing*

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**MEANING OF GREEN AND SUSTAINABLE MARKETING**

Sustainable development can only be achieved when we do not harm our environment. For attaining our goal of sustainable development we can use the tool of green marketing in order to protect the environment from many types of harmful effects which our traditional marketing had. Green marketing basically means the marketing of environment friendly products. Previously many concepts of marketing was there like product concept, production concept, selling concept, marketing concept but now what works is the green marketing concept or the societal marketing concept which means we must market those products which are environment friendly and not harmful to the society. There is no widely used definition of Green Marketing. Green Marketing has been defined differently by different persons as green, sustainable, ecological, environmental, environmentally – friendly marketing, environmental green marketing and sustainable green marketing, while in some cases difference in their content can be hardly find.

In the year 1975 American Marketing Association (AMA) held the first workshop on “Ecological Marketing” the proceedings of which have resulted in the form of a book on green marketing entitled “Ecological Marketing”

According to AMA, “Green Marketing is the marketing of the products that are presumed to be environmentally safe”.

A mixture of traditional as well as green concept of green marketing includes all the activities which satisfy the human needs with minimal detrimental impact on the

Green Marketing, also alternatively known as environmental marketing and sustainable marketing, refers to the organizations' efforts at designing, promoting, pricing and distributing products that will not harm the environment.

This definition includes all the efforts of marketing in a manner which will not be proved to be destructive to the environment.

While defining green marketing it seems to be important to explain the meaning of green consumers also. In the words of Elkington (1994:93) green consumer is the one who avoids products that are likely to endanger the health of the consumer or others; cause significant damage to the environment during manufacture, use or disposal; consume a disproportionate amount of energy; cause unnecessary waste; use materials derived from threatened species or environments; involve unnecessary use of cruelty to animals; adversely affect other countries.

**REVIEW OF LITERATURE**

Kilbourne, W.E. (1998) discussed the failure of green marketing to move beyond the limitations of the prevailing paradigm. The author identified areas that must be examined for their effect in the marketing/environment relationship, namely economic, political and technological dimensions of the cultural

frame of reference.

Prothero, A. (1998) introduced several papers discussed in the July 1998 issue of 'Journal of Marketing Management' focusing on green marketing. This included a citation of the need to review existing literature on green marketing, an empirical study of United States and Australian marketing managers, a description of what a green alliance look like in practice in Great Britain, ecotourism and definitions of green marketing.

Prothero, A. & Fitchett, J.A. (2000) argued that greater ecological enlightenment can be secured through capitalism by using the characteristics of commodity culture to further progress environmental goals. Marketing not only has the potential to contribute to the establishment of more sustainable forms of society but, as a principle agent in the operation and proliferation of commodity discourse, also has a considerable responsibility to do so.

Oyewole, P. (2001) in his paper presented a conceptual link among green marketing, environmental justice, and industrial ecology. It argues for greater awareness of environmental justice in the practice for green marketing. A research agenda is finally suggested to determine consumer's awareness of environmental justice, and their willingness to bear the costs associated with it.

Karna, J., Hansen, E. & Juslin, H. (2003) interpreted that proactive marketers are the most genuine group in implementing environmental marketing voluntarily and seeking competitive advantage through environmental friendliness. The results also give evidence that green values, environmental marketing strategies, structures and functions are logically connected to each other as hypothesized according to the model of environmental marketing used to guide this study.

Sanjay K. Jain & Gurmeet Kaur (2004) in their study of environmentalism which had fast emerged as a worldwide phenomenon discussed business firms too have risen to the occasion and have started responding to environmental challenges by practicing green marketing strategies. Green consumerism has played a catalytic role in ushering corporate environmentalism and making business firms green marketing oriented. Based on the data collected through a field survey, the paper made an assessment of the extent of environmental awareness, attitudes and behaviour prevalent among consumers in India.

Donaldson (2005) in his study realized in the Great Britain that in general the ecological attitude of consumers changed positively. This study reported the strong faith of consumers in the known commercial brands and in the feeble behaviour referring to the "green" claims, which was the main cause behind the consuming failure to interpret their concerns beyond the environment in their behavior.

Alsmadi (2007) while investigating the environmental behaviour of Jordanian consumers reveals a high level of environmental conscience. Unfortunately however this positive tendency and preference in the "green" products did not appear to have any effect on the final decision, obviously because these consumers had a stronger faith in the traditional products and a small confidence in the green statements. The above obstacles were further strengthened by the lack of environmental conscience by a lot of enterprises and the existence of a large scale of prices for the same product, many of which included an impetuous estimate of environmental responsibility. The same phenomenon has been presented in other researches too (Ottman, 2004; Donaldson, 2005; Cleveland et al, 2005).

Brahma, M. & Dande, R. (2008), The Economic Times, Mumbai, had an article which stated that, Green Ventures India is a subsidiary of New York based asset management firm Green Ventures International. The latter recently announced a \$300 million India focused fund aimed at renewable energy products and supporting trading in carbon credits.

### **OBJECTIVES OF THE STUDY**

- To understand the evolution of Green Marketing
- To explain the reasons for adopting Green Marketing
- To discuss the green marketing strategies
- To discuss remarkable achievements of green business

### **RESEARCH METHODOLOGY**

This paper is based on secondary data. The data has been collected with the help of various books, journals, magazines and internet. The present study is an exploratory study. The scope of this study is limited to the reasons for adopting green marketing practices in India, green marketing practices which have been adopted in India for the purpose of achieving sustainable development and to discuss the remarkable achievements of the

country in this direction.

### **EVOLUTION OF GREEN MARKETING**

Environmental problems has got in the focus in 1962, when Rachel Carson's book, the Silent Spring was published and it draw people attention to the anthropocentric root and frightening extent of environmental problems, and blamed economic activities for them.

From the 70's ecological green marketing had been flourishing in developed countries. Ecological green marketing was the sport of the minority, and caused changes in the lifestyle of only a few consumers.

The term Green Marketing came into dominance in the late 1980s and early 1990s, began in Europe in the early 1980s when certain products were found to be harmful to the environment and society as a whole.

According to Peattie (2001), the evolution of green marketing can be divided into three phases; first phase was termed as "Ecological" green marketing, to help solve environment problems through remedies. Second phase was "Environmental" green marketing with focus on clean technology that involved designing of innovative new products, which take care of environmental and waste issues. Third phase was "Sustainable" green marketing, came into prominence in the late 1990s and early 2000 where it becomes necessary for companies to produce environmental friendly products as the awareness of such products is on the rise as customers are demanding eco-friendly products and technologies.

Beginning in the 1990s, the agenda of green marketing began to expand as new topics emerged related to individual's motivation, such as perceived consumer effectiveness, cooperative behaviors and strategic alliances<sup>4</sup>. However in the late 90's green developments had slowed down - the literature speaks about meeting with the Green Wall. On the other hand the negative attitude of the media toward green companies' trustworthiness, problems of green painting and the growing skepticism of consumers toward green advertisement meant burden. On the other hand cheap and easy green practices and solutions – especially those which caused cost reduction – had come to an end, so new steps towards being more green needed lot of investments and sacrifices from the firms. Moreover doubt emerged on the market related to what kind of products were proved to be as really green and the identification and reach of green consumer segment seemed to be very difficult in practice- similarly to the contradictory results of studies in this topic (Peattie 2001).

### **REASONS FOR ADOPTING GREEN MARKETING**

Due to various reasons like consumer beliefs are still in the evolving stage, demand is not well established; and even where it is, purchase behavior tends to be inconsistent, Implementation of Green Marketing is considered as the challenging job. Szillisi pointed out that from the 60s it became gradually evident that human intervention into the natural cycle to such extent has brought incalculable and irreversible consequences. To minimize environmental impacts by significant orders of magnitude requires the blending of good engineering with good economics as well as changing consumer preferences is the suggestion given by Arnulf Grublerr. There are many potent reasons responsible for the increasing demand of green marketing. Some of the reasons can be explained as below

**Strict Government Regulations** Tightening of emission norms in vehicles to minimize release of hydrocarbons into the atmosphere, Encouraging use of biodegradable materials through incentives, Issuance of various environmental licenses to control the production of by-products are some of the government regulations which force the companies to behave in environment friendly manner. The European Commission's "Green Package" of legislation on climate change and renewable energy represents a significant potential opportunity for European utilities, according to a report released by the Brattle Group and Trilemma UK. The green package sets targets that represent a step in the energy market: save 20% of energy, increase the share of renewable energy to 20%, and cut greenhouse gas emissions by at least 20%, all by 2020.

India took a series of legislations has been enacted in order to reduce pollution of water, air and other environmental resources. The aftereffect of which is that the refrigerator industry has shifted from chlorofluorocarbon (CFC) gases to more environmentally friendly gases. The Ban of plastic bags and prohibition of smoking in public areas and compulsion of CNG in buses and autorichaws are some of the important regulations of Indian Government to increase green in the country.

**Increased Goodwill of the Company** Successful marketing of green products will definitely help in the boosting up the company's image and reputation in the market. The increased goodwill of the company will definitely win customer's loyalty and the increased sales as well. Some of the first companies to benefit from gong green include Wal-Mart's Eco-store and McDonald's McRecycle. By doing so, these companies will eventually cut costs and gain a competitive edge compared to companies taking no actions (Kassaye, 2001).

**International Pressure** Several international agreements require nations to adhere to specified environmental standards. For example, under the Montreal Protocol, nations are committed to protecting the ozone layer by controlling the release of chlorofluorocarbons and halons. The Kyoto Protocol requires developed nations to reduce emission of greenhouse gas and outlines an agenda with regard to climate change. Similarly, the Basel convention provides guidelines regarding the generation, transportation and disposal of hazardous waste across nations.

**Increased Consumer Awareness** Consumer awareness towards green products have increased their demand and in turn motivated the companies and businesses to incorporate green alternatives to products and services. Statistical analyses of consumer behaviors have shown that customers are willing to pay a higher premium for a greener product (Czamowski, 2009). Recent polls report that 87% of U.S. adults are concerned about the condition of the natural environment (Phillips, 1999), 80% believe that protecting the environment will require major changes in current life-styles (Ottman, 1996) and 75% consider themselves to be environmentalists (Osterhus 1997). A 2009 Landor survey of the world's greenest brands in six nations has revealed some interesting facts. As per the report, consumers all over the world believed that it was important for companies to be green and despite economic concerns consumers said that they would spend more on green products. Consumers relied on a variety of sources to make their green purchase decisions. Hence consumer pressure is one of the most important factors which contribute in enhancing the green marketing in practice.

**Green a response to Competitor Initiative** As the market grows, more companies will attempt to dip into this green market segment to become the pioneer and dominant supplier (Hartmann, Ibanez, 2006). In the words of Polonsky (1994), at times firms may be forced to become more environmentally responsible because their competitors are taking major initiatives in that direction and using the fact as a marketing platform. For example, one Tuna manufacture stopped using driftnets the others followed suit. In the same manner Amway claims that its products are environmentally friendly. In the context of electricity industry in the U.S.A., Rader (1997) emphasized that it is not possible to have an effective green market unless and until there was a truly competitive market. For example, Xerox's "Revive 100% Recycled paper" was introduced in an attempt to address the introduction of recycled photocopier paper by other manufacturers.

**Green a commitment to Society** The Companies Act 2013, has made it obligatory for the companies to contribute a specified percentage of their profits towards Corporate Social Responsibility. The environmental responsibility is a part of every organizations commitment to society. Polonsky (1994) points out the instances of companies such as Walt Disney World, which have instituted environmentally responsible behavior in their processes and systems, but do not promote the fact externally. In the same manner Coca Cola have invested large sum of money in various recycling activities, as well as having modified their packaging to minimize its environmental impact and has not used this concern as a marketing tool. This proves that now firms started viewing greening as a part of their moral obligation toward the society.

**Green a Weapon to reduce Cost** While considering the short term, going green might mean higher costs but in the long term the benefits heavily outweighs the initial costs of going green. In order to reduce the high cost incurred in disposal of waste and by-products, such as poly chlorinated biphenyl (PCB) contaminated oil, businesses are forced to re-examine their inputs and production processes. In this direction they have started to use green or environmentally friendly raw materials or green technology, as a weapon to reduce cost to the company. Now firms also develop more effective production processes to reduce waste as well as the need for some materials. The search for cost reduction may lead companies to develop ways of recycling their waste or by products either for their own use or to be sold to other industries. Maruti Limited saved Rs. 26 crores in the first year after obtaining an ISO 14001 certification. At Jubliant Organosys Distillery at Gajraula, the treated wastewater is piped to farmers and CO<sub>2</sub> is sold to Cola majors.

### **GREEN MARKETING STRATEGIES**

There are many strategies through which we can achieve the objective of sustainable development through green marketing

**Recycling** An important way to go green and to be environmentally safe is Recycling. To help keep the environment clean, corporations could start from implementing green strategy in the office. Small changes in recycling habits for small or big companies can make a big difference in keeping the environment safe.

**Market positioning on consumer health and safety** Nowadays people have become more health conscious and prefer to consume only those products which are good for health and safe to use. "In India, around 25% of the consumers prefer environmental-friendly products, and around 28% may be considered health conscious. A study conducted by Alliance for Environmental Innovation and household product- maker S.C.Johnson found

that consumers are most likely to act on green messages that strongly connect to their personal environments. Specifically findings suggest that the majority of consumers prefer such environmental household product benefits as “safe to use around children”, “no toxic ingredients”, “no chemical residues”, and “no strong fumes” over such benefits as “packaging can be recycled”, “not tested on animals”. It can be said a good strategy to market the green product is to market position on the basis of consumer safety and health as these have been proved to be the key motivators driving the green building movement.

**Avoiding Green Marketing Myopia** In 1960, Harvard business Professor Theodore Levitt introduced the concept of “marketing myopia” in a now famous and influential article in the Harvard Business Review. Green marketing is expected to satisfy two objectives i.e. improvement environmental quality and customer satisfaction. Green marketing myopia is misjudging either or overemphasizing the former at the expense of the later. There are many examples like Whirlpool (in 1994) launched the “Energy Wise” refrigerator, the first chlorofluorocarbons (CFC) free cooler and one that was 30% more efficient than the U.S. Department of Energy’s highest standard<sup>13</sup>. But unfortunately the sale of “Energy Wise” languished due to its high price premium i.e. from \$100 to \$150 and also because of not offering additional features or new styles that consumers desired. Hence the best strategy for enhancing green marketing is to avoid green marketing myopia and manufacturing products by taking into account both the environment friendliness and consumer satisfaction also.

**Raise Consumer awareness through proper education** Majority of the people are not aware of green products and their uses. They lack a basic awareness of labels like ‘carbon neutral’, ‘carbon zero’, and ‘carbon negative’, ‘Green tariff’ and ‘100% recycled’. In one of the surveys conducted on green consumers the environmental Non-Government Organizations (ENGOS) were considered as providing credible information about environmental issues. For spreading the knowledge about green products various seminars and workshops should be organized. Various engaging and educational Internet sites about environmental products with the desired consumer value must be created as for example Tide Cold Water’s Interactive Website allows visitors to calculate their likely annual money savings based on their laundry habits, utility source (gas or electricity), and zip code location.

**“Green Washing” should be restricted** Information provision about greenness is a key component of green marketing. Clearly, firms should not advertise products’ environmental benefits unless such claims can be credibly substantiated. As the misleading communication and exaggerated product claims are more likely to deter consumers from buying a company’s products and open a business up to scrutiny. The key to successful green marketing strategy is clear communication and transparency, which can help to increase consumer loyalty and create a ‘feel good’ culture with companies.

**Organize Sustainability Audit** In order to ensure that the claims made by the companies are up to the standard of greenness a sustainability audit of each and every company must be conducted in relation to all the raw materials, water and energy usage, waste disposal and social partnerships. Social Responsibility Accounting is a good practice the business firms are adopting in practice these days.

**Compulsory Eco-Certifications** Expert third parties with respected standards for environmental testing (such as independent laboratories, government agencies, private consultants, or nonprofit advocacy organizations) can provide green product endorsements and/or “seals of approval” to help clarify and bolster the believability of product claims. The “Energy Star” label, is a common certification of electronic products consuming up to 30 percent less energy than comparable alternatives. Green Seal and Scientific Certification Systems emblems certify a broad spectrum of green products. In order to assure a product to be ‘green’ these eco-certification systems should be made compulsory in order to stop the companies from giving misleading information.

**Standardized minimum norms for ‘Green’** To have a social conscience as to what create green some minimum acceptable standard should be laid down so that there remains to be no confusion. Green management measures such as certified environmental management systems(EMS) or tools like life cycle assessment activities are considered to improve corporate environmental performance directly by mandating companies to introduce environmental goals and management structures as well as programs to achieve them (Coglianese and Nash, 2001; Johnstone, 2001)

## **REMARKABLE ACHIEVEMENTS OF GREEN BUSINESS & INDIA’S INITIATIVES FOR GREEN MARKETING**

Green Business in practice has shown remarkable achievements. Most of the ‘green’ companies such as the Body Shop, Patagonia, Aveda, Malden Mills, Johnson and Johnson and other, have shown that the principles of sustainable development and environmental protection can be good for public relations, employee morale and

sales. The “National Green Pages” published by Co-op America currently lists more than 2000 green companies. Organic food marketing has grown from a few funky local co-op to a \$7bn marketing segment. Natural care, health and beauty products reached \$2.8bn in sales in 1990 out of a \$33bn industry. Pollution-prevention programs at 3M, have saved \$875mn over the past 25 years. Du Pont has cut its emissions of airborne cancer causing chemicals almost 75% since 1987.

Toyota’s Prius is the first major consumer product that fits nearly all of the criteria for success in the green-consumer market place<sup>19</sup>. Prius registered a great success with a sale of 7, 57,600 cars by June 2007.

Apple, HP, Microsoft, IBM, Intel, Sony and Dell are the companies that have succeeded in their GM strategies. HCL has a comprehensive policy designed to drive its environment management program ensuring sustainable development. HCL is duty bound to manufacture environmentally responsible products and comply with environment management processes right from the time products are sourced, manufactured, bought by customers, recovered at their end- of- life and recycled.

Potato starch trays made by Dutch Paper Foam protect the iPhone launched by Apple Computers which equals 90% reduction in the carbon footprint compared to the plastic tray used in the past.

Indian Oil also aims at developing techno-economically viable and environment-friendly products and services for the benefit of the millions of its consumers, while at the same time ensuring the highest standards of safety and environment protection in its operation.

**Eco-mark Scheme** introduced by the Government of India in 1981 was a major step towards the promotion of green marketing in the country. Eco-labels provide information regarding the environmental performance of products. The basic objective of eco-labeling is to provide authentication to genuine claims regarding the environmental impact of products and processes by manufacturers. The eco-labeling schemes in several countries worldwide are given in the table

**Table-1: Eco-labeling Schemes in Various countries**

COUNTRY	SCHEME	COUNTRY	SCHEME
Austria	The Austrian Eco-Label	Netherland	Stiching Mileukeur (Ecolabel)
Canada	Environmental Choice	New Zealand	Environmental Choice
China	Green Mark	Singapore	Green Label
France	NF Environmental label Retour Brand	Sweden	Nordic Swan, Sito Eco-Declaration, Falcon/Good Environmental Choice, Environmentally – Friendly Office Programme (TCO’95)
Japan	Eco Mark	Switzerland	Swiss Energy 2000
Germany	Blue Angel TUV Rhineland	Taiwan	Green Mark
India	Ecomark	Thailand	Green Label
European Union	Eco-label	USA	Energy Seal, Green Star, Green Cross
Korea	Ecomark		

Source: Childs and Whiting 1998

The Eco-mark Scheme of India has the following stated objectives:

- To provide incentives to manufacturers and importers to reduce adverse environmental impact of products.
- To reward genuine initiatives by companies to reduce adverse environmental impact of products.
- To assist consumers to become environmentally responsible in their daily lives by providing them information to take account of environmental factors in their daily lives.
- To encourage citizens to purchase products which have less environmental impact
- Ultimately to improve the quality of the environment and to encourage the sustainable management of resources.

**RENEWABLE ENERGY**

Setting up Indian Renewable Energy Development Agency Limited (IREDA) in 1987 is one of the attempts of the Indian Government to reduce dependence on fossil fuels. IREDA facilitates with monetary and technical support to industries for pursuing projects related to solar, bio and hydro and wind energy.

At the customer end, only solar energy has found applications for retailing Green products. TATA BP Solar, a leading private enterprise to venture in this area, markets many solar products targeted at households under different brands. Vajra, for example, is its domestic water heating system. Similarly, Jugnu and TATADEEP are its brands for home lighting kits and lanterns respectively.

### **HOSPITALITY**

ECOTEL is a global certification for eco-friendly hotels. Most of the hotels in India are now becoming ECOTEL certified. Some of them are ORCHID Hotel (a 5 star hotel in Mumbai), Hotel Rodas (a 3-star hotel in Mumbai), Rain Tree (a 5-star Hotel in Chennai).

### **BUILDINGS**

In India, the Green Building Movement, spearheaded by the Confederation of Indian Industry (CII) - Godrej Green Business Centers, has gained tremendous impetus over the last few years. From 20000 sq ft in 2003, India's green building footprints now over 25 million sq ft.

The rating system - GRIHA - has been adapted by the government of India as the National rating system for rating green buildings. As much as 22,50,000 sq m of built up space (including schools, colleges, hospitals, offices, embassy, commonwealth games village, residences, IT parks, Metro station, integrated communities Goverdhan Eco Village) is registered under GRIHA and the number is increasing by the day. GRIHA has been mandated for all upcoming buildings of the Central Public Works Department. Minimum 3-star rating is in the process of getting mandated for all upcoming central government and public sector buildings.

### **CONCLUSION**

The ever increasing pollution and the harmful effects of the chemicals on the environment have raised the attention towards saving and protecting the environment from the detrimental effects of these pollutants. Green and sustainable marketing is a step towards resolving this issue. Sustainable marketing can be achieved through recycling, Market positioning on consumer health and safety, Standardized minimum norms for 'Green' Compulsory Eco-Certifications. Indian government has taken various initiatives like Eco-mark scheme introduced by the Government of India in 1981, Setting up Indian Renewable Energy Development Agency Limited (IREDA) in 1987 is one of the attempts of the Indian Government to reduce dependence on fossil fuels, the Green Building Movement, spearheaded by the Confederation of Indian Industry (CII) to promote green and sustainable marketing and also achieved success in this direction.

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**TESTING OF EFFICIENT MARKET HYPOTHESIS: A STUDY ON STOCK MARKET REACTION TO DIVIDEND ANNOUNCEMENTS**

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**ABSTRACT**

*This study examines the efficient market hypothesis by adopting Event Methodology to test weak form of efficient market hypothesis. Efficient market hypothesis theory holds that the stock markets are efficient and prices fully reflect all the available information. EMH implies that it is not possible for anyone to earn abnormal return by trading in the stock market and no investor could be able to outperform the market. Daily stock prices of 29 out of 30 companies of BSE sensex were collected to test Efficient Market Hypothesis (EMH). The data for one company was not available, hence not included in the study. The paper examines the stock price response to dividend announcements. The analysis includes the testing of individual company-wise Abnormal Returns (ARs), Average Abnormal Returns (AARs) and Cumulative Average Abnormal Returns (CAARs). The results show that there is no possibility to earn abnormal returns because of dividend announcements as there is no significant abnormal return near the event date.*

*Keywords: Efficient Market Hypothesis (EMH); Bombay Stock Exchange (BSE); Dividend Announcement; Stock Market Reaction; AR; AAR; CAAR; Event Study; T-test.*

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**INTRODUCTION**

There are various macroeconomic and microeconomic events which may impact the share prices of any company. Dividend announcement is one of the major events which are supposed to impact the prices of equity share. The Efficient Market Hypothesis (EMH) hold that the security markets are efficient and absorb every available information within no time hence, no one can outperform to earn abnormal returns because of any event and past pattern.

In India there are various stock markets but BSE is one of the major stock exchanges. The stock prices are assumed to be random walk as no one can predict the next movement. In case of efficient market, the future prices of the stock can-not be predicted with the help of technical analysis because every information of such analysis has been absorbed in the current market prices. When the stock prices follow random walk, it means the changes in the prices are independent from the past movements. Technical analysis is used to “identify the presence of weak-form of EMH” (Reilly and Brown, 2012). The semi strong-form of EMH encompasses the weak form hypothesis as historical information of market such as past stock prices and trading volume is public. FAMA (1991) coined a new term for the semi strong model—the event study. He uses event studies instead of semi strong-form to test “adjustment of prices to public announcements” (Nadig, 2014). In case of inefficient markets, some stocks may outperform and attract investors with positive sentiments while some stocks may underperform and create panic among the investors. The focus of the study is to test the efficiency of Bombay Stock Exchange with the help of EMH. In the present study, an attempt is made to test the efficient market hypothesis by considering closing prices of 29 companies listed in BSE Sensex over a period of time.

**LITERATURE REVIEW**

Sharma and Kennedy (1977) conducted research to study random walk model by applying run test and spectral analysis on data of three stock exchanges London, New York and Bombay stock exchange. The test data covered 132 monthly observations for each index for 11 year period. (1963-1973). Results reveal that all three stock exchanges have random walk movement.

Pinches et. al (1980) studied events like accounting changes, stock splits on the risk adjusted return of securities and concludes with their methodology that it directly affects the result of market efficiency.

Sanger and McConnell (1986) in their event study of over the counter stocks listed on the NYE and found that market is insensitive to variations in empirical methodology.

Jegadeesh and Titman (1993) studied the holding period return pattern based on past and found that the stocks performed well in past generates positive returns over the 3 to 12 months holding period.

Dow and Gorton (1997) studied the difference or connection between economic efficiency and stock market efficiency and found that stock price efficiency is not sufficient for economic efficiency.

Pandey (2003) analyzed three popular stock indices and tested the efficiency level in Indian stock market and the random walk nature of the stock market by using the run test and the autocorrelation function ACF for the

period from January 1996 to June 2002 and concluded that the series of stock indices in the India stock market are biased random time series.

Pradhan et al. (2009) tried to examine efficient market hypothesis in the context of global financial crisis with concern to Indian stock market by employing the unit root test on the sample of daily stock returns of National stock Exchange (NSE) and Bombay Stock Exchange (BSE). The sample period lies between January 2007 to July 2009. Results reveal that Indian stock market is not weak form efficient.

Dasilas and Stergios (2011) investigated the market reaction to cash dividend announcements for the period 2000-2004 employing data from Athens stock exchange (ASE). This paper examines both the stock price and trading volume response to dividend distribution announcements. Results indicate that there is a statistically significant market reaction on the dividend announcement day.

Gupta and Gedam (2014) tested the weak form of efficient market hypothesis using Runs test on stock price of selected companies has been taken from National stock exchange (NSE ) Companies over the period of 1<sup>st</sup> January 2014 to 31<sup>st</sup> march 2014. Four companies are selected each from Automobile Industry and IT industry and found that except Tech Mahindra, the stock prices are independent of the past prices therefore they favor random walk theory.

### **OBJECTIVES OF THE STUDY**

1. The Prime objective is to study the stock market reaction to the dividend announcements on the share prices of selected companies in the event window to find out whether the Semi-Strong form of market efficiency holds true or not.
2. To study the presence of abnormal returns during the days surrounding the announcement date.

### **RESEARCH METHODOLOGY**

The study considered 29 companies listed at BSE Sensex for the purpose of study because of the unavailability of data for one company. The closing prices of selected companies were collected from yahoo finance. One company named Sesa Sterlite Limited is now Vedanta limited and due to changes in name of company, required data of Sesa Sterlite was not available on yahoo finance and hence it was not included in this research. According to literatures and previous researches, it was observed that 200 prior and 20 after observations from event date are taken to see the impact of announcement of dividend. In the present study 190 observations prior event date and 10 observation after event date were collected to apply event methodology by using Microsoft Excel.

Reason for selecting these companies in study is that these companies represent all the listed companies in the BSE. To check efficiency, event methodology technique was applied. *T-test was also applied in MS-excel* to evaluate the reaction of market on dividend announcement event. Different Time periods were taken as dividend announcements dates were different for each company and accordingly closing prices were collected.

To test the semi strong market efficiency hypothesis, firstly expected returns are calculated using ordinary least square method and then abnormal returns are calculated by taking difference between the companies' actual return and expected returns. Average Abnormal return is computed by summing of all abnormal returns. This study is divided into three sections. First section analyses that whether the dividend announcements yields any significant Abnormal Returns in case of an individual company. Second section comprises of analyses that whether the dividend announcements yields any significant Average Abnormal Return and last part i.e. third part comprises of whether the dividend announcements yields any significant Cumulative Average Abnormal Returns.

### **RESEARCH PLAN**

There are two hypotheses that have been consider examining the randomness of the prices in weak form efficiency, these two hypotheses are:

#### **1. Null Hypothesis**

H<sub>0</sub>: BSE Sensex holds Semi Strong form of efficiency. It means that investors cannot make abnormal returns based on the Dividend announcement event.

To test above hypothesis, following sub-hypothesis are formulated:

H<sub>0a</sub>: The AR (Abnormal Return) of the sample firms are not different from Zero in the event Window.

H<sub>0b</sub>: The AAR (Average Abnormal Return) of the samples firms are not different from Zero in the event Window.

$H_{0c}$ : The CAAR (Cumulative Average Abnormal Return) of the sample firms are not different from Zero in the event Window.

## 2. Alternative Hypothesis

$H_1$ : Semi Strong form of efficiency doesnot exists in the BSE Sensex which means that investors can make abnormal returns based on the Dividend announcement event.

This study examines the efficient market hypothesis, by employing Event methodology technique by using *T-test* tool in Microsoft Excel software. Through Event Methodology *T-test* is used, it is a parametric test. *T-test* in Event methodology data is used to see the event date impact on market share price and also when sample size is small i.e, less than 30 *T-test* is applied. In this paper it is taken to judge the reaction of selected closing prices of Bombay Stock Exchange to the dividend declaration.

Daily return of both individual company and S&P BSE Sensex are calculated on basis of event date.

After calculating return of each company and market return according to respective date, Intercept ( $\alpha$ ), Slope ( $\beta$ ), R-square and Standard Error were also calculated. Explanation of each terminology:

$\alpha$  - Intercept parameter

$\beta$  – Slope parameter in the relation between dependent variable and independent variable.

**R-square** – The variance explained by independent variable to dependent variable.

These all above terminologies are calculated to help in calculation of Event window. Below formulas are mentioned for calculating

### CALCULATION OF EVENT WINDOW

**Expected return  $E(r)$**  or Normal Returns were calculated using the market model. For any Security  $i$ , the market model is calculated as

$$E[R_{it}] = \alpha_i + \beta_i R_{mt} + \varepsilon_{it}$$

Where,  $E[R_{it}]$  = It is the Expected Return on Security  $i$  on day  $t$ ,

$\alpha$  = Intercept,

$\beta$  = slope

$R_{mt}$  = It is the return on market index on the day  $t$ ,

$\varepsilon_{it}$  = It is the zero mean disturbance term.

To determine the market model parameters, Ordinary Least Square method has been used on the estimation window of 180 days prior to the Event Window.

- **Abnormal Returns (AR)** were calculated by using formula

$$AR = \text{Actual Return} - \text{Expected Return or } R_{it} - E[R_{it}] \text{ or } R_{it} - E[R_{it}]$$

Where,  $R_{it}$ , is the Actual return for the security  $i$  during the time  $t$ ,

$E[R_{it}]$ , Expected return is calculated using market model.

- **Cumulative Abnormal Return** is calculated by

CAR, is the sum of all **abnormal returns**.

- **T-test value** is calculated by using below mentioned formula

$$T\text{-test} = \text{Abnormal Return} / \text{Standard Error}$$

- **Average Abnormal Return(AAR)** is the average of abnormal returns of individual securities for each day before and after the event day in the event window and the AAR is obtained using formulae;

$$AAR_t = t/N \text{ where } t = -10 \text{ to } +10$$

- **Cumulative Average Abnormal Returns** is calculated by

CAAR is the sum of all average abnormal returns.

- **P-value** is calculated by using function

$P\text{-value} = \text{TDIST}(T\text{-test value, df,2})$

*P-value* signifies if market is efficient or not at gives level of significance for this there are three types of signs are used in above analysis such as cross symbol (red color), right symbol (Green color) and exclamation mark symbol (orange color).

1. Cross symbol (Red color symbol) signifies that market is efficient and abnormal return cannot be earned.
2. Right symbol (Green color symbol) signifies that at 5% level of significance market is inefficient and abnormal return is earned.
3. Exclamation symbol (Orange color symbol) signifies that at 10% level of significance market is inefficient and abnormal return can be earned.

So Exclamation symbol (Orange color symbol) and right symbol (green color symbol) shows that market is not efficient and due to event (dividend announcement) market participant can earn abnormal profit therefore null hypothesis is rejected and cross symbol (Red color symbol) shows that market is efficient at which market participants can-not earn abnormal profit therefore null hypothesis is accepted.

**DATA ANALYSIS & INTERPRETATION**

**Table-1: Company-Wise Analysis of Abnormal Returns**

Event days	ITC			Reliance			HDFC Bank			INFOSYS		
	AR	t-test	p-value	AR	t-test	p-value	AR	t-test	p-value	AR	t-test	p-value
-10	0.020	2.111	0.036	0.008	0.751	0.454	0.004	0.565	0.573	0.017	1.338	0.183
-9	-0.008	-0.841	0.402	-0.006	-0.560	0.576	-0.013	-1.789	0.075	-0.017	-1.365	0.174
-8	-0.019	-2.032	0.044	0.003	0.284	0.777	-0.003	-0.473	0.637	-0.021	-1.676	0.095
-7	0.010	1.043	0.298	-0.006	-0.518	0.605	0.001	0.154	0.878	0.031	2.420	0.016
-6	0.002	0.203	0.839	0.001	0.056	0.956	-0.002	-0.234	0.816	-0.013	-1.057	0.292
-5	-0.002	-0.210	0.834	-0.014	-1.306	0.193	0.002	0.347	0.729	0.005	0.361	0.718
-4	-0.006	-0.674	0.501	0.006	0.517	0.606	0.002	0.283	0.777	-0.032	-2.542	0.012
-3	0.009	0.914	0.362	0.030	2.718	0.007	-0.004	-0.620	0.536	-0.028	-2.236	0.027
-2	0.002	0.211	0.833	0.004	0.368	0.713	0.000	-0.015	0.988	-0.006	-0.459	0.647
-1	-0.009	-0.893	0.373	-0.003	-0.268	0.789	0.010	1.348	0.179	0.026	2.021	0.045
0	0.018	1.924	0.056	0.011	0.953	0.342	-0.016	-2.209	0.028	-0.010	-0.763	0.446
1	-0.019	-1.982	0.049	-0.039	-3.547	0.000	-0.003	-0.379	0.705	0.015	1.179	0.240
2	0.018	1.898	0.059	0.009	0.811	0.419	-0.008	-1.083	0.280	-0.027	-2.144	0.033
3	0.005	0.559	0.577	-0.009	-0.820	0.413	0.002	0.223	0.824	-0.006	-0.452	0.652
4	-0.012	-1.251	0.212	-0.004	-0.331	0.741	-0.010	-1.422	0.157	-0.028	-2.247	0.026
5	-0.012	-1.272	0.205	0.008	0.755	0.451	0.007	0.928	0.355	-0.016	-1.278	0.203
6	-0.001	-0.152	0.879	-0.005	-0.481	0.631	0.012	1.745	0.083	0.012	0.987	0.325
7	0.003	0.353	0.725	0.004	0.343	0.732	0.000	-0.040	0.968	-0.022	-1.716	0.088
8	0.007	0.739	0.461	0.007	0.647	0.518	0.014	1.975	0.050	0.004	0.345	0.731
9	-0.001	-0.109	0.913	-0.002	-0.196	0.845	-0.011	-1.563	0.120	0.025	1.987	0.048
10	-0.005	-0.480	0.632	-0.005	-0.461	0.646	-0.007	-1.037	0.301	0.030	2.377	0.018

Event days	TSC			SUN PHARMA			DR. REDDY			BAJAJ		
	AR	t-test	p-value	AR	t-test	p-value	AR	t-test	p-value	AR	t-test	p-value
-10	-0.034	-2.183	0.030	-0.060	-3.293	0.001	0.002	0.133	0.895	-0.022	-2.190	0.030
-9	0.021	1.363	0.175	0.005	0.256	0.798	-0.005	-0.271	0.787	0.001	0.061	0.951
-8	0.000	0.031	0.975	-0.011	-0.614	0.540	-0.035	-1.960	0.051	-0.009	-0.872	0.384
-7	0.013	0.805	0.422	0.013	0.723	0.470	-0.004	-0.246	0.806	-0.009	-0.890	0.375
-6	0.000	0.002	0.998	0.026	1.396	0.164	0.013	0.727	0.468	-0.014	-1.388	0.167
-5	0.006	0.398	0.691	-0.022	-1.224	0.222	-0.002	-0.128	0.898	-0.012	-1.236	0.218
-4	-0.011	-0.730	0.466	-0.038	-2.074	0.039	-0.002	-0.127	0.899	0.006	0.605	0.546
-3	0.009	0.604	0.546	0.020	1.098	0.273	0.000	-0.021	0.983	-0.002	-0.184	0.854
-2	0.005	0.309	0.758	0.008	0.449	0.654	0.007	0.405	0.686	-0.002	-0.210	0.834
-1	0.023	1.478	0.141	0.013	0.688	0.493	-0.037	-2.060	0.041	0.011	1.117	0.265
0	0.003	0.211	0.833	0.002	0.112	0.911	0.061	3.454	0.001	-0.006	-0.565	0.573
1	-0.009	-0.603	0.547	0.062	3.376	0.001	-0.022	-1.262	0.209	-0.014	-1.371	0.172
2	-0.018	-1.159	0.248	0.005	0.280	0.780	0.004	0.235	0.814	0.032	3.215	0.002
3	-0.015	-0.963	0.337	-0.005	-0.300	0.764	-0.006	-0.335	0.738	-0.003	-0.316	0.752
4	-0.001	-0.060	0.953	-0.042	-2.319	0.021	0.005	0.288	0.774	-0.024	-2.360	0.019
5	-0.055	-3.499	0.001	0.009	0.513	0.608	0.002	0.125	0.901	0.001	0.076	0.940
6	0.003	0.209	0.835	-0.002	-0.091	0.927	-0.008	-0.474	0.636	0.004	0.433	0.665
7	0.023	1.445	0.150	-0.006	-0.331	0.741	-0.017	-0.938	0.349	0.008	0.766	0.445
8	0.005	0.295	0.769	0.024	1.288	0.199	0.001	0.032	0.974	-0.010	-0.959	0.339
9	0.009	0.543	0.588	-0.009	-0.489	0.625	0.034	1.933	0.055	-0.016	-1.615	0.108
10	-0.860	-54.840	0.000	0.079	4.344	0.000	-0.015	-0.856	0.393	0.053	5.297	0.000

Event days	ICIC			HDFC COR			L&T			ONGC		
	AR	t-test	p-value	AR	t-test	p-value	AR	t-test	p-value	AR	t-test	p-value
-10	-0.024	-1.557	⊗0.121	0.012	1.215	⊗0.226	-0.006	-0.568	⊗0.571	-0.006	-0.440	⊗0.660
-9	-0.009	-0.609	⊗0.543	0.007	0.703	⊗0.483	-0.003	-0.282	⊗0.778	0.014	1.097	⊗0.274
-8	0.010	0.640	⊗0.523	-0.005	-0.525	⊗0.600	-0.003	-0.288	⊗0.774	-0.013	-0.990	⊗0.324
-7	-0.013	-0.841	⊗0.401	-0.010	-0.942	⊗0.348	0.008	0.770	⊗0.442	0.008	0.627	⊗0.532
-6	-0.009	-0.601	⊗0.549	-0.018	-1.716	⊗0.088	-0.025	-2.447	⊙0.015	-0.008	-0.638	⊗0.524
-5	0.022	1.447	⊗0.150	-0.002	-0.164	⊗0.870	0.007	0.641	⊗0.522	-0.042	-3.176	⊙0.002
-4	-0.020	-1.314	⊗0.191	0.007	0.662	⊗0.509	0.003	0.283	⊗0.778	-0.054	-4.154	⊙0.000
-3	-0.026	-1.699	⊗0.091	0.001	0.108	⊗0.914	0.016	1.589	⊗0.114	0.038	2.910	⊙0.004
-2	0.021	1.351	⊗0.178	-0.003	-0.308	⊗0.759	-0.003	-0.332	⊗0.740	-0.003	-0.219	⊗0.827
-1	0.013	0.839	⊗0.402	-0.007	-0.679	⊗0.498	-0.006	-0.582	⊗0.562	0.002	0.149	⊗0.882
0	0.011	0.690	⊗0.491	0.008	0.810	⊗0.419	0.016	1.525	⊗0.129	-0.008	-0.611	⊗0.542
1	0.067	4.339	⊙0.000	0.013	1.253	⊗0.212	0.009	0.903	⊗0.368	0.009	0.675	⊗0.500
2	-0.011	-0.698	⊗0.486	0.008	0.818	⊗0.414	-0.010	-0.924	⊗0.357	-0.023	-1.780	⊗0.077
3	0.004	0.235	⊗0.814	0.000	-0.025	⊗0.980	-0.014	-1.314	⊗0.190	-0.005	-0.391	⊗0.696
4	0.001	0.092	⊗0.927	-0.008	-0.782	⊗0.435	0.006	0.563	⊗0.574	0.002	0.123	⊗0.902
5	-0.004	-0.251	⊗0.802	-0.005	-0.517	⊗0.606	-0.001	-0.053	⊗0.958	-0.012	-0.904	⊗0.367
6	-0.005	-0.326	⊗0.745	-0.008	-0.759	⊗0.449	-0.016	-1.530	⊗0.128	0.006	0.490	⊗0.625
7	-0.026	-1.679	⊗0.095	0.002	0.170	⊗0.865	0.001	0.127	⊗0.899	0.005	0.354	⊗0.723
8	0.004	0.289	⊗0.773	0.004	0.422	⊗0.673	-0.007	-0.688	⊗0.492	-0.003	-0.218	⊗0.828
9	-0.019	-1.212	⊗0.227	0.004	0.354	⊗0.724	-0.007	-0.719	⊗0.473	-0.016	-1.259	⊗0.210
10	0.022	1.452	⊗0.148	0.000	0.012	⊗0.990	-0.002	-0.238	⊗0.812	-0.009	-0.724	⊗0.470

Event days	COAL			NTPC			CIPLA			WIPRO		
	AR	t-test	p-value	AR	t-test	p-value	AR	t-test	p-value	AR	t-test	p-value
-10	0.019	1.277	⊗0.203	-0.003	-0.250	⊗0.803	-0.001	-0.036	⊗0.971	0.015	1.160	⊗0.247
-9	0.016	1.044	⊗0.298	-0.009	-0.883	⊗0.378	-0.005	-0.342	⊗0.733	0.000	0.038	⊗0.970
-8	-0.025	-1.689	⊗0.093	-0.015	-1.394	⊗0.165	-0.021	-1.384	⊗0.168	-0.002	-0.165	⊗0.869
-7	-0.011	-0.707	⊗0.480	0.007	0.682	⊗0.496	-0.011	-0.699	⊗0.485	-0.038	-2.988	⊙0.003
-6	-0.019	-1.272	⊗0.205	-0.010	-0.956	⊗0.340	0.005	0.354	⊗0.723	-0.002	-0.152	⊗0.879
-5	0.016	1.088	⊗0.278	-0.018	-1.752	⊗0.081	-0.003	-0.216	⊗0.829	0.035	2.759	⊙0.006
-4	0.014	0.941	⊗0.348	-0.004	-0.385	⊗0.701	-0.022	-1.459	⊗0.146	0.000	0.018	⊗0.986
-3	0.014	0.958	⊗0.339	-0.026	-2.519	⊙0.013	-0.006	-0.392	⊗0.696	0.025	1.999	⊙0.047
-2	-0.010	-0.642	⊗0.522	0.002	0.181	⊗0.857	-0.027	-1.773	⊗0.078	0.000	0.018	⊗0.985
-1	0.009	0.583	⊗0.561	0.002	0.192	⊗0.848	-0.021	-1.347	⊗0.180	0.006	0.446	⊗0.656
0	0.017	1.111	⊗0.268	-0.003	-0.288	⊗0.774	0.008	0.512	⊗0.609	-0.005	-0.366	⊗0.715
1	0.004	0.248	⊗0.804	-0.003	-0.319	⊗0.750	0.024	1.557	⊗0.121	-0.038	-2.974	⊙0.003
2	-0.002	-0.125	⊗0.900	0.017	1.641	⊗0.102	-0.009	-0.614	⊗0.540	0.015	1.220	⊗0.224
3	-0.002	-0.115	⊗0.909	0.006	0.556	⊗0.579	0.000	0.021	⊗0.983	0.003	0.241	⊗0.810
4	0.011	0.740	⊗0.460	-0.024	-2.284	⊙0.024	0.002	0.146	⊗0.884	-0.001	-0.060	⊗0.952
5	-0.008	-0.536	⊗0.593	-0.003	-0.244	⊗0.808	-0.012	-0.797	⊗0.426	-0.001	-0.078	⊗0.938
6	-0.006	-0.429	⊗0.668	-0.012	-1.164	⊗0.246	-0.009	-0.593	⊗0.554	-0.001	-0.070	⊗0.944
7	0.009	0.598	⊗0.551	-0.019	-1.808	⊗0.072	-0.012	-0.788	⊗0.432	0.004	0.351	⊗0.726
8	-0.002	-0.126	⊗0.900	-0.005	-0.479	⊗0.633	0.000	0.021	⊗0.984	-0.004	-0.328	⊗0.743
9	-0.005	-0.362	⊗0.718	-0.008	-0.746	⊗0.457	-0.001	-0.071	⊗0.943	-0.003	-0.253	⊗0.800
10	-0.003	-0.218	⊗0.828	-0.018	-1.729	⊗0.085	0.042	2.716	⊙0.007	0.005	0.369	⊗0.712

Event days	TCS			TMS			SBI			HUL		
	AR	t-test	p-value	AR	t-test	p-value	AR	t-test	p-value	AR	t-test	p-value
-10	-0.021	-1.441	⊗0.151	-0.032	-1.502	⊗0.135	-0.011	-0.629	⊗0.530	-0.001	-0.095	⊗0.925
-9	0.019	1.296	⊗0.196	0.014	0.649	⊗0.517	0.008	0.451	⊗0.653	0.012	1.161	⊗0.247
-8	-0.006	-0.381	⊗0.703	-0.001	-0.056	⊗0.956	-0.008	-0.471	⊗0.638	-0.005	-0.490	⊗0.625
-7	0.032	2.159	⊙0.032	0.026	1.233	⊗0.219	-0.006	-0.372	⊗0.710	0.003	0.253	⊗0.800
-6	-0.042	-2.832	⊙0.005	0.004	0.199	⊗0.842	0.009	0.560	⊗0.576	0.019	1.872	⊗0.063
-5	-0.046	-3.118	⊙0.002	-0.001	-0.054	⊗0.957	-0.003	-0.198	⊗0.843	-0.014	-1.439	⊗0.152
-4	0.015	1.049	⊗0.295	0.012	0.558	⊗0.578	0.012	0.687	⊗0.493	-0.003	-0.268	⊗0.789
-3	-0.013	-0.887	⊗0.376	0.006	0.275	⊗0.784	0.021	1.224	⊗0.222	0.004	0.359	⊗0.720
-2	0.000	0.007	⊗0.995	-0.002	-0.099	⊗0.921	-0.001	-0.071	⊗0.943	-0.007	-0.656	⊗0.513
-1	-0.022	-1.522	⊗0.130	0.005	0.257	⊗0.797	-0.017	-0.992	⊗0.323	-0.001	-0.125	⊗0.901
0	-0.038	-2.563	⊙0.011	-0.013	-0.631	⊗0.529	0.016	0.968	⊗0.334	-0.005	-0.545	⊗0.586
1	-0.035	-2.377	⊙0.018	-0.029	-1.345	⊗0.180	-0.049	-2.899	⊙0.004	0.003	0.338	⊗0.736
2	0.012	0.802	⊗0.423	-0.004	-0.210	⊗0.834	-0.020	-1.190	⊗0.235	0.003	0.254	⊗0.800
3	0.005	0.362	⊗0.718	-0.017	-0.785	⊗0.434	-0.019	-1.126	⊗0.261	0.008	0.761	⊗0.447
4	-0.018	-1.241	⊗0.216	0.027	1.287	⊗0.200	0.025	1.457	⊗0.147	0.003	0.311	⊗0.756
5	-0.008	-0.513	⊗0.609	-0.022	-1.016	⊗0.311	0.003	0.162	⊗0.871	-0.003	-0.334	⊗0.738
6	-0.009	-0.634	⊗0.527	0.019	0.880	⊗0.380	-0.015	-0.908	⊗0.365	0.000	-0.028	⊗0.978
7	-0.033	-2.217	⊙0.028	0.046	2.186	⊙0.030	0.014	0.813	⊗0.417	0.014	1.451	⊗0.148
8	0.003	0.187	⊗0.852	-0.017	-0.782	⊗0.435	-0.002	-0.147	⊗0.883	0.004	0.367	⊗0.714
9	-0.001	-0.041	⊗0.967	0.002	0.102	⊗0.919	-0.005	-0.277	⊗0.782	-0.004	-0.422	⊗0.673
10	-0.035	-2.398	⊙0.017	-0.012	-0.545	⊗0.587	-0.001	-0.065	⊗0.948	0.014	1.386	⊗0.167

Event days	BHEL			HERO MOTOT			MARUTI			TPS		
	AR	t-test	p-value	AR	t-test	p-value	AR	t-test	p-value	AR	t-test	p-value
-10	0.009	0.568	⊗0.570	-0.009	-0.865	⊗0.388	-0.010	-1.076	⊗0.283	-0.006	-0.408	⊗0.684
-9	0.022	1.358	⊗0.176	-0.006	-0.545	⊗0.586	0.006	0.673	⊗0.502	0.005	0.357	⊗0.721
-8	0.012	0.739	⊗0.461	-0.005	-0.503	⊗0.615	-0.011	-1.233	⊗0.219	-0.012	-0.836	⊗0.404
-7	-0.023	-1.454	⊗0.147	0.005	0.428	⊗0.669	-0.003	-0.305	⊗0.761	-0.012	-0.847	⊗0.398
-6	-0.007	-0.417	⊗0.678	-0.008	-0.734	⊗0.464	-0.009	-0.928	⊗0.355	-0.008	-0.583	⊗0.561
-5	0.013	0.830	⊗0.408	-0.003	-0.288	⊗0.774	-0.005	-0.515	⊗0.607	-0.007	-0.501	⊗0.617
-4	0.004	0.230	⊗0.819	0.002	0.217	⊗0.828	0.001	0.098	⊗0.922	0.011	0.819	⊗0.414
-3	-0.019	-1.179	⊗0.240	0.006	0.540	⊗0.590	-0.005	-0.511	⊗0.610	-0.005	-0.353	⊗0.725
-2	-0.007	-0.447	⊗0.655	-0.017	-1.565	⊗0.119	-0.012	-1.290	⊗0.199	0.012	0.842	⊗0.401
-1	0.046	2.881	⊙0.004	0.001	0.087	⊗0.931	-0.006	-0.622	⊗0.535	0.000	0.028	⊗0.977
0	0.064	4.014	⊙0.000	-0.019	-1.815	⊗0.071	-0.027	-2.946	⊙0.004	-0.014	-1.022	⊗0.308
1	-0.004	-0.279	⊗0.781	0.000	0.036	⊗0.971	-0.001	-0.112	⊗0.911	-0.010	-0.751	⊗0.454
2	-0.011	-0.657	⊗0.512	0.005	0.476	⊗0.635	-0.009	-0.992	⊗0.323	-0.004	-0.291	⊗0.771
3	-0.031	-1.946	⊗0.053	-0.008	-0.714	⊗0.476	0.002	0.183	⊗0.855	-0.008	-0.612	⊗0.542
4	-0.056	-3.483	⊙0.001	0.000	0.040	⊗0.968	-0.004	-0.463	⊗0.644	-0.010	-0.740	⊗0.460
5	-0.021	-1.305	⊗0.193	-0.002	-0.179	⊗0.858	-0.002	-0.189	⊗0.851	-0.014	-1.003	⊗0.317
6	0.007	0.453	⊗0.651	-0.002	-0.193	⊗0.847	0.003	0.300	⊗0.765	-0.016	-1.146	⊗0.253
7	0.015	0.952	⊗0.343	-0.014	-1.276	⊗0.204	-0.011	-1.157	⊗0.249	-0.013	-0.951	⊗0.343
8	0.015	0.957	⊗0.340	0.009	0.824	⊗0.411	0.001	0.067	⊗0.947	-0.001	-0.041	⊗0.967
9	0.002	0.118	⊗0.906	0.002	0.142	⊗0.887	-0.005	-0.577	⊗0.565	-0.003	-0.189	⊗0.850
10	0.003	0.215	⊗0.830	-0.018	-1.643	⊗0.102	-0.004	-0.431	⊗0.667	0.004	0.263	⊗0.793

Event days	M&M			AIRTEL			GAIL			JINDAL			HINDALCO		
	AR	t-test	p-value	AR	t-test	p-value	AR	t-test	p-value	AR	t-test	p-value	AR	t-test	p-value
-10	-0.003	-0.045	0.964	0.014	0.760	0.448	0.000	-0.010	0.992	-0.063	-2.796	0.006	-0.032	-1.770	0.078
-9	0.001	0.019	0.985	-0.008	-0.409	0.683	0.002	0.083	0.934	-0.002	-0.098	0.922	0.018	0.992	0.322
-8	-0.009	-0.123	0.902	-0.003	-0.152	0.879	0.000	-0.016	0.987	-0.014	-0.641	0.523	0.009	0.509	0.611
-7	-0.024	-0.341	0.733	0.002	0.124	0.902	0.005	0.251	0.802	-0.002	-0.107	0.915	0.014	0.746	0.457
-6	-0.014	-0.199	0.843	0.003	0.178	0.859	0.009	0.455	0.649	-0.036	-1.612	0.109	0.005	0.263	0.793
-5	0.004	0.059	0.953	-0.006	-0.330	0.742	0.016	0.825	0.411	0.009	0.399	0.691	-0.005	-0.298	0.766
-4	-0.005	-0.071	0.943	0.012	0.636	0.525	0.025	1.289	0.199	0.024	1.076	0.283	0.014	0.763	0.446
-3	0.019	0.260	0.795	0.005	0.284	0.777	0.028	1.454	0.148	0.000	0.014	0.989	-0.008	-0.461	0.646
-2	0.018	0.255	0.799	0.011	0.590	0.556	-0.018	-0.942	0.348	-0.022	-1.000	0.319	-0.003	-0.180	0.857
-1	-0.007	-0.091	0.928	0.100	5.375	0.000	-0.006	-0.315	0.753	-0.012	-0.540	0.590	0.007	0.357	0.722
0	0.018	0.246	0.806	-0.055	-2.965	0.003	0.008	0.390	0.697	0.006	0.284	0.777	-0.005	-0.292	0.771
1	0.028	0.396	0.693	0.021	1.141	0.255	0.007	0.350	0.727	0.006	0.283	0.778	-0.017	-0.929	0.354
2	0.036	0.502	0.617	-0.033	-1.795	0.074	-0.003	-0.149	0.882	-0.002	-0.070	0.944	0.010	0.538	0.591
3	-0.027	-0.375	0.708	0.002	0.108	0.914	-0.017	-0.875	0.383	-0.076	-3.391	0.001	-0.005	-0.277	0.782
4	0.010	0.135	0.893	-0.012	-0.625	0.533	-0.001	-0.073	0.942	0.009	0.385	0.701	0.027	1.455	0.147
5	-0.017	-0.238	0.812	0.006	0.300	0.765	-0.004	-0.209	0.835	-0.070	-3.113	0.002	-0.007	-0.392	0.695
6	0.017	0.239	0.811	0.019	1.030	0.304	-0.036	-1.856	0.065	0.017	0.770	0.442	0.004	0.237	0.813
7	0.008	0.113	0.910	0.013	0.711	0.478	-0.015	-0.750	0.454	0.006	0.264	0.792	0.036	1.954	0.052
8	-0.011	-0.150	0.881	0.010	0.554	0.580	-0.021	-1.094	0.275	-0.010	-0.428	0.669	-0.027	-1.459	0.146
9	0.006	0.077	0.938	-0.001	-0.044	0.965	-0.027	-1.411	0.160	-0.036	-1.613	0.108	0.014	0.750	0.454
10	0.002	0.025	0.980	-0.020	-1.048	0.296	0.034	1.771	0.078	0.001	0.024	0.981	-0.009	-0.484	0.629

In above tables it is analyzed that the AR (Abnormal Return) in the event window are not statistically significant. The P-value in the event window for most, of the days is greater than 0.05, which indicates the support for the Null hypothesis i.e. the AARs in the event window is statistically and significantly not different from zero. But few companies in market are inefficient of day after of dividend announcement, they are Tata Consultancy services, State Bank of India, Wipro private limited, ICICI bank and Reliance Industries. Inefficiency means market participants can easily earn abnormal returns. Therefore, after analyzing 29 companies on stock exchange it can be said that other than five companies market is efficient. The information was quickly reflected by the stock prices and there was no scope of earning abnormal returns.

**Daily AARs before and after the announcement Date in the Event Window:**

The AARs of the selected companies were calculated and listed during event window. As H<sub>0a</sub> in the study was that AARs of the sample firms are not different from zero in the event window. Parametric T-test has been used to test the significance of AARs during the Event window. The p values in the following table 2 represent the values of test statistic for AARs and can be seen that around the event date there is no significant abnormal return except -10, -8, +3, +5 and +10 day of the event.

**Table-2: Representing AAR and t values.**

Event Window	AAR	T-Stat	P-Value
-10	-0.008	-2.0873835	0.03821
-9	0.003	0.9060745	0.36606
-8	-0.008	-2.1975004	0.02921
-7	0.000	0.0462145	0.96319
-6	-0.005	-1.2340873	0.21872
-5	-0.004	-1.1463984	0.25310
-4	-0.003	-0.8156795	0.41572
-3	0.004	1.2284756	0.22081
-2	-0.002	-0.5023416	0.61602
-1	0.004	1.20951	0.22799
0	0.001	0.180596	0.85688
1	-0.001	-0.2326176	0.81631
2	-0.001	-0.3082357	0.75825
3	-0.008	-2.1528382	0.03261
4	-0.005	-1.2481706	0.21353

5	-0.009	-2.5765538	0.01075
6	0.000	-0.0505008	0.95978
7	0.001	0.2671518	0.78965
8	0.000	-0.021097	0.98319
9	-0.003	-0.8851665	0.37720
10	-0.026	-6.9935631	0.00000

**INFERENCE**

In table 2 it is analyzed that the AAR (Average Abnormal Return) in the event window are not statistically significant. The *P-value* in the event window for most, (say 16 observations out of 21 observations) of the days is greater than 0.05, which indicates the support for the Null hypothesis i.e. the AARs in the event window is statistically and significantly not different from zero. Therefore, it can be said that the information was quickly reflected by the stock prices and these was no scope of earning abnormal returns.

**Daily CAARs before and after the announcement Date in the Event Window**

The CAARs of the selected companies were calculated and listed during event window. As  $H_{0b}$  in the study was that CAARs of the sample firms are not different from zero in the event window. Parametric T-test has been used to test the significance of CAARs during the Event window. The p values in the following table 3 represent the values of test statistic for CAARs and can be seen that around the event date these is no significant abnormal return except -10, -6, -5, -4, +4, +5, +6, +7, +8, +9 and +10 day of the event.

**Table-3: Representing CAAR and t values.**

Event Window	CAAR	T-Stat	P-Value
-10	-0.0076	-2.0874	0.0382
-9	-0.0043	-0.8353	0.4046
-8	-0.0124	-1.9508	0.0526
-7	-0.0122	-1.6663	0.0973
-6	-0.0167	-2.0423	0.0425
-5	-0.0209	-2.3324	0.0207
-4	-0.0239	-2.4676	0.0145
-3	-0.0194	-1.8739	0.0625
-2	-0.0212	-1.9342	0.0546
-1	-0.0168	-1.4525	0.1480
0	-0.0161	-1.3304	0.1850
1	-0.0170	-1.3409	0.1816
2	-0.0181	-1.3738	0.1711
3	-0.0260	-1.8992	0.0591
4	-0.0305	-2.1571	0.0323
5	-0.0400	-2.7327	0.0069
6	-0.0401	-2.6634	0.0084
7	-0.0392	-2.5254	0.0124
8	-0.0392	-2.4629	0.0147
9	-0.0425	-2.5984	0.0101
10	-0.0681	-4.0619	0.0001

**INFERENCE**

In table 3 it is analyzed that the CAAR (Cumulative Average Abnormal Return) in the event window are statistically significant. The *P-value* in the event window for most, (say 11 observations out of 21 observations) of the days is lesser than 0.05, which indicates the rejection for the Null hypothesis i.e. the CAARs in the event window is statistically and significantly different from zero. Therefore, it can be said that the information was not quickly reflected by the stock prices and there were scope of earning abnormal returns, if the investor holds the stock.

**CONCLUSION**

The objective was to find out the stock market (BSE Sensex) efficiency to the dividend announcements for the selected companies. From the above study it is concluded that market is efficient is case of the event of dividend announcement and participants of market can-not earn abnormal returns from the stock market due to market capacity of fast absorbing information.

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**MANAGERIAL LEADERSHIP STYLE & EMPLOYEE JOB SATISFACTION; AN EMPIRICAL STUDY OF TRAVEL ORGANIZATIONS**

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**ABSTRACT**

*Present paper intends to probe the relationship between employee job satisfaction and managerial leadership style with focus area being travel organizations from National Capital Region (NCR). This study delves deep into the relationship between employee's job satisfaction and leadership styles adopted by their reporting managers. A questionnaire consisting 51 items based on five-point Likert scale was used to get responses with regard to managerial leadership style as well as job satisfaction levels. Based on researcher's prior job experience in travel organizations of study area, convenient sampling was used to select five travel organizations from NCR. Further a mix of judgment and snowball sampling was used to collect primary data for the study. Total of 350 questionnaires were executed through personal interview, mail and e-mail interactions. Out of which 289 were responded back. Data so collected was analyzed using SPSS (Statistical Package for the Social Sciences) Version 18. Empirical evidence has been indicative of mainly two types of leadership styles i.e. democratic and laissez-faire, which were found to have direct positive relation with employee job satisfaction.*

*Keywords: Leadership Styles, Job Satisfaction, Travel Organizations*

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**INTRODUCTION**

Leadership styles have always been a subject that has attracted researchers for being an important construct of overall leadership abilities and competencies (Woods, 1990). Leadership style has been found to be having significant bearing on subordinate performance since they tend to work more effectively and productively when their managers employ a specific leadership style (Mullins, 1998). Managers develop their personal leadership style through their education, training, and experience (Hersey et al., 2001). It has been noted that when managers adopt their subordinates' preferred leadership style giving them due respect, care and fair treatment they deserve, then it leads to job satisfaction, which is further linked to overall functioning of the organisation (Spector, 1997). Satisfied employees shows lesser absenteeism, lesser job stress, longer work periods and more likely to make positive contributions towards performance of their organizations (Griffin, 2002). Further, it has been confirmed through various empirical studies that satisfied employees stay more vigilant, attentive and aware of changes taking place in their business environment that further helps the organization in aptly accommodating the changes and further optimizing its performance. On account of its sheer nature and unpredictable demands that tourism industry poses, managerial leadership style becomes significant in deriving subordinate performance. Continuously changing business environment along with evolving consumer preferences create difficulties in adopting the participative leadership style (Woods, 1990). However, managers in tourism organizations can also provide various motivations for their subordinates to enhance their job satisfaction (Mullins, 1998). Leadership styles have been emerged as vital tools to create satisfied employees which in turn help fine tuning organizational functioning (Kavanaugh, 2001). Therefore tourism organizations should give due importance to effective leadership for not just improving the client services but also for improvements in employee job satisfaction (Woods, 2002). Successful organisations need to have employees with high levels of job satisfaction (Purcell, 2003). Present study is an attempt to investigate the nature and influence of three leadership styles (namely, democratic, autocratic, and laissez-faire) have on job satisfaction of employees working in tourism organizations.

**LITERATURE REVIEW****A. Leadership Styles**

Since early 1900s there has been various studies on leadership, which have contributed to a large pool of theoretical knowledge related to various leadership concepts. Leadership style has been defined as an interaction process between managerial & subordinate groups in structured & unstructured situations including members' expectations and perceptions (Bass, 1990). It has also been defined as behavioral patterns exhibited by leaders while working with and through others (Hersey, 1993). There are three factors that are primary determinants of leadership style viz. leaders' characteristics, subordinates' characteristics and organization's environment (Kavanaugh, 2001). Leadership styles can be classified according to leaders' power and behavior as autocratic, democratic, or laissez-faire, where styles are distinguished by the influence of leader on subordinates (Rollinson, 2005). Different leadership styles may be adopted by leaders according to their perception of their subordinates' style preferences (Woods, 1990) and therefore the

influence of leadership style could differ according to the type of power used by a leader over subordinates (Mullins, 1998).

In tourism sector, the management is characterized by 'being there' style, which further results in stress, intervention, and control of operations and interactions at all levels of organization (Woods, 1990). Further, Mullins (1998) has also confirmed that managerial leadership style of 'being there' or 'hands-on' is considered as a prevalent leadership style in tourism industry, this style could be more effective than other styles to achieve employees' job satisfaction, since managers work all the time with their employees and can therefore give more concern to employees' problems at work. However, this has not been a preferred leadership style in Indian tourism industry (Chaudhary, 2001). On the other hand, participative leadership style seems to be more difficult to adopt for sheer nature of business. This does not make autocratic style as preferred option, While, Okumus and Hemmington (1998) indicated that the prevalent leadership style in tourism industry was autocratic leadership style. On the contrary, Gupta (2004) found that the most common leadership style among managers in Indian travel organizations based on power sharing was democratic style.

### ***B. Job satisfactio***

Job satisfaction as stated by Locke (1976) is "a pleasurable or positive emotional state resulting from one's job or job experiences". Later, Armstrong (2003) also stated job satisfaction as the attitudes and emotions of people for their job. He further stated that if people have favorable and positive attitudes towards their job, it will imply job satisfaction, but in case they have unfavorable and negative attitudes towards their job, this will result in job dissatisfaction. Spector (1999) in his study bifurcate the constructs of job satisfaction in two main groups. The first group encompasses of job environment itself along with some other factors related to job, whilst the second includes personal factors related to the individual performing the job. This primarily deals with previous experiences and personality traits. Content theories of motivation are also equally relevant for job satisfaction. For example, Herzberg's theory of motivation can be comfortably considered as a theory of job satisfaction in relation to motivation at work (Mullins, 1998). Content theories relate unsatisfied needs to a tensional state and eventually dissatisfaction. Herzberg's (1959) theory argued that hygiene factors that includes work conditions, interpersonal relationships, supervision quality, job security, organizational policies & management style along with salary. Levels of these factors falling below acceptable limits resulted in job dissatisfaction; nevertheless acceptable level did not necessarily lead to job satisfaction, thus preventing dissatisfaction and poor performance. Motivating factors like reward & recognition, advancement & achievement, autonomy & responsibility leads to job satisfaction. In case of Tourism industry, hygiene factors were found to be more commonplace as against other industries as some employees have lower level of expectations to satisfy higher needs and thus making hygiene factors appears as a greater place (Mullins, 1998). Furthermore Chitiris (1988) in his study on Greek hotel employees have found that they were more concerned with hygiene factors as against motivating factors. Moreover, Hancer and George (2003) related higher level of job satisfaction with intrinsic factors and vice versa.

### ***C. Leadership Style and Job Satisfaction***

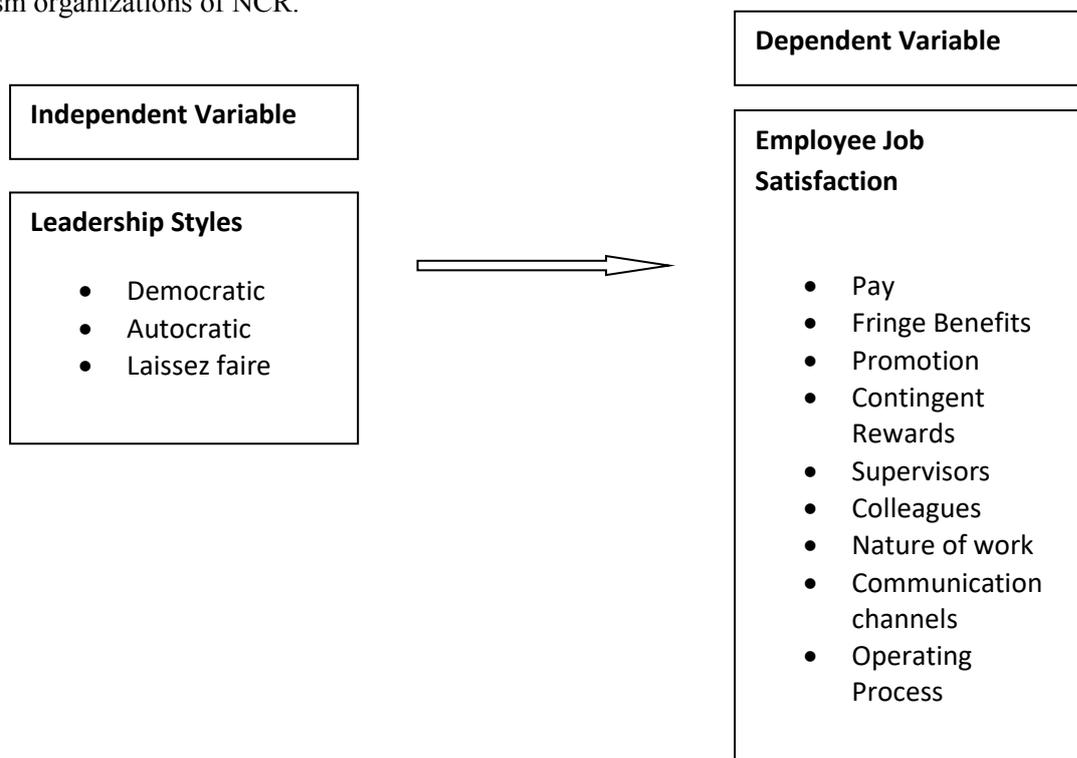
Leadership style and job satisfaction have been extensively researched however Tourism industry with its relatively new advent does not have much studies particularly delving into this intricate relationship between Leadership styles and Job Satisfaction. Significance of leadership in relation with job satisfaction was first researched in 1920s using various surveys, a positive co relation between employees' favorable attitudes toward supervision and job satisfaction was found (Bass, 1990). Many other studies were also conducted during 1950s and 1960s to look into the possibilities of enhancing employee satisfaction favorable leadership behavior of managers and supervisors (Northouse, 2004), these studies further confirmed the significant bearing of leadership styles on employees' job satisfaction levels (Bass, 1990). Employee job satisfaction is greatly influenced by the internal environment of organization such as leadership styles (Seashore, 1975), and therefore employees tend to be more satisfied with leaders who are considerate and supportive rather than with those who are either indifferent or critical towards their subordinates (Yukl, 1971). Consequently, leadership style has emerged as an important determinant of employee job satisfaction. Yousef (2000) has also confirmed that leadership behavior has a positive co relation with employee job satisfaction levels and therefore managers need to exhibit appropriate leadership styles in order to improve employees' job satisfaction levels. Managers and their leadership style prove to be an important determinant of job satisfaction levels among subordinates (Chen, 2005). Further Yousef (2000) has also confirmed the validity of theories developed and tested in Western organizations for non-western countries and organizations as well. Hence it will be safe to assume that leadership style has very significant impact on job satisfaction levels, and this relationship is irrespective of geographical and cultural differences between west and east. Hence leadership quality has emerged as an important determinant of success or failure of any business organization. (Lok, 2004).

Leaders thus can alter employees’ level of job satisfaction significantly through improving their effectiveness and enhancing their motivation levels. Different leadership styles are found to have different type of effect on job satisfaction levels, for example autocratic leadership style tends to have less satisfied employees, while democratic leadership style leads to higher levels of job satisfaction among subordinates. Moreover, the level of job satisfaction under laissez-faire leadership tends to be less than that of under democratic leadership style (Bass, 1990). Savery (1994) also confirmed a positive relation between employees’ job satisfaction levels and leadership styles in federal organizations of Western Australia. Lok and Crawford (2004) found that consideration leadership style bears a positive co relation with job satisfaction, however initiating structure leadership style was negatively co related to job satisfaction. In contrast, Rad and Yarmohammadian (2006) found no co relation between leadership styles and job satisfaction in their study conducted at Isfahan University Hospitals in Iran. Furthermore, Erkutlu and Chafra (2006) in their study on boutique hotels found that laissez-faire leadership style led to negative results in terms of organizational performance as well as low satisfaction, high stress, and low commitment levels. Tsai and Su (2011) in their study on airlines also confirmed that transactional leadership has a greater positive co relation with job satisfaction as against transformational leadership. Also Shurbagi and Zahari (2012) confirmed a positive relationship between transformational leadership and job satisfaction in national oil company. Voon et al. (2011) has also conducted studies confirming that two types of leadership styles, namely, transactional and transformational have a direct bearing on employees’ job satisfaction levels. Results further showed that transformational leadership style has a stronger relationship with employees’ job satisfaction levels in case of public sector organisations. Bhatti et al. (2012) in his studies on public and private teachers affirmed that Leadership styles has a positive impact on job satisfaction as well that public teachers were found to be more satisfied as against their private sector counterparts. Thus with this background it can be safely assumed that leadership styles have a bearing on employee’s job satisfaction levels in different sectors.

**THEORETICAL FRAMEWORK**

Theoretically present study is an attempt to gauge the impact of managers’ leadership styles on job satisfaction levels of employees working in travel organizations. Manager’s leadership style has been conceived as an independent variable whereas job satisfaction has been taken as a dependent variable as shown in below. Based on these theoretical underpinnings a hypothesis has been developed to co relate the effects of leadership style on employee’s job satisfaction levels.

**H1:** Is there any relationship between leadership style and job satisfaction levels of employees working in tourism organizations of NCR.



As shown above three different leadership styles i.e. democratic, autocratic, and laissez-faire leadership has been considered in this study. Further employee job satisfaction levels has been measured in terms of pay, promotion, supervision, fringe benefits, contingent rewards, operating procedure, co-workers, nature of the work and communication.

**METHODOLOGY**

Questionnaire method was used to conduct this study. A questionnaire consisting 59 items based on five-point likert scale (ranging from strongly disagree to strongly agree) was used to measure both leadership style as well as job satisfaction from employees’ perspective. The job satisfaction section consisted of 39 statements based on nine dimensions that were adapted from Job Satisfaction Survey (JSS) as developed by Spector (1985), to measure job satisfaction throughout nine job characteristics that are pay, promotion, supervision, fringe benefits, contingent rewards, operating conditions, co-workers, nature of work, and communication. The leadership style section consisted of 22 statements about three leadership styles considered for this study i.e. autocratic, democratic and laissez-faire style, adapted from a leadership style survey, developed by Clark (2002). A total of 1400 employees working in six travel organizations in National Capital Region were the population of this study, and 350 employees were selected using simple random sampling technique. Accordingly 320 questionnaires were distributed mainly using e mails out of which 209 were completed and analysis of data was done using SPSS.

**FINDINGS AND DATA ANALYSIS**

An internal consistency test was performed on the whole data collected. Results indicated a Cronbach’s Alpha coefficient value ( $\alpha$ ) = 0.85 for the leadership style, and  $\alpha$  = .97 for job satisfaction, thus confirming a high consistency and reliability among statements in each variable.

A total number of employees participated in this study was 209. Most participants (n=195) were males. The majority of participants (n=163) aged 35 years or less. However, most of participants (n=89) were degree holders. The highest number of participants (n=87) was with 2-4 years of service.

<b>Variable</b>	<b>Frequency</b>	<b>Percent (%)</b>
<b>Gender</b>		
Male	195	93.30
Female	14	7.7
<b>Age</b>		
25 Years or less	92	43.4
26-35 Years	71	32.9
36-45 Years	41	20.1
46-55 years	4	1.3
56 Years and more	-	-
<b>Education</b>		
Diploma	78	38.6
Graduate Degree	89	44.2
Post Graduate & Above	32	11.8
<b>Length of Service</b>		
1 Year or less	45	21.1
2-4 Years	87	40.8
5-7 Years	66	30.3
8 Years and more	11	7.8

Mean of scores for all dimensions of job satisfaction varied between 3.1366 to 3.5474, thus indicating a moderate level of satisfaction. It was also found that the highest levels of satisfaction among employees were for co-workers, fringe benefits, and operating conditions, whereas lowest levels of satisfaction were found for communication and work nature. Moreover, the findings reported the highest mean (3.8457) for democratic leadership style thus confirming the same being prevalent leadership behaviors exhibited by managers, followed by laissez-faire style with mean (3.5531), and autocratic style was found to have lowest mean (3.2743) as shown in Table below, thus emerged as least prevalent style. Mean scores for all three leadership styles were found to be more than (3) and varied with minute differences, implying that managers were oblivion towards their leadership style, or they are novice managers trying to find correct leadership behavior.

**DESCRIPTIVE FOR MAJOR CONSTRUCTS**

Dimension	Mean	Std Deviation
Pay	3.2156	.98657
Supervision	3.3789	.94563
Promotions	3.2477	.91072
Working conditions	3.4654	.97456
Nature of job	3.1645	.95110
Colleagues	3.6453	.98738
Fringe Benefits	3.2437	.81420
Contingent Rewards	3.3065	.97003
Communication channels	3.6163	.92651
Job Satisfaction	3.3456	.88336
Democratic leadership style	3.6745	.98756
Autocratic Leadership Style	3.7335	.87564
Laissez Faire Leadership Style	3.3265	.81435

(All items using a five point likert scale with 1 denoting strongly agree and 5 strongly disagree)

Carl Pearson’s correlation coefficient (P=.321) indicated a moderately significant correlation between democratic leadership style and job satisfaction, as the significant level was less than 0.01. Also a moderately significant correlation between laissez-faire style and job satisfaction was also indicated with Carl Pearson’s correlation coefficient (P=.206), since the significant level was less than (0.05) and more than (0.01), no correlation between autocratic style and job satisfaction was found, as shown in below table. Generally, democratic and laissez-faire leadership styles and job satisfaction are found to have moderate levels of correlation.

**Correlation between Leadership Style and Job Satisfaction**

		Auth. Style	Democratic Style	Laissez-faire Style
Job Satisfaction	Pearson	.102	.324**	.207*
	Correlation Sig (2-tailed)	.287	.001	.042
	N	209	209	209

\*\* Correlation is significant at the 0.01 level (2-tailed).

\* Correlation is significant at the 0.05 level (2-tailed).

Further, a linear regression model was also applied in order to indicate the impact of each leadership style i.e. democratic, laissez-faire and autocratic separately as independent variable on job satisfaction being a dependent variable as shown in Table below.

**Linear Regression for the Impact of Leadership Style on Job Satisfaction**

Variable	R	R <sup>2</sup>	F	B	T	Sig
Democratic Style	.324a	.106	13.738	.546	3.540	.001
Laissez Faire Style	.216b	.052	4.716	.265	2.194	.030

a) Predictors: (Constant), democratic style

b) Predictors: (Constant), laissez-faire style

**Dependent Variable:** Job satisfaction

Findings of regression model as shown in above table indicated a weak positive relation between democratic style and job satisfaction at a lesser significance level of .001. The results also indicated that democratic style explains only 10.4% of the variance in job satisfaction thus meaning that democratic style cannot be termed as sole determinant of job satisfaction. As shown in table above, an increase of one unit in democratic style increase in job satisfaction will be only .466 units. A slightly positive relation between laissez-faire style and job satisfaction is also noticed, as the significance level was less than 0.05. As per the findings laissez-faire

style explains 4.2% of the variance in job satisfaction, with this low percentage it can be concluded that laissez-faire style is also not a good determinant of job satisfaction. In other words an increase of one unit in laissez-faire style will increase the job satisfaction by .286 units only. Based on these results hypothesis (H1) is accepted. Since R for democratic style (0.320) was more than R for laissez-faire (.206) it can be safely assumed that democratic style has more impact on employee job satisfaction as against laissez-faire style. Based on these findings it can be concluded by the researcher that there exist a positive relationship between leadership style and employee job satisfaction.

### **MANAGERIAL IMPLICATIONS**

Findings of this study revealed a moderate level of job satisfaction. More satisfaction was reported with regard to co-workers, fringe benefits, operating conditions, supervision, pay, and contingent rewards. However lower levels of satisfaction were indicated for promotion schemes, communication within organization, and the nature of work. Findings of present study have a mixed relation with regard to studies conducted in western countries, while current findings are in agreement with some of the studies however there exist some contrary studies as well. Managerial implications of present study include a renewed thrust by managers on factors found to have a significant impact of employee job satisfaction. Present study recommends the managers to encourage hygiene factors for being vital to enhance job satisfaction among employees. Managers in the tourism industry could enhance employees satisfaction levels by providing various motivators as well there should be a focus on job facets that relates with job satisfaction (Hencer, 2003). Current study advocates concentrating on job aspects that support the highest levels of job satisfaction such as co-workers, fringe benefits, operating conditions, supervision, pay, and contingent rewards. Also other factors such as promotion, communication, and nature of work should also be taken into account. Moreover it is recommended for managers have to acquaint themselves with various leadership behaviors and their applicability, thus helping them adopt the style most appropriate in their organizational roles. Also job satisfaction of employees needs to be perceived as one of the key result areas for future managers.

### **LIMITATIONS AND FUTURE RESEARCH**

Research is a process with never ending scope and this study is no exception. Lack of studies in Indian context can be termed as one of the major limitations. Most of the works referred in this study were from western countries; however there exist a considerable difference in western and Indian contexts. There is also a lack of awareness among Indian organizations and any participation in research works is with suspicion, thus authenticity of information provide remain doubtful and hence affect the results. Owing to physical access and logistical constraints sample size chosen was small and less representative of population.

Further research could probe into the impacts of organizational and national culture on employees' job satisfaction levels and leadership styles. Further studies could also focus on analyzing the differences in leadership styles over time. Additionally, further research can be undertaken to conduct cross-cultural research, thus exploring the impact of national culture on the relationship between employees' job satisfaction levels and leadership behaviors in order to replicate this study at different cultures and generalize the findings.

### **CONCLUSION**

This study found a lack of relevant literature for tourism industry especially in Indian context. Almost all relevant studies were taken from Western countries. It was noticed that no studies have looked at the impact of managerial leadership style on employees' job satisfaction in Indian travel organizations. Review of literature indicated a difference in leadership styles based on managers' demographic profile. Moreover job satisfaction among employees was found to be varying based on their demographic profiles. A positive relation between managerial leadership styles and employee job satisfaction was confirmed. Results of analyzed data confirmed a moderate level of job satisfaction with democratic style of leadership was found to be the prevalent style among managers.

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**AN ANALYTICAL STUDY OF FINANCIAL PERFORMANCE OF PUBLIC SECTOR UNDERTAKING WITH SPECIAL REFERENCE TO ONGC LTD.**

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**ABSTRACT**

*Since independence, among all sectors that have contributed to the growth of Indian economy, PSU sector has been the most consistent and prominent regarding its contribution towards the country. PSU sector has not only contributed in terms of GDP's growth and development, but also assured self-reliance to the people of the country. Public Sector Undertaking (PSUs) plays an important role in the development of Indian economy as these sectors have been perceived to accelerate the growth of core sectors of the economy like, agriculture development, regional development, increasing employment opportunities, mobilisation of resources, diversification to cover-up wide spectrum of industries etc. It is also very apparent from the available literature that with the growth and expansion of Public Sector Undertakings; the developing economy of India will also develop to a large extent. With this perspective this write up is an attempt by the researchers to study and find out the effect of financial performance on the overall performance of a public sector undertaking that is ONGC Ltd. The researchers have used various parameters to measure and quantify the financial performance of the concern. The primary objective behind this research study is to provide fruitful suggestions not only the PSU under study but also for other PSUs comprising of similar nature of business. Since these PSUs are contributing huge to the Indian economy, this study will be an attempt to provide necessary suggestions and remedies to increase their financial performance, with a view that they can provide invaluable contribution towards the economy.*

*Keywords: Indian Economy; PSUs; ONGC; Financial Performance*

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**INTRODUCTION**

Public sector undertakings are those which are owned by government, In these companies majority of the share (more than 50%) is owned by the government it may be state or central if it is owned by central government then we call it central PSU and if owned by state government then it is called state PSU, some of the well-known PSU are ONGC, IOCL, BHEL, SBI etc. these undertakings are having the government ownership and management, financed from government fund, and are also for public welfare, having public utility service and public accountability. In Indian Public sector undertakings plays very important role in economic development both in pre independence and post-independence period, before independence it was confined to certain sectors but after independence it got diversified and plays very important role in the Indian economy after independence there is progressive expansion of the public sector undertakings the government has made the strong efforts to develop the PSU. approximately 27% of the national income comes from the public sector and 21% of the total working population is engaged in this sector, these enterprises shapes the path of Indian economy, there are several public sector enterprises which plays very vital role in the development of Indian economy as these companies helps the Indian economy to generate the income, formation of capital, generation of employment, mobilisation of resources and also helped the Indian economy in development of infrastructure and strong industrial base etc. The development of the public sector enterprises also prevents concentration of the economic power in the hands of an individual or a group of individuals. In India economic inequalities are increasing as the poor are becoming poorer and rich are becoming richer the public sector can reduce the inequalities with the help of various policies like utilise the profit in public welfare activities. Most of the PSU hold the following areas mainly coal, oil and natural gas, Power generation, telecommunication etc.

**REVIEW OF LITERATURE**

**Sheela (2011)**, researcher has revealed the financial performance of Wheels India ltd. through various financial tools namely ratio analysis, comparative balance sheet and DuPont analysis and also statistical tools such as trend analysis and correlation. The main contribution of this study is the use of five power analysis methodology to retrieve ratios commonly used in financial analysis to tackle the problem of sample size and distribution uncertainty.

**Singh A. & Tandon P. (2012)**, in their paper they examined the financial performance of SBI and ICICI banks public sector and private sector respectively they compare the financial performance of SBI and ICICI banks on the basis of ratios such as credit deposit, net profit margin etc. The period of study taken is from the year

2007-08 to 2011-12. The study found that SBI is performing well and financially sound than ICICI Bank has better managing efficiency than SBI.

**Roy M. & Sabah N. (2014)**, in their paper analyzed the performance of Oil and Natural Gas Corporation by using ratio analysis tool particularly those which are related to financial statement and find out the strength and weakness of the company and their position in the market for the balance of 2010-2013 are used.

**RESEARCH METHODOLOGY**

This study is micro analytical in nature and is entirely based on secondary data. The data has been retrieved from various secondary sources such as Annual Reports, research journals, articles, magazines, and newspapers.

**DATA ANALYSIS**

**Profitability analysis:** Profitability means the ability of an enterprise to use its resources to generate revenue in excess of its expenses. In other words we can say it is the ability of an enterprise to generate profit from its operation it is one of the most important block for analysing the financial performance and its effect on the country’s economy. Profitability can be determined through profitability analysis as it allows management and outsiders to forecast the profitability of a project or an enterprise.

**Analysis of Profitability of ONGC based on following ratios**

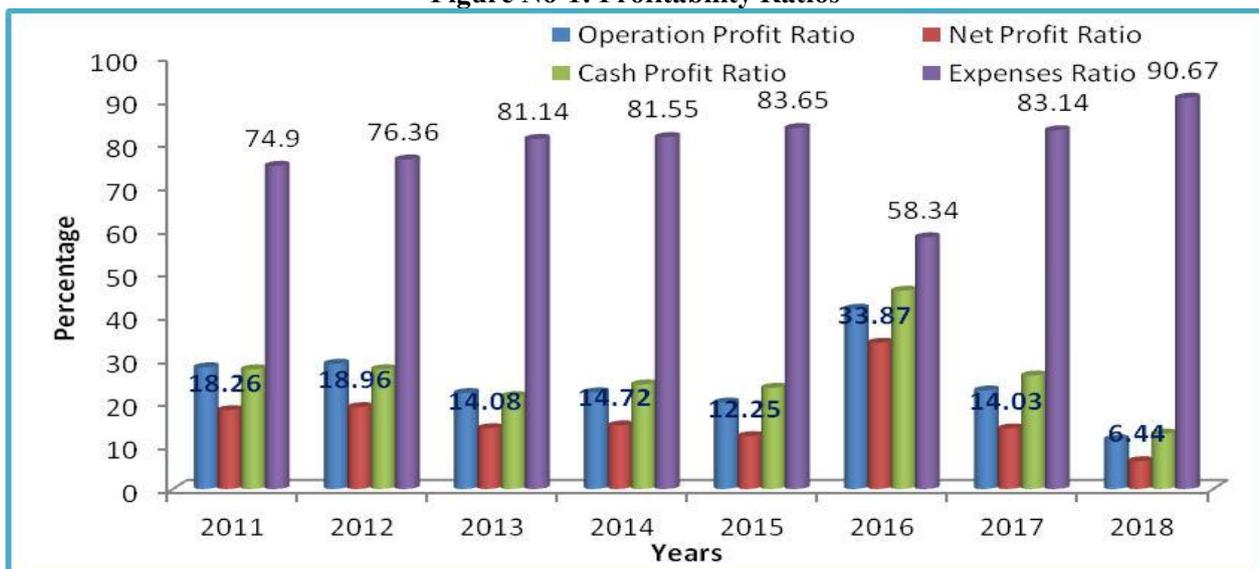
To find out the profitability analysis of ONGC various ratios related to the profitability with a view to find out the position or the trend of ONGC Ltd from 2013 to 2018.

**Table No-1: Calculation of Profitability Ratios**

Year	Operating Profit Ratio (%)	Net Profit (%)	Cash Profit (%)	Expenses Ratio (%)
2011	28.19	18.26	27.72	74.90
2012	29.02	18.96	27.74	76.36
2013	22.23	14.08	21.52	81.14
2014	22.39	14.72	24.22	81.55
2015	20.05	12.25	23.45	83.65
2016	41.77	33.87	45.95	58.34
2017	22.84	14.03	26.30	83.14
2018	11.45	06.44	12.81	90.67
<b>Average</b>	<b>24.74</b>	<b>16.57</b>	<b>26.21</b>	<b>78.71</b>

**Source: Annual Reports of ONGC Ltd. (2011-2018)**

**Figure No-1: Profitability Ratios**



**INTERPRETATION**

While analyzing the profitability of the concern under study, it is revealed that the profitability is showing a declining trend during the study period, excluding the year 2016. While talking about operating profit ratio, it is ascertained that this ratio is declining during the study period. The highest (41.77%) and lowest (11.45%) percentage of this ratio is found during the years 2016 and 2018, respectively. As the profitability of any

concern depends largely on the cost incurred by the company, it is found that the expenses incurred by the company during the year 2018 are 90.67%, which is highest during the study period. Hence if we correlate the net profit ratio with the expense ratio, it is clearly depicted that the highest expenses ratio, the lowest net profit ratio is found and vice versa.

### SUGGESTIONS

- Profitability provides clues to the company's pricing policies, cost structure and production efficiency. It is recommended from the results that ONGC Ltd is maintaining a satisfactory level of Profitability. Increasing profitability is a key objective for every business unit and the same must be maintained effectively and efficiently. Here are various cost-effective tactics that could, if implemented properly, help to save money and increase profits.
- ✓ **Control expenses.** The advantage of controlling expenses is that, for every rupee you save by eliminating an expense, you gain an extra rupee in profits. One way to be conscious of cash flow is to use the zero-based budgeting system. It requires beginning each year's annual budget process by setting each category to zero.
- ✓ **Increase margins.** A margin is the difference between the sales price of a good or service and the price the business owner paid to attain that product or service.
- ✓ **Reduce marketing costs.** Invest in methods proven to increase profits, and stop using methods that show minimal results.
- ✓ **Manage your inventory.** Stay vigilant of products which are selling and which are not by efficiently monitoring inventory. Based on that knowledge, determine if the company is purchasing too few of the top-selling items or too many of the worst-selling items. Adjust accordingly. This will end up meeting customers' needs and saving money.

### CONCLUSION

It is worth to conclude that the results shown during analysis are representing a negative approach adopted by the company. In order to make a mark regarding profitability, it will be highly recommended by the researchers that the company should endeavour a greater control over its expenses which in turn will result in increasing profitability.

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**EMPIRICAL EVIDENCES ON COMPLEXITIES AND CHALLENGES ON WORK-LIFE INTERFACE: A GLIMPSE ON DUAL CAREER COUPLES WORKING IN CORPORATE SECTOR**


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**ABSTRACT**

*Objective: The purpose of this empirical paper is to explore various work-life challenges faced by dual career couples working in the corporate sector.*

*Design/methodology/approach: This study is explorative and descriptive in nature. It involves exploring various challenges faced by working couples in their work and non-work domain.*

*Findings: Results reveal that there are various challenges faced by DCC on professional fronts such as emotional exhaustion, job stress, time conflict, work-demand factor, 24\*7 work-life confrontation. Therefore it is recommended that a number of company initiatives such as flexible work arrangements, on-site child care centres, and reduced work load arrangements can be made.*

*Originality/value: The literature on the work-family interface is complex and results also vary from one demographic profile to another. However, the result clearly draws the significance of balance between work and non-work domain. Therefore it is insufficient for DCC to work without supportive organisational work-life balance policies, which are in a great need.*

*Keywords: DCC- dual career couples, work-life challenges, work-non-work domain.*

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The literature on the work-family interface is very complex on several accounts, and not surprisingly, this interface has become crucial area in organizational and human resource research. Family and work life are the two most important domains for most of the working couples (Andrews and Withey, 1976). When conflict arises between these two domains, it has adverse consequences for both employees and organisation. These juggling dual roles may prevent dual career couples to contribute optimally to the organisation because of time pressure and increased levels of stress and emotional burnout. Inability of the dcc to deal with the demands of the two domains, results in the form of higher attrition rate, reduced organisation commitment and lower productivity. Greenhaus et al (1989) proposed that the number of hours worked per week by spouses was positively associated with conflict between work and family. Non-working spouses are usually the pillars of the family, and they take custody of most of the family responsibilities. This frees the employed partner to fully concentrate on his/her work. In contrast, families with both partners working full-time (or part-time), employees face dual demands from work and family activities, resulting in increased levels of FIW conflict.

**DEFINITION OF TERMS**

**Dual Career Couple (DCC):** DCC was originally discussed and the phrase coined by Rapport and Rapport (1969, 1971) they describe such a family as “one where both heads of household pursue a professional career by choice and at the same time maintain a family together”. Family was arbitrarily defined as “involving at least a marital pair and one child living as a domestic unit” (Cherpes, 1985). Consistent with the existence literature DCC will also be called as dual income couples regardless of organisation type (Brett et al, 1992; Hall and Hall, 1979; Hammer et al, 1997).

**Work Family Conflict (WFC):** WFC occurs when demand of family and work are incompatible so the participation in either the family or work roles is more difficult because of participation in the other (Peralin 1989; Voyodanoff, 1988). Greenhaus and Beutell (1985) have offered the following definition of this conflict “Work-Family Conflict is a form of inter-role conflict in which the role pressures from the work and family domains are mutually incompatible” (p.22).

Carter (1997) states “ To function effectively in the workplace must be able to negotiate a balance between the demands of work and family. So, family friendly policies make good business sense. Proactive Corporate Programs- including child and elder care, flexible benefits, job sharing, part-time work, telecommuting, parental leave, personal time and employer assistance programs- all have reflected the change perspective of corporate interest and involvement” (p.22). Work and family emerges as a major reason for negative outcomes for work, family and individual in order to integrate their work and family in a more satisfying way. This integration results into bidirectional interference of WFC i.e. work to home and home to work. This bidirectional influence is mainly because of two careers i.e. of husband and wife in one family which results into “more complex career development processes”. However this complexity has increased particularly more in family with young

children. Couples with young children are bounded with the responsibilities of raising the children, which leads to a greater need to coordinate work and family roles. Therefore, when DCC tries to raise their own career, multiple issues arise such as relocations, promotions and transfers, sharing of household tasks and many more. Therefore this makes DCC to go for unique work-life arrangements style (O'Neil et al, 1987; Pixley Moen, 2003). DCC also experiences higher level of work exhaustion leading to tension between work and family domains. Furthermore, this exhaustion leads to emotional drainage and depletion of physical energy level. We combat that this blurring boundary between work and family should become more tangible in the eyes of today's HR professional and corporate houses.

Consistent with the above researches, Greenhaus and Beutell (1985) gave three forms of WFC (a) time-based conflict (b) strain-based conflict, and (c) behaviour based conflict. Time based conflict occurs when time devoted to one role makes it difficult to participate in another role. "Strain-based conflict" suggests that strain experienced in one role intrudes into and interferes with participation in another role. In 1991, Gutek et al also mentioned two directions of WFC with each of these three forms. When two directions WIF and FIW are combined with three forms i.e. time based conflict, strain-based conflict and behaviour based conflict results into six dimensions (1) time-based WIF (2) time-based FIW (3) strain based WIF (4) strain based FIW (5) behaviour based WIF (6) behaviour based FIW. Multiple threads of evidence consistently indicate that work-family spillover appears to be in every DCC daily routine.

### **WORK LIFE CHALLENGES FACED BY DUAL CAREER COUPLE**

When conflict between work and non work domains occurs there are adverse consequences for both the individuals and organisations. Thus, DCC are playing more dynamic and pivotal role in meeting work life challenges faced by them in various corporate sectors. However these work life challenges requires the understanding of all the variables that trigger WFC. Conflicts originating in the work domain may impinge on the family such as long working hours prevents the performance of domestic tasks. Similarly, those stemming from the family domain may have negative organisational consequences, such as care of sick child or elders in the family prevent attendance at work. Also, Frone, M.R., Yardley, J.K. and Markel, K.S. (1997b) expanded the term working hours. According to him 'working more hours means employee is at work for more hours and may have more work duties and has less time for other activities'. As hours increase, so should one's level of perceived work demand (Greenhaus et al.,1987). Therefore with increasing work demands, WFC also increases which may affect employee work activities. In addition to this, role stressors also directly affect an employee's level of demand (Voydanoff, 1988).

According to Heraty Noreen, Morley J. Michael, Cleveland N. Jeanette, (2008) two separate forms of work-family conflict i.e. work interfering with family (WIF) and family interfering with work (FIW) have 'negative impact' on organisation, family and personal outcomes. At "individual level" the problematic issues arising out are tensions between work and family, reduced well-being, stress, and life satisfaction and dissatisfaction and disturbed psychological activities. At "organisational level", critical issues emerging are negative organisational commitment, negative job performance and job attitude, absenteeism and turnover. At "societal level", concerns relate to dumping of social and community activities, family disruption and reduced social citizenship. In addition, these challenges are even more 'catalyzed' when work demand and family demand coincides due to non-supportive society and organisation. In addition, receiving conflicting direction from working environment may affect employee work activities and be perceived as work demand. This leads to role overload which makes impossible for DCC to perform roles comfortably (Greenhaus and Beutell, 1985). Work overload tends to increasing experience of negative emotions, fatigue, tension, lower level of energy and reduced mental health (Cooper and Hensman, 1985). These symptoms further leads to increasing work-life challenges faced by DCC. Furthermore, these detrimental work outcomes such as lower performance, burnout, increased turnover and adverse health effects (Carson, R. L., Baumgartner, J. J., Mathews, R. A., & Tsouloupas, C. N., 2010; Cropanzano, R., Rupp, D. E., & Byrne, Z. S., 2003; Demerouti and Bakker, 2006; Maslach, C., Schaufeli, W. B., & Leiter, M. P., 2001; Moore 2000a; Shirom 2011; Swider and Zimmerman, 2010; Taris 2006) are the 'dramatic trends' in corporate sector.

Role ambiguity an important construct, given by House, R.J., Schuler, R.S. and Levanoni, E. (1983), defines "it occurs when individuals are unsure of what is expected of them for a given role". Thus as role conflict and role ambiguity increases, an employee suffers from lower levels of job satisfaction, high related tensions and lower self confidence. The role mixing of work and home domains results into workload and emotional exhaustion. Working couples often feel emotionally drained off after full day working. Work exhaustion is also a growing concern for many professional level employees, who are working long hours and excessively breaking their work energy threshold level. Hence they are unable to meet the required job demands ( Moore 2000a, b;

Hobfoll, 1989; Lee and Ashforth, 1996; Wright and Cropanzo, 1998). In addition, many researchers have previously linked work exhaustion to an array of negative outcomes such as increased absenteeism, turnover, physical illness, reduced satisfaction, and lower job performance (Carson et al 2010; Cropanzo et al 2003; Demerouti and Bakker, 2006; Maslach, C., Schaufeli, W. B., & Leiter, M. P., 2001; Moore 2000a; Parker and Kulik, 1995; Shirom 2011).

### OBJECTIVE

To determine the various challenges faced by the dual career couples in corporate sector.

### RESEARCH DESIGN

This study was exploratory and descriptive in nature. In the present study, various work-life challenges were explored with the help of *exploratory factor analysis*. The study was carried out in corporate sectors in North Zone of India. The corporate sectors includes manufacturing, services, consulting, IT, institutes and training, ITES (BPO, KPO), hospital and healthcare, telecommunication, and mobile. These sectors were also included in similar studies by Bailyn, Lotte; Drago, RobertKochan, Thomas (2001) including system engineers and software engineers in IT firm, Health senior account executive in healthcare and education sector's university professor's, product-development engineers in manufacturing and IT sector. Similarly, Golden, T. D., (2011), also mentioned the use of technology at corporate offices including higher percentages of IT sector firms. Parasuraman, S., Purohit, Y.S. and Godshalk, V.M. (1996) also included the respondents from healthcare units. From the list of 1047 companies, 40 companies were chosen covering these sectors. Approximately 10 Questionnaires was distributed in these 40 companies, Out of these 40 companies, 30 companies responded back. Hence 315, filled questionnaires were collected back. Out of 315 questionnaires, 271 filled questionnaires were found to be suitable for this study after editing and criterion meeting. Likert scale ranging from 'strongly agree =1 to strongly disagree =5' was used for quantifying our study.

### POPULATION

For questionnaire, online and field survey was done. Companies with more than 100 employees and participants from executive level to higher managerial level were taken. Minimum criterion of education was graduation and age of minimum 21 years. This study includes the age limit of 21 years, since as per law the marriage below 21 years is considered

as illegal. Carnicer, M.P.D.L., Sanchez, A. M., Perez, M. P., & Jimenez, M. J., (2004) and Duxbury & Higgins (2003) also reported similar types of demographic and job characteristics including employees in managerial and professional positions, employees with a graduation, master's or doctoral degree. Finally, 315 filled questionnaires were collected, out of this after editing and criterion meeting, only 271 respondents were found to be suitable. The response rate was approximately 67 %.

### SAMPLING TECHNIQUES

Scientific approach was adopted for sampling technique and completed in three steps.

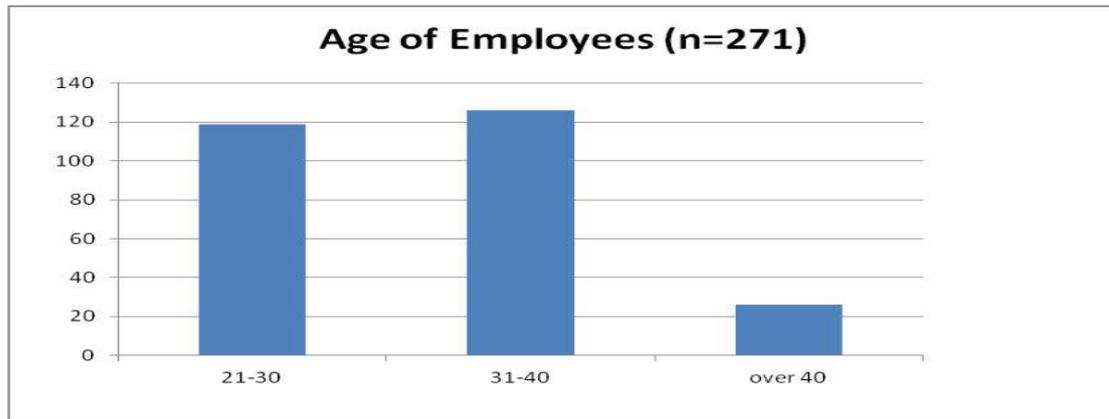
- i) **Convenience Sampling:** was done for the selection of corporates and respondents in 'Delhi/Ncr region'. Further sub-dividing to Delhi, Noida, Gurgaon, Faridabad.
- ii) **Quota Sampling:** Through 'quota sampling' 50% quota was fixed for IT sector and rest, 50% from non-IT sectors.
- iii) **Snowball sampling:** subsequent respondents were selected based on the 'referrals and through social networks'.

### ANALYSIS

#### Descriptive Statistics

The sample consisted of 271 dual career couples sample. The mean age of respondents was in the range of 31-40 years. The age of the employees range in three categories: 21-30, 31-40, over 40.

Age of Employees



Exploring various work-life challenges faced by DCC by Exploratory Factor Analysis

A list of 25 statements was taken, to explore the various factors responsible for work-life challenges. Exploratory factor analysis was performed to explore the various factors (an underlying dimension that explains the correlations among a set of variables) responsible for these challenges. The chronbach's alpha was calculated to know the reliability of data. The chronbach's alpha came out to be 0.79 for the selected variables of work-life challenges.

ASSUMPTIONS OF EXPLORATORY FACTOR ANALYSIS

**Kaiser-Meyer-Olkin Measures of sampling adequacy:** In present study, the KMO Measures of sampling adequacy comes to be 0.88. The value of KMO 0.88 is more than the p-value of 0.5. Thus exploratory factor analysis may be considered to be as an appropriate technique for analyzing the correlation matrix. Therefore, the first attempt of KMO was fulfilled for the present study. **Bartlett's test of sphericity** In the current study, the null hypothesis that the population correlation matrix is an identity matrix, is rejected by Bartlett's test of sphericity. The p-value comes to be 0.000 which is significant for the p-value 0.05 level of significance. A value less than 0.05 indicates that the data in hand do not produce an identity matrix. This tells that there is a significant relationship among the variables, taken for factor analysis.

**The Principal component Analysis:** In the present study, for the extracting the components PCA was used. The diagonal of correlation matrix consists of unities and full variance can be observed into the factor matrix. Overall, PCA is used when minimum numbers of factors have to be extracted that will account for maximum variance in the data. **Eigen:** Only factors with eigen values more than 1 are retained. Factors with variance less than one are equivalent to a single variable. **Varimax rotation:** In rotating the factors, each factor will be showing significant loadings with some of the variables only. For the present study, varimax procedure is followed for rotating the factors. This also leads to achieving simplicity and interpretability of the factors. Specific items were retained whose factor loadings comes to be greater than 0.40.

Factor Loadings for Work Life Challenges

Items	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Communalities
I feel emotionally drained when I get home from work.			0.423			.486
I wish I had more time to do things with my family.				0.811		.699
My commitment to job is inhibiting my leisure activities.				0.503		.558
After getting home from work I am unable to switch off and relax.			0.434			.659
I almost bring work home with me.	0.748					.670
I often put extra hours at work.	0.778					.624

Work pressure often interferes with my personal life.	0.647					.560
My spouse demands greater attention from me.					0.706	.537
My boss favors those employees who believe in 24x7 work concept (workaholics).		0.728				.741
Working long hours are expected and regarded as signs of high job commitment.		0.714				.635
An employee who uses flexi-time is less likely to advance his career than non-users.		0.729				.677
The expectations of my subordinates conflicts with those of my family demands.					0.446	.699
<b>Eigen values</b>	7.8	1.7	1.5	1.3	1.2	
<b>% of Variance</b>	31.4	38.5	44.8	50.4	55.3	

**CONCLUSIONS**

With the changing composition of today’s workforce, DCC consists of equal percentage of men and women. Participation of women has made it tough for them to balance work and life. Therefore, DCC faces various work-life challenges in various corporate houses, leading to increasing complexities on personal and professional front. All these imbalances have increased the turnover intentions of employees, increased absenteeism and reduced organisation commitment. Total five factors responsible for work-life challenges were discovered.

**work-demand factor**(Fu, Carmen K, Shaffer Margaret A., 2001; Golden, T. D., 2011; Geurts, S. A. E., & Demerouti, E. 2003; Meijman, T. F., & Mulder, G. 1998; Pleck, J., Staines, G. and Lang, L. 1980; Greenhaus and Beutell, 1985 and Small, S. A., & Riley, D. 1990); **24\*7 work-life confrontations**(Piotrkowski, C. 1979; Burke. J. Ronald, 2004; Burke. J. Ronald, 2004; Carlson, D.S. and Perrewe, P.L. 1999; Frone, M.R., Yardley, J.K. and Markel, K.S. 1997b; Gutek, B.A., Searle, S. and Klepa, L. 1991 and Parasuraman, S., Purohit, Y.S. and Godshalk, V.M. 1996); **emotional exhaustion**(Kossek & Ozeki 1998, 1999; Maslach and Jackson 1981; Carlson, D. S., Kacmar, K. M., & Williams, L. J. 2000; Kossek, E. E., & Ozeki, C. 1998; Allen, T. D. 2001) **job stress** (Lu, Y. Y. 2008; Judge, T.A., Boudreau, J.W. and Bretz Jr. R.D. 1994); as **time-conflict** it was found to be the social challenge faced by dual career couple; all the above mentioned factors were found to be responsible for work-life challenges.

In the work and organisational spheres, the existence of DCC is increasing in every type of organisation. This results into increased challenges and complexities in the work-family interface, this further creates imbalances on both personal and professional front. Undoubtedly, these problems are faced not at individual level but also at societal level. So proper initiatives are required both from organisation and employer side, to ease out these DCC’s work-life complexities and issues.

Thus it is recommended that a number of company initiatives such as flexible work arrangements, on-site child care centres, and reduced work load arrangements can be made. Also, Duxbury, L., & Higgins, C., (2003) reported similar type of sample selection including DCC from managerial and professional positions than those working in non-managerial and non-professional positions as they reported higher levels of work-to-family conflict. Similar type of respondents were also taken by Carnicer, M.P.D.L., Sanchez, A. M. , Perez, M. P., & Jimenez, M. J., (2004) and they found that employees with a master’s or doctoral degree experienced greater work-to-family conflict and family-to-work conflict than employees with high school education. Therefore, it encourages both society and corporate houses to support working couple in handling work and non-work domain. This will lead to increased quality of work-life. It was also discovered that support from society and

family also plays a vital role in balancing work-family domains. Social support from family, friends, co-workers and peer helps in maintaining a harmonious relationship between the work and family domains.

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**ANALYTICAL STUDY OF MICRO INSURANCE IN INDIA: POLICY, PROSPECTS, AND STRATEGY****Dr. Shikha Gupta**

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**ABSTRACT**

*Developing countries lack an effective social protection mechanism to reach the vast majority of the population systematically, which is engaged in the informal economy. As several low-income people cannot access necessary risk-management tools, they are vulnerable to fall into deep poverty in times of hardship. Micro insurance as combined with micro credit is widely recognized as an important tool for down streaming the economic and social security benefits towards the low-income strata. The study examined the present Indian scenario of micro insurance scheme especially in the state of Uttar Pradesh and Rajasthan. Although India is the first such country who has initiated the micro insurance scheme in a big way through enactment of special regulations, its grassroots level condition is in infant stage. To assist the policy makers in drafting future strategy, a conscientious analysis has taken through a scheduled questionnaire over the 400 low-income peoples residing in rural urban settings of sample states. The study emphasized over the questions whether low-income people are getting micro insurance policy, if yes then what type of products they are availing, their future requirements, and problems associated with products offered, followed with policy recommendations. The author found no statistically significant relationship between the micro insurance scheme and the sample states. The author further reported, lack of awareness, and faulty product designs are the major reasons for low penetration of the scheme and through efficient and effective utilization of the available means, the scheme may perhaps promoted to the masses.*

*Keywords: micro insurance, psychological security, social security, economic security, customized products, risk hedging technique.*

Developing countries lack an effective social protection mechanism to reach the vast majority of the population systematically, which is engaged in the informal economy. "The poor face more risks than the well off, but more importantly, they are more vulnerable to the same risk", (Rangrajan, 2008, p. 6). For instances a chronic illness, accidental death, destroy of crop due to unfavorable monsoon conditions, destruction of property due to natural disasters, etc shatter the household economy of poor peoples, that may take years and years to stand again. However, the risk mitigating techniques such as saving money, storage of grain, borrowing from friends, relatives or moneylenders, and at times involves selling of assets, or live stock which are the only source of earning, sometimes push the household in to the chronic debt trap. With the passage of time, these risk-mitigating techniques are no longer adequate. To trim down the vulnerability in face of such risks, insurance prove to be great help. However, the poor's are also deprived of insurance services just as they have been for credit by the formal financial institutions. The insurance providers approach the middle and upper income stratum to make easy profit. Consequence, the poor live off the banking grid, due to lack of awareness, high costs of issuing millions of small policies and typical products not designed for the needs of the poor.

The Rangrajan Committee, 2008 defined the term micro insurance as "the protection of low income households against specific perils in exchange for premium payments proportionate to the likelihood and cost of the risk involved." Thus, the focus of Micro insurance is on the low-income segment ignored by mainstream commercial and social insurance schemes. The aim of the micro insurance is to provide quality insurance services at affordable price to the weaker sections. It is characterize by low premium and low coverage limits. Each policy generates a "micro" financial transaction. However, the risks are not "micro" to the households, which experience them. Low-income people are exposing to numerous perils. They live in continuous uncertainty about whether and when a loss might occur. Poverty and vulnerability reinforce each other in a viciously escalating downward spiral. By linking multiple small units into larger structures, micro insurance pools the risk and creates networks that enable better governance. This gives easy access to reinsurance and helps to generate data, which can help in product design and development.

India is the first country to have special regulations for micro insurance scheme. In India the micro insurance schemes had earlier started by social organizations to provide security to communities they were working with. As the Micro Finance Institutions evolved in the country, they took up micro finance in a big way. The Insurance Regulatory Authority (IRDA) of India supported the momentum and made India, the first such country in the world, who has special regulation for growth of micro insurance scheme. IRDA made it mandatory for all formal insurance companies to extend their activities to rural & social sectors in the country. The Indian Institute of Bankers, (2010). As former IRDA Chairman, Mr. C.S. Rao put it succinctly, "IRDA

made serving the poor compulsory for insurers in India." India has become a hot spot for the development of micro insurance. To fulfill the obligations insurance companies found that Micro Finance Institutions as an ideal partner for this. Hence, insurance companies and Micro Finance Institutions are increasingly negotiation to provide group or standardized individual schemes for the low-income people. In consideration, many micro-schemes have emerged in recent years. The fast development of the micro insurance might be due to three reasons:

1. All companies that operate in India must dedicate a fraction of their business to the low-income market. Few companies regard the rural and social obligations as a business opportunity. Nevertheless, the number of policies with poor customers increases with increasing penetration of the higher-income market.
2. India has a successful history with self-help groups in the area of microfinance. Many microfinance institutions have set up schemes to serve their clients. Other community-based organizations have taken the same path, leading to the development of stand-alone community schemes in which a growing number of people are covered.
3. Mobile coverage today has been an extremely large user base and has literally broken all barriers to connect to the last mile. A citizen from all strata of society, especially weaker sections has affected by this technology. Such a platform helps to provide insurance and other valuable services to the low-income strata at affordable cost.

Government and the regulating authority acknowledge that insurance can be a risk management mechanism for the poor. Therefore, rural and social obligations for the formal insurance companies had introduced, which has led to the widespread use of the partner-agent approach.

In a country where about 78 per cent of the population has no access to insurance, micro insurance is proving to be a life-saving boon. However, as of now, over a million Indians covered by micro insurance. These people are mostly from the poorest section of society, ignored by the insurance sector. Their poverty enhances their risk to disease and other natural catastrophes but they simply could not afford insurance. Until, micro insurance came along.

Although micro insurance is in the early stages of development, efforts have taken to formalize and design the process. There are certain case studies like Yeshasvini Cooperative Farmers Health Care Trust of Karnataka, Karuna Trust of Karnataka, and Iffco Tokio's in India etc., that offers micro insurance policy to the below poverty line sections. Although overall success of the micro insurance program is limited due to faulty planning, poor administration, and lack of expertise in operating such scheme, their potential viewed to be considerable.

The crucial reason for the growth of the scheme has been the entrance of commercial players. The micro insurance sector is at booming stage where in 2005, only fourteen percent of the fifty largest insurance companies in the world offered micro insurance, now sixty six percent of it offering such services, according to the International Labour Organization. "In the previous five years, the number of people who have micro insurance has increased by a factor of 6.5, with a market size of as Rs. 280 billion, according to the International Labor Organization. Today, that is half a billion people". (ROSENBERG, 2012) The Lloyds, and SwissRe Sigma (2010), estimates the potential of micro insurance market is approximately 2.6 billion peoples with the potential of US dollar forty billion.

The Micro insurance is still in its infancy. Problems include be short of awareness, high transaction costs, complex procedures, frauds in claims, impede settlements of claims, inappropriate distribution systems, product design issues especially related to the irregular cash flows of the low-income market and lack of data to interpret the vulnerabilities of the poor.

The challenge is to promote an insurance culture in the low-income group and simultaneously develop an appropriate business model that creates a profitable & sustainable market at the "bottom of the pyramid." This will help to realize the immense potential of the vast, underserved market of low-income households. Besides, it also provides certain social benefits like protecting vulnerable people, expanding financial inclusion, and safeguarding hard-won income gains.

Reviews of research on micro insurance scheme have conducted that just as a large demand for formal savings and loans exist among the poor, there was also believed to exist a large demand for formal insurance. Nourse, 2001; Churchill, 2002. It has realized that, "just providing micro credit without micro insurance component is self-defeating" (Rangrajan). There is, therefore, a need to emphasize linking of micro credit with micro-insurance to keeping this segment away from the poverty trap. Further, it observed that well-designed

customized micro insurance products if offered would provide great economic and psychological security to the poor as it reduces exposure to multiple risks and cushions the impact of a disaster. Thus, seeing, huge success of the microcredit to meet credit needs of low-income strata. Now a similar revolution is beginning with micro insurance. The widespread use of mobile phones in our country and a vast network of microfinance service providers offer a platform for growth of micro insurance services for the people who would otherwise be outside the purview of the financial system. This will help to drive down the cost of reaching insurance services at the bottom. Nourse goes on to argue that Micro Finance Institutions need to provide tailored lending services for the poor instead of rigid loan products. Supporting this latter assertion of Nourse, and Eyiah (2001) developed a model of small construction management contractors and Micro Finance Institutions in developing countries that provides a tailored lending structure for microenterprise contractors. Similarly, Woller (2002a), Cohen (2002), and Dunn (2002) argue that Micro Finance Institutions need to be more client-focused, including offering a mix of financial products tailored to the varied needs and wants of poor consumers. Poor people require insurance more than better-off people do, because they have no other cushion. Weaker sections are generally in a state of poverty. Most are cyclically poor. They work and save, but then due to certain events they fall into poverty like a crop failure, a loss of a job, the death of a breadwinner. Often, the trigger for poverty is illness. As stated by the findings of the Indian Ministry of Health, a quarter of all people hospitalized pushed into poverty by their hospital costs rather than the cost of missed work. Insurance offers a safety net, but it is more than that. If you know you are covered, you will be more likely to invest in the future. "Your whole capacity to take risks changes," Andrew Kuper.

Nearly all the studies examined revealed that low-income people need customized micro insurance services. Nevertheless, no effort made to know what type of risk poor actually face in different geographical area. Moreover, none of the study attempted to know the defects in the existing micro insurance products offered to the low-income peoples who are residing in different states of India. The present study tries to gauge flaws of existing varied insurance products offered. It also revealed whether micro insurance services are actually reaching the masses and the type of risk faced by the low-income peoples particularly in the state of Uttar Pradesh and Rajasthan.

## **METHOD**

### **Participants**

We randomly selected 400 low-income peoples from the state of Uttar Pradesh and Rajasthan, India. From each state 200 subjects were selected, out of it fifty percent of subjects belong to the rural areas and rest from urban settings.

### **Materials and Procedures**

To collect the valuable primary data, we developed the structured questionnaire schedule. The questionnaire comprises of four items. The item do they have taken micro insurance is a dichotomy question with closed ended option yes and no. The second and third item is the type of insurance taken and type of insurance product required by the subjects respectively. The last but not the least fourth item i.e. the three most important risk faced by the subjects according to their preference helped to make future strategy while designing the products for the low-income strata particularly in the given sample states. In addition, the observation tool incorporated in the research study. In the study, the state is the dependent variable and insurance policy is independent variable. The objective of the study is to gauge whether the service of micro insurance is reaching to the poor's and what they understand by the scheme. The study also tried to find out the type of risk they are prone to particularly in the sample state, and what the low-income strata expect from the micro insurance scheme.

H1: Low-income peoples are obtaining micro insurance services.

H2: Low-income peoples are aware about the type of micro insurance products available.

H3: Low-income peoples require variety of micro insurance products.

## **RESULT**

The skewness lies between + 1 to -1, which indicates data is normally distributed. The majority of the sample does not have micro insurance ( $M = 0.18$ ,  $SD = 0.380$ ). Although 82.5% respondents reported that they have not taken any micro insurance product, 17.5% do have micro insurance. The average type of commercial insurance taken by the respondents was 2.28 ( $SD = 2.63$ ). However, where majority 45% respondents has never taken any insurance, 33% respondents reported that they have taken life insurance, 18% taken health insurance, 3% education insurance, and only half a fraction 0.5% taken accidental insurance, and 0.5% has taken building insurance, respectively. The average of type of insurance required in future was 0.20 ( $SD = 0.401$ ). The 80% of the respondents reported that they do not need any kind of insurance, while 20% felt the need to have health

insurance product. The illness reported as the fore most risk respondents faced in near future, while no risk and natural disaster were comes in the second and third preference of the respondents respectively. The other risk faced by the respondents following their preference order comprises of loss or damage of vehicle, poor business performance, loss of job, loss or damage of house, fall in harvest, and loss of cattle respectively.

A chi-square test of independence was performed to examine the relationship between the micro insurance scheme and the sample state. These results indicate that there is no statistically significant relationship between the micro insurance scheme and the sample states (chi-square with one degree of freedom = 1.690,  $p > .001$ ). Hence, we reject the hypothesis that, low-income peoples are obtaining micro insurance products. Similar trends were observed in case of micro insurance requirement in sample states (Chi-square with one degree of freedom = 144.0,  $p < .001$ ), and type of insurance taken and sample states (Chi-square with five degree of freedom = 427.40,  $p < .001$ ). we further rejected the hypothesis that, low-income people are aware of micro insurance products, and low-income people require variety of micro insurance products.

**Table-1: Mean, Standard Deviation and skewness of insurance services, type of insurance services availed and type of insurance services required by low-income peoples**

	Do insurance	Type of insurance taken	Type of insurance required
N	400	400	400
Mean	.18	2.28	.20
S D	.380	2.693	.401
Skewness	1.717	.584	1.506

**Table-2: Frequency, parentage and cumulative parentage of low-income peoples who have micro insurance**

Do Micro Insurance	Frequency	Percentage	Cumulative Percentage
No	330	82.5	82.5
Yes	70	17.5	100.00
Total	400	100.00	

**Table-3: Frequency, parentage and cumulative parentage of type of insurance taken by low-income people**

Type of Insurance Taken	Frequency	Percentage	C.P.
No	180	45.00	45
health	72	18.00	63
Building	2	0.5	63.5
Education	12	3.00	66.5
accident	2	0.5	67
life insurance	132	33.00	100
Total	400	100	

**Table-4: Frequency, parentage and cumulative parentage of type of insurance required by low-income people**

Type of insurance required	Frequency	Percentage	C.P.
No	320	80.00	80.00
health /medical	80	20.0	100.00
Total	400		

**Table-5: Ranking of type of risk faced by low-income people**

Risk Faced by Low-income Peoples	Rank
Illness	1.00
No	2.00
Natural Disaster	3.00
Loss or Damage of Vehicle	4.00
Poor Business Performance	5.00
Loss of Formal/Informal Employment	6.00
Loss or Damage of House	7.00
Fall in Harvest	8.00
Loss or Damage of Cattle	9.00
Other	10.00

Table-6: Chi-Square Testing Results

	Do insurance	Type of insurance taken	Type of insurance required
Chi-Square	1.690E2 <sup>a</sup>	427.400 <sup>b</sup>	144.000 <sup>a</sup>
df	1	5	1
Asymp. Sig.	.000	.000	.000

a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 200.0.

b. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 66.7.

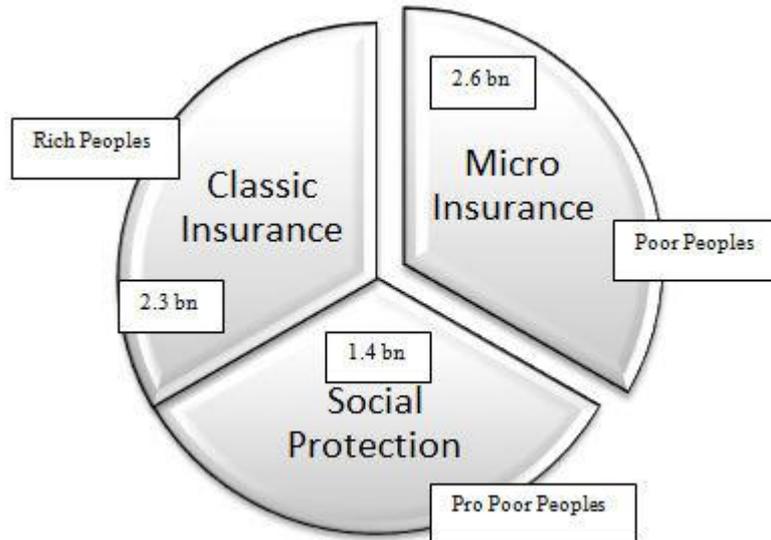


Figure-1: Pie graph showing the potential market of micro insurance. From “UN MDG Report”, 2011

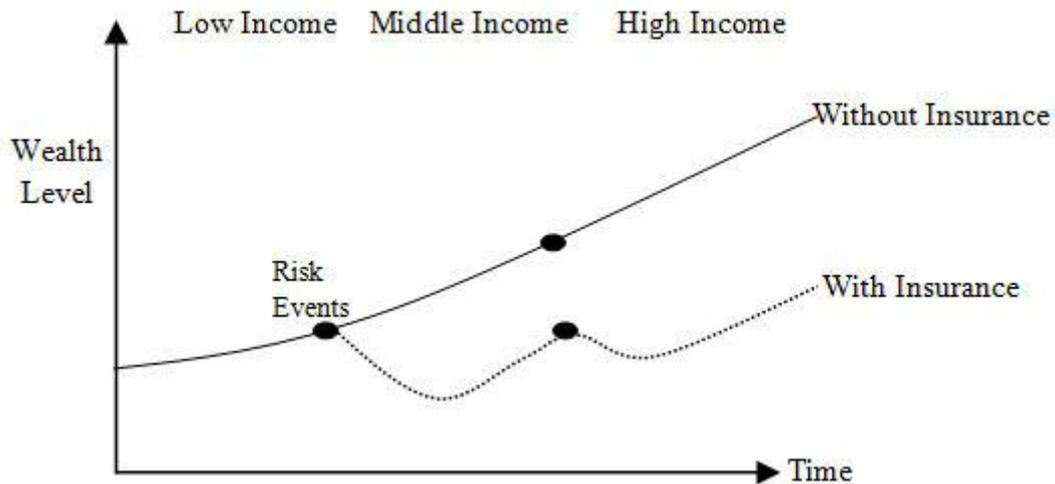


Figure-2: Line graph showing micro insurance as a risk hedging technique for low-income peoples

**DISCUSSION**

The major findings of the study reveals that majority (82.5%) of the respondents do not have micro insurance policy, and (80%) not even feel any need to have such policy. The result gives a clear implication that the sample population had very little knowledge about the micro insurance and its products offered. In the absence of information about such loans, they resort to rely on traditional techniques to mitigate such risks. lack of awareness among the low-income peoples about the micro insurance services. Further, the results revealed that the 17.5% respondents who had taken the micro insurance, actually provided by the micro finance institutions as a compulsory obligation prior to avail micro credit services. As mentioned above in literature, to meet their legal obligations the insurance companies are leveraging the infrastructure of micro finance institutions. The alliance between the two made the micro insurance product compulsory for the micro finance borrowers. Although the arrangement is compulsory for micro credit borrowers but the scheme has help to achieve triple effect. At the one side, such contracts facilitate insurance companies to meet their social obligations. It help the micro finance institutions to make easy income by the commission received from the insurance company, along with surety of credit in case of death of borrower, as the institution firstly settle down the outstanding loan amount from the insurance money. The policy takers also benefited as they get some cushion to save themselves

from the vulnerability associated with the state of their poverty. The policyholder family immediately gets some money to meet burial expenses. The family also gets relief from outstanding loan burden and sometimes gets part of insured money left after settling all prior loan obligations from the micro finance institutions. However, 45% refused to take any type of insurance policy, only 33% taken life insurance policy and just a fraction taken other insurance products namely health, education, accidental, and building insurance. The similar results had also reported by the CPD baseline study, 93% of people had no knowledge about health insurance. Even less was know about vehicle, property and fire/theft insurance. The respondents seemed to be more familiar with life insurance, with 29.5% expressing some knowledge about life insurance. Over half of those who knew about insurance before joining got their knowledge from insurance agents or health institutions.

The majority find illness as the most important risk due to which the borrower work suffers and their financial budget disturbs. They wish to have such micro loans, which protect them and their family against expenses they need to bear in case of major illness. The other important risk according to the borrower are natural disaster, loss or damage of vehicle, poor business performance, loss of employment, loss or damage of house, fall in harvest, and loss or damage of cattle respectively in chronological order of their preference.

Thus, health is an important risk factor for poor households. It had observed that not improper health infrastructure, but insufficient financial means, which hindered the poor people from curing their health problems. The costs of even minor health problems (e.g., appendix surgeries) make it very difficult for low-income groups to obtain the necessary care. To address the problem of low purchasing power, the idea of health insurance covering critical surgeries evolved, and the insurance model developed.

The above-mentioned results evidently indicate low-income people do not find insurance an ailment to save them from the certain life miss-happening events. It considered, as a financial burden than a home economy savvy product. Micro insurance even today associated with life insurance policy by the majority of respondents. Its visible there is immense shortage of awareness among the low-income peoples about the micro insurance services, range of products offered by the insurers, the key benefits, the service providers, and the government regulations with regard to micro insurance.

The micro-insurance sector is unique in the sense that there is an ongoing challenge to explain the concept and benefits to the insured. It was observed that lack of understanding of insurance and its benefits is a major obstacle to the expansion of micro insurance. Those who not know how micro insurance works, and benefit them, are unlikely to trust its worth valuable proposition. It was further observed that for effective implementation, there is an urgent need to promote financial literacy. It help low-income strata to understand how insurance works as a risk management tool.

Creating awareness thru' use of pictorial posters, local folk arts and street theatres might be useful to explain the mechanisms of insurance, and helps gives them at least a chance to consider adding micro insurance to their financial planning strategies.

It was also observe that the information flows fast among the local community when disseminated through SHG members. The reason behind it that the women tends to be more socialize, disadvantaged women feel empowered when they get informal power to have a better understanding than others. Hence sharing new information and knowledge not only makes flow of information better but also satisfy their self-esteem issues. It was confirmed by the findings of Karuna Trsut of Karanataka, India, in its household survey over 358 SHG members and non- members and found that 40% of the respondents had better knowledge about the micro insurance scheme as compare to respondents of control group. Thus, it is strongly recommended to disseminate quality knowledge among the micro finance clients so that its benefit reached to the masses through word of mouth publicity.

There is a need to design customized flexible micro insurance products to meet the needs of diverse regions of India. The micro insurance policy should be design keeping in view the pro poor clients with the options to be availed at individual as well as group policy. Such as personal insurance of life and property, fire & allied perils and burglary cover to the building(house) and its contents, personal accident, group health policy that covers hospitalization expenses, critical illness policy, comprehensive protection against loss or damage to the property insured by Fire and allied perils and burglary & house breaking. For casual labourers and workers in factories, personal accident policy for Self Help Groups clients, providing coverage against death, permanent total disablement, permanent partial disablement and temporary total disablement resulting out of an accident. The majority of women microfinance client found engaged in cattle rearing. The survey revealed that many who starting cattle rearing as a new occupation are ignorant of risk associated with the business i.e. loss of cattle due to disease, accident, lack of proper take care and vaccination etc, result in overburden the household to repay the

micro loan. Hence, there is a strong need to introduce cattle insurance policy compulsory for those who are in the cattle rearing business. The policy must be comprehensive to include all types of risk associated with the business and thus applicable to indigenous, cross breeds and exotic breeds of cattle, covering the death of the animal due to accident, disease, surgical operations, strike, riot and civil commotion, terrorism and earthquake. The prime occupation of the rural India is agriculture and its yield depends on the monsoon, which is uncertain. This uncertainty may sometimes make the poor rich and in contrast rich to poor. The survey also revealed certain stories where the micro credit women handover the loan money to their husbands or children to their existing agriculture occupation. Being investing the loan money in the same existing occupation, a high risk is involved. A bad monsoon may collapse the household economy and drive in to debt trap. Hence, there is a strong need to initiate weather insurance policy that may include the products for Kharif (monsoon) crops like Jowar, paddy, soyabean, cotton etc., and for Rabi crops like Wheat, Mustard, and Potato etc. against financial losses arising due to adverse weather perils- temperature, humidity, and unseasonal, deficient, or excess rainfall.

To penetrate the micro insurance market the micro insurance providers need to maintain quality of the insurance products. The financial sustainability should not be justified at the cost of defective insurance products introduction. The policy should be value for money, service oriented, with quick settlement of claims. It had observed that people hesitate to take insurance due to its lengthy procedures, complex terms and conditions, frauds by agents, who run away after taking few installments, and bad settlement procedures. Therefore, it is strongly recommended that the insurer should settle the policy claims with in a period of two weeks. The localite, well qualified, and specialist staff employed should be hired for responsible sales practices. The micro insurance provider should maintain the transparency, clear communication, sharing information and costs, accountability for results.

The low-income people residing in different geographical conditions are prone to different types of risk. Thus rather than creating standardized insurance products. There should be room for flexibility. So that insurance policy customized according to the specific location.

According to the Rangrajan Committee, Micro-insurance has not penetrated rural markets. Traditional insurers have not made much headway in bringing micro-insurance products to the rural poor. It has not even penetrated among the urban poor.

To make the micro insurance services a viable venture, there is a strong need of collaboration between the public-private partnerships. The service of micro insurance could be made economical and widely acceptable through using existing government network, which are commonly perceived as most secure channel by the weaker segment.

The micro insurance products have to be simple, customized, available, affordable and accessible to the poor. To promote micro insurance service certain models viz., the Partner-Agent Model, Full Service Model, Community Based Model and Provider Model, advised by the Rangrajan committee, 2008 may implemented.

The strategic alliance should takes place with such partners who have expertise in the field. Leveraging the existing banking infrastructure, network of micro finance sector and telecommunication services set-up, is a good option to accelerate the scheme. While a technology platform may take time for setting up, in the long-run, the same will be cost-effective and reliable. The government could do efforts to bring Corporate Social Responsibility (CSR) and micro insurance to leverage synergies and create better social impact.

Local community-based organizations could organize premium collections, as they have better access to the local people. To make it more acceptable to the people, micro-insurance products, apart from covering only risks, should also provide an opportunity for long term savings (endowment).

Seeing the diversity in the demand side of micro insurance market, the products need to be refined and develop time to time. For this appropriate feedback, systems must be created. The service providers could adopt strategies like sharing knowledge, timely follow up by customer satisfaction surveys, grievance mechanism, and judging through social and financial indicators, to enrich and make the products offered defect free.

Being learning the lessons from the bad past experiences of Karuna Trust Karnataka, Yashaswini Trust Karnataka, Sewa Ahmedabad, FINCA, Uganda etc., the right products with right pricing should be launched through pilot study of the risk profiles, claims, settlement ratios etc. in the potential market prior introducing the product.

A holistic inclusive effort is required. Micro insurance cannot work alone, and the micro credit providers have to make it integral part of their services render to weaker segments.

**CONCLUSION**

Micro insurance is still in its infancy. Problems include high transaction costs, inappropriate distribution systems, product design issues especially related to the irregular cash flows of the low-income market and lack of data to interpret the vulnerabilities of the poor. The challenge is to promote an insurance culture in the low-income group and simultaneously develop an appropriate business model that creates a profitable & sustainable market at the "bottom of the pyramid." This will help to realize the immense potential of the vast, underserved market of low-income households.

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**A STUDY ON THE IMPACT OF EMERGING TECHNOLOGIES ON EMPLOYEE ENGAGEMENT**

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**ABSTRACT**

*To increase the profitability in an inundated marketplace Employee Engagement has become the hotspot of HR Paradigm in recent times. Although the importance of Employee Engagement is invasive, however the move is from conversations, connecting with an approach that is reactive and now organizations are turning to Technology to create steps that are predictive and correcting behaviors that are proactive. Human Professionals role has been completely redefined by the use of Technology all over the world. Every aspect of Human Resource Management have transformed by the recent advancement in Technology.*

*Earlier was the time when the major challenge was the process of identifying and measuring the engagement levels. Various methods like surveys, feedback forms and conversations HR Professionals used to measure the engagement levels, critical areas were identified and later strategies were formed in rectifying behaviours. This whole process involved both operational and strategic processes. But now the tiresome task of measuring Employee Engagement has become more simpler and comprehensive by the use of Technology which have led to better decision making.*

*To solve the Employee Engagement challenge Undoubtedly HR and Technology have to move forward. There are challenges that Technology has been able to overcome but it has its own set of limitations. This paper attempts to study the Impact of Emerging Technologies on Employee Engagement.*

*Keywords: Human Resource, Employee Engagement*

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**INTRODUCTION**

Employee engagement—defined in Forbes as “the emotional commitment the employee has to the organization and its goals”—is a critical part of any human resources or internal communications’ strategy. Engagement enables businesses to reach their full potential by helping to create open communication channels, improve productivity, and retain talented staff. On the employee side, engagement helps workers fulfill a wide range of personal and professional needs that can ultimately lead to feelings of life-changing self-actualization and desire to make a social impact. EX—which is based on employees’ positive and negative associations and opinions about a company based on their interactions with it—is more than just the latest HR buzzword. The experience that an employee has with a company is now rated as the fourth most important global trend for business leaders to address, according to the Deloitte Human Capital Trends Report 2017. Yet despite management’s growing admission of the importance of EX, Deloitte found that only 22 percent of companies report excellence in building a differentiated employee experience.

Over the last few years, we have seen a vast amount of attention paid to the impact of technological development on work, sometimes referred to as the changing world of work, particularly by popular media and consultants. Newspaper headlines such as “Robots will take our jobs. We’d better plan now before it’s too late” (Elliott, 2018) have become commonplace. Some commentators also suggest that advances in technology will lead to changes in the workplace as dramatic as the collapse of the traditional employment relationship, the widespread use of artificial reality instead of travel and the replacement of humans with artificial intelligence (AI) and robotics. It is true to say that the most recent advancements in technology, such as AI, are having a dramatic effect on the workplace. Indeed, we are seeing rapid growth in the use of AI and robotics to automate simple and repetitive tasks such as factory work and many back-office duties; and to make complex decisions, such as medical diagnostics, quickly and more accurately via predictive algorithms.

In order to address the question above, an analysis of published evidence relating to the impact of technology on work and people management was undertaken. Evidence reviews typically focus on peer-reviewed, academic papers. However, due to the time it takes to research and publish such outputs and the speed of change in relation to technology, published information on technological advancement and its impact on work and people management tends to be slightly out of date. In order to address this limitation, we broadened our review to include the grey literature, and research undertaken by consultancies and similar bodies.

A comprehensive review of the existing evidence in relation to how technological advancement has/is changing the world of work; what technological trends are likely to directly affect work, the workplace or the workforce;

and the role of HR in relation to these changes was therefore undertaken. To identify published evidence related to the above areas, a list of appropriate keywords and search strings was identified. These were grouped into the following six thematic areas: technology, work, future, HRM, working practices, and other trends

### **METHODS**

Publications were analysed for relevance to our research question (i.e. did they focus on research pertaining to the research question?) and quality in relation to the research design. For example, studies were assessed in relation to whether they: were based in a comprehensive literature review; used rigorous and appropriate research methods; used a large enough and appropriate sample; employed appropriate analyses; drew conclusions based on the evidence. The research team reviewed the titles and abstracts of all the identified literature making an initial selection of 115 documents. Then, each document was critically examined for relevance to the literature review by a careful read of the document itself and evaluation of the contribution of each article to the three areas investigated. The final selection of this review comprised 51 documents.

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### **FINDINGS**

The results identified a number of emerging technologies that are likely to have an impact on the future of work and therefore have implications for the HR function. First, digital platforms were shown to be used commonly within work and are central to online marketplaces such as Amazon or e-Bay and to labour market platforms such as Uber or Freelancer.com (Morgan, 2014; Zysman & Kenney, 2018). Second, AI and machine learning were prominent within the published evidence and mostly applied for data analysis, finding patterns and making predictions (Government Office for Science, 2015). Third, robotics was seen as affecting employment as industrial robots have increasingly taken on routine tasks usually performed by manufacturing workers (Frey & Osborne (2017)). Fourth, augmented and virtual reality (AR and VR) are demonstrated to be playing an increasingly significant role in industries such as healthcare, construction, oil and gas and aerospace (Higgins, 2017). Fifth, wearable devices are increasingly being employed in the workplace to improve employees' awareness about their personal wellness, to track employees' progress and plan measures to sustain their engagement.

These emerging technologies will present a number of challenges for the HR function and for people management more broadly (Bondarouk & Brewster, 2016; Marler & Parry, 2016; Stone *et al.*, 2015). Organizations will need to build a strategy for how they can most benefit from these technologies, for example to build efficiencies and improve the accuracy of decision-making, while also addressing any potentially negative impacts on employees. The role of the HR function in facilitating, or mitigating, the potential effects of emerging technologies on the workforce are presented briefly below.

### **AUTOMATION AND CHANGING SKILLS REQUIREMENTS**

Evidence suggests that there are enormous financial incentives for employers to increasingly automate their (currently human) processes (Markoff, 2011) and that advances in automation could dramatically change the nature of jobs available (PWC, 2017). Realistically, whether a task can be automated depends on the ability of coders to write a set of procedures that will improve the problem specification and account for every possible contingency (Frey & Osborne (2017)). Despite this limitation, automation is increasingly being used in areas that require the storing or access of information (Frey & Osborne (2017)), such as in fraud detection, medical diagnosis (Cohn, 2013; Wolcott, 2018) and law (Markoff, 2011). In addition, the automation of manual tasks is increasingly widespread, including tasks such as driving (Autor *et al.*, 2003; Veres *et al.*, 2011), cargo handling (Bloss, 2011) and mining (Frey & Osborne (2017)).

The role of HR practitioners in the process of automation is not clear from the evidence, but it would seem that they could play a key role in identifying tasks (and thus eventually roles) that could be automated. Perhaps more

important however, is the HR function's role addressing the impact of job losses as a result of automation (Frey & Osborne (2017); PWC, 2017). Not only should HR practitioners be central to supporting employees through a period of uncertainty while such decisions are made, they should also be responsible for considering how employees can be re-skilled or up-skilled in order to replace obsolete skills so that they can be retained in the workforce.

f Automation will accelerate the shift in required personnel skills we have seen over the past 15 years. Our delve into finds that the strongest development in demand will be for technological skills, the smallest category today, which will rise by 55 percent. This surge will affect demand for basic digital skills as well as advanced technological skills such as indoctrination. insist for social and touching skills such as guidance and managing others will rise by 24 percent, to 22 percent of hours worked. Demand for advanced cognitive skills will grow rather overall, but will rise piercingly for some of these skill, specially ingenuity. f Some skill category will be less in demand. indispensable cognitive skills, which include basic data key and handing out, will beg off by 15 percent, lessening to 14 percent of hours worked from 18 percent. Demand for physical and manual skills, which include general equipment operation, will also drop, by 14 percent, but will remain the largest category of workforce skills in 2030 in many countries, accounting for 25 percent of the whole hours work. Skill shifts will play out differently across sector. Healthcare, for example, will see a rising need for physical skills, even as demand for them declines in manufacturing and other sectors. f Companies will need to make significant organizational changes at the same time as addressing these skill shifts to stay aggressive. A survey of more than 3,000 business best in seven countries tourist attractions a new importance on permanent learning for workers and a shift to more cross-functional and team-based work. As tasks change, jobs will need to be redefined and companies say they will need to turn into more agile. sovereign work will likely grow. control and human property will also need to adapt: almost 20 percent of company say their executive team lacks sufficient knowledge to lead adoption of automation and artificial intellect. Almost one in three firms are fretful that lacking the skills they need for automation espousal will hurt their future financial performance. f friendship for high-skill human resources will increase, while displacement will be resolute largely on low-skill staff, long-lasting a trend that has make worse income difference and summary middle-wage jobs. Companies say that high-skill workers are most likely to be hired and retrained, and to see rising wages. Firms in the forefront of mechanization adoption expect to draw the talent they need, but slower adopters fear their options will be more incomplete.

### **INCREASED FLEXIBILITY OF TIME AND PLACE**

There is considerable evidence that organisations are increasingly offering flexible working practices in order to meet employees' needs and to reduce costs associated with having a physical workplace (Berkery *et al.*, 2017; de Menezes & Kelliher, 2011; Stavrou *et al.*, 2015). It is clear that developments in internet, and more recently mobile, technologies have increased the ability of individuals to work remotely and therefore out of usual office hours. However, it is also important to realise that technology is not the sole driver for an increase in flexible working as this has also been influenced by higher numbers of women in the workplace and by flexible pension arrangements (Atkinson, 2017). The management of flexible working policies, and creation of career and performance management systems that ensure that employees are not disadvantaged by working flexibly are undoubtedly the remit of the HR function.

### **JOB DIAGNOSIS**

Not all jobs are favorable to occasion or rest flexibility. yet, most have convinced duty that are amenable to being done at exchange period and chairs other than the workplace. If you look at the jobs you supervise and break them into their constituent parts, it is possible you'll find that some tasks, maybe even up to a third of an whole job, loan themselves to instance and put flexibility.

### **PERSON DIAGNOSIS**

very soon like all jobs are not equally contributing to to elasticity, some staff are better candidates for give than others. If you have a high-performing worker who has demonstrated he can self-manage fit, you most likely can trust him with added flexibility. If you have a additional not established worker, or one whom you experience wants more arrangement and hands-on leadership, I'd chat to them about what they need to demonstrate to you before they earn a more flexible bargain.

### **JOB REDESIGN**

In her groundbreaking research, Harvard economist Claudia Goldin establish that career in which work is substitutable be inclined to have more flexibility and gender fairness. That is, when the conclusion of work is not fully needy on one individual worker, but quite when employees can coordinate actions to the point that many can competently satisfy client needs, workers are freer to work additional flexibly.

### EMPLOYMENT ARRANGEMENTS

The evidence suggested that the trend towards workers undertaking jobs using AI platforms via the gig economy and open talent economy is resulting in employment relations increasingly based on self-employment contracts, subcontracts, and various forms of ‘gig-work’ (Deloitte, 2013). Research suggests that almost 2.8 million workers in the UK are involved in the gig economy to some extent and that this is contributing to a decrease in demand for permanent employees, allowing organisations to reduce costs and increase their numerical flexibility (Berg, 2016). This in turn is said to be leading to precarious work conditions (Fleming, 2017; Moisander *et al.*, 2018), the inability of individuals to be able to influence their working environment (CIPD, 2017) and a lack of institutional connectedness (Fitzgerald *et al.*, 2012). In addition, the gig economy has been linked to growing economic insecurity, low productivity, diminished autonomy and increased levels of personal debt

### EFFECTS ON EMPLOYEE WELL BEING

The above discussion suggests that employers need to consider a possible downside of the increased use of technology in the workplace. Indeed, research has proposed that the move to a workforce that is increasingly connected and contactable, along with the increase of global working, means that work is becoming nearer to 24/7 (Deloitte, 2016) and that the potential for employees to overwork (and thus damage their wellbeing) is increasing (Chron, 2016; Schlacter *et al.*, 2018). Media coverage demonstrates that employees are concerned about this prospect. For example, employees from Google referred to connectivity as an “electronic leash” that damages their wellbeing (Independent, 2017), while other reports have linked increased connectivity with stress and burnout (The Guardian, 2016).

### THE IMPACT OF EMERGING TECHNOLOGIES ON HRM

The above examples suggest a role for the HR function in navigating the changes to work, the workplace and the workforce that are driven by technological advancement. However, it is important to also note that emerging technologies have been shown to also influence the way that organisations undertake their HR activities. The principal HR functions of attracting, selecting, developing, motivating and retaining talented employees in organisations (Stone *et al.*, 2015) remain important, but potentially require different approaches in the future world of work (Holland & Bardoel, 2016). For example, as reported by Davenport *et al.*, (2010) we see companies adopting sophisticated data collection technology and analytics to improve methods of attracting and retaining talent, thus confirming the idea that technology is transforming the way that HR processes are managed, especially in relation to collecting and using data. Using interactive technologies can support line managers and HR professionals to enhance interactions and communication with their employees

### CONCLUSIONS AND IMPLICATIONS

We would go beyond that statement and propose that actually the role of the HR function is also to develop and support employees in order to ensure their growth and wellbeing, as well as the sustainability of the organisation, against the backdrop of this technological advancement. The findings of the evidence review and above discussion suggest that emerging technologies such as AI, robotics, VR and AR, digital technologies, wearables and blockchain have the potential to affect work and employees significantly. The degree and speed of this impact depends to a large extent on developments in the technologies themselves and the willingness of organisations to adopt them. This review also indicates that the HR function has a key role to play in helping employees to navigate the changes to the world of work particularly in relation to skills development, work organisation and mental health. While the key activities involved in HRM – to support managers in employees in going about their daily work (CEB, 2018) – are unlikely to change, the role of the HR function may become even more important as both the potential benefits and risks of emerging technologies for employees develop. Whether the HR function can successfully undertake this role depends upon their own skills development and their own understanding of technologies and their implications. Jesuthasan (2017) suggests that sustaining digital engagement in the future workplace will become a key part of the HR role

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**GST E-WAY BILL: PAVING THE WAY TO THE DIGITAL TAX REFORM**

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**ABSTRACT**

*Purpose: The purpose of this paper is to discuss the concept and role of E-way Bill in bringing digitalized taxation practice in India. It also reports the present status of online billing and logistics in India.*

*Design/methodology/approach: The paper is descriptive in nature. Qualitative analysis of available literature in form of research papers, news articles, rules and notifications issued by the GST council has been done.*

*Findings: Present paper concludes that GST E-Way is undoubtedly an effective way to report both intrastate and interstate transactions, but still there is scope to improve the system and make it more hassle free. There is lack of awareness and knowledge of law among traders and transporters regarding the E-Way Bill. In addition, if implemented as planned, the system of E-Way Bill can revolutionize the tax compliance mechanism.*

*Practical implications: This paper attempts to clarify the concept of E-Way Bill with the context of Goods and Services Tax (GST) in India. As GST is a new concept for India, there is lack of literature and work available for reference.*

*Originality/value: The paper extends the literature on GST and E-Way Bill by incorporating the latest changes brought by the GST Council. An attempt has been made to highlight the need of digitalization in the taxation practice. Few suggestions for improvement in the reporting system have been given for better tax compliance.*

*Keywords: GST, E-Way Bill, Tax Reform, Indirect Tax, Indian Economy.*

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**INTRODUCTION**

Digital tax data gathering and analysis is getting popular in today's era. It not only facilitates greater efficiency in tax collection with improved compliance but generates more revenue as well. This move towards "digitalized tax reform" helps to collect tax in real time and maintain assessee's tax record properly. Some countries have come a long way in digitalizing their tax system while some are still struggling to embrace digitalization. India, with the implementation of GST E-way bill from 1<sup>st</sup> April 2018, has marked its step in the path of "tax digitalization". E way bill system is introduced to track the movement of goods. It is an attempt to pave the way for a nation-wide single bill system. Initially, E-way Bill system was only applicable for inter-state movement of goods but in later phases, states agreed to adopt and implement the system for intra-state transactions as well. Data collected for the study shows that generation of E-way Bills for intra state transactions is more as compare to inter-state transactions within the period of April, 2018 to February, 2019.

Before the implementation of GST, the Centre and State indirect tax administration used to work under different laws, rules, regulations, procedures and formats. Hence, resulting in- different independent IT sites for each law/act. With the implementation of GST, entire indirect tax system came to same level of IT knowledge and maturity with uniform format and interface for taxpayers and other external stakeholders (2017, May 10: economic times).

**1.1 Background of the study**

The GST System Project is one of its kind and complex IT initiative. It is unique as it establishes, for the first time ever to establish a uniform interface for the tax payers and a common and shared IT structure between Centre and the States.

Under the headship of Mr. Nandan Nilekani, a Technology Advisory Group for Unique Projects (TAGUP) was set up in 2010. The group submitted its report in January, 2011.

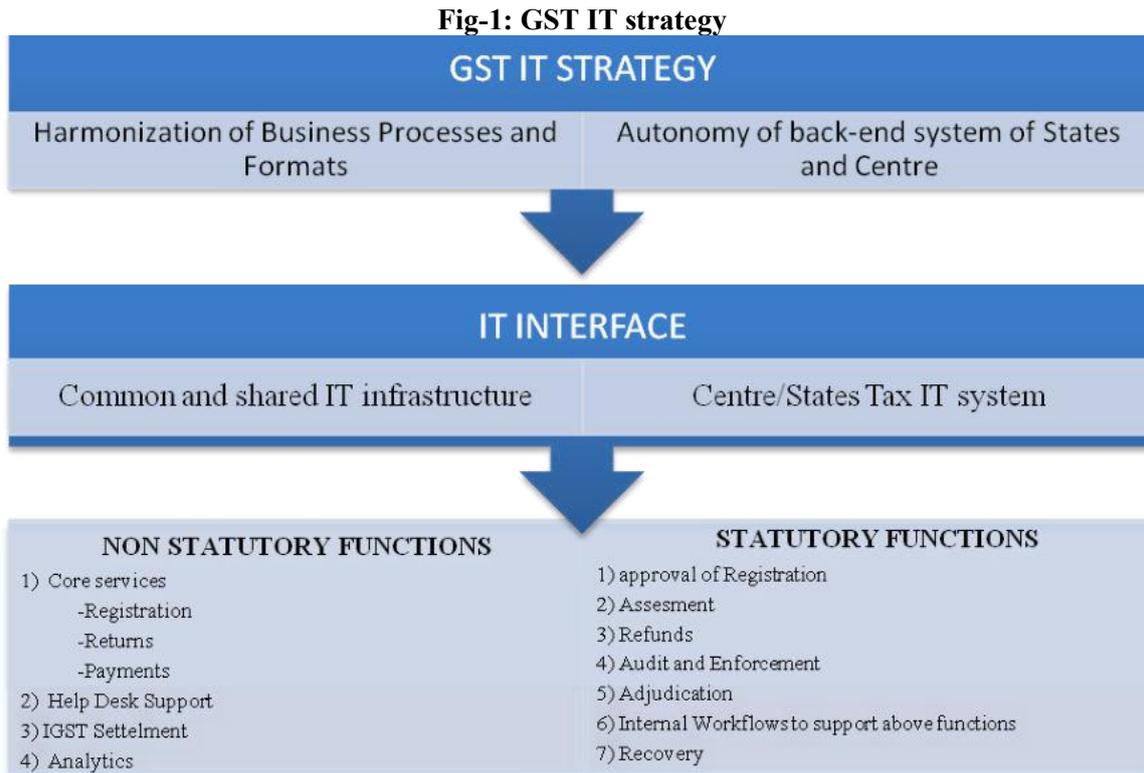
A Goods and Service Tax Network (GSTN) has been constituted as Special Purpose Vehicle (SPV) in August 2012. NSDL is providing service to this GSTN.

Goods and Services Tax Network (GSTN) was formed as a Section 8 (under new companies Act, not for profit companies are governed under section 8), non-Government, private limited company. It was incorporated on March 28, 2013. The Government of India initially had 24.5% equity in GSTN and all States of the Indian Union, including NCT of Delhi and Puducherry, and the Empowered Committee of State Finance Ministers (EC), together held another 24.5%. Balance 51% equity was with non-Government financial institutions. The

Company has been set up primarily to provide IT infrastructure and services to the Central and State Governments, taxpayers and other stakeholders for implementation of the Goods and Services Tax (GST). The Authorized Capital of the company is Rs. 10,00,00,000 (Rupees ten crore only).

**1.2 Role of GSTN**

Aptly remarked as “Technology backbone for GST in India”, GSTN is a linking pin between tax officials and ultimate tax payers. Creation of common and shared IT infrastructure for functions facing taxpayers has been assigned to GSTN and these are filing of registration application, filing of return, creation of challan for tax payment, settlement of IGST payment (like a clearing house), generation of business intelligence and analytics. All statutory functions to be performed by tax officials under GST like approval of registration, assessment, audit, appeal, enforcement etc. will remain with the respective tax departments (www.gstn.org). The diagram below shows the work distribution.



**2. LITERATURE REVIEW**

**Silpa P. et al., (2018)** in his study on the topic “An introduction to E-way bill; a game changer of the Indian economic system” emphasized on the positive outcome of E-way Bills. Researchers are of the view that if the system of E-Way bills is implemented as planned, will reduce the documentation and lead to faster movement of goods unlike VAT way bills. They also highlight the significance of RFID (Radio Frequency Identification Device). This device helps in mapping and verification of E-way bills when attached with the vehicle.

**Sivashankari K., (2018)** anticipates for Indian logistics industry to develop at CAGR of 15%-20% between 2016 to the budgetary year 2020. In his paper he concludes that there will be positive impact on companies dealing in logistics and negative for shipping owners.

**Dr Shakir shaik, Dr S.A. Sameera & Mr S.K.C. Firoz(2015)** in their study on the topic "Does Goods and Service tax (GST) leads to Indian economic Development” concludes that GST will have both positive and negative impact on the Indian economy. They are of the opinion that foreign trade and logistics will show gradual growth with the passage of time after implementation of GST in India.

“GST Impact Analysis: on various sectors” conducted by **Mercurius Advisory Services (2017)** compares the supply and distribution models before and after implementation of GST. It reports efficient supply chain restructuring in the business and predict lower distribution and transportation costs in future. However, it also warns of higher compliance charges to be incurred by e-commerce sector.

“**The E-way Bill System: How, what and what next?**”(2016). Retrieved from <https://www.pwc.in/research-insights/2018/the-e-way-bill-system.html> hails GST E-way Bills for increase in the collection of tax and rise in revenue. The researcher finds it too early to comment on the success or failure of the system.

The website of **National Informatics Centre (NIC)** highlights GST E-Way Bills as a tool to reshape the logistics industry by making the transport of goods and services easier and faster. Transparency in the taxation system will be brought with the digitalization of documentation.

### 3. RESEARCH GAP

Since GST is new for the Indian economy, there is huge inadequacy of literature on the concerned topic. Concept of Electronic way bill is not very much popular among the mass. A very few studies have been done that focuses on this emerging topic. Attempt has been made to fill the gap and clarify the mechanism of e way bill in simple language.

### 4. RESEARCH OBJECTIVES:

1. To discuss the concept and role of E-Way Bill in digitalized taxation practice
2. To investigate the IT strategy and role assigned to GSTN
3. To report the present status of online billing and logistics in India.

### 5. RESEARCH METHOD

The present research paper is descriptive in nature.

Secondary data available in form of research papers, reports, news papers articles, rules, notifications issued by the government is thoroughly examined. Electronic data from various websites have been taken with due credit to fulfill the objectives of this paper.

### 6. DISCUSSION AND FINDINGS

E-way bill is not an entirely new billing system. Under the VAT regime, road permit or way bill serve the same purpose as of E-way Bill. The main highlight of the e-way bills is its electronic generation and tracking system. This electronic billing system provides for Radio Frequency Identification Device (RFID) which tracks the movement of RFID embedded vehicles. As per the new notification issued by the department, there will be automatic calculation of the distance between the supplier and recipient on the basis of their pin code provided.

E-way bill has the status of documentary evidence of a transaction of value more than Rs. 50,000/-. A GST registered person (Consignor, consignee, transporter) cannot engage in movement of goods within the state or outside without electronically generated bill from the [ewaybillgst.gov.in](http://ewaybillgst.gov.in). Alternatively, GST Council has also provided the facility to generate E-Way bills through SMS, android app or site to site integration. Few exceptional cases have also been mentioned in the act in which there is no requirement of generation of electronic bills. In case of composition traders E-way bills shall not be generated as they are barred from inter-state movement of goods.

During the study it has been found that there is lack of knowledge and awareness about GST E-way bill among the traders and transporters. This is mainly because of low literacy rate and lack of self motivation towards tax compliance. Major updates and changes need to be communicated properly to the tax payers so that they could update their working system and knowledge.

#### ➤ CURRENT STATUS

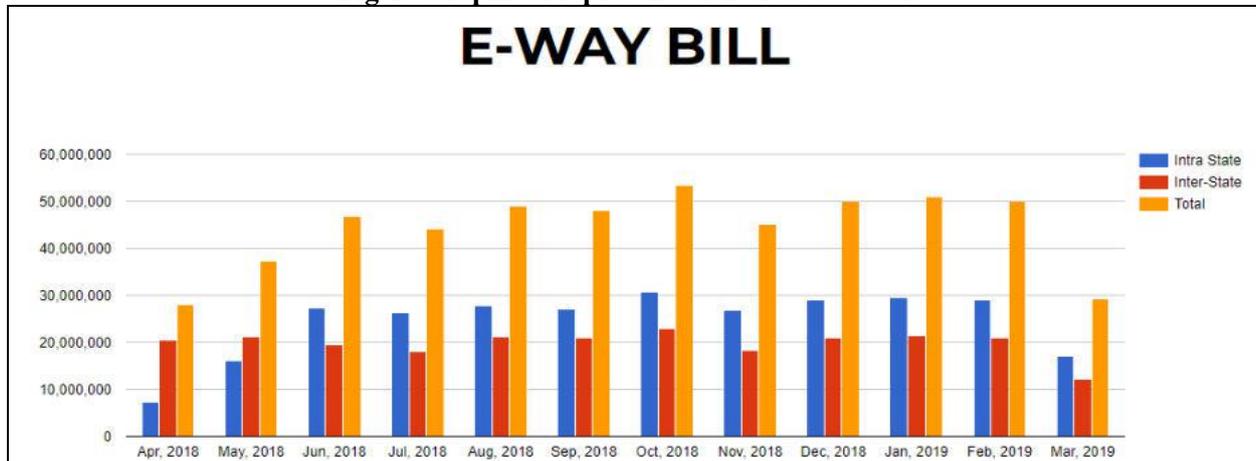
It has been found that there is a significant rise in the generation of E-way bills after the system has been implemented in the country. The figure mentioned below shows that intra state movement of goods have been accounted more with the passage of time while inter-state movement of goods show an irregular pattern of rise and fall. Maximum intra-state and inter -state movement of goods was accounted in the month of October, 2018 with number of bills generated rising to 30,651,459 for intra-state and 22,856,671 for inter-state transactions, respectively. Whereas, least number of transactions were recorded in March, 2019. Below mentioned table shows the total number of E-way bills generated within the stipulated time:

**Table-1: E-Way bills generated:**

Month, Year	Intra-State	Inter-State	Total
April, 2018	74,377,665	20,558,339	27,996,004
May, 2018	16,100,890	21,130,776	37,231,666
June, 2018	27,273,991	19,491,208	46,765,199
July, 2018	26,221,010	17,989,426	44,210,436
August, 2018	27,783,011	21,168,113	48,951,124
September, 2018	27,074,491	21,039,539	48,114,030
October, 2018	30,651,459	22,856,671	53,508,130

November, 2018	26,745,667	18,316,758	45,062,425
December, 2018	28,924,054	21,054,452	49,978,506
January, 2019	29,565,228	21,452,244	51,017,472
February, 2019	29,057,120	20,978,733	50,035,853
March, 2019	17,096,321	12,265,424	29,361,745

Fig-2: Graphical representation of above table:



(Source: <https://www.gstn.org/>)

7. CONCLUSION

7.1 Problems to be resolved

On the event of “One Year journey of GST” organized by Federation of Indian Chambers of Commerce and Industry (FICCI), Finance Secretary Hasmukh Adhia admitted that there were some teething problems while implementation of GST. Earlier, Telangana Principal Secretary (Commercial Taxes and Excise) Somesh Kumar, too, raised certain technological glitches in the GST network that need to be resolved. He said: "Though there are issues and concerns like invoice- matching which was one of the highlights of GST, the GST network has not been able to provide this facility. We also want to do lot of data analytics in Telangana but we do not get the full data as we would like from the GSTN." Somesh Kumar further said that "if there is any criticism of GST it is not on GST per se, it is on GSTN, and its inability to respond to various problems" as reported by Business Today.

Challenges may include

- Lack of data available in the required formats
- Difficulty submitting data
- Inefficient processes for transforming data
- Lack of process support for new data requirements
- Outdated tax operating models
- More frequent need for more comprehensive analytics, in advance of submission to tax authorities
- Inability to respond to audit notices in a timely or effective manner
- Inability to respond quickly when there is disagreement with a tax assessment

7.2 Forthcoming changes in E-way Bill system:

As per the government’s latest notification (dated: 25.03.2019) following changes will be done to for the effective implementation and monitoring of GST E-Way Bill system:

1) **One invoice, one E-way bill:** There will be only one e-way generated for each invoice. This change is brought by the recommendation given by transporters. Now, neither consigner or consignee nor the transporter can generate multiple e-way bills on behalf of an invoice.

2) **Automatic calculation of route distance:** Now, e-way bill system will auto calculate the distance between the supplier and the recipient based on their pin code. This system will predict the time involved in each transaction and eliminate ambiguity. Various attributes like type of road, traffic condition, average speed, travelling direction etc will be considered before automatic generation of route distance.

3) **Extension of EWB in case consignment is in transit:** When the consignment is in transit i.e. either it could be on road or in warehouse, it will be considered to be 'consignment in-transit'. It is to be chosen by the dealer whether the Consignment is in Transit or in Movement. On selection of In Transit, the address details of the transit place need to be provided. On selection of In Movement the system will prompt the user to enter the Place and Vehicle details from where the extension is required.

4) **NO EWB for composition dealers:** GST Act prohibits dealers, who have opted for composition scheme, to enter in inter-state transactions. Thus, as per the new notification by the department, no e-way bill will be generated for composition dealers. This rule shall be implemented from the new version of the system.

Thus, it can be concluded that GST E-way bill is a commendable step towards digitalization of tax system and compliance. There are many positive sides of Electronic bill generation system as it promises to make logistics industry more advanced in its operation. A lot is expected by the public but it is matter of time that how well it gets executed. Till date no major issues or loopholes in the system has been detected. It can be expected that E-way bills will lead Indian logistics and transport industry to the path of digitalization.

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- <https://economictimes.indiatimes.com/news/economy/policy/e-way-bill-for-inter-state-goods-movement-from-april-1-recommends-gom/articleshow/63056558.cms>
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- <http://telanganaentrepreneurnews.com/2018/07/07/one-year-of-gst-its-technology-that-failed-us-not-people-says-hasmukh-adhia/>

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**REGIONAL SPREAD AND HEALTH OF MICROFINANCE INSTITUTIONS POST  
DEMONETIZATION IN INDIA****Himanshu<sup>1</sup> and Sumit Bansal<sup>2</sup>**Research Scholar<sup>1</sup>, Department of Management Studies, Indian Institute of Technology, Roorkee  
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**ABSTRACT**

*The microfinance sector in India is growing at an exponential rate. Demonetization announced by the government has been challenging for this sector. It has affected the regional spread and health of microfinance institutions (MFIs) in the country. This paper aims to examine the regional disparities in the client outreach and gross loan portfolio, and the health of MFIs post demonetization. The paper is based on the trend analysis of secondary data collected from various published sources. The paper finds that post demonetization, the growth rate in client outreach and gross loan portfolio (GLP) has declined. The domination of Southern region and subservient of Northern and Northeastern regions in client outreach and GLP reflect regional disparities which exist even after demonetization. The demonetization move has also adversely affected repayment rates and portfolio at risk of MFIs drastically. This reflects bad health and sub-standard performance of MFIs. This study recommends that MFIs should equally cover all regions of the country to achieve operational sustainability.*

*Keywords: Microfinance, gross loan portfolio, demonetization, portfolio at risk, repayment rates.*

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**1. INTRODUCTION**

The Government of India announced the demonetization drive in November 2016 which created turbulence in the economy. The government of India withdrew 500 and 1000 rupees notes from circulation. Demonetization affected various sectors in different degrees. One of the such sectors is microfinance which was shattered badly by demonetization. However, this impact has not gained significance in overall discussion on demonetization drive. The CEO of Microfinance Institutions Network reported that delinquencies due to demonetization may require MFIs to write-off 7 per cent of total loan portfolio i.e. over Rs 1 lakh crores (Mondal, 2017). Demonetization has created disruptions, not only in the services provided by microfinance institutions (MFIs hereinafter), but also in the businesses of clients of MFIs.

Microfinance acts as a mechanism for offering financial services to the poor and deprived. Poor people have no access to the formal financial system. As a result, they tend to rely extensively on informal credit markets for their financial needs, that typically operate unregulated and unmonitored by government agencies and beyond the purview of codes of law, which make them highly risky. Therefore, in order to meet the substantial demand created by low-income micro-entrepreneurs for formal and dependable financial institutions, the first seeds of microfinance was sowed during the period between 1950-1980 (Sundaresan, 2008), with the purpose of eliminating poverty in regions where there is an unreasonable gap in the demand and supply of financial services by providing loans in small amounts to the vulnerable class who did not possess sufficient collateral. Microfinance was pioneered by institutions such as the Grameen Bank in Bangladesh, ACCION International in Latin America, and Self-Employed Women's Association (SEWA) Bank in India (Sundaresan, 2008). The Grameen Bank, established by Dr. Mohammad Yunus in 1983, started offering financial services to the poor women in Bangladesh. This bank received Nobel Prize in the year 2006. Grameen bank remains to be one of the most prominent and successful MFIs in the world. The model has been replicated in numerous nations including India.

**The Concept of Microfinance in India**

The evolution of microfinance sector in India dates back to 1980s when Self Help Groups (SHGs hereinafter), kind of informal groups that used to pool small savings and to lend them to the needy. The tremendous growth of the sector makes it a multi-billion-dollar industry. NABARD (National Bank for Agriculture and Rural Development) and SIDBI (Small Industries Development Bank of India) provide majority of the financial resources to microfinance sector in India.

Microfinance is a form of banking service that is extended to low-income or unemployed people who do not have access to financial services due to inadequate collateral and complexity involved. The National Task Force constituted by NABARD (1999) has defined microfinance as "the provision of thrift, credit and other financial services and products of very small amounts to the poor in rural, semi-urban or urban areas for enabling them to raise their income levels and improve living standards". In the contemporary scenario, the scope of financial

services under microfinance is not limited to credit disbursement, but it also encompasses other services such as insurance services, micro pension, and micro remittance etc.

## **2. RATIONALE AND SCOPE OF THE STUDY**

The India Microfinance Industry is growing at an exponential rate in the recent time. It has a gross loan portfolio of Rs 55,061 crore for the year ended March 2018 compared to Rs 46,842 crore for the year ended March 2017. However, the compelling feature of this growth is that there are regional disparities in the concentration of MFIs in the country. The studies and the reports examining the growth of Indian microfinance highlight that the MFIs are mainly concentrated in southern part of India. Out of the total client base of 295 lakh, the respective contribution of Southern part alone is 38%, which is followed by Eastern part with 25%, Central part with 19%, and Western part with 9%. The least client base is observed in Northern and North-eastern with 6% and 3% respectively (The Bharat Microfinance Report, 2017). The post demonetization period has been challenging for the microfinance sector in India. The microfinance sector witnessed disruption in its business as the clients primarily use cash for transactions. MFIs faced a reduction in their repayment rates, with several prominent MFIs reporting Portfolio at Risk (PAR) over and above 10%. MFIs having significant exposure in states of Madhya Pradesh, Maharashtra, Uttar Pradesh, Karnataka, and Uttarakhand continue to experience problems in their loan portfolios (The Bharat Microfinance Report, 2017). Demonetization also emphasized digital transactions (Balaji and Balaji, 2017). In December 2017, only after 1 year from demonetization, the volume of digital transactions crossed 1 billion (Reserve Bank of India). The shift towards digital transactions may affect the regional disparities in the concentration of MFIs in the country. In the recent years, there has been a steady shift in client outreach and loan portfolios of MFIs towards other states. The MFI client outreach has registered an intensive growth in the states of Assam, Gujarat, Jharkhand, Bihar, and Madhya Pradesh. Hence, there is a need to examine the penetration and the health of MFIs in different regions post demonetization.

The study is based on MFIs in India. It covers three financial years: the financial year (FY) before demonetization (2015-16), the FY in which demonetization took place (2016-17) and the FY after demonetization (2017-18). The FY 2018-19 is not considered because the data for the financial year ending March 2019 is not available.

## **3. LITERATURE REVIEW**

Nerkar (2016) observed that it was unlikely to eliminate black money and to fight parallel economy. Dasgupta (2016) provided a theoretical analysis of demonetization and concluded that demonetization would not seem to provide benefits in short-term and medium-term scenario. It would be less likely that economic variables such as demand and goods and services move in a healthy direction. Balaji and Balaji (2017) studied the impact of demonetization on cashless transactions and concluded that it has a significant positive impact on cashless transactions. Ghosh (2017) reported that demonetization would lead to the contraction in unorganized and organized sectors. It destroyed the low skilled jobs. Samuel and Saxena (2017) highlighted that demonetization would be beneficial in the long run. It would lead to increase in tax revenue of the government which can be used for new projects of national importance. Goel (2018) stated that demonetization has several positive effects such as eliminating staked up money, improving governance, and purifying financial system. Sethi et al. (2018) contended that demonetization has adverse effects on cash in hand and money supply, thus pressurizing investments and development across different sectors.

Zerai and Rani (2012) found that operational sustainability of MFIs was positively related to breadth of client outreach. Rupa (2014) reported that Indian MFIs had higher financial performance, as they had lower operating expenses and higher financial revenue by assets.

Champatiray et al. (2010) revealed that the Southern region dominated in terms of access to microfinance services which accounts for 54% of all microfinance loan portfolios and 52% of all microfinance clients. In contrast, microfinance sectors were underdeveloped in the Central, Northeastern, and Northern regions, accounting for 2%, 2%, and 8% of loan portfolio and 3%, 3% and 9%, of client outreach respectively. Nasir (2013) observed that the progress of microfinance programme in India had been seen in those areas where formal financial institutions were growing exponentially. The spread of microfinance programme was larger in four southern states such as, Tamil Nadu, Andhra Pradesh, Kerala, and Karnataka, while it was negligible in northern states and north-eastern states. Goyal (2013) found that MFIs are heavily concentrated in small regions. This results in glaring regional imbalances in access to their products. Regions and states which have some of the highest indices of poverty and lack of banking infrastructure ironically have one of the lowest MFIs' penetration. Mittal (2014) overviewed the progress of microfinance programme in India by examining number of Self-Help Groups (SHGs) with outstanding loan. She highlighted that the numbers of SHGs with

outstanding loan were highest in Andhra Pradesh in 2013, followed by West Bengal, Tamil Nadu, Orissa, and Karnataka. There were only a few SHGs with outstanding loan in Bihar, Madhya Pradesh, and Kerala. It was concluded that there were regional disparities in the progress of the programme across the country.

Laha and Kuri (2015) analyzed variations in microfinance among different states of India. They found that the outreach of the SHG-Bank linkage program is much widespread in southern region, specifically Kerala and Tamil Nadu; more than 100 percent of the poor households have been covered under microfinance program. The outreach of microfinance program to poor households was higher in states like Tamil Nadu, Kerala, Andhra Pradesh, Karnataka, and Himachal Pradesh. Of these states, three southern states (Tamil Nadu, Kerala, and Andhra Pradesh) outstrip in outreaching microfinance program to the most vulnerable sections. Saraf (2015) used OLS regression to find out possible justification for concentration of MFIs in southern states and highlighted that presence of MFIs in southern states had a significant and positive correlation with wealth and past history of those states and female literacy rates had mixed effects in different states. Ray and Mahapatra (2016) collected data on the penetration of MFIs from 26 states and 4 union territories and suggested that MFIs were dominant in states which had good rural infrastructure, and were relatively richer but devoid of adequate banking facility. Kanjilal (2016) compared the district-level data on microfinance institutions of north-eastern and southern states and observed that an anomaly exists in the penetration of MFIs in north-eastern states, nevertheless the factors promoting the growth of MFIs were present in similar capacity in both southern states and north-eastern states. Socio-cultural and political background of the states might create a such difference. Dhar (2016) constructed a state-wise microfinance penetration index and reported that there was an uneven distribution in microfinance services, which were mainly concentrated to southern part of India, while north and north-eastern part had not access to these services.

Many studies show the concentration of MFIs in southern region and to some extent in western region. There are very few studies which examine the regional disparities in the client outreach and spread of loan portfolio of MFIs post demonetization, and also the health of MFIs post demonetization.

#### **4. OBJECTIVES AND RESEARCH METHODOLOGY**

- To examine the regional disparities in the client outreach of MFIs post demonetization.
- To examine the regional disparities in the spread of loan portfolio of MFIs post demonetization.
- To assess the health of MFIs by analyzing loan portfolio at risk post demonetization.

This study is based on the trend analysis of secondary data which is obtained from various sources such as The Bharat Microfinance Report, MFIN Micrometer Report, Government publications, NABARD reports, articles in newspapers, and various published sources on microfinance.

#### **5. FINDINGS AND DISCUSSION**

The study analyzed data for the financial year end of three financial years: the FY before demonetization (2015-16), the FY in which demonetization took place (2016-17) and the FY after demonetization (2017-18). FY 2015-16 and FY 2016-17 were considered to know about the changes that took place post demonetization.

##### **Regional client outreach of MFIs**

Total client base of MFIs as on 31 March 2016, 31 March 2017, and 31 March 2018 stood at 399 lakhs, 295 lakhs, and 281 lakhs respectively. The growth rate in client outreach decreased by 26.06% in March 2016-March 2017 period and by 4.74% from March 2017 to March 2018. The reason for decrease in growth rate is that 6 MFIs have been converted into small finance banks. It is also likely that consecutive fall in growth rate is attributable to demonetization effect.

In figure 1, there is a clear indication of regional disparities in client outreach of MFIs. MFIs are mainly concentrated in Southern region. MFIs have moderate outreach in Eastern, Western and Central regions. The least client outreach can be observed in Northern and Northeastern regions.

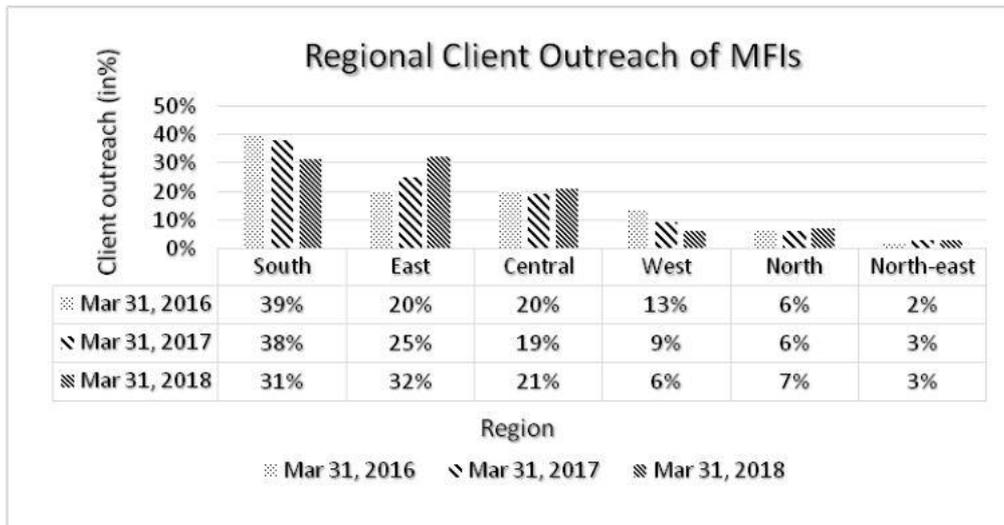


Figure-1: Regional Client Outreach of MFIs

Source: Numerical data was taken from The Bharat Microfinance Report

Post demonetization, the client base in Southern and Western regions declined from 39% to 38%, then to 31% and from 13% to 9%, then to 6% respectively. However, Eastern region witnessed upward growth in client base from 20% to 25%, then to 32%. There was a meagre change in clients served in Central, Northern, and Northeastern regions. It seems that MFIs are shifting their focus on clients served from Southern and Western regions to Eastern region.

**Regional spread of MFIs’ gross loan portfolio**

The Gross loan portfolio (GLP hereinafter) of MFIs as on 31 March 2016, 31 March 2017, and 31 March 2018 stood at Rs. 63853 crores, Rs. 46842 crores, and Rs. 55061 crores respectively. The growth rate in GLP decreased by 26.64% from March 2016 to March 2017. The main contributing factor for decrease in growth rate is conversion of 6 MFIs into small finance banks. Although GLP rose from March 2017 to March 2018, it was still lower as compared to GLP in March 2016. One of the reasons for fall in GLP may be demonetization effect.

In figure 2, post demonetization, the GLP of MFIs witnessed an upward trend in Eastern region. In Southern region, GLP increased in March 2017 but declined in March 2018. GLP of MFIs in Western region faced a downward trend. There was a very little change in GLP in Central, Northern, and Northeastern regions.

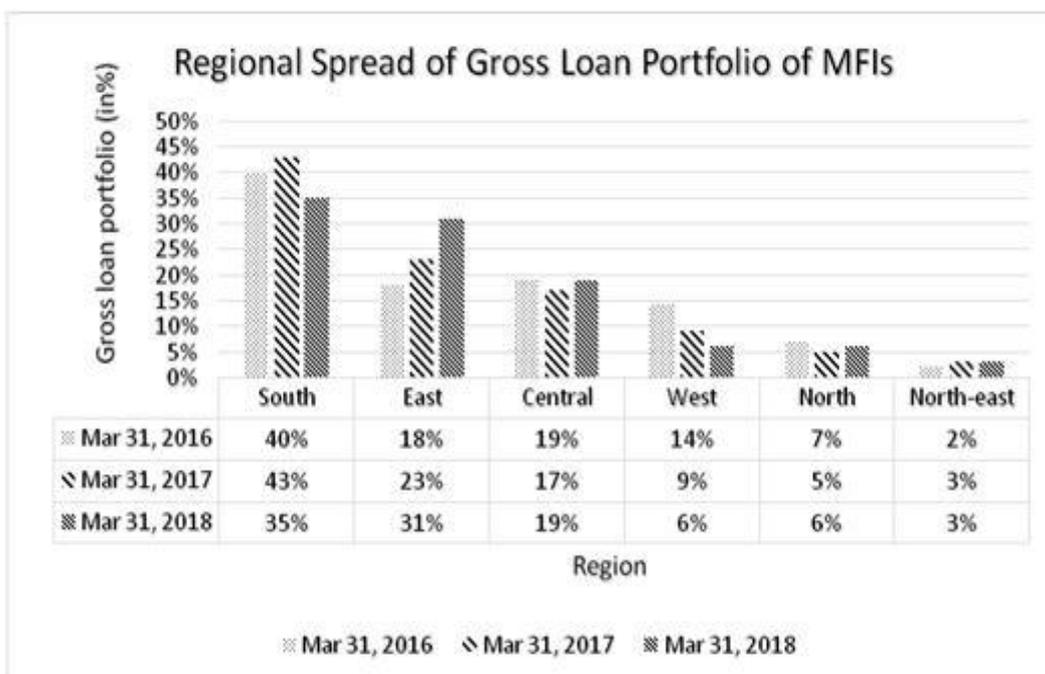


Figure-2: Regional Spread of Gross Loan Portfolio of MFIs

Source: Numerical data was taken from The Bharat Microfinance Report

It seems that MFIs are also shifting their position of GLP from Southern and Western regions to Eastern region. However, the domination of Southern region and subservient of Northern and Northeastern regions in all years reflect regional disparities which still exist post demonetization.

#### Health of MFIs by analyzing loan portfolio at risk

The loan portfolio is the main revenue yielding asset for MFIs. As mentioned in The Bharat Microfinance Reports 2016 and 2017, it also provides information about the health of MFIs. The trends of loan portfolio at risk are analyzed to gauge the health and performance of MFIs. The data on portfolio at risk (more than 30 days and more than 90 days) of MFIs for top 15 states in terms of Gross Loan Portfolio (GLP) was analyzed for the March 2016, March 2017, and March 2018, shown in table 1 and table 2.

**Table-1: Portfolio At Risk more than 30 days of MFIs (in %) for top 15 states in terms of Gross Loan Portfolio**

States	March 31, 2016	March 31, 2017	March 31, 2018
Tamil Nadu	0.21	14	1.5
Karnataka	0.49	18	3.7
Maharashtra	0.29	28	10.4
Uttar Pradesh	0.39	37	10.8
Madhya Pradesh	0.46	17	6.3
West Bengal	0.18	14	1.1
Bihar	0.22	3	0.8
Gujarat	0.53	16	*
Kerala	0.10	1	2.7
Odisha	0.09	1	0.6
Haryana	0.38	22	10.5
Rajasthan	0.64	11	3.7
Punjab	0.19	16	5.9
Assam	0.07	1	0.9
Jharkhand	*	10	3.4

Source: MFIN Micrometer Reports

\*Data was not available

Table 1 shows that portfolio at risk (PAR hereinafter) more than 30 days has increased significantly in most of the 15 states after demonetization. Because of cash crunch, the riskiness of loan portfolio might be increased. The expectation of riskiness of loan portfolio in some states came down in a financial year after demonetization. However, in March 2018, PAR more than 30 days was still higher in states such as Maharashtra, Uttar Pradesh, Madhya Pradesh, Haryana, and Punjab. These findings show the bad health and performance of MFIs in these states.

**Table-2: Portfolio At Risk more than 90 days of MFIs (in %) for top 15 states in terms of Gross Loan Portfolio**

States	March 31, 2016	March 31, 2017	March 31, 2018
Tamil Nadu	0.11	2	1
Karnataka	0.33	12	3.2
Maharashtra	0.19	20	9.7
Uttar Pradesh	0.23	14	8.4
Madhya Pradesh	0.30	9	5.1
West Bengal	0.13	4	0.9
Bihar	0.14	1	0.5
Gujarat	0.33	9	*
Kerala	0.06	1	1.8
Odisha	0.06	0.3	0.4
Haryana	0.20	11	8.4
Rajasthan	0.47	5	2.8
Punjab	0.13	5	4.4
Assam	0.04	0.3	0.7
Jharkhand	*	5	2.9

Source: MFIN Micrometer Reports

\*Data was not available

Table 2 shows that PAR more than 90 days has also increased in majority of 15 states after demonetization. But the increase was less than increase in PAR more than 30 days. It reveals that majority of loans overdue by 30 days as compared to overdue by 90 days. PAR more than 90 days decreased in March 2018 except few states which were same as in case of PAR more than 30 days. The results reveal that MFIs continue to experience worse repayment rates which adversely affect their health.

## 6. CONCLUSION AND RECOMMENDATIONS

Demonetization was an unanticipated event for the microfinance sector. It has given severe blow to the MFIs. It has damaged the repayment behavior and credit discipline culture of MFIs which is necessary for their survival. It is concluded that the demonetization move has negative effects. Post demonetization, the growth rate in client outreach and gross loan portfolio (GLP) has declined. It seems that MFIs have been shifting their focus on client outreach and their GLP from Southern and Western regions to Eastern region. The domination of Southern region and subservient of Northern and Northeastern regions reflect regional disparities which still exist post demonetization. The demonetization move has also adversely affected repayment rates drastically. PAR more than 30 days and 90 days has increased in majority of the states. It reflects bad health and sub-standard performance of MFIs.

As the study is limited to three years, future research could examine the regional disparities and health of MFIs by taking data for a large number of years. It is recommended that MFIs should equally cover all regions of the country to achieve operational sustainability. The basic motive of microfinance is to provide financial services to under-served. It cannot be achieved until MFIs understand their roles in extending their ambit to under-served regions so as to eliminate regional disparities.

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**AN IMPACT OF GST ON COMMON MEN (WITH SPECIAL REFERENCE TO DELHI REGION)**

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**ABSTRACT**

*There are different sorts of duties winning in our nation under an umbrella of direct assessment and backhanded expense, for example, pay charge, blessing charge, capital addition ta(CGT), security exchange charge, perquisites charge, corporate assessments, deals charge, administration charges, esteem included charges, extract duty, octroi and custom obligation, proficient assessment, civil charges, riches charges, amusement charges and so forth. The introduction of new arrangement of tax assessment framework in india. i.e. GST has supplanted all the roundabout assessments, for example, administration tax(ST), extract obligation aside from custom obligation." The present research paper is an endeavor to examine idea of merchandise and administration duty and its effect on Indian economy.*

*Keywords: ST, GST, VAT, impact of GST, CGT, GST rates.*

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**INTRODUCTION**

Tank was brought and came into power into the Indian tax collection framework from 1 April 2005. Esteem included expense is a noteworthy improvement over the nearby deals charge.

At the state level, the merit of tank is that it is a multi-arrange charge with change for duty paid on buys and it anticipates repeating tax collection of a similar item. In spite of the accomplishment of tank framework, there are as yet certain restrictions in the structure of tank both at focal and state level too. To explain the issues immaculate by VAT the then Finance Minister Pranab Mukherjee while introducing the spending limit on July 6, 2009, said that GST would become effective from April 2010, however at this point it is the period of GST which is appearing from April 2017.

The merchandise and enterprises Tax (GST) can so be an extra significant improvement towards a thorough income upgrade changes inside the nation.

Reconciliation of items and administrations tax assessment would give India a world class legitimate framework and improve charge accumulations.

It would complete mutilations of differential medications of creating and fix part.

It will cause the finish of expenses like obligation, focal deals charge, state level deals charge, passage charge, stamp obligation, telecom permit charges, turnover charge and so on. GST is anticipated to shape a business amicable environment, as value levels and thus swelling rates would descend additional time as a uniform duty rate is connected.

It will moreover improve government's business undertaking wellbeing in light of the fact that the gathering framework would turn into extra clear, making delinquency extreme.

**MEANING OF GST**

The item and administrations charge (GST) might be an extract charge required on most merchandise and enterprises sold-out for residential utilization.

The duty is required to supply income for the focal.

The GST is paid by customers, however it is required and dispatched to the legislature by organizations selling the products and enterprises.

GST is one tax assessment for the whole country, which will make India one bound together basic market.

GST might be a tax collection on the arrangement of items and administrations, directly from the maker to the buyer.

Credits of info charges paid at each stage will be accessible in the consequent phase of significant worth expansion, which makes GST basically an expense just on esteem expansion at each stage.

The last customer can along these lines bear exclusively the GST charged by the last seller inside the offer chain, with set-off advantages at all the past stages.

**ADVANTAGES OF GST**

1. GST is a straightforward Tax and furthermore lessen quantities of circuitous assessments.

With GST authorized a business premises will demonstrate the assessment connected inside the business receipt.

Client will know precisely how much assessment they are paying on the item they purchased or benefits they expended.

2. GST won't be an expense to enlisted retailers in this way there will be no shrouded duties and the expense of working together will be lower. This progressively can encourage Export being a ton of aggressive.

3. GST can likewise help to enhancement of salary hotspots for Government other than pay duty and oil charge.

4. Under Goods and Services Tax, the taxation rate will be separated similarly among Manufacturing and administrations.

This should be possible through lower charge per unit by increment resources and lessening exceptions.

5. Under the arrangement of GST, both state GST and focal GST will be charged on the expense of assembling and gathered on purpose of offer. This will in the end give the advantages to the general population as costs will descend that thusly will help the corporates as utilization will increment.

6. Incredible advantage will be that various expenses like octroi, focal deals charge, state deals charge, passage charge, permit expenses, turnover charge and so forth will be dispensed with and all such duties will go under a one umbrella called GST. With GST, doing any business will currently be simple and agreeable in light of the fact that the same number of concealed assessments will be absent.

**DISADVANTAGES OF GST**

1. It is being discovered that Critics additionally rotating round over the GST framework and it is being imagined that it would affect adversely on the land advertise. It would mean 8 percent to the expense of new homes and lessen request by around 12 percent.

2. Some Economist says that SGST, CGST are only new names for Central Excise/Service Tax, VAT and CST and henceforth GST gets just the same old thing new this.

**OBJECTIVES OF THE STUDY**

1. To investigation the effect of GST on the basic men in Delhi and NCR area.

2. To discover the impact of GST on the pay of center and lower white collar class regular people.

3. To Study the impression of everyday citizens over the GST arrangement of the Govt in numerous issues, for example, Food, Clothes, Houses, Aviation and so on.

**RESEARCH METHODOLOGY**

The study is based on the primary data where the most of the areas of Delhi were covered and Survey was conducted and questionnaire was being taken from the people over their perception regarding GST policy of the government.

Sample Size:- More than 500 persons from different places of Delhi is considered in the form of the sample size.

**FOOD PROCESSING INDUSTRY**

The sustenance preparing industry can inhale simple as bundled nourishment things might be exempted from the proposed Goods and Services Tax (GST). At Current, handled sustenance products(PFP) are exempted from focal extract, however most states demand Value Added Tax (VAT) on these.

Certain bundled nourishment things may be placed in the exempted class, said an account service official. He said the administration may need to excluded these products from obligation in GST, on fears that exacting it even at the lower rate of 12 percent (6 percent each for the Center and the states) could fuel swelling.

Prepared leafy foods, prepared to-eat nourishment, solidified sustenance, bread shop items, infant nourishment, curd, spread milk, tea, ketchup, refreshment and noodles, among others, go under the bundled nourishment class. On a portion of these things, numerous states are as of now collecting assessment at a rate lower than the one endorsed by the Empowered Committee (EC) of state fund clergymen. For example, Tamil Nadu charges pastry shop items at 4 percent, rather than the 12.5 percent affirmed by EC. Maharashtra likewise requires 4

percent expense each on semi-handled natural product/meat and dry organic products, though the EC-endorsed rate is 12.5 percent. Most states demand 4 percent VAT on tea, rather than the affirmed 12.5 percent rate.

Examiners, in any case, think saddling prepared nourishment in GST at a lower rate would not have much effect on costs. The Center is taking a gander at a solitary rate of 16 percent in three years from the date of presentation of GST. The products like virus drinks, which are saddled at 12.5 percent, by the states may not be affected much, however natural product juices, tea, consumable oil, which are burdened at 4 percent, will be hit whenever exhausted in GST.

"I think from future point of view we ought to have two rates — a legitimacy rate and a concessional rate, which is lower than 12 percent. Items which are not expose to focal extract but rather pull in VAT may go under the lower rate in GST".

Made nourishment items establish around 12 percent of the Wholesale Price Index (WPI) crate. The Rs5,45,000-crore sustenance handling industry includes around eight percent of the nation's GDP. It is assessed to achieve a dimension of Rs8,73,000 crore by 2014-15.

At present, 350 things are exempted by the Center, while states have avoided 99 things. A joint gathering of the Center and states will work out a rundown of things to be exempted. The Center may want to keep some different products exempted from extract obligation under the zero-charge classification in GST. Power: GST is said to have negative effect on power, GST is relied upon to blow up power costs by up to eight percent as the administration has chosen to keep power out of the circle of this new assessment administration.

**Power manufacturing corporations:-** - each sustainable and customary - would need to be constrained to pay GST for his or her data sources like fuel and apparatus anyway won't almost certainly get these charges discounted, given that their yield - power - is absolved.

This greater expense of delivering power will at that point be passed on to customers under the "difference in law" proviso in power buy understandings (PPA).

Designers mercantilism power inside the wares advertise or on a non-PPA premise would need to be constrained to consider the upper cost.

### **WORK CONTRACTS**

GST has Positive effect GST tries to give truly necessary clearness on works contracts, and accordingly, on the designing, procurement and development (EPC) business line. Works contracts are proposed to be burdened as "administrations".

This implies the GST rate and arrangements, similar to place of supply rules, as material on administrations will apply to works contracts.

The significant addition from this treatment is that the expense would be right now charged on the specific composed agreement base.

Additionally, nearby versus between state works gets, that at present prompts endless question, ought to get disposed of.

Thus, EPC contract costs should return fairly by virtue of this new assessment proficient structure, that progressively should benefit venture property holders.

### **CEMENT INDUSTRY**

GST has positive effect on bond industry, Cement is a vital contribution to the infra area, and GST is relied upon to affect it decidedly. The overall indirect charge rate is at present evaluated to associate with 25 for every cent. The bond exchange is also expected to gain from lower costs of supply. Overall, a diminishing in concrete costs is normal.

### **LOGISTICS**

GST has positive effect on coordinations industry The GST is relied upon to empower a decrease in coordinations cost by as much as 20 percent to 30 percent, as firms reconfigure their supply chains on four tallies. To start with, as Asian Nation ends up one gigantic market, there'll be bigger anyway less distribution centers.

Also, it will prompt a bigger number of greater trucks on streets as there is more prominent appropriation of the center point and-talked model.

Third, these progressions can result in bigger economies of scale for transport administrators and result in extra firms re-appropriating their supply tasks. Four, decrease in pausing and sitting time at between state hindrances and registration is required to give an enormous alleviation.

Warning, counselling, designing and venture the board services: GST is said to have negative effect on counselling and undertaking the executives administrations, As with all different administrations, firms giving these administrations to the foundation division will have a negative effect because of the higher frequency of GST at 17 to 18 percent opposite the present 15 percent Abolition of assessment occasions and exclusions: GST has negative effect There are distinctive expense occasions and exceptions for framework advancement and activities at both the focal and state levels.

While there's the expectation that inside the end, these duty occasions and exclusions will be permitted to run their course, the prowling dread is that they will be evacuated.

**Civil aviation:** GST has negative impact on Five petroleum products - crude, natural gas, aviation turbine fuel (ATF), diesel and petrol - are excluded from the coverage of GST for the initial years whereas the remaining fossil fuel product - coal oil, naphtha and liquefied petroleum gas (LPG) - are covered.

Flight tickets area unit possible to urge costlier as airlines won't be able to claim credit on tax paid on jet fuel. The current service tax ranges from 5.6 per cent to nine per cent of the base fare, which is considerably less than the GST rate that is being spoken about, of 15 to 18 per cent.

Currently, airlines will claim what's known as a cenvat credit on the central excise duty for fuel. They stand to lose this within the GST regime as ATF is outside the view of GST. While there's this bundle of negatives and positives, this columnist is of the opinion that on the whole, GST has a positive impact on the sector.

Increase in costs of airline tickets and electricity area unit shortly absorbed and forgotten. But the positives that emanate from rationalisation of taxes on works contracts, reduction in cement costs, the massive profit to supply and also the elimination of a raft of complicated exemptions and tax holidays has clear long-term advantages.

#### **ADVANTAGES TO BUSINESS AND INDUSTRY**

Simple consistence: a solid and thorough IT framework would be the motivation of the GST routine in Republic of India.

In this manner, all citizen administrations such as registrations, returns, installments, etc. would be out there to the citizens on the web, which may fabricate consistence direct and clear.

Consistency of assessment rates and structures: GST will guarantee that roundabout expense rates and structures are basic the nation over, in this manner expanding certainty and simplicity of working together.

In various words, GST would fabricate working together inside the nation charge impartial, independent of the decision of spot of working together.

**Removal of cascading:-** An arrangement of consistent duty credits all through the esteem chain, and crosswise over limits of States, would guarantee that there is minimal cascading of charges. This would diminish shrouded expenses of doing business. Improved intensity: Reduction in exchange expenses of working together would inevitably prompt an improved aggressiveness for the exchange and the business. Addition to producers and exporters: The subsuming of real Central and State imposes in GST, complete and exhaustive set-off of information products and services and eliminating of Central Sales Tax (CST) would downsize the estimation of locally industrial facility made product and services. This will expand the forcefulness of Indian product and administrations inside the worldwide market and gives lift to Indian exports. The consistency in expense rates and techniques the nation over will go an extended methodology in diminishing the consistence esteem.

#### **FOR CENTRAL AND STATE GOVERNMENTS**

Basic and clear to Administer: Multiple backhanded assessments at the Central and State levels territory unit being supplanted by GST.

Sponsored with a solid start to finish IT system, GST would be less complex and simpler to regulate than all other circuitous assessments of the Center and State imposed up until now.

Better Controls on Leakage: GST can finish in higher assessment consistence because of a solid IT foundation.

Because of the consistent exchange of information charge credit from one stage to another in the chain of significant worth expansion, there is an in-constructed system in the structure of GST that would boost charge consistence by dealers.

Higher Revenue Efficiency: GST is relied upon to diminish the expense of accumulation of assessment incomes of the Government will in this manner lead to the higher income productivity. .

### **FOR THE CONSUMER**

Single and Transparent Tax Proportionate to the Value of Goods and Services: Due to different aberrant assessments being collected by the Center and State, within complete or no info charge credits .

accessible at dynamic stages helpful expansion, the expense of most products and ventures in the nation today are loaded down with many shrouded charges.

Under GST, there would be only one expense from the maker to the purchaser, prompting straightforwardness of duties paid to the last shopper.

Help in Overall Tax Burden: Because of proficiency additions and avoidance of spillages, the general taxation rate on most wares will descend, which will benefit buyers.

At the Central dimension, the accompanying assessments are being subsumed:

- a. Focal Excise Duty,
- b. Extra Excise Duty,
- c. Administration Tax,
- d. additional custom typically alluded to as levy, and
- e. Exceptional Additional Duty of Customs.

At the State level, the accompanying duties are being subsumed:

- a. Subsuming of State Value Added Tax/Sales Tax,
- b. amusement Tax (other than the duty demanded by the local bodies), Central Sales Tax (exactd by the Center and gathered by the States),
- c. Octroi and Entry charge,
- d. Buy Tax,
- e. Extravagance charge, and
- f. Charges on lottery, wagering and betting.

If there should arise an occurrence of between State exchanges, the Center would require and gather the Integrated Goods and Services Tax (IGST) on all between State supplies of merchandise and enterprises under Article 269A (1) of the Constitution.

The IGST would generally be up to CGST and SGST.

The IGST component has been intended to ensure consistent progression of information decrease from one State to an alternate.

The between State vendor would pay IGST on the closeout of his product to the Central Government when adjusting credit of IGST, CGST and SGST on his buys (in that order). The corporate greed State can exchange to the Center the credit of SGST used in installment of IGST.

The business seller can guarantee credit of IGST while releasing his yield liabilities (both CGST and SGST) in his own State. The Center can exchange to the trade State the credit of IGST used in installment of SGST. Since GST might be a goal based assessment, all SGST on a definitive item can normally collect to the mind-boggling State. For the usage of GST inside the nation, the Central and State Governments have conjointly enlisted product and Services Tax Network (GSTN) as a not-for-benefit, non-Government Company to provide shared IT foundation and administrations to Central and State Governments, citizens and option stakeholders. The key targets of GSTN square measure to deliver an ordinary and uniform interface to the citizens, and shared framework and administrations to Central and State/UT governments.

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GST is dealing with building up a cutting edge thorough IT framework including the basic GST entryway giving frontend administrations of enlistment, returns and installments to all citizens, just as

the backend IT modules most likely States that grasp procedure of profits, enlistments, reviews, evaluations, offers, and so on.

All States, bookkeeping specialists, count and banks, are additionally setting up their IT foundation for the organization of GST.

There would be no manual recording of profits. All expenses can likewise be paid on the web.

All mis-coordinated returns would be auto-produced, and there would be no need for manual intercession.

### **CONCLUSION**

GST has made another situation in the Indian economy, which diminishes twofold tax assessment on the products, buyers will have more noteworthy preferred standpoint as the duty rate is 0% on sustenance gains, the nation will have uniform expense rates there will no twofold tax assessment on merchandise. It is utilization based assessment, all the extravagance merchandise become costlier, though fundamental needs winds up less expensive, and wipes out the impact of expansion on purchaser products.

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**A STUDY ON POST HOC TESTS ON OCCUPATIONAL PERCEPTION ON UDAN SERVICES**

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**ABSTRACT**

*Present study is to administer the Post Hoc Tests on Occupational perception on UDAN services. The analysis is in conformity with the objectives of the study and the hypotheses formulated. The collected data has been analyzed using post hoc analysis and multi comparison through SPSS. Findings include that service people have a significant difference than students which is supported by opposite signs of Lower bound and Upper bound. Student has a significant difference than service persons for location of airline office sand authorized agents were in reach. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations at 5 percent level of significance.*

*Keywords: Occupation, Post hoc, UDAN, customers, satisfaction.*

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**INTRODUCTION**

The Indian Aviation Sector has witnessed marvelous development in the recent past which is driven by sound demographic, macroeconomic, government supported reforms & changing market forces at work. The three-fold increase in consumerism, rising disposable income; developing aviation sector; burgeoning middle class; increasing business travel; government reforms; entry of low cost carriers; increasing competition etc have positioned the Indian Aviation Sector in a high development path. Almost 35 % of exports from India & 97% foreign tourists to India arrive by Air each year. Aviation sector has undergone a major development and growth in past 5-6 years.

Customer service has a direct impact on the customer's level of satisfaction, which in turn, ultimately reflects on the service provider's bottom line. Although, it is difficult to analyze and predict the true influence of customer service, quality customer service has been found to be a major means for improving a variety of aspects of a business.. The key to getting closer to one's customers is making it easier for them to do business with the service provider, better known as convenience (Anton, 1996). • The number and quality of services offered, founds the brand image of the service provider.

Multiple services reinforce customer's sense of security. Protective services such as security staff, emergency medical facilities, clearly marked exits impart trust and confidence in customers. • Quality customer service has the potential to produce increased traffic for the service provider. Further, the delivery of quality service and customer satisfaction has been clearly associated with profits, cost savings and market share (Sager, 1994). • Service providers who encompass their services beyond slight expectations have a far better chance of satisfying their customers.

An airline company provides services to its travellers at the airport (check-in, during boarding and on arrivals), F/C class lounge services, ground staff service, cabin staff service, services at the airline website and onboard products offered to the passengers. India is expected to be the fastest growing civil aviation market in the world by 2020 with about 420 million passengers being handled by the Indian airport system, according to the Economic survey 2010-11. The number of passengers carried by the domestic airlines during Jan-Feb 2011 was 9.51 million as against 7.95 million in the previous year in 2010, as a result, registering a growth of 19.6%, according to the data released by DGCA. The domestic airlines registered a growth of almost 16 % year-on-year (y-o-y), carrying record 5.2 million passengers in Dec. 2009. The domestic air passenger traffic grew by 19% in 2010, registering 51.53 million passengers as compared to 43.3 million in 2009, according to economic survey 2010- 11. (Aviation, March 2011)

**REASONS FOR BOOM IN INDIAN AVIATION INDUSTRY**

- Foreign equity allowed- The RBI declared that foreign institutional investors might have shareholdings more than the limited 49% in the domestic sector.
- Low entry barriers- Now a days, venture capital of \$10 million or less is enough to launch an airline.
- Attraction of foreign shores- Kingfisher airline and Jet Airways have gone international by starting operations, first to SAARC countries, and then to South-East Asia, the UK and the US.

- Increased income levels - Though India's GDP (per capita) at \$3,100 is still very low as compared to the developed country standards, India is admirable at least in metro cities and urban centers, where IT and BPO industries have made the younger generation prosperous.
- Intact potential of India's tourism- Currently, India attracts more than 5.11 million passengers every year, while China gets 10 times the number. Tourist arrivals in India are predicted to grow exponentially, especially due to open sky policy between India and SAARC countries and the increase in two-sided entitlements with European countries and the US.
- Charm of the airlines- No industry other than film-making is as glamorous as the airlines. Airline tycoons from the last century, like J.R.D. Tata, Howard Hughes, Sir Richard Branson and Dr. Vijaya Mallaya today have been idolized. Airlines have a culture of glamour around them and high net worth individuals can always enlighten with the idea of owning an airline.

## REVIEW OF LITERATURE

**K Vasantha (1997)** investigated the association between the financial and operating characteristics of an airline and its service quality by using correlation analysis. The service quality variables were denoted by the complaint rates, delays, and involuntary denials of boarding; and operating and financial variables by market share, revenue per passenger per mile, revenue growth- rate, debt to capital ratio, current ratio, load factor, employees per departure and operating revenue per employee. The analysis specified that airlines delays are directly related to load factors, and complaint rates to debt to capital ratios. Thus, airline complaint rates, delays and involuntary denials of boarding factors are pointedly taken as major consideration while analyzing service quality of domestic airlines.

**John and Robin (2001)** examined the power of consumers' perception of service assessment according to their personality traits. The application of personal traits, including the Jungian personality types as a probable predictor of perceived satisfaction levels. The review of literature did not confirm any relationship between airline flights service satisfaction levels but always there was a strong relationship between perceptions of quality and satisfaction. The distinction of the Jungian personality types used in the evaluation of leisure airlines' service attributes appeared to be useful of further examination.

**David and Robin (2002)** attempted to recognize the service dimensions on airline passengers in Hong Kong. The study compared the differences in passengers' expectations of the desired airline service quality in terms of the dimensions of reliability, assurance, facilities, and employees' flight patterns, customization and responsiveness. The primary data were collected from passengers departing in Hong Kong airport. The study evidently showed that assurance was the imperative service dimension and also concluded that passengers were concerned with the safety and security aspect. This pointed out that why there has been such a downturn in demand means. This study was conducted just prior to the world trade centre incident on the 11th September 2001.

**Bhagyalakshmi and Nargundkar (2006)** investigated the service quality delivered by four major airlines in India on the background of rigid competition in the airline service sector. Pricing and service quality are the major variables that decided the brand equity of each organization in the airline industry. The process of traveling on a domestic airline was divided into pre-flight, in-flight and post-flight experiences. A survey was conducted to find out the perceived service quality of frequent fliers on each of the four airlines across a series of service performance variables. The airline brands were placed in a perceptual space, where the perceived service attributes were also plotted. Clear differences existed among the airlines, with two of them perceived as being similar to each other, and the other two divergent in many respects.

**Philemon et al. (2007)** examined the problem of customer satisfaction in the airline industry with reference to Malaysia. The data were collected through questionnaire survey at Kuala-Lumpur international airport in Malaysia. The findings of the study retrieved that human interactions, check-in procedures, source of recommendations on choice of Airline, as well as monetary incentives do not influence the level of customer satisfaction. On the other hand, factors such as use of Information Communication Technology, reservation procedures, in-flight services, company image, and mode of registering complaints/suggestions seem to influence customer satisfaction in Malaysian setting.

**Agarwal and Dey (2010)** provided a comparison on the customer satisfaction based on service quality as perceived by air travelers on six domestic airlines namely Go Air, Kingfisher, Jet Airways, Indigo, SpiceJet and Air India (Domestic) by using different variables such as ease of bookings through the website/call center, hassle free check in, efficient ticketing staff, regular announcements during flight delays at airport, on time

performance of flights, in flight experience, baggage handling and value for money. Approximately, 150 questionnaires were collected by using convenient sampling method. The Perceptions travelers were captured who had actually undergone the experience of travelling by an airline. The result of the study revealed that travelers perceive a significant difference between six airlines for each of the above six identified variables. The study concluded the study useful to help marketers of domestic airlines and designers of flight service offerings to enhance the satisfaction level of air travelers.

**Krishna Kumar and Baby (2012)** studied the domestic airlines preferences and purchase decision in TamilNadu. Eight factors had been acknowledged and employed to study the preference and purchase decision of domestic airlines services. Primary data was collected through well-structured questionnaire through convenient sampling method. It was recognized through the research that among the eight factors convenient arrival and departure were the most influencing factor and facilities in ticket booking was least influencing factor of preference and purchase decision. The researchers recommended that importance must be given by the airline service providers in those aspects to retain the passengers.

**Grove and Fisk (1997)** conducted a study "The Impact of Other Customers on Service Experiences: A Critical Incident Examination of 'Getting Along'" using the critical incident method, data were gathered from 486 customers regarding satisfying or dissatisfying incidents with service organizations that were the result of other customer's presence. The findings of this study are (a) Prolonged waits that often go with many service encounters can put people in a bad mood, displeasures can burst and disruptive behavior can result, (b) apparently satisfying all customers with the same service delivery is almost impossible, (c) tendency of people to be less self-conscious when they are "out-of-town" or among strangers has long been observed, (d) methods for improving customer-to-customer relationships are apparently required. The study suggested that before means of enhancing customer-to-customer relationships or governing against negative incidents can occur, organizations need to progress for an appreciation for the importance of managing other customers.

**Aksoy, Atilgan and Akinci (2003)** quoted in their paper "Airline services marketing by domestic and foreign firms: difference from the customers' view point" that significant differences exist between the foreign and domestic airline passenger groups on the same flight terminuses with respect to their demographic profiles, behavioral traits and understanding of airline service parameters. They also suggested that a firm's competitive advantage is established by its ability to satisfy customers' present and future needs.

### **THE UDAAN SERVICE**

The UDAAN service is portion of the regional connectivity scheme also known as 'UdeDesh ka AamNagrik' (UDAN) which seeks to connect unserved and under-served airports as well as make flying more affordable, with fares capped at Rs 2,500 for one-hour flights.

### **Research Methodology**

#### **Scope of the Study**

The present study is confined to A study on Post Hoc Tests on Occupational perception for UDAN services in India

#### **Objectives of the Study**

The main objective of the A study on Post Hoc Tests on Occupational perception towards UDAN scheme. In the broader framework, the specific objectives of the study are as under:

- (i) To study the post hoc analysis of student with service, self-employed and others for perception in UDAN service.
- (ii) To understand the post hoc analysis of service with student, self-employed and others for perception in UDAN service.
- (iii) To comprehend the post hoc analysis of self-employed with service, student and others for perception in UDAN service.
- (iv) To twig the post hoc analysis of others, self-employed service and student for perception in UDAN service..

### **RESEARCH HYPOTHESES**

To validate the results of the study, the following hypotheses have been formulated:

**H<sub>01</sub>:** There is no relationship between occupations student, service, self-employed and others towards the satisfaction in UDAN services

**Sample Profile**

In the present study, the population considered is all the customers of aviation industry. But the target population is defined by considering all the customers using UDAN service during the target period of study *i.e.* 2017. Judgment sampling was used to collect the data. As the population was not defined, therefore standard proportion formula was adopted for sample selection.

**Data Collection**

The present study was based on both primary and secondary data. Primary data were collected through well-structured questionnaire on 5-point Likert scale *i.e.* Strongly Disagree (SD), Disagree (D), Indifferent (I), Agree (A) and Strongly Agree (SA). After examination, 103 questionnaires were found complete in all respect and considered for further analysis. Secondary data include the research studies and articles published in various journals, magazines, newspapers and websites.

**Reliability Test for Scale**

A reliability coefficient of 0.60 or higher is considered "acceptable" in most social science research situations. The alpha coefficient is 0.802 for 12 items of customer satisfaction suggesting that these items have relatively high internal consistency.

**Data Analysis**

The collected data were analyzed through descriptive statistical techniques like frequency distribution, percentage, mean, standard deviation, *etc.* For coding and analyzing the data, weights were assigned in order of importance *i.e.* 1 to Strongly Disagree (SD), 2 to Disagree (A), 3 to Indifferent, 4 to Agree (A), and 5 to Strongly Agree (SA). ANOVA were used to test the hypotheses and validate the results. The analysis is in conformity with the objectives of the study and the hypotheses formulated. The collected data were analyzed through SPSS.

**Limitations of the Study**

The study was confined to the study of perception of customers only but did not consider the industry's viewpoint. As UDAN is a new concept and there is a lack of awareness among the people about the scheme, therefore the sample size was limited to 103 respondents only. The results derived based on sample may not be generalized on population.

**Significance of the Study**

The present study would be beneficial to the policy makers, aviation employees, and researchers to know the levels of passengers' satisfaction to formulate the suitable strategies to improve customer satisfaction.

**Table-1: Quality of in-flight Was Satisfactory**

(I) Occupation	(J) Occupation	Mean Difference (I-J)	Std. Error	p-value	95% Confidence Interval	
					Lower Bound	Upper Bound
Student	Service	.0500	.2337	.997	-.561	.661
	Self-Employed	.0250	.2630	1.000	-.662	.712
	Others	-.5417	.4383	.606	-1.687	.604
Service	Student	-.0500	.2337	.997	-.661	.561
	Self-Employed	-.0250	.2512	1.000	-.681	.631
	Others	-.5917	.4314	.520	-1.719	.536
Self-employed	Student	-.0250	.2630	1.000	-.712	.662
	Service	.0250	.2512	1.000	-.631	.681
	Others	-.5667	.4479	.587	-1.737	.604
Others	Student	.5417	.4383	.606	-.604	1.687
	Service	.5917	.4314	.520	-.536	1.719
	Self-Employed	.5667	.4479	.587	-.604	1.737

Degree of freedom=3, 99 Source: Survey

Post hoc analysis for occupation level-wise perception of the customers about satisfaction about quality of in-flight was satisfactory in UDAN is given in Table 1, which shows that Students have no significant difference than service persons (Mean Difference=.0500, SE=.2337) which is supported by opposite signs of Lower bound=-.561 and Upper bound .661. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=0.997$ ,  $df=3, 99$ ) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

Similarly, Student have no significant difference than self-employed (Mean Difference=.0250, SE=0.2630) which is supported by opposite signs of Lower bound=-.662 and Upper bound .712. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=1.000$ ,  $df=3$ , 99) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

Similarly, Student have no significant difference than others (Mean Difference=.5417, SE=0.4383) which is supported by opposite signs of Lower bound=-1.687 and Upper bound .604. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=.606$ ,  $df=3$ , 99) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

**Table-2: Meals Were Timely Delivered**

(I) Occupation	(J) Occupation	Mean Difference (I-J)	Std. Error	p-value	95% Confidence Interval	
					Lower Bound	Upper Bound
Student	Service	.1063	.2277	.966	-.489	.701
	Self-Employed	-.3488	.2562	.527	-1.018	.321
	Others	.3646	.4270	.828	-.751	1.481
Service	Student	-.1063	.2277	.966	-.701	.489
	Self-Employed	-.4550	.2447	.252	-1.095	.185
	Others	.2583	.4202	.927	-.840	1.356
Self-employed	Student	.3488	.2562	.527	-.321	1.018
	Service	.4550	.2447	.252	-.185	1.095
	Others	.7133	.4364	.364	-.427	1.854
Others	Student	-.3646	.4270	.828	-1.481	.751
	Service	-.2583	.4202	.927	-1.356	.840
	Self-Employed	-.7133	.4364	.364	-1.854	.427

Degree of Freedom=3, 99 Source: Survey

Post hoc analysis for occupation level-wise perception of the customers about satisfaction about meals were timely delivered in UDAN is given in Table 2, which shows that Student have no significant difference regarding Meals were timely delivered than service persons (Mean Difference=.1063, SE=0.2277) which is supported by opposite signs of Lower bound=-.489 and Upper bound .701. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=0.966$ ,  $df=3$ , 99) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

Similarly, self-employed have no significant difference than service (Mean Difference=.4550, SE=0.2447) which is supported by opposite signs of Lower bound=-.185 and Upper bound 1.095. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=.252$   $df=3$ , 99) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

Similarly, others have no significant difference than students (Mean Difference=.3646, SE=0.4270) which is supported by opposite signs of Lower bound=-1.481 and Upper bound .751. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=.828$ ,  $df=3$ , 99) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

**Table-3: Quality of Food and Beverage was Satisfactory**

(I) Occupation	(J) Occupation	Mean Difference (I-J)	Std. Error	p-value	95% Confidence Interval	
					Lower Bound	Upper Bound
Student	Service	.0813	.2342	.986	-.531	.693
	Self-Employed	.1363	.2636	.955	-.553	.825
	Others	.3229	.4394	.883	-.825	1.471
Service	Student	-.0813	.2342	.986	-.693	.531
	Self-Employed	.0550	.2518	.996	-.603	.713
	Others	.2417	.4324	.944	-.888	1.372
Self-employed	Student	-.1363	.2636	.955	-.825	.553

	Service	-.0550	.2518	.996	-.713	.603
	Others	.1867	.4490	.976	-.987	1.360
Others	Student	-.3229	.4394	.883	-1.471	.825
	Service	-.2417	.4324	.944	-1.372	.888
	Self-employed	-.1867	.4490	.976	-1.360	.987

Degree of freedom=3, 99 Source: Survey

Post hoc analysis for occupation level-wise perception of the customers about satisfaction about the punctuality of flights and ground deserved to be appreciated in UDAN is given in Table 4, which shows that Student have no significant difference than self-employed (Mean Difference=.1363, SE=0.2636) which is supported by opposite signs of Lower bound=-.553 and Upper bound .825. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=0.955$ ,  $df=3, 99$ ) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

Similarly, service people have no significant difference than others (Mean Difference=.2417, SE=0.4324) which is supported by opposite signs of Lower bound=-.888 and Upper bound 1.372. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=.944$ ,  $df=3, 99$ ) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

Similarly, others have no significant difference than self-employed (Mean Difference=-.1867, SE=0.4490) which is supported by opposite signs of Lower bound=-1.360 and Upper bound .987. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=.976$ ,  $df=3, 99$ ) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

**Table-4: The Punctuality of Flights and Ground Deserved to be Appreciated**

(I) Occupation	(J) Occupation	Mean Difference (I-J)	Std. Error	p-value	95% Confidence Interval	
					Lower Bound	Upper Bound
Student	Service	.5625	.2387	.092	-.061	1.186
	Self-Employed	.2175	.2687	.850	-.485	.920
	Others	-.0625	.4478	.999	-1.233	1.108
Service	Student	-.5625	.2387	.092	-1.186	.061
	Self-Employed	-.3450	.2566	.537	-1.016	.326
	Others	-.6250	.4406	.491	-1.776	.526
Self-employed	Student	-.2175	.2687	.850	-.920	.485
	Service	.3450	.2566	.537	-.326	1.016
	Others	-.2800	.4576	.928	-1.476	.916
Others	Student	.0625	.4478	.999	-1.108	1.233
	Service	.6250	.4406	.491	-.526	1.776
	Self-employed	.2800	.4576	.928	-.916	1.476

Degree of freedom=3, 99 Source: Survey

Post hoc analysis for occupation level-wise perception of the customers satisfaction about ticket was available properly online as well as offline in UDAN is given in Table 5, which shows that Student have no significant difference than self-employed (Mean Difference=.2175, SE=0.2687) which is supported by opposite signs of Lower bound=-.485 and Upper bound .920. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=0.850$ ,  $df=3, 99$ ) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

Similarly, service people have no significant difference than others (Mean Difference=-.6250, SE=0.4406) which is supported by opposite signs of Lower bound=-1.776 and Upper bound .526. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=.491$ ,  $df=3, 99$ ) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

Similarly, others have no significant difference than self-employed (Mean Difference=.2800, SE=0.4576) which is supported by opposite signs of Lower bound=-.916 and Upper bound 1.476. Multi comparison results show

that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=.928$ ,  $df=3$ , 99) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

**Table-5: Ticket was Available Properly Online as well as Offline**

(I) Occupation	(J) Occupation	Mean Difference (I-J)	Std. Error	p-value	95% Confidence Interval	
					Lower Bound	Upper Bound
Student	Service	.6125	.2337	.049	.002	1.223
	Self-Employed	-.0625	.2631	.995	-.750	.625
	Others	-.5625	.4384	.576	-1.708	.583
Service	Student	-.6125	.2337	.049	-1.223	-.002
	Self-Employed	-.6750	.2513	.041	-1.332	-.018
	Others	-1.1750	.4314	.038	-2.302	-.048
Self-employed	Student	.0625	.2631	.995	-.625	.750
	Service	.6750	.2513	.041	.018	1.332
	Others	-.5000	.4480	.681	-1.671	.671
Others	Student	.5625	.4384	.576	-.583	1.708
	Service	1.1750	.4314	.038	.048	2.302
	Self-employed	.5000	.4480	.681	-.671	1.671

Degree of freedom=3, 99 Source: Survey

Post hoc analysis for occupation level-wise perception of the customers satisfaction about Location of fairline offices and authorized agents was in reach in UDAN is given in Table 6, which shows that Student have a significant difference than service persons (Mean Difference=.7750, SE=0.2365) which is supported by opposite signs of Lower bound=-.157 and Upper bound 1.393. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=0.008$ ,  $df=3$ , 99) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is rejected.

Similarly, service people have a significant difference than students (Mean Difference=-.7750, SE=0.2365) which is supported by opposite signs of Lower bound=-1.393 and Upper bound .157. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=.008$ ,  $df=3$ , 99) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is rejected.

Similarly, others have no significant difference than self-employed (Mean Difference=.3000, SE=0.4534) which is supported by opposite signs of Lower bound=-1.485 and Upper bound .885. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=.911$ ,  $df=3$ , 99) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

**Table-6: Location of Airline Offices and Authorized Agents was In reach**

(I) Occupation	(J) Occupation	Mean Difference (I-J)	Std. Error	p-value	95% Confidence Interval	
					Lower Bound	Upper Bound
Student	Service	.7750	.2365	.008	.157	1.393
	Self-Employed	-.0500	.2662	.998	-.746	.646
	Others	.2500	.4437	.943	-.909	1.409
Service	Student	-.7750	.2365	.008	-1.393	-.157
	Self-Employed	-.8250	.2543	.009	-1.489	-.161
	Others	-.5250	.4366	.627	-1.666	.616
Self-employed	Student	.0500	.2662	.998	-.646	.746
	Service	.8250	.2543	.009	.161	1.489
	Others	.3000	.4534	.911	-.885	1.485
Others	Student	-.2500	.4437	.943	-1.409	.909
	Service	.5250	.4366	.627	-.616	1.666
	Self-employed	-.3000	.4534	.911	-1.485	.885

Degree of freedom=3, 99 Source: Survey

Post hoc analysis for occupation level-wise perception of the customers satisfaction about Airfarespricewasreasonable in UDAN is given in Table 7, which shows that Student have no significant difference than service persons (Mean Difference=.3875, SE=0.2319) which is supported by opposite signs of Lower bound=-.218 and Upper bound .993. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=0.344$ ,  $df=3, 99$ ) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

Similarly, service people have no significant difference than self-employed (Mean Difference=-.3000, SE=0.2492) which is supported by opposite signs of Lower bound=-.951 and Upper bound .351. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=.626$ ,  $df=3, 99$ ) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

Similarly, others have no significant difference than service persons (Mean Difference=-.6333, SE=0.4280) which is supported by opposite signs of Lower bound=-1.752 and Upper bound .485. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=.453$ ,  $df=3, 99$ ) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

**Table-7: Airfares Price: Was The Price Reasonable**

(I) Occupation	(J) Occupation	Mean Difference (I-J)	Std. Error	p-value	95% Confidence Interval	
					Lower Bound	Upper Bound
Student	Service	.3875	.2319	.344	-.218	.993
	Self-Employed	.0875	.2609	.987	-.594	.769
	Others	1.0208	.4349	.094	-.116	2.157
Service	Student	-.3875	.2319	.344	-.993	.218
	Self-Employed	-.3000	.2492	.626	-.951	.351
	Others	.6333	.4280	.453	-.485	1.752
Self-employed	Student	-.0875	.2609	.987	-.769	.594
	Service	.3000	.2492	.626	-.351	.951
	Others	.9333	.4444	.160	-.228	2.095
Others	Student	-1.0208	.4349	.094	-2.157	.116
	Service	-.6333	.4280	.453	-1.752	.485
	Self-employed	-.9333	.4444	.160	-2.095	.228

Degree of freedom=3, 99 Source: Survey

Post hoc analysis for occupation level-wise perception of the customers satisfaction about Decoration: Interiordesignofaircraftandcabinrewin UDAN is given in Table 8, which shows that Student have no significant difference than service persons (Mean Difference=.2250, SE=0.2321) which is supported by opposite signs of Lower bound=-.382 and Upper bound .832. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=0.767$ ,  $df=3, 99$ ) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

Similarly, service people have no significant difference than self-employed (Mean Difference=-.0800, SE=0.2495) which is supported by opposite signs of Lower bound=-.732 and Upper bound .572. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=.989$ ,  $df=3, 99$ ) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

Similarly, self-employed have no significant difference than others (Mean Difference=-.0200, SE=0.4450) which is supported by opposite signs of Lower bound=-1.183 and Upper bound 1.143. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=1.0$ ,  $df=3, 99$ ) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

**Table-8: Decoration: Interior Design of Aircraft and Cabin Crew**

(I) Occupation	(J) Occupation	Mean Difference (I-J)	Std. Error	p-value	95% Confidence Interval	
					Lower Bound	Upper Bound
Student	Service	.2250	.2321	.767	-.382	.832
	Self-Employed	.1450	.2613	.945	-.538	.828
	Others	.1250	.4354	.992	-1.013	1.263
Service	Student	-.2250	.2321	.767	-.832	.382
	Self-Employed	-.0800	.2495	.989	-.732	.572
	Others	-.1000	.4285	.995	-1.220	1.020
Self-employed	Student	-.1450	.2613	.945	-.828	.538
	Service	.0800	.2495	.989	-.572	.732
	Others	-.0200	.4450	1.000	-1.183	1.143
Others	Student	-.1250	.4354	.992	-1.263	1.013
	Service	.1000	.4285	.995	-1.020	1.220
	Self-employed	.0200	.4450	1.000	-1.143	1.183

Degree of freedom=3, 99 Source: Survey

Post hoc analysis for occupation level-wise perception of the customers satisfaction about onboardentertainmentin UDAN is given in Table 9, which shows that Student have no significant difference than service persons (Mean Difference=.3750, SE=0.2202) which is supported by opposite signs of Lower bound=-.200 and Upper bound .950. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=0.328$ ,  $df=3, 99$ ) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

Similarly, service people have no significant difference than students (Mean Difference=-.3750, SE=0.2202) which is supported by opposite signs of Lower bound=-.950 and Upper bound .200. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=.328$ ,  $df=3, 99$ ) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

Similarly, self-employed have no significant difference than service (Mean Difference=-.5050, SE=0.2367) which is supported by opposite signs of Lower bound=-.114 and Upper bound 1.124. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=.150$ ,  $df=3, 99$ ) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

**Table-9: On Board Entertainment**

(I) Occupation	(J) Occupation	Mean Difference (I-J)	Std. Error	p-value	95% Confidence Interval	
					Lower Bound	Upper Bound
Student	Service	.3750	.2202	.328	-.200	.950
	Self-Employed	-.1300	.2478	.953	-.778	.518
	Others	.4167	.4131	.745	-.663	1.496
Service	Student	-.3750	.2202	.328	-.950	.200
	Self-Employed	-.5050	.2367	.150	-1.124	.114
	Others	.0417	.4065	1.000	-1.021	1.104
Self-employed	Student	.1300	.2478	.953	-.518	.778
	Service	.5050	.2367	.150	-.114	1.124
	Others	.5467	.4221	.568	-.556	1.650
Others	Student	-.4167	.4131	.745	-1.496	.663
	Service	-.0417	.4065	1.000	-1.104	1.021
	Self-employed	-.5467	.4221	.568	-1.650	.556

Degree of freedom=3, 99 Source: Survey

Post hoc analysis for occupation level-wise perception of the customers satisfaction about loyaltyprogrammeVIPcardfrequentflyerprogrammein UDAN is given in Table 10, which shows that Student have no significant difference than others (Mean Difference=.0208, SE=0.4222) which is supported by opposite signs of Lower bound=-1.082 and Upper bound 1.124. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of

different occupations ( $p=1.000$ ,  $df=3$ , 99) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

Similarly, service people have no significant difference than students (Mean Difference=-.3625, SE=0.2251) which is supported by opposite signs of Lower bound=-.951 and Upper bound .226. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=.951$ ,  $df=3$ , 99) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

Similarly, self-employed have no significant difference than service (Mean Difference=-.1150, SE=0.2419) which is supported by opposite signs of Lower bound=-.517 and Upper bound .747. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=.964$ ,  $df=3$ , 99) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

Similarly, others have no significant difference than service (Mean Difference=-.3417, SE=0.4154) which is supported by opposite signs of Lower bound=-.744 and Upper bound 1.427. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=.844$ ,  $df=3$ , 99) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

**Table-10: Loyalty Programme VIP Card Frequent Flyer Programme**

(I) Occupation	(J) Occupation	Mean Difference (I-J)	Std. Error	p-value	95% Confidence Interval	
					Lower Bound	Upper Bound
Student	Service	.3625	.2251	.377	-.226	.951
	Self-Employed	.2475	.2533	.763	-.414	.909
	Others	.0208	.4222	1.000	-1.082	1.124
Service	Student	-.3625	.2251	.377	-.951	.226
	Self-Employed	-.1150	.2419	.964	-.747	.517
	Others	-.3417	.4154	.844	-1.427	.744
Self-employed	Student	-.2475	.2533	.763	-.909	.414
	Service	.1150	.2419	.964	-.517	.747
	Others	-.2267	.4314	.953	-1.354	.901
Others	Student	-.0208	.4222	1.000	-1.124	1.082
	Service	.3417	.4154	.844	-.744	1.427
	Self-employed	.2267	.4314	.953	-.901	1.354

Degree of freedom=3, 99 Source: Survey

Post hoc analysis for occupation level-wise perception of the customers satisfaction about flightsafety in UDAN is given in Table 11, which shows that Student have no significant difference than others (Mean Difference=-.1250, SE=0.4516) which is supported by opposite signs of Lower bound=-1.305 and Upper bound 1.055. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=.993$ ,  $df=3$ , 99) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

Similarly, service people have no significant difference than students (Mean Difference=-.2000, SE=0.2408) which is supported by opposite signs of Lower bound=-.829 and Upper bound .429. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=.840$ ,  $df=3$ , 99) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

Similarly, self-employed have no significant difference than service (Mean Difference=-.0350, SE=0.2588) which is supported by opposite signs of Lower bound=-.711 and Upper bound .641. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=.999$ ,  $df=3$ , 99) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

Similarly, others have no significant difference than service (Mean Difference=-.3250, SE=0.4445) which is supported by opposite signs of Lower bound=-.884 and Upper bound .836. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the

customers of different occupations ( $p=1.486$ ,  $df=3$ , 99) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

**Table 11: Flight Safety**

(I) Occupation	(J) Occupation	Mean Difference (I-J)	Std. Error	p-value	95% Confidence Interval	
					Lower Bound	Upper Bound
Student	Service	.2000	.2408	.840	-.429	.829
	Self-Employed	.2350	.2710	.822	-.473	.943
	Others	-.1250	.4516	.993	-1.305	1.055
Service	Student	-.2000	.2408	.840	-.829	.429
	Self-Employed	.0350	.2588	.999	-.641	.711
	Others	-.3250	.4445	.884	-1.486	.836
Self-employed	Student	-.2350	.2710	.822	-.943	.473
	Service	-.0350	.2588	.999	-.711	.641
	Others	-.3600	.4615	.863	-1.566	.846
Others	Student	.1250	.4516	.993	-1.055	1.305
	Service	.3250	.4445	.884	-.836	1.486
	Self-employed	.3600	.4615	.863	-.846	1.566

Degree of freedom=3, 99 **Source:** Survey

**FINDINGS**

Students have no significant difference than service persons about quality of in-flight were satisfactory. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

Students have no significant difference than self-employed which is supported by signs of Lower bound and Upper bound. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

Similarly, Student has no significant difference than others which is supported by opposite signs of Lower bound and Upper bound. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

Flight safety in UDAN is shown that Student have no significant difference than others which is supported by opposite signs of Lower bound and Upper bound. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations for flight safety.

Similarly, service people have no significant difference than students which is supported by opposite signs. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

Similarly, self-employed have no significant difference than service which is supported by opposite signs of Lower bound and Upper bound. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

Similarly, others have no significant difference than service which is supported by opposite signs of Lower bound and Upper bound. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

**SUGGESTIONS**

Quality of in-flight was satisfactory. UDAN schemes should be affordable for more booking. It should be done with collaboration with private partnership. Traffic congestion and safety issues are other points for consideration. Reduced check in time will be more beneficial. MRP of items and other services should be checked. Better food options should be provided to passengers. Better customer services are expected. More service quality. Sanitation must be taken care of. Delay in flights should be reduced, as far as feasible. Online

and Offline Ticketing Should be reliable for first time users. Interior should be more comfortable. Baggage security is also suggested to be taken care of. Work life balance of employees must be improved

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## JOB SATISFACTION TOWARDS THE AGE OF EMPLOYEES'

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**ABSTRACT**

*This is a research to study effect of age on job satisfaction. The factor of job satisfaction was identified by review of literature and pilot study. Twelve factors of job satisfaction were identified which affect employees' satisfaction. It is a descriptive type of research and based on primary and secondary data. Primary data was collected from books, journals, magazines and websites. Secondary data was collected from self-administered questionnaires. Questionnaires asked questions about demographic details and twelve questions about employees' satisfaction. After data collection, data analysis was done using SPSS version 21. Statistical tools used in this study are percentages, correlation, regression analysis, reliability analysis and hypothesis testing. Hypothesis was tested by regression analysis. The result of regression analysis proved that the impact of age of respondents on job satisfaction is not significant.*

*Keywords: Job Satisfaction, Age*

**1. INTRODUCTION**

Studies in the area of job satisfaction as an important and popular research topic started decades ago. In 1935, the concept of job satisfaction gained importance through the publication of a monograph by Hoppock on "Job Satisfaction". Hoppock in his monograph defined job satisfaction as "any combination of psychological, physiological and environmental circumstances that cause a person truthfully to say I am satisfied with my job". (Frukh. et al 2009)

Many researchers and investigators identified that job satisfaction has direct relations to human psyche, emotion, behavior and attitude. These all parameters help the individual to understand what the level of job satisfaction showed by others (Nazir et al., 2013). In current era, most organizations set out their goals regarding employees and customers' satisfaction. One of the important goals of any organization is job satisfaction of employees (Mohammed & Eleswed, 2013).

**1.1. Factor Affecting Job satisfaction**

The organizational determinants play an important role in job satisfaction. Employees spend lots of time in organization so there are number of organizational factors that affect satisfaction of the employees. The employee satisfaction in the organization can be increased by organizing and managing the organizational factors (Sageer, 2012). Following these 10 variables come in this category:-

**i. Working Environment**

Work environment plays an important role in influencing job satisfaction, as a comfortable physical work environment that will ultimately render a more positive level of job satisfaction in employees (Robbins 2001). Lack of favorable working conditions, amongst other things, can affect badly on the employees' mental and physical health (Baron and Greenberg, 2003).

**ii. Workload and Stress Level**

Dealing with a workload that was too heavy and deadlines that were impossible to touch it can cause job dissatisfaction in the most dedicated employee. The office operates in a crisis mode because supervisors did not have enough time to perform the assigned tasks effectively or because staff levels are inadequate (Swarnalatha & Vasantham, 2011).

**iii. Respect from Co-Workers**

Employees seek to be treated with respect by those they work with. A hostile work environment with rude or unpleasant coworkers is one that usually has lower job satisfaction.

**iv. Organization Development**

Organizational development is a continuous and organized process to implement effective change in an organization. Its objective is to enable the organization to adopt better to the fast-changing external environment of new markets, regulations, and technologies. It starts with a careful organization-wide analysis of the current situation and of the future requirements (Sageer, 2012).

**v. Policies of Compensation and Benefit**

Pay is one of the fundamental components of job satisfaction since it has a powerful effect in determining job satisfaction. Employees should be satisfied with competitive salary packages and they should be satisfied with it when comparing their pay packets with those of the outsiders who are working in the same industry. Individual has infinite needs and money provides the means to satisfy these needs, (Arnold and Feldman 1996).

**vi. Promotion and Career Development**

Promotion can be reciprocated as a significant achievement in the life. It promises and delivers more pay, responsibility, authority, independence and status. So, the opportunity for promotion determines the degree of satisfaction to the employee. There is a consensus among the researchers that job satisfaction is strongly associated with the opportunities for promotion (Pergamit & Veum, 1999; Sclafane, 1999).

**vii. Job Security**

Job security is an employee's assurance or confidence that they will keep their current job. Employees with a high level of job security have a low probability of losing their job in the near future. Certain professions or employment opportunities inherently have better job security than others; job security is also affected by a worker's performance, success of the business and the current economic environment (Simon, 2011).

**viii. Relationship with Supervisor**

Research demonstrates that a positive relationship exists between job satisfaction and supervision (Smucker, Whisenant, & Pederson, 2003). According to Ramsey (1997), supervisors contribute to high or low morale in the workplace. The supervisor's attitude and behavior toward employees may also be a contributing factor to job-related complaints (Sherman & Bohlander, 1992). Supervisors with high relationship behavior strongly impact on job satisfaction (Graham & Messner, 1998; Luddy, 2005).

**ix. Leadership Styles**

The satisfaction of employees was also affected by the leadership style. Employee satisfaction is high with democratic style of leadership. It is because democratic leaders encourage friendship, respect and warmth relationship among the employees. On the other hand employees working in authoritarian and dictatorial leaders show lower employee satisfaction (Sageer, 2012).

**1.2. OBJECTIVE OF THE STUDY**

- A. To identified the components of employee satisfaction.
- B. To analyse the effect of age on employee's satisfaction.

**1.3. Hypothesis**

**Alternative Hypothesis (H1):** Age has a direct significant effect on employee's satisfaction.

**Null Hypothesis (H0):** Age has no direct significant effect on employee's satisfaction.

**1.4. LIMITATIONS OF THE STUDY**

The limitation in the theoretical framework is that only one demographic variables were studied in the current research which affect employee's satisfaction. Impact of other variables and interaction effects of those variables with employee's satisfaction are not taken into account. It would be ideal to take up a larger sample in future research to avoid practical restrictions. The other limitation is the swearing of an oath of secrecy and indifference on the part of interviewees and respondents were limitations to the study as some of the employees felt uncomfortable and other were simply not bothered.

**2. REVIEW OF LITERATURE**

Soni, Chawla and Sengar (2017) their study find a significant correlation between the variables from job satisfaction and employee experience. Their study also shows that relationship between job satisfaction and employee experience and job satisfaction to some extent is dependent on employee experience. So it is important for companies in today's world to make sure that the experience of employees in their organization is a positive one as it would affect the job satisfaction of employees and would also create a word of mouth amongst the work force.

Riza, Ganzach, Liu (2015) studies contributes to job satisfaction research by providing a rigorous, empirical answer to the question of whether and how the two primary time metrics, age and tenure, relate to job satisfaction and whether job rewards mediate this relationship. They leveraged two multiyear, large-scale representative longitudinal datasets to study age and tenure in relation to job satisfaction simultaneously. They found that people became less satisfied as their tenure increased within each organization, yet as people aged

and transitioned from organization to organization their satisfaction increased. Their study also found that an exemplar of job rewards, pay, mediated these relationships.

**Samaiya (2015)** founded that there is no significant difference in employee satisfaction in employees of public and private sectors. No significant difference found in employee satisfaction in employees along age, and gender in public and private sectors.

**Yapa, Rathnayake, Senanayake, and Premakumara (2014)** The younger staff members (age group 20-40) were more satisfied than older staff members (Age group 41-60). Interacted effect of age and job category showed relatively high satisfaction of young technical staff members while older group of technical staff had the least satisfaction. Although young and old clerical staff had nearly equal level of job satisfaction; in labourer grades young males were more satisfied than older labourers. Human resource managers need to concern more about carrier needs of older labourers. They have devoted their energy for long years for the sake of the institution.

**Oktug (2013)** The results of the study showed that age and organizational tenure do not affect job satisfaction. However, job tenure has a moderating effect on job satisfaction.

**Parvin and Kabir (2011)** had performed research on "Factors Affecting Employee Job Satisfaction of Pharmaceutical Sector". The study attempted to evaluate job satisfaction of employees in different pharmaceutical companies. The result shows that salary, efficiency in work, fringe supervision, and co-worker relation are the most important factors contributing to job satisfaction.

**Sowmya and Panchanatham (2011)** studied on "Factors influencing job satisfaction of banking sector employees in Chennai, India". The result describes that in the case of job satisfaction aspects the commercial banks perceived pay and promotion is an indispensable factor to decide their satisfaction level. The employees have significant inclination towards optimistic supervisory behaviour and pleasant organizational setup. The factor analysis meticulously identified that the job, suitability as well as the working condition and other, interpersonal relationship among the workers are able to, ascertain their level of satisfaction within the working, domain.

**Nousheen, et.al. (2009)** had conducted the research in order to critically evaluate and examine the level of employees' satisfaction as well as the factors of dissatisfaction among the employees **and** especially among the hardworking managers, and to find out the reasons which make them realize that they do not have a clear of Karachi Electric Supply Corporation (KESC). The results had shown that working environment, total compensation, growth opportunities and training & development are significant factor and these four are affecting job satisfaction and correlated with each.

**Avery, McKay & Wilson (2007)** the suggest that organizations can capitalize on the prospective value added by older workers by surrounding aging employees is efficient, reliable, knowledgeable, and enthusiastic peers. Doing so should create psychological conditions in the workplace to increase their engagement, which should aid in decreasing turnover, absenteeism, and employee theft and enhancing customer service, safety, and performance.

**Bernal, Snyder & McDaniel (1998)** there findings conclude that there is a positive linear relationship between age and job satisfaction, albeit a weak association. Aging is a multifaceted process that should not be represented in simple terms of chronology alone, because changes are brought on by various physiological, social, and psychological factors (Warr, 1994). Thus, the psychological mechanisms that accompany aging need to be properly identified in order to enhance the prediction of job satisfaction based on age. Such research should allow investigators to find more definitive (and thus stronger) relations between variables associated with the "aging process" and job satisfaction.

**Judge and Hulin (1993)** had performed research on "Job satisfaction as a reflection of a disposition: a multiple source causal analysis". Their findings suggested that employee satisfaction is positively correlated with motivation, job involvement, organizational citizenship behaviour, organizational commitment, life satisfaction, mental health, and job performance and negatively related to absenteeism, turnover, and perceived stress and identify it as the degree to which a person feels satisfied by his/her job.

### 3. RESEARCH METHODOLOGY

The present research focused on the effect of employees age on their job satisfaction level. The variables of job satisfaction were identified by literature review, secondary data and pilot study. The factors identified were work environment, relationship with superior, relationship with peer group, job security, decision making, leadership, performance appraisal, career growth, physical condition of job, opportunity to learn, working hour & job location. Employees are divided in three age group *first* is 25-35-year-old employees, *second* 35-45-year-

old employees and *third* is 45 years above. Sample size 50 respondent. The survey instrument was composed of questions relating to demographic details and employee satisfaction. Questionnaire used was self-administered based on Likert scale (1= highly dissatisfied, 2= dis satisfied, 3= neutral, 4= satisfied, 5= highly satisfied) format with a five-point response scale. In questionnaire the respondents were given five response choices. Perception regarding the employee’s satisfaction was obtained through 12 item questions. Percentage analysis, correlation and regression analyse are used as a Statistical tool in a study.

**4. ANALYSIS AND DISCUSSION**

**4.1. Description of the Respondents**

AGE OF RESPONDENT					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	25-35 YEAR OLD	23	46.0	46.0	46.0
	35-45 YEAR OLD	12	24.0	24.0	70.0
	OVER 45 YEAR OLD	15	30.0	30.0	100.0
	Total	50	100.0	100.0	

The description of respondent according to age groups is 46% of respondent is 25-35 year-old, 24% respondent is 35-45 year- old, and the 45 year old and above respondent were 30%.

**4.2. Percentage Analysis**

**Percentage Analysis** was done to summarize quantitative data in a manageable and user-friendly way to obtain a holistic overview of the research data. Percentage Analysis had been completed in three age group. From the study of review of literature twelve variables were identified which affect employees’ satisfaction. To calculate the level of employees’ satisfaction with these variables, the percentage of employees satisfied with each of the twelve variables was calculated.

**Percentage Satisfaction Level of Employees According to Age**

Sl. No.	Job Satisfaction Variable	Satisfaction Level 25-35 year old	Satisfaction Level 35-45 Year old	Satisfaction Level 45 Year Above
1.	Work Environment	65%	66%	86%
2.	Work load	65%	91%	73%
3.	Work relationship with co-workers	86%	91%	86%
4.	Job Security	60%	75%	93%
5.	Decision making	73%	58%	60%
6.	Leadership	60%	66%	46%
7.	Performance Appraisal	47%	58%	80%
8.	Career Growth	65%	66%	93%
9.	Physical Condition of Job	65%	66%	80%
10.	Opportunity to Learn	86%	91%	86%
11.	Working Hour	73%	83%	100%
12.	Job Location	78%	83%	100%

The result of percentage analysis shows that satisfaction level of work environment, job security, performance appraisal, career growth, physical condition of job, working hour and job location found highest in 45 year-olds and above respondent. The satisfaction level of work load, relationship with co-worker, leadership, opportunity to learn found highest in 35-45 year- old and the satisfaction level of decision-making is found highest in 25-35 year old employees.

The employee satisfaction was increase with increasing age. The senior employees of 55 years and above had satisfaction level maximum then other age groups in all the variables except Appropriate & Fair Compensation. The youngest employees of 25-35 year-old had minimum satisfaction level then other age group except monetary compensation and appropriate and fair compensation. Employees’ satisfaction and satisfaction with retirement benefits and recognition and reward increases with increasing age, but there was no such linear relation was seen with monetary compensation and appropriate and fair compensation.

**4.3. Correlation**

Correlation was between the compensation variables and the demography of respondent was calculated. In interpreting the correlation the guidelines suggested by Cohen (1988) were followed. In terms of these writings, correlation coefficients of r=0.10 show a small effect size. Correlations of r=0.30 show a medium effect size whilst those of r=0.50 indicate a large effect size. These guidelines assist in quantifying and reporting on the

effect sizes of the findings. Pearson correlation coefficient was used to measure the strength of association between these variables at \* $p < 0.01$  and \*\* $p < 0.05$  level.

		AGE OF RESPONDENT
Age Of Respondent	Pearson Correlation	1
	Sig. (2-tailed)	
Work Environment	Pearson Correlation	.296*
	Sig. (2-tailed)	.037
Work Load	Pearson Correlation	-.036
	Sig. (2-tailed)	.805
Work Relationships	Pearson Correlation	-.084
	Sig. (2-tailed)	.561
Job Security.	Pearson Correlation	.245
	Sig. (2-tailed)	.086
Put Forward My Opinions.	Pearson Correlation	-.207
	Sig. (2-tailed)	.148
Leaders	Pearson Correlation	.014
	Sig. (2-tailed)	.924
Performance Appraisal	Pearson Correlation	.200
	Sig. (2-tailed)	.163
Career Growth	Pearson Correlation	.170
	Sig. (2-tailed)	.237
Physical Job	Pearson Correlation	-.101
	Sig. (2-tailed)	.484
Opportunity To Learn.	Pearson Correlation	-.180
	Sig. (2-tailed)	.210
Working Hour.	Pearson Correlation	.039
	Sig. (2-tailed)	.790
Job Location	Pearson Correlation	.125
	Sig. (2-tailed)	.388

From the above table it is evident that strong positive correlation was seen between age and work environment, performance appraisal, career growth and job security.

The workload, relationship with co-worker, decision making, opportunity to learn and physical condition of job has strong negative correlation with age. The leader, career growth, job location and working hour does not have strong correlation with age.

4.4. Regression

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.081 <sup>a</sup>	.006	-.014	.59191

a. Predictors: (Constant), Age Of Respondent

ANOVA <sup>a</sup>						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.110	1	.110	.314	.578 <sup>b</sup>
	Residual	16.817	48	.350		
	Total	16.927	49			

a. Dependent Variable: Job Satisfaction  
b. Predictors: (Constant), Age Of Respondent

Coefficients <sup>a</sup>						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.731	.290		12.877	.000
	Age Of Respondent	.055	.098	.081	.560	.578

a. Dependent Variable: Job Satisfaction

The model summary showed that Adjusted R Square is a -.014. The regression test implies that model is fit having F value .314. The overall p-value of model is <0.001. This shows that Monetary Compensation has significant effect on employee satisfaction. The regression coefficient of monetary compensation is .055 with p-value of  $p < 0.001$ . It shows that a unit change in monetary compensation causes almost 5.5 % change in employee satisfaction. The t value for monetary compensation is .560. In the above variables t value is less than 2.5. According to the rules if t value is lesser than 2.5 ( $2.5 > t$ ) than null hypothesis will be accepted and alternate hypothesis will be rejected. Results had showed that age does not has a strong a significant impact on job satisfaction and hypothesis was rejected.

## 5. CONCLUSION AND RECOMMENDATION

This study was design to investigate Job Satisfaction level towards the age of respondent. The result of regression analysis, correlation analysis and regression analysis shows that impact of age on employees' satisfaction is negligible. The impact of age on employees' satisfaction is evidently visible only in job security, performance appraisal, working hour and job location variable of employees' satisfaction.

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**GAMIFICATION: A NEW TOOL FOR RECRUITMENT**

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**ABSTRACT**

*Now a day’s HR Professional face biggest challenges in finding suitable candidate for required vacancies. Due to the advancement of the internet nowadays the traditional recruitment process has been reshaped. The fast growing technological innovation creates several changes in recruitment practices, in recent days companies are using gamification for recruitment which make the process simpler and faster than earlier. Gamification of the process creates time for the recruiter, organizes their tasks and deeply engages them in the creative steps of sourcing the best talent. This paper will explore the concept of gamification in recruitment process.*

*Keyword: Gamification, Recruitment, Game*

**INTRODUCTION**

Employees are asset of an organization. Acquiring the right talent can be a challenging task for the HR Professionals. Gamification is an emergent technique, to contact the candidates on individual bases. Gamification is latest concept which helps to recruit, select and retain the employee in the current position. By using games as a strategy for recruitment the HR professionals to judge the candidate’s aptitude, innovation in thinking, problem solving competencies. In addition to that the can assess the candidates specific skills like creative thinking, time management etc. It save time of process candidate elimination, less stress in recruitment, helps to keep competitor, which not possible with the traditional recruitment process.

To contact the candidates on individual bases. Gamification is latest concept which helps to recruit, select and retain the employee in the current position.

**Fig-1: Reasons for using Gamification**



Source: TalentLYFT

HR Professionals need to design the recruitment game to inspire potential candidates to engage with careers portal and social media. A game is not only for psychometric test, it attracts more candidates so the recruiter can easily hire the best candidate for the required position by shortlisting those who achieve the highest score in the game.

**Gamification in Recruitment**

In Modern days recruiter know that gamification is the best way to tap millennial candidates who have grown up playing reality games. Among talent management organizations, a generally agreed upon definition is that gamification is the concept of applying game mechanics and game design techniques to engage and motivate people to achieve goals. A recent report on gamification by Markets and predicts that the gamification industry will grow by 67 percent by 2018 and worth estimated to \$5.5 billion. Gamified recruitment enable recruiters to significantly enhance talent pool, make better selection of candidates using the platforms cognitive to test candidates behavior, strengthen brand value and to able to attract and retain the right candidate.

**APPLICATION OF GAMIFICATION**

**Employee Referral Tool**

Gamification has leverage to boost the employee to share job vacancies on prominent social networks. For example, providing a cash rewards like, share job vacancies with five friends and get a chance to win cash awards. It will work just like an in house referral program except that with social sharing which reach wider.

**Virtual job fair**

The internet allow the recruiters to create fun and engaging virtual job fairs for attract the candidates. Theses virtual job fairs can employ different logic games to test the skill and abilities of job seekers, assist the recruiter to screen the right ones with ease and accuracy. There are plenty of tools online which enable recruiter to create a virtual job fair with ease. Recruiter can also design fair in a way that will also test candidate’s skills and qualifications, narrowing down our choice of the right people.

**Puzzles:**

Puzzles are effective and low cost recruitment strategy for gaining valuable insights throughout the sourcing cycle. It assists the recruiter to assess the problem solving skills among jobseeker. Puzzles help recruiters check the ability of candidates without putting them bore and time consuming screening test.

**Rewards:**

If the organizations have a careers site as a part of recruitment process, it offers plenty of scope for gamification and makes the process more engage. It can include reward point and badges for jobseekers every time they leave a comment or rate company videos.

**Video Interview:**

Video interviews are favorable for both employers and job seekers. Employees can cut down the costs because they no need to go for interview location and they can back to work quickly. On the hand, there was less stress for the candidates because they can present themselves from the comfort zone which in their home or in their workplace.

**Real time Progress Bar**

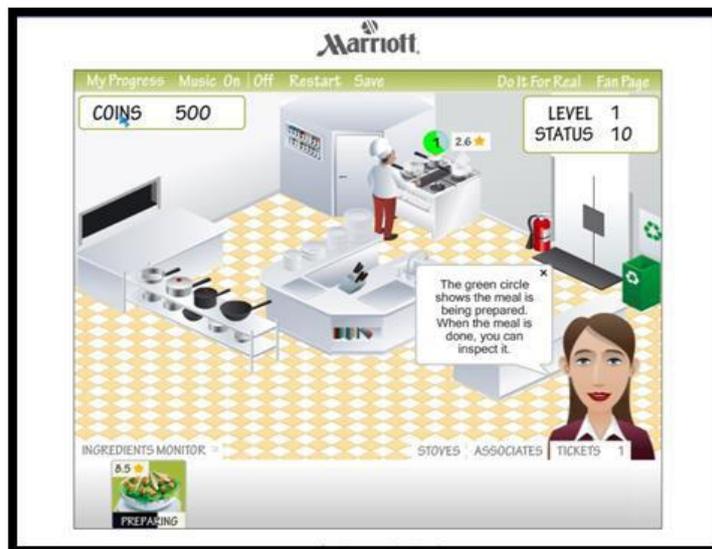
Great way to use a candidate-centric careers portal is to provide an easy-to-follow progress bar where candidates can check their progress in the recruitment funnel in real-time. This will not only keep them updated and engaged but also help them stay focused on reaching the next stage and collecting the prize.

**ORGANIZATIONS USING GAMIFICATION:**

Tech master Google has been organising a Google Code Jam software-writing competition for 12 years as a way to find fresh, new talent to work for the company.

**Marriott**

Marriott International developed a game called My Marriott Hotel to recruit millennials. It permits candidates to run their own virtual hotel and other functions. Players design their own restaurant, procure stock on a budget, train employees and serve guests. They are award score for happy customers, and they lose score for poor customer service.

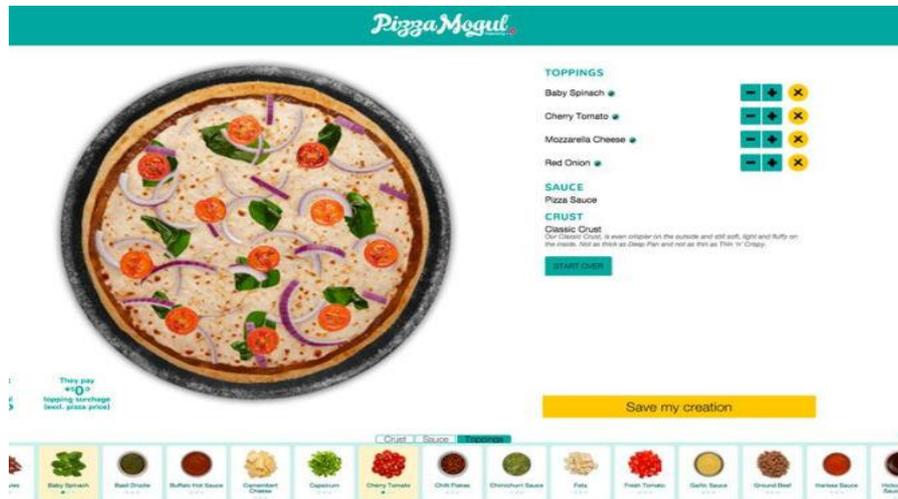


Source: Recruiter Box

**Domino's**

Domino's launched a game named "Create Your Own Pizza Legend." It's available for everyone. The customers have a chance to create their digital pizza and they get all the fame for it. The customers have an opportunity to make their own digital pizza. Instead of inviting all candidates for test, by using this type of game in recruitment process to simplifies test to examine their activity by allowing them to play with digital ingredients

Gamification is relevant to the all industries. Hiring manager can test the multiple candidates, can help them to hire the qualified candidate than actual interview



Source: Recruiter Box

**CONCLUSION**

Gamification helps the both hiring manager and application can interact more fun and meaningful. Not only has the recruiter had ability to better assess the applicant through real game, but applicant too would be enthralled to be part of such innovative organization. Gamification has the potential to work as a talent magnet.

Gamification is the chance to make employer-candidate interactions more fun and meaningful. Not only will the recruiter be able to better assess talent through real games, but candidates too would be enthralled to be a part of such an innovative company. Gamification has the potential to work as a talent magnet.

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**TRANSFORMING TO SMART DIGITAL SUPPLY CHAIN – TECHNOLOGY –SUSTAINABILITY-  
INNOVATION**

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**INTRODUCTION**

A world where automation comes together, with technology, to deliver products without human intervention is digital supply chain.

Digital supply chain is an authentic media come into existence, which encompasses the process of delivery of a digital media, from the point of origin (content provider) to the destination (consumer) in a supply chain.

In supply chain it is the processing of the order which end up into a consumable product.

Digital supply chain was configured to distribute goods or services, that had been in the early times had been previously been done on a physical form of goods and services.

The content provider provides the necessary format into digital files, hard disks, in a digital supply chain.

The content which is in the digital form is to set to capture the digital forma by the content provider, and convert them into digital supply chain format, which undergo various process, including quality process in supply chain.

The digital file in supply chain, which may usually be large as the matter confined to supply chain does not matters, which requires appropriate digital storage, and does become impossible to delivery in broad band form, are compressed into a process of encoding or trans-coding.

Digital supply chain data is a fundamental problem, due to continuous growth, and since the increasing number of complex problems, that comes up due to competitive advantage in supply chain.

**Cost:** Low cost including using of cloud, storage, encourages organization, to capture all supply chain data, but due to aggregate system, in a supply chain the cost may be higher, and it is necessary to retain how much data is necessary, and to gauge which is essential or non-essential.

**Value:** The growing consensus in supply chain drives to the value of data to be developed into a single data, managing the strategy that overlooks the business goals in digital supply chan.

The data of strategy should be complied with simplification, and the approach for data acquisition should classify in supply chain.

Data for guiding on artificial intelligence technology in digital supply chain is important, and also machine learning can help to automate, and integrate the data in digital supply chain.

Internet of things, block chain is technology in supply chain that transforms the magnitude of cloud technology in digital supply chain.

**Risk:** Much is needed in digital supply chain, with complex data that go into the interpretation of supply chain. Advance analytics with data strategy results in complication, and rather mistaken identities in supply chain. Inadvertent data leads to risk in digital supply chain.

**LITRATURE REVIEW**

If an order is placed by a consumer in a digital supply chain, the 3D printer's pick-up, the details, and print the requirement of finished product. It is then picked by robots, from the shelves packed and placed, into a self driven truck. The trucks leave the facility, and drones are automatically dispatched from the truck to deliver products while moving. The truck never stops until arriving for re-loading this is the future of digital supply chain.

Generate a huge data that leverage the supply chain. The same data have a drastic impact on supply chain planners, and agencies around the globe, it is important that you understand how the top emerging trends in the digital supply will shape the supply chain, and transportation process in coming years.

The objective to understand supply chain is on the right path, towards using of digital 3D printers, internet of things, and artificial intelligence in supply chain:

Methodology surveys conducted by the supply chain, and the methods adapted to digital insights has been different in many ways.

Digital transportation and logistics in supply chain: **Telematic** (enabling fleet, manages drivers to mitigate the customer issues with significant supply chain disruption), and any disruption can happen in a small scale, in such cases when unpredictable traffic occurs, on a large scale will bound to have unscheduled delays in delivering the products, and to supplement the inventory it is best to have sufficient inventory to take care of any disruption, and the use of Global Positioning devices have changed the life of the driver in a transport vehicle. The driver can see real time traffic, jams, sense, and then shift due to congestion of roads, heavier traffic and also the maintenance status. The dispatcher can also sense the position of the vehicle also able to give the expected time of arrival; this concept is adoptable in supply chain. Digital systems in supply chain are changing rapidly for the logistic convenience.

The digital supply chain is very discrete, and largely penetrating into marketing products, development, manufacturing, and distribution of products, and finally into the hands of the consumer. Digital supply brings down the walls of supply chain into a completely integrated system, thus coinciding with fully transparent to all involved in supply chain, from suppliers, raw-materials, components, and spare parts to transporting of those supplies, and finished goods, and finally to customer demand fulfillment.

### **METHODOLOGY RESULTS**

The network of digital supply chain will depend upon number of key technology, associated with integrated planning, and execution systems logistics, visibility, autonomous logistic, smart procured, and warehousing spare parts management, and advanced analytics, this will result in supply chain, to react, to disruption in the supply chain, and even anticipate by fully implementing the network, creating and adjusting supply chain, real-time, conditions of change.

Digital supply chain have been used to improve service, and reduce cost with the wide availability, and adoption of powerful digital technology, include advanced analytics, cloud based solution organization are getting better returns on investment.

Digital supply chain and data has allowed emergence of supply chain to allow the organization: 1. Understand the customer needs more better, and thus match supply chain, and inventory. 2. Optimize the network to build an expensive supply chain, which optimizes manufacturing, distribution, and logistic transportation. 3. End-to-end visibility in digital supply chain thus enabling performance management, and operation success and digital supply chain.

Digital procurement in supply chain: The automation of digital procurement depends upon having real-time data base that combine to join the point of sale, loyalty of information in supply chain process. Procurement has changed considerably in digital supply chain management, with robotic process, automation, cloud based applications, sophisticated analytics, and they have gained importance. Classified procurement has been identified ways to make substantial gains and cost savings.

Digital supply chain will play a significant role in robotics and automation digital transformation to come by. There will be massive productivity gains to be made across manufacturing and logistics and also in the service sectors, as artificial intelligence that takes on some of the workload of certain white collar roles in supply chain. Going into digital in supply chain network, is a means of capitalizing on the inter-connecting of all the functions in supply chain. The key is seeing activities to come together and drive operational excellence across the network in supply chain. Will there be a change in demand if you automate exception management, and make it more predictive by leveraging analysis in supply chain.

If in making new designs to suppliers and switching over production will there be a surge in demand in supply chain. Is there a chance of suppliers calling apart, if predicted in digital supply chain and the aftermarket service is responding to change.

Digital supply chain can deliver: 1. Increase revenue. 2. Reduce cost 3. Reduce working capital. 4. Improve customer service. Digital supply chain becomes completely integrated, that is fully transparent to all players involved from suppliers of raw materials-components, parts, transporters, and of those suppliers and also finished goods, and finally customers demand fulfillment.

Digital supply chain network will depend upon a number of key technologies, integrated planning, and execution systems, logistic visibility, automation in logistics, smart procurement, and warehousing, spare parts management, and advanced analytics. This will result, and will enable companies to react to disruption in supply chain, and even anticipate them by fully modeling network, and creating, and adjusting supply chain real time in conditions of change.

The digital supply chain in planning and distribution, consists of key elements, which consists of integrated planning, and execution, and logistic visibility and volatility, procurement in modern digital system, smart warehousing, efficient spare parts management, autonomous supply chain management, and B2C logistics, prescriptive supplier analytics, and digital supply chain enablers.

### **DISCUSSION**

The goal of digital supply chain is ambitious to build, an altogether new kind of supply chain network, that is both resilient, and responsive, and if companies are to make digital supply chain- aggressive, and digital supply chain ecosystem a reality, and gather technologies, and build capabilities it must also find right people with right skills, and manage the supply chain, and transform the entire organization.

The digital supply is a new media, which encompasses the process of delivery from the point of origin (provider) to destination (consumer). In this process the physical media must go through a process in ordering to mature into a consumable product digital media, and must pass through various stages in processing to get to a point in which a consumer can comply the concept of supply chain activities.

Digital Supply chain trends that digitalization that will experience: 1. Picking optimization: when with the use of wireless network, mobile computer, RFID technology, and voice picking, application, it can extend the facilities to the mobile worker in supply chain activities. Mobile and wireless systems make workers more productive, and reduce the labor required to manage materials, Bar code or RFID data to capture improves and preserve inventory accuracy. While providing real time, visibility in supply chain.

Facility planning In digital supply chain the implementation of easy work flow through facility planning, as this saves money, capital investment, freight or container loading, automatic loading facilities which could replace physical loading and unloading, with driverless SUV vehicles, lifts, with heads on display and step-by-step instructions on how efficient load a container given the size, dimensions, weight, and packages, going into it in digital supply chain.

Traffic support in supply chain going digital which is being equipped with Global Position devices systems and navigation controls that allow carriers to efficiently route shipments, without the distraction to the driver. The display will show the importance when transporting special materials of medical supplies thus maintaining cargo temperature which importance should be given to digital supply chain.

All these aspects clearly should change the digitalization of supply chain, but one understanding is that how it plays in a work-in-progress. Breaking down some of the enabling technology should help logistic manner, and figure out how to embrace the new era. Technology like predictive analysis better visibility over the movement of goods, and robotics application that help warehouses and distribution centre's keep pace with all, and play pivotal role in digital supply chain management, so will the realization that new technologies many often lay over the existing system, as a means of trading partner, and better communication system in digital supply chain system.

### **LIMITATION**

Digital supply chain is about systems that can be more aware of what is developing and which are quick or smart enough to change the supply chain physical process for optional process.

Digitalization in supply chain will change the world supply chain activities, expecting leaps and bounds in adoption of digital information technology: 1. more process with suppliers will be automated. 2. Organization with real-time status updates of information will be available from across the entire supply chain. 3. Organisation will use more data analytics to bench mark and evaluate the supplier's performances. 4. Holding suppliers to higher standards will become more and more important, as the pressure moves from transparency, ethical and sustainable supply chain, and the importance of collaborating with suppliers goes beyond of assuring supply and optimizing cost.

Technology investment in modern digital supply chain is on Internet of Things, Bar code scanning, Tablet computers, data analytics, warehouse truck loading automation, advanced images, mobile thermal printers, stationary label printers, wearable, RFID. Technology deployment in the warehouse is expected to increase productivity, efficiency, and visibility in supply chain. Wireless network that is to be built for environment that deals in manufacturing and warehouses are limited in a digital supply chain.

Drone delivery E-commerce has announced its plan to use drone to deliver products to customers, as a part of innovation, sustainability in supply chain, and this has led to a new heat wave in the industry, and now most companies are considering the idea of drone delivery in supply chain but drone delivery has battles to fight as it

is subjected to a lot of skepticism, but drone delivery will foster delivery in shipping and highly specialized areas as delivering drugs to remote location in a digital supply chain.

Cloud computing intelligence, transportation systems, and automation will help companies to provide customer centric solutions based on their needs. Bar codes and RFID's are very useful for tracing the location of shipments and tracking them on real time basis and use of warehouse automation, cold storage technologies also are becoming widespread in e-commerce logistic.

### **FUTURE WORK**

Automatic identification technologies like RFID/RFT (a request for tender an opportunity for suppliers to submit an offer to supply goods or services) are increasing being used now for vehicle and fleet tracking management. Bar coding also widely incorporated for material storage retrieval/dispatch with minimum error. Communication technologies is a core business enabler now as the system EDI/GPS/IDS are fostering innovating, and bringing in sustainability in helping logistic companies become efficient. Tools like ERP/WMS and the software related to inventory management, scheduling planning optimizers, and customer management are favored by logistic industries. Companies are well equipped with proper information technology systems and able to create higher performance visibility with minimum manual intervention, and having a competitive edge over others.

Total visibility in digital supply chain is to bring in everything from movement of goods in production or transit to demand signals, and relevant data from the point of sale system, and critical source in digital supply chain. Total visibility is the ability is to see perfect deliveries, so as to take care of any supply chain disruption.

In order to have a total free visibility is to have flexibility in organization collaboration across the network, manufacturing facilities, and warehouse.

In order to improve digital supply chain: 1.improve the sustainability across the global supply chain. 2. Ensure ethical product sourcing. 3. Minimize the exposure to ensure that performance of recalling of products.

The demand in supply chain drive, integrated planning process in business is the primary part of digital supply chain, and is responsive to flexible changes in supply demand across supply chain.

Predictive analysis in maintaining design of the product has a note to be assessed in digital supply chain: 1. Addressing major issues as they become a major concern in supply chain management. 2. Predicting the breakdown of machine, and fixing them so as to avoid break down. 3. Aligning of shipping of goods to forecast weather problems or calamity. 4. Realigning the manufacturing problems so as to adjust the analysis of meeting any undue circumstances. Digital supply chain can better manufacturing, and the lot sizes of the products that are in demand in conjunction with agile manufacturing process in supply chain, and thus improve the distribution process by giving an impetus to the delivery schedules in digital supply chain.

As technology progress in the organization, it has become necessary to realize the advantage of digital supply chain to maximize the carrying cost of large amount of inventory, with the help of better advancement, and generate product demand.

### **CONCLUSION**

Digital supply chain data sources are multiplying, and technology is becoming widely used in cloud based technology, sharing the organizations changing technology, and becoming more volatile. Many organizations are going in a digital way in supply chain to take control of the most important the data growth, complexity, standardization, data analysis, through data exploring management, and going into the possibility of different digital supply chain offered by machine learning, Internet of Things, Block chain taking advantage of the growth of the digital supply chain.

As the digital supply chain becomes more volatile, and complex, the future of digital supply chain bring I market changes, conditions, trends, and the digital supply chain will innovate and adapt more quickly.

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**IMPACT OF E-HRM SYSTEM ON ORGANISATIONAL PERFORMANCE: A CASE STUDY IN AUTO-COMPONENT MANUFACTURING SECTOR**

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**ABSTRACT**

*PURPOSE: Human resource management is replacing its activities involving face to face interaction with web-based HR tools. The purpose of this paper is to study a Research project on impact of E-HRM system on overall organisational performance on the basis of Employees responses in an Auto component manufacturing organisation i.e IMPERIAL AUTO INDUSTRIES LTD on departmental basis.*

*Methodology: The study used a questionnaire in which Top and Middle level executives of 3 Departments (Management department, Human resource Department & Accounts Department) in Imperial Auto Industries ltd headquarters participated. They responded to the questions on the basis of their experience and access to different components of e-HRM which reflected their attitude towards this system and their views regarding the overall performance of the organisation. The whole study is based on the responses attained from the employees of the organisation and some literature review is done to study the meaning of E-HRM, E-HRM Activities, its benefits to the organisation and a little study on the organisation in which this study is conducted.*

*Findings: 1. About 69% of the HR activities have an access to information technology system, electronic modes, internet etc.*

*2. There is a visible difference in the levels of accessibility to E-HRM activities amongst different Departments.*

*3. Approximately 80% of the employees (in all the 3 Departments) agree (including 45% strongly agreeing) with the statement that E-HRM system has a positive impact on the overall Performance of the organisation taking basis of certain selected statements related to Electronic Human Resource Management.*

*Originality/ Value: 1. This Research Paper will help the organisations in the Auto-component manufacturing industry in understanding the level difficulties which employees are facing in using offline modes of performing HRM activities and which are the major Activities which should be inculcated electronically to solve their problems.*

*2. It also helps to analyse and improve the thought process of the employees regarding E-HRM system on overall performance of the organisation.*

*3. This paper will help to understand the importance of E-HRM activities in Auto component manufacturing firm.*

*Keywords: E-HRM, Information Technology, Auto component Industry, Overall Performance.*

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**INTRODUCTION**

Organisations are made and run by Humans. The most important Pillar for proper functioning of any organisation is Human Resources irrespective of the type of industry it belongs to. Further information technology systems, electronic modes, internet etc are increasingly influencing every aspect of an organisation including human resource management practices. Due to this rapid development of information technology it has enhanced the adoption of Electronic Human Resource management.

E-HRM can be narrowly defined as the administrative support of the HR function in organisation by using internet Technology. Due to the introduction of this concept of e-HRM (A web tool used to support the HR processes), it is very important to study its impact on the overall performance of the organisation. The impact of E-HRM on the overall organisation performance depends on the way the employees in the organisation approach towards the adoption and acceptance of IT based HR system. E-HRM is divided into these following activities:

- 1. Transactional Activities** (For instance those activities which involve day to day transactions and record keeping)
- 2. Traditional HR Activities** (Recruitment, Selection, Training, Compensation, Performance Management etc)
- 3. Transformational Activities** that adds values to the organisation and may be used to manage HR across the whole employee life cycle.

E-HRM offers a large number of **advantages** like Data security and Personal Privacy, Automated employee information records, Fast response to employee grievances, Considerable reduction in administrative work, Quick Decision making, Standardisation etc.

Evidently, every economy requires a well-versed transportation system for its smooth functioning and further development. The automobile industry along with the auto component manufacturing industry is one of the core industries in India. This sector has a major contribution in the economic growth of the country. Automobile industry is incomplete without the base of auto components industry. **Auto-components industry** has benefitted India in the following aspects:

- Growing Demand
- Export opportunities
- Policy support
- Competitive Advantages.

This sector has provided India with a global standing in the international market. As this sector has a strong economic standing at national and international level, it is very important to cope up with the new technologies used all over the world. Therefore, there is a **need** to check the impact of e-HRM system in this industry.

This paper helps to study the introduction of e-HRM practices in a leading Auto-component manufacturing company i.e **Imperial Autos Industries Ltd** and to find out its impact on the overall organisational performance. Imperial Autos industries ltd is one of the largest integrated manufacturer of Fluid transmission Products (FTP's) and an approved global supplier of International Truck cummins, Caterpillars, JCB, Joh Deere and other OEM manufacturers overseas.

To check the impact of E-HRM activities on the overall organisation it is important to differentiate between the responses of various departments. This Paper represents employees responses on departmental basis and integrates the results to analyse the overall impact. This research offers recommendations and suggestions for improving the effectiveness of e-HRM systems.

#### **METHODOLOGY**

The Present Research is conducted by using Questionnaires amongst the top and middle level employees at imperial Auto industries headquarters in three departments i.e General Management Department, Human Resource Department, Accounts Department. The questionnaire had Three sections A, B & C

Section A included Statements regarding whether the organisation has introduced IT based practices in various activities related to HR like

- E-Recruitment (Process of Personnel Recruitment)
- E-Training (Anywhere, Anytime instruction delivered over the internet)
- Performance Management (Appraisal Process)
- Payroll (Electronic Salary transfer and processing)
- Leave Management (Apply for leave online)
- Attendance management (Managing Attendance or presence at work)
- Employee Grievance Management

Section B introduces a scale rating from 1(NOT AT ALL) to 5(VERY HIGH EXTENT) to check that up to what extent E-HRM practices are being implemented i.e upto what level Different departments have access to these activities. Statements included:

- Presence of online recruitment and selection policy
- Presence of formal induction and orientation to help new Recruits
- Use of online training facilities for Promotion
- Effective salary Administration system
- Use of online system for tracking and applying for leaves
- Use of online system for time and Attendance Management
- Provision of online medical Aid request and claim

- Availability of online suggestion Box
- Arrangement of online stress management Programs

Section C helps to analyse employees views regarding the impact of these E-HRM practices on the overall Performance of the organisation. The employees have provided ratings from 1 to 5 on the basis of their Personal experience where 1 represents Strong Dis-agreement with the particular statement and 5 represents Strong Agreement with the corresponding statements. Statements include:

- Aims at increasing efficiency
- Cost Reduction due to E- HRM system
- Aims at visibility
- Increases Productivity
- Promotes ability to attract/retain employees
- Improves quality of HRM services
- Reduces dependence on HR professionals
- Increases competency Development
- Increases Transparency
- Improves Monitoring
- ROI has increased with E-HRM implementation
- Improved organisation Image.

These three sections included different aspects of E-HRM on the basis of which further Grphical Representations will be made and percentages will be calculated to find the final conclusions.

FINDINGS / SECTION A / TABLE A1

Sno.	E-HR Activities	Available (online/web)	Only offline	Both online and offline
1	E-Recruitment	32	0	0
2	E-Training	0	32	0
3	Performance Management	12	16	4
4	Payroll Facility	32	0	0
5	Leave Management	32	0	0
6	Retirement	19	5	8
7	Attendance Management	32	0	0
8	Compensation Planning	0	32	0
9	Career Planning	0	32	0
10	Employee Self-service	32	0	0
11	Employee grievance Management	11	10	11
12	Travel management	0	32	0
13	Promotion and Career Advancement	0	19	13

GRAPH A1

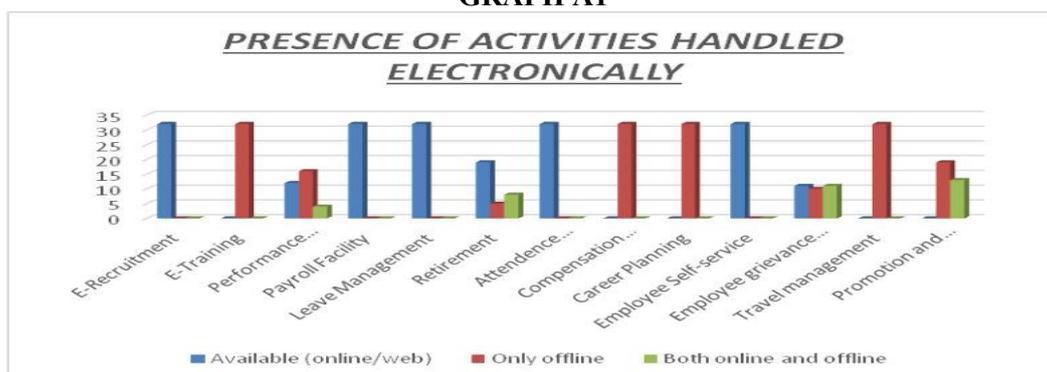
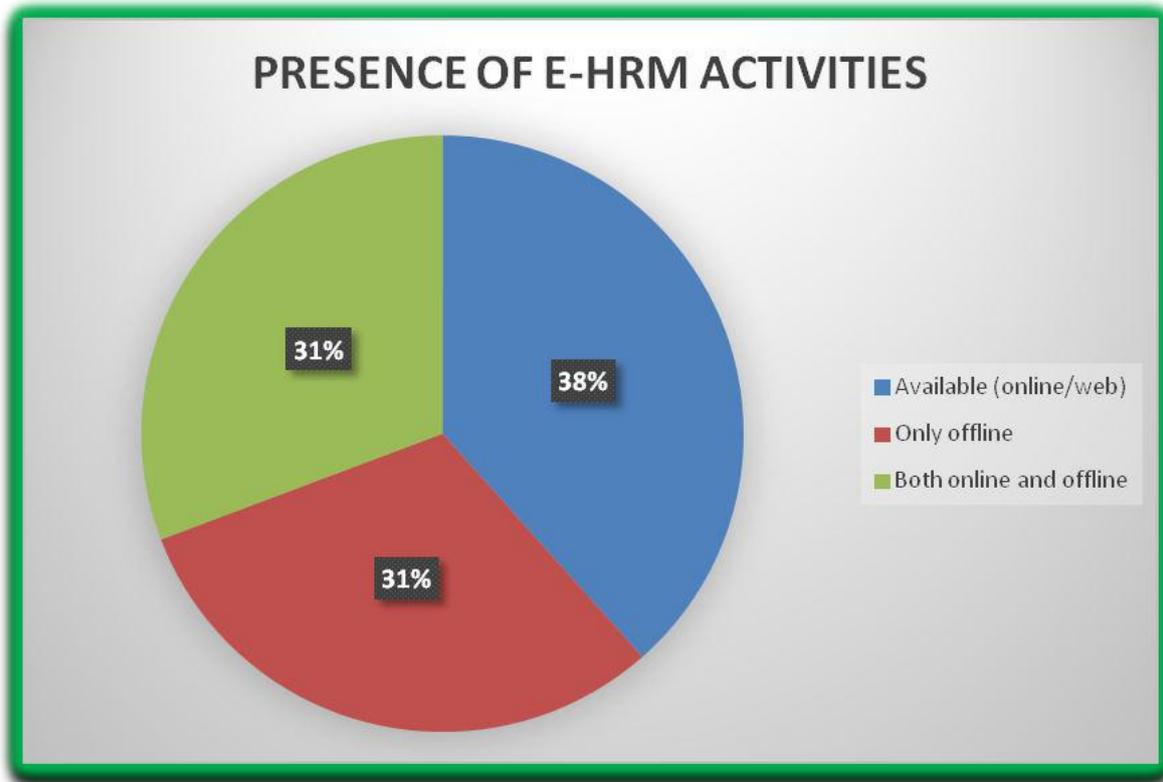


TABLE A2

Total E-HR Activities	Available (online/web)	Only offline	Both online and offline
13	5	4	4

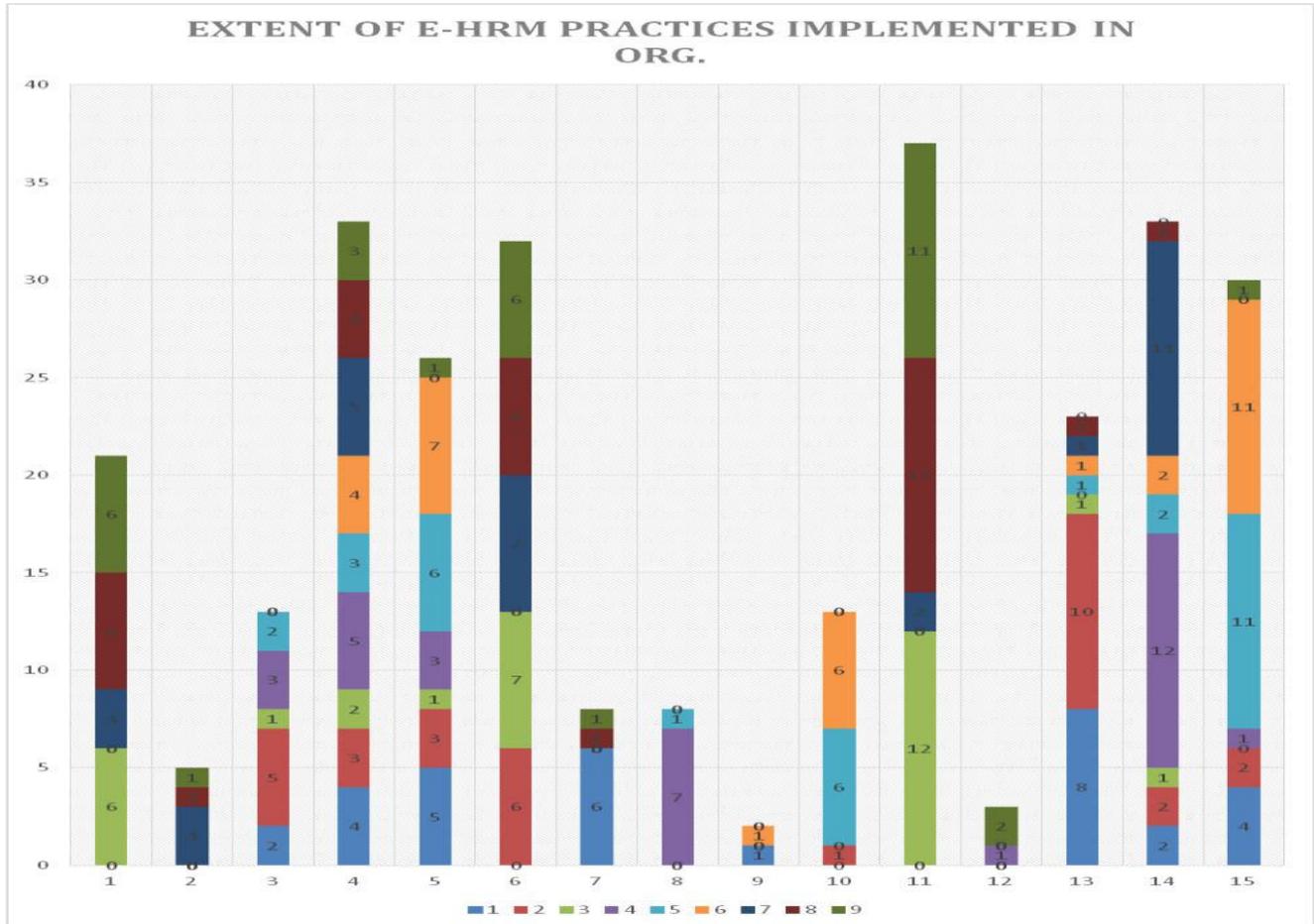
CHART A1



SECTION B / TABLE B1

SNO.	STATEMENTS	GEN. DEPT.					MGT. DEPT.					HR DEPT					ACCOUNTS DEPT				
		Rating scale					Rating Scale					Rating Scale									
		1	2	3	4	5	1	2	3	4	5	1	2	3	4	5					
1	Presence of online recruitment and selection policy	0	0	2	4	5	0	6	0	1	0	0	0	8	2	4					
2	Presence of formal induction and orientation to help new Recruits	0	0	5	3	3	6	0	0	0	1	0	0	10	2	2					
3	Use of online training facilities for Promotion	6	0	1	2	1	7	0	0	0	0	12	0	1	1	0					
4	Effective salary Administration system	0	0	3	5	3	0	0	7	0	0	0	1	0	12	1					
5	Use of online system for tracking and applying for leaves	0	0	2	3	6	0	0	1	0	6	0	0	1	2	11					
6	Use of online system for time and Attendance Management	0	0	0	4	7	0	0	0	1	6	0	0	1	2	11					
7	Provision of online medical Aid request and claim	3	3	0	5	0	7	0	0	0	0	2	0	1	11	0					
8	Availability of online suggestion Box	6	1	0	4	0	6	1	0	0	0	12	0	1	1	0					
9	Arrangement of online stress management Programs	6	1	0	3	1	6	1	0	0	0	11	2	0	0	1					

GRAPH B1



SECTION C / TABLE C1

SNO.	STATEMENT	GEN. MGT. DEPT.					HR DEPT					ACCOUNTS DEPT					TOTAL
		Rating scale					Rating Scale					Rating Scale					
		G 1	G 2	G 3	G 4	G 5	HR 1	HR 2	HR 3	HR 4	HR 5	A/C 1	A/C 2	A/C 3	A/C 4	A/C 5	
1	Aims at increasing efficiency	0	1	2	3	5	1	0	0	0	6	0	0	3	8	3	
2	Cost Reduction due to E- HRM system	0	0	3	4	4	1	0	0	0	6	0	0	7	5	2	
3	Aims at visibility	0	0	2	4	5	0	0	1	6	0	0	0	0	11	3	
4	Increases Productivity	0	0	2	4	5	0	0	0	1	6	0	0	1	10	3	
5	Promotes ability to attract /retain employees	0	0	2	4	5	0	0	0	0	7	0	0	13	0	0	
6	Improves quality of HRM services	0	0	4	3	5	0	0	0	0	7	0	0	8	2	4	
7	Reduces dependence on HR professionals	0	0	2	6	3	0	0	0	0	7	0	0	2	9	3	
8	Increases competency development	0	0	0	8	3	0	0	0	0	7	0	0	1	12	1	
9	Increases Transparency	0	0	4	4	3	0	0	0	0	7	0	1	2	8	3	
10	Improves Monitoring	0	0	1	5	5	0	0	0	0	7	0	0	8	4	2	
11	ROI has increased with E-HRM implimentation	0	0	4	2	5	0	0	1	6	0	0	0	2	9	3	
12	Improved Organisation Image	0	0	5	0	6	0	0	0	6	1	0	0	2	5	7	
		0	1	3	4	54	2	0	2	19	61	0	1	49	83	34	384

GRAPH C1

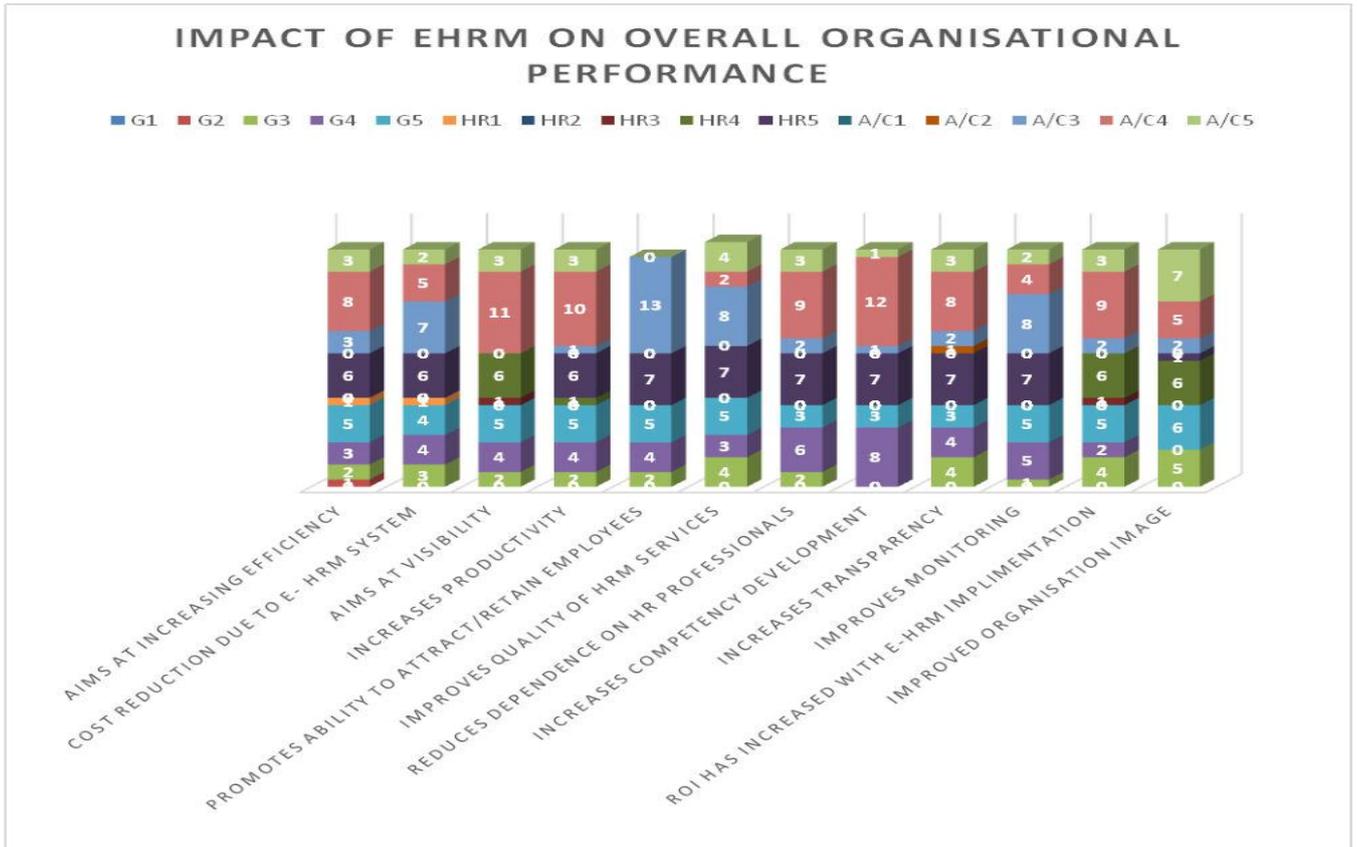
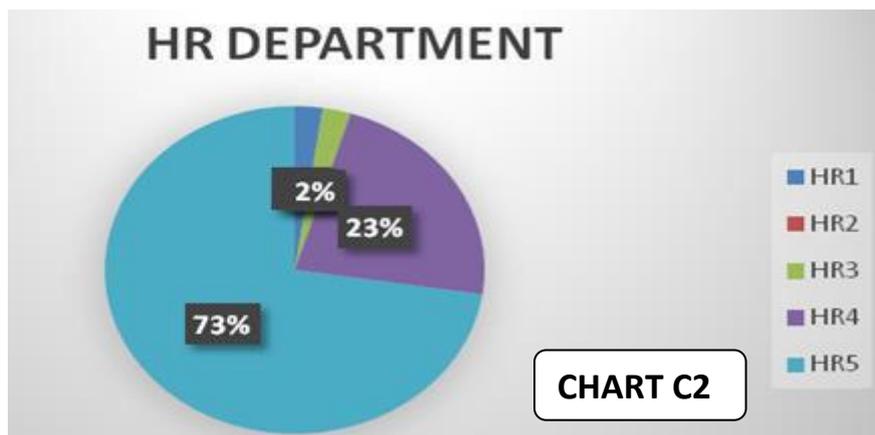
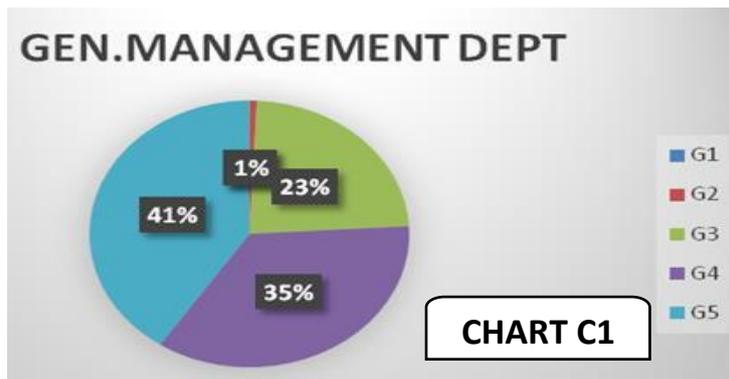
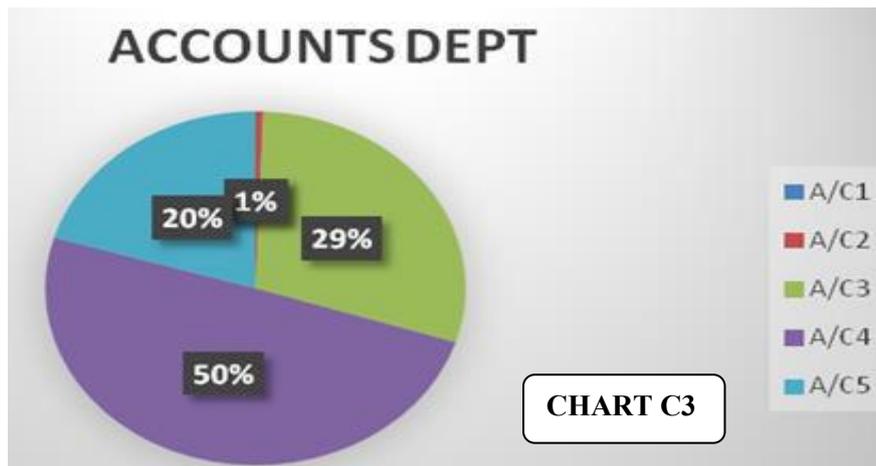


TABLE C2

EHRM statements	GEN. MGT. DEPT.					HR DEPT					ACCOUNTS DEPT				
	G1	G2	G3	G4	G5	HR1	HR2	HR3	HR4	HR5	A/C1	A/C2	A/C3	A/C4	A/C5
TOTALS	0	1	31	47	54	2	0	2	19	61	0	1	49	83	34





### DISCUSSION SECTION A

The responses of the questions(mentioned in methodology above) asked in this section gave the following outcomes.

1. **38% of HR** activities are Performed completely on online/web basis ( E-RECRUITMENT, PAYROLL, LEAVE MANAGEMENT, ATTENDANCE MANAGEMENT, EMPLOYEE SELF SERVICE)
2. **31% of HR** activities are performed on online as well as offline basis. (PERFORMANCE MANAGEMENT, RETIREMENT, EMPLOYEE GRIEVANCE MANAGEMENT, PROMOTION AND CAREER ADVANCEMENT)
3. **Only 31% of HR** activities are performed on offline basis. (TRAINING, COMPENSATION PLANNING, CAREER PLANNING, TRAVEL MANAGEMENT)

These outcomes provide clear picture that even though IMPERIAL AUTO INDUSTRIES LTD is a manufacturing organisation , is still handling approximately 70% of its activities in web basis. (**REFER CHART A1**)

### SECTION B

The responses gathered from this section helped to analyse the extent upto which various departments had access to different E-HRM activities. Following outcomes were recorded:

1. Activities related to ONLINE SYSTEM FOR TRACKING AND APPLYING LEAVES AND USE OF ONLINE SYSTEM FOR TIME AND ATTENDANCE MANAGEMENT (**S.NO. 5,6 REFER TABLE B1**) have the highest rating of 5 from all the employees in all the departments. This means that all the departments have complete access to these E-HRM services.
2. Activities related to USE OF ONLINE TRAINING FACILITIES FOR PROMOTION, PROVISION FOR ONLINE MEDICAL AID REQUEST AND CLAIM, AVAILABILITY OF ONLINE SUGGETION BOX, ARRANGEMENT OF ONLINE STRESS MANAGEMENT PROGRAMS (**S.NO- 3, 7, 8, 9 REFER TABLE B1**) have the lowest ratings from maximum employees.

Management department=54.5%

HR Department= 89.2%

Accounts Department= 83.9%

This means that the above-mentioned percentage of people in the 3 departments have least access to these HRM activities.

3. Activities related to PRESENCE OF FORMAL INDUCTION AND ORIENTATION TO NEW RECRUITES AND EFFECTIVE SALARY ADMINISTRATION SYSTEM have mixed responses inter-departmentally.
  - i. In management and Accounts department, the ratings of activity mentioned in **S.NO. 2 (REFER TABLE B1)** from maximum employees is 3. In HR Department this activity is given the ranking of 1 which means they donot have access to online induction and orientation.

- ii. In Management and Accounts Department the ratings for activity mentioned in **SNO. 4 (REFER TABLE B1)** from maximum employees is 4(High accessibility) whereas in HR Department ratings for this activity ,from maximum employees is 3 (low accessibility).

### SECTION C

The outcomes of this section represent the following:

- 1) In General Management Department ,76% of employees agree that the e-HRM systems has a positive impact on the overall performance of organisation out of which 41%(Rating 5) strongly agree to the statement.(**CHART C1**)
- 2) In HR department 96% of employees agree that e-HRM systems has a positive impact on the overall performance of organisation out of which 73%(Rating 5) strongly agree to the statement(**CHART C2**)
- 3) In Accounts department 70% of employees agree that e-HRM systems has a positive impact on the overall performance of organisation out of which 20% strongly agree with the statement. (**CHART C3**)

### CONCLUTIONS

- I. Electronic HRM is progressively being implemented in the organisation. (**GRAPH A1**)
- II. There is a disproportionate access to E-HRM activities in different departments i.e the employees of different departments do not have equal access to E-HRM activities.
- III. Approximately 80% of the employees in the organisation have a clear view that E-HRM activities have a strong positive impact on the overall performance of the organisation

**To sum up** on the basis of this case study research it can be concluded that the integration of Information technology with HR activities is a blessing for the organisation satisfying the employees in almost all the departments. The benefits which are provided by E-HRM activities force the employees to form a positive opinion on the impact of the practices on the organisational performance.

Taking this case study research as a base we can conclude that E-HRM is a blessing for all the organisations irrespective of the sector it belongs to. **It can also be said that the Auto-component manufacturing sector is significantly rising at national and international levels and E-HRM has its significant role in this growth.**

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**LIFE SKILL EDUCATION: A VEHICLE FOR SOCIAL TRANSFORMATION OF YOUNG ADOLESCENTS**

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**ABSTRACT**

*Adolescence is a transitional period in the human life span. It links childhood and adulthood and happens to major physical changes and health related issues and other social problems in any country. It is also the most demanding period of one's life and can be better described as a stormy and stressful time in life. At this period they portray of their self to others and try to establish a personality of their own and seeking a new identity. On the other hand, they also confronted with the problems of tension, anxiety, fear, drug abuse, juvenile delinquency, violence, sexual-problems, School and College related problems etc., etc. This is the problem of our society as Adolescents are the part of it. Life Skill Education is the study of abilities for adaptive and positive behaviour that enable individuals to deal effectively with the demands and the challenges of everyday life. It has an impact over the life and sound life skills usually increase potentiality, reduce stress and conflict, improve human social relationship building ability, increase human understanding, promote joy and thus make a healthy and peaceful life. In this Paper an attempt has made to highlight on some basic concepts of Life Skill education, its aims and objectives, scope , area and how they can be helpful as a tool for social transformation of the young adolescents and to make them a good citizen of our country.*

*Keywords: Life Skills, Adolescents, Interpersonal Skills, Effective Communication, Stress Management, Diversity Management, Time Management, Conflict Management, Peace and Shared Humanity, Prosperous Nation.*

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**INTRODUCTION**

Adolescents is a period of ranging from 10 to 21 years, during which a growing person makes a transition from childhood to adulthood. WHO refers age range to adolescents between 10 to 24 and it is a transitional period in the human life span that prepares a young individual to meet the challenges of social and economic world. Most of the youth at this period becomes a perfect dreamer. He dreams of a perfect friend, perfect teacher, a perfect philosophy of life, a perfect job and a perfect conduct in life. On the other hand young adolescents also face different social problems. It occurs due to various factors like unresolved conflicts, misunderstanding with parents, impulsiveness, anger outburst, aggressive behaviour, increased interest in sexuality etc. The challenges faced by the youth may be categorized as i) Psychological e.g. preparing examinations, peer pressures, etc. ;ii) Social e.g. peer pressure, inter-relationships, etc. iii) Economic e.g. lack of resources such as finance, basic necessities, excessive resources ; iv) Spiritual e.g. exposure to conflicting religious beliefs etc. As the youth are the part of the society, so this is a social problem and have to be tackled at a more fundamental level. Adolescence is also the most demanding period in one's life—a period of anxiety and stress. Accurate portrayal of self to others is in the process of establishment during this period and this is also the identifying criterion of healthy personality. Thus, it is important to understand the need of social and emotional support to the young adolescents. It requires to reinforcement of norms, acquisition of skills which are essential to cope with the difficult situations, that they encounter in their day-to-day lives, manage peer pressure and deal with gender stereotypes etc. The absence of such support can lead to confusion and misinterpretation about these changes and adversely affect not only their academic performance but also their social behaviour. To develop a sound and healthy personality of our young people as well as to develop a knowledge based society life skills are one of the crucial element for their sustainable and professional growth. It is better to say make them a better citizen and a whole round man of the society.

**What is Life Skill Education?**

The term Life Skill Education is being widely used now-a-days but it is often used interchangeably with Livelihood Skills. But the two are different. Livelihood Skills as the name suggests, are skills related to generate income to fulfill one's household or individual economic goals. These skills are basically connected with vocational Skills, business management skills etc. , where as Life Skills encompasses all the dimensions of human life, be it economical, social or psychological.

World Health Organization(WHO) in 1993 defined Life Skills as “ the abilities for adaptive and positive behaviour that enable individuals to deal effectively with demands and challenges of everyday life”.

UNICEF defined Life Skills as, “ a behaviour change or behaviour development approach designed to address a balance of three areas : knowledge , attitude and skills”.

Hendricks (1966) defined Life Skills as “ Skills that help an individual to be successful in living a productive and satisfying life”.

Yarham(1919) defined Life Skills as “ the personal competence that enables a person to deal effectively with the demands and challenges confronted in everyday”.

Powell (1995) defines Life Skills as” the life coping skills consonant with the developmental tasks of basic human development processes, viz. those skills necessary to perform tasks for a given age and gender in the following areas of human development- psychological, physical, sexual, vocational, cognitive, moral, ego and emotional”.

Therefore, Life Skills are a large group of psycho-social and inter personal skills, which can help people, to make informed decisions, communicate effectively and develop coping and self management skills that may help an individual to lead a healthy and productive life.

### **LIFE-SKILLS EDUCATION - A BRIEF HISTORY OF DEVELOPMENT**

Life Skills-based education(LSBE) has a history of gradual development in its present form. In 1986 the Ottawa Charter for Health Promotion first recognized life skills in terms of making better health choices. It was followed by an another event in 1989 i.e. Convention on the Rights of the Child(CRC). It linked life skills to education by showing that education should be directed towards the development of the child’s fullest potential. In 1990 Jomtien Declaration on Education for All took this vision further and included life skills among essential learning tools for survival, capacity building and improvement of quality of life. Thereafter in 2000 Daker World Education Conference took a position that all young people and adults have the human right to benefit from “ an education that includes learning to know, to do, to live together and to be”, and included Life Skills in two out of six EFA(Education for All) Goals.

Life Skills- based education is now recognized as a methodology to address a variety of issues of child and youth development and thematic responses including as expressed in UNGASS on HIV/AIDS(2001), UNGASS on Children(2002), World Youth Report(2003),World Programme for Human Rights Education(2004), UN Decade on Education for Sustainable Development(2005), UN Secretary General’s study on Violence Against Children(2006), 51<sup>st</sup> Commission on the status of Women(2007), and the World Development Report(2007).

### **IMPORTANCE OF LIFE SKILL EDUCATION**

Prosperous and healthy nation is the valuable resource for the development of any country. Indian youth represent a significant proportion of World wide population. It was estimated that young Adolescents below 20 years of age represent 40% of the World’s population, while 80% are living in the developing countries(SEARO,2000). Life Skills help adolescents to transit successfully from childhood to adulthood by healthy development of social and emotional skills. It helps the student to recognize their talents and abilities; to develop their social competence and problem solving skills, which in turn help adolescents to form their own identity. The awareness about themselves help them to set goal in their life. Finally enhancement of these skills are useful to address the needs and concerns of their daily life. Life skills will develop a wide range of Psycho-social and interpersonal skills which will help students to make informed decisions, communicate effectively, develop coping with stress and self management skills. These will help them to develop into healthy and well balanced individuals leading to a productive life and contribute in the development of a peaceful, healthy and sustainable environment. Life Skills will equip the students with the knowledge, skills and attitude to face the challenges in their adult life and the world of work. It will develop an awareness of our history and inform the students of their rights and responsibilities as an active citizen. They will learn movement and motor skills for an active participation in physical and leisure activities. They will be empowered to recognize the benefits of healthy lifestyles, analyze the risks and consequences of unhealthy life styles and to take responsible decisions to manage their own lifestyle and behavior. In short, this field of education help students and young adolescents to develop into whole individuals with a good sense of significance, responsibility, competence and well being.

### **Aims and Objectives of Life Skills to the Students and Young Adolescents**

In respect to the above stated discussion it may be said that the basic aims and objectives of Life Skills to the students and young adolescents are as follows :

- i) The young Adolescents should understand the importance of a healthy and active lifestyle.

- ii) To develop a range of movement and motor skills for a healthy and active life.
- iii) To develop a range of interpersonal and social skills through games and activities.
- iv) To develop an awareness of the past so as to understand the evolution of society to its present state.
- v) To aware students and young Adolescents of their rights and responsibilities as an active citizens for sustainable development.
- vi) To develop knowledge, skills and attitudes needed to preserve, appreciate, share our multiple cultural heritages.
- vii) To develop skills to deter behaviours and lifestyles associated with crime, drugs and violence.
- viii) To develop an atmosphere of peace and a sense of shared humanity; demonstrate basic assertiveness, strategies to manage interaction with others.
- ix) To develop an understanding of the functioning of the human body.
- x) To develop action competence to reduce vulnerability to health problems.

### **SCOPE OF LIFE SKILL EDUCATION**

Life Skill Education increase the practical knowledge and skills of the young adolescents backed by their emotional and social intelligence. It help them to behave in a socially acceptable manner and adapt themselves to a social environment so that the others may feel comfortable with them and vice versa. So Life Skills increase their ability to function harmoniously with others in a larger society. It make them to be openness to learning new ideas. It promote their tolerance to an unfavourable situations and differences in opinions. It help them to be broad minded to accept people from different cultures. Learning ground of Life Skill education raise their eagerness to make things work in their personal and professional life. Life Skill education also help the young Adolescents to manage their own emotions. At the same time it promote their ability to manage others by mapping their mood. Thus they becomes dim fit to manage a situation by predicting its depth and nature and do needful accordingly.

The three broad areas of Life Skills are :i) Rational Abilities-it means to understand a problem and then to find a way to solve it effectively. ii) Personal Qualities- it means whether having or not the qualities to take initiative, responsibility, accountability, self esteem, sociable and socially sensitive, well adaptive capacity, ability for self management in personal and professional life with integrity and honesty etc. iii) People Skills-means ability to participate as a member of a team, leadership qualities when situation demands, negotiating and working capacity with ease even with people from different socio-economic and cultural background.

Thus the scope of the Life Skills education are varied in nature ;from the individual self development in the day-to-day life of the young adolescents to the social, cultural, economic development of the larger society , community, organization and the whole nation.

### **SOME AREAS OF LIFE SKILLS EDUCATION**

World Health Organization(WHO, Geneva,1997)"Life Skill Education for Children and Adolescents in Schools"-determined ten core areas of Life Skills education. These are-i) Self Awareness, ii) Decision

Making, iii) Coping with Stress, iv) Managing Emotions, v) Empathy, vi) Interpersonal Skills, vii) Effective Communication, viii) Creative Thinking, ix) Critical Thinking and x) Problem Solving for School Students and young Adolescents.

The other areas which the Experts suggested as a part of Life Skills Education are-Leadership Skills, Team Playing Skills, Adaptability, Mood management, Conflict management, Diversity management, Time management, Image management, Stress management, Change management etc.

### **CONCLUSION**

Every nation, society and community should take responsibility to work for promoting Adolescent's physical, social and mental health. This should be done by helping young people acquiring knowledge, attitudes, and value added skills etc. It eventually benefit them in a variety of ways such as taking informed decisions, solving problems, thinking critically and creatively, communicating effectively, empathizing with others, coping with stress and managing their lives in a healthy and productive manner. These knowledge, attitude and skills etc., thus lead to behaviours that prevent disease and injury, foster healthy relationships and enable young people to take ownership of their action and play leadership roles constructively. These are all helpful to develop a healthy and prosperous nation as well as a responsible citizen of our country.

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**DIGITALISATION AND ITS IMPACT ON CUSTOMER RELATIONSHIP MANAGEMENT- A STUDY FROM CUSTOMERS' PERSPECTIVE**

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**ABSTRACT**

*A customer is an individual or a group of individuals or business that purchases the goods or services produced by a business organization. Attracting, retaining and satisfying customers is the primary and most important goal of most of the public facing businesses, because it is the customer only who creates demand for goods and services. It has become very important for business units to emphasize on creating long-term relationships with customers to nurture their stability in today's blooming market. These days customer's expectations are now not only limited to get best products and services but they also need a face-to-face business in which they want to receive exactly what they demand and also in a quick times so that a relationship of trust can be built. Also, we are living in a dynamic world where digitalization is taking on everything including marketing. All the objectives of Customer Relationship Management can be easily achieved through digitalization. So, it is becoming important for the businesses to have an efficient Customer Relationship Management system in place in this world of digitalization. So, the research has been conducted to find out the satisfaction level of customers of ICICI Bank with its services online services also. The research study is Empirical in nature and is based on Primary sources. It provides deep insight into the problems that customers are experiencing in the current scenario and suggestions have been provided that may act as a solution to the emerging issues in the bank.*

*Keywords: customer information, digitalization, customer satisfaction, loyalty, customer relationship,*

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**1. INTRODUCTION**

Customer Relationship Management (CRM) refers to strategies, ways and technologies that are used by the companies to analyze and manage client interactions and their data throughout the client lifecycle, with the objective of improving relationships with the customers, which ultimately helps in customer retention and enhancing the sales growth. CRM systems help in giving customer-facing staff detailed information including customer's personal information, purchase history, buying preferences and concerns. CRM is a practice that solidifies a company's relations with its customers. An ideal CRM system is a centralized collection of all data sources of customers under an organization and provides detailed customer information.

The new age of transformation in India and in the whole world is called '**Digital Era**'. Though digitization and digitalization are interchangeably used but the two words are conceptually different. While the term digitization means the technical method of changing streams of analog info into digital bits of 1s and 0s with separate and discontinuous values, the term digitalization means using digital technologies to change the model of the business and to provide new revenue and value-producing opportunities. Some of the best examples of digital technologies are applications on mobile phones, data analytics, customer profiling, cloud computing, and IOT (Internet of Things) Technology which has led to the growth of Information age business and knowledge driven virtual markets. Use of digital technologies in Customer relationship management is becoming very important to improve customer life time value and to survive in today's Digital Era. Understanding the needs of customers and meeting their needs efficiently by offering value-added services are the recognized factors that determine the success and failure of companies nowadays. So, more and more companies have begun to attach greater importance to digitalization to revive relationships with customers, so that customer's needs are considered in all aspects of a business in an easy and efficient manner ensuring customer satisfaction to a great extent. Customer relationship management focuses on customers rather than products and services. Companies that enter to compete in a market may weaken the existing and solid ones, due to new ways of doing and conceiving business by using new digital technologies. So, it is very important for existing companies to maintain and retain customers which can be done effectively with the help of digitalization in customer relationship management.

Usually, an organization has various departments which predominantly have access to customers' information whether directly or indirectly. To make the work easy for human resource managers, the CRM system piles up with this information centrally, examines it and then makes it addressable within all the departments. Digitalized CRM system provides a well-defined platform for all the business units to interact with their current and potential customers and fulfill all their demands and needs effectively and to build a long-term relationship with them. It is an application or initiative designed to help an organization to optimize its interaction with

customers, suppliers or prospects via one or more touch points such as call center, salesperson, distributor, store, branch office, web or e-mail – for the purpose of acquiring, retaining or cross-selling customers.

A digitalized CRM system is not only used to deal with existing customers but is also useful in attracting and acquiring new customers. Firstly customers are identified by using online sources and all the corresponding details are maintained into the digitalized CRM system which is also called ‘Opportunity of Business’. After that, the sales and field representatives try to get business out of these customers by following up with them and converting them into a winning deal. Digitalized CRM strategies have helped in giving a new outlook to all the organizations to keep the business going under a strong relationship by fulfilling the mutual needs of buyers and sellers.

The growth of CRM in recent years is led by some important perspectives. Some of these are:

- The belief that customers are the real assets of the organization and not just the people in audience.
- The change of business view from transactional approach to relationship approach.
- The change in the approach of concentrating on how the product is delivered to the customer to concentrating more on customer values.
- The approach of focusing on customer satisfaction and loyalty rather than focusing on self-satisfaction and profit.
- The increasing tendency among the organizations to retain existing customers and trying to get more and more business out of them by using digitalized means.
- The realization by the businesses that the traditional strategies and trends of marketing and selling are increasingly fading out in the current economic scenario.

## **2. LITERATURE REVIEW**

CRM is a strategy which is customized by an organization according to its own objectives and structures to maintain and administrate its customers and vendors in an efficient manner for achieving excellence in business. In this era of Digitalization, most of the organizations are adopting new technological ways of planning their Customer Relationship Management. So, various scholars and researchers are doing research on the current scenario of Digitalized CRM system. A focused review of the literature was conducted to evaluate recent publications on Digitalization and CRM.

The research paper by Geeti Mehra (2017), titled- ‘Era of Digitalization and Indian Economy’ describes the idea of Digitalization and steps taken by the government so far to influence organizations to adopt new ways of doing business. It highlights the positive impact of such an era on India’s GDP and increasing job opportunities in India, the likely financial impact with increase in foreign direct investment (FDI) in the country and the path towards overall development with innovations and better administration.

Santhanamuthu. D. & Manickam S. (2012) in their research paper, with title- ‘Impact of Digitalization on Rural India stresses the importance of telecommunication in the development process, importance of mobile phones in reducing information asymmetry in most of the sectors, growth of telecommunication network in India and the studies relating to its growth with that of economic growth . It concludes with the transformation of villages into knowledge centers with the introduction of internet connections in rural areas to bridge the digital gaps. Rural population comprises of the 70% of the Indian population. So, it can be said that most of the Indian population is digitally educated. Hence, it becomes extremely important for the organizations nowadays, to go with the modernized ways of handling businesses.

Vollmer & Precourt, (2008) suggested that nowadays, the internet has become a mass media vehicle for communications with customers. Now it represents the number one source of media for customers at work. Customers are parting away from the traditional sources of advertising like, radio, television, magazines, and newspapers. Customers are consistently demanding more control over their media consumption. They need on demand and immediate access to information at their own convenience. Customers are using more frequently various types of social media to conduct various information searches and to make their purchasing decisions.

Chaffey, 2007 said that it is becoming important to understand the relationship between digital communication and traditional communication. In the old media; for example, TV, radio, newspapers, magazines and billboard ads, the communication model was and is one-to-many compared to one-to-one or many-to-many communication model in digital media like blogs, social networks, wikis and other social media.

Consumers are known to be the best judge in terms of service quality. Their conclusion is based on several factors and some of these factors like Responsiveness, Assurance, Tangibles, Empathy and Reliability are identified by Parsuraman, Berry and Zeithmal. Their model is called Servqual model. They believe that good amount of information related to service quality of organizations can be gathered on the basis of these factors (Nargundkar, 2009).

Servqual surveys are conducted by the organizations to understand the quality of their relationship with their consumers. These surveys are known as relationship surveys that assist banks in analyzing the strengths and weaknesses of their relationship. These surveys are also worthwhile in making comparison with competitors of an organization (Zeithaml, Bitner, Gremler & Pandit, 2011).

CRM in banking sector is essential for the survival of the banks. Banks must take ideas from consumers to enrich their services. (Putney & Puney, 2013).

CRM is known to be a process which increases customer satisfaction. In today's competitive business environment if any competitor wants to enter the market, then it has to focus on how to satisfy the customers. And this represents successful implementation of CRM (Shaon & S. M., 2015).

Banking sector is a fully customer-oriented sector and so, research is needed in this sector to analyze customers' needs and attitude in order to build long term relationship with them and hence building a successful CRM system. (Renuga & Durga, 2016).

The review of Literature has helped in developing a conceptual framework of the study.

### **3. OBJECTIVES OF THE STUDY**

The following objectives are set up for this study:

1. To find out whether the customers are satisfied with the current CRM practices adopted by ICICI Bank in South Delhi.
2. To find out whether the customers of ICICI bank are using Digitized services provided by the bank.
3. To find out whether the customers are satisfied with the current digitized CRM practices adopted by ICICI Bank in New Delhi.
4. To understand the impact of digitalization and online services on CRM of ICICI bank.

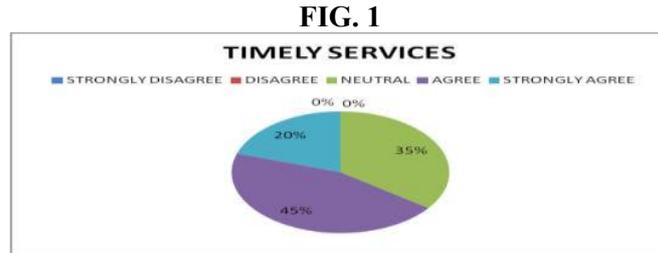
### **4. RESEARCH METHODOLOGY**

- The nature of research for this study is empirical because data has been collected to understand the customers' point of view about the CRM practices of ICICI bank.
- Questionnaires were used to collect the data from the customers of ICICI Bank. All the respondents belong to the region of New Delhi.
- The primary sources have been used to collect the data.
- Observations were made to come to conclusion.
- The Sample size for research work is 50 customers of ICICI Bank.

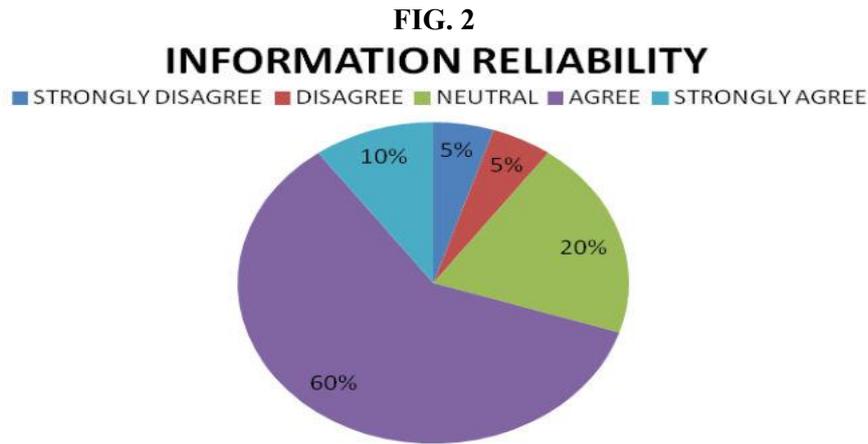
### **5. DATA ANALYSIS AND RESULTS**

The data has been profoundly analyzed to understand the perception of the customers about the current CRM practices followed by the ICICI Bank. The data collected through questionnaires has been diagrammatically represented below:

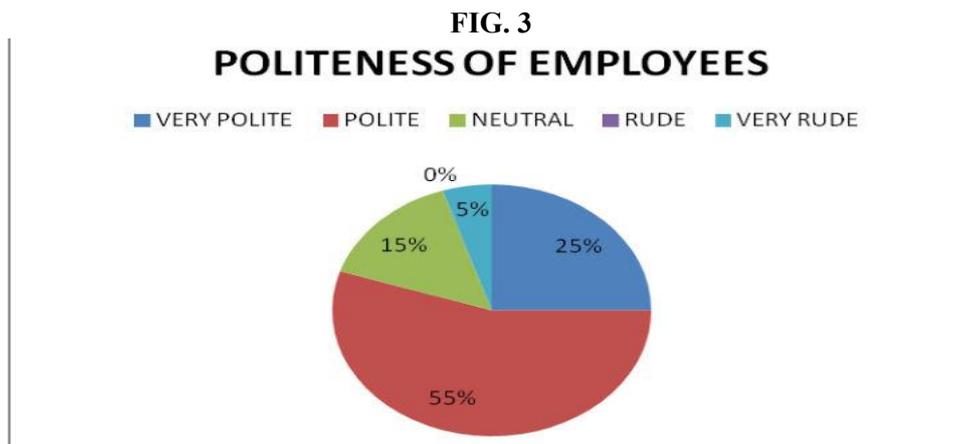
- 1.) The following figure (Fig 1) shows that 20% of the customers of ICICI bank are very much satisfied with getting the timely services from the employees of the bank with regards to introduction of any new policy or scheme or rule in the bank. 45% of the customers are also satisfied to an extent in getting timely services from the bank. Remaining 35% of the customers are neutral to say whether they are satisfied with timely services or not.



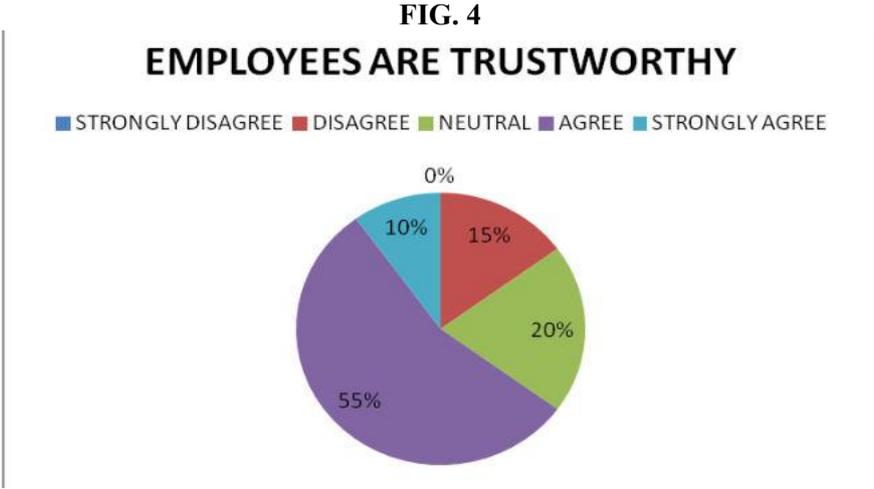
2.) Fig. 2 shows that 10% of the customers fully trust the information provided by the employees of ICICI Bank and 60% of the customers also trust the employees of the bank. But, 20% of the customers are neutral regarding trust issues in the employees. On the other hand, remaining 10% of the customers don't trust the services and information provided by the bank.



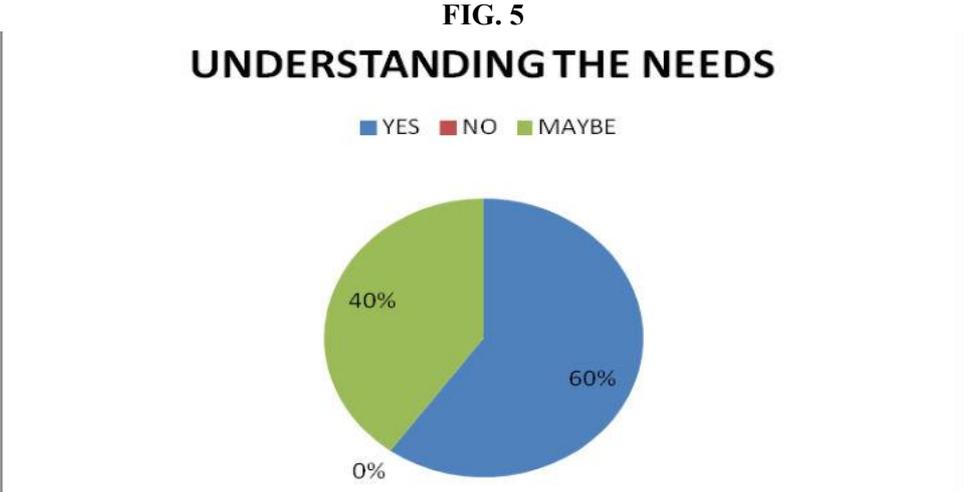
3.) The following fig. 3 depicts that majority of the customers (80%) are satisfied with the behavior of the employees and they agree to the fact that employees are polite in nature towards the customers. 15% of the customers are neutral in terms of behavior of employees and 5% of the customers are not at all satisfied with the behavior of employees towards customers.



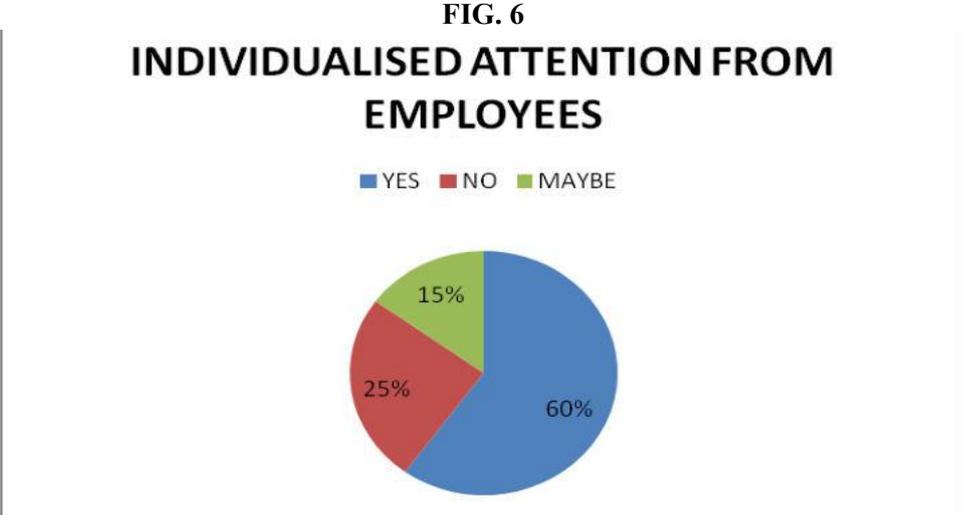
4.) The following figure shows the result that whether the customers are satisfied and whether they trust the employees in case of any discrepancy or any issues in their bank account or their transactions. Positive response is depicted in the figure which means that 65% of the customers feel that employees are trustworthy in terms of resolving issues. But 15% of the customers are not satisfied with the ways of solving issues.



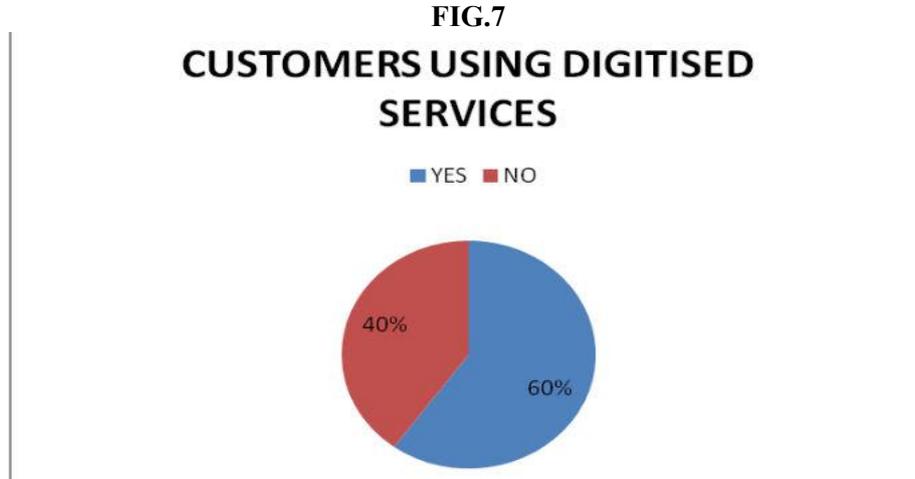
5.) The following figure shows that customers are somewhat satisfied that employees of the bank understand the needs of customers appropriately as 60% of the customers have thoroughly agreed for that point. On the other hand according to 40% of the customers, sometimes their needs are understood appropriately and sometimes not.



6.) FIG. 6 shows that 60% of the customers strongly agree that they have received individualized attention from the employees of the bank in case if any issue or problem arose. But, 25% of the customers strongly disagree in getting personal attention from the employees of the bank.



7.) The following figure shows that whether the customers of ICICI Bank are using the bank application on their mobile phones named as 'i mobile app' or not. Majority of the customers (60%) are using the application while 40% are not using the application in this digitized era.



8.) The following figure shows that whether the customers are satisfied with the digitized services provided by the bank on the application 'i mobile' app or not. More than half of the customers are satisfied with the online services. On the other hand, 42% of the customers are not fully satisfied with the services provided on the application.

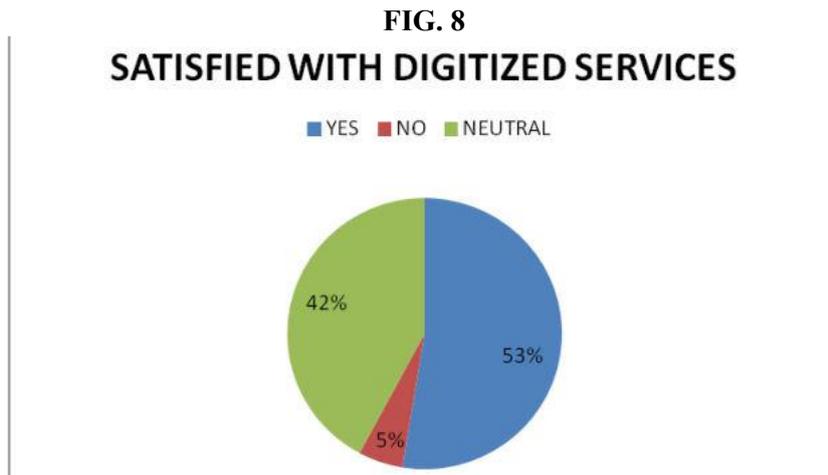
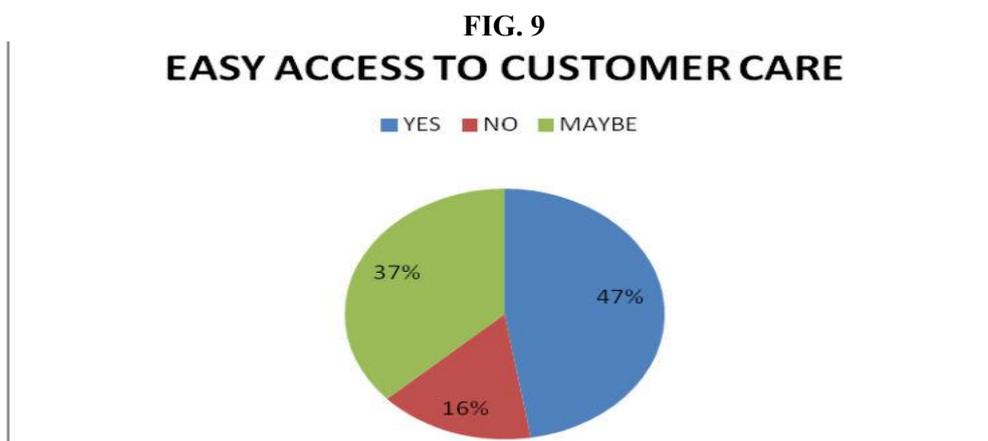
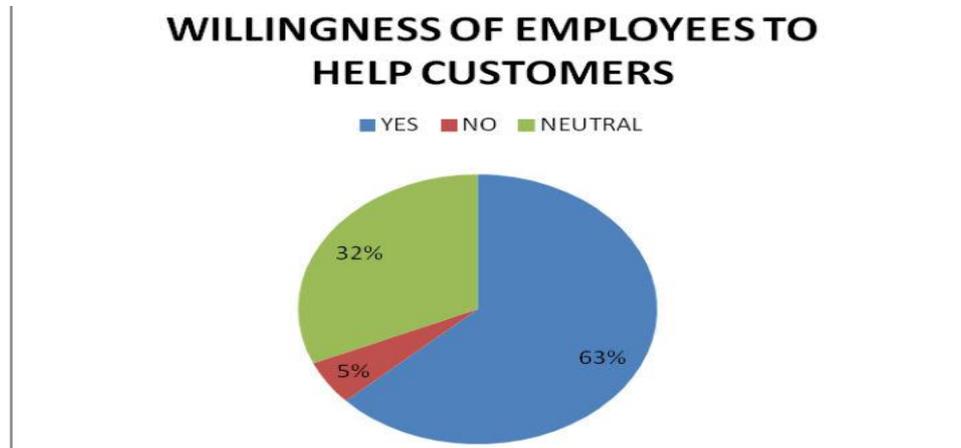


FIG. 9 shows that in case of any problem in operating the application on their mobile phones, whether the customers are able to contact the customer care easily or not. According to 47% of the customers, customer care is easily accessible and their problems are resolved easily. 37% of the customers say that sometimes they are able to contact customer care easily and sometimes not. But, 16% of the customers are not satisfied with bank in terms of customer care services for 'i mobile' app.



9.) This figure reflects that in case of any issue relating to online services, whether the employees of the bank are willing to help the customers and resolve their problems. More than half of the customers are satisfied that employees are eager help their customers anytime. But 5% of the customers are not satisfied with the employees' behavior towards resolving problems and issues.

FIG. 10



## 6. FINDINGS AND SUGGESTIONS

- From this study, it is found that most of the customers are satisfied with the employees of the bank in terms of getting timely information, authentic information and politeness of the employees. So, the bank must be having a strongly managed CRM system in place.
- 40% of the customers think that their needs are not appropriately understood by the employees. So, the management of the bank should train its employees in understanding needs and wants of customers because no organization can survive until and unless it understands its customers.
- Individualized attention to customers is very important to understand them and their needs. 40% of the customers don't agree that they receive personal attention. So, employees of the ICICI Bank should try to give time each and every customer.
- In this era of digitalization, 40% of the customers of ICICI Bank are not at all using the online and digitized services provided by the bank on its application. So, customers should be convinced and influenced to use digitized services.
- More than half of the customers are satisfied with online services. So, it can be said that digitalization has a great impact on Customer Relationship Management. By getting digitized services, customers are more satisfied and relationship with them is maintained for a lifetime. It can be suggested that the bank must work on with continuously providing better and updated services.
- For digitized services, customer care number and email id should be provided to customers so that in case of any discrepancy, they can easily able to contact the employees of the bank.

## 7. LIMITATIONS OF THE STUDY

1. The sample size of this study may not be sufficient to represent the whole population.
2. The research is done in New Delhi only and other states of India may also be considered to conduct research to have better results.

## 8. CONCLUSION

After the analysis done for this research study, it is clear that CRM is the backbone of any organization. In today's business markets, the key to sustainable competitive advantage is the customer. It can become much difficult for the business units without proper CRM systems to survive in today's market scenario. Companies should have knowledge about who their customers are, which customer populations directly drive their profits and what efforts will keep these customers loyal and happy over time. Customers drive business success to a great extent. CRM systems move a business unit beyond the obvious. CRM also helps in the main functions of planning and decision making. With a balanced CRM system, not only the customers will get to know about a particular business unit, but they will also value their relationship with such unit and will also become loyal customers. Each and every bank and organization is following the CRM practices to face challenges of the

rivalry. During the data analysis, it has been identified that customers are highly satisfied with ICICI Bank in the area of NEW DELHI. However, they are still expecting and looking for some important factors to be improved in the bank which would further enhance their satisfaction level. Customers need some more personalized treatment and they expect that the employees help in making their problematic situations easier for them. So, it can be concluded that Digitalization has its impact on CRM because in this world of digitalization, customers are more satisfied with online services. Also, having a Digitized CRM system has a great impact on satisfaction level of employees. CRM which was earlier a very difficult task, has been simplified in today's era of Digitalization.

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**A STUDY ON CONSUMER PERCEPTION TOWARDS DIGITAL WALLET WITH REFERENCE TO SURAT CITY**

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**ABSTRACT**

*This paper addresses the issues of consumers' perception towards digital wallets. We were conducted a research on the consumers perception and the findings are presented and analyzed in the content of this paper. The objectives of the research were to study the factor that influences the consumer in adoption of mobile wallet, to study the problem faced by the consumer in use of digital - wallet, to study the purpose of using digital wallet. This paper argues the positive and negative impact of digital wallet. This research has made it possible to identify the various factors which influence people to adopt digital wallet and most relevant reason behind usage of digital wallet. The last part of the paper includes some recommendations for the digital wallet players and consumers too.*

*Keywords: Perception, Digitalization, Digital wallet*

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**INTRODUCTION****DIGITAL WALLET**

In today-world, smart phone has become important part of everyday life. As it has become more affordable, the number of Smartphone users has increased dramatically. The quantity of smart phone consumers surpassed 1.75 million in 2014 and predictably it will reach 60 billion in 2018.

Along with smart phone production, plenty of services have been created to utilize the possible functions of Smartphone's. Not only smart phones are used as communication devices, but also to be used as socialized tool, entertainment tool, internet access tool, and even payment tool.

Thanks to technology, mobile users can nowadays use their smart phones to make money transaction or payment by using applications installed in the phone. Besides payment, people can also store receipts, coupons, business cards, bills...in their smart phones. When smart phones can function as leather wallets, it is called "Digital Wallet" or widely known as "Mobile Wallet".

**CONSUMER PERCEPTION**

Perception is defined as the process by which an individual select, organize and interprets stimuli into a meaningful and clear picture of the world.

Two individuals may be exposed to the same stimuli under the same time apparent condition but how each person recognizes, selects and organizes and interprets these stimuli is highly individual process based on each person's own needs, values and expectations and past experience.

Consumer perception theory is any attempt to understand how a consumer's perception of a product or service influences their behavior. Those who study consumer perception try to understand why consumers make the decisions they do, and how to influence these decisions.

A customer's perception can be defined as an accumulation of past experiences and personal believes. This is because the customer would be bias favorably or unfavorably towards a particular product based on the number of information received.

**Changed perception = Changed buying behave**

**LITERATURE REVIEW**

**Dr. Ramesh Sardar (2016)** in this study targeted among the "population of Jalgoan the preference towards mobile wallets" and carefully examines the effects of demographic variables on the use of m-wallets along with the factors influencing and refraining for the use of m-wallets. The study concludes that India needs to move towards a cashless. This will be useful in reducing currency management cost, check tax avoidance / fraud, track transactions, reduce terrorism funding etc... This paper concludes that in pushing cashless and electronic payments, the most significant contributor emerged is the M-wallet.

**Ms. Seema Rathi, (Dec 2016)** in her paper "Demonetisation and Digital Payment System in India: Issues and Challenges" discussed about demonetisation in India, digital payment platforms, and thus identify issues and challenges and strategies to overcome these issues and concluded that there are some problems for public to use

cashless digital methods at present. But government can create awareness, build trust, provide cyber security framework and provide necessary infrastructure to make it possible for public to adopt digital payment systems.

**DR.S. Manikandan, J. Mary Jayakod, (May2017)** in their paper “The empirical study on consumers adoption of mobile wallet with special reference to Chennai city” they studied the application and usage of wallet money endorsed by different companies and various factors that affect the consumer’s decision to adopt mobile wallet and various issues and challenges faced by the users of mobile wallet. And from the study it was analysed that Factors like brand loyalty, convenience of shopping plays an important role in adoption of mobile wallet while Security and safety of funds plays a challenging factor for the users and also concluded that Mobile wallet awareness is spreading among the people in India due to government policy so might have tremendous growth in adoption of mobile wallet in the forthcoming years.

**S. NazimSha, Dr. M. Rajeswari, (2018)** in their paper “A Study on Paytm Services in Promoting Cashless Economy After Demonetization In India And An Outline On Its Support Towards Making India Digital” discussed the opinion among people in adopting Paytm as a solution to the Indian Demonetization. And examine the importance of Paytm in day to day life, and way its flexible service contributes to digital India.

**OBJECTIVES OF THE STUDY**

- To study consumer perception toward digital wallet
- To study the factor that influences the consumer in adoption of mobile wallet
- To study the problem faced by the consumer in use of m- wallet.
- To study the purpose of using digital wallet.

**RESEARCH METHODOLOGY**

- **Type of Research:-** In this study Descriptive research was used in order to Study Consumer Perception towards Digital wallet in Surat city
- **Data collection method:-** In this research study the survey method was used to collect the data.
- **Population:-** Population for the study was people in Surat city
- **Sampling method:-** Non Probability convenience sampling method was used .
- **Sampling frame:-** Sampling frame 243 people from different areas in Surat
- **Sample size:-** 243 respondents were selected for the purpose of the study.
- **Research instrument:-** Questionnaire was used for the purpose of the data collection as the research instrument.
- **Source of the data:-** Primary data was collected by survey method while Secondary Data was collected through book, research paper and various authenticated websites.

**DATA ANALYSIS AND PRESENTATION**

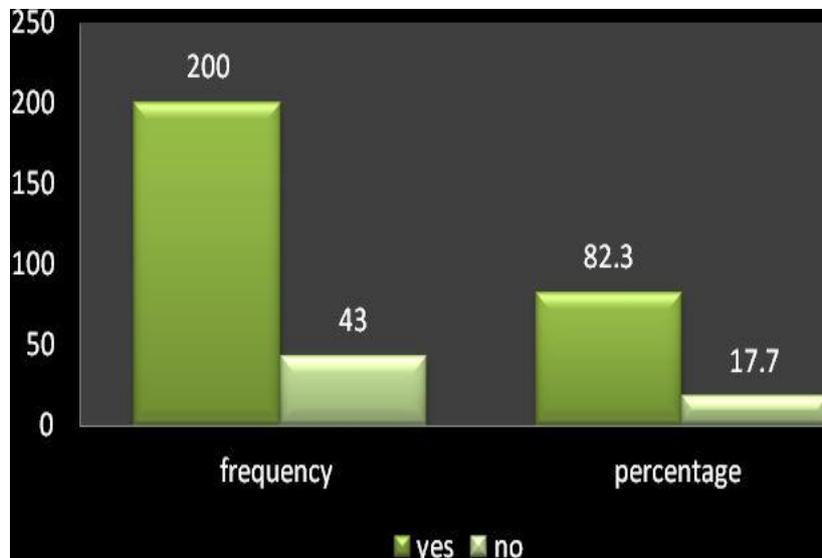


Figure-1: Users of Digital Wallet

**INTERPRETATION**

From the above representation it can be inferred that 82.3% of respondents are users of Digital Wallet and 17.7% were not use it.

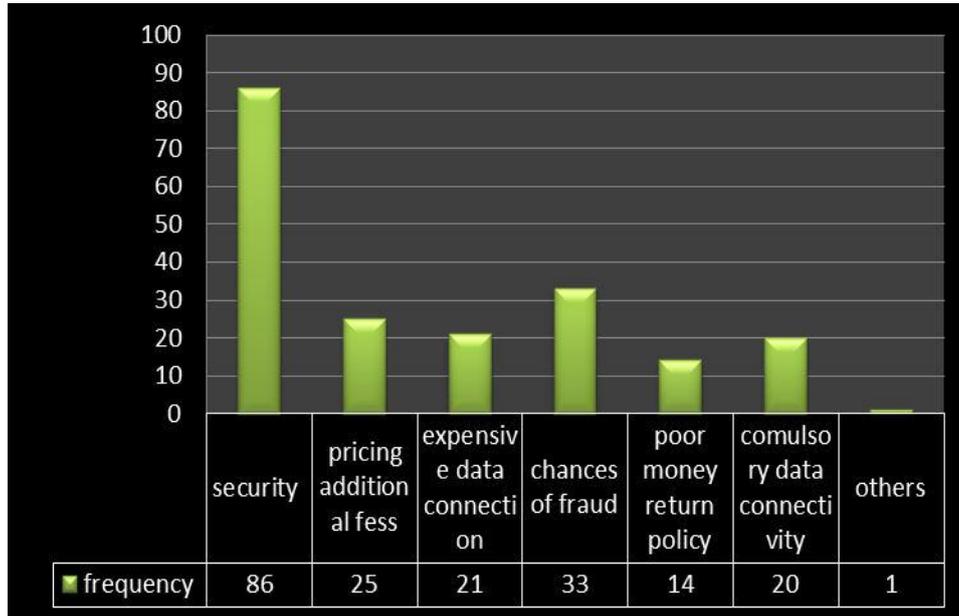


Figure-2: Issues/problems faced by users

**INTERPRETATION**

1. 86 respondents consider security /safety problems as biggest risk factor while using Digital Wallet
2. 25 respondents consider pricing as risk factor while using Digital Wallet
3. 21 respondents consider expensive data connection as a risk factor while using Digital Wallet
4. 33 respondents consider more chances of fraud as risk factor while using Digital Wallet
5. 14 respondent consider poor money return policy of companies as risk factor while using Digital Wallet
6. 20 respondents consider compulsory data connectivity as risk factor while using Digital Wallet and
7. 01 respondent consider other factor risky while using Digital Wallet.



Figure-3: Purpose of using digital wallet

**INTERPRETATION**

1. 23% of respondent use Digital Wallet for payment purposes at hotel, restaurant bill etc...
2. 16% of respondent use Digital Wallet for paying utility bills like electricity, gas bills etc...
3. 20.5% of respondent use Digital Wallet for shopping purposes
4. 18.5% of respondent use Digital Wallet for recharge purpose
5. 11.5% of respondent use Digital Wallet for transferring money and
6. 10.5% of respondent use Digital Wallet for ticket booking at movie, train, and flight etc...

**Table-1: Factors that influence customers to adopt Digital wallet**

Factors	Frequency value				
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Convenience in buying	50	106	41	03	00
Easy to use	61	100	36	03	00
Brand loyalty	37	64	88	07	04
Security	34	84	56	21	05
Privacy	42	71	66	19	02
Discounts/Offers	80	73	42	05	00
Advertisement	43	71	57	28	01
Speedy Transaction	97	60	33	06	04

**INTERPRETATION**

From above table it reveals that 50 respondents strongly agreed and 106 respondents agreed that Convenience in buying is the factor which influenced them towards digital wallet. Out of 200 hundred users 100 agreed that Easy to use is the influencing factor for them. 64 respondents agreed and 88 respondents stay neutral for Brand loyalty factor. 84 respondents agreed that Security is influencing factor while 05 respondents were disagree with the same. 42 respondents strongly agreed and 71 respondents agreed that Privacy is the essential influencing factor for them. 80 respondents strongly agreed and 73 agreed with Discounts factor. 71 respondents agreed that Advertisement influenced them towards digital wallet while 01 respondent disagreed with the same. Out of 200 users 97 strongly agreed and 60 agreed with Speedy transaction factor

**FINDINGS**

**To study the factor that influences the consumer in adoption of mobile wallet**

- It is found that 25% of respondent strongly agree that convenience in buying factor encourage them to use Digital Wallet,53% agree ,20.5% are neutral, 1.5% disagree on that point.
- It is found that 30.5% of respondent strongly agree that easy to use factor encourage them to use Digital Wallet, 50% agree, 18% are neutral, 1.5% disagree on that point.
- It is found that 18.5% of respondent strongly agree that brand loyalty factor encourage them to use Digital Wallet, 32% agree, 44% are neutral, 3.5% disagree and 2% strongly disagree on that point.
- It is found that 17% of respondent strongly agree that security factor encourage them to use Digital Wallet, 42% agree, 28% are neutral, 10.5% disagree and 2.5% strongly disagree on that point.
- It is found that 21% of respondent strongly agree that privacy factor encourage them to use Digital Wallet, 35.5% agree, 33% are neutral, 9.5% disagree and 1% strongly disagree on that point.
- It is found that 40% of respondent strongly agree that discount/offers factor encourage them to use Digital Wallet, 36.5% agree, 21% are neutral, and 2.5% disagree on that point.
- It is found that 21.5% of respondent strongly agree that advertisement factor encourage them to use Digital Wallet, 35.5% agree, 28.5% are neutral, 14% disagree and 5% strongly disagree on that point.
- It is found that 48.5% of respondent strongly agree that speedy transaction factor encourage them to use Digital Wallet, 30% agree, 16.5% are neutral, 3% disagree and 2% strongly disagree on that point.

**To study the problem faced by the consumer in use of m- wallet.**

- It is found that 43% of respondents consider safety and security as biggest risk factor they faced mostly while using Digital Wallet, 16.5% respondent consider more chances of fraud as risky factor, 12.5% of respondent consider pricing, and the rest 10.5%, 10% ,7% ,5% consider expensive data connection, compulsory data connectivity, poor money return policy, other factor as a risky factor respectively.

**To study the purpose of using digital wallet**

- It is found that 23% of respondents were using digital wallet for payment purposes, 16% were using Digital Wallet for paying utility bills, 20.5% use for shopping purpose ,18.5% use for recharge purpose, and the rest 11.5% and 10.5% of respondent use for transferring money and ticket booking respectively.

**CONCLUSION**

Digital wallet usage awareness as spread among the people in India due to government policy of demonetization and this as forcefully induced the usage of digital wallet. The security issues are tightening and risk factors are

reduced will automatically increase the adoption of digital wallet. Apart from these issues the convenience and ease of use as gained a credit to digital wallet and it can be concluded that they will be a tremendous growth in adoption of digital wallet in the forthcoming years.

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**TRANSFORMING EDUCATION IN INDIA: TEACHING AND LEARNING IN THE DIGITAL ERA**

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**ABSTRACT**

*Technology plays a vital role in the digital era for imparting education both at school and higher education level. Today's generation have high level of technological literacy. Use of digital innovation has led to the expansion of technology in education. These generations are receptive to outside impressions and have an active participation in the social environment. Hence, technology has to be embraced in today's education and teachers have to apply technology as part of the students learning. The aim of this paper is to review the role of technology in improvising the teaching and learning aspect in the digital era. This paper also presents some of the emerging issues related to inclusion of "Quality Education" as one of the key sustainable development goals of UN.*

*Keywords: Technological literacy, quality education, education in digital era, social environment, sustainable development goals, technology for teaching and learning*

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**OBJECTIVE OF STUDY**

The paper focuses on following key areas:

Imbibing technology in teaching and learning framework

Ways through which digital education is transmitted to a learner in a better way

Government initiatives and future endeavors to enable technology based learning

Overcome Challenges of Digital education

**INTRODUCTION**

It has become a worldwide concern for our educational system to shift its gear from formal lecture method to learning-by-doing approach. The previous generation was inclined towards the sense of duty. Present generations have different motivational profiles: Interest, peer pressure, engagement and competition. In past, higher education has been seen through the lens of its institutions. Students in various job profiles were considered according to their marks and the institution they attended.

With rapidly changing technology and constantly evolving job types companies require skilled and competent employees therefore, student's education need an ecosystem that integrates theoretical and practical learning approach. In order to have a transformative impact on student learning and success, it must be aligned with quality content and flexible learning opportunities to facilitate the needs of a broader range of students. Institutions should encourage instructors and department leaders to review courses and employ technology-based applications, tools, and resources to redesign these courses to support student success. Technology, with wider reach can be used to complement the instructor interaction with the students and the available academic and non-academic support.

**TECHNOLOGY ENABLED TEACHING**

Technology enable instructors to create active learning environments that connect students with content in different ways. For example, rather than formal lectures, instructors can use demonstrations and short films along with lecture-discussion method. Online tools can create active learning environments that encourage students to collaborate, participate and engage in activities that promote the attitudes and non-cognitive skills needed for real-world application of their knowledge. In addition, learning can be organized around real-world challenges and scenarios through various case studies, role plays and training methods. So that students can master skills and work together to find collaborative solutions.

**THE EMERGING VIRTUAL TECHNOLOGY**

Computer and mobile technology has become an important tool in the teaching and learning process. It involves connectivity for downloading, uploading and working online via wireless networks. Virtual reality uses additional tools such as VR goggles which help to present an artificial environment using sounds, 3D images and other stimuli to accommodate the new generation of learners, Artificial Intelligence is being used for developing virtual teaching assistants and personalized learning for a student, as the technology evolves and becomes more commercially viable.

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**DIGITAL TRANSFORMATION PATHS IN HIGHER EDUCATION**

Historically, Higher education has never focused as a means of social mobility and an engine of economic growth. With the transforming India technology has paved the way for the future aspects of higher education to fulfill its promise as a great equalizer; continued innovation can move us toward increased access, affordability and equity. The upcoming years will see an ecosystem that will provide wide range of opportunities for high-quality education and learning suited for the differing needs of students.

**Remote classrooms and Exam Proctoring:** Remote classrooms will enable students in far corners of the world to attend a class in school or university in countries. It let students to appear for exams from any location. The system can track and monitor remote using advanced image, video, audio streaming with the intelligence to analyze if the student is cheating.

Technology, has evolved at an interesting stride in the last decade, college enrollment has increased due to economic recession, competition, deindustrialization, and increasing demand for skilled workers. For a particular job, where, it was previously possible to get high-paying middle-class job with no post secondary education, workers new to the workforce are finding they need comparatively more education for applying new job types in industries. In the recent years, external environment have also dramatically changed where students seeking higher education are already working or have family obligations to support them financially. At the same time, increasing costs and decreased state funding for higher education have created challenges for all students. By placing students at the center, policies should be framed to provide flexible learning schedules, include courses they can complete at their own pace, faster or slower, depending on their obligations.

**Tailor made education Aid-** Every student is different in terms of educational aptitude, retention ratio and learning behavior. This brings us to rejuvenate the longest persisting flaw in our education system. With the ongoing AI systems and its applications, students get individual attention and reasonable care which was not possible in a batch of more than fifty students. AI allows teachers to monitor and guide students individually.

**Government initiatives** such as E-Basta, skill India, SWAYAM, Rashtriya Madhyamik Shiksha Abhiyan (RMSA) and Digital India will provide the infrastructure needed by students to study online. *Union Budget 2018 brought many announcements in the area of Artificial Intelligence as a welcome initiative.* Government also doubled allocation to \$480 million in 2018-19 to create a robust ecosystem to promote education, health and other sectors. According to Forbes in 2017, international funding reached USD 9.52 Billion and EdTech investments mark a gain of 30% from 2016. One of the India's leading EdTech startups Byju's raised USD 40 million as its total funding.

**Online learning platforms at school level-** Virtual school teaches students primarily through the internet. Online education delivers instruction to students who are separated from the instructor to support their regular interaction. It exists at all levels of education. At earlier times conventional learning which put emphasis on course curriculum served well in the past, now the scenario has changed, to be innovative and outperform others right skill sets and practical knowledge is the need of the hour. Online k-12 courses are designed to help children learn to diversify their learning and vary with the pace of learning. Online learning apps like BYJU'S, Khan Academy; Coursera and Teachoo are some common examples which have become part and parcel of student's life.

**Online learning platforms at undergraduate level -** undergraduate education in India is also known as higher education. According to All India Survey on Higher Education (AISHE) report the Survey covers all institutions at undergraduate level in the country categorized in 3 broad Categories, University, Colleges and Institutions. There are 903 Universities, 39050 Colleges and 10011 Stand Alone Institutions listed on AISHE. Students studying at this level generally begin their education from 18 onwards. As per one estimate 88% of higher education is provided by colleges in India. In the domain of higher education online learning is provided through E-content listed on MHRD website includes NPTEL, virtual labs, Talk to teacher, E-Yantra, Digital library InFLiNet and E-kalpa. According to Haugen, LaBarre, & Melrose, 2001, Universities and Colleges have increased their web-based course offerings appealing to such working adults who otherwise have limited access to higher education.

According to **Forbes** following are the ways to impact student's learning:

**Virtual Reality** Technology is making learning collaborative and interactive which enhance teacher's instruction along with creative learning environment. It has the capability of bringing the outside world into the classroom reality.

**Artificial Intelligence-** AI an area of computer science proficient to perform tasks which require human intelligence such as voice recognition, decision making and translation between languages. AI has already been applied to education industry that develops skills and provides solution to bridge teaching- learning gaps. India, being the fastest growing economy and amplified with the youth population consisting half of the population below age 25 are well equipped with digital innovation, by channelizing their potential in right direction towards learning though digital aids will help to create well developed education sector. According to EdTechXGlobal, Edtech is becoming a global phenomena, the market is projected to grow at 17.0% per annum. India's digital learning market was valued at USD2 billion in 2016 and projected to grow at CAGR of 30% and according to technopak will reach USD 5.7 billion in 2020.

**Gamification** when learning and playing collide and classrooms utilize gaming as an instructional tool it makes learning more exciting and interactive. New technology enables a team-based approach. It promotes educational games which provide immediate feedback and keep students motivated.

**USE of Smart Boards** Educators have realized that they no longer require limiting their teaching and learning space. With collaborative-friendly spaces it facilitates students visiting field trips instead just reading text books. In 21<sup>st</sup> century classrooms are equipped with smart boards instead of chalkboards.

### **WHICH MODE IS BETTER- TRADITIONAL LEARNING OR ONLINE LEARNING?**

Over few decades, it has been observed that most institutions have started offering online courses over traditional face to face. Respondents believed that offering online courses are advantages due to its easy understanding of course content compared to formal lecture method (Ella Carter, Bowie State University, USA). Earlier contributions made by proponents differ as (Farmakis and Kaulbach (2013)) is of the view that there is little change in the perception of online offering when compared to face-to-face, According to proponents of online education (Bernard et al, 2004; Means et al, 2009 and Farmakis and Kaulbach (2013)) little difference found between the learning outcomes of the two formats. Harasim (1989) and Talebain et al (2014) believed that online mode represents augmented environment which allows users to greater control over time, place and interaction with participants and instructors compared to face to face education. However critics (Allen and Seaman (2013) stated that online courses perceived to be inferior compared with face to face. According to Gallup poll, October 2013 (Saad, Busted, and Ogisi, 2013) online education in US revealed that online education was positively perceived as it offers wide range of courses along with flexibility at reasonable costs. On the other hand, it was negatively perceived because it involves less qualified instructors.

### **Overcome Measures of Challenges to Digital Innovation**

#### **Internet connectivity issues**

The internet connection in rural areas and some parts of urban areas is poor. Due to digital illiteracy it becomes a challenging issue for a large part of the population to get online education and access to appropriate resources. To solve such issues there is a need to increase IT department and spread awareness in rural areas.

#### **LACK OF FUNDS**

In developing country like India, it becomes difficult to implement digital technology into education system as it requires huge amount to build infrastructure and get updated with latest technology. This issue can be resolved through government initiatives, venture capitalists and other private financiers to promote Digital innovation programme.

#### **SHORTAGE OF TRAINED STAFF**

In the realm of digital innovation lack of knowledge and skills in rural area is the hindrance to economic growth. There is shortage of teachers and trained staff who could share their abilities and learning. At some places in rural areas, school teachers and college professors are not interested in using digital tools for conducting classes. They generally use traditional chalk board method and believe in providing a lot of information at one go. In rural areas, teachers are reluctant to be trained and adopt digital technologies for digital education in school because they are in view that these disruptive technologies are out to replace them permanently. The solution is to have blended learning process which involves learning by doing approach.

#### **FUTURE PROSPECTS**

Technology is changing at a fast pace, from 2016 introduction of MOOC with focus on blended learning models developed. To promote technology startups, app developers and entrepreneurs are being financed by venture capitalists. By 2020, cloud-based learning will be the rule which will help in better data sharing and more visual assessment results. According to a report over 5.8 million students enrolled for online courses in 2016, which is a 263% increase over the last 12 years. As per report of KPMG and Google points, online education in India

will witness a robust growth with an eighth fold increase by the year 2021, the focus has been shifted from rote learning to building skills.

### **LITERATURE REVIEW**

To develop student's interest and gain positive learning outcomes an instructor has to position the content with practical applications along with theoretical framework to create an interactive session through "learning by doing" approach (Picciano, 2002; Watkins, 2005). A teacher should be enthusiastic and appreciate students for their contributions in overall participation (Adler, Milne & Stablein, 2001; Burke & Moore, 2003; Meyers & Jones, 1993)

Barron (2001) observed that Online learning is cost effective method to provide standardized and an efficient content delivery but according to Ludwig-Hardman and Dunlap (2003) e-learning is not sufficient alone, due to feelings of isolation, decrease in motivation and lack of direction, therefore focus should be on blended learning which includes classroom sessions, technology based sessions and web based sessions (Rubenstein, 2003; Ward & LaBranche, 2003). Marcus, Taylor and Ellis (2004) dealt with blended learning process involving conversion of 2-4 hours of lectures to 2 hours of practical class to 2 hours of online case session in small groups and finally 2 hour of case resolution session.

With the fast pace life and to increase standard of living, both parents become the breadwinner to support their family. In such a situation parental contribution (Kerr & Stattin, 2000; Stattin & Kerr, 2000) becomes utmost important to accomplish their children in using technology helping them in the overall development and encourage social interaction (Rhee & Bharnagri, 1991; Bergin, Ford, & Hess, 1993; and Clements, 1994).and get report by teachers via online which includes attendance report, emails, instant messaging and video calling.

To indulge students in e-learning estimates suggests that a good sum of money being spent by U.S. companies to provide I.T based training (Koprowski, 2000) universities and colleges continued to increase offering web-based courses to target those who have limited access to materials and face time constraints due to fulfilling family obligations.

Colleges and universities will increase their web based offerings to cater the needs of those who have limited access to higher education. Various projections made by (Forbes) suggest, e-learning market will grow by \$325 Billion by 2025.

E-learning overcomes the limitations of physical presence (Biocca et al. 2001) and subjectivity involved. Performance of students improves through applied learning in real life situations of theoretical framework (Bereiter & Scardamalia, 1989; Bransford, Brown, & Cocking, 2000). With the help of technology and online instruction learning can be facilitated by providing real-life contexts to solve complex problems (Duffy & Cunningham, 1996; Honebein, 1996).

(Benek-Rivera & Matthews, 2004; Sarason & Banbury, 2004) stated that student's involvement increases through "instructional activities involving students in doing things and thinking about what they are doing" called active learning.

With the help of E-learning "new" information can be delivered which were not included in traditional sources, by citing examples information are reinforced through examples, , assessments, explanations and exercises. (McEwen, 1997), in this way, online instruction can potentially enhance learning compared to what can be accomplished using a classroom approach only.

According to Jinal Jani and Girish Tere (2015), Digital India drive introduced by Government of India to create digital empowered society will help in creating jobs. According to (Meyen, Aust, Gauch, Hinton, & Isaacson, 2002).Projections suggested that online offerings will continue to increase rampantly in educational as well as corporate settings in years to come.

### **RESEARCH METHODOLOGY**

The data for this study are gathered from NITI Aayog discussion paper (niti.gov.in). The online learning programs having future growth prospects for quality education has been into limelight by UN environment, www.unenvironment.org according to which by 2030 all learners will be equipped with knowledge and skills to promote sustainable development through education. The paper puts emphasis on the government's role to fuel the Indian economy through Artificial Intelligence in the current budget 2018. In India, it is estimated that schools are investing around 20% of their budget on teacher and administrator training. Proving continuing education is a great strategy for Teacher retention and career advancement. The infusion of AI and technology will require the teachers to be equipped with latest knowledge, tools and guidelines on 'how to deal with the

changes' and educate effectively. According to research conducted by KPMG and insights from Google study online education industry will be \$1.96 billion industry by 2021. Primary and secondary education category has the largest segment of audience comprise a student base of around 260 million and expected to reach \$773 million by 2021 compared to competitive exams and other tests which likely to become \$515 million.

### CONCLUSION REMARKS

India holds a key place in the global education industry. Education sector has seen a rapid expansion in the last couple of years with the help of digital education landscape for learners is increasing. The study reveals that development of infrastructural facilities for online education is required for making population digital literate across the country. Government has taken initiatives for transforming India by doubling the allocation of resources in education, health and other sectors. While there are number of obstacles to scale up online programs such as lack of funds, shortage of trained staff and internet connectivity issues. The future prospects of digital education is prospering and challenging. It is therefore required to overcome such challenges for the development of digital education in India.

Based on previous literature, investigators expected no difference in learning outcomes between online learning and face to face learning outcomes.

Overall, this paper provides an analysis of the key characteristics of the set of institutions that have gained significant scale in their online education offering platforms, various startups emerged as a giant in education industry including BYJU'S, unacademy, vedantu, Meritnation and anymore and has provided some direction for what other institutions should do to expand their own online offerings.

On comparing the points made by proponents and critics on online education, it can be concluded that it is better to have a hybrid method which involves a blended learning.

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**POST LIBERALISATION SCENARIO OF INDIAN BANKING AND REGULATIONS FROM CUSTOMER SERVICES PRESPECTIVE: A CRITICAL REVIEW****Suman Mittal<sup>1</sup> and Dr. K. K. Garg<sup>2</sup>**Research Scholar<sup>1</sup> and Associate Professor<sup>2</sup>, Lingaya's Vidyapeeth, Faridabad**ABSTRACT**

*In 1991-1992 Liberalisation has been initiated in Indian economy, and liberalisation is incomplete without Globalisation and Privatisation (LPG). All these initiatives have opened the doors for the private and foreign parties, who were interested in banking business. LPG has fastened the pace of growth in Indian Economy, mobilizing the funds, immense infrastructure development, investment churning etc. From the customer perspective, services have been improved drastically, transaction time has been reduced, customers are empowered by technology driven banking. Earlier customers had to choose Public sector banks as an only option, to avail the banking services but after LPG there are many options to get banking services. Although private sector banks has given a intense competition to the PSU banks but they joined the banking industry with a motive of profitability and wealth maximisation, a large number of complex products are introduced to meet the different requirements of the customer, but these products are not easily understood by the customers and leads to misselllling. In the name of the superior services, multiple and exorbitant charges are levied on the customers and erode the customer money. By arranging the modern looking facilities and maintaining physical appearance of the branch premises, higher Average balance is demanded from the customers. The services are provided on the basis of the financial health of the customer. In this paper we briefly elaborate the post liberalization scenario and the bank practices with the provisions of the Banking code and standard board of India (Autonomous body established by Reserve Bank of India to take care of the customer interest by monitoring the customer services practices in banks). In this research we found that banks are lacking in providing services as per the commitments made by BCSBI code and certain issues are raised by the customers regarding insufficiency in the services.*

*Keywords: Liberalization, BCSBI code, Bank Practice, Customer Services*

**1. INTRODUCTION**

Banking industry is a symbol of trust in any economy and regulator works as a watchdog, to safeguard that trust from erosion by regular monitoring and by setting up rules, regulations and standards. After independence in 1947 Indian banking industry was in miserable state but gradually various steps were taken by the government for the overall development of the country including banks. But the turning point was the introduction of Liberalisation, due to which norms were relaxed for the private banks to enter in the market. Private Banks were very aggressive in grabbing the market share and hence provided good physical facilities, ambiance and excellent customer service, where the PSU banks were lacking. Private Banks also introduced the computers in banking, which created a great difference in transaction timing in private and PSU banks. PSU banks have also undertaken all these changes to retain the customer from losing to private banks. Private Banks also make use of liberalized interest rates and provide higher interest to the customers on their deposits with the banks but same time charges a higher rate of interest from the loan customers. When private banks started to establish their selves they used penetration strategy to grab the market share by opening zero balance accounts and the basic accounts for the general masses, but gradually the strategy has been changed from penetration to skim the cream. In this skimming strategy private banks has started concentrating on wealthy individuals, corporate, wholesale customers etc, which is called as a creamy layer of the society. In short, the actual image of the private banks appears after some time that these banks are meant for the customers who are not poor and above an average class, if a customer is having adequate amount to fulfill the average balance criterion of the private banks only then they are welcomed. In this case poor is still excluded from getting good financial services and they have to stand in the long waiting queues for hours, where no customer is entertained by the staff during the long lunch and tea hours. Can we assume this practice as Financial Exclusion of the disadvantage group?

Not only poor public but rich and wealthy customers are also exploited on the name of service. Such a wide range of products are documented by banks that neither the bankers nor the customers are able to remember or gain knowledge about all the products/services. Only those product/services are sold to the customers which are target based or earn revenue for the bank and incentive for the employees, customer need identification is just an eye wash or as a formality for the sake of adherence of regulations. Not only in Indian Banking but all over the world banking history has seen scandals for the wealth maximisation like LIBOR scandal, Financial crisis in 2008, Deutsche Bank's \$10 billion scam, Lehman brothers collapse etc. in the core of all these scam activities

making easy money was the motive. Generally in international frauds poorer countries become more poor and rich become richer.

In this paper we have elaborated those services which are mentioned in the BCSBI code's commitments and all the member banks are bind to follow the same. We have recorded customer's perception regarding the fulfillment of these services and done a bank wise comparison of the adherence of the regulations.

## 2. LITERATURE REVIEW

To check the service quality of the bank (*Valarie A. Zeithaml, A. Parsuraman, Leonard L. Berry 1985,1988*) has developed a scale named SERVQUAL having five dimension of service quality named as Reliability, assurance, tangibility, empathy and responsiveness and that create the acronym RATER. Although private banks are providing good services but still there is a huge gap in resolving customer issues emphatically by the bankers, they have modern looking facilities, good ambiance and mannered staff but still lacks in understanding the customer (*A. Anant, R. Ramesh, B. Prabakaran 2010*). Various researches has found that banks concentrate on other facilities but do not work on their human resource, it's the personal touch of the banker that makes a difference, because services are available in all the banks (*Dr. S. Saraswathi 2012*). Researchers have also found that bank branches are skewed distributed, the average density in urban branches are 6000 population and in rural area this average density is 24000 population per branch. It also states that as per census of 2011, 9% of the deposit and 8% of the advances are contributed by the rural population and India's rural population is 68% of the total population. Urban population contribute 32% of the total population and approximately 91-92% of the deposit and advances come from urban population and moreover in this urban contribution 92% of the total contribution comes from some affluent business families. This shows the changing mind set of the banking industry, that discrimination exists on the basis of the location and in the core its financial difference (*R.K. Dubey 2014*). Since the inception of the banking industry the focus has been shifted a lot in terms of services to marketing activities. Nowadays banking marketing strategies are only concentrating on those persons who are getting rich income through agriculture, industry, business sector and neglecting the rural masses and the retail customer segment that is actually creating the wealth for the nation by working in these industries and business. Banks are unwilling to market those products that are pushed by the government and basically meant for poor and rural masses (*Boruggadda Subbaiah 2012*). Not only this but sometimes the basic products like Lockers are given to the customers only after getting a big amount in their accounts or a handsome amount of investment policies purchased by the customers. Nowadays bank uses locker as a product for completing their third party product targets (*Why it is difficult to get a locker 2011*). [24]

Regulators also keeps an eye on the banking activities and levies fine if the regulations are not obeyed by, in 2013 The Reserve bank of India has imposed penalty on 22 banks amounting Rs. 50 lacs to 3 crores. All the big banks were included in it like State bank of India, ICICI, HDFC and others for violating the KYC norms, procedures and compliance system in April 2013. Money laundering charges have been levied on various banks including ICICI, HDFC, INDUSIND, AXIS etc. (*RBI fines 22 banks for violating KYC norms 2013*). [22]

It is not only the banks but customer's orientation has also changed in terms of getting services, they have high expectation but their perceived quality is quite low particularly across the public sector banks. Continuous feedback from the customer is required to improve the service quality and reliability of the bank (*Dr. T. Meharajan, Dr. P.S. Venkateswaran, S. Arvind, 2015*). There are seven reasons which are identified by the researches which are responsible for customer bank switching nature these are price, reputation, service quality, advertising, involuntary action, distance, cost and other factors. Among all these factors reputation and pricing are main factors to influence the customer decision of switching the bank (*Dr. Ramaiyer Subramaniam, Dr. Jayalakshmy Ramachandran 2012*). Last 5 years report of banking ombudsman shows that they used to receive approximately 70-80 thousand complaints every year from the customers and approximately 25-30% of the complaints are related to non fulfillment of BCSBI code/ unfair banking practices. One more thing which was highlighted that approximately two third of the complaints are received by urban area, it shows the level of awareness among the customers (*Reserve Bank of India-Banking Ombudsman reports from 2010-2011 to 2015-2016*).

We have tried to check the level of services provided to the customer while keeping the BCSBI code as a standard for comparison and developed a questionnaire on the basis of code and evaluated the bank wise services provided to the customers.

## 3. SCOPE OF THE STUDY

In our study BCSBI (Banking Code And Standard Board of India) has been taken as the regulatory standard for comparing the actual banking practices. BCSBI code is having two parts one is for retail customer and another

is for MSME (Micro, Small and Medium Enterprises), in this study we have taken Retail customers for our study.

**4. CONCEPTUAL FRAMEWORK**

In 2006 Banking Code and Standard Board of India was established by Reserve Bank of India to safeguard the interest of common bank customer, BCSBI code is established to maintain and monitor the bank services as per the provisions of the code. Code made provisions for the fair and equal treatment of the bank customers and time to time monitor the bank practices who become member of this code. This code is revised time to time in this study we are working on latest i.e. Code of Bank’s Commitment to Customers – January 2014

**Key Commitments of the code**

- To act fairly and reasonably in all our dealings with Customers
- To help customer to understand how our financial products and services work
- To help you use your account or service
- To deal quickly and sympathetically with things that go wrong
- To treat all your personal information as private and confidential
- To publicise the Code
- To adopt and practice a non - discrimination policy

**Initiative taken by Regulators to improve the customer services**

- *Committee on Capacity Building 2014, Purpose- Human Resource development in Financial sector*
- *Goiporia Committee 1990, Purpose- Improvement in Customer service*
- *Damodaran Committee 2011, Purpose-Improvement in Customer service*
- *R. Jilani Committee 2016, Purpose-for Audit/inspection soundness and accountability*

**5. Objective and Hypothesis of the Study**

**OBJECTIVES**

1. To check the overall score of bank practices with the commitments of BCSBI code.
2. To do a bank wise comparative analysis of the dimensions of the bank practices.

**HYPOTHESIS**

**1<sup>st</sup> Objective- H0-** Customers are satisfied by the bank practices.  $\mu \geq 4$

**H1-** Customers are not satisfied by the bank practices.  $\mu < 4$

**2<sup>nd</sup> Objective- H0-** There is no significant difference in the bank practice of different banks.

**H1-** There is a significant difference in the bank practice of different banks.

**6. RESEARCH METHODOLOGY**

**Research type-** Exploratory, Descriptive and Explanatory

**Sampling Technique-** Banks are chosen randomly and customer are chosen by Stratified sampling technique.

**Sample Size-** 570 customers have been chosen for the study from 8 banks, among which 4 are private banks and 4 are Public sector banks. The banks are selected Randomly on the basis of the highest number of branches in Faridabad region (Data about the number of branches has been collected from the lead bank i.e. Syndicate Bank).

**Table-1: Bank wise Number of respondents**

Private Banks	No. of Actual Respondents
Axis Bank	71
HDFC Bank	74
ICICI Bank	72
Kotak Mahindra Bank	69
Public Banks	
Syndicate Bank	71

Canara Bank	71
Punjab National Bank	72
State Bank of India	70
Total	570

**Questionnaire Design and Data Collection**

Questionnaire is designed by using the commitment of BCSBI code and data is collected by the researcher only. Questionnaire is having 35 statements related to below mention 7 dimensions.

**Table-2: Instrument design and variable identification**

Sr. No.	Commitments	Variable
1.	<ul style="list-style-type: none"> <li>To provide fair, reasonable and adequate services to the customers</li> <li>Maintain a efficient payment system</li> </ul>	<ul style="list-style-type: none"> <li>Duty Deliverance</li> <li>Transactional Efficiency</li> </ul>
2.	<ul style="list-style-type: none"> <li>To help the customer to get knowledge about the banking products and services.</li> <li>Marketing material should be in local language and clear</li> <li>Pricing and terms related to product/service should be clear to the customer</li> </ul>	<ul style="list-style-type: none"> <li>Sales Conduct</li> </ul>
3.	<ul style="list-style-type: none"> <li>To advice the customer in using their financial product/ services</li> <li>Inform the customer about the change in fee/ charges structure and change in interest rates.</li> </ul>	<ul style="list-style-type: none"> <li>Communication</li> </ul>
4.	<ul style="list-style-type: none"> <li>Resolve the customer complaints emphatically and satisfy the customer</li> </ul>	<ul style="list-style-type: none"> <li>Empathy</li> </ul>
5.	<ul style="list-style-type: none"> <li>Treat the personal and financial information as important and secret.</li> </ul>	<ul style="list-style-type: none"> <li>Merged with Transactional Efficiency</li> </ul>
6.	<ul style="list-style-type: none"> <li>To spread awareness about the code and its provisions among the customers and bank staff.</li> </ul>	<ul style="list-style-type: none"> <li>Awareness</li> </ul>
7.	<ul style="list-style-type: none"> <li>Do not discriminate with the customer on the basis of their race, religion, financial status etc.</li> </ul>	<ul style="list-style-type: none"> <li>Discrimination</li> </ul>

**Duty Deliverance-** includes statements related to day to day dealing with the customers

**Transactional efficiency-** includes statements related to transactional efficiency of the bank staff

**Sales Conduct-** includes statements related to sales practice, need identification and disclosure norms

**Communication-** includes statements related to updating the customer about the change in bank rates and fee structure

**Empathy-** includes statements related to resolving the customer complaints empathetically

**Awareness-** includes statements related to awareness about the various provisions of the code

**Discrimination-** includes statements related to check the discrimination on the basis of location or financial position of the customer.

**7. ANALYSIS AND INTERPRETATION RELIABILITY**

Table-3: Reliability Statistics	
Cronbach's Alpha	N of Items
.867	35

Cronbach’s Alpha should be more than .7 for considering the responses as reliable. []

**1<sup>ST</sup> OBJECTIVE ANALYSIS**

1. To check the overall score of bank practices with the commitments of BCSBI code.

**Technique-** Frequency Distribution, one sample T test

**Confidence Interval-** Alpha ( $\alpha$ )- 95%

**Table-4: Statement wise analysis (Mean Values)**

Sr No.	Statement	Mean Value	Comment
1.	Bank Provides minimum banking facilities of receipt and payment of cash/ cheques, etc. at the bank's counter.	3.65	Moderate to agree
2.	Bank employees are friendly in their attitude towards customers.	2.96	Disagree to moderate
3.	All the transactions are fulfilled in the minimum required time.	2.83	Disagree to moderate
4.	It happens that work got delayed due to staff shortage/ server problem.	2.31	Agree to moderate
5.	Employees are willing to help the customers.	3.02	Moderate
6.	Special services are provided for senior citizens and disabled.	3.02	Moderate
7.	Bank employees always treat the customer with respect.	2.87	Disagree to moderate
8.	Misbehaviour by employees is a major reason of customer complaints.	3.29	Agree
9.	Bank services are provided at a reasonable cost.	2.96	Disagree to moderate
10.	Transacting with bank provides a feeling of safety and security.	3.59	Agree
11.	Bank treats your personal/ financial/transactional information as important and maintains secrecy.	3.98	Agree
12.	Bank insists on doing error free transaction.	2.97	Disagree to moderate
13.	Advertising and promotional literature is clear and not misleading	2.38	Disagree to moderate
14.	Term & conditions of the products are fully explained to the consumers By banker /agents/sub agents.	2.20	Disagree
15.	Banking products/documents are easily understandable by common people.	2.08	Agree
16.	Agents or bank officials do not disclose the negative features of the schemes/ policies to the consumer while selling the same.	2.25	Agree
17.	Bank staff/ agents sometime fails to understand/identify the customer's need and recommend the product.	2.02	Agree
18.	Sometimes bank staff/agent sell the products to the customer to complete their targets.	2.09	Agree
19.	Bank employees work undue pressure to bring maximum business for the company.	2.07	Agree
20.	Sometimes customers have to bear loss due to wrong/ inadequate information provided by bank officials/agents.	2.00	Agree
21.	Employees/agents have sufficient knowledge to resolve the customer questions.	3.56	Moderate to agree
22.	Malpractices in sales is a major reason of customer complaints	2.47	Agree to moderate
23.	Bank provides information for all the newly introduced services.	2.02	Disagree
24.	Timely information about changes in charges and interest rates are provided by banks.	2.10	Disagree
25.	All the marketing/informational material is available in the local language	2.32	Disagree
26.	Marketing material (pamphlets, brochures) are visually appealing in the bank premises.	2.69	Disagree to moderate
27.	Employees are capable to resolve the complaints satisfactorily.	2.58	Moderate
28.	Bank staff shows sincere interest to resolve the customer complaints.	2.69	Disagree to moderate
29.	Provide your agreement regarding the awareness of the	1.55	Disagree

	BCSBI code.		
30.	Complaints escalation is very well known by the customers.	1.58	Disagree
31.	Provide your agreement regarding the awareness of the Informational portal/ Booklet.	1.63	Disagree
32.	Provide your agreement regarding the awareness of the Citizen Charter.	1.57	Disagree
33.	Location of bank branches are convenient to all the sections of the society (e.g. villages, backward areas etc.)	1.61	Disagree
34.	Difference on the basis of financial status is common in banking.	1.59	Agree
35.	Economically weaker and socially oppressed people can get the loan easily and on easy credit term.	1.72	Disagree

Table No. 4 shows that non of the statement is having score close to 5, hence there is a need of drastic improvement.

**One Sample T Test is done of overall dimension**

	N	Mean	Std. Deviation	Std. Error Mean
Duty Deliverance	570	2.9968	.85064	.03563
Transactional Efficiency	570	3.3759	1.03022	.04315
Sales conduct	570	2.3111	.82471	.03454
Communication	570	2.2829	.80986	.03392
Empathy	570	2.6377	1.25622	.05262
Awareness	570	1.5838	.70594	.02957
Discrimination	570	1.6116	.60799	.02547

Source: SPSS output

	Test Value = 4					
	T	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Duty Deliverance	-28.157	569	.000	-1.00323	-1.0732	-.9332
Transactional Efficiency	-14.464	569	.000	-.62412	-.7089	-.5394
Sales conduct	-48.894	569	.000	-1.68895	-1.7568	-1.6211
Communication	-50.620	569	.000	-1.71711	-1.7837	-1.6505
Empathy	-25.890	569	.000	-1.36228	-1.4656	-1.2589
Awareness	-81.716	569	.000	-2.41623	-2.4743	-2.3582
Discrimination	-93.786	569	.000	-2.38835	-2.4384	-2.3383

Source: SPSS output

Table no. 6 shows that all the dimensions of the BCSBI code is significantly different from score 4, but table no.5 shows that the overall mean value of the dimension is exceeding the customer expectation or lower from customer expectation. All the values of the dimensions are low from 4, actual values are ranging between 1.5 to 3.3, hence customers are not at all satisfied with the quality of service provided by banks.

**Hypothesis Testing**

**1<sup>st</sup> Objective- H0-** Customers are satisfied by the bank practices.  $\mu \geq 4$

**H1-** Customers are not satisfied by the bank practices.  $\mu < 4$

To check the above mentioned hypothesis we have to use 7 sub hypothesis, as we have seven dimensions.

**Table: 7.1<sup>st</sup>objective , Hypothesis results**

Null Hypothesis	Sig. Value	Result
1.1 Customers are satisfied by the Duty Deliverance practices of the banks. $\mu \geq 4$	.000***	Alternate Hypothesis Accepted
1.2Customers are satisfied by the Transactional efficiency of	.000***	Alternate Hypothesis

the banks. $\mu \geq 4$		Accepted
1.3 Customers are satisfied by the Sales Conduct practices of the banks. $\mu \geq 4$	.000***	Alternate Hypothesis Accepted
1.4 Customers are satisfied by the Communication practices of the banks. $\mu \geq 4$	.000***	Alternate Hypothesis Accepted
1.5 Customers are satisfied by the Empathy practices of the bank. $\mu \geq 4$	.000***	Alternate Hypothesis Accepted
1.6 Customers are satisfied by the Spreading Awareness practices of the bank. $\mu \geq 4$	.000***	Alternate Hypothesis Accepted
1.7 Customers are satisfied by the Discrimination practices of the bank. $\mu \geq 4$	.000***	Alternate Hypothesis Accepted

Sig. Value-\*\*\* significant at 1% level, \*\* significant at 5%, \* significant at 10%

**2<sup>nd</sup> Objective**

1. To do a bank wise comparative analysis of the dimensions of the bank practices.

**Technique-** MANOVA (Multivariate Analysis of Variance)

**Confidence Interval-** Alpha ( $\alpha$ )- 95%

		Value Label	N
bankname	1.00	Axis Bank	71
	2.00	HDFC Bank	73
	3.00	ICICI Bank	72
	4.00	Kotak Mahindra Bank	70
	5.00	Syndicate Bank	71
	6.00	Canara Bank	72
	7.00	Punjab National Bank	71
	8.00	State Bank of India	70

Source: SPSS output

Table-8 shows the number of respondents from each bank which are used for the analysis.

Bank name	Duty Deliverance	Transactional Efficiency	Sales conduct	Communication	Empathy	Awareness	Discrimination
1.00 Axis Bank	3.3032	3.7641	2.4028	2.4437	3.1268	1.6796	1.5632
2.00 HDFC Bank	3.1286	3.5890	2.1164	2.3356	3.0616	1.6027	1.5936
3.00 ICICI Bank	3.4157	3.3889	2.0611	2.5278	3.1667	1.4618	1.6806
4.00 Kotak Mahindra Bank	3.0776	3.5750	2.2443	2.2786	3.3071	1.7214	1.6477
5.00 Syndicate Bank	2.9635	3.4472	2.7606	2.1655	2.5141	1.4648	1.8121
6.00 Canara Bank	2.6878	3.1563	2.5667	2.3646	1.9028	1.6181	1.5232
7.00 Punjab National Bank	2.6717	2.9437	2.0775	2.0528	1.7606	1.5070	1.5539
8.00 State Bank of India	2.7180	3.1393	2.2629	2.0857	2.2571	1.6179	1.5189
Total	2.9968	3.3759	2.3111	2.2829	2.6377	1.5838	1.6116

**Table-10: Tests of Between-Subjects Effects**

Source		Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power <sup>h</sup>
bank name	Duty Deliverance	40.926	7	5.847	8.862	.000	.099	62.031	1.000
	Transactional Efficiency	37.821	7	5.403	5.364	.000	.063	37.548	.998
	Sales conduct	31.260	7	4.466	7.055	.000	.081	49.384	1.000
	Communication	14.296	7	2.042	3.198	.002	.038	22.386	.953
	Empathy	186.354	7	26.622	21.026	.000	.208	147.180	1.000
	Awareness	4.665	7	.666	1.343	.228	.016	9.399	.576
	Discrimination	4.879	7	.697	1.907	.066	.023	13.346	.758

Table no. 10 shows that all the banks are significantly different in providing services to the customers in all the dimensions except spreading awareness among the customers, but the table no. 9 of mean value shows that which banks are last in the comparison and which banks are doing comparatively good.

**HYPOTHESIS TESTING**

**2<sup>nd</sup> Objective-H0-** There is no significant difference in the bank practice of different banks.

**H1-** There is a significant difference in the bank practice of different banks.

To check the above mentioned hypothesis we have to use 7 sub hypothesis, as we have seven dimensions.

**Table: 11 2<sup>nd</sup> objective, Hypothesis results**

Null Hypothesis	Sig. Value	Result
There is no significant difference in the Duty Deliverance practices of different banks.	.000***	Alternate Hypothesis Accepted
There is no significant difference in the Transactional efficiency of different banks.	.000***	Alternate Hypothesis Accepted
There is no significant difference in the Sales conduct practices of different banks.	.000***	Alternate Hypothesis Accepted
There is no significant difference in the Communication practices of different banks.	.002***	Alternate Hypothesis Accepted
There is no significant difference in the Empathy practices of different banks.	.000***	Alternate Hypothesis Accepted
There is no significant difference in the awareness practices of different banks.	.228	Null Hypothesis Accepted
There is no significant difference in the discrimination practices of different banks.	.066*	Alternate Hypothesis Accepted

Sig. Value-\*\*\* significant at 1% level, \*\* significant at 5%, \* significant at 10%

**8. FINDINGS**

**1<sup>st</sup> Objective**

By analyzing the 1<sup>st</sup> objective we have found that in non of the service dimension the bank is providing the satisfactory services to the customers, in fact the level of services are quite poor, the highest mean value was 3.3 in transactional efficiency and rest of the dimensions are less than 3.3, which says that customers are not at all satisfied in duty deliverance, transactional efficiency, communication, sales conduct, empathy, awareness and discrimination practices of the banks. Public and private sector banks both needs to gear up in providing services to the customers up to the level of satisfaction and at an acceptable level.

The result of this objective shows the another side of the coin:

Low score of duty deliverance means- misbehavior is prevailing in the industry

Low score of transaction efficiency means- transactional inefficiency

Low score of Sales Conduct means- Sales misconduct or Misselling is prevailing in the industry

Low score of Communication means- Customer is not updated about the changes

Low score of Empathy means- customer complaints are not resolved properly

Low score of Awareness means- Customers are not aware about their rights

Low score of Discrimination means- Discrimination of financial basis is prevailing in the industry

**2<sup>nd</sup> Objective**

The study depicts that the banks are significantly different in providing services in all the dimensions except awareness, score of awareness is low throughout the banks .

**Table-12: Dimension wise Scoring of banks**

Sr. No.	Dimensions	Highest Score	Lowest score
1.	Duty Deliverance	ICICI Bank	Punjab National Bank
2.	Transactional Efficiency	Axis Bank	Punjab National Bank
3.	Sales Conduct	Syndicate Bank	ICICI Bank
4.	Communication	ICICI Bank	Punjab National Bank
5.	Empathy	Kotak Mahindra Bank	Punjab National Bank
6.	Discrimination	Syndicate Bank	State Bank of India

Table No. 12 shows that Punjab national bank has reflected in 4 dimension in which it scored poorly and Syndicate bank scored highest in two dimensions, ICICI bank has scored highest in 2 dimensions, Kotak Mahindra and Axis score highest in one dimensions. ICICI and SBI bank scored poorly in one dimension.

**9. CONCLUSION**

Private Banks are blindly following the money, hence they are not able to see the mutual benefit of all the stakeholders. Public banks have relaxation in terms of monitoring and supervision, hence they did not bother the customer and their services and behavior is not up to the required standard. In both the cases some sort of action is required on the part of the regulators. In Private Banks auditors or monitoring staff should take necessary care that equal services should be provided to all the section of the society and in public banks they should have strict standards for customer services.

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**AN INVESTIGATION OF SCIENCE TEACHING-LEARNING PROCESS AND LEARNING ENVIRONMENT IN SCHOOLS AT SECONDARY LEVEL**

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**ABSTRACT**

*In order to develop students' scientific competencies systematically, educational experiences in school, especially high-quality classroom level processes, are crucial (Muller et al., 2016). Science teaching is a complex activity that lies at the heart of the vision of science education presented in teaching standards which describe what teachers of science at all grade levels should understand and be able to do. To teach science as portrayed by the Standards, teachers must have theoretical and practical knowledge and abilities about science, learning, and science teaching. In this context, it is very essential to study the teaching-learning process and learning environment of present classrooms in the light of guiding principles laid in National curriculum framework, 2005 (NCF, 2005) for bringing out best practices in teacher education. Teacher education is equipping the perspective teachers with qualities in order to perform their task effectively and also works on how to implement the guiding principles laid down by Right to Education Act (RTE), National Council of Educational Research and Training (NCERT) etc. in actual classroom practice by educating perspective teachers. It is very challenging as on one side these principles have to be understood in their actual sense and on the other side the situation/conditions, real difficulties, opportunities, powers and weaknesses of the teachers in the classroom must be studied. This study has investigated the pivotal strengths and weaknesses in science teaching learning process being practiced and learning environment being provided to the learners in science classrooms which was conducted at the selected schools in district Sonapat of Haryana State.*

*Keywords: Science Education, Teaching and Learning, Teacher Education*

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**INTRODUCTION**

Equity in education means that regardless of ethnicity, gender, religion and tribe, every citizen has the right to education. To date, on-going efforts of the Indian government aim to enhance educational equity and educational quality for all Indian citizens. To some degree, this effort has been successfully achieved. For example, the number of illiterate people has decreased and the number of student enrolments has increased. Yet, the Indian government is still struggling and trying to provide all students with the best quality teaching practices. In context of Science teaching which is a complex activity that lies at the heart of the vision of science education presented in teaching standards. These standards describe what teachers of science at all grade levels should understand and be able to do. In the vision of science education portrayed by standards effective teachers of science create an environment in which they and students work together as active learners. While students are engaged in learning about the natural world and the scientific principles needed to understand it, teachers are working with their colleagues to expand their knowledge about science teaching. To teach science as portrayed by the Standards, teachers must have theoretical and practical knowledge and abilities about science, learning, and science teaching. The standards for science teaching are grounded in five assumptions.

- ✓ The vision of science education described by the Standards requires changes throughout the entire system.
- ✓ What students learn is greatly influenced by how they are taught.
- ✓ The actions of teachers are deeply influenced by their perceptions of science as an enterprise and as a subject to be taught and learned.
- ✓ Student understanding is actively constructed through individual and social processes.
- ✓ Actions of teachers are deeply influenced by their understanding of and relationships with students.

For best practices of teacher education to meet teaching standards it is essential to study the teaching-learning process and learning environment of present classrooms in the light of guiding principles laid in National curriculum framework, 2005 (NCF, 2005) and the quality parameters of RTE Act, 2009. The RTE Act in force since April 2010, has not only generated a series of huge challenges for the country, but also, enormous opportunities. As states think about how to admit students currently out of school into the age – appropriate class, it is important to think about how to help those students who are already enrolled in school, achieve the levels of learning appropriate to their age. As the rapidly mushrooming private schools and tuition classes show, parents all over the country are pointing their expectations on education for the better life of their wards. The time is right to think about what our schools can do to ensure that these aspirations are fulfilled, so that not just

schooling, but learning is guaranteed to every child. This is the Right to Education 2009 (RTE) Act, in its true spirit.

As Teacher education is the production base of teachers who work as farmers for the product (learner) and also equipping the the perspective teachers with qualities in order to perform their task effectively. It also works on how to implement the guiding principles laid down by National Council of Educational Research and Training (NCERT) etc. in actual classroom practice by educating perspective teachers and by providing in service training to teachers. It is very challenging as on one side these principles have to be understood in their real sense and on the other side the situation/conditions, actual difficulties, opportunities, strengths and weaknesses of the teachers in the classroom have to be studied.

So, the present study was undertaken with the aim of studying of the teaching-learning process being adopted and learning environment being provided at the secondary level in the schools of district Sonipat of Haryana State.

### **OBJECTIVES**

- To find out the teaching learning processes being adopted by teachers while teaching science at the secondary level.
- To study the learning environment being provided by teachers in the science classroom at the secondary level.
- To compare the areas of improvement in teaching-learning process and learning environment in science classroom to those mentioned in teacher education programme at secondary level.

### **RESEARCH METHOD**

Descriptive Survey method was used for studying the teaching learning processes adopted by teachers and learning environment being provided to students in science classroom in schools of district Sonipat of Haryana State. . The study involves collection and analysis of data both qualitatively and quantitatively.

**Population:** Students studying in classes IX and X in schools of district Sonipat of Haryana State comprised the population of the study.

### **SAMPLE SELECTION PROCEDURE**

- Ten Schools Were Selected Randomly From The Schools Of District Sonipat Of Haryana State.
- A list of teachers teaching science to students of classes IX and X in each sample school was prepared. Two teachers were selected randomly from each sample school. In all twenty teachers were selected for the study.
- In most of the schools there were two sections of classes IX and X. Five students were selected randomly from each class. In this way fifteen (10) students were selected from each school. In all one hundred and fifty (100) students were selected for the study.
- Five schools (05) were selected randomly from the ten sample (10) schools already selected for the study. Two classrooms were selected from each of these five schools in which the teachers selected for the study were teaching. In all ten sections (10) were selected for the classroom observation. As it is not justified to generalise anything by observing any classroom once only. Therefore it was decided to visit a classroom three times at least for observing the actual teaching learning process taking place and learning environment being provided in these classrooms.

### **TOOLS USED IN THE STUDY**

Keeping in view the objectives of the study, three tools were developed:

1. **Interview Schedule for Teachers (IST):** to interview the teachers, selected for the study about the teaching-learning processes adopted and learning environment being provided by them in the science classroom.
  2. **Learning Environment Scale (LES):** to take views of the learners about the learning environment being provided to them in Science classroom.
  3. **Classroom Observation Schedule (COS):** to observe the teaching-learning process adopted and learning environment being provided in science classroom in actual situations.
- All the above points have been concluded in the following table:

S. No.	Selection of	No.	Specification	Purpose: For
1	Schools	10	5 schools from randomly from the schools of district Sonipat of Haryana State.	carrying out the Study
2	Teachers	20	2 Teachers from each school	carrying out Teachers Interview Schedule
3	Students	100	10 students from each school	carrying out Learning Environment Scale
4	Classrooms	10	2 classrooms in five schools	carrying out classroom Observation Schedule

### DEVELOPMENT AND DESCRIPTION OF TOOLS

The items for these tools were framed on the basis of what NCF-2005 has said on teaching learning process and learning environment in the classroom. For example: Was teaching learning material available in the classroom?

One way to develop learning atmosphere in the classroom is to display teaching learning material in the class which students can use and manipulate even in the absence of the teacher. Students can discuss about that material with other students of the class and explore scientific concepts themselves.

- Were students' experiences used while teaching?
- Were students' performing experiments in laboratories?
- To show students that they are valued, it is essential to ask them about their experiences and use them while teaching.
- Did the teacher use any teaching learning material other than textbook?
- Did the teacher ask students to work in small groups or pairs?

The NCF states: "The pluralistic and diverse nature of Indian society definitely make a strong case for preparing a variety of not only textbooks but also other materials, so as to promote students' creativity, participation and interest, thereby enhancing their learning. No single textbook can cater to the diverse needs of different groups of students".

Keeping the above points in mind, the first draft of all the three tools was developed.. Each tool was sent to experts and was discussed item wise. Valuable suggestions given by the expert were incorporated and tools were finalized.

A try out of the tools was done during School Experience Programme in govt. schools of district Sonipat other than the sample schools. All the three tools were conducted to see whether students and teachers were comprehending language of items. The sequencing of the items was also checked. Minor variations were made wherever the need was felt.

IST was a semi structured interview in which items were prepared on the following parameters:

- Introduction of the teacher
- Teaching plan and its execution
- Teaching-learning process
- Identification and remediation of learning difficulties
- Evaluation
- Problems related to teaching-learning process and learning environment
- Reflection by teachers

For LES the learning environment was classified into three categories: Traditional teacher- centred classroom environment, Transforming learning environment and Child friendly learning environment. Quantitative analysis of learning environment of the classrooms was done on the following scores of LES:

36 – 52 Traditional teacher- centred classroom environment

52 – 68 Transforming learning environment

68 – 84 Child friendly learning environment

The researcher conducted COS in Science classes and wrote a descriptive note on teaching-learning process and learning environment keeping in mind the following thrust areas:

S.No.	Parameter	Thrust areas
1	Learner friendly environment in class	Introduction of the concept being taught
		Seating arrangement
		Teaching-Learning material used
		Activities undertaken
		Group size
		Feedback mechanism
		Evaluation procedure
2	Activities in class were teacher driven/student engagement	Maintenance of discipline
		Strategies adopted to engage students
		Management of students responses
		Type of assignments given

### ANALYSIS OF DATA

Quantitative data of LES revealed that out of ten sample schools observed, six had Traditional teacher- centered learning environment, four had Transforming learning environment and none of the school had Child friendly learning environment.

Qualitative data of IST, LES and COS revealed that there were many strengths of teaching-learning process and learning environment in classrooms in post NCF scenario, but at the same time some areas were identified which need improvement.

### STRENGTHS OF TEACHING-LEARNING PROCESS AND LEARNING ENVIRONMENT

**Physical environment:** All the classrooms were built for all weather. Teacher could physically approach all students sitting in the classroom. The ventilation and light were adequate in all the classrooms. Students were sitting on the wooden desks. Blackboard was available in each classroom. Sufficient number of fans in working condition was also there in each classroom. On the whole the physical environment of the classroom was reasonably good for students as well as teachers.

**Well qualified and trained teachers:** The teachers were well qualified. Most of the teachers in the sample had Postgraduate degrees. All the teachers had the professional qualifications in teaching. This way the teachers were well acquainted with content and pedagogy of sciences.

**Following plan provided by the Department:** All the teachers were following the Weekly Plan provided by the board of Education. Sometimes due to other duties they could not follow that plan rigidly. Otherwise they tried to teach according to that plan only. It helped teachers not only in teaching but also devoting sufficient time on each and every concept given in the text book.

**Corporal punishment:** During the administration of tools, teachers giving corporal punishment to students in science class were not observed at all. It was good that students were not harassed in any way. The guiding principle of NCF-2005 that "Learning takes place in fearless environment" was followed.

**Discrimination:** During the Classroom Observation of science teaching any discrimination on the basis of sex, colour, cast, religion or disability was not observed. All the students were treated equally in the class. Teachers were not found biased for any sex or religion. It leads to healthy environment in the class.

**Scientific inquiry based learning:** All the teachers at the secondary level gave due weight age to teaching-learning of complex scientific concepts in science classroom which is helpful in developing scientific attitude. Teachers organized science Quizzes/science exhibition and various competitions for students at school level and district/zone level. Prizes and certificates were also distributed in those competitions.

**Laboratory work:** Teachers assigned students the project work and other lab activities in physics/chemistry/biology in sciences. It helped students in learning by doing and exploring scientific concepts on their own. Students take interest in doing practical assignments provided they are meaningfully planned by the teachers.

**Responses of teachers to students' queries:** It was observed that teachers responded to questions raised by students in science class. Students were not insulted for raising questions or asking their doubts during teaching-learning process. Though such incidences were rare but still it encourages them to ask more doubts.

**Teachers showed willingness to field work:** Teachers told that they wanted to teach by organizing science activities apart from classroom in outer field, but due to large classroom, vast syllabus and other duties they could not plan more activities in the science class.

### IMPROVEMENT AREAS

**Planning:** It was observed that all the teachers in the sample schools developed the plan of the lesson in the teacher diary. It was a weekly plan based on the plan provided to the teachers by the board of Education. It was observed that the weekly plan was very sketchy as many important points were missing, like teaching aids or concrete materials to be used in the class for teaching the planned content, strategies to be used for transacting the content, tools of continuous evaluation and remediation etc. It was basically mentioning of syllabus to be covered and not a teaching plan. As these points were missing in the weekly plan, the same were missing in the teaching-learning process being adopted by them in the science classroom.

**Traditional method:** In most of the sample schools traditional method of teaching was still prevalent. Teacher was dominating and students were passive listeners in the class. Students were not asking questions/doubts to the teacher. Students' experiences were not shared. Students' participation was negligible in the teaching-learning process. Interaction with peers was also missing. Use of activity method/demonstration method for transacting content was not found in any of the classroom observed under study. Use of models/real learning materials/models and students working in groups and sharing their experiences were missing in science classroom. Use of innovative techniques, multiple approaches or alternative approaches had no place in the teaching-learning process of science class. Important scientific skills like analysing ,observation/visualization, experimentation were not visible at all in science class.

**Lack of proper introduction of the lesson:** Improper previous knowledge testing hamper in developing interest of the students in the lesson. It is like hammering the cold iron which is a fruitless exercise. It is against the psychological principles of learning i.e. learning from the known to the unknown especially at this stage of learning. Students who need individual attention or are not very regular in school or are first generation learner may not understand the topic/concept being introduced without explaining the need and importance of studying that concept. Slowly and gradually they develop the notion that learning sciences is not their cup of tea. This very thought blocks their way of learning science.

**Rigid class arrangement:** The infrastructure of the class made the sitting arrangement of students very rigid. It was not possible for students to work in groups (small or large) in science class. Students' desks were too heavy to move and rearranged.

**Lack of identification and remediation of learning difficulties:** Identifying learning difficulties of the students and providing remediation for the same was not observed in any science classroom. It was found that teachers were rushing for the completion of the science syllabus and had no time for discussing and removing bottlenecks of learning in the classroom. Students were also not bothered to ask their difficulties about understanding concepts in science class.

**No planned homework/practical assignments:** It was found that students were not assigned well planned assignments. They were just given the problems from the textbook. Assignments involving elements of variety, interest and extension of classroom learning were not observed in any of the classroom.

**Students did not ask questions:** Students were not asking questions or their doubts in science classroom. It led to lack of interactions between the teacher and students. The environment of the class needs improvement so that students could raise and discuss their doubts in science class. It would help teacher in planning the lesson better.

**Pupil teacher ratio:** The pupil teacher ratio in the classrooms of five schools observed in the present study was 45:1, which is much more than the recommended norms. It was observed that in two classrooms out of ten, the students of two sections (between 70 to 80 in numbers) were sitting in the same room in science class. Three to four students were sitting on one desk meant for two students. Teacher told that it was due to shortage of classrooms in their schools. This ratio needs to be improved for effective teaching-learning process.

**Intrinsic Motivation:** The data of the study revealed that more than half the number of teachers in the sample joined the teaching profession not as their choice. They lack intrinsic motivation, which is an important factor for teaching profession. Self motivation is essential for improving oneself in the profession. Such teachers take teaching as a job and not as a profession.

After knowing these areas of improvement in teaching-learning process and learning environment in actual classrooms the researcher was keen to know whether such areas were being addressed in teacher education programme at the secondary level. A group discussion was arranged with students of B.Ed i.e. teacher education programme at the secondary level. Students gave following areas which need to be addressed for preparing effective and quality teachers at the secondary level. They also pointed out certain practical tasks to be involved in teacher education programme.

**Planning:** Pupil teachers told the researcher that they were doing a lot of work during school experience programme like observing and developing a lot of records, conducting action research and delivering forty lessons during SEP in schools but still there are problems which need to be addressed in teacher education programme.” The problems mentioned were as follows:

- “We are studying constructive approach of teaching-learning, but we are not told how to make lesson plans using constructive approach. How to develop teaching plans using seven E’s namely engagement, eliciting responses, exploration, explanation, elaboration, evaluation and extension. How to share experiences of learners and use them for construction of knowledge? We are studying strategies of constructive approach theoretically, how to develop concept maps for teaching-learning in different subjects which are not known to us.”
- Other student said, “We have all theoretical knowledge, practically we are not using such concepts in teaching-learning.”
- Some pupil teachers mentioned, “We do not know how to develop interesting plans and include elements of challenge in teaching-learning process? How to develop activities through which each and every student may be engaged in learning? How to plan lesson which provide success experience to each and every child of the class? How to plan experimental activities in large classroom? What may be the criterion of forming groups of students while conducting group activities in the class? Pupil teachers also mentioned that they lack understanding of how to integrate various strategies and tools of continuous and comprehensive evaluation in the lesson plan?”
- They mentioned that theoretically they knew the use of ICT in teaching, but practically they could not plan lessons based on it.
- They knew the meaning, needs and characteristics of inclusive classroom but they were not able to develop teaching plan for mathematics in such classrooms. There is no separate paper on Inclusive Education but workshops are conducted for their awareness. Some teaching aids are developed for inclusive classrooms in such workshops but neither demonstration of teaching-learning process nor how to adapt curricular strategies in such classroom is explained.
- Some pupil teachers mentioned, “When they conduct activities during SEP, they find few students complete their activity before the estimated time while some do not even understand it. We are not able to deal with such variation in the classrooms.”
- During SEP the only source used for developing teaching plan by the pupil teachers was text book. They suggested that they were hardly made aware of using other resources for planning teaching-learning process.

**Traditional Method:** Pupil teachers told that they studied about various teaching methods like inductive-deductive, problem solving, project, analytic- synthetic, inquiry, discovery and experiential methods but these were hardly used for the purpose of teaching-learning in their classrooms. They said, “As the demonstration of such methods was also not done in our class, so we might not feel confident in using such methods for teaching. We are taught through traditional methods only”.

They suggested that if they were taught using such methods then it would help them in employing the same when they became teachers. Some pupil teachers mentioned that they were not motivated to ask doubts or queries during their lectures.

Some pupil teachers viewed, “in teaching subjects like teaching of hindi, social science etc. more emphasis is given on content and pedagogy, which we lack in, is not given its due importance.”

**Assignment:** Some pupil teachers told, “We are not taught about assigning meaningful and interesting home assignments in different school subjects. How to develop such assignments for students? How to deal with defaulters? How to motivate students who do not want to study? Basically we feel we have all theoretical knowledge but practical aspects of all these strategies are weak and need to be strengthened.”

**Evaluation Strategies:** Pupil teachers mentioned, “They study about importance and construction of Achievement Tests, use of Diagnostic Tests, and difference between the two. Different tools of Continuous and Comprehensive Evaluation and their formation need to be included in our curriculum.” They wanted to learn how to develop different tools of evaluation and actually wanted to develop them.

**Identification and remediation of learning difficulties:** Pupil teachers wished to add the topic: different strategies of remediation to be adopted at the elementary level, in their curriculum in detail. They added it further, “We want to learn it practically. It may be added in our assignments also.”

**Conclusion:** The three tools of the research study namely ITS, LES, COS and the group discussion with pupil teachers revealed that the areas of improvement in teaching-learning process and learning environment in actual classrooms are similar to those areas which need to be addressed in teacher education programme i.e. B.Ed Programme. For effective teaching in schools there is a need to add practical aspects of concepts to be used in classroom either as group field activities/lab activities/visualizing experiments through the use of ICT or as practical home work. Pupil teachers are well aware of the aspects they need to strengthen for performing their task of teaching effectively.

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**DIGITAL INNOVATION AND MEDIA: OPPORTUNITIES AND FUTURE AHEAD**

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**INTRODUCTION**

The power of the Internet has penetrated every parts of life so it is there in the arena of Mass Communication and Journalism. It has also been revolutionized with the inclusion of the World Wide Web for newsgathering and news dissemination. Aspiring journalists today need to be familiar with cyber journalism and the basics of web designing.

Also, it is important to understand the hugest impact of online media and news dissemination though it, how media is not only making but also changing opinion in today's times via various Social Media platforms. Besides, It has also become a major source of advertising. Gone are the days, when people used to wait for newspaper for getting information in a certain way. In the era of smart phones, everything is in our hands and just a click away. Almost every big and small media houses are online through channels, apps, or even on YouTube, instead they have a fully fledged websites of their own. Which has completed changed the scenario, of the way media is consumed today.

This Research Paper “ **Digital Innovation and Media**” aims at covering various aspects of New Age media with presenting a review of various studies and research done on Digital Revolution, Media Advertising, Artificial Intelligence, Internet of Things, Consumption of Social media via Mobile and Penetration of Internet in the lives of Users. Although the presenter has tried its level best to give you a glimpse of the study but due to the vast capacity and capabilities of Digital platforms and paucity of words could not get into the depth of the area of study. All the details are elaborated with the help of Text, Graphs and Pictures.

**EXPANSION OF INTERNET IN NEWS MEDIA**

Computers had entered the nation the early 90's with the policies of Liberalization and globalization. Since then, Computer technologies are growing upward, taking over all the areas of life. From education to banking, from shopping to trading, from entertainment to serious discussions and what not.

In such a transformation when nothing left untouched of computer and internet, it is impossible for journalism to remains aloof. Last one decade has witnessed changes upside down. With the fact that smart phones entering in the hand of everyone, all of it has changed.

Every Media house is running its digital version independently or dependently. Teams of people dedicated to digital media are formed that is the reason why digital journalism terms have coined and new crop of journalist are taught to be digitally sound. In nutshell, we have reached a phase where it is impossible to imagine news without internet and digital.

**Digital journalism**, also known as **online journalism**, is a contemporary form of journalism where editorial content is distributed via the Internet, as opposed to publishing via print or broadcast.

What constitutes digital journalism is debated by scholars; however, the primary product of journalism, which is news and features on current affairs, is presented solely or in combination as text, audio, video, or some interactive forms like news games, and disseminated through digital media technology.

Fewer barriers to entry, lowered distribution costs, and diverse computer networking technologies have led to the widespread practice of digital journalism. It has democratized the flow of information that was previously controlled by traditional media including newspapers, magazines, radio, and television.

**MARKET DYNAMICS**

Indian Media & Entertainment sector is expected to grow at a Compound Annual Growth Rate (CAGR) of 14.3 per cent to touch Rs 2.26 trillion (US\$ 33.9 billion) by 2020, while revenues from advertising is expected to grow at 15.9 per cent to Rs 99,400 crore (US\$ 14.91 billion).

While Digital Advertising will grow at 33.5 per cent. The largest segment, India's television industry, is expected to grow at a CAGR of 15 per cent, while print media is expected to grow at a CAGR of 8.6 per cent.

**ONLINE GLOBAL TREND**

In the present Digital Marketing landscape, New Media marketing has emerged as one of the most indispensable tools for marketing products and services. There are various tools and forms used for the same.

In 2018, social media sphere enjoyed more than 2.3 billion active users and more than 1.9 billion active mobile social users which is increasing at an amazing pace.

More than 83% of marketers have already utilized social media marketing to boost their sales and gain better brand identity which itself is a huge number of people.

**ONLINE CONSUMPTION PATTERN**

As shown in the below image, 45% of the consumer using laptops and desktops whereas 50% consumers are using mobile phones for getting the information. Only 5% consumers are using tablets and very minimum 0.12% is using other devices to get the information.

The usage of Mobiles phones, especially smart phones is maximum that is maybe because the low cost and easy availability of the mobiles. Even a rickshaw driver or a fruit seller is using mobiles these days. Those who are even little educated and can understand the functionality of the phones are using them for various information. The telecom industry has made this possible by providing mobile phones at reasonable prices.

Desktops and laptops are most convenient and easy way to work and access digital platforms. And then come the later.

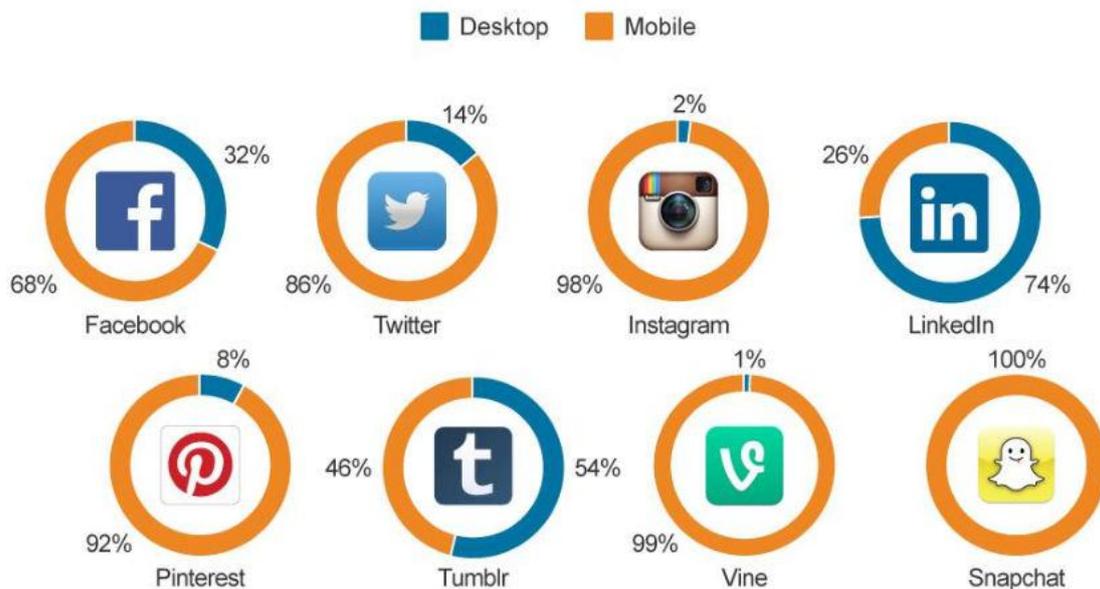


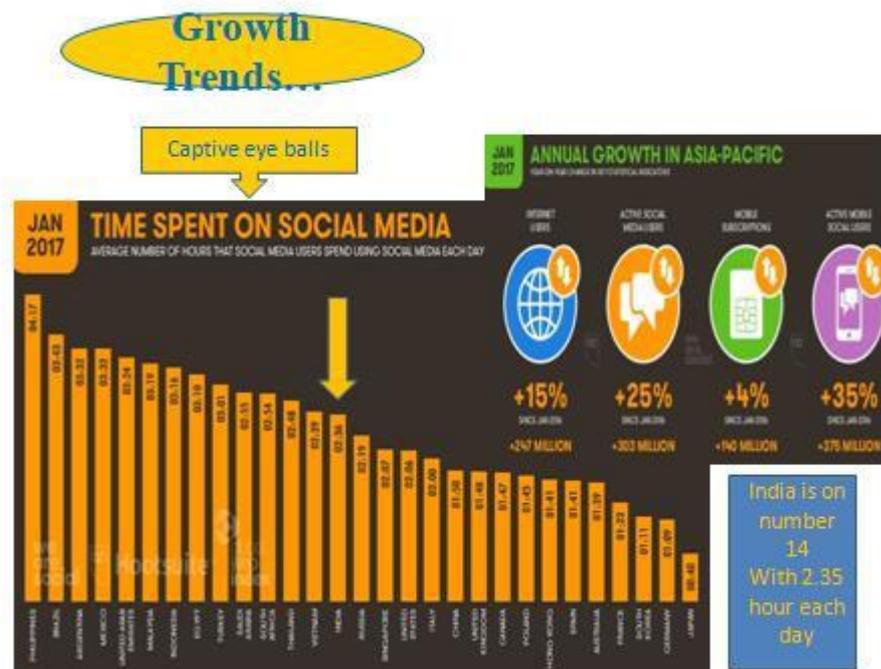
**MOBILE FIRST**

Following image provide the mobile usage data in detail defining the range of various social media approaches. Take a look at it:

**Most Social Networks Are Now Mobile-First**

% of time spent on social networks in the United States, by platform\*





**Live Videos**

The trend of live video is not going anywhere rather will continue to rise in the year 2019. In fact, 14% of marketers experimented with it in 2018 itself and 43% plan to use live video this year.

Every social platform has introduced the feature of live streaming, and it has become the hottest thing in the social media. Face book’s Live Video and sharing Stories, Twitter’s periscope and Instagram stories has created quite a buzz in social media.

Thanks to live video feature, Facebook has enjoyed lot of growth last year and particularly on the New Year’s Eve, live streaming on Facebook reached a record-breaking number. Even Instagram did not lag behind and enjoyed 100 million active users on Instagram Stories.

In digital marketing trends, now video is shifting and shaping the world of marketing more than ever in 2018.

Video is no longer an option for marketers it’s a vital part of any content strategy that wants to taste success.

The shifts in the video marketing industry will help understand audience’s preferences, habits, and how video can help move the needle and drive ROI for the business.

82 % of internet traffic will be video in 2020

**EVERYTHING IS SMART**

The **Internet of things (IoT)** is the inter-networking of physical devices, vehicles (also referred as "connected devices" and "smart devices"), buildings, and other items embedded with electronics, software, sensors, actuators, and network connectivity which enable these objects to collect, exchange data and talk to each other.

**IoT** is a key component of home automation and **Smart Homes**.

A **Smart City** is an urban development vision to integrate information and communication technology (ICT) and Internet of Things (IoT) technology in a secure fashion to manage a **city's** assets.

**Future:**

VR - Virtual Reality is actually computer-generated simulation of a three-dimensional image or environment that can be interacted with in a seemingly real or physical way by a person using special electronic equipment, such as a helmet with a screen inside or gloves fitted with sensors. '*Virtual reality*' basically means 'near-reality'.

**OPPORTUNITIES**

- Digital Marketing
- TV Industry
- Film Industry

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- Marketing
  - Event Industry
  - Public Relation
  - Corporate Communication
  - Corporate Affairs
  - Education

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## ALTERNATIVE ENERGY FOR SUSTAINABLE DEVELOPMENT

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**ABSTRACT**

*Energy drives development of mankind, economic growth, and increases social equity. Development is not possible without energy and sustainable energy is pre-requisite for sustainable development. In the context of sustainable energy, alternative energy sources play an important role. So far, the energy needs of the world have been catered to by majorly conventional sources of energy such as coal, gas, petroleum etc. These resources pose two concerns, first, these are available in limited quantity and are depleting at a high rate. Second, these are not environment friendly. Coal/liquid fuel based electricity generation, and petrol/diesel run vehicles are one of the major sources of pollution.*

*In this context, the role of alternative sources of energy or renewable energy sources as sustainable energy source that comes from natural environment becomes important. Various countries in the world have realized the importance of keeping the balance between the development and environment and are taking steps to in this regard. The United Nations Climate Change Conference (COP 21 or CMP 11) held in Paris, France in Dec, 2015 witnessed consensus among 196 participating entities to pursue efforts to limit the temperature increase to 1.5 °C. India, in its Intended Nationally Determined Contribution (INDC) has pledged to improve the emissions intensity of its GDP by 33-35% by 2030 below 2005 levels. It has also pledged to increase the share of non-fossil fuels-based electricity to 40% by 2030. It has agreed to enhance its forest cover which will absorb 2.5 to 3 billion tonnes CO<sub>2</sub> by 2030.*

*For implementation to achieve this aim, India has taken various initiatives including making a target to install 175 Giga Watts of renewable energy by 2022 (100 GW-Solar, 60 GW-Wind, 5 GW-Small Hydro, 10 GW Biomass). Till Feb, 2019, we have over 75 Giga Watts of Renewable Energy installed in India. Promotion of Electric vehicles is also expected to reduce pollution. Energy Efficiency measures also help in reducing energy usage.*

*The education system should encourage students to generate new ideas for efficient and innovative use of resources and create interest in working including research and development in areas related to deployment of alternative energy sources for sustainable development.*

*Keywords: Alternative Energy, Sustainable Development, Environment, Renewable Energy, Education*

**1. INTRODUCTION**

In recent years, the focus has shifted from growth to sustainable development. As per NITI Aayog, sustainable development is defined as development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Sustainable development requires collective efforts for building an inclusive, sustainable and resilient future for people and planet. Harmony in three core elements namely economic growth, social inclusion and environmental protection is pre-requisite for sustainable development.

One of the biggest obstacles to achieve sustainable development is climate change. Climate change resulting from fast pace development has posed a threat to biodiversity, ecosystem and wellbeing of people. As per World Bank, countries and communities around the world are already experiencing increased climate change impacts including droughts, floods, more intense and frequent natural disasters, and sea-level rise. Climate change is an acute threat to global development and efforts to eradicate poverty and could push an additional 100 million people into poverty by 2030 if timely appropriate measures are not taken. Climate change is already having real and measurable impacts on human health wherein air pollution is causing more than 7 million premature deaths each year.

In Indian context, energy is central to achieving India's development targets, to support its fast growing economy, to provide electricity to all, to fuel the demand for greater mobility and to develop the infrastructure to meet the needs of the people. Fossil fuels (Coal, gas, petroleum products) have been traditionally used as main source of energy in India. Besides their limited availability, fast depletion and import burden on the economy, they also have adverse impact on the environment. There have been efforts to find alternative energy sources which is clean, green and as far as possible, indigenous.

Alternative energy is any energy source that is an alternative to fossil fuel. These alternatives are intended to address concerns about fossil fuels, such as their limited availability, pollution issues and high carbon dioxide

emissions causing global warming. There are differences of opinion related to what constitutes alternative energy. However, in general, it is termed as fuel sources that are other than those derived from fossil fuels. Alternative energy is generally used interchangeably for renewable energy.

Some of the benefits of alternative energy are: reduced overall usage of fossil fuels, reduced pollution, distributed generation, diversified energy supply and lesser dependence on imported fuels. They also create economic development and employment in manufacturing, installation, and operation and maintenance.

## **2. ALTERNATIVE ENERGY SOURCES:**

### **❖ Solar Energy**

Solar power is the conversion of energy from sunlight into electricity, either using photovoltaics (conversion of light energy to electrical energy), or using concentrated solar power (conversion of heat energy to electrical energy). In India total installed capacity of solar energy is 26.03 GW (Giga Watts) as on Dec, 2018. Government has made a target of installation of 100 GW of solar power by 2022. Its modular structure provides flexibility in terms of innovative installations both in rooftop and ground mounted and from small to large sizes. Solar power has proved beneficial in electrifying remote areas through distributed generation. Solar lanterns are rapidly replacing kerosene lamps. Solar photovoltaic water-pumping systems are being used for irrigation and drinking water. Government is also providing subsidy for solar power installations.

### **❖ Wind Energy**

In wind energy, wind turbines convert the kinetic energy in the wind into mechanical power and a generator is used to convert mechanical power into electricity. Mechanical power can also be utilized directly for specific tasks such as pumping water. In India total installed capacity of wind energy is 35.29 GW as on Dec, 2018. Government has made a target of installation of 60 GW of wind power by 2022.

### **❖ Biomass**

Biomass is a fuel developed from organic materials such as scrap lumber, forest debris, crop residuals, manure and waste residues. They provide an efficient way to convert waste and crop residues into electricity and reduce pollution. In India total installed capacity of biomass energy is 9.78 GW as on Dec, 2018. Government has made a target of installation of 10 GW of biomass power by 2022.

### **❖ Hydro Electric Power**

In hydropower or hydroelectricity the conversion of energy takes place from flowing water into electricity. It is considered a renewable energy source because the water cycle is constantly renewed. Hydro power plants can be small or large. Hydro power plants are run of the river or storage with dam. Dammed reservoirs can also help with flood control, be a reliable source of water for irrigation and drinking. However, there are many concerns with hydropower, particularly large dam facilities which include significant impact on the regional ecosystem, flooding upstream landscapes, disrupting habitats for wildlife, blocking fish passages, and displacing local communities. In India total installed capacity of hydro power is 50 GW as on Dec, 2018 out of which 45.4 GW is large hydro (above 25 MW) and 4.6 GW is small hydro (less than 25 MW).

### **❖ Geothermal Energy**

Geothermal energy is the heat from the Earth. Resources of geothermal energy range from the shallow ground to hot water and hot rock found a few miles beneath the Earth's surface, and down even deeper to the extremely high temperatures of molten rock (magma). Many technologies have been developed to take advantage of geothermal energy such as generating geothermal electricity, producing heat directly from hot water within the earth and using the shallow ground to heat and cool buildings through geothermal heat pumps.

### **❖ Tidal Energy**

Tidal energy converts the natural rise and fall of the tides into electricity. The high cost and lesser availability of appropriate sites have been limitations of deployment of tidal energy in large scale. Tidal power can also have adverse effects on marine life.

### **❖ Wave Energy**

Wave Energy is another type of ocean based renewable energy source and uses power of the waves to generate electricity. Unlike tidal energy which uses the flow of the tides, wave energy uses the vertical movement of the surface water that produces tidal waves. Wave power converts the up and down movement of the ocean waves into electricity. Equipments are placed on the surface of the oceans to convert mechanical energy into electrical energy. This technology requires constant strong waves. The limitations of this technology are high costs, intermittent power and threat to navigation that cannot see or detect the equipments by radar.

**3. RESEARCH AND DEVELOPMENT (R&D)**

R&D for renewable technology development should involve industry and scientific establishments. Time bound specific tasks for identified R&D activities should be assigned to recognized / identified industry and institutions with clear understanding on the achievement of results. There is a need to develop platforms for sharing of knowledge so as to avoid 'reinventing the wheel'. Local innovations for new and emerging technologies should be done for improvement of available technologies to cater to the specific needs of the people of a particular area. In India, Ministry of New and Renewable Energy has been supporting R&D for technology and manpower development in Renewable Energy. Clean Energy Research Initiative (CERI) by Department of Science and Technology is one of the schemes to support R&D and capacity building in the area of solar technologies.

**4. COMMUNITY INVOLVEMENT**

Getting community engagement and sharing the benefits equitably is a key part of a renewable energy project. Various steps involved in community involvement include providing balanced and objective information, assisting the community in understanding all aspects of a project, including possible problems/issues, obtaining feedback from the community on plans, options and decisions and skill development of the community members to work and manage the project. Some of the benefits of community involvement are minimized objections, good stakeholder relations and a level of community awareness and trust in the project.

**5. CONCLUSION**

Energy is of utmost importance for modern economies and societies. The management and development of energy resources are priority from a sustainable development perspective. Improving energy access is critical to progress in the areas of poverty reduction, industrialization, economic growth, health, and education. Efforts to increase energy access must also factor in climate change as encompassed in the United Nations Climate Change Conference (COP 21 or CMP 11) Paris 2015 agreement. With this objective, carbon-intensive economic development is no longer an option and focus needs to be shifted towards clean and renewable sources.

In Indian context, with right investments in green technologies, India is well positioned to achieve renewable energy targets. The pursuit towards renewable energy will have an important role in enabling the country's transition to a fully sustainable energy system supporting sustainable development. With 300 clear sunny days, over a dozen perennial rivers and a coastline of more than 7,500 KMs, India has huge potential of development of renewable energy for the benefit of its inhabitants. India with its population of 1.3 billion people is the world's fourth-largest carbon emitter and power sector contributing majorly to the same. But in the recent years, due to climate change concerns have led to a significant shift from fossil fuel based energy sources to renewable energy sources. One more benefit of renewable energy is providing employment to local population. India has made significant developments in the renewable energy space with present installed renewable energy capacity of over 75 GW. In order to make the most of renewable energy sources, there is also a need to focus on energy efficiency practices as India's energy demand will witness an exponential growth owing to the lighting and cooling requirements due to the varied climatic conditions, increasing electric mobility, growth of the industries and rural electrification.

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**DIGITAL INNOVATION AND SUSTAINABLE DEVELOPMENT: IMPLICATIONS FOR AN ENGLISH CLASSROOM**

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**ABSTRACT**

*The onset of Global Digital Revolution has revolutionised the way in which all fields of knowledge function. It is not only supremely interesting as far as the question of technological innovations go but also the implication that these technologies offer a host of possibilities in varied industries and contexts. Since digitalisation has taken over the entire world, it seems like being digitally literate is the only way to go. Key research studies have also attempted to create a positive correlation between digital innovation and sustainable development. The important area for discourse is to create solutions in the classroom wherein learners can use digital innovation to further sustainable development. Just like any other domain of knowledge, use of digital resources, traditionally under the purview of Information and Communication Technology, has become the talk of the day much more than the need of the hour in classrooms, globally. Indian classrooms, too, irrespective of the context, type of school, regional placing of the school are opening their arms to use of digital resources (or ICT resources as they are popularly referred to) infusing them into the teaching-learning process.*

*In this paper, the author attempts to establish the extent to which digital innovation has been infused in classrooms, especially the typical English classroom and its impact on sustainable development.*

*Keywords: Digital Innovation, Sustainable Development, Information and Communication technology and resources (ICT resources), Typical English classroom*

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**INTRODUCTION**

The onset of Global Digital Revolution has revolutionised the way in which all fields of knowledge function. It is not only supremely interesting as far as the question of technological innovations go but also the implication that these technologies offer a host of possibilities in varied industries and contexts. Since digitalisation has taken over the entire world, it seems like being digitally literate is the only way to go. Key research studies have also attempted to create a positive correlation between digital innovation and sustainable development. The important area for discourse is to create solutions in the classroom wherein learners can use digital innovation to further sustainable development. Just like any other domain of knowledge, use of digital resources, traditionally under the purview of Information and Communication Technology, has become the talk of the day much more than the need of the hour in classrooms, globally. Indian classrooms, too, irrespective of the context, type of school, regional placing of the school are opening their arms to use of digital resources (or ICT resources as they are popularly referred to) infusing them into the teaching-learning process.

For the purpose of establishing a context, it is imperative to operationally define some key terms. These terms have been defined as follows:

- **Digital Innovation-** Digital innovation is in consonance with Digital Technology. A digital innovation refers to key transformations in the field of technology, be it computers, tablets, mobile phones which lead to a relatively enhanced productivity and democratization of a particular discipline or field.
- **Sustainable Development-** Sustainable development has often been conceptualised as economic development without the depletion of natural resources, implying that it is a development which does not hamper the natural and ecological environment of the world.
- **English Classroom-** A classroom where English is the target language being actively taught as a Second language, especially in the Indian context.

The relationship between Digital Innovation and Sustainable Development is a much discussed one. The term, "Sustainable Development" was first used by the Brundtland Commission which defined it as, "the development with sustainability that meets the needs of the present without compromising the ability of the future generations to meet their own needs." This phrase is now being used in most official documents and policies across the globe. It is also important to underline that sustainable development can have various dimensions- social, political, economic, ecological, environmental, educational, socio-political, so on and so forth.

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“Technology has great potential to help deliver the SDG’s but it can also be at the root of exclusion and inequality. We need to harness the benefits of advanced technology for all”

-UN Secretary General, Antonio Guterres, at the closing of the 2018 High-Level Political Forum on Sustainable Development”

Guterres seems to be banking on the merits of digital technology for sustainable development. As academicians, researchers and teacher educators, it is imperative that we understand, address and bank upon this relationship between digital innovation and sustainable development to use it inside our classrooms. In this section, we will try and delve deeper into the nuance of this relationship.

Firstly, technology has transformed our world into being a more compact one. People are connected now more than ever. If any form of development happens in any part of the world, it reaches the other parts of the world at a lightning speed.

Secondly, the access of development and news of development (emphasising the difference between the two) is not only quick to reach its audience but is faster in elicitation of responses. The eventual and expected outcome of Sustainable Development Goals is to bring communities (irrespective of any barriers) and individuals to come closer. We are also close to this outcome through digital innovation, literally at the tap of a button.

Thirdly we must hold ourselves (the community of teachers) accountable for the introducing Sustainable Development and its goals to our students. UNESCO in its key document on Sustainable Development asserts that quality education must be imparted to students of all grades, learning levels, irrespective of context, to educate them about the skills, values, morals and attitudes to create a sustainable future. It has also been suggested that issues pertaining to sustainable development should be introduced in the curriculum such as climate change, environmental concerns and degradation among others to create a more aware, responsible, alert and proactive population. The opening lines of Kothari Commission say, “The future of the country is being shaped in our classroom today.” It will not be an exaggeration to say that this historical statement holds true for classrooms across the world.

### **Infusing Technology in Classrooms for a Sustainable Future**

It is a truth, universally acknowledged (alluding to Austen) that technology has become the prime, driving force of our classrooms today. Lesson plans with ICT infused in them are not considered ‘modern’, ‘innovative’ or ‘unconventional’ are now counted as being the norm. Classrooms with traditional teaching methodology interspersed with ICT have revolutionised the way students are taught turning the process of learning from drab and dreary to more learner-centred, entertaining and engaging. While students were earlier used to rote memorizing facts and figures, now are moving towards a sense of self motivation and self regulation. This whole concept of ‘Blended Classrooms’ which meaningfully and pragmatically integrates technology with conventional pedagogical techniques is being touted as the solution to what UNESCO posed in front of educators: teaching our young learners about sustainable development.

In this section, we will try to take a sample of a middle school English classroom to closely examine and critically analyse how the concept of Blended Classrooms can be used to effectively teach learners to engage with the concept of Sustainable Development.

### **Blended Classrooms and Sustainable Development**

The concept of Blended Classrooms has gradually but consistently found its way inside our classrooms. Not just any one particular subject, but all subjects are using the advantages and merits of ICT in classes of various subjects. English classrooms have greatly benefitted from Blended classrooms. The world of English language learning has opened up after the use of ICT in classrooms. Areas of Prose, Poetry, Drama and Grammar teaching have become mesmerizing with the use of ICT. Multiplicity of interpretations, considered an important attitude has become easier to impart and engage with through the use of ICT resources such as PowerPoint presentations, Audio-Visual aids and Simulations.

Bloom’s Taxonomy considered to be a tool for creating successful educational objectives is the driving force behind most of the lesson planning that pre-service and in-service teachers engage in. It is divided into three hierarchical levels of educational objectives which function as domains, namely, cognitive, affective and psychomotor.

Blended classrooms are misconstrued as being extremely different from regular classrooms, which is inaccurate. Blended classrooms are an extension of conventional classrooms using digital content to increase some of its advantages. Its advantages include, but are not limited to the following:

- Individualised or personalised instruction
- Less reliance on rote learning
- More entertaining, fun learning
- Activity-based learning
- Child centred learning
- Accelerated learning
- Scope to adapt lessons in accordance and consonance with desirable learning outcomes

Regular classrooms can have some, most or all of these features. The only difference between regular classrooms and blended classrooms is that blended classrooms make use of digital content.

There are various models and approaches to successfully create a Blended Classroom and effectively integrate and use digital innovation in the classrooms:

One way is to use the 'Lab Rotation Method' which means that a limited number of computers or electronic devices are accessible to the students on a rotation basis when they visit the lab for full or partial access to digital content.

The second method is 'Classroom Rotation'. In this method, the number of electronic devices is not limited and is available for access in classrooms. However this access to digital content is centred on the activity and the teacher's reliance and willingness to use digital content in the classroom.

The third and last method is the 'Flex Method' which is basically a large room where each learner works on an individual computer through online courses with the help of a teacher. This large also consists of some smaller rooms where learners (individually or in a small group) work their way to advanced learning stages.

These three methods can be used individually or in a group

Let us take an example to understand this better. An English teacher teaches a poem by Alexander Pope to young English learners. Elements and characteristics of Neoclassicism reflected in the poem are discussed by the teacher along with the central theme of the poem. Now the teacher has the option of closing this discussion right here and now or also has the scope of using videos to discuss how different readers across the world have interpreted this poem in different ways. A popular activity done with the use of ICT is "The Author/Poet's Hat". In this activity, the learners are asked to metaphorically don the hat of the author/poet. Then they are asked various questions and they answer these questions based on their own understanding of the poem. The underlying idea of this activity is that every reader is a poet/writer herself as every piece of literary writing is open to interpretation.

While English learning is mostly equated with development of communicative competence, it can be used for a variety of other purposes as well. English language teaching is divided into teaching of Prose and Poetry, traditionally while modern advocates of ELT also add the teaching of Drama and Grammar to this. A primary aspect of English teaching and learning is the learning, relearning and unlearning of stories. These could be in any form- prose, poetry or drama but essentially we teach students the narratives of these stories. It is important that we also understand the way these stories are to be told: there are two central themes of any story. These themes are the implicit theme and the explicit theme. The explicit theme is what is generally taught in a classroom which refers to the core storyline of the piece. It includes the basic plot structure and the central characters. The teacher tries to explain the bell-shaped curve in the story focussing on the introduction, the main conflict and the resolution of the conflict. We also come to understand that there is one more theme in any literary piece, the implicit theme. This theme is of a greater concern to teachers as it talks about the moral systems, values and cultural norms which learners are socialised into. And this is where the teachers must help students imbibe the concept of sustainable development. We live in a world where it is becoming increasingly important to develop a lifestyle which uses our natural resources in a sustainable way. While the use of ICT and Blended Learning in itself is a step towards furthering the cause of sustainable development, English pedagogy can also be used to narrate stories about sustainable development to students. It has been proven time and again that literary pieces, be it stories, poetry or drama can be used as didactic tools to help students understand about various issues around them, especially as a tool to inculcate moral values and aspects of humanism

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It can be asserted that these can also be used to teach students about our current practices of over exploitation of our natural resources and overdependence on artificial or man-made resources. We can also use the English content matter to teach students about the importance of Sustainable Development and what can be done on the grassroots level to further establish an attitude of the progression of Sustainable Development.

**CONCLUSION**

English classrooms are considered to be extremely didactic in nature. We must acknowledge the fact that we can use English content to help students learn, unlearn and relearn theories, ideas and contexts. Literary pieces can be used to help students understand and engage with the idea of Sustainable Development. Stories and poems can be used to educate children about possible ways to establish Sustainable Development and use digital innovation to use our natural resources wisely. In itself, digital innovation is something which helps the cause of Sustainable Development. Infusion of digital resources helps institutions to save paper, time and other resources and has also been found to lead to more effective teaching- learning process. These digital resources can be used to help students generate discourses about Sustainable Development.

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**DIGITAL INNOVATIONS: A TOOL FOR SUSTAINABLE DEVELOPMENT IN EDUCATION**

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**ABSTRACT**

*The point of this paper entitled Digital Innovations: A Tool for Sustainable Development in Education is to contribute in the discourse on advanced advances as the way to cultivate practical instructive advancements for improving the instructing, taking in and appraisal from K-12 to Higher Education. It gathers the information and substance from different researchers and sources which have as its objective to address these difficulties and advance the viable utilization of new devices and advances to help educating, learning and appraisal. The paper comprises of 6 Digital Transformation Trends In Education and exhibit how they can be utilized to address center instructive difficulties; crossing from reexamining and changing learning conditions crosswise over instructive settings to viably developing understudies capabilities for the computerized brilliant society of things to come.*

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**INTRODUCTION**

Instructors from all evaluation levels are coming to understand the advantages of innovation in the homeroom. Normally, instruction is one of the last businesses to roll out broad improvement, clutching techniques and practices that were not coordinating pace with the consistently changing specialized world. In any case, through the advanced change and the ascent of instructive innovation, educators have started rolling out radical improvements to their guidance, evaluations, even the physical make-up of their homerooms, and at an a lot quicker rate than anticipated. These present patterns are standing out as truly newsworthy in training on account of the manners by which they are affecting understudy realizing, which will be talked about further:

**Virtual Reality**

Many allude this as increased reality but another term could be Mixed Reality. Gone are where understudies are relied upon to sit discreetly at their work areas. Instructive innovation is prevailing with regards to making learning community and intuitive. Computer generated reality is a case of transformative innovation that improve instructor guidance while all the while making vivid exercises that are fun and drawing in for the understudy. Augmented reality has the capacity of carrying the outside world into the homeroom and the other way around. Combining AR/VR/MR is exceptionally foreseen. Take, for instance, Experiential learning procedures, the utilization of computerized reasoning in training, and customized learning strategies are a portion of the real patterns which keep on reforming the Indian instruction framework in 2019. Experiential learning is being actualized in India as virtual labs, internet based life stages, virtual and enlarged reality instruments, and Virtual labs are intuitive conditions for making and leading reenacted tests dependent on certifiable wonders so understudies can collaborate with an exploratory contraption or other action by means of a PC interface. VR permits understudies utilizing e-learning stages on cell phones to straightforwardly connect with concentrate material. This keeps their commitment levels high and spurs them to find out more and better. Then again, AR encourages instructors and coaches in performing undertakings, they beforehand haven't or can't, in a protected situation.

**Classroom Set of Devices**

Schools are moving far from conventional ways and understudies never again need to go to the innovation lab for access to a PC or PC. Late years have demonstrated an expansion in study hall sets of PCs. Gadgets, for example, SMART Board permit both the educator and understudy to investigate the subject more than what's composed on the course books. It opens up the part of this present reality to the student and at the am etime makes the communication all the more vivacious and pleasant. As that number keeps on developing, so does the requirement for expanded spotlight on projects that show advanced citizenship abilities. We have to set up sessions for educators were they can gain proficiency with a wide range of new things that can be attempted with this colossal progression in innovation.

**Redesigned Learning Spaces**

Teachers have understood their homerooms must copy such a situation, which isn't just community oriented yet in addition well disposed spaces to encourage understudy learning. The onboarding of innovation has upheld their undertaking. Understudies are going on virtual field trips through these upgraded learning spaces rather than simply perusing from a content; they are making media rather than simply taking a gander at it. These spaces are loaded down with incorporated innovation, which implies understudies aren't simply utilizing these things, yet they are understanding howto use them so as to accomplish a particular objective. In addition, a

portion of these learning spaces aren't even in the study hall. Schools and colleges are making increasingly casual grounds learning spaces since they comprehend the significance of making and teaming up day in and day out, not exactly when class is in session.

### **Artificial Intelligence**

The utilization of AI in advanced education has effectively demonstrated helpful. Australia's Deaken University utilized IBM Watson to make a virtual understudy warning administration that was accessible 24-hours every day, seven days seven days. Watson's virtual counselors handled in excess of 30,000 inquiries in the main trimester. Another utilization for AI incorporates chatbots. Since chatbots are furnished with Natural Language Progression, as found in Siri, they have the human ability of answer inquiries concerning homework, helping understudies through an administrative work process like money related guide or paying bills, and facilitating the outstanding task at hand of the general population who might typically serve these jobs. Different utilizations of AI in instruction incorporate customizing realizing (which is talked about in more detail beneath), assessing the nature of educational programs and content, and encouraging one-on-one coaching with the utilization of Intelligent Tutoring Systems. We should keep one thing very clear in our psyches that innovation doesn't plan to supplant instructors, just to supplement them.

### **Personalized Learning**

We can customize adapting more now than any other time in recent memory. From school decision — open, private, sanction, virtual — to the alternatives accessible for how an understudy learns, training can be customized to suit every person. Mixed learning gives greater duty to the understudy, as it includes less immediate guidance from the instructor and more disclosure based techniques for learning. Mixed learning is a case of how understudies can control certain components of their learning by settling on choices about things like where and at what pace they travel through material. Versatile learning is like mixed in that it, as well, enables understudies to settle on choices about things like the time period and way of their learning. Versatile learning innovation gathers data about understudy conduct as they're responding to questions, and after that along these lines utilizes that data to give moment criticism so as to change the learning knowledge as needs be. Instructive devices with versatile SEQUENCE ceaselessly examine understudy information continuously and settle on split second choices dependent on that information. It consequently changes what comes next in a grouping, be it modified substance or an alternate request of aptitudes, in light of how understudy an understudy is performing.

### **Gamification**

Playing and learning impact when homerooms use gaming as an instructional device. Gaming innovation makes learning troublesome topic all the more energizing and intelligent. As the innovation advances, it is rapidly being utilized to upgrade instructive recreations in each order. Recreations are intended to give prompt input, understudies are inherently inspired to continue playing them, sharpening aptitudes all through. New innovation and new learning models are energizing and offer already incomprehensible potential outcomes to understudies, however they require consistent IT support. As instructive establishments keep on getting on board with the temporary fad and embrace these advanced change patterns, we should think about the present worldview for innovation guidance and push toward a group based methodology. As understudy desires increment, responsiveness to those requirements must increment too.

Case Study: How did Byju's transform education on the online platform

Raveendran, a mechanical specialist from Calicut University, established Byju's in October 2012. It tries to adjust the manner in which understudies learn, offers programs for youngsters from Classes IV to XII, other than getting ready alumni for aggressive tests - CAT, IAS, GRE and GMAT. The emphasis is on making learning visual and relevant, instead of simply hypothetical. The startup use innovation and information to offer customized exercises. "This methodology encourages understudies acknowledge what to realize, when to realize, how to learn and the amount to learn," says Raveendran, Founder and CEO. The thought is to modify understudies' learning knowledge to make the way toward learning pleasant. "On the off chance that the understudies learn in the correct manner and, on the off chance that they like learning, they will verify great stamps in any case," says Raveendran. Established with an underlying venture of Rs 2 lakh, put in by Raveendran, Byju's begun with study hall instructing and, throughout the years, it developed as an instructive innovation organization, with an attention on online activities. Byju's learning application, propelled in August 2015 has been a gamechanger, and is presently contributing 90% to its income. The application offers unique substance, watch-and-learn recordings, movements and intelligent recreations that assistance understudies handle things effectively and in a fun manner. "No repetition learning," says Raveendran. The startup pursues a freemium display a portion of the substance is offered for nothing, while understudies need to pay a charge for

cutting edge levels. The application is presently being utilized by 40 lakh understudies and, of these, 1.6 lakh are paid supporters. Somewhere in the range of 25,000 paid clients are jumping aboard consistently. "When youngsters perceive how fun and drawing in learning can be, they begin learning alone. This self-roused learning has helped manufacture the confidence of the two understudies and guardians in the item," says Raveendran. The startup, whose normal yearly membership ticket measure is Rs 10,000, created an income of Rs 4 crore in its first year of activity (2011-12). In pretty much five years, it has seen sensational development with income ascending to Rs 120 crore in 2015-16. Its staff quality has additionally developed from 10 to 900. Raveendran says that improved learning background that Byju's offers is the key explanation behind its tremendous development. Its 500-in number R&D group enables produce and bundle to content that makes learning alluring for students. "Our USP is that we make each understudy experience passionate feelings for learning and not concentrate on simply the propelled ones and the toppers," says Raveendran. The startup has won a few honors including Big Research NDTV Profit Business and Service Excellence Award, CNBC-TV 18 Crisil Emerging India Award in Education, Deloitte Technology Fast 50 India and Fast 500 Asia Award (for four successive years) and, most as of late, VC Circle Award for Education Company of the Year. As anyone might expect, Byju's guarantee has attracted financial specialists. The startup, which saw 15% of its income a year ago from abroad clients, for the most part from West Asia, has gotten a gigantic subsidizing of more than Rs 700 crore in three rounds from funding firms Aarin Capital and Sequoia Capital, and Belgian speculation firm Sofina. "We've made understudies who are dependent on learning, and in that lies the key to our prosperity," says Raveendran.

### **Future Scope**

"No Technology Can Replace Teachers". Notwithstanding, it is likewise the duty of the instructors, as it were, to consolidate present day training innovations like online task and video address in the homerooms to help make the examination material connecting with, intelligent and reviving. Aside from getting engaged with considering through such imaginative measures, understudies will comprehend the significance and significance of the whole substance, consequently demonstrating more enthusiasm for studies and learning. The benefit of computerized learning is likewise that it helps both withdrawn and outgoing understudies voice their perspectives in the homeroom. With the assistance of web apparatuses like message sheets, gatherings and online addresses, understudies who are bashful and reluctant can be enabled by the educators in study halls. These days, delicate aptitudes are more significant than hard abilities for one reason: everything changes so quick, that your capacity to adjust to evolving conditions, persistently adapt new patterns, think efficiently and be proactive – these are the abilities that are regularly esteemed the most at this point. 75% of teachers and understudies feel there is a hole in their capacity to meet the abilities needs of the IT workforce. To set up the ability required for the advanced economy, instruction must adjust as quick as the interest for IT aptitudes is developing and advancing. Innovation has significantly extended access to instruction and gave tremendous open doors for adolescents beginning their very own new businesses before even they turn 18. Just by realizing how to code, they can program their site and begin doing their business. In addition, presently all data that you need is accessible on the web and you have online gatherings, where you can really solicit exhortation from the experts, gain admittance to the contextual analyses and begin self-training.

In the customary homeroom, the instructor is the essential wellspring of data, and the students inactively get it. This model of the educator has been in instruction for quite a while, and today is still especially in proof. Be that as it may, on account of the entrance to data and instructive open door that innovation has empowered, in numerous study halls today we see the educator's job moving to the "manage as an afterthought" as understudies assume greater liability for their very own getting the hang of utilizing innovation to assemble pertinent data. Schools and colleges the nation over are starting to update learning spaces to empower this new model of instruction, cultivate more connection and little gathering work, and use innovation as an empowering agent. The fate of innovation in training is helping instructors to grow past direct, content based learning and to draw in understudies who adapt best in different ways. Its job in schools has developed from a contained PC class into a flexible learning apparatus that could change how we exhibit ideas, allocate extends and survey advance.

Likewise, the fate of innovation in training is to improve correspondence. In districts that were hard to achieve, for example, puts in sub-Saharan Africa are currently beginning to be open through eLearning. Mentors can address students over long separations and researchers can accomplish their scholarly papers through eLearning. Additionally, understudies that vibrate like examining from home would now be able to do it. Headway of data innovation in instruction has improved research. There are a lot of online libraries that help instructors and understudies with exhaustive perusing materials. Educators and teachers are additionally ready to post their work online for their understudies to peruse.

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**FUTURE OF TECHNOLOGY IN EDUCATION: EXAMPLES & POSSIBILITIES**

- **Social media in education** – allow learners and educators to post thoughts, ideas, and comments in an interactive learning environment. Also, students can follow influencers and learn from their posts.
- **Ipads& computers** – technology helps students be more responsible. Owning their own device or borrowing the school's devices gives students the opportunity to improve their decision-making skills as well as taking ownership of a valuable and often times expensive device.
- **Better Simulations and Models** – digital simulations and models can help teachers explain concepts that are too big or too small or processes that happen too quickly or too slowly to demonstrate in a physical classroom. Other simulations the organization is developing include a software that allows students to experiment with virtual greenhouses in order to understand evolution, a software that helps students understand the physics of energy efficiency by designing a model house, and simulations of how electrons interact with matter.
- **Global Learning** – at sites like Glovico.org, students can set up language lessons with a native speaker who lives in another country and attend the lessons via Skype, hangouts, etc. Learning from a native speaker, learning through social interaction, and being exposed to another culture's perspective are all incredible educational advantages. Also, podcasts are another popular learning method, with hundreds of free educational programs now available online.
- **More efficient assessment** – teachers can collect real-time assessment data from their students. When the teacher gives out an assignment, she or he can watch how far along students are, how much time each one spends on each question, and whether their answers are correct. With this information, a teacher can decide what concepts students are struggling with and can pull up examples of students' work on a projector for discussion.
- **E-books** – a digital textbook is a PDF on a tablet that students can carry around and now there is no need to carry five textbooks anymore. It's all digital. What used to take hours in the library to find, now students find instantaneously.
- **Students database and results tracking** – teachers are able to track individual progress, and are encouraged to identify learning objectives and differentiate instruction based on the needs of their students. Also, "My dog ate my homework" just won't work anymore, everything is saved on cloud. Other than that, students are able to check their grades immediately in the digital diary. Basically, students will each have a digital portfolio where they store all of their projects, assessments, notes.
- **Interactive textbooks & case studies** – the way that we think of textbooks is completely changing. It is no longer limited to merely text and pictures. Today's textbooks often have web-based sites that include assessments, animations, additional materials, videos, and other materials to support the learning of new content. Normally students have questions after reading a material and they can answer them in an interactive way.
- **Digitalization of everything** – students don't need pass notes in class anymore. And have their room full of notebooks, books and papers. Now everything is available online.
- **Extended classroom communities** – technology facilitates to extend classroom community by using web-based platforms like Edmodo or others. Teachers and students can use this platform to discuss homework, post assignments, and interact with peers as they work on projects.
- **Flexibility and online learning** – it is now easy for anyone to learn at their own pace, rather than being forced to adhere to strict timelines. I think, that the future of technology in education is about making it possible for people to learn from any place in the world. Online learning means that people can learn at varying pace, depending on their ability and the amount of time that they are willing to devote to their learning effort. Given learning materials are delivered to learners online, learners can schedule their learning timetables as they wish and submit homework and exams online.
- **Making learning fun again** – Teachers can now use videos, animations and other forms of content to enhance the process of learning. Nowadays, with the help of technology, it is now common for learners and teachers to use games as a way of enhancing the process of learning and teaching. As a result of the use of various forms of content, learning and teaching are now fun and more meaningful than the way it was in the past.

- **Cost Reduction** – technology has contributed to significant reductions in the costs of accessing education. Everything is available online now.
- **Improved student-teacher Interaction** – more and more teachers are now using technology to keep in touch with their students, for example e-mails and services like dropbox that allows you to upload and share content with a large number of people.
- **Video Games** – simulating real life problems, video games can bring about behavioral changes in the students by making them more goal-oriented. Gaming models not only provide a wide range of information but also initiate students to be problem-solvers.
- **Lifelong Learning** – the future of technology in education is also about revolutionizing education by normalizing lifelong learning. Online learning is a great way to facilitate today’s knowledge-driven society and the ongoing demands for continuous professional development. The nature of employment has changed, and keeping one job for life is no longer expected. As a result of globalization, educational institutions around the world are now integrating technologies into all elements of their courses. Online education has become part of mainstream teaching and learning, since students now have access to a wide range of increasingly impressive online resources.
- **Virtual reality is a hot topic in education.** With brands such as Oculus, Samsung and Google innovative learning resources are now available, capable of immersing students in their chosen subject.
- **Classes available online + live streaming** – schools can create private channels and upload classes video on youtube, so that students who are sick, can watch it from home and ask questions in real time.
- **Differentiate assignments to fit student’s personal learning style** – they is no need to assign a project like “write a book report using MS Word” or “create a slideshow in PowerPoint”. Now, students receive the “book report” assignment and make their own determination how best to communicate their thoughts, be it audio, visual, written, musical, video, artistically. As long as they fulfill the requirements of the project, the delivery format will be up to them. Like this students can find their passion, develop their strengths and polish their skills that they will need for their future.

## CONCLUSION

The paper briefly covers all the trends which can digitally transform education and the way students learn. Not only students but also teachers/instructors need to adapt to the current changing times so that learning no longer remains a dull activity and ensures entire growth of the learner. We must also ensure that these facilities to all irrespective of caste, colour and creed.

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**RELATION OF ACADEMIC ACHIEVEMENT WITH CRITICAL THINKING AND LEARNING SATISFACTION OF VIII STANDARD STUDENTS OF SCIENCE**

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**ABSTRACT**

*This research paper focuses on the relation of Academic achievement with Critical Thinking and Learning Satisfaction of VIII standard students of Science. Science is fundamentally concerned with exploring the physical world through the three fundamental areas of Physics, Chemistry and biology. Science is a very essential subject for a student. It familiarizes him with the empirical mode of investigation. It gives an answer to all the questions that keep disturbing him from time to time like how different processes takes place, how things are carried out etc. Understanding its conceptual structures and methodologies are an important part of an educated person.*

*Thus, Academic Achievement is one's intellectual ability to gain knowledge in a learning environment which is provided in school, college and universities. The student performance is measured through examinations or continuous assessments carried out during the course of study. The main concern is the how much the students have acquired and achieved. Therefore, it represents performance outcomes that indicate the extent to which an individual has accomplished specific goals.*

*Critical Thinking is the ability to think clearly and rationally about what to do and what to believe. It includes the ability to engage in reflective and independent thinking, making clear decisions. Learning Satisfaction plays a major role in shaping a student to become successful in pursuing their education. Students are viewed as customers of education market and as such their satisfaction is invaluable. Understanding the students learning satisfaction is to be able to provide improvements that may contribute to quality.*

*Keywords: Reflective, Conceptual Structures, Methodologies, Outcomes*

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**INTRODUCTION**

In the present Indian Education system, we still follow the traditional method of teaching without considering the need of the child and the society. Besides the fact that our educators are aware of the different approaches and strategies to be adapted inside a classroom but it is really unfortunate that our teachers follow the traditional lecture method and all other methods do not have their applicability. Having just the theoretical knowledge of the concepts and then memorizing it is not the aim of education. Science is a subject of experiments. No concept is accepted without a proof and a proper explanation supported by experimentation, whether it is physics, chemistry or biology. They are all very close to the world we live in. There is nothing which the student has to study virtually; all things have evident proof behind its acceptance. Science is fundamentally concerned with exploring and interpreting the physical world through the three fundamental areas of Physics, Chemistry and Biology. We live in a scientific and technological age and none of us can function properly without the basic scientific literacy and scientific skills. We also depend on scientific techniques for our economic and materialist requirements.

Science helps us to comprehend and establish connection with the physical and biological world around us. It has provided a pathway for advanced life from bicycle to jet aircraft, medicine to high-tech surgeries, televisions to gazettes like mobiles, tablet etc and many more. It has really affected the life style of people living from villages to towns and cities. Science cannot be used in a society without of men and women who have specially trained for science based vocations in industry, research and teaching. Science is all around us. Talk about household or everyday living, we are all the time surrounded by science .Right from how we breathe, what we eat, the machineries we use at home and outside how we travel to work place, what activities we do and so on. There is an endless list to the importance of science. We are all the time applying scientific steps to explore, study and to find out the reason and the cause of what all is happening around us.

Science is a very essential subject for a student. It familiarizes him with the empirical mode of investigation. It gives an answer to all the questions that keep disturbing him from time to time like how different processes takes place, how things are carried out etc. Understanding its conceptual structures and methodologies are an important part of an educated person. It helps in the development of intellectual skills and motor abilities. It develops a power of thinking, reasoning, curiosity, open-mindedness which leads to the development of scientific attitude and scientific temper. Thus science is such a subject which will always help in the progress of

the people and the nation by bringing out social changes for the betterment of the society. A student of science has knowledge based on facts, concepts, processes which enable him to continue to learn throughout his life.

Academic achievement is very important in the life of the student. It helps the students to know their level of performance and the weak areas in different subjects. It also helps the teachers to analyze their teaching and thus can bring in improvement accordingly. In today's competitive world academic achievement of a student holds lot of importance. The present society is achievement oriented. For taking admissions in higher classes or professional courses, academic achievement plays a role. Students who do not score well do not get admissions in reputed colleges. It is concerned with both the quantity and quality of learning. It is assessed continuously throughout the year in the form of formative and summative assessments. Thus, academic achievement is the marks obtained by the students through examination or achievement test which may be standardized or non-standardized. Academic Achievement is one's intellectual ability to gain knowledge in a learning environment which is provided in school, college and universities. The student performance is measured through examinations or continuous assessments carried out during the course of study. The main concern is the how much the students have acquired and achieved. Therefore, it represents performance outcomes that indicate the extent to which an individual has accomplished specific goals. In other words, it is the end product of all educational programmers.

Critical Thinking is the ability to think clearly and rationally about what to do and what to believe. It includes the ability to engage in reflective and independent thinking, making clear, reasoned decisions. During the process of critical thinking ideas should be reasoned, well thought out and judged (Beyer, 1995). Critical thinking is a skill where the student not only solves the problem but also in a position to take his own decisions, develops rational thinking and is able to reason out effectively. It is a skill in which he acquires the ability to interpret, analyze and evaluate the problem. In its exemplary form, it is based on universal intellectual value that studies subject matter divisions: clarity, accuracy, precision, consistency, relevance, sound evidence, good reasons and fairness. The term is used to describe forms of learning, thought and analysis that go beyond memorization and recall of information and facts. A person with good memory and who knows a lot of facts is not necessarily good at critical thinking. A critical thinker is able to analyze things and come to a conclusion and he knows how to make use of information to solve problems and to seek relevant sources of information. Critical thinking helps us acquire knowledge, promotes creativity, enhances language and presentation skills and is also a foundation for progress in science and technology.

Education is all about learning in a conducive environment where the students are satisfied and contented with what they learn and acquire in their classes. Learning Satisfaction is the major criteria used to evaluate the personal satisfaction towards his academic environment (Lee, 2008). Learning Satisfaction plays a major role in shaping a student to become successful in pursuing their education. Students are viewed as customers of education market and as such their satisfaction is invaluable. Understanding the students learning satisfaction is to be able to provide improvements that may contribute to quality (Ansari, 2011). Learning satisfaction is the pleasure or contentment that a student feels when he has achieved something. Teachers who show care or appreciation for their students influenced the student's satisfaction of learning (Teven & Croskey, 1997). The factors that affect students learning satisfaction are the instructor, technology, course management, Instruction and interactivity. Satisfaction can be manifested in student feelings and attitude towards learning activities; a cheerful mood or positive outlook shows satisfaction, while an unhappy mood or negative outlook shows dissatisfaction.

#### **LITERATURE REVIEW**

Wu and Hsieh (2006) conducted a study on sixth graders science students. A series of Critical Thinking Skill activity were selected. 58 sixth graders science students were exposed to these learning activities and they showed improvement. The statistical results showed that there was significant difference in their academic achievement. Joan (2007) conducted a study on the longitudinal impact of an eight-grade inquiry curriculum on student's beliefs and achievement in science. A longitudinal study followed 42 students through high school, contrasting attitudes and achievement towards science. Results showed significant gains in student's belief and achievement during the eighth grade curriculum followed by the general pattern in continuing education. Taylor and Bilbrey (2012) conducted a research on the effectiveness of Critical thinking techniques on 5<sup>th</sup> grade science and mathematics school students in Alabama, USA. The school changed the science and mathematics curriculum for a period of 3years. A statistical analysis showed significant improvement in the academic achievement of students. Kalaian and Kasim (2014) A meta analytical study was conducted to compare the academic achievement of students who have been instructed using one of the learning methods to those who have been instructed using lecture based instruction. The results showed that Inquiry based Instruction,

cooperative and collaborative learning methods supported the effectiveness of the small-group learning methods in improving students' academic achievement with an overall average effect size of 0.60.

Nuangchalerm and Thammasena (2009) studied the effect of cognitive development, analytical thinking and learning satisfaction on second grade students through Inquiry based Instruction. The participants of this study were 10 second grade students, sampled by purposive sampling technique. The scores revealed that the cognitive development, analytical thinking and learning satisfaction on students were high. Hwang and Chiu and Chen (2015) conducted an experiment on social studies students of elementary school to study the effect of Inquiry based Instruction on students' performance and their learning satisfaction. The results showed significant difference in the scores showing increase in students' performance and learning satisfaction. Gomez and Martinez (2015) studied the impact of Inquiry based Instruction on students' academic performance and to assess their satisfaction. Linear and logistic regression analysis proved that there is significant difference in the scores showing increase in students' performance and learning satisfaction.

### **OBJECTIVES OF THE STUDY**

The present study undertakes the following objectives:

- To find the relation between Critical Thinking and Academic Achievement of VIII Standard Science students.
- To find the relation between Learning Satisfaction and Academic Achievement of VIII Standard Science students.
- To find out the difference between Critical Thinking of boys and girls student of VIII Standard Science students.
- To find out the difference between Learning Satisfaction of boys and girls student of VIII Standard Science students.

### **HYPOTHESES OF THE STUDY**

The hypotheses of the study were as follows:

- There is no significant relation between Critical Thinking and Academic Achievement of VIII Standard Science students.
- There is no significant relation between Learning Satisfaction and Academic Achievement of VIII Standard Science students.
- There is no significant difference between Critical Thinking of boys and girls of VIII Standard Science students.
- There is no significant relation between Learning Satisfaction of boys and girls of VIII Standard Science students.

### **SAMPLE**

In every research project, it is not only difficult but impossible to include the whole population. Thus the researcher tries her best to select such a sample which is representative of the whole population to be studied. For the present study, six high schools of Dwarka, New Delhi were randomly selected. Totally 300 students were selected by randomly selecting 50 students from each school including boys and girls.

### **TOOLS USED**

For the present study, following tools were used:

- Critical Thinking Scale (Mincemoyer and Perkins)
- Learning Satisfaction Questionnaire prepared by the Investigator
- School Records for academic achievement.

Learning Satisfaction Questionnaire was given to experts to study and to check the suitability, language and the relevance of the test items. The suggestions were incorporated and the test items were modified accordingly. This test was then subjected to pilot administration.

### **COLLECTION OF THE DATA**

The researcher collected the data by visiting the six schools personally. The Critical thinking Scale and learning Satisfaction Questionnaire was given to the students. They took around an hour to complete both the scale and

the questionnaire. The scoring procedure was then done and the collected data was classified according to the hypotheses.

**STATISTICAL TECHNIQUES USED**

- ‘t’-test will be used to see the significant difference between the Means.
- Correlation (Pearson Product Moment) is used to find the relation between Critical Thinking, Learning Satisfaction and Academic Achievement.

**ANALYSIS AND DISCUSSION**

**Table-1: Analysis of Critical Thinking of VIII Standard Science Students.**

<i>Critical Thinking</i>	<i>No. of Students</i>	<i>Percentage</i>
Very High	169	56.4
High	38	12.7
Medium	64	21.3
Low	29	9.6
Very low	00	00

From table1 it is clear that most students have high Critical thinking and there are no students fall in the category of very low Critical thinking.

**Table-2: Analysis of Learning Satisfaction of VIII Standard Science Students**

<i>Learning Satisfaction</i>	<i>No. of Students</i>	<i>Percentage</i>
Above Average	66	22.0
Average	176	58.7
Below Average	58	19.3

From Table 2 it is clear that more students fall in the average category showing average learning Satisfaction.

**Table 3: Significance of Relation between Critical Thinking and Academic Achievement**

<b>Variable 1</b>	<b>Variable 2</b>	<b>Co-relation co-efficient</b>	<b>Significance</b>
Critical Thinking	Academic Achievement	0.385	0.000

From Table 3 it is seen that the co-relation co-efficient 0.232 is significant, there is considerable evidence to reject the null hypotheses. Positive co-relation indicates that as Critical thinking increases Academic Achievement also increases.

**Table-4: Significance of Relation between Learning Satisfaction and Academic Achievement**

<b>Variable 1</b>	<b>Variable 2</b>	<b>Co-relation co-efficient</b>	<b>Significance</b>
Learning Satisfaction	Academic Achievement	0.311	0.000

From Table 4 it is clear that the Co-relation co-efficient 0.311 is significant, there is considerable evidence to reject the null hypothesis. Positive co-relation indicates that as Learning Satisfaction increases Academic Achievement also increases.

**Table-5: Significance of Difference between Critical Thinking of Boys and Girls.**

<b>Variable</b>	<b>Sex</b>	<b>N</b>	<b>Mean</b>	<b>S.D.</b>	<b>t</b>
Critical Thinking	Boys	150	57.26	14.67	-4.927
	Girls	150	65.43	15.52	

From Table 5 it is clear that the t- value is 4.927 which is greater than the value meant for 0.05 level of significance, the null hypotheses is rejected. Thus Girls have greater critical thinking skills as compared to boys as is evident from the data.

**Table-6: Significance of Difference between Learning Satisfaction of Boys and Girls.**

<b>Variable</b>	<b>Sex</b>	<b>N</b>	<b>Mean</b>	<b>S.D.</b>	<b>t</b>
Learning Satisfaction	Boys	150	36.61	8.54	-0.521
	Girls	150	38.45	9.32	

From Table it is clear that the t- value is -0.521 which is less than the value meant for 0.05 level of significance, the null hypotheses is accepted. Thus Girls and boys have equal learning Satisfaction in Science.

**FINDINGS**

According to the above study the findings are as follows:

- There is a significant co-relation between Critical Thinking and Academic Achievement. As the critical thinking increases academic achievement also increases.
- There is a significant co-relation between Learning Satisfaction and Academic Achievement. As the learning Satisfaction increases academic achievement also increases.
- There is a significant difference between Critical thinking of Boys and Girls. The data reveals that girls have more critical thinking than boys.
- There is no significant difference between Learning Satisfaction of Boys and Girls.

**EDUCATIONAL IMPLICATIONS**

In accordance with the findings of the study, a few suggestions are given which can help students to achieve better in academics

- ✓ Critical Thinking helps student to achieve better. So teachers should make a point to enhance the critical thinking skills of students from time to time. Special lessons and workshops should be organized to help the students with this skill.
- ✓ Learning Satisfaction is must for each child's growth. As educators we should take care that the child is able to understand and grasp each topic. This will be possible only and only if we make our lesson simpler and easy by using certain techniques and teaching aids. Then only students will have learning Satisfaction and will achieve academically.

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**THE IMPORTANCE OF LANGUAGE IN THE SCHOOL CURRICULUM**

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**ABSTRACT**

*This article shed light on the importance of language in one's life and how it is an integral part of the school curriculum. This will be discussed how teachers play a major role in classroom scenario and how they deal with communication. Language is a dynamic concept as there is a first language and also acquired language through education. Teacher can use negotiation, semantic mapping to enhance language. We need language to learn, to retain and to recall our knowledge. Linguistic preservation and protection is necessary so that the languages don't die out.*

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**INTRODUCTION**

The role of language in the life of a human being holds supreme importance. For the all round development of the child, shaping the child's world, giving him/ her a means of expressing himself/herself; and fostering emotional growth besides improving academics, language is important.

**THE PRESENT INDIAN SCENARIO**

India has often been touted as a 'sociolinguistic area', 'a linguistic giant' and a 'language laboratory' by researchers who have engaged themselves in the study of language. For a country as multilingual and pluralistic like India, the requirement of more than one language becomes imperative in order to attain 'national cohesion', 'cultural integration' and 'social area mobility'.

Therefore, in the context of a classroom, the objective of teaching languages to students is not only equip them with the necessary language skills but also enable them to be effective communicators. . For this the teachers need guidance on how to use the textbook(s) in the classroom so as to fulfill the purpose for which it was intended; besides it will also help the students become competent users of the language.

**TEACHING AND LEARNING IN LANGUAGE**

A rising debate is between the cognitivists and the behaviorists. Skinner explains language behavior and language acquisition in terms of

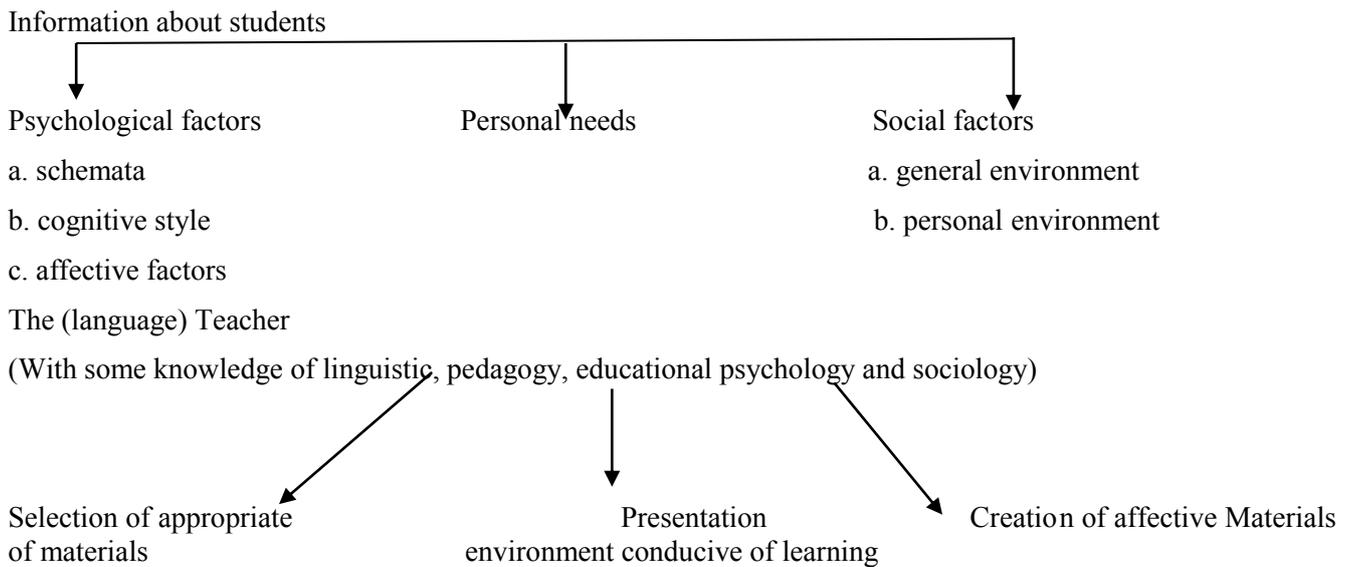
1. Stimulus,
2. response and
3. reinforcement.

Chomsky's cognitive model postulates a Language Acquisition Device (LAD) which is an inner mechanism in the brain that contains innate knowledge of grammatical universals and a hypothesis-forming capacity. Thus the child who is provided exposure to a language is able to deduce the system of rules of that language. While cognitivism today is given more importance than behaviorism, many teachers still believe that a response positively reinforced is more likely to be learned.

Language is much more than lists of vocabulary and sets of grammar rules. Language learning is not simply a matter of acquiring a system of linguistic formulas but is the mastery of language skills and all teachers at the school and college level direct their energies to achieve this. Language is a way of thinking and processing information apart from being a symbol of culture and personal identity.

Research involving the teaching of language is progressing at an ever- accelerating rate. The most significant discoveries in this area of research has not been about the methods to be used but recognizing the importance of psychology and sociology in the classroom, as well as more extensive training in pedagogy.

It is a fact undeniable that every learner is unique and constructs his/her own knowledge. Considering this, only one teaching methodology may not suffice. The trend now is shifting towards 'eclecticism', which is, selecting materials and techniques from various sources. This shoulders the teacher with additional responsibilities of drawing up activities which each student can select from. A wider training in pedagogy is thus called for. The following diagram will clarify the concept.



However, “Psychology and linguistics”, as Chomsky says “have caused a good deal of harm by pretending to have answers to those questions and telling teachers and people who deal with children how they should behave. Often, the ideas presented by the scientists are totally ambiguous and may cause trouble.

**THE CONTEMPORARY SCENARIO**

The focus today is on the functional approach to language teaching. Pit Corder and Alexander have grouped together related speech acts which could be termed functions, under different sets of categories. Their categories are:

1. Imparting and seeking factual information (identifying, reporting, correcting).
2. Expressing and finding out intellectual attitudes (agreeing, disagreeing, denying).
3. Expressing and finding out emotional reactions (expressing pleasure or displeasure, likes or dislikes).
4. Expressing and finding out moral attitudes (apologizing, forgiving, and disapproving).
5. Persuasion (getting things done (suggesting, requesting, inviting)).
6. Socializing (introducing, leave-taking).

Functions must be taught from the very outset, without waiting till a certain measure of fluency has been achieved. They are grouped as macro-functions subsuming micro-functions, skills as macro- skill and micro-skills. For instance,

1. Articulating sounds in connected speech
  2. Strong and weak forms
  3. Neutralization of weak forms
  4. Reduction of unstressed vowels
  5. Modification of sounds especially at word boundaries through
    - a. Assimilation
    - b. Elision and
    - c. Liaison
  6. Phonemic change of word boundaries
  7. Allophonic variation of word boundaries
  8. Expressing conceptual meaning, specially
    - a. Quantity and amount

- b. Definiteness and indefiniteness
- c. Comparison, degree
- d. Time, especially tense and aspect
- e. Location, direction
- f. Means, instrument
- g. Cause, result, purpose, reason, condition, contrast

### **TEACHER'S RESPONSIBILITY**

A teacher has to be well -versed and alert to the realities of:

1. The importance of language in scholastic and co- scholastic activities
2. Importance and implementation of the three language policy
3. Roles of different languages in our country.

Language learning and teaching today has become task-based, activity oriented and follows the participatory mode of learning. In this context the role of the teacher in the classroom is to motivate the students to learn the subject through their joyful involvement and a sense of achievement through and with the language.

In the wider context language has to be viewed:

- a. As a mean of communicating ideas
- b. As a means of social coordination
- c. As a means of expressing events, beliefs, desires

The teacher is thus expected to be able to manipulate information in several distinct areas of knowledge, besides the subject he/she is teaching. This will require a change both in the attitudes of the teacher and the students.

### **FIRST LANGUAGE ACQUISITION AND SECOND LANGUAGE LEARNING**

Here it may be clarified that children acquiring their native language are not merely learning a specific language; but they are learning control over their speech organs and learning to organize their experiences, with the use of that language .On the other hand, second language learners already have language as well as concepts and ways of naming and describing them through their first language.

Another difference between the first and second language learner is the immensely greater exposure to the language in the case of the former. Children hear their native language spoken around them over a period of years. The second language learner hears the language classroom for about an hour a day. Compare for yourself the exposure here! The native language is a means of relating to the world of children, of people, of expressing their needs, emotions and beliefs. The second language learner is denied this favorable position. The classroom remains an artificial setting, no matter how much we may seek to simulate a natural one, through varied contexts.

In our school under the three language policy, English is generally taught as a second language, where many children are the first generation learners who receive no help at home, and many teachers when speaking spontaneously commit the very same errors which they are supposed to correct, and hence teacher training and material production become extremely important.

It may be more efficient for teachers to focus on form for meaningful interaction, i.e. to act as a conscious "monitor". It may also focus on language, language support, and reduce ambiguity by providing relevant and helpful information about language. Rather than correcting forms through recasts and explicit correction, feedback techniques are preferred that provide active engagement for assisting them to draw on what they already know.

### **LANGUAGE AND CULTURE**

According to Fishman, language is an integral part of culture. Ceremonies, rituals, songs, stories etc. constitutes our textbooks. Language is therefore a crucial part of the culture. It reveals the basis for thinking and organizing experiences that have commonality with associated cultures. A particular language becomes symbolic of a particular ethnic culture in which they are embedded, for instance; food, clothing, means of earning livelihood etc.

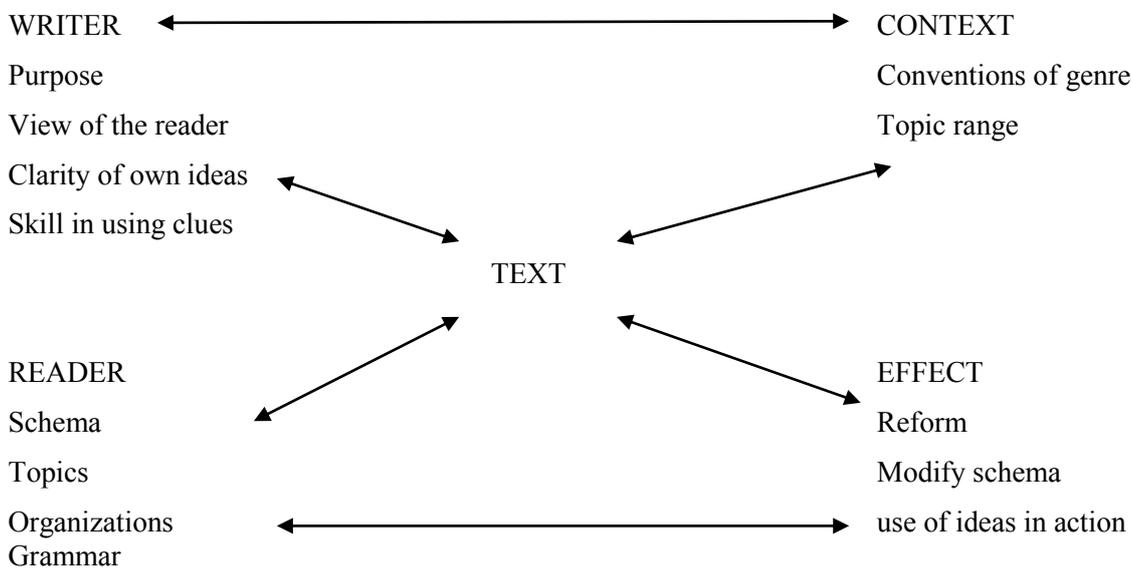
**EFFECTIVE COMMUNICATION**

In schools, we generally have recitation and speech contests to prepare students for declamation. In reality, a great majority of us are shy when speaking. In addition, when we have spoken before a crowd, or express our views at a seminar we become tongue-tied and inarticulate in thought. This is all because we have not mastered our skill of public speaking primarily because we took the recitation contests and language classes less seriously than the other school subjects. We therefore feel hesitant in our language today. To be effective in communication, one has to be near – perfect which comes through practice. Cicero, one of our greatest orators, had at one time a speech defect. He overcame this problem by keeping a small pebble in his mouth and practiced talking aloud to the vales and mountains.

**ESSENTIAL LANGUAGE SKILLS**

Language teaching and learning requires the four skills of listening, Speaking, Reading and Writing in that order. There is an interrelation between them. Some of them are regarded as receptive while others are taken to be productive skills. Such a distinction may not be wholly true.

Perhaps the reading skill seems to be the most important for our teachers and students. Reading is an important aspect in our life. There are a number of definitions for reading. Researches have shown that there is much similarity in acquisition of the reading skill in the first language and in the second.



**NEGOTIATING SKILLS**

Teachers can also engage their students by eliciting synonyms, precise terms, spelling, and pronunciation in form negotiation. By providing feedback in this way during meaningful interaction in subject lessons or in thematically contextualized language lessons, teachers do not undermine the expression of meaning, yet provide opportunities for students to notice unambiguously.

A high degree of reciprocity and shared involvement characterize interpersonal communication on a daily basis. It is a cooperative enterprise that involves the participants in a negotiation process as to who will speak, what will be discussed and how the discussion will proceed.

Speakers and listeners are constantly negotiating meaning through conversational adjustments to ensure that messages are communicated effectively if necessary. This is particularly important in a classroom situation for a teacher.

In the classroom, our students may be encouraged to use negotiation to manage their own learning. Students can take advantage of the learning opportunities presented by questioning, checking, asking for clarification or additional explanation. They thus signal where the language input needs to be modified or adapted to better fit their learning level.

Long and Porter suggest that there may be little opportunity to develop negotiating skills in large group situations. However, negotiation can take place when students work in pairs or in small groups, and it usually does. In addition, interaction patterns are closer to those found in real life as students are more relaxed and willing to take on different roles. Since not all are of the same linguistic ability, the teacher will have to guide the students to gain negotiating skills in order to take advantage of such opportunities for interaction in the classroom. Some suggestions are:

1. Examine the degree of negotiation that occurs in the classroom.
2. Maintain a classroom climate in which negotiation is encouraged.
3. Use teaching materials that focus on negotiation.
4. Employ activities that give students practice in negotiations.

### **SEMANTIC MAPPING**

Semantic mapping in language classroom can become an effective technique. When we teach meaning in language, we usually resort to the dictionary. The dictionary is of little help many times because word meanings do not always carry the word's power. Semantic mapping has been successfully tested to clarify concepts in other subjects, especially science. Even students in language learning have shown significant improvement in reading understanding, writing, expression, and development of vocabulary. Brown and Perry found weekly processing to be an effective strategy for vocabulary learning. Studies by Carrel (1989) have examined how schema theory and semantic mapping can improve the reading skills of the students.

Semantic mapping can be used as a pre-assignment strategy to activate the students' prior knowledge or to assist the teacher in evaluating the readiness of the students to do the job. It therefore enables students to record what they are learning during their assignment. As a post-assignment strategy, semantic mapping will help them integrate what they've studied and help students view learning from an organized perspective rather than from a fragmented perspective.

Briefly, semantic mapping involves the following phases:

1. Introducing the topic
2. Brainstorming
3. Categorization
4. Personalizing the map
5. Post-assignment synthesis

The map- either in its final form or in the personalized version made by each student can serve as a springboard for other language activities. Semantic mapping will thus be profitably used in communicative classes because it is:

- a. interactive
- b. allows for negotiation
- c. an information gap activity
- d. a productive activity
- e. student-centered
- f. teacher-friendly, and
- g. an integrative activity

### **HOME ATMOSPHERE LANGUAGE AND SCHOOL / STANDARD LANGUAGE**

It is generally understood that dialect and language differ somewhat. Similarly, the language spoken at home is very different from the language spoken at school, which is usually the standard language, although between the two there is a lot of giving and taking. Standard Hindi was derived from Khari Boli, for example. Awadhi, Brij, Maithili, Bhojpuri were once fully developed languages, now relegated to dialect status.

It is assumed that his / her first language or mother tongue is the one spoken in the school whenever the child enters the school in his / her locality. Which may not be true at all? The child is therefore educated in the standard language form. The child is placed in a dilemma in such a situation as to which language to use, or which one is correct. The student may use Brij at home, for example, but he / she learns Hindi standard at school, which is different. The standard form is also used by other subjects taught through the Hindi medium.

Teachers should be aware of the first language or mother tongue of their student so that they can explain the concepts in a simple and comprehensible language to the students in times of difficulty. Teachers of other subjects like history, economics, physics, botany, etc. should also have dialect knowledge spoken around their

area. Students can be unobtrusively and authoritatively corrected. Even teaching the mother tongue or the first language should create a proper atmosphere in the classroom.

### **EXTINCTION OF LANGUAGE**

It is a matter of concern to linguists that almost every fortnight a language somewhere in the world is dying. Out of the world's nearly 12000 languages only 6500 are being today. Bernard Comrie lists only 5000. If this trend continues the day is not far when we will have only SMS or any other man-made language for our life or work. We know the fate of many artificial languages, Esperanto being the most common example. In a way, the language world might be lost in the not too remote future. When astrology, magic, alternate medicine are being included in university courses, the moot point is why are languages being cold shouldered in various courses, including at the school level. Perhaps because of the economic and political clout wielded by some Western languages, English in particular, many of the languages of the third world are on the brink of extinction. Then it will be difficult to reconstruct the civilization which is evident from the fact that we have still not been able to decipher the script of Harappa and Mohenjodaro in spite of the many artifacts, including the Rosetta stone.

In the present scenario, the mother tongue is being neglected. In many schools, even speaking in Hindi invites a fine or punishment. And because of increasing mobility in our country languages tend to suffer as speakers of dialects have to speak the language of the state they are posted in. To save languages from extinction China can be cited as an example which has set up a number of surveys in different linguistic areas, which thus keep the language from dying out. India should also focus its concern towards doing research in linguistic areas.

### **ZERO CREDIT BUT COMPULSORY PASS**

In this regard, we can suggest that since languages are not part of many professional courses, they are never given any attention. Although language forms a component in some courses, students hardly pay any attention to it as it does not add its marks to the aggregate. The teachers take it lightly, as do the students, though each realizes how important a role the language will play in their later lives. In any professional course, languages should be made compulsory with zero credit.

### **RESTORING SANSKRIT, OL - CHIKI, URDU**

Sanskrit's revival can be called reverse sanskritisation— an attempt to hold back people in cultural ghettos as Indians aspire to globalize themselves. This is hardly economically reasonable. Indian teachers are recruited abroad for jobs. Learning Japanese, German, and Chinese in this context would be as fruitful as earlier learning English.

Recently, there has been a growing demand for tribal language introduction in the state of Orissa. Since the inclusion of Santhali language in the 8th schedule, Ol-chiki is now the language many tribals want to include in the curriculum along with its script, especially in the Mayurbhanj, Keonijhar, Balasore and Sundargarh districts. The establishment of a Santhali Academy on the lines of the Urdu Academy is also demanded.

In the schools, Urdu must be kept alive. However, Urdu medium school and Urdu textbook conditions are abysmally low; textbooks are only available late in the school session. Indian Urdu schools' ever-declining results show the parents of the teacher and the confusion of the student. Low results are indicative of incoherence and lack of coordination between managing bodies and stakeholders in Urdu schools.

### **THE TEACHER FOR THE NEW GENERATION**

Therefore, every teacher would do well to introspect and reflect on his / her teaching in the context of languages and the vast changes taking place in society and education, with particular attention to the language he / she uses.

Who am I as a teacher?

Who are my students? How do they experience my teaching?

Do they easily understand my language?

Do I use too many technical words?

Do I follow known conventions of language?

What are the consequences of my language abilities on the students?

Do I fortify my language with slang?

How is my tone in the language?

Do I maintain the rhythm of the language?

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What sort of change do I see as fit for my own teaching?

The teacher has to reason with himself/herself about his/her teaching which he /she lives to improve upon continuously. The answer lies in the ultimate question.

**CONCLUSION**

Language is not merely the medium of instruction at all levels of education, it is the medium of growth. It provides capacity for preservation and communication of intellectual life. At higher level, language provides the medium of fresh and free thinking and research. In education it is supposed to communicate knowledge, and in general life it is the instrument to pick up information. We need language to learn, to retain and to recall our knowledge. It is the primary need of the child. Thus language teaching should be a concern for both the teachers and teacher educators so that our originality and diversity of languages don't die out.

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**AN OVERVIEW OF AWARENESS ABOUT E-BANKING FACILITIES**

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**ABSTRACT**

*The resultant of technological innovation has been the transformation in operational dimension of banks over some decades. Internet technology has brought a paradigm shift in banking operations to the extent that banks embrace internet technology to enhance effective and extensive delivery of wide variety of value added products and services.*

*Globalization and technological advancements like internet, brought about many products and services like ATMs, Smart Cards, etc. This paper discusses an overview of e-banking facilities with respect to various products and services.*

*Keywords; E-banking, Electronic banking products and services, Mobile Banking.*

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**E-BANKING**

**Electronic Banking**, also known as **Internet Banking and Online Banking**, is an electronic payment system that enables customers of a bank or other financial institution to conduct a range of financial transactions through the financial institution's website. The online banking system will typically connect to or be part of the core banking system operated by a bank and is in contrast to branch banking which was the traditional way customers accessed banking services.

Some banks operate as a "direct bank" (or "virtual bank"), where they rely completely on internet banking.

Internet banking software provides personal and corporate banking services offering features such as viewing account balances, obtaining statements, checking recent transaction and making payments. Access is usually through a secure web site using a username and password, but security is a key consideration in internet banking and many banks also offer two factor authentication using a (security token).

**ELECTRONIC BANKING**

For many people, electronic banking means 24-hour access to cash through an automated teller machine (ATM) or Direct Deposit of paychecks into checking or savings accounts. But electronic banking involves many different types of transactions, rights, responsibilities — and sometimes, fees. Do your research. You may find some electronic banking services more practical for your lifestyle than others.

- Electronic Fund Transfers
- Disclosures
- Errors
- Lost or Stolen ATM or Debit Cards
- Overdrafts for One-Time Debit Card Transactions and ATM Cards
- Limited Stop-Payment Privileges
- Additional Rights
- For More Information and Complaints

**ELECTRONIC FUND TRANSFERS**

Electronic banking, also known as electronic fund transfer (EFT), uses computer and electronic technology in place of checks and other paper transactions. EFT's are initiated through devices like cards or codes that let you, or those you authorize, access your account. Many financial institutions use ATM or debit cards and Personal Identification Numbers (PINs) for this purpose. Some use other types of debit cards that require your signature or a scan. For example, some use radio frequency identification (RFID) or other forms of "contactless" technology that scan your information without direct contact with you. The federal Electronic Fund Transfer Act (EFT Act) covers some electronic consumer transactions.

**Here are some common EFT services:**

**ATMs** are electronic terminals that let you bank almost virtually any time. To withdraw cash, make deposits, or transfer funds between accounts, you generally insert an ATM card and enter your PIN. Some financial

institutions and ATM owners charge a fee, particularly if you don't have accounts with them or if your transactions take place at remote locations. Generally, ATMs must tell you they charge a fee and the amount on or at the terminal screen before you complete the transaction. Check with your institution and at ATMs you use for more information about these fees.

**Direct Deposit** lets you authorize specific deposits — like paychecks, Social Security checks, and other benefits — to your account on a regular basis. You also may pre-authorize direct withdrawals so that recurring bills — like insurance premiums, mortgages, utility bills, and gym memberships — are paid automatically. Be cautious before you pre-authorize recurring withdrawals to pay companies you aren't familiar with; funds from your bank account could be withdrawn improperly. Monitor your bank account to make sure direct recurring payments take place and are for the right amount.

**Pay-by-Phone Systems** let you call your financial institution with instructions to pay certain bills or to transfer funds between accounts. You must have an agreement with your institution to make these transfers.

**Personal Computer Banking** lets you handle many banking transactions using your personal computer. For example, you may use your computer to request transfers between accounts and pay bills electronically.

**Debit Card Purchase or Payment Transactions** let you make purchases or payments with a debit card, which also may be your ATM card. Transactions can take place in-person, online, or by phone. The process is similar to using a credit card, with some important exceptions: a debit card purchase or payment transfers money quickly from your bank account to the company's account, so you have to have sufficient funds in your account to cover your purchase. This means you need to keep accurate records of the dates and amounts of your debit card purchases, payments, and ATM withdrawals. Be sure you know the store or business before you provide your debit card information to avoid the possible loss of funds through fraud. Your liability for unauthorized use, and your rights for dealing with errors, may be different for a debit card than a credit card.

**Electronic Check Conversion** converts a paper check into an electronic payment in a store or when a company gets your check in the mail.

When you give your check to a cashier in a store, the check is run through an electronic system that captures your banking information and the amount of the check. You sign a receipt and you get a copy for your records. When your check is given back to you, it should be voided or marked by the merchant so that it can't be used again. The merchant electronically sends information from the check (but not the check itself) to your bank or other financial institution, and the funds are transferred into the merchant's account.

When you mail a check for payment to a merchant or other company, they may electronically send information from your check (but not the check itself) through the system; the funds are transferred from your account into their account. For a mailed check, you still should get notice from a company that expects to send your check information through the system electronically. For example, the company might include the notice on your monthly statement. The notice also should state if the company will electronically collect a fee from your account — like a "bounced check" fee — if you don't have enough money to cover the transaction.

Be careful with online and telephone transactions that may involve the use of your bank account information, rather than a check. A legitimate merchant that lets you use your bank account information to make a purchase or pay on an account should post information about the process on its website or explain the process on the phone. The merchant also should ask for your permission to electronically debit your bank account for the item you're buying or paying on. However, because online and telephone electronic debits don't occur face-to-face, be cautious about sharing your bank account information. Don't give out this information when you have no experience with the business, when you didn't initiate the call, or when the business seems reluctant to discuss the process with you. Check your bank account regularly to be sure that the right amounts were transferred.

Not all electronic fund transfers are covered by the EFT Act. For example, some financial institutions and merchants issue cards with cash value stored electronically on the card itself. Examples include prepaid phone cards, mass transit passes, general purpose reloadable cards, and some gift cards. These "stored-value" cards, as well as transactions using them, may not be covered by the EFT Act, or they may be subject to different rules under the EFT Act. This means you may not be covered for the loss or misuse of the card. Ask your financial institution or merchant about any protections offered for these cards.

## DISCLOSURES

To understand your rights and responsibilities for your EFTs, read the documents you get from the financial institution that issued your "access device" – the card, code or other way you access your account to transfer

money electronically. Although the method varies by institution, it often involves a card and/or a PIN. No one should know your PIN but you and select employees at your financial institution. You also should read the documents you receive for your bank account, which may contain more information about EFTs.

Before you contract for EFT services or make your first electronic transfer, the institution must give you the following information in a format you can keep.

- a summary of your liability for unauthorized transfers
- the phone number and address for a contact if you think an unauthorized transfer has been or may be made, the institution's "business days" (when the institution is open to the public for normal business), and the number of days you have to report suspected unauthorized transfers
- the type of transfers you can make, fees for transfers, and any limits on the frequency and dollar amount of transfers
- a summary of your right to get documentation of transfers and to stop payment on a pre-authorized transfer, and how you stop payment
- a notice describing how to report an error on a receipt for an EFT or your statement, to request more information about a transfer listed on your statement, and how long you have to make your report
- a summary of the institution's liability to you if it fails to make or stop certain transactions
- circumstances when the institution will share information about your account with third parties
- a notice that you may have to pay a fee charged by operators of ATMs where you don't have an account, for an EFT or a balance inquiry at the ATM, and charged by networks to complete the transfer.

You also will get two more types of information for most transactions: terminal receipts and periodic statements. Separate rules apply to deposit accounts from which pre-authorized transfers are drawn. For example, pre-authorized transfers from your account need your written or similar authorization, and a copy of that authorization must be given to you. Additional information about pre-authorized transfers is in your contract with the financial institution for that account. You're entitled to a terminal receipt each time you initiate an electronic transfer, whether you use an ATM or make a point-of-sale electronic transfer, for transfers over \$15. The receipt must show the amount and date of the transfer, and its type, like "from savings to checking." It also must show a number or code that identifies the account, and list the terminal location and other information. When you make a point-of-sale transfer, you'll probably get your terminal receipt from the salesperson.

You won't get a terminal receipt for regularly occurring electronic payments that you've pre-authorized, like insurance premiums, mortgages, or utility bills. Instead, these transfers will appear on your statement. If the pre-authorized payments vary, however, you should get a notice of the amount that will be debited at least 10 days before the debit takes place.

You're also entitled to a periodic statement for each statement cycle in which an electronic transfer is made. The statement must show the amount of any transfer, the date it was credited or debited to your account, the type of transfer and type of account(s) to or from which funds were transferred, the account number, the amount of any fees charged, the account balances at the beginning and end of the statement cycle, and the address and phone number for inquiries. You're entitled to a quarterly statement whether or not electronic transfers were made.

Keep and compare your EFT receipts with your periodic statements the same way you compare your credit card receipts with your monthly credit card statement. This will help you make the best use of your rights under federal law to dispute errors and avoid liability for unauthorized transfers.

### **ERRORS**

You have 60 days from the date a periodic statement containing a problem or error was sent to you to notify your financial institution. The best way to protect yourself if an error occurs is to notify the financial institution by certified letter. Ask for a return receipt so you can prove that the institution got your letter. Keep a copy of the letter for your records.

**Under federal law, the institution has no obligation to conduct an investigation if you miss the 60-day deadline.**

Once you've notified the financial institution about an error on your statement, it has 10 business days to investigate. The institution must tell you the results of its investigation within three business days after

completing it, and must correct an error within one business day after determining that the error has occurred. An institution usually is permitted to take more time — up to 45 days — to complete the investigation, but only if the money in dispute is returned to your account and you're notified promptly of the credit. At the end of the investigation, if no error has been found, the institution may take the money back if it sends you a written explanation.

An error also may occur in connection with a point-of-sale purchase with a debit card. For example, an oil company might give you a debit card that lets you pay for gas directly from your bank account. Or you may have a debit card that can be used for a various types of retail purchases. These purchases will appear on your bank statement. In case of an error on your account, however, you should contact the card issuer (for example, the oil company or bank) at the address or phone number provided by the company for errors. Once you've notified the company about the error, it has 10 business days to investigate and tell you the results. In this situation, it may take up to 90 days to complete an investigation, if the money in dispute is returned to your account and you're notified promptly of the credit. If no error is found at the end of the investigation, the institution may take back the money if it sends you a written explanation.

### **LOST OR STOLEN ATM OR DEBIT CARDS**

If your credit card is lost or stolen, you can't lose more than \$50. If someone uses your ATM or debit card without your permission, you can lose much more.

If you report an ATM or debit card missing to the institution that issues the card before someone uses the card without your permission, you can't be responsible for any unauthorized withdrawals. But if unauthorized use occurs before you report it, the amount you can be responsible for depends on how quickly you report the loss to the card issuer.

- If you report the loss within two business days after you realize your card is missing, you won't be responsible for more than \$50 of unauthorized use.
- If you report the loss within 60 days after your statement is mailed to you, you could lose as much as \$500 because of an unauthorized transfer.
- If you don't report an unauthorized use of your card within 60 days after the card issuer mails your statement to you, you risk unlimited loss; you could lose all the money in that account, the unused portion of your maximum line of credit established for overdrafts, and maybe more.

If an extenuating circumstance, like lengthy travel or illness, keeps you from notifying the card issuer within the time allowed, the notification period must be extended. In addition, if state law or your contract imposes lower liability limits than the federal EFT Act, the lower limits apply.

Once you report the loss or theft of your ATM or debit card to the card issuer, you're not responsible for additional unauthorized use. Because unauthorized transfers may appear on your statements, though, read each statement you receive after you've reported the loss or theft. If the statement shows transfers that you didn't make or that you need more information about, contact the card issuer immediately, using the special procedures it provided for reporting errors.

### **OVERDRAFTS FOR ONE-TIME DEBIT CARD TRANSACTIONS AND ATM CARDS**

If you make a one-time purchase or payment with your debit card or use your ATM card and don't have sufficient funds, an overdraft can occur. Your bank must get your permission to charge you a fee to pay for your overdraft on a one-time debit card transaction or ATM transaction. They also must send you a notice and get your opt-in agreement before charging you.

For accounts that you already have, unless you opt-in, the transaction will be declined if you don't have the funds to pay it, and you can't be charged an overdraft fee. If you open a new account, the bank can't charge you an overdraft fee for your one-time debit card or ATM transactions, either, unless you opt-in to the fees. The bank will give you a notice about opting-in when you open the account, and you can decide whether to opt-in. If you opt-in, you can cancel any time; if you don't opt-in, you can do it later.

These rules do not apply to recurring payments from your account. For those transactions, your bank can enroll you in their usual overdraft coverage. If you don't want the coverage (and the fees), contact your bank to see if they will let you discontinue it for those payments.

### **LIMITED STOP-PAYMENT PRIVILEGES**

When you use an electronic fund transfer, the EFT Act does not give you the right to stop payment. If your purchase is defective or your order isn't delivered, it's as if you paid cash: It's up to you to resolve the problem with the seller and get your money back.

One exception: If you arranged for recurring payments out of your account to third parties, like insurance companies or utilities, you can stop payment if you notify your institution at least three business days before the scheduled transfer. The notice may be written or oral, but the institution may require a written follow-up within 14 days of your oral notice. If you don't follow-up in writing, the institution's responsibility to stop payment ends.

Although federal law provides limited rights to stop payment, financial institutions may offer more rights or state laws may require them. If this feature is important to you, shop around to be sure you're getting the best "stop-payment" terms available.

### **ADDITIONAL RIGHTS**

The EFT Act protects your right of choice in two specific situations: First, financial institutions can't require you to repay a loan by preauthorized electronic transfers. Second, if you're required to get your salary or government benefit check by EFT, you can choose the institution where those payments will be deposited.

### **FOR MORE INFORMATION AND COMPLAINTS**

If you decide to use EFT, keep these tips in mind:

- Take care of your ATM or debit card. Know where it is at all times; if you lose it, report it as soon as possible.
- Choose a PIN for your ATM or debit card that's different from your address, telephone number, Social Security number, or birthdate. This will make it more difficult for a thief to use your card.
- Keep and compare your receipts for all types of EFT transactions with your statements so you can find errors or unauthorized transfers and report them.
- Make sure you know and trust a merchant or other company before you share any bank account information or pre-authorize debits to your account. Be aware that some merchants or companies may process your check information electronically when you pay by check.
- Read your monthly statements promptly and carefully. Contact your bank or other financial institution immediately if you find unauthorized transactions and errors.

If you think a financial institution or company hasn't met its responsibilities to you under the EFT Act, you can complain to the appropriate federal agency. Visit the Consumer Financial Protection Bureau or HelpWithMyBank.gov, a site maintained by the Office of the Comptroller of the Currency, for answers to frequently-asked questions on topics like bank accounts, deposit insurance, credit cards, consumer loans, insurance, mortgages, identity theft, and safe deposit boxes, and for other information about federal agencies that have responsibility for financial institutions.



### **DIFFERENT TYPES OF ONLINE FINANCIAL TRANSACTIONS ARE:**

#### **National Electronic Fund Transfer (NEFT)**

National Electronic Funds Transfer (NEFT) is a nation-wide payment system facilitating one-to-one funds transfer. Under this Scheme, individuals, firms and corporates can electronically transfer funds from any bank branch to any individual, firm or corporate having an account with any other bank branch in the country

participating in the Scheme. Individuals, firms or corporates maintaining accounts with a bank branch can transfer funds using NEFT. Even such individuals who do not have a bank account (walk-in customers) can also deposit cash at the NEFT-enabled branches with instructions to transfer funds using NEFT. However, such cash remittances will be restricted to a maximum of Rs.50,000/- per transaction. NEFT, thus, facilitates originators or remitters to initiate funds transfer transactions even without having a bank account. Presently, NEFT operates in hourly batches - there are twelve settlements from 8 am to 7 pm on week days (Monday through Friday) and six settlements from 8 am to 1 pm on Saturdays.

**Real Time Gross Settlement (RTGS)**

RTGS is defined as the continuous (real-time) settlement of funds transfers individually on an order by order basis (without netting). 'Real Time' means the processing of instructions at the time they are received rather than at some later time; 'Gross Settlement' means the settlement of funds transfer instructions occurs individually (on an instruction by instruction basis). Considering that the funds settlement takes place in the books of the Reserve Bank of India, the payments are final and irrevocable. The RTGS system is primarily meant for large value transactions. The minimum amount to be remitted through RTGS is 2 lakh. There is no upper ceiling for RTGS transactions. The RTGS service for customer's transactions is available to banks from 9.00 hours to 16.30 hours on week days and from 9.00 hours to 14:00 hours on Saturdays for settlement at the RBI end. However, the timings that the banks follow may vary depending on the customer timings of the bank branches.

**Electronic Clearing System (ECS)**

ECS is an alternative method for effecting payment transactions in respect of the utility-bill-payments such as telephone bills, electricity bills, insurance premium, card payments and loan repayments, etc., which would obviate the need for issuing and handling paper instruments and thereby facilitate improved customer service by banks / companies / corporations / government departments, etc., collecting / receiving the payments.

**Immediate Payment Service (IMPS)**

IMPS offers an instant, 24X7, interbank electronic fund transfer service through mobile phones. IMPS is an emphatic tool to transfer money instantly within banks across India through mobile, internet and ATM which is not only safe but also economical both in financial and non-financial perspectives.

**OBJECTIVES OF IMPS**

- To enable bank customers to use mobile instruments as a channel for accessing their banks accounts and remit funds
- Making payment simpler just with the mobile number of the beneficiary
- To sub-serve the goal of Reserve Bank of India (RBI) in electro notification of retail payments
- To facilitate mobile payment systems already introduced in India with the Reserve Bank of India Mobile Payment Guidelines 2008 to be inter-operable across banks and mobile operators in a safe and secured manner
- To build the foundation for a full range of mobile based Banking services.

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**A STUDY OF PARENTAL ENCOURAGEMENT ON EMOTIONAL INTELLIGENCE OF  
11<sup>TH</sup> GRADE STUDENT**

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**ABSTRACT**

*Parental Encouragement plays a significant role in developing emotional well-being of the students. Now a days we can see that in this fast paced world, no one has time to spend with each other and to share their feelings as we are living in 21<sup>st</sup> century where the life has become really busy. Due to complexities of life, the students, especially the adolescents, always want someone to stand on their side as this stage is regarded as very crucial in their lives. They are on that path where they can't take correct decision for their lives. Therefore, this stage requires constant support being provided by the parents as they act as the biggest guiding force in the students' life. This support, emotions if channelize properly, can help the students to achieve their goals in their lives. The present study was undertaken to study the effect of parental encouragement on emotional intelligence of 11<sup>th</sup> grade students. The sample of the study composed of 160 senior secondary school students in which 80 were Males and 80 were females of 11<sup>th</sup> grade. The sample was collected through simple random sampling technique based on gender from 8 senior secondary schools. Descriptive Survey Method was employed for the present study. Parental encouragement scale (APES) developed by Dr. Kusum Agarwal and Mangal Emotional Intelligence Inventory developed by Dr. S.K. Mangal and Mrs. Shubhra Mangal was used for data collection from the selected sample. The objective that has been formulated for the present study were i) To find out the effect of parental encouragement on emotional intelligence of male students studying in 11<sup>th</sup> class. ii) To find out the effect of parental encouragement on emotional intelligence of female students studying in 11<sup>th</sup> class. Mean, Standard Deviation One – Way Anova and 't' test were used for the analysis and interpretation of data. After the analysis of the results it was found that there was significant effect of parental encouragement on emotional intelligence of both male and female students.*

*Keywords: Parental Encouragement, Emotional Intelligence*

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**INTRODUCTION**

Yes, now a days life has become very complex and full of challenges. The life which was lived by our ancestors was totally different from the one that we are living today. The competition in every field has increased a lot and everyone, especially the students who are at their adolescent stage, want to be first at every step. At this stage they want someone who can show them a right path, provide them guidance and support them for their good deeds. Earlier, neither the parents nor the students were, in most cases worried about their future, as the options for career were limited and competition was also not at its peak like it is these days. Now the things have changed a lot. There is a change in our education system and despite a plethora of opportunities, competition has created multiple obstacles. For overcoming these obstacles, students must need encouragement from their parents and that too at an appropriate time and in an appropriate manner, i.e. without hurting their emotions. Emotions play a vital role in one's life, especially in the students who are at the critical stage of their lives when they can't decide what is good and what is bad for them. Under such circumstances parent need to step in and try and take control of their child's emotions in a most effective manner. It is absolutely true that emotionally intelligent people get more success in life than those who are not as they are able to understand their emotions and others too. They know how people would react if their emotions get hurt. This helps them to handle their relationships in a better manner, both in personal as well as in professional life. This is because the above mentioned quality makes them to feel and understand the emotions and problems of others. So, both the qualities i.e. parental encouragement and emotional intelligence are necessary for one's life, especially for those who are at their adolescent stage for achieving desired objectives.

**STATEMENT OF THE PROBLEM**

“A Study of Effect of Parental Encouragement on Emotional Intelligence of 11<sup>th</sup> Grade Students”.

**DEFINITIONS OF KEY TERMS**

**1. Parental Encouragement:** Parental encouragement is the motivation provided by parents to their children at every stage of their lives. With the help of this support, the children are encouraged to achieve success in every field and do not get disheartened in spite of failures.

**2. Emotional Intelligence:** Emotional Intelligence is the good aspect of one's personality in which an individual develops the quality of understanding the emotions of others as well his too. This quality helps the person to maintain relationships with others in a better manner.

### **OBJECTIVES OF THE STUDY**

The objectives for the present study have been formulated below:

1. To find out the effect of parental encouragement on emotional intelligence of male students studying in 11<sup>th</sup> class.
2. To find out the effect of parental encouragement on emotional intelligence of female students studying in 11<sup>th</sup> class.

### **HYPOTHESIS**

Following hypothesis have been formulated for the present study

H<sub>01</sub> - There is no significant effect of parental encouragement on emotional intelligence of male students studying in 11<sup>th</sup> class.

H<sub>02</sub> - There is no significant effect of parental encouragement on emotional intelligence of female students studying in 11<sup>th</sup> class.

### **REVIEW OF LITERATURE**

#### **1. Studies on Parental Encouragement**

Rafiq, Waqas, Fatima, Tehsin, Sohail, Muhammad, Saleem, Muhammad, Khan, Ali (2013) conducted a study on "Parental Encouragement and Academic Achievement; A Study on Secondary School Students of Lahore, Pakistan". The sample was selected from 9<sup>th</sup> class of secondary schools (public and private) from Allama Iqbal Town, Lahore City. A total of 150 students (boys and girls) were included in the sample. Simple random technique was adopted for the purpose of the study. Survey questionnaire was used as a tool for data collection. Through the results it was found that parental encouragement has significant effect in better academic performance of their children. Kishore, Vimal (2014) conducted a study on "influence of parental encouragement on students' academic achievement of high school students". The sample comprised of 200 (both male and female) from government and private high school. For the research study, the parental encouragement scale developed and standardized by Dr. R.R. Sharma was used. For testing the hypotheses descriptive statistics, 't' test and product moment coefficient of correlation has been used. The findings of the study showed that government and private high school students differ significantly on their parental encouragement and academic achievement. The study also revealed that there is a significant and positive relationship between parental encouragement and academic achievement of government and private high school students. Afroza, Akhter & Pandey, Shalini (2018) conducted a study on "A study of parental encouragement on the academic achievement of secondary level students in J & K". The sample was selected from 10<sup>th</sup> and 12<sup>th</sup> grade by using purposive sampling technique. It consists of hundred secondary school students in which 50 were Rural (25 Male and 25 Female) and 50 were Urban (25 Male and 25 Female). Parental Encouragement Scale (PES) by R.R. Sharma and for deducing the academic achievement of the students, result of High School Board Examination (2014) was used. The findings revealed that there is significant difference between rural secondary students and urban secondary students on their parental encouragement. Further it was found that secondary students have better academic achievement as compared to male secondary students. It was also found that parental encouragement with respect to domicile is positively correlated with academic achievement. The study also indicates that parental encouragement with respect to gender is positively correlated with academic achievement.

#### **2. Studies on Emotional Intelligence**

Lawrence, Arul & Deepa. T (2013) conducted a study on "Emotional Intelligence and Academic Achievement of High School Students in Kanya Kumari District". The sample comprised of 400 students (male and female) studying in IX and X standard. The tools employed in the study were self – made Trait Emotional Intelligence Questionnaire Form (TEIQue SF) and Achievement Test Questions. The findings of the study revealed that there is no significant difference between male and female high school students in their emotional intelligence. The study also indicated that there is no significant correlation between emotional intelligence and academic achievement of high school students. Chamundeswari, S. (2013) conducted a study on "Emotional Intelligence and Academic Achievement among Students at the Higher Secondary Level". The sample comprised of 321 students, selected from the higher secondary level through random sampling technique. The tools that were employed for the study were Emotional Intelligence Scale (Hydes and others, 2002) and the marks scored in

Science Subject in half yearly examination was taken to measure the academic achievement of the students. The findings of the study revealed that there was a positive significant correlation between emotional intelligence and academic achievement among the students. The students belonging to the central board schools have a higher level of emotional intelligence compared to students in state board but did not differ with students in matriculation board schools at the higher secondary level. Further the study indicates that the students belonging to central board schools are found to perform better in academics in comparison to the students who are in state and matriculation board schools at the higher secondary level. Sarita & Kataria, Sumit (2014) investigated “A Study of Emotional Intelligence and Academic Achievement among Secondary School Students”. The sample consists of 100 secondary school students selected through stratified sampling technique. The tools that were used for the study were, Emotional intelligence scale developed by Anukool Hyde and Sanjyot Deth. Descriptive Survey Method was employed in the study. The results showed that there was no significant difference in the mean score of emotional intelligence in relation to gender. There was significant difference in the mean score of Academic Achievement in relation to gender. Further it was also highlighted that there was slight relationship between Emotional Intelligence and Academic Achievement among secondary school students.

**METHODOLOGY**

Descriptive Survey Method was employed in the present research study. Quantitative approaches were adopted for the analysis and interpretation of data.

**SAMPLE USED FOR THE PRESENT STUDY**

The sample for the current research study comprised of 160 senior secondary school students, i.e. of 11<sup>th</sup> grade in which 80 were males and 80 were females which were selected by simple random sampling technique.

**TOOLS USED IN THE PRESENT RESEARCH STUDY**

1. Parental Encouragement Scale (APES) developed by Dr. Kusum Agarwal and
2. Mangal Emotional Intelligence Inventory (MEII) developed by Dr. S.K. Mangal and Mrs. Shubhra Mangal was used for the collection of data.

**STATISTICAL TECHNIQUES USED IN THE RESEARCH STUDY**

With a view to understand the parental encouragement on emotional intelligence of students at (10+1) stage, different statistical techniques were adopted for testing the hypothesis. Mean value and standard deviation were calculated from the obtained scores. Then F – ratio was worked out to judge the difference among several samples means was significant or it just a matter of sampling fluctuations. Further T – Test was used to see the significant difference among each two groups i.e. i) High – Average, ii) High – Low and iii) Average – Low.

**ANALYSIS AND INTERPRETATION OF DATA**

**Table – 1.1: Table showing Numbers, Means, Standard Deviation of High, Average and Low groups of Male Students Emotional Intelligence with respect to parental encouragement**

Different Groups/Levels	High			Average			Low		
	N	M	SD	N	M	SD	N	M	SD
Male Students	15	61.73	7.41	37	60.72	8.45	28	53.53	6.47

The groups were made on the basis of parental encouragement and scores of emotional intelligence have been taken according to these groups. From the table it was found that there is not much difference between High and Average groups’ mean scores which was 61.73 and 60.72 respectively. But High and Average groups’ mean scores were quite high than Low groups’ mean scores which was found to be as 53.53. To see whether the difference was significant or not, One Way ANOVA was calculated whose summary were as follow.

**Table - 1.2: Table showing One Way ANOVA (Male Students)**

Source of Variation	Sum of squares	df	Mean square variance	F – Ratio	Result
Between - groups	1029.99	2	514.995	8.53	Significant P < 0.05
Within - groups	4645.21	77	60.32		
Total	5675.2	79			

From the above table, it was found that calculated value of ‘F’ was 8.53 which was significant at 0.05 level. Since table value of ‘F’ was less i.e. at df = (2,77) it was 3.11. So, Hypothesis H<sub>0</sub>1 was rejected at point 0.05 level of significance with respect to groups of Male students.

**Table – 1.3: Table showing ‘t’ value of Male students**

Groups/Levels	Percentage	‘t’ value	Level of Significance
High/Average	73%/54%	5.98	P < 0.05
High/Low	70%/25%	4.87	P < 0.05
Average/Low	50%/17%	5.66	P < 0.05

To find whether there was significant difference between each two groups or not ‘t’ value was calculated. ‘t’ value between High and Average group was 5.98 and table value was 1.98 which was significant at 0.05 level. Percentage value concludes that High groups were more affected by parental encouragement on emotional intelligence as compared to Average groups of Male students.

When ‘t’ was worked out in between High and Low groups, it was found to be 4.87 which was significant at 0.05 level of significance. Table value was 2.63 and Percentage value concludes that High groups were more affected by parental encouragement on emotional intelligence as compared to Low groups of Male students.

Again, when ‘t’ was worked out in between Average and Low groups, it was found to be 5.66 which was significant at 0.05 level of significance. Table value was 2.62 and Percentage value concludes that Average groups were more affected by parental encouragement on emotional intelligence as compared to Low groups of Male students.

**Table – 2.1: Table showing Numbers, Means, Standard Deviation of High, Average and Low groups of Female Students Emotional Intelligence with respect to parental encouragement**

Different Groups/Levels	High			Average			Low		
	N	M	SD	N	M	SD	N	M	SD
Female Students	24	59.87	7.07	22	61.63	8.41	34	52.11	5.71

The groups were made on the basis of parental encouragement and scores of emotional intelligence have been taken according to these groups. From the table it was found that there is not much difference between High and Average groups’ mean scores which was 59.87 and 61.63 respectively. But High and Average groups’ mean scores were quite high than Low groups’ mean scores which was found to be as 52.11. To see whether the difference was significant or not, One Way ANOVA was calculated whose summary were as follow.

**Table - 2.2: Table showing One Way ANOVA (Female Students)**

Source of Variation	Sum of squares	df	Mean square variance	F – Ratio	Result
Between - groups	1481.425	2	740.72	14.73	Significant P < 0.05
Within - groups	3871.255	77	50.27		
Total	5352.68	79			

From the above table, it was found that calculated value of ‘F’ was 14.73 which was significant at 0.05 level. Since table value of ‘F’ was less i.e. at df = (2,77) it was 3.11. So, Hypothesis H<sub>02</sub> was rejected at point 0.05 level of significance with respect to groups of Female students.

**Table – 2.3: Table showing ‘t’ value of Female students**

Groups/Levels	Percentage	‘t’ value	Level of Significance
High/Average	76%/57%	7.89	P < 0.05
High/Low	72%/23%	7.11	P < 0.05
Average/Low	52%/13%	6.20	P < 0.05

To find whether there was significant difference between each two groups or not ‘t’ value was calculated. ‘t’ value between High and Average group was 7.89 and table value was 1.98 which was significant at 0.05 level. Percentage value concludes that High groups were more affected by parental encouragement on emotional intelligence as compared to Average groups of Female students.

When ‘t’ was worked out in between High and Low groups, it was found to be 7.11 which was significant at 0.05 level of significance. Table value was 2.63 and Percentage value concludes that High groups were more affected by parental encouragement on emotional intelligence as compared to Low groups of Female students.

Again, when ‘t’ was worked out in between Average and Low groups, it was found to be 6.20 which was significant at 0.05 level of significance. Table value was 2.62 and Percentage value concludes that Average groups were more affected by parental encouragement on emotional intelligence as compared to Low groups of Female students.

**EDUCATIONAL IMPLICATIONS**

1. The study should be simulated on a vast sample.
2. The study may be investigated to study the parental encouragement of exceptional students.
3. A comparative study may be investigated to study the parental encouragement, emotional intelligence of Government and Private senior secondary school students.
4. The study may be investigated to study the parental encouragement, emotional intelligence in different area i.e. Rural, Urban, Semi – Rural and Semi – Urban.
5. The students in various streams (i.e. Arts, Science, Commerce, Humanities) may be compared on parental encouragement and emotional intelligence.

**SUGGESTIONS FOR PARENTS**

1. Parents are the first teachers of a child, so parents should provide proper and conducive environment for the development of its emotional intelligence.
2. The small accomplishments of the child ought to very warmly appreciated by the parents.
3. Parents should not focus on what the child could not do, but instead encourage him and be positive about whatever he does.
4. Parents should not be harsh while giving any kind of instructions to their child.
5. Parents should motivate their child by giving rewards for achieving good grades.

**SUGGESTIONS FOR TEACHERS**

1. Teachers should recognise the importance of emotions of students and proper encouragement should be given to them based on those teachings.
2. Teachers should help the students to become emotionally strong by making them practice yoga and meditation.
3. Teachers should develop democratic attitude towards the students and should encourage them to express their own ideas and views.
4. Teachers should provide extra attention to the students who are emotionally weak.

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**CONTINUOUS AND COMPREHENSIVE EVALUATION AND LEARNING TECHNOLOGY****Ghazala Khatoon**

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**ABSTRACT**

*Continuous and Comprehensive Evaluation (CCE) refers to a system of school-based evaluation of students that covers all aspects of students' development. The main aim of CCE was to evaluate every aspect of the child during their presence at the school through integrating assessment with the teaching-learning process on learning and development of children holistically. Comprehensive means the scheme attempts to cover both the scholastic and the co-scholastic aspect of student's growth and development. This study covers implementation and recommendations by Kothari Commission (1964-66), acceptance and modification through different educational supportive bodies. Evaluation process developing ICT enabled CCE framework to help teachers manage the complex learning and assessment activities in CBSE schools with tools and techniques. It covers assessment pattern with advantages and disadvantages of CCE.*

*Keywords: Evaluation, Curricular, ICT, CCE, RTE Act 2009, Assessment*

Implementation of Continuous and Comprehensive Evaluation was one of the recommendations of Kothari Commission (1964-66). The recommendation was accepted by the Govt. of India under National Policy of Education (NPE), 1968 which was formulated on the basis of the recommendations of the Kothari Commission. Since then lot of changes was made by introducing unit tests in place of Term end exam or yearend exam. All the documents such as National Curriculum Framework for School Education (2000) and the National Curriculum Framework (2005) also stressed on the implementation of the CCE. One of the important features of right to education act (RTE) was the introduction of continuous and comprehensive evaluation (CCE). Thus CCE is implemented now during the tenure of Shri Kapil Sibbal, Minister of Human Resource Development. This is the new evaluation method introduced recently to decrease the accumulated stress of board exams. To achieve the objectives of evaluation or to work on the functions of evaluation "The Central Board of Secondary Education introduced Continuous and Comprehensive Evaluation (CCE) in Primary Classes in 2004 (Circular No. 5/18/25/04). The achievement records and its formats was also circulated for Classes I to V with the objective of facilitating holistic learning in the school. The Board recommended a five-point rating scale, it also recommended the elimination of the pass/fail system at the primary classes (Circular No. 31/04/21/05). The Board has also followed it up by extending this scheme up to classes VI to VIII and developed a CCE card on School Based Assessment for the same Circular No./2/06). The scheme of Continuous and Comprehensive Evaluation (CCE) will be now further strengthened in all affiliated schools from October 2009. The Class IX students will be assessed through the CCE by the school itself.

In 2009, the Right to Education (RTE) Act had mandated 'continuous and comprehensive evaluation (CCE) of a child's understanding and ability to apply the same' (Section 29.2.h) to complement policies such as no detention and age appropriate admission at the elementary stage among its slew of reform measures having the potential to transform the institutional structure and climate of elementary education in India (Kumar, 2017). Simultaneously, for the secondary stage, the CBSE announced a paradigm shift from examination to effective pedagogy in the replacement of its 10th class board exams with school-based evaluation—CCE with effect from 2011 (CBSE, Circular No. 39).

As per its provisions, section 29(2) ensures the right of each child to full time elementary education of satisfactory and equitable quality in a formal school that satisfies certain essential norms and standards. The RTE Act demands that each child should get an opportunity to learn and progress and be supported during this process. CCE can be a potent tool in respecting the intent of the RTE Act by ensuring learning for all children, as assessment during teaching-learning process would help teachers observe child's learning progress, provide timely feedback support to help the child to overcome the learning difficulties. In that case the state of 'failing' and thus detaining any child at the end of a term can be minimized. Therefore, it is crucial to understand and use both teaching learning and assessment in tandem, one complementing the other to arrive at a realistic picture of students' learning and development to help them accomplish the desired goals of education.

Thus, in order to impart quality education and help children develop holistically it is important to know their learning progress in such a manner through CCE so that it helps to;

- Find out the change in a child's learning and development over a period of time.
- map these changes through assessment of different curricular areas

- Identify the support each child needs to progress individually.
- Plan teaching-learning situations to suit their needs to enable them improve their learning.
- To allow children to assess themselves through reflection, seeking ways to regulate and improve learning by him/her.
- Find out to what extent curricular expectations and learning outcomes have been achieved. improve teaching-learning processes in the classroom.
- Provide evidence based feedback and communicate children's progress to different stakeholders including parents and guardians and involve them constructively in child's growth, learning and development.
- Encourage each child to be confident of learning by doing away with the fear of assessment and providing continuous support to ensure every child's learning and development.
- Keeping in view the primary purpose of learning which is to promote an overall development of children i.e. development of the cognitive, physical and socio-emotional dimensions holistically, the major aspects under CCE that need to be explored are;

– What is the understanding about CCE?

– Why Continuous and Comprehensive Evaluation (CCE) is to be undertaken?

– What is to be assessed under CCE? – How should it be assessed?

– When should it be assessed? – How can assessment information under CCE be used? Against this backdrop, this document endeavours to answer these questions and provide guidelines that give a research-based perspective of CCE and the process of its implementation at the ground level, in tune with the RTE Act. The content placed under four subsequent sections includes Section 2 dealing with 'Why' and 'What CCE is' and section 3 comprising of 'What needs to be assessed'. Section 4 details out the 'How' aspect of CCE i.e. the process of CCE and its implementation in schools whereas the last Section 5 includes some examples of checklists, rubrics and progress report.

### **Recommendations of National Curriculum for Elementary and Secondary Education in Reforming Evaluation Practices**

The continuous and comprehensive evaluation was initiated based on the recommendations to reform evaluation practices in school education by National curriculum for elementary and secondary education – a framework (1988). Therefore, it is desirable to examine the viewpoints presented in the framework with respect to evaluation. The framework emphasizes the following.

- Defining minimum levels of learning at all stages of education while evaluating the attainment of children
- Attaining mastery level in all competencies.
- Broadening the scope of learners' assessment by way of including the assessment of psychomotor skills and socio-emotional attributes.
- Aiming at qualitative improvement in education through valuation.
- Using grades instead of marks
- As feedback mechanism for the benefit of teachers, learners and parents providing timely corrective measures for improving attainment level of students.
- Using various tools, techniques and modes of evaluation such as paper, pencil test, oral testing, observation schedules, rating scales, interviews and anecdotal records, individual and group evaluation methods at different stages. Maintain comprehensive student portfolios based on observational and situational tests.
- Reducing undue emphasis on paper pencil tests in evaluation process.
- Using more and more informal means of testing to reduce the anxiety and fear of the examinees.
- Laying more stress on informal and child friendly methods of testing.
- Recording of evidences regarding psychomotor skills related to co-scholastic areas such as work experience, art education and physical education.
- Preparing a profile of the growth and development of every learner.

- Every school may do planning of a detailed scheme of evaluation in view of the minimum learning outcomes coupled with content.
- Evaluation of the key qualities like regularity and punctuality, cleanliness, self-control, sense of duty, desire to serve, responsibility, fraternity, democratic attitude and sense of obligation to environmental protection.
- Participatory and humane evaluation.
- Continuity of evaluation through periodical assessment of learning to be utilized for diagnosing the areas of difficulty and arranging remedial instruction.
- Demystification of evaluation process for making it transparent by taking parents and community into confidence.
- Communication of the evaluation outcomes in a positive manner.
- Developing competence for self-evaluation keeping in view the maturity level of children.

### **EVALUATION**

Education is a process of changing behaviour pattern of human beings in terms of thinking. The aim of education is the comprehensive & the all-round development of the child. It may be physical, intellectual, social, emotional, spiritual and moral. It is a continuous process. Evaluation is the systematic process of collecting and analysing data in order to determine whether, and to what degree objectives have been, or are being achieved. Evaluation is a systematic process of collecting and analysing data in order to make decisions. Evaluation is not an objective process. There is another dimension of evaluation process that is, the individual judgment. Evaluation in teaching learning is very much essential for

- (1) Making teaching learning process more effective,
- (2) Organizing the teaching activities in a proper way and
- (3) Keeping track of the teaching-learning process in a right direction.

### **FEATURES OF EVALUATION**

- The teacher evaluation system must have the two purposes of improving as well as measuring teaching effectiveness. The system should focus on improving teaching as well as accountability—improved student learning.
- The system should be based on teacher standards that define teaching and teacher quality.
- The system must be linked with professional development. Providing feedback to teachers on their performance is meaningless if there are no opportunities provided to learn and practice new skills.
- Because teaching is complex, it cannot be measured by just one or two tools. The system must include multiple sources of information on teachers' effectiveness such as observations, student evaluations of teachers, parent surveys, teacher self-report measures, teacher portfolios, and evidence of student learning.
- A career ladder as well as merit pay for teachers should be in place to recognize and reward teaching excellence.
- All evaluators should be well trained and knowledgeable so that the evaluations are credible and conducted with expertise.
- Serious evaluations require time and money. We must spend to get teacher evaluation right, and effective evaluation systems require a budget to support and sustain them.
- A top-down evaluation system can create resistance among teachers. Effective evaluation systems must be designed in partnership with teachers participating from the beginning.
- A teacher evaluation system must take into account the external factors that impact teachers' performance and effectiveness. One factor is the conditions of teaching in an institution, such as class size. These conditions may vary from one workplace to another and thus, an educator who is an effective teacher in one context may be less effective in a teaching context with different, or more difficult conditions. Other factors that affect teacher practices are culture, teaching traditions. and examinations systems.

### **CONTINUOUS AND COMPREHENSIVE EVALUATION**

Continuous and Comprehensive Evaluation refers to a system of school based assessment that covers all aspects of student's development. The comprehensive component of CCE takes care of assessment of all round

development of the child’s personality. As a part of this new system, student’s grades are given instead of marks which will be evaluated through a series of curricular and extra-curricular evaluations along with academics. The aim is to reduce the workload on students and to improve other skills; more emphasis is given on expression or presentation ability of the student with the help of so many activities inside and outside the school. Grades are awarded to students based on work experience skills, innovation, steadiness, teamwork, public speaking, behaviour, etc. to evaluate and present an overall measure of the student's ability. This type of evaluation help the student who are not good at studies they get the chance to perform in other fields like art, games, robotics, athletics etc. Unlike CBSE's old pattern of only one test at the end of the academic year, the CCE conducts several. There are two different types of tests the formative and the summative.

**TOOLS AND TECHNIQUES OF EVALUATION**

**Formative Assessment (FA)**

Through Formative tests student’s work at class and home, the student's performance in oral tests and quizzes and the quality of the projects or assignments submitted by the child are judged. Formative tests will be conducted four times in an academic session, and they will carry a 40% weightage for the aggregate. Some of the main features of Formative assessment are that it is diagnostic and remedial, provides effective feedback to students, students can understand their own problems and can work on them accordingly. It enables teachers to adjust teaching to take account of the results of assessment and recognizes the profound influence that assessment has on the motivation and self-esteem of students, both of which are crucial influences in learning. FA should not be confined to only paper, pencil tests but should include use of other tools and techniques such as project work, assignments, practical work etc.

**Summative Assessment (SA)**

Summative Assessments carried out at the end of a course of learning. It measures or ‘sums up’ how much a student has learned from the course. It is like traditional exams generally taken by school at the end of a unit or semester to demonstrate the “sum” of what they have or have not learned. It is usually a graded test, i.e., it is marked according to a scale or set of grades. Grades are given according to the performance of the student in these summative exams. It, at best, certifies the level of achievement only at a given point of time. In summative assessment, the students will be tested internally. The Summative assessment will be in the form of a pen-paper test conducted by the schools themselves. It will be conducted at the end of each term twice in a year.

**Evaluation of Scholastic Areas**

Area	Technique	Tool	Periodicity	Reporting
All the school Subjects	Oral test	Oral questions	Every day after completing a competency or group of competencies	Using direct or Indirect Grades
	Written test Project work Practical activities Maintenance of Portfolios	Class work Question paper Unit test Assignments Diagnostic test	Monthly class test Unit test Terminal test	

**Evaluation of co-scholastic areas and Personal and Social qualities**

Area	Technique	Tool	Periodicity	Reporting
Health	Medical checkup for physical growth	Norms of fitness used by Doctor	Once in a year	Health status
Physical Education	Observation of activities	Rating scale	As per time table	Direct Grading
Work Experience & Art Education	Observation at work and activities Maintenance of Portfolios	Rating Scale	As per timetable	Direct Grading
Social and Personal qualities -Cleanliness -Obedience -Discipline -Co-operation -Regularity -Punctuality -Protecting environment -Truthfulness -Patriotism -Responsibility	Observation, Interview and Self reporting techniques (students' diary)	Rating scale, Checklist and Anecdotal Records	Day to day observations by the teachers by determining criteria for each trait	Direct Grading (once in every month)

**CCE using learning Technology**

Evaluation process of developing ICT enabled CCE framework to help teachers manage the complex assessment activities in CBSE schools. We are developing a framework for incorporating formative and summative assessments, calculating and storing student data like marks, grades and percentage for scholastic and co-scholastic areas. CCE framework analyzes the students' performance data and provides easy to understand visualizations giving students and teachers a complete picture of performance of one student or a class of students, need for improvement in performance of a particular student, alerts for continuous degradation in performance, etc. These are helpful for the students since they get timely feedback and can work accordingly to improve the performance, as well as teachers and school management in monitoring the overall teaching-learning process and to identify the need for improvement.

**Salient Features**

- Teachers can define activities under assessments, do mark entry for scholastics and co-scholastics and can generate the score cards.
- Functionality to show Performance analysis of student and teacher.
- Functionality to show Performance analysis of students grouped at school level and CBSE Board level.
- Alerts for students and teachers.
- Animation, Video or Rich media for hard spots.
- Multimedia enabled Question Bank with metadata attribute for class 9 and 10, (Physics, Chemistry, Biology, and Mathematics).
- Web based Teacher training materials.
- Hosting on cloud with deployment support.

**Expected Outcomes**

- Development of ICT enabled CCE framework as contained in the CBSE Teacher's Manual and other appropriate material available on the CCE portal of CBSE Board's website for Class 9, 10.
- Innovation in learning environment during formative evaluation of a topic to allow a student to be adaptively assessed and then learn at their own pace in areas of needs improvement.
- Advanced students may work on advanced areas, while weaker students can practice more to get to the Minimum Levels of learning (MLL) for that topic.
- Develop an ICT based interactive CCE delivery system in a user friendly interface to administer assessments online and on demand, securely and dependably.

**CCE Help a Classroom Teacher**

In sum, the continuous and comprehensive evaluation helps a classroom teacher in the following ways.

- To identify learning difficulties in mastering certain competencies and the intensity of such learning difficulties.
- To improve students' learning through diagnosis of their performance.
- To plan appropriate remedial measures to enable the students who have learning difficulties in mastering the competency.
- To improve or alter instructional strategies to enhance the quality of teaching.
- To decide upon the selecting of various media and materials as a supportive system in mastering the competencies.
- To strengthen evaluation procedure itself.

**Current Assessment Pattern**

Under the current assessment pattern, students have to focus on one final annual exam. Each paper carries a total of 100 marks with 80 marks component for board examination or final examination and 20 marks component of Internal Assessment (IA). Here, we are discussing about the advantages and disadvantages of the current assessment pattern.

**ADVANTAGES**

- The board exams give students a fair idea about the exams far away from the home atmosphere of their schools and teachers, hence prepare them for the pan India exams.
- An exam conducted by one board throughout the country, provides transparency and standardisation in the whole system.
- In school exams, there may be chances of discrimination as some school exam papers might be really easy while some might be very difficult.
- As a student has to write a test for the whole syllabus so he/she get to revise it many times before the final exam. Thus, it helps to make a strong academic base.
- The Class 10 board exams give the students a trial run for the class 12 board exams.

**DISADVANTAGE**

- Due to the extra hype and extra emphasis on good scores in board exams, it automatically promotes rote learning and exam-centric education.
- Though the internal assessment includes weightage of subject enrichment activities, it does not give room to non-academic activities like listening and speaking skills, promoting logical and conceptual thinking, etc.
- Parents' and teachers' high expectations from the student's board result, imposes a great mental pressure on him/her.
- Students have to study the complete syllabus at the end which makes it more difficult for them to prepare for the annual exams.

**SUGGESTIONS**

Although CCE is a good system of evaluation but there are few problems regarding its implementation.

- Formative Assessment needs to be taken up with discrimination and in consultation with all subjects' teachers so that projects of all subjects are not given at the same time.
- Student should be encouraged for Self-learning and study skills through in-class activities. 3. Project work may be given in groups and the group members need to work in school under the direct supervision of the teacher.
- The classrooms should be interactive so that the teacher can help students in exploring, experimenting and experiencing learning.
- School may lay emphasis on Co-Scholastic Areas i.e., Life Skills, Attitudes and Values for personality development.
- It's very important to give feedback to the students and to their parents about their performance time to time.
- Due to lot of activities some time syllabus either not finished or not done properly so there should be proper time management.
- To reduce the work pressure from students Integrated Projects may be given where subjects are interlinked, through this they will be able to understand some new concepts. Subject teachers should plan and develop the project and assess it together.
- All the rules and regulation about CCE should be known to parents and student through hand outs. Details of CCE can be mentioned in the schools Almanac/ Diary/Syllabus booklets.
- Student teacher ratio is almost 42:1 which is destroying the purpose of CCE. It should be taken care.
- There is a need to train the teachers about CCE, because according to a survey lot of teachers doesn't understand this System (67%) and lot of teachers oppose this (58%).

**CONCLUSION**

CCE system is not a simple task by teachers in class rooms. A trained teacher required knowledge of ICT and CCE with enthusiasm to handle this system. This technology helps to frequent interaction between among students, teachers and the Principal. Teachers will have to put in greater effort to improve their teaching on the basis of regular feedback and diagnosis followed by remedial instruction through the use of learning technology.

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**INCLUSIVE EDUCATION: ACCESS TO QUALITY EDUCATION**


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**ABSTRACT**

*The purpose of the study was to identify the pedagogical practice adopted by the teachers and to identify the challenges encountered by them in managing in an inclusive set up. The literature review shed light in the various related aspects of inclusive education. The study employed qualitative method in which (FGD) Focus Group Discussions were used. Eighteen elementary school teachers from three government schools of Delhi were purposively sampled. The findings of the study revealed that majority of the teachers were not trained on how to teach in an inclusive classroom and hence faced many challenges which are discussed below. Most of the teachers were also not have exposure to the appropriate inclusive pedagogy. However, it is suggested that with proper training and resources, the teacher could be able to create an inclusive and effective learning environment. It can be concluded that mainstream teachers generally lacked confidence as they attempted to include students with disabilities in classrooms.*

*Keywords: Inclusive Classroom, Inclusive Pedagogy, Mainstream Education*

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**INTRODUCTION****Inclusion and Inclusive Education**

“Inclusion means that anyone, regardless her/his deficiency or learning difficulties, must be treated as a member of the society, and s/he is entitled to any available special services which he/she needs in the frame of the social, educational, medical and other services available to all the members of the society.” (Doru-Vlad POPOVICI - Elements of integrative psycho-pedagogy, Pro Humanitate, 1999 – p. 4). The word inclusion refers to a model where children with special needs spends more and more time with the students of general education or mainstream students. The purpose of inclusion is that the students with special needs can get a mixed experience and to enable them for successful social interaction so that they can lead a successful life. Inclusion is an approach going beyond the idea that all children should be educated in the same place, stressing equity and including everyone, if possible, in the curriculum. Major ideas are participation, development of full potential and involvement in the wider community. (Sage, 2004) Inclusion is the provision of services to students with disabilities, including those with severe impairments, in the neighbourhood school in age-appropriate general education classes, with the necessary support services and supplementary aids (for the child and the teacher) both to ensure the child's success academic, behavioural and social and to prepare the child to participate as a full and contributing member of society. (US National Centre on Educational Restructuring and Inclusion 1995, cited in Frederickson and Cline, 2002) Inclusive education is when all students (with special needs and children without any disability learn together) under same roof. It means improving schools so that all children learn more successfully. **Inclusive education** might be seen as a luxury, or as the responsibility of specialists,<sup>3</sup> but inclusive education is crucial to ensure all children have access to quality education. (Teachers, Inclusive, Child-Centered and Pedagogy, Webinar 12- technical booklet, UNICEF 2014)

Inclusive education is not about **containment, assimilation or accommodation**. It is not about placing particular pupils in changed, under-resourced and unplanned circumstances. (Barton, 2003: 427) It is a good example of new social condition where all students are treated equally. There is a slight change in the curriculum and adapted for hassle free learning for example TLM are developed for blind students where the child uses his/her tactile ability and learn. An inclusive classroom is a general education classroom in which students with and without any disability learns together where in special classroom only students with any disability and learning disability learns. Inclusive education describes **the process by which a school attempts to respond to all pupils as individuals** by reconsidering and restructuring its curricular organisation and provision and allocating resources to enhance equality of opportunity. Through this process the school builds its capacity to accept all pupils from the local community who wish to attend and, in doing so, reduces the need to exclude pupils. (Sebba and Sachdev, 1997, cited in Frederickson and Cline, 2002: 66)

**Who is and Inclusive Teacher?**

The European Agency for Development in Special Needs Education developed a profile of inclusive teachers based on four core values for inclusive teachers and a set of competences related to each core value. It has been recognized that inclusive values and attitudes in teacher training are essential for inclusive teachers. (Teachers, Inclusive, Child-Centered and Pedagogy, Webinar 12- technical booklet, UNICEF 2014 p-8). Actions in inclusive schools (such as adaptations in *teaching style, content and materials*) that are not related to

inclusive values such as equality, rights, respect for diversity and participation, etc., are less sustainable and more related to instructions from higher authorities. The skills and knowledge teachers learn in order to teach in inclusive settings should therefore be embedded in inclusive values to be meaningful. Teachers who believe it is their responsibility to teach all children are more effective teachers in general. (Rieser et al., "Teacher Education for Children with Disabilities: Literature Review").

### **Policies and Legislative Frameworks for Education and Inclusion**

- National Policy of Education (1968)
- National Policy of Education (1986)
- Bahrul Islam Committee (1985)
- Program of Action MHRD (1990 & 1992)
- Centrally sponsored scheme of Integrated Scheme Education for the Disabled (1974)
- Rehabilitation Council of India Act (1992)
- District Primary Education Programme (1994)
- Janshala (1998)
- National Trust Act (1999)
- Action Plan for Inclusive Education of Children and Youth with Disabilities (2005)
- Sarva Shiksha Abhyan (2001)
- National Policy for persons with Disabilities (2006)

### **Related Term**

There are few terms in which are used mostly and have an unclear meaning to layman for ex:

The two terms are very frequently used interchangeably i.e. impairment and disability. While impairment refers to a *lesser degree* of complexity in the way our bodies work whereas disability refers to *inability* or not being able to perform a task.

**Impairment:** In Hindi language it is translated as **Dosh, Vikaar**. Impairment can be defined as reduced quality of strength due to some injury or illness, it is a complexity in the functioning of our body or any part of the body which arises from any difficulty.

**Disability:** Disability is a permanent injury, illness or physical or mental condition that tends to restrict the way that someone can live their life. Disability may be intellectual, developmental, mental, physical, sensory or some combination of these. It substantially affects a person's life activities and may be present from birth or occur during a person's lifetime.

### **Special Education, Inclusive Education and Integrated Education**

**Special Education:** The term special education includes all aspects of education which are applied to all exceptional children, physically and mentally disadvantaged and gifted children and is provided in special schools which literary means a school that is specially organized to meet the needs of specific groups of children (such as children with disabilities). (*Teachers, Inclusive, Child-Centered and Pedagogy, Webinar 12-technical booklet, UNICEF 2014 p-46*).

Modern definition of special education is the education for special need children where as in primitive era it means the education for Brahmins, Kshatriyas, Vaishya, Shudras etc. It is an especially designed instruction that meets the unusual needs of special children

**Inclusion (Samavesh)/ Inclusive Education (Samaveshi Shiksha)** to an education system which takes into account the learning needs of ALL children and young people, street children, girl children, children of ethnic minority group, children from economically weaker sections (EWS). It includes all the students who are away from the education for any reasons like physically or mentally challenged, economically, socially deprived or belonging to any caste, creed, gender etc.

Inclusive education is a part of a broader goal of creating an inclusive society. Not developing yet more methods and systems, but nurturing values and beliefs. Its focus is not the disabled children and children with learning disability, it means inclusion of all children where each child has equal opportunity to learn. Inclusive

Education ensures that these children are afforded equal rights and opportunities to education. Inclusive education aims to combat the marginalization of individuals and to promote difference in a positive way.

**Integration (Ekikaran)/Integrated Education (Ekikrit Shiksha)** means providing education to students with special needs in regular classrooms either on full time or part time basis. Focus of integrated education is on having the child adapt and adjust to the regular classroom. The concept of integrated education ascends as outcome of recommendation National Policy of Education, 1986 i.e. to provide equal opportunities to all not only for access but also for success. The main aim of integrated education is to remove the feeling of inferiority among the children with any disability, and to ensure social integration. It is less expensive as there is no need to appoint specially trained teacher and special infrastructure is not required.

Exclusion means one to one instruction and educational support services for students with special needs that are provided outside of the typical school environment.

### OBJECTIVES OF THE STUDY

- To study the pedagogical practices followed by the teachers in inclusive schools
- To study the challenges faced by teachers in inclusive schools

### Sample

Eighteen teachers of Elementary classes from three government schools were taken as sample i.e. 6 teachers from each school. Purposive sampling technique was used for the sample selection.

### Tool

Semi structured focus group interview was taken as the tool of the study.

### Analysis

Analysis of the study was done qualitatively and the findings are as follows:

### FINDINGS

#### Pedagogical Practices

The teachers suggested the following pedagogical practices which they prefer to use

#### (a) Demonstration through Oral Presentations

There is a wide variety of learning styles and educational needs of students in an inclusive classroom for which the teacher has to adopt appropriate teaching learning strategies which makes learning accessible to all students e.g. if the student does not have the writing skills, the teacher may demonstrate learning through an oral presentation.

#### (b) Collaborative Style

If the student is able to learn visually, a piece of art may be presented in front of him/her. These ways can also help in their assessment. Similarly, the activities can also be done in groups in a collaborative way. The principle of "one method or strategy fits for all" does not apply in an inclusive classroom. Inequality and diversity found here demands the maintenance of too much flexibility and diversity in the use of teaching learning methods and strategies.

#### (c) Use of IEPs (*Individual Education Plans*)

Pedagogy of inclusive classrooms is derived from special education practices, this can be justified by the example of IEP's (*Individual Education Plans*) which were developed initially for special classroom specifically but gradually shifted by the time and used today in mainstream classrooms with an idea to promote learning of children with learning disabilities, language learning and other learning problems.

IEP and other practices are helpful in development of inclusive pedagogy, but in classroom where there are learners of diverse educational needs, such pedagogy is needed where no form of diversity exists and caters the needs of all and reduce or eliminates the singling out the individual for special teaching. The most familiar of these approaches includes *Universal Design of Learning (UDL)* and *Differentiated Instruction (DI)*, however new approaches continue to be developed that are also worthy of attention, such as Florian's and Spratt's (2013) "*Inclusive Pedagogical Approaches in Action (IPAA) framework*".

#### (d) Use of Assistive Technologies

Teachers suggested that assistive technologies can also be used for individual with disabilities and includes adaptive, rehabilitative devices such as

- *Screen readers* that enable person to hear electronic text as synthesized speech,

- *Speech to text software* that enable people to use their voices to enter text, *text telephone*, *accessible keyboards*, *standing frames*, *large print*, *braille* and, *speech recognition software*.

#### (e) Other Pedagogical Strategies

The other pedagogical strategies that can be practiced in an inclusive classroom may be

- **Peer tutoring:** Pairing of two students together where one is high performer and another one is low performer with any disability. Through this method student can learn better and interact without hesitation with his/her better knowing peer. This method also helps in building confidence and gives social learning experiences to students.
- **Cooperative Learning:** Through cooperative learning students learn to articulate their thoughts more freely, receive constructive feedback and gets more opportunities to respond.
- **Multisensory Teaching:** It used all/ maximum senses of students in the learning process. It is ideal for students with disabilities learning in an inclusive environment. To be effective teachers must be adequately trained to teach students with disabilities along with their non-disabled peers. ([www.questia.com](http://www.questia.com))
- **Buddy System:** In buddy system a learner is paired with another one usually an older one or with higher abilities. This promotes friendship and a sense of belongingness between them. Through this social interaction skill and a sense of independence is also developed among students with special needs.

#### CHALLENGES FACED BY TEACHERS IN INCLUSIVE SCHOOLS

On the basis of interview, it was found that most of the teachers faced following challenges:

- **Professional Training**

Teachers said that they are not trained for inclusive classrooms as they are mainstream teachers and mostly are not trained special educator or have thorough knowledge of special education. They also said that opportunities are given to them to attend the workshops on inclusive education but most of the time the schedule of workshop doesn't match the busy schedule of teachers. Only few stated that they are comfortable in teaching in an inclusive classroom. They emphasized that such programmes should be organized at regular basis, so that teacher can become familiar with the strategies that can be used in inclusive classrooms, as they did not learn about inclusion and were not exposed to teaching learner with disabilities.

- **Lack of teaching learning Resources**

It was found that there is lack of teaching learning resources in schools which hamper the teaching to deal with learners with disabilities. Teachers stressed that there should be concrete material which visually impaired learners can touch and feel. For example, Braille, magnifying glasses, hearing aids etc. But when asked whether they are trained enough to use these devices, they answered that they need training to use some devices such as Braille. They also suggested that all stakeholders including parents need training to use these devices.

- **Large Classroom Sizes**

Another challenge faced by teachers is the large size of classrooms which hinders them to give equal attention to each student in an inclusive classroom. If the teacher pays more attention to special children or CWSN, then the other gifted children becomes restless and sometimes it becomes difficult to handle the class discipline.

- **Time Management**

It was stated by the teachers that it becomes difficult sometimes to complete the syllabus on time because there is diversity in class and we have to use different teaching strategies for CWSN, so it is a big issue to manage time.

- **Assessment**

The teachers responded that the centralized system of assessment caters only the mainstream students and does not include methods of assessment for CWSN or with disability. Educators need to assess where learners have difficulty and determine if the learner needs extra help.

#### CONCLUSION

From this study it is concluded that teachers are somewhat familiar with the pedagogies and suggested some effective methods such as cooperative learning, reflective teaching, buddy system etc and they are also open to adopt new pedagogies. They also felt the issue of time which is short due to which they are not able to implement the new teaching methods. The teachers also faced a number of challenges while teaching in an inclusive classroom such as large classroom size, using new assessment techniques, limited or non-availability of teaching learning resources etc. They felt that they need training to work in an inclusive environment as they

were trained to work in mainstream. The continuous training may help them to build a positive opinion towards inclusive education.

### RECOMMENDATIONS

The vision of inclusive education is that all children reach their full learning potential, to reach this vision certain recommendations are made on the basis of the study conducted.

- Practical portion should be included in the pre-service curriculum where pre service teachers must use teaching methods and teaching aids meant for inclusive setup.
- Short term/ Long Term training courses must be organized for in-service teachers.
- Parents must be given orientation which enable them to inculcate values in their child to cooperate with their special need peers.
- A sufficient amount must be assigned to teachers from which appropriate teaching aid or device can be purchased.
- Experts must be invited from the area of special education for extension lectures so that there could be a healthy interaction between teachers and special educators

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**INTEGRATION OF INFORMATION AND COMMUNICATION TECHNOLOGY IN INCLUSIVE SCHOOLS**

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**ABSTRACT**

*This paper presents and evaluates the development of Information and communication technology in inclusive curriculum the focus is on the incorporation of ICT competences for inclusive education. Students were able to monitor the development and implementation of technology tools for special needs pupils. Within an educational technology curriculum, a competence framework was developed for fostering the use of ICT in the teaching of, and learning by, special needs pupils. This was achieved various learning objectives of autonomy, inquiry, creativity and innovation. It focus more specifically on the use of ICT for special needs pupils, the aim is to carry into effect the principles of equality, diversity and inclusive education. The research was designed to evaluate the candidate students' learning and to consider the alignment of learning objectives and activities with learning outcomes in the new curriculum. The research questions considered within the paper are: (1) How the new curriculum assists mutual development of ICT in inclusive schools? (2) How were various tools of technology are used in the assessment of students?*

*Keywords: educational technology curriculum, pre-service teacher education, inclusive education, special educational needs, e-learning environment for special educational needs, competences*

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**INTRODUCTION**

Information and Communications Technology commonly termed as ICT comes from the acronym IT and CT and refers to methods of storing, manipulating and communicating information. Information Technology (IT), as defined by the Smart Computing Dictionary, is

“A general term used to describe any technology that helps to produce, manipulate, store, communicate, or disseminate information. IT refers to the most expensive, complex computers, with devices usually dealing with electronic data in binary format. However, these IT machines are not able to communicate with one another.”

And, Communication Technology (CT) is “the term used to describe telecommunications equipment through which information can be sought and accessed”. (New Zealand MOE, 1998). Examples include: video conferencing, teleconference phones, and modems.

Globally, educational systems are adopting new technologies to integrate ICT in the teaching and learning process, to prepare students with the knowledge and skills they need in their subject matter. In this way the teaching profession is evolving from teacher-centered to student-centered learning environments. “ICT integration is understood as the usage of technology seamlessly for educational processes like transacting curricular content and students working on technology to do authentic tasks” (Kainth and Kaur). Nowadays ICT facilitate not only the delivery of lessons but also the learning process itself. This includes computer based technologies, digital imaging, the internet, file servers, data storage devices, network infrastructure, desktops, laptops and broadcasting technologies namely radio and television, and telephone which are used as instructional tools at schools.

**INTEGRATING ICT IN THE TEACHING AND LEARNING PROCESS**

Allen (1997) believed that the basic skills of the future are the use of powerful technologies. The traditional textbook can no longer fulfill the need in the rapid changing and the information-explosion world. He asserted that the traditional teacher-centered approach makes classroom no longer an effective system to prepare students for the realities which they face in the near future.

Parmley et al. (1997) stated that technology works best as a supporting tool-making complex processes or creative experience either possible or easier to accomplish. He thought that technology can offer new ways to provide meaningful, real-life context for learning, it also allow students to collaborate with peers and experts across the country and around the World.

Rosener (1997) described IT as good as, or even better than, traditional method of teaching and learning as it being limitless of time and space. Poole (1998) pointed out that suitably integrated computer use can contribute to successful results in the classroom as to: support teaching and learning, support children's socialisation, enable children with disabilities to integrate and enables a teacher to duplicate excellence.

According to Kennewell et al. (2000), integration of ICT in teaching requires understanding at a deeper level to facilitate the development of strategies and process to identify opportunities, solve problems and evaluate solution. They believe that these higher-level objectives require not only technical knowledge and skills, but the ability to choose an effective strategy for a problem. Poole (1998) shared his view that the technology is only a tool to both teacher and student. The effectiveness of the tool depends entirely on the skills they bring to the learning process. He believed that the teachers' task is thus to nurture the students' willingness to learn.

The present paper tries to evaluate the development of Information and communication technology in inclusive curriculum. The focus is on the incorporation of ICT competences for inclusive education. Students were able to monitor the development and implementation of technology tools for special needs pupils. Within an educational technology curriculum, a competence framework was developed for fostering the use of ICT in the teaching of, and learning by, special needs pupils. This was achieved through various learning objectives of autonomy, inquiry, creativity and innovation. It focuses more specifically on the use of ICT for special needs pupils, the aim is to carry into effect the principles of equality, diversity and inclusive education. The research was designed to evaluate the candidate students' learning and to consider the alignment of learning objectives and activities with learning outcomes in the new curriculum. The research questions considered within the paper are: (1) How the new curriculum assists mutual development of ICT in inclusive schools? (2) How were various tools of technology used in the assessment of students with special needs?

### **ICT FOR INCLUSIVE CLASSROOM PROJECT WORK STRUCTURE**

The project work is incorporated within the new Educational technology curriculum. The basic scope of the curriculum is to develop an autonomous teacher, who shall autonomously choose between options and tools, and adopt decisions on introducing creative and innovative solutions during lessons, taking into account the needs of individuals as well as groups. During tutorials, the students work on projects. At the beginning of the Project work, authentic cases from pedagogical practice are presented. Tutorial structure consists of the familiarization with learning objectives, introductory motivation, discussing a topic or issue, working in groups, and completing the reflection journal at the end of every tutorial.

The tutorial work is followed with practical work which is conducted by full-time students during their teaching practice in schools. The part-time student teachers have a good opportunity to apply the project work during their normal professional work. For final assessment of the course, students write an essay on ICT use for special needs pupils and ICT in teacher's professional development and learning.

A qualitative study by Williams explored the working environment of teachers to identify what needs are to be addressed when developing an ICT learning environment for special educational needs. It considered the main issues in everyday work, the information needs of teachers, new experiences with ICT and knowledge of ICT impact upon the special educational needs learning environment, facilities and tools within environment (Williams, 2005, p. 540). During their daily work, teachers need most: familiarization with the administrative procedures and policies, lesson plans and ideas, how to evidence work undertaken, and current level of areas in the curriculum that every individual student still needs to cover. In this inclusive approach, Project work is focusing on lesson plans and ideas, which form an integral part of teacher's daily work. Project topics need to be selected exclusively by students, which is a prerequisite for quality learning that is based on the motivation and interest of every individual student. Students will prepare projects which included the deliberation on and proposals of creative ICT use in resolving different problems and dealing with different topics in inclusive classroom.

## DIGITAL RESOURCES OF EDUCATION

**Jugnu Khatter Bhatia<sup>1</sup> and Dr. Sushma Rani<sup>2</sup>**Assistant Professor<sup>1</sup>, Satyug Darshan Institute of Education & Research, Faridabad  
HOD<sup>2</sup>, School of Education, Lingaya's Vidyapeeth, Faridabad**ABSTRACT**

*In a technology driven world where change is constant, there is a perpetual need to acquire new skills, knowledge and gain insight. In today's competitive and globalized world, digital learning provides learners not only with the different tools to add value to their current skill set but also to refine old set of skills and knowledge and provide opportunities to broaden their horizons without the constraints of time and pace. Digital learning helps to eliminate all types of borders and barriers whether social and physical. Emerging Online courses are a great solution to the challenges that learners face as they are provided with high-quality education according to their learning pace and on their own place and time. Everyone can access to the information and knowledge through various tools of digital learning. Through digital learning, the society can pave its way to accessing a conducive and effective e-learning environment with the ease of availability to necessary resources, teacher and learner-controlled activities, and collaborative opportunities & activities with peers. The digital platforms are able to enhance the learning and knowledge with respect to any field and across all age groups There are several online tools of learning that offer high-end innovative and budget-friendly digital learning opportunities.*

*Keywords: Digital Learning, Online Courses*

Technology is becoming an essential part of people's lives, and it has led to many drastic changes – both in how we think and in how we learn. The globalization of our society is a direct result of the recent technological development, which means that the barriers between different parts of world are starting to break down and world is becoming more and more closer. In today's competitive and globalized world, digital learning provides learners not only with the different tools to add value to their current skill set but also to refine old set of skills and knowledge and provide opportunities to broaden their horizons without the constraints of time and pace. Digital learning helps to eliminate all types of borders and barriers whether social and physical. Education system is moving into a new phase when it comes to the power of innovations and technology in a classroom. More effective, stimulating and sophisticated learning tools are being developed and they changed the whole scenario of how teacher will teach and students will learn. Such innovations and technological developments are being met with a blend of resistance and acceptance. Some educators worry that these new innovations may reduce their importance and role in the education process and eventually will replace them, or these learning tools are too costly, complex to understand or not required. Some are concerned that their teaching work will increase with these learning tools. Despite of these contradictory views, a growing number of teachers are accepting these tools and utilizing them in innovating ways to enhance students learning.

**DIFFERENT DIGITAL LEARNING TOOLS AND RESOURCES**

The medium of digital learning makes the overall education system highly comprehensive and effective. Development of Technology allows for various interactive activities for consolidating learning in an effective manner.

**• Webinars (Web-based Seminar)**

These are web-based seminars which are organized through the medium of the Internet. The webinars are a productive and interactive way of preaching the recent trends as well as updates with respect to global education. The webinars are held live which is attended exclusively by an online audience. These offer the opportunity to ask a question, poll, chat, survey, test, and so more over a specified topic. From a teaching and educational perspective, webinars are interesting and stimulating tool because of the very high degree of interaction, helping participants to learn and understand more rapidly.

**• E-Learning Portals**

Through e-Learning portals, effective educational and training programmes can be brought to the desktops and mobile devices of learners. They can benefit from them, by receiving up to date information. These learning portals can be customized, made accessible 24/7, are flexible, convenient and user-friendly as a centralized knowledge management entity. Learners can enhance their skills and knowledge over a certain subject or topic, learn about the latest trends and acquire some new skill through these online learning portals.

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- **Massive Open Online Course (MOOC)**

A Massive Open Online Courses is a completely free online portal that offers high-end educational materials for the students of all intellectual levels. Anyone can access these courses depending upon his time and pace. Through this portal, the learners are able to participate, engage, connect, or collaborate in various interactive learning processes and programs.

- **Edublogs (Educational Blog)**

Educational Blogging is another significant aspect of digital learning in the current education system. Through education-based blogging, teachers as well as students can utilize to their advantage. Edublogs is a specialized WordPress-based blogging platform that has been designed by keeping the teachers on focus specifically. This platform serves to be a great platform for the creation of online documents like handouts and assignments that can be easily shared with students. There is even an option of adding images with the given assignments.

- **Learning Management System (Moodle)**

A Learning Management System (LMS) is a secure and private online space to post content and to facilitate online learning activities and communications for a course. Instructors can use an LMS to enhance a face-to-face class or as an integral part of blended or online classes.

- **Learning Apps/Google Apps**

Through the means of advanced smartphone technology, there are various e-learning apps available for the students. Google consists of a set of apps that have been specifically designed for educators and teachers of the current education system. There are several teachers and educators that utilize Google Hangouts as it allows the students to initiate video-based conversations even from the most remote locations. Through these apps, the students can learn content. They can also enhance their skills and talents through these apps. For eg: E-Pathshala an initiative by NCERT and MHRD.

- **Clickers**

Clickers, are a tool used to make lectures more active, effective and engaging. Clickers use PowerPoint Presentations as a vehicle for delivering questions throughout the lecture that students can answer using a personal device. Clickers can make lectures more engaging by requiring students to actively apply their learning in class, and they provide very helpful feedback about student learning to instructors.

- **Lecture Capture**

Lecture capture is a tool used to record what the instructor is displaying on the computer along with the accompanying audio of a lecture. Instructors can use lecture capture to record in-class lectures for students to use as a review resource and to improve accessibility for all learners. An instructor can also record lectures to use in place of in-class meetings in other or future sections of the course. Concordia currently supports *Panopto* and *Camtasia* as lecture capture solutions.

- **Dropbox**

Cloud computing has changed the way people store files on their computers and Laptops. Many organizations have used it to make it easier for people to access files from multiple systems, as well as to share information with different users on their network. The same technology can also be used in a classroom setting, as it can make it easier for teachers and students to share files and electronic documents. Dropbox has a number of features that can allow teachers to share specific folders with their students, and they can access them from their computers.

- **ClassDojo**

A large part of teaching is managing the classroom, and ClassDojo makes the process easier. It puts more emphasis on providing “positive feedback” to students. One can also add more detailed information about the student’s performance or behavior, and can send messages to parents about their progress. It will even allow parents to look at their children feedback in real time, so they can stay up to date about how they are doing in class.

- **Edmodo**

Classroom Communication can be a challenge, especially if one has a large group of students to manage. Edmodo can offer a more streamlined approach to this part of classroom management. It can serve as a means for submitting assignments, getting grades, and sending any relevant information to students. It makes it easier to post assignments, messages, polls, quizzes, calendars, and other classroom resources, and they can access them online.

- **Slack**

This is a great tool for assigning group projects, as students can easily collaborate with others in their group. Slack also streamlines the communication among students so they can work together from remote locations. It incorporates Google Docs and Google Hangouts so students can share files with each other.

- **Educreations**

It gives the ability to create electronic whiteboards with lessons and tutorials that teachers can share with students. It's easy to create diagrams, commentaries, animations, and other instructions, and one can even record audio for narrative purposes and share it with students – both in the classroom or via e-mail or social media.

- **Cloud-Based Word Processors (e.g., Google Drive)**

Cloud-based word processors were a boon to teachers. With cloud-based word processors, students can collaborate on writing pieces from anywhere, save comments, and curate all steps of the writing process in digital portfolios.

- **TED Talk (Technology, Entertainment and Design)**

TED Talk has a library of video lectures that cover a wide range of topics and content, and they can be used in the classroom to supplement what one is teaching. This covers almost all topics — from science to business to global issues — in more than 100 languages.

- **Kahoot**

It is a game-based learning platform where students can learn through games or, 'Kahoots,' which are multiple-choice quizzes. With this digital learning tool, which can be accessed through a web browser, teachers can draft questionnaires, discussions online with academic lessons. The material can be then projected in the classrooms and questions are answered by students while playing and learning at the same time. This not only enhances student engagement but also creates a dynamic, social, effective and fun educational environment.

The digital world has blurred the walls of the schools and places of learning. Individual learners can learn anywhere, anytime and at their own pace. Digital learning resources can add considerable value to the quality teaching and to the learner's experience. Use of Technology extends our communications ability beyond face-to-face talking. It expands it beyond the printed page and reading to a new dimension. It is building a new and more efficient means of sharing ideas and information among all people.

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**SCAFFOLDING THE DEVELOPMENT OF TECHNO-PEDAGOGIC COMPETENCIES AMONG  
PRE-SERVICE TEACHERS THROUGH GOOGLE CLASSROOM AND MOODLE: A  
COMPARATIVE STUDY**

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**ABSTRACT**

*The 21<sup>st</sup> century has brought along a plethora of web and digital technologies. The advent of these information communication technologies (ICT) has altered the principals and process of teaching and learning. The learners of this century are no longer depended on the teachers for knowledge as all the knowledge that they seek is just a click away from them. Hence to meet the demands of these digital learners, the teachers must change their roles from sage on the stage to the guide on the side in knowledge exploration and creation. Therefore it is imperative to develop techno-pedagogic competencies among the teachers. UNESCO (2002) asserted that the best way to inculcate the ICT competencies among the teachers is by integrating the ICT into their learning environment. Learning management systems (LMS) is a software-based online platform that facilitates the management, delivery and measurement of the e-learning programmes. Through this study an attempt has been made to integrate ICT into the pre-service teacher's learning environment via learning management systems; Moodle Cloud and Google classroom. The LMS provided the instructional support to the 50 pre-service teachers enrolled in Central Institute of Education for developing the desired techno-pedagogic competencies. The present paper focuses on the comparative analysis of the two LMS used to scaffold the development of the competencies. The findings of the study highlighted that interface of the Google classroom is easy to access and learn than Moodle cloud.*

*Keywords: LMS, pre-service teacher education, techno-pedagogic competencies, Moodle, Google Classroom*

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**INTRODUCTION**

The fast paced life of the 21<sup>st</sup> century has welcomed the virtual ways of doing things. Digital technologies have become the integral part of all aspects of life; education, social, professional and health as they save time and allow huge scope for personalization. The drift in the orientation of the education from the teacher centered to the learner centered has further established the need for an education system that individualized the instructions as per the ability, interest and the need of the learner. Information communication technologies (ICT) allow the ease of accessibility to the learning content from anywhere, anytime. Also ICT helps in catering to the diversity in learning needs and styles of all the learners. With the help of ICT it is possible to personalize the instructions as per the interest of the individual. One such information communication technology is learning management systems (LMS).

Learning management systems (LMS) is a software-based online platform that facilitates the management, delivery and measurement of the e-learning programmes. The LMS software helps in administration, documentation, tracking and recording of the e-learning programmes. It also helps to maintain the collaboration over the internet and hence can be used to deliver online training and offering online courses to those learners who are not able to attend regular college because of certain reasons. Along with the distance education it also helps in providing the continual support to the regular face to face course in terms of maintaining the records, documenting the instructions, tracking and assessing the learning.

Most of the learning management systems are cloud based. Some of the Learning management system like moodle.org provides for the desktop or mobile application extensions that could be accessed without internet. On a LMS a course can be created and organized into topics. Each topic is supported by resources and followed with an assignment. There is also a provision for making an announcement. The LMS is also responsible for keeping a record of the submission status by the students and help students tracking their own progress. Grades and feedback on the submitted assignment can be shared with the learner instantly. In some cases LMS may have certain built tools like survey, quiz etc. that enable the development of the online learning material without any other software. Looking at the affordances of the LMS, it would not be wrong to say that LMS provides excellent support and opportunity to provide online or blended learning.

The learning management systems have lots of benefit. LMS increases the teaching efficiency as they facilitate flexible delivery of the course, provide multiple learning resources, and support online collaboration and helps in tracking progress assessments (Ryan, Scott, Freeman & Patel 2000). LMS also decreases the capital investment required for a course as it reduced the demand for space and infrastructure (Coates, James &

Baldwin, 2005). LMS also enhances student learning by supporting constructive pedagogies as the course contents provides diverse range of resources and knowledge networks to the learners to engage with. It also supports the provision of formative assessments and instant feedback (Coates, James & Baldwin, 2005). It also supports student's expectations to work with advance technologies as the present generation learners are highly influenced by upcoming technologies (Coates, James & Baldwin, 2005).

There are many learning management systems such as moodle, schoology, blackboard and many more. However there are certain common characteristics to all the learning management systems. According to Jill (2016) these are

- Managing users, courses and roles; all the LMS have a process through which courses are uploaded, users are added to the course and their role is assigned.
- Course calendar: it helps in managing the course activities like completion/submission of tasks
- Messaging and notifications: there is provision for sending individual messages to the users and the notification of any new addition on the course is also sent to the users
- Assessments: LMS supports the automated evaluation of the learners. Assignments, quizzes, activities, etc. can be assigned to the learners for tracking their progress.
- Maintain records: LMS helps in maintain the records/grades of the learners
- Course/content management: LMS helps in organizing the contents of the course into an effective learning pathway like the topic, subtopic, class etc.
- Administration: LMS allows the instructor to manage the course display, course settings, etc.

Learning management systems plays a very important role in supporting the teaching and learning so one must choose a LMS that plays this role well. Pappas (2018) mentioned certain points that could be looked at while choosing an LMS for teaching. The LMS must have a very effective course management system. It must be able to create learner centred, user friendly and easy to use learning path. The LMS must appropriately track the progress for each learner for evaluation of the learning. The data access must be unrestricted i.e. the user must have the access to the database anytime, anywhere and from any operating system. The LMS must not be too complex for the user to use. The interface must be user friendly. LMS must be well integrated with other social media and application so that data can be easily import/export across the various systems. LMS must be budget friendly, if possible it should be free and open sources so as users can use it freely without any financial constraints. The LMS selected must have a very strong technical support.

### **THE STUDY**

The learning management system has the potential to provide the academic support to the learners and helps the teachers in designing their courses better. The present study is aimed at comparing the two learning management systems; Google classroom and the Moodle with regard to user friendliness, ease of use and accessibility. The Moodle is the free and open sourced learning management system licensed under GNU (general public license) and the Google classroom is an application of the G-suite and is owned by the Google. The reason for choosing these two learning management systems is that they are free to use. The learning management systems are used to provide the instructional support to the pre-service teachers for the course 'Critical Understandings of the ICTs'. The course content provided on both the learning management systems is same however the interface of the two learning management systems is different. The objective of the study is to explore whether this difference in the interface of the two learning management systems brings any difference in the use and accessibility of the two systems.

### **METHODOLOGY**

The study is descriptive in nature and adopted the survey method.

### **RESEARCH OBJECTIVES**

- To compare the Google classroom and Moodle with respect to ease of use
- To compare the Google Classroom and Moodle with respect to accessibility.
- To explore the learning opportunities provided by Moodle and Google Classroom.
- To explore the difficulties arises while using Moodle and Google Classroom

**Participants and Setting**

The sample for the study is consisted of 50 students enrolled in B.Ed programme for the academic year 2018-2019 at Department of Education, University of Delhi having Critical understanding of ICTs in education as their course. The course is been implemented using learning management systems on two portals; www.learningict2018.moodlecloud.com and https://classroom.google.com along with the face to face classes. The course content for these two learning management system which consisted of manuals of various software and assessment tasks is also prepared. The sample is divided randomly in two equal groups, having 25 participants each.

**Tool and data collection**

A questionnaire having open and closed ended questions is constructed. The close ended questions aimed to explore the ease of use and accessibility of the learning management systems. The open ended questions are aimed to explore the opportunities and difficulties arise while using the learning management systems. The questionnaire is circulated to all the 50 participants through Google form.

**DATA ANALYSIS AND DISCUSSIONS**

**Ease of use**

The ease of use in the context of this study refers to the simplicity and user friendliness of the interface of the learning management systems. The participants were asked about the difficulty that they faced while working with various aspects of the learning management system (Moodle and Google classroom) and the responses were compiled in the Figure 1 and 2:

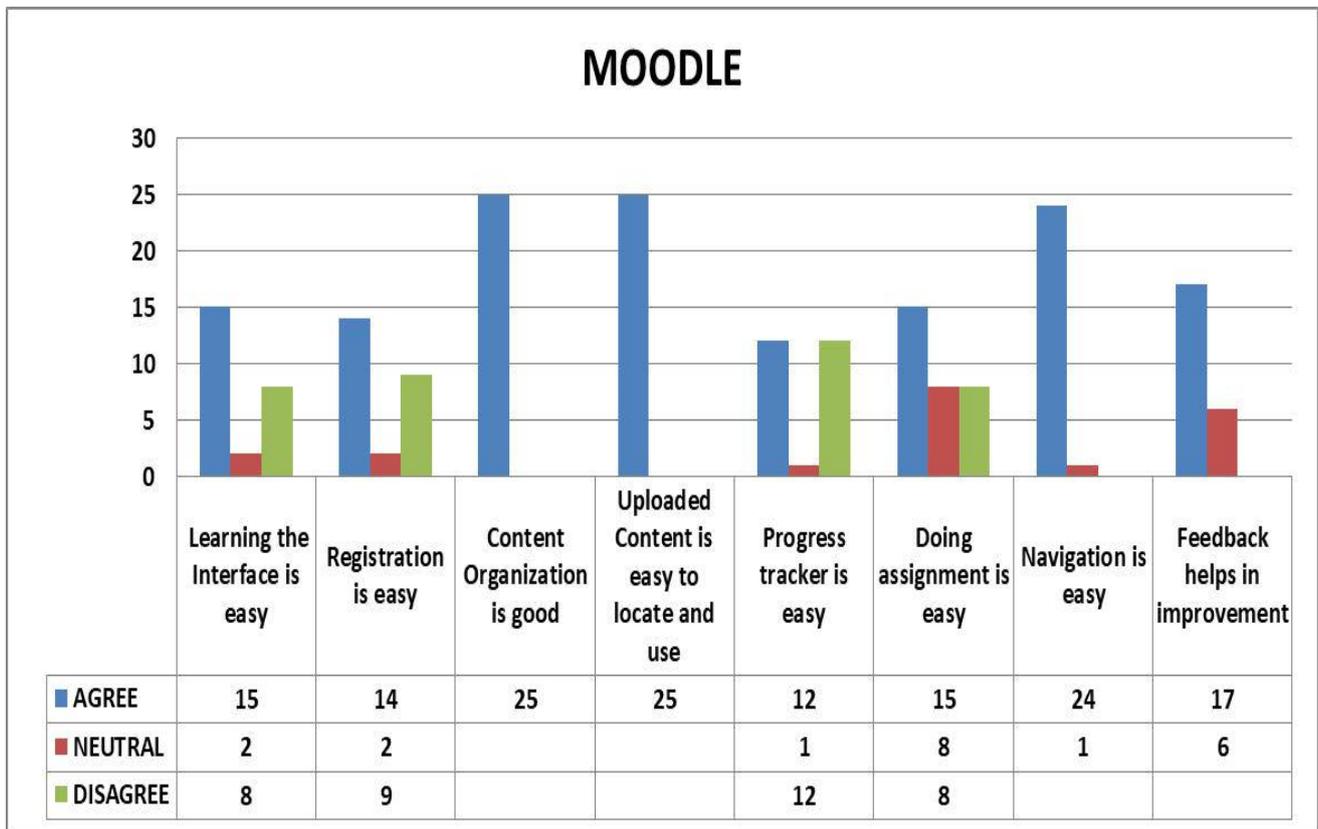


Figure-1: Ease of use with respect to Moodle

The Figure 1 clearly illustrates that 60% of the pre-service teachers finds that the interface of the Moodle was easy to learn and 32% finds it difficult to learn. Majority (56%) of the pre-service teachers said that registration to the Moodle cloud is easy whereas 38% said that the registration was not easy. All the pre-service teachers agreed that content organization on the Moodle cloud in topics and sub-topics is well organized and easy to locate. The progress tracker aspect of the Moodle cloud that helped the pre-service to map their learning received mixed response, almost half of the pre-service teachers (48%) find it easy to use and equal number of teachers (48%) found it not useful. Most of the teachers (60%) find it easy to do assignments on the Moodle cloud and 32% finds it difficult. Majority (96%) of the pre-service teachers said that the navigation in Moodle cloud from one topic to another is easy. Most of the pre-service teachers (68%) agree that the automated feedback provided by the Moodle cloud helps them in improving their assignments whereas rest of the teachers were unsure.

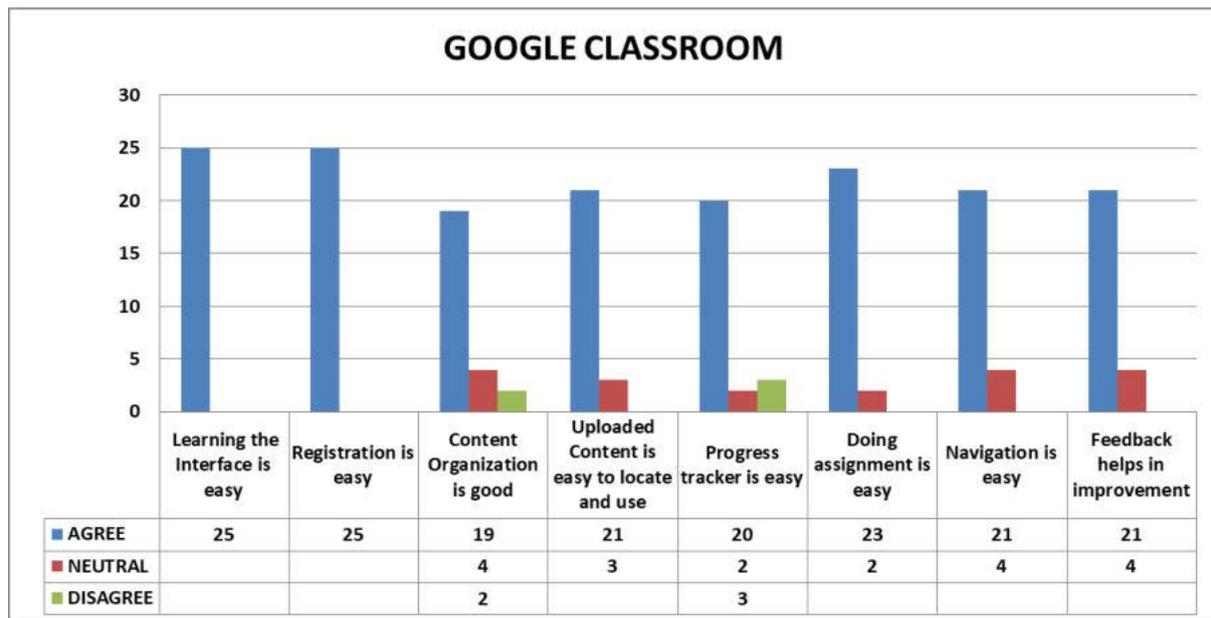


Figure-2: Ease of use with respect to Google classroom

All the teachers said learning the interface of the Google Classroom and the registration is easy. Majority of the pre-service teachers (76%) agreed that the content on the Google classroom is organized well into topics and sections. Only 1% of the pre-service teachers disagrees the content on the Google class room is not organized well rest of the pre-service teachers were not sure. Most of the pre-service teachers (84%) said that the content uploaded on the Google classroom is easy to locate and use whereas rest of the teachers are not sure. Most of the pre-service teachers (80%) agreed that the progress tracker of the Google classroom is easy to use, very few (1%) said that the tracker is not easy to use and rest of them are not sure. Majority (92%) of the pre-service teachers agreed that doing the assignment assigned on the Google classroom is easy to do and 84% of the pre-service teachers agreed that the automated feedback helped them in improvements. Most of the pre-service (84%) teachers said that the navigation on the Google classroom is easy and rest of them is unsure.

The comparison of the responses of the pre-service teachers with respect to the ease of use of both the learning management systems is compared and illustrated in the figure 3 below.

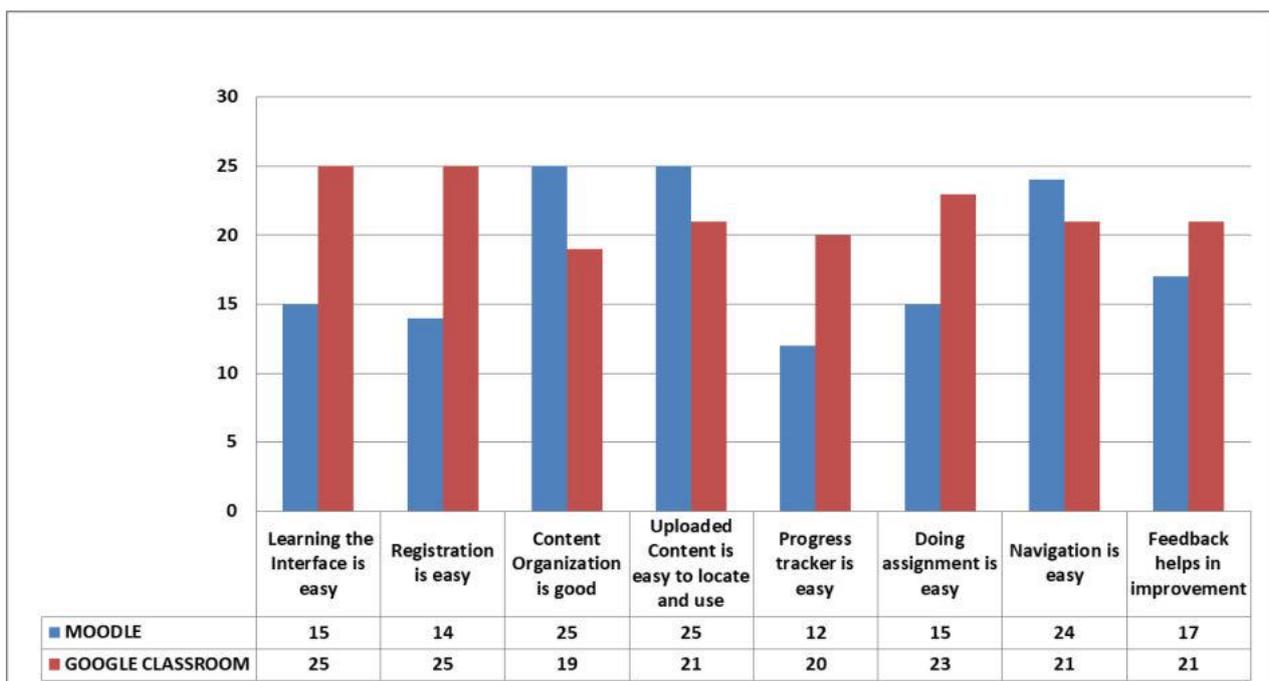


Figure-3: Comparison of Moodle and Google classroom with respect to the ease of use

The Figure 3 depicts that the learning of the interface and the registration is easy on Google classroom as compared to the Moodle cloud. On the other hand content organization and searching the desired topic from the uploaded content is slightly easy on the Moodle cloud as compared to the Google classroom. The progress

tracker function of the Google classroom is easier to work with than that of the Moodle Cloud. Assignments are easier to submit on Google classroom than on the Moodle. Also the automated feedback given on the assignment is slightly easier to access than that of Moodle. However the navigation of the Moodle cloud is slightly better than that of the Google Classroom.

**Accessibility**

Accessibility is one of the crucial aspects for easy use of any learning management systems. One of the main features of the learning management systems that it is web based which provides the freedom to the learner to access the course content from anywhere and at any time. Also the course contents can be downloaded and used offline in case on no internet connectivity. The Figure 4 and 5 below illustrated the pre-service teacher’s opinion about the accessibility of the Moodle and Google classroom respectively.

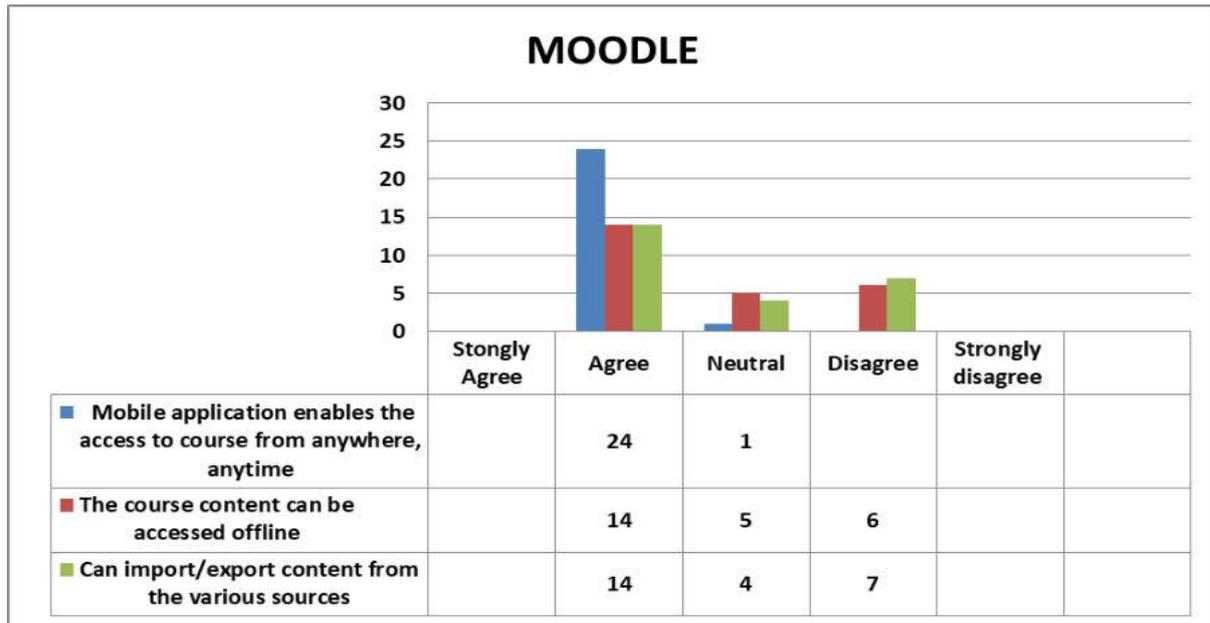


Figure-4: Accessibility with respect to Moodle

Almost all the pre-service teachers (96%) agree that the mobile application of the Moodle cloud enables them to access the course form anywhere as per their requirements. Many pre-service teachers (56%) said that the course content can be downloaded for offline use, some of the (24%) disagree to this and rest is not sure. Pre-service teachers (56%) agree that content from the various cloud storage, networks and websites can be imported to Moodle cloud and vice versa, however 28% felt that content cannot be imported and few are not aware of this.

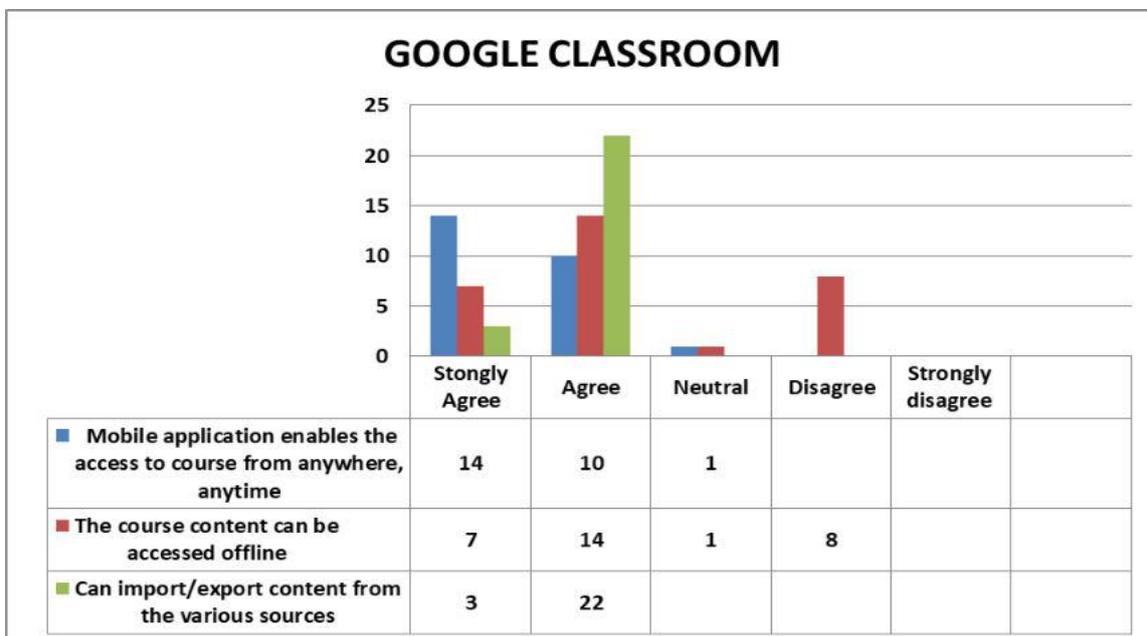


Figure-5: Accessibility of the Google Classroom

The figure 5 illustrates that majority of the pre-service teachers (96%) said that the mobile application of the Google classroom enables them to access the course from anytime, anywhere. All the pre-service teachers agree that the Google classroom enable them to import the content from various other online sources. Majority of the pre-service teachers (84%) states that the online contents of the course can be downloaded for offline use; however some of them (32%) disagree to it.

The comparison of the responses on the accessibility of the two learning management system is shown in figure 6.

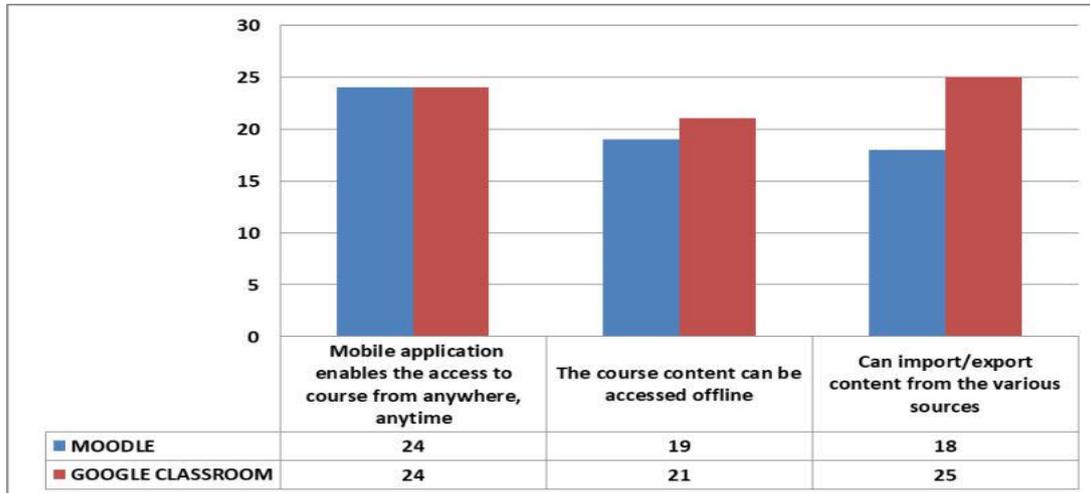


Figure-6: Comparison of Moodle and Google Classroom with respect to accessibility

The comparative analysis of the two learning management systems revealed that both the LMS provides the mobile access to the learners. The online course contents on both the learning management systems can be downloaded for the offline access, the difference is not much in this case. The ability to import content from various web sources is higher in Google Classroom than that of Moodle cloud.

**Learning opportunities provides by Learning Management Systems**

The pre-service teachers are inquired about the usefulness of the instructional support provided through the Moodle cloud and Google Classroom.

In the context of Moodle cloud the pre-service teacher’s respondent that it helped them by providing a backup for the face to face classes which help them in revision, deliver them learning materials, helps in recovering the missed classroom instructions as evident from the responses of the participants;

*“When I missed classes, I was able to go back and read the topics discussed in class. Lessons along with tasks assigned (with detailed instructions on how to do them) helped me in learning about ICT through using ICT.”*

*“It has helped me a lot. Everything was given in details so even if I forgot anything I faced no problem in completing my tasks”*

*“It helps me revising the steps of the software learnt. Also readings on the theory topics”*

*“Agar koe concept samajnahiaaya to use moodle cloud me phir se dekhkarsamajhsaktehai.Moodle cloud ICT sikhne main bahutmadadgarhai.Iskokahebhpadhajasaktahai.”*

*“It make the task easier and help in recapping the various step for the respective task. It gives a backup for class notes”*

*“It was structured, short and crisp.It provides knowledge about different software and ICT topics”*

In the context of Google classroom, similar findings are discovered. The pre-service teachers’ mentions that Google classroom helps in solving the classroom queries by reflecting by to the learning material uploaded. The learning material also addresses their technical queries. The Google class room helps them in keeping the record of their assignments. Some of the responses for the pre-service teachers’ are;

*“It helped me in solving my queries, keeping a track on what all has been covered and what all I have done and organized content in a very systematic and planned manner”*

*“Clear and accurate instructions through attached files, PDFs, video links and articles has helped a lot in directing to sort out all problems and technical issues related to projects of ICT.”*

*"I can keep track of the assignments given and read manual whenever I have problem"*

*"Google Classroom helped in keeping my assignments organized and I didn't face problem in finding them. It is very useful for learning and teaching in the world of technology."*

*"It provides backup of the class notes. So I can go to that in case I miss the class"*

*"In the process of doing my assignments, if I face any problem I can go back to Google classroom and read through the respective instructions. This helps me to resolve problems I face"*

### **Difficulties faced in using Moodle and Google classroom**

Most of the pre-service teachers mentioned that main difficulty that they had witnessed in the context of the Moodle cloud was uploading the assignment and registration. The difficulty in uploading the assignment is that the Moodle cloud accepts the file of size not exceeding more than 1MB. The registration process requires an automated generated password that would be sent to the user as soon as admin added him/her to the course. Some of the pre-service teachers had problem in logging in using the system generated password. The responses of the pre-service teachers which substantiate the above problem are as follows;

*"I had difficulty in registration as the password generated was not working"*

*"Aisekoedikkatnahithakintu Submission karne main kabhekabhedikkathotatha."*

*"Earlier I found interface a bit complicated but later I got used to it. Apart from this, one thing I would want in Moodle is ample space to upload our files. I have to share links if my file exceeds the file limit."*

*"I had to look for online software to merge two files and upload as it provided only one file to be uploaded."*

*"I have difficulty in uploading assignment as it does not file size above 1 MB"*

The difficulty faced by the pre-service teachers in the using the Google class is not much. The only problem articulated by them is that they had issues in finding the class code to join the class. The content in the Google classroom is organized in the form of classes, to join a class, one requires a class code, so the participants had problem in searching for the code as evident from a response *"I have difficulty in locating the class code"*.

### **EDUCATIONAL IMPLICATIONS**

- The study could help the teacher educator in choosing the appropriate learning management system for their pupil teachers
- The study revealed the opportunities and difficulties that arises while using Moodle and Google classroom that one can keep in mind before designing the course

### **CONCLUSION**

Moodle and Google classroom have provided an instructional support to the pre-service teachers. The learning management systems have helped them in keeping the track of their assignment and help them in coping up with missed instructions. Though there are certain technical difficulties like problem in registration, access to class code and uploading assignment, still the learning management systems have provided the desired instructional support. The comparative analysis of the two learning management systems depicts that Google classroom is more user friendly than the Moodle. However the content organization of the Moodle is better than of the Google classroom. The findings highlighted that both the learning management system have mobile application that provide offline access as per the requirement.

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**A STUDY OF EDUCATIONAL ASPIRATION OF SECONDARY SCHOOL GIRLS IN RELATION TO THEIR SOCIO-ECONOMIC STATUS**

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**ABSTRACT**

*Educational aspiration plays a very important role in one's academic and career achievement. If a person has high level of educational aspiration he will move towards the path of success in his career. But the level of educational aspiration is dependent on many factors. One of them is socio-economic status of individual. Hence present study explored the relation between these two variables. Researcher used descriptive research methodology. The population of research consists of secondary school girls from Jalaun district of UP. For data collection researcher used an Educational Aspiration Scale and a self-developed SES scale with semi structured interview schedule.*

*After qualitative and quantitative analysis researcher found that the girls from secondary school hold high educational aspiration. The study concluded by proposing that parents should improve their socio-economic status and government should also modify their policies accordingly as it has an impact on educational aspiration and attainment.*

*Keywords: Educational Aspiration, Socio-Economic Status, Secondary School Girls*

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**INTRODUCTION**

The immense potential of education in the development of an individual and in the promotion of a society has been widely accepted. Education has been recognized as a major instrument which societies can use to direct the process of change and development towards desired goals. Education plays a vital role in the programme of nation building.

"Education is one of the most important means of empowering women with the knowledge, skills and self-confidence necessary to participate fully in the development process. Education played an important role in emancipation of women as said that it is a liberating force. The importance of education of women gets highlighted when one looks into the role to be played by women in nation building.

If one takes the literacy figures as any indication of how various factors, be they personal, governmental, or societal, have helped the females in getting education, it is noted that over the years the progress is slow. As data reveals that female literacy has increased from 53.70 % to 64.60% in India and 42.20% to 52.20% in Uttar Pradesh in recent decade. Besides this improvement there is another major improvement in GER of girls at secondary level.

Educational enhancement raise aspirations among girls related to their career, vocation and education. Aspirations, whether they are related to career or higher education, play a significant role in someone's life. Aspirations represent not only the present level of achievement of an individual but also the level he would like to achieve in future.

Girls studying in secondary schools are in adolescent stage of development. This stage is an important stage to determine the direction of life. The decisions had been taken at this stage; the choices had been made at this stage affect significantly one's potentialities and abilities to be actualized. The choices and decisions are partly affected by the opportunities available to a person and his aspirations. Aspirations play a key role in the actualization of potentialities of any person. The person with high level of aspiration, not only achieves great achievements by developing his talent, but also became an active citizen by participating in social-cultural activities of the country, whereas the low aspires to leave undeveloped and also create problems in the development of society and country.

Aspirations, however, usually connote the achievement of something high or great. They also address both present and future perspectives. In this sense, aspirations can be defined as an individual's "ability to identify and set goals for the future, while being inspired in the present to work toward those goals".

Traditionally, aspirations in research spheres have focused on the career and educational ambitions of young people. In research, for example, educational aspirations typically have been measured with questions regarding how far one hope to go in school or how much education one hopes to achieve. Career aspirations may be classified according to the type of job that young people aspire to do in the future. The classification can be

based on the socio-economic classification of occupations. Beyond educational and occupational goals, however, aspirations are multidimensional, encompassing a range of future desires from personal needs to collective duties.

Educational aspirations help in choosing a vocation and appropriate educational stream. The main purpose of educational system is to enhance individual employability so that the mismatch between demand and supply of skilled manpower could be reduce and to provide an alternative for those pursuing higher education without any particular purpose or interest. (NPE-1986)

Socio-Economic Status plays an important role in the development of an individual. Educational status is contingent on socio-economic status of the family/household in principal, area and region of residence. Socio-economic characteristics exert a profound influence on the literacy and schooling of girls. Socio economic status includes variable of category, religion, education of parents, parents' occupation, family income etc.

A number of factors such as Parental Aspiration, family background, social and psychological factor, play a key role in the determination of aspiration. Parents have aspirations for their children which has major impact on the formation of educational aspiration. Socio-economic conditions are often proposed to explain the educational aspirations. Education does not hold equal appeal to all the social strata (Warren1996). In other words, the educational status of a group or a sub-group of population largely depends on the size of the strata aspiring for education. The strong influence of socioeconomic background (parent's education, occupation, family income) on educational expectations was reported by Trusty (1998). Family background variables including parental education, parental income, social class and minority status have been shown to influence on students (Kao and Tienda, 1998).

Aspirations are also shaped by the characteristics of young people and their families, peers, schools and neighbourhoods as well as wider social forces such as the labour market social background, parents education, peers, school environment, teachers, classroom environment etc. There are few psychological factors responsible to the determination of level of aspiration. Maslow in his theory of "hierarchy of needs" pointed out the need of Self-actualization". What a man can be, he must be." This famous quotation explains all four dimensions of aspirations or the need of self-actualization.

#### **REVIEW OF RELATED LITERATURE**

From the literature available on aspiration one can understand the importance of Aspirations in one's life. They play an important role in shaping future. They are decisive at the adolescent stage. Therefore in the present study the primary purpose of the researcher is to measure the level of educational aspiration among adolescent girls. The contradictory results in various researches about the relationship between educational aspirations and socio-economic status, lead researcher to the present study. Findings of Some researches in this area reflect that there is no relation between these two variables and on contrary other depicts that a positive correlation is there.

The study of educational aspirations in relation to socio-economic status is worth studying for a variety of reasons. First, because educational aspirations play a very important role in one's academic and career achievement. If a person has high level of educational aspiration he will move towards the path of success in his career. It has proved by researches that students having high level of educational aspirations are much focused, task oriented; set challenging goals and feel a sense of purpose (Quagila& Cobb, 1996). Evidently there is no confusion that the one of the major task of educational system should be to raise in the educational aspirations of students.

Second, the girls getting secondary education may have some educational aspirations. Study of their educational aspirations will help in policy formation towards achieving higher education and developing the plan at the district level. It will also help educational system including school and teachers to understand their aspirations and the hurdles towards achieving them. Educational aspirations show students inclination towards science, humanities, commerce, engineering, and medical courses. This study will be useful to understand the marketability and employability of individuals. It will also help government to reviewing their schemes of women empowerment.

Educational aspiration among girls comes from the attitude of society in general and parents in particular. Our society has traditionally specified different roles, personality characters and accepted behavior of male and female. This results in restricted range of educational choices. Therefore it is require understanding the impact of socio-economic background on educational aspirations of second sex. "Apart from the schooling factors, the family and social factors direct, promote and inspire the educational aspirations and vocational preferences of the girls"(Kushwaha and Vandana-2012). Aspirations are also affected by urban and rural background. In

literature it has been stated that urban students have higher educational aspirations than their rural counterpart (MacBrayne-1987). Literature throws a light on the importance of educational aspirations and factors of their formation. So being an educator it is important to understand these variables and use them in directing the youths.

Jalaun is my native place which is situated in one of the most backward pocket i.e. Bundelkhand of the country. It has improved its female literacy rate than other district of this region like Banda, Mahoba, Lalitpur and Hamirpur which have female literacy rate of 53.67, 53.22, 50.84, and 55.95 respectively. Jalaun has improved its female literacy rate and it is near national average. So it is useful to study the girls' educational aspirations in this district. Since no work was done in this direction in Jalaun district. So there is a need of study to fill this research gap, and therefore the researcher wants to do the present study.

### **RESEARCH QUESTIONS**

The present study is aimed at finding answer of the following research question.

1. What is the level of educational aspiration of secondary school girls?
2. What is the difference in level of educational aspirations of secondary school girls studying in private management and government management schools?
3. What is the socio-economic status of secondary school girls?
4. What is the difference between the socio-economic status of secondary school girls studying in private management and government management schools?
5. What is the relationship between the educational aspiration and socio-economic status of secondary school girls?

### **OBJECTIVES OF THE STUDY**

In order to concretize the study and address the aforesaid research questions it is important to formulate the research objectives. The objectives of the study are as follows.

- 1) To study the educational aspirations of secondary school girls.
- 2) To study the socio-economic status of secondary school girls.
- 3) To study the relationship between the educational aspirations and socio-economic status of secondary school girls.

### **METHODOLOGY**

A descriptive research methodology was used for this study. A descriptive research is concerned with a condition or relationship that exists (Best-1970). A survey was administered to a selected sample from a specific population. The term 'survey' is commonly applied to a research methodology designed to collect data from a specific population, or a sample from that population, which typically use a questionnaire or an interview as the survey instrument.

Surveys are used to obtain data from individuals about themselves, their households, or about larger social institutions like schools. Sample surveys are an important tool for collecting and analysing information from selected individuals. They are widely accepted as a key tool for conducting and applying basic social science research methodology.

### **POPULATION AND SAMPLE**

The population of this study consists of girls studying in secondary schools of Orai Sub-Division of Jalaun district.

The sample of the study is consisting 92 girls studying in secondary school from 4 secondary schools Orai Sub-Division of Jalaun district. Stratified random sampling method was used by the researcher for data collection. Stratified random sampling method was used for homogeneous groups of population. The Researcher has divided the population into the strata of girl students studying in government schools and girls studying in private management schools. Two government and two private management schools were randomly selected for the sampling by the researcher. And then all the girl students, who were present on the day of data collection, were selected. On the day of data collection 25 girls of class 10<sup>th</sup> were present in the AryaKanya inter college, 24 girls of class 10<sup>th</sup> were present in the Government Girl Inter College, 20 girls of class 10<sup>th</sup> were present in the M.V.M. Inter college, and study 24 girls of class 10<sup>th</sup> were present in the R.N.T. Inter college. All these 92 girls were selected for the study.

**TOOLS AND TECHNIQUES USED FOR DATA COLLECTION**

After a thorough survey of literature available on educational aspiration and socio-economic status researcher used the following tools for data collection.

1. Educational Aspiration Scale (Form-P) developed by Prof. V.P. Sharma and Anuradha Gupta (1996) for measuring the educational aspiration of Secondary School girls.
2. Semi structured interview schedule to measure the level of educational aspiration.
3. Socio-Economic status scale (Self-Developed).

**OPERATIONAL DEFINITION OF KEY TERMS**

**Educational Aspiration:** Educational aspirations are the function of goal discrepancy i.e. level of past performance and setting new goals, and attainment discrepancy i.e. setting of goal level and new performance.

**Socio-Economic Status:** Socio-economic status (SES) is an economic and sociological combined total measure of a person's work experience and of an individual's or family's economic and social position in relation to others, based on income, education and occupation. When analysing a family's SES, the category, religion, type of family and number of family members, education of parents and siblings, the household income, and occupation will be examined.

**Secondary School Girls:** Secondary school girls mean the girls studying in 10<sup>th</sup> class.

**Data analysis:** Data analysis is done qualitatively and quantitatively to fulfil the purpose of the present study.

**Delimitation of the study:** The study is confined to the secondary girl students of Orai sub-division of Jalaun district of Uttar Pradesh only.

**MAJOR FINDINGS**

1. The secondary school girls possess high educational aspiration
2. There is a big difference between the educational aspiration of secondary school girls from the government schools and the private schools. Girls from private school possess higher educational aspiration than their counterparts.
3. There is also a big difference between the socio-economic status of secondary school girls from the government schools and the private schools. Girls from private school have better socio-economic status than that of government school girls.
4. There is relationship between the educational aspiration and socio-economic status of secondary school girls.
5. Girls belongs to general category possess very high educational aspirations.
6. Family size and number of siblings have impact on educational aspirations of girls. The girls belong to smaller family possess higher educational aspirations.
7. Parent's income and education are positively co-related with girls' educational aspiration. Parental educational background and income has emerged as an important factor for higher educational aspirations.
8. The girls have higher educational aspiration whose parents are in service sector.
9. Possession of laptop and Mobile phones also emerged as important indicator for high educational aspirations among girls. The girls using computer and mobile possess very high educational aspiration.

**DISCUSSION AND ANALYSIS****1. Educational Aspiration of secondary school girls**

The secondary school girls hold high educational aspirations. The girls from private management schools possess much higher aspiration than that of government management schools. There is also a difference between the aspirations of Hindi medium girl students and English medium girl students. The reason for this difference is that the English medium girls are from private schools, where they are getting quality education.

Hindi medium girls are from government schools, where poor infrastructure, and lack of other educational facilities results into low aspiration of girls. This result contrast with the previous results of R.K. Sharma (1992) and Veenakumari (2001), their finding was that girls possess average educational aspiration. This result is due to advancement in technology, awareness about the benefits of education, Media, and Government initiatives for higher education.

**2. Socio-Economic Status**

The SES of Secondary school girls was determined by its constituents variables, which are category, religion, family type and size, number of siblings, parents, occupation, and family income.

Most of the girls are staying in single family system although joint family system also exists there. Joint family system represents the traditional mindset of the people, whereas single family system is of modern and progressive outlook similarly family size and numbers of siblings in the family also determine SES of a family.

Majority of the population has larger family size and more than three children. In the present age having large family represents the stereotype mindset of the people. This means they are not aware of family planning, Health, schooling and other economic benefits of the small family system. As the population policy also says to maintain the TFR below 2.1. These data depicts the low socio economic status of the majority of the sample.

**CONCLUSION**

As the socio-economic status of the students plays a major role in academic excellence. It is the duty of the parents to improve their socio-economic status by way of higher earnings, participation in community programs, saving their earnings for future needs etc.

From the research findings it is clear that the students who studies in the private schools have better socio-economic status than their counterparts. The parents who have adequate economic resources and recognizable social status admit their children in private schools as they provide quality education and develop an all-round personality. Identifying the role of socio-economic status in getting better educational opportunities, it is necessary to develop each ones socio-economic status through various personal and social welfare programs.

The government and other social agencies are also supposed to help the low socio-economic status people to improve their status by way of implementing social welfare schemes. Once socio-economic status of the parents is improved, they will provide better educational facilities to their children. Even the confidence that gives the socio-economic status to a child will help him to achieve well in all spheres of life. So, everyone in the society must try to direct the ladder of socio-economic status.

Usually schools which offer English as a medium are managed by private trust societies and individuals. These schools demand high fees and the parents who can afford them only join their children in these English medium schools. These parents with good socio-economic status can afford English medium education and quality education in private schools. Everybody in the society aspires for better education but the socio-economic status restricts it. Hence S.E.S. is to be improved and also the government schools which provide education in Hindi-medium also try to provide quality education and sound of English.

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**EMOTIONAL INTELLIGENCE AND SELF-CONCEPT: A CORRELATIONAL STUDY OF B.ED. STUDENTS**

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**ABSTRACT**

*The study examines the relationship between Emotional Intelligence and Self-concept of B.Ed. students of Haryana state. Emotional Intelligence and Self-concept inventory is administered on 150 B.Ed. students. Normative survey method is utilized to gather the data and is subjected to descriptive, correlation and differential analysis. The results revealed that there is positive significant relationship between Emotional Intelligence and Self-concept. Students from unaided colleges have possessed high level of Self-concept compared to students from aided colleges. This study further reveals that female B.Ed. Students are significantly different from male B.Ed. students as far as Emotional Intelligence is considered. Students from unaided colleges have possessed high level of Emotional Intelligence in comparison to students from aided colleges.*

*Keywords: Emotional Intelligence, Self-concept, B.Ed. students*

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**INTRODUCTION**

“The destiny of India is being shaped in its classroom”, as rightly pointed by Kothari, the teachers are the future destiny makers of our nation. If the teacher is well matured emotionally, he can easily understand others feelings or emotions which help him to predict future behavior according to situation. If the teacher has a self – ideal means he will become role model to students. The aim of education is to discover and develop each individual’s abilities and full moral excellence in order to serve society better. The education imparting institute should emphasize intellectual activities, moral judgments, aesthetic judgments, self – realization, individual freedom, individual responsibility and self-control development. In the educational process, a good and effective teacher occupies a place of tremendous importance (NPE, 1986). A teacher is not just a mere passenger of information, he is more than that. Apart from performing the role of teacher he should be in such a position to guide and understand his/her students emotions, feelings and able to have supportive relationship. For this he should be Emotionally Intelligent and have better knowledge of his/her self-i.e., Self-concept.

Happiness is the nearest and dearest emotion desired by people and a state of wellbeing as well as of contentment. According to Mayers and colleagues (2000), happiness is the key to many things enabling the perception of the world a safer place to live, healthier and more satisfying lives, and perception also that one has the ability to make decisions more easily. The modern concept of emotions focuses on emotional competency and emotional intelligence. Emotionally intelligent people are well aware of these things hence they use their rational skills to handle their emotions and moods rather allowing them to dominate. Latest researches have shown that the emotional intelligence is significant to make life successful than the educational intelligence.

Emotional intelligence on the whole refers to the ability to deal with people and make better decisions, which is more helpful for a person than theoretical or abstract intelligence when he joins any profession. Person who recognizes and identify various types of emotions in others, able to sense his own feelings and emotions and capable of integrating these emotions in his thought can be called an emotionally intelligence person. Person with emotional intelligence understands nature and strength of his own emotions; therefore he easily can control and normalize his expressions while dealing with himself and others too, just to promote coordination, attainment and peace (Hussein, 2015). It is very important for an emotionally intelligence person to develop ability to face setbacks, having empathetic attitude, co-operation, managing emotions and making right decisions at right moment of time. The concept of emotional intelligence with its need at every sphere of life emerged out and highlights that only high intelligence is not enough to be successful person in the society. Person who co-operates, motivates, and empathize with others and build healthy relations are more appreciated and valued always. We can understand person’s emotional intelligence by observing, how he taps situations during crisis and gets responses to meet the demands of the immediate situations, very successfully.

During the process of growth and development, every individual acquires the awareness of ‘self’. This includes ‘ones identity’ in the sense that the impressions one has about one’s physical appearance and other tangible properties. It further includes the conception of oneself about one’s traits, abilities, roles, attitudes, beliefs, values and the possibilities of future. Referring to School subject choice Marsh and Young (1997) says that self-concept in specific school subject are significantly related to subsequent coursework selection between the

choice of the subject students want to study and the choices of what they actually pursue. Thus, in the modern era, 'self-concept' is recognized as a potent means for making a deep study of personality as it helps in understanding human behaviour. It is believed that 'self' is a principal controlling agent, which shapes human destiny. In reality, 'self' is viewed by the majority of psychologists as the nucleus of human being. The development of self-concept involves a slow process of differentiation, in which the child gradually emerges into focus out of his total world of awareness.

Fundamentally human beings are creatures of feelings and emotions. Our emotions control our behavior; emotion in the organism is a dynamic internal adjustment that operates for the satisfaction and welfare of the individual and society. Mere acquisition of degree and position are not a great thing but the conduct and character are very important. To behave in this manner the teacher should have the self-perception himself which leads him to understand professional and personal life. Then he will be capable to express his emotions in a right time, in a right manner and right amount. If the teacher is well matured emotionally, he can easily understand others feelings or emotions which help him to predict future behavior according to situation. As the B.Ed. student teachers are future teachers who deal with the student at the transition stage who face lot of emotional problems. Hence it is better to train them itself at the preparation to have knowledge of their self and an understanding of the emotions i.e., make them emotionally intelligent and possess all the capacities to make use of the opportunities and available resources for students' welfare and also social welfare. With this background the researcher made an attempt to know about the Emotional Intelligence and Self-concept of B.Ed. students.

### **METHODOLOGY**

The present study is purposed to measure the level of Self-Concept and Emotional Intelligence of B.Ed. student teachers of Haryana State. The study is descriptive in nature and survey method is used. Sample consists of 150 B.Ed. Students studying in both aided and unaided B.Ed. colleges in Haryana State are drawn through random sampling technique.

### **OBJECTIVES OF THE STUDY**

The following objectives are formulated to carry out the study:

- To study the level of Self-concept and Emotional Intelligence of B.Ed. students.
- To find out whether there is a significant difference in the means of Self-concept of B.Ed. student's with reference to-
  - a) Male and female students
  - b) Aided and unaided college students
  - c) Science and Arts subject background students
  - d) Kannada English medium of instruction students
  - e) 21-25 years age and above 25 years age students
- To find out whether there is a significant difference in the means of Emotional Intelligence of B.Ed. student's with reference to the following categories of variables.
  - a) Male and female students.
  - b) Aided and unaided college students.
  - c) Science and Arts subject background students.
  - d) Kannada and English medium of instruction students.
  - e) 21-25 years age and above 25 years age students.
- To find out whether there is a significant correlation between Self-concept and Emotional Intelligence of B.Ed. students of Haryana.

### **Tools Utilized**

- '**Emotional Intelligence Scale**' (EIS) standardized by Anukool Hyde SanjyotPethe, UpindarDhar is used to measure Emotional Intelligence of B.Ed. students
- '**Self-Concept Scale**' (SCS) standardized by S. P. Ahluwalia is used to measure the self-concept of the B.Ed. students.

**DATA ANALYSIS AND INTERPRETATION**

Data analysis is divided into three parts.

- Percentage analysis
  - ‘t’ test
  - Correlation test
- **Percentage Analysis** In this part, level of Self-concept and Emotional Intelligence of the B.Ed. students is analyzed by using percentage analysis technique.

**Level of Self-concept of B.Ed. Students:**

Category	Score limits	Students	Percentage
<b>Above average</b>	113 and above	20	13.33%
<b>Average</b>	86-112	102	68%
<b>Belowaverage</b>	0-83	28	18.66%

Table-1: Level of Self-concept of B.Ed. Students

The above table-1 shows that 68% of the B.Ed. students have average level of Self-concept (102 students out of 150 students). 18.66% (28 students) B.Ed. Students have below average and 13.33% of (20 students) B.Ed. students have above average Self-concept level. This means most of the B.Ed. students are at average level of self-concept.

**Level of Emotional Intelligence of B.Ed. students**

Category	Score limits	Students	Percentage
<b>Above average</b>	148-177	22	14.67%
<b>Average</b>	124-147	104	69.33%
<b>Belowaverage</b>	0-123	24	16%

Table-2: Level of Emotional Intelligence of B.Ed. students

The above table-2 shows that 104 students out of total 150 B.Ed. students have average level of Emotional Intelligence which is 69.33% of total sample. 22 B.Ed. students have above average Emotional Intelligence which is 14.67% of total B.Ed. students. 24 B.Ed. students have below average level of Emotional Intelligence which is 16.3% of total sample. It can be interpreted that most of the B.Ed. students are at average Emotional Intelligence level.

- **T-Test:** In this part, level of Self-concept and Emotional Intelligence of the B.Ed. students is analyzed by using t-test.

**Self-concept with reference to gender, types of college, stream, medium of instruction & age**

Gender	N	Mean	SD	‘t’value	df	Level of significance
<b>Male</b>	34	97.714	15.56	0.12	148	Not Significant
<b>Female</b>	116	99.46	12.01			
<b>Types of college</b>						
<b>Aided</b>	71	101.39	11.06	2.14	148	0.05 Significant
<b>Unaided</b>	79	96.75	14.44			
<b>Stream</b>						
<b>Arts</b>	91	97.21	12.46	0.412	148	Not Significant
<b>Science</b>	59	98.76	13.33			
<b>Medium of Instruction</b>						
<b>Hindi</b>	68	98.65	11.55	0.77	148	Not significant
<b>English</b>	82	99.89	14.37			
<b>Age</b>						
<b>21-25 years</b>	32	99.52	14.25	0.32	148	Not significant
<b>Above 25 Years</b>	118	98.70	12.80			

Table-3: Self-concept with reference to gender, types of college, stream, medium of instruction and age

**RESULTS AND DISCUSSION**

**1. Comparison of Self-concept of B.Ed. Students with regard to gender**

Mean Self Concept scores of male and female group of B.Ed. Students were compared in the table-3. The t-value calculated is found to be 0.12 which is not significant. Therefore the first hypothesis that Self-concept among male and female B.Ed. students does not differ significantly is accepted. It means that both male and female B.Ed. students have same level of Self-concept. The probable reason for this result may be that nowadays both male and females have equal opportunities with respect to all domains of the society which makes them to develop high level of Self-concept.

**2. Comparison of Self-concept among B.Ed. students with regard to types of colleges**

The t-value calculated (2.14) between these two groups of B.Ed. students was found to be significant. Therefore the hypothesis that Self-concept among B.Ed. students does not differ significantly with regard to types of colleges is rejected. So the conclusion may be drawn that B.Ed. students from aided and unaided are significantly different as far as Self-concept is considered.

**3. Comparison of Self-concept among B.Ed. students with regard to their stream of study**

The t-value calculated between these two groups was found to be 0.412 which is not significant. Therefore the hypothesis that Self Concept among B.Ed. students does not differ significantly with reference to their stream of study was accepted. It means that B.Ed. students from Arts stream and Science stream possess same level of Self-concept.

**4. Comparison of Self-concept of B.Ed. students with regard to their medium of instruction**

Mean Self Concept scores of B.Ed. Students from Hindi and English medium of instruction were compared in the table-3. T-value calculated was found to be 0.77 which is not significant. Therefore the hypothesis that Self Concept among B.Ed. Students from Hindi and English medium of instruction does not differ significantly is accepted. It means that both the groups of B.Ed. students have the same level of Self-concept. The probable reason for this result may be that the system of education has considered both the languages are essential for the development of the students where the regional language or mother tongue is vehicle for understanding of the other languages. Hence the language builds up confidence among the students which in turn develops the self-image of the students.

**5. Comparison of Self-concept of B.Ed. students with regard to their age**

Mean Self-concept scores of B.Ed. students from age group of 21-25 years and above 25 years were compared in the table-3. T-value calculated is found to be 0.32 which is not significant. Therefore the hypothesis that Self Concept among B.Ed. Students from age group of 21- 25 years and above 25 years does not differ significantly is accepted. It means that both the groups of B.Ed. students have the same level of Self-concept. The probable reason for this result may be that nowadays individuals have open and wider opportunities to widen their knowledge irrespective of their age group which helps in building up their Self-concept.

**Emotional Intelligence with reference to gender, types of college, stream, medium of instruction and age**

Gender	N	Mean	SD	't' value	df	Level of significance
Male	34	130.14	10.63	2.38	148	Significant
Female	116	135.32	12.18			
<b>Types of college</b>						
Aided	71	133.17	11.06	2.38	148	Significant
Unaided	79	135.32	11.05			
<b>Stream</b>						
Arts	91	134.01	11.03	0.40	148	Not Significant
Science	59	134.32	13.58			
<b>Medium of Instruction</b>						
Hindi	68	133.43	11.08	0.80	148	Not significant
English	82	135.03	12.60			
<b>Age</b>						
21-25 years	32	136.93	14.20	1.34	148	Not significant
Above 25 Years	118	133.66	11.30			

Table-4: Emotional Intelligence with reference to gender, types of college, stream, medium of instruction and age

**RESULT AND DISCUSSION**

**1. Comparison of Emotional Intelligence of B.Ed. students with regard to their gender**

Mean Emotional Intelligence scores of male and female group of B.Ed. Students were compared in the table-4. The t-value calculated was found to be 2.30 which is significant. Therefore the first hypothesis that Emotional Intelligence among male and female B.Ed. Students does not differ significantly is rejected. It means that female B.Ed. Students are significantly different from male B.Ed. students as far as Emotional Intelligence is considered. Female B.Ed. Students have high level of Emotional Intelligence than the male B.Ed. students. The probable reason for this result may be females have more patience when compared to male who can think about their emotions and take decisions. The finding is in agreement with the report of Gowdhaman and BalaMurugan, Umadevi, Indu.H (2009). They reported that gender has significant effect on Emotional Intelligence of B.Ed. students.

**2. Comparison of Emotional Intelligence among B.Ed. students with regard to types of colleges**

The t-value calculated (2.38) between these two groups of B.Ed. students was found to be significant. Therefore the hypothesis that Emotional Intelligence among B.Ed. Students does not differ significantly with regard to types of colleges is rejected. So the conclusion may be drawn that B.Ed. students from aided and unaided are significantly different as far as Emotional Intelligence is considered. The finding is in agreement with the report of Singaravelu, S. (2009). He reported that locality of residence has significant influence on Emotional Intelligence of primary student teachers.

**3. Comparison of Emotional Intelligence among B.Ed. students with regard to their stream of study**

The t-value calculated between these two groups was found to be 0.50 which is not significant at 0.01 level. Therefore the hypothesis that Emotional Intelligence among B.Ed. Students does not differ significantly with regard to their stream of study was accepted. It means that B.Ed. students from Arts and Science stream have same level of Emotional Intelligence. The result is in agreement with the findings of Patil. A.B. (2004), Umadevi. M.R. (2009).

**4. Comparison of Emotional Intelligence among B.Ed. students with regard to their medium of instruction**

The t-value calculated between these two groups is found to be 0.80 which is not significant at 0.01 level. Therefore the hypothesis that Emotional Intelligence among B.Ed. students does not differ significantly with regard to their medium of instruction was accepted. It means that B.Ed. students from Hindi and English have same level of Emotional Intelligence.

**5. Comparison of Emotional Intelligence among B.Ed. students with regard to their age**

The t-value calculated between these two groups was found to be 1.34 which is not significant at 0.01 level. Therefore the hypothesis that Emotional Intelligence among B.Ed. students does not differ significantly with regard to their age is accepted. It means that B.Ed. students from different age have same level of Emotional Intelligence.

➤ **Correlation test:**In this part, level of Self-concept and Emotional Intelligence of the B.Ed. students is analyzed by using correlation technique.

**Relationship between Self- concept and Emotional Intelligence**

Variable	N	df	r-value	Result
Self-concept and Emotional Intelligence	150	148	3.16	S*

Table-5: Relationship between Self- concept and Emotional Intelligence

Table-5 shows that the correlation between variables Emotional Intelligence and Self-concept is positive and significant at 0.01 levels of significance. This shows that there is a significant relationship between Emotional Intelligence and Self-concept of elementary teacher B.Ed. students. The finding is in agreement with the findings of the Deshmukh&Sawalakhe, 2010 which suggests that there is a significant positive and low correlation ship between Self Concept and Emotional Intelligence. This implies that the Self-concept supports the development of Emotional Intelligence. If an individual has higher level of Self-concept he/she is able to have knowledge of his capabilities, limitations, make judgments, take decisions which in turn are the essential characteristics of an emotionally intelligent individual. A person with high self-concept may naturally have more self-confidence and deals with other persons and situations in life in a positive way. Thus high self-concept has a positive correlation with emotional intelligence.

**MAJOR FINDINGS**

- B.Ed. students have possessed the same level of Self-concept with reference to the variables viz., gender, subject, medium of instruction and different age groups. But as far as B.Ed. students from aided and unaided are considered they significantly different, where students from unaided colleges have possessed high level of Self-concept compared to students from aided colleges.
- Female B.Ed. students are significantly different from male B.Ed. students as far as Emotional Intelligence is considered. B.Ed. students from aided and unaided colleges are significantly different with reference to Emotional Intelligence. Students from unaided colleges have possessed high level of Emotional Intelligence when compared to students from aided colleges.
- But the B.Ed. students from Arts Science stream, medium of instruction and different age groups have possessed same level of Emotional Intelligence.
- A significant relationship was found between Emotional Intelligence and Self-concept of B.Ed. students.

**EDUCATIONAL IMPLICATIONS**

As the students from the aided college have possessed high level of Self-concept and Emotional Intelligence, the government institutions should also emphasize development of the competencies of Emotional Intelligence and should take necessary actions to develop the self-concept of the students. The training programmes related to life skills should be organized for the students. It is essential to include the components of emotional intelligence and self-concept in the curriculum and ample opportunities should be provided for practical as the theoretical knowledge will not help students to develop their self-concept and emotional intelligence. Moreover it is the duty of the teachers who should be the role models and first they should have high level of self-concept and emotional intelligence should take active role in the enhancing these factors among the students who in turn can contribute to the national development.

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**A STUDY OF TECHNOLOGY READINESS AMONG SCHOOL TEACHERS OF KURUKSHETRA DISTRICT**

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**ABSTRACT**

*In the present paper it has attempted to study the technology readiness of school teachers of kurukshetra district. The investigation was carried out on 100 school teachers of kurukshetra district of Haryana. The data was collected from 50 government school teachers (25 male teachers and 25 female teachers) and 50 private school teachers (25 male teachers and 25 female teachers). The self-constructed questionnaire was used to conduct the investigation. Descriptive Statistics was used to analyses the data. The findings of the study shows that the technical readiness is don't differ significantly among male and female teachers. But technical readiness is differ significantly among government and private schools teachers of kurukshetra district.*

*Keywords: Technology Readiness, School Teachers, Class-room learning, Technology integration, digitalization.*

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**INTRODUCTION**

Education is a process of human development and achievement of better quality of life. Education is urged to integrate technology with curriculum. But its effectiveness can be judged by the readiness of teachers to use it in a proper way. Technology is considered the wave of future. So teachers must use various technological resources in their classroom while teaching. But are all the teachers ready and capable to use technology in their teaching? Integrating technology into classes is depends on teachers' readiness to use it. If teachers don't feel comfortable with the technology then they are hardly ready to use technology in their teaching plans.

**TECHNOLOGY READINESS**

Today's era is the era of science and technology. Technology spreads in everywhere and in every field. Use of Technology in teaching is the demand of our society. It is a practical art of using scientific knowledge in teaching- learning process. The adaptation of technology in the field of education requires readiness of teachers to use it in their teaching.

**“Technology** is the branch of knowledge that deals with the creation and use of technical means. **Readiness** is the state of preparedness of persons to meet a situation and carry out a planned sequence of action. **Technology readiness** is the overall state of mind determines a person's intention to use new technologies.”

The use of digital technology brings about a powerful change in learning environment and it transforms the whole learning and teaching process. Now-a-days digital technology is used as an important instrument to support new ways of teaching-learning process. Technology is being integrated into the teaching-learning process in our education system. Successful integration of Technology in teaching-learning process is dependent on the readiness of teachers to use new technology in classrooms. The use of technology in the classroom is very important to provide opportunities for students to learn and operate in the information age.

Only teachers can determine the development and innovation in the field of education. Because they are the people who use various technological resources for the development of education. There are various technological resources which teachers can use in teaching-learning process.

- Electronic interactive boards
- Hardware and software tools
- Digital cameras
- Computers
- LCD Projectors
- Audio tools
- Video tools
- Internet .....etc.....

When teachers effectively integrate technology into classroom teaching, teachers grow into roles of adviser, content expert, and supervisor. Technology helps make teaching and **learning** more meaningful and interesting. Students are also able to collaborate with their own peer groups through technological applications.

### **Integration of technology in education**

Teacher plays a very important role in the development of society. They play a crucial role in education system. Teachers make the curriculum of a school and execute them for the development of students. But a challenge faced by our education system is lack of competent teachers who are literate or proficient in the use of technology. Technology proficiency is the ability to use various technology tools and resources. It is the ability to access, evaluate, organise and use digital technology. "Teacher work as an agent of change so it is important that teachers must technology literate as this could bring a lot of positive attitude towards the use of technologies. Hence it is important that teachers are competent and have the right attitude towards technology" (Kadel, 2005). A school could have technological resources, but whether used efficiently will depend on the teachers. It will depend on the teachers' beliefs about the educational applications of technology.

Technology enhances the learning outcomes of students. It is a tool to transform the traditional -classrooms into innovative and digitalised classrooms. Teachers are the key elements in this transformation process which is based on the technological readiness of teachers in their teaching-learning process.

"The literature suggests that lack of adequate training and experience is one of the main factors why teachers do not use technology in their teaching. This also results in teachers' negative attitude towards computer and technology." (Kumar and Kumar, 2003).

"Teachers in Nigerian secondary schools are not competent in basic computer operations and in the use of the generic software. If teachers are expected to integrate ICT into the school curriculum, preparations must be made at the pre-service teacher education level. Teacher preparation programmed should focus on the need for student-teachers to have ICT skills for their own use, in the preparation of materials for teaching and learning activities: the need to facilitate the direct use of ICT in students' learning activities within the classroom situation, and the need for teachers to develop in their students a critical awareness of ICT applications and the social implications" Yusuf (2005)

"Teachers' attitudes toward computer technologies are also related to teachers' competence in using the technology. In addition, they have a significant impact on the openness to new experiences, and also reflect and implement the changes. Positive attitude towards ICT, though too limited support their use in classes. ICT should be effectively used in classrooms as this would serve justice to the investments made for the ICT to be available in the classrooms." (Albirini, 2006)

### **NEED OF THE STUDY**

The ongoing technological innovations in the society change the system of education. Technological tools and digital resources have become a part of the learning environment and a part of the school curriculum. There is lack of research on teacher readiness about use of various technical tools in teaching-learning process. Technical readiness of teachers is very important and challenging task. So there is need to study the level of technical readiness of teachers and to use various tools of technology in their teaching-learning process.

### **OBJECTIVES**

1. To study the level of technology readiness among secondary school teachers.
2. To compare the level of technology readiness between male and female teachers.
3. To compare the level of technology readiness between government and private school teachers.

### **HYPOTHESES**

- i. There is no significant difference between technology readiness scores of male and female teachers.
- ii. There is no significant difference between technology readiness scores of government and private school teachers.

### **DELIMITATION OF THE STUDY**

- The study is delimited to 100 school teachers.
- The study is delimited to one variable i.e. Technology readiness.
- The study is delimited to Kurukshetra District of Haryana only.

**SAMPLE**

The study was conducted on 100 school teachers working in government and private schools in Kurukshetra district of Haryana. Sample was collected through random sampling method. Out of 100 school teachers the researcher selected 50 government schools teacher (25 Male Teachers and 25 Female Teachers) and 50 private schools teacher (25 Male Teachers and 25 Female Teachers).

**RESEARCH METHODOLOGY**

Descriptive survey method of Research was employed for the present study and data was collected from kurukshetra district of Haryana.

**TOOLS USED**

For the present study, the investigator used a self-made questionnaire (English-Version). The questionnaire contains 50 test items. The judgment is done on 5-point Likert-rating scale from “strongly disagree” to “strongly agree”. It is related to know about the reasons why teachers are ready and not ready to integrate technological resources in their classrooms.

**DATA COLLECTION**

The data were collected by administering above mentioned tool on individual schools teacher. On completion of the data scoring was done with the help of likert scale

**STATISTICAL TECHNIQUES**

The investigator used the following statistical techniques in the interpretation of the data.

1. Mean
2. Standard Deviation
3. t-ratio

**RESULT & FINDINGS**

On the basis of the interpretation of the data, certain results had drawn which have been summarized in the following tables:

**Table-1: Table showing t-ratio of mean scores of Technical readiness of male and female Teachers**

GROUP	N	M	S.D.	t-ratio	Level of significance
Male teachers	50	93.24	21.52	0.63	Not significance
Female teachers	50	95.26	21.24		

**For the both group;-**

Degree of freedom =  $N_1 + N_2 - 2(50 + 50 - 2) = 98$

Tabular value of t at 0.05 level = 1.96

**INTERPRETATION**

It can be observed from table 1 that Technical readiness scores of male and female Teachers are found to have mean scores of 93.24 and 95.26 and S.D. of 21.52 and 21.24 respectively. The value of t-ratio between the mean scores of two groups comes out to be 0.63 which is smaller than 1.96 at 0.05 level. It means there is no significant difference between male and female teachers regarding technical readiness. Thus the hypothesis that there is no significant difference regarding Technical readiness between male and female Teachers is accepted.

**Table-2: Table showing t-ratio of mean scores of Technical readiness of government and private school Teachers**

GROUP	N	M	S.D.	t-ratio	Level of significance
Government school teachers	50	81.40	16.55	2.32	significance
Private school teachers	50	107.10	17.48		

**For the both group**

Degree of freedom =  $N_1 + N_2 - 2(50 + 50 - 2) = 98$

Tabular value of; t' at 0.05 level = 1.96

**INTERPRETATION**

It can be observed from above table 2 that the technical readiness scores of government and private schools teacher are found to have mean scores is 81.40 and 107.10 and S.D. is 16.55 and 17.48 respectively. The value

of t-ratio between the mean scores of two groups comes out to be 2.32 which is more than 1.96 at 0.05 level so it is significance at 0.05 level. It means that there is significant difference between government and private school teachers regarding technical readiness. Thus the hypothesis that there is no significant difference regarding technical readiness among government and private schools teacher is rejected.

### CONCLUSION

Technical readiness of teachers is must for the successful integration of technology in education system. The above study shows that there is no significant difference exists between male and female teachers regarding level of technology readiness. But there is significant difference is found between government and private school teachers due to lack of facilities available in government schools. The technology readiness level of the teachers is moderate. This can cause a problem in integration of technology in education system. We recommend that the curriculum should be updated according to the present scenario. Ministries, various educational committees and boards, school level administration should design various activities which enhance the technology readiness of school teachers. This may increase the quality of education and successful integration of technology in education system.

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## HISTORY OF INDIAN EDUCATION

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### ABSTRACT

*Education is the process of learning, or getting of knowledge, skills, values and habits of essential needs of life. It occurs through any experience that has an effect on the way one thinks, feels or acts. Indian education has many facets. These are formed by different institutions that existed from historic times to the present day. Like the culture and traditions of India, the Indian education system also has a rich history of its own.*

*In the ancient times, the education was imparted orally by the scholars and the information was passed on from one generation to the other. When the letters were developed, it took the form of writing on the palm leaves and the barks of trees. This also led to the spread of the written literature. Then the Gurukul system of education came into existence. These were the traditional residential schools of learning which were typically in the teacher's house or a monastery. At that time education was free, the students from well-do families paid the Gurudakshina as a voluntary contribution after the completion of their studies.*

*In the different eras, knowledge was imparted on various aspects of the religion, the scriptures, the philosophy, the literature, the warfare, the statecraft, the medicine, the astrology and the history. The education was widespread in the 18<sup>th</sup> century, with a school for every temple, mosque or village in most regions of India. The school had the student representatives from all sections of the society.*

*The present system of education was founded by the British in the 20<sup>th</sup> century, by the recommendations of Macaulay. It had western style of content. After independence, the education became the responsibility of the States and the Central Government. They coordinated the technical and higher education by specifying the standards. In 1964, the Education Commission started functioning with 11 Indian members and 5 foreign members.*

*The Central and the State Government formulated various education policies, of which, NPE 1986 and revised POA 1992 envisaged the free and compulsory education should be provided up to the age of 14 years before the commencement of 21<sup>st</sup> century. So, both western and our traditional models mixed together to form a different entity. Thus Indian Education was shaped by influences and institutions in various periods throughout the history.*

*Keywords: Education, Indian education system, Ancient times, Macaulay Minutes, Education policies.*

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### INTRODUCTION OF EDUCATION

Education is the process of acquiring developed by learning process in training a child or a person. Education is a comprehensive term. Its implications are rich and varied. It is, therefore, very difficult to give a single meaning to education. However, to enter into the domain of education, it is essential to understand what 'Education' is.

### NATURE OF EDUCATION

1. Education is **life-long process**- Education is life long process because every stage of life of an individual is important from educational point.
  2. Education is a **systematic process**- It refers to transact its activities through a systematic institution and regulation.
  3. Education is the **development of individual and the society**- It is called a force for social development, which brings improvement in every aspect of the society.
  4. Education is **modification of behavior**- Human behavior is modified and improved through educational process.
  5. Education is a **training**- Human senses, mind, behavior, activities; skills are trained in a constructive and socially desirable way.
  6. Education is **instruction and direction**- It directs and instructs an individual to fulfill his desires and needs for exaltation of his whole personality.
  7. Education is **life**- Life without education is meaningless and like the life of a beast. Every aspect and incident needs education for its sound development.
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8. Education is a **continuous reconstruction of our experiences**- As per the definition of John Dewey, education reconstructs and remodels our experiences towards socially desirable way.
9. Education is a **power and treasure** in the human being through which he is entitled as the supreme master on the earth.

### **EDUCATION SYSTEM IN INDIA**

The Indian education system has evolved to a great extent from the Vedic days to today's computer age and e-learning. However, there is one thing that remains common between the two scenarios, and that is the **importance of education**. As Indians, our parents have always been emphasizing on the importance of education. However, the education scenario wasn't this way ever since the existence of man. The Education system has evolved considerably from the Vedic Times to now and only for the better. So let's have a look on it.

#### **TIMELINE**

##### **VEDIC ERA (3000 B.C. to 500 B.C.)**

The system of education which was developed during Vedic period is known as the Vedic system of education. During this period, the Brahmins had gained their command over education. The education was completely under the individual control of the Gurus. The gurus themselves arranged for lodging and boarding of the students. The students used to pay Gurudakshina to their teachers according to their financial position.

The aims of education were inculcating religion, achievement of absolute which he himself is, and it was recognized that the entire visible world is fully pervaded with the absolute, development of knowledge, acquaintance and observance of social and national duties, preservation and development of culture, moral and character development, education of livelihood, arts and skills.

The students were taught language, grammar, numerology, agriculture, cattle rearing, arts, skills, economics, politics, medical science, exercise, Gurukul organization, Vedic literature, ethics and training in activities like control of sense organs, religion based conduct, mode of worship etc. The methods of teaching were oral method, thinking method and manas (reflection) method. The teachers and students enjoyed a father and son relationship.

##### **BUDDHIST ERA (500 B.C. to 1200 A.D.)**

The Buddhist period occurred after the Vedic period. When in Vedic period, harsh class system and rituals became excessive, these were opposed. In 563 BC, Mahatma Buddha took birth. And Buddhism was started by Gautam Buddha. He taught the principle of a religion which was based on the analysis of actual problem of life. The aims of education was physical development for good health, development of knowledge, education about compassion and kindness, preservation and development of human culture, character formation, vocational development. Students were trained in the eight fold path namely right view, right resolve, right occupation, right speech, right behavior, right effort, right contemplation and right meditation to achieve salvation.

In Buddhist education primary, higher and bhikshu education were organized in Monasteries and Viharas. After completing the education of twelve years, the monk at the age of 20 years had to undergo the Upasampada ritual and then he becomes the permanent members of the Sangha.

Teaching methods were lecture method, question answer method, logic and conference method. Activity oriented subjects were taught by demonstration, imitation and practice method. Students had to reside in Monasteries and Viharas. Teachers were like father figure to students. They looked after the administration of Monasteries and Viharas and organized teaching work while students carry out the different tasks as advised by their teachers.

##### **ISLAMIC ERA (1200 A. D. to 1700 A.D.)**

After the Islamic invasion of India from Persia and Asia Minor, and the establishment of Islamic theocratic monarchies under Mahmud of Ghazni in A. D. 1001, Muhammad Ghor in A. D. 1175, the educational institutions of the Hindu and the Buddhist religion were destroyed paving their ways for the development of the Muslim education in India.

During medieval period, Muslim rulers started a new system of education. At that time, by education was meant what was taught at Maktabas and Madrasas. The main aim of Muslim education was development of knowledge, spread of Islamic culture and Islamic religion, development of character and morality, loyalty to the Government, education of arts, skills and vocations.

Knowledge of alphabets, 30 section of Quran, reading, writing, mathematics were given to children. Special practice in Arabic and Persian languages and their literature, Islamic law, Unani Medicine, Islamic literature,

various arts, skills and vocations were included in the syllabus. In the Muslim education different teaching methods were adopted to teach different subjects at different levels.

In the Medieval period, discipline referred to obeying the teachers and compliance to the rules. Corporal punishment was given and at the same time there was a provision of reward for disciplined students. Teachers loved their students and taught them with great concern. Students also respected their teachers and obeyed them out of fear.

### **BRITISH SYSTEM OF EDUCATION ( The Pre- Independence Era 1800 A.D. to 1947)**

After the downfall of the Muslim rule, Britishers came to India and established the East India Company but soon the reign of the government reached the hands of the British Parliament. During this period western science and literature made good progress through English medium. By the time the British came to India as traders of the East India Company and to spread their religion with the attempt of Christian Missionaries. The Modern System of Education in India was started to take place with the efforts of Britishers.

### **EDUCATIONAL ACTS AND LAWS DURING BRITISH ERA**

#### **CHARTER ACT OF 1813**

In 1813, the charter came for renewal in the British Parliament and as a result three articles were added – **(1)** Missionaries of any European country will have full freedom to visit India to propagate Christianity and to expand education there. **(2)** It will now be the responsibility of East India Company to organize education in the areas under its rule. **(3)** A sum of not less than one lakh of rupees each year shall be set apart and applied to the revival and improvement of literature and the encouragement of the learned natives of India and for the introduction and promotion of a knowledge of the science among the inhabitants of the British territories in India.

#### **ANGLICISTS – ORIENTALISTS CONTROVERSY**

The Anglicists – Orientalists controversy had its origin in the Charter Act 1813. The terms literature and the learned natives were not clearly defined in the section 43 of this Act. **Orientalist Group** – Mostly the senior and the experienced officials of the company belonged to this group. According to them, the term literature meant Indian literature and the term learned natives meant the scholars of Indian literature. **Anglicist Group** – This group contained mostly the young officials of the company. For them, the term literature and learned natives in the Charter Act 1813 meant Western literature and the learned natives of the western literature respectively.

#### **MACAULAY MINUTES 1835**

The Anglicists and Orientalists controversy could not be solved even after 20 years in the new Charter Act of 1833. On June 10, 1834 Lord Macaulay came to India as a law member of the Governor General's Council Lord William Bentinck. The Governor General appointed him the president of the public instructions and asked him to render his opinion on three points: **(1)** how to spend rupees ten lakh per annum on education **(2)** to define the terms literature and learned natives **(3)** to solve the anglicists - orientalist controversy. **He submitted his report and mentioned that** the word literature meant only English literature and not Sanskrit or Arabic or Persian literature. The word learned natives meant a scholar who is learned in the Locke's philosophy, Milton's poetry that is English literature.

#### **WILLIAM BENTINCK RESOLUTION**

Lord Bentinck seriously went through the Macaulay's report and declared the new education policy of the British Government on March 7, 1835. The major declarations were: **(1)** All Government fund appropriated for the purpose of education would be best employed on English education alone. **(2)** The educational institutions of Sanskrit, Arabic, Persian shall not be closed down. The economic grants for their teacher's salary and student's scholarship will continue as before. **(3)** In future no expenditure will be made on the printing and publication of Oriental literature. **(4)** The money so saved will be spent on the education of the English language, literature and Western knowledge and Science.

#### **DOWNWARD FILTRATION THEORY**

**This theory meant**, "Education is to be filtered to the common people. Drop by drop the education should go to the common public so that at due time it may take the form of a vast stream which remained watering desert of the society for long times and high class of people should be educated and common people gain influence from them". **Its basic causes** are: **(1)** The company needed various types of workers to run the business and government. They wanted to have cheap servants who work in different capacities. **(2)** The government did not have enough money to take the responsibility of educating the masses. **(3)** If the standard of living and ideas of the people of higher classes in society could be changed through the English education then the people of the

lower classes also be influenced and they shall grow loyal to the British government. (4) If educated high class people are given higher posts in government services then naturally they will use their influence for controlling the masses from going against British Government.

#### **WOOD'S DESPATCH 1854**

The company has to take orders after every 20 years from the British Parliament and in each order something was written about the education in India. Therefore when time for the Charter of 1853 came, the directors of the company thought for laying down a definite policy in regard to educational matters of India. So a Parliamentary Committee was appointed to survey the educational progress in India. As Mr. Wood was chairman of the Board of Control, so the declaration was Christianized as Wood's Educational Despatch.

The recommendations of the Despatch are as follows:

1. It proposed the setting up of primary schools (Vernacular languages) at lowest level, High schools (Anglo Vernacular) and Colleges (English medium) at district level.
2. Establishment of Institutions for training teachers on English model.
3. Universities on the Model of London University were proposed for Madras, Bombay and Calcutta. Each University should have a Senate, Chancellor, Vice-chancellor and fellows nominated by the government.
4. Female education was to be encouraged by the Government.
5. The system of grants-in-aid was recommended to help Private enterprises. However, the grants were conditional based on the principle of Religious neutrality.
6. Comprehensive system of scholarship was recommended.
7. More attention was to be given to Elementary education.
8. Director of public instruction was to be appointed in every province.

#### **HUNTER'S COMMISSION 1882**

Hunter Education Commission was a landmark commission appointed by Viceroy Lord Ripon with objectives to look into the complaints of the non-implementation of the Wood's Despatch of 1854; the contemporary status of elementary education in the British territories; and suggest means by which this can be extended and improved. This commission, headed by Sir William Wilson Hunter, had submitted its report in 1882. The Hunter Commission report is considered to be an important stage in history of education in India. Most of its recommendations were accepted by the British Government which resulted in the devolution of elementary education. This significantly reduced the British element in elementary education. In 1882, the Punjab University was established which lessened the burden over Calcutta University. Between 1882 to 1901, the number of students enrolled in primary and secondary schools increases substantially.

#### **WARDHA SCHEME OF EDUCATION 1937**

On July 31, 1937, Gandhi had published an article in the Harijan. Based upon this article, an all India National Education Conference was held on October 22 and 23, 1937. The conference is called Wardha Educational Conference and the president of this conference was Gandhi himself. Resolution at Wardha Conference:

1. Free and compulsory education to be provided for 7 years at a nationwide scale.
2. Mother tongue should be the medium of instruction.
3. Through out this period of 7 years, the education should be around some forms of manual and productive work and for this purpose a handicraft must be chosen, based upon the environment of the child.
4. This system would generate the remuneration of the teachers.

#### **BASIC EDUCATION COMMITTEE UNDER Dr. ZAKIR HUSSAIN**

Following Wardha conference, a committee under Dr. Zakir Hussain was appointed to formulate the scheme of the basic education. The aim of the basic education was to develop the qualities of the ideal citizenship and more aspect should be given to the Indian culture than the literacy. There should be NO PLACE for English in the curriculum. There was no place for religious education in this scheme. The most important point was the economic goals of the basic education, which would develop by the manual handicraft of the children for a period of 7 years. This was not accepted by Muslim League, for religious education was of utmost importance.

**THE EDUCATION SYSTEM AFTER INDEPENDENCE ( 1947 TILL DATE)**

On August 15, 1947 India attained independence from the British domination. This gave the people of the country the first fullest opportunity to mould their educational policy according to the needs of the nation in the fast changing times. Since 1947, Education Department in the centre has developed in a full - fledged Ministry under the Central Government. The education at the state level is the responsibility of the State Government; the Union Government is concerned only with the coordination and determination of academic standards in respect of higher education, research and scientific and technical education.

**THE UNIVERSITY EDUCATION COMMISSION (1948-49)**

After independence, the first significant step taken by the Government of India in the field of education was the appointment of the University Education Commission in 1948 under the Chairmanship of Dr. Sarvapalli Radhakrishnan. The Commission was appointed by the Government of India to go into the problems and prospects of Indian University Education and to suggest improvements and extensions that might be considered desirable to suit the present and future requirements of the country. The Commission was appointed in November, 1948 and it submitted its report in August, 1949.

The Report of the Commission is a document of great importance as it has guided the development of university education in India since independence. The Inter-University Board of Education and Central Advisory Board of Education recommended to the Government of India that an All India Commission on Education should be appointed to inquire into the requirements of the higher education in India and to put forward the recommendations for the re-organization of the University Education system in the light of the requirements of the country and its traditions.

In subsequent years, **several commissions and committees were also appointed by the government for educational restructure and changes in the system of education in India.** Some of them are:

1. Report of the Education Commission 1964-66
2. National Policy on Education, 1968
3. Draft Policy on Education, 1978
4. National Commission on Teachers-II, 1983
5. Challenge of Education: A Policy Perspective, 1985
6. National Policy on Education, 1986
7. National Policy on Education : A Programme of Action, 1986
8. Towards an Enlightened and Human Society – A Perspective Paper on Education, 1960
9. National Policy on Education : A Programme of Action, 1992

**SECONDARY EDUCATION COMMISSION (1952-53)**

After achieving the independence in 1947, both the public and the Government began to take keen interest in the development of secondary education. The university Education Commission also remarked that our secondary education remained the weakest link in our educational machinery and it needed urgent reforms. The Central Advisory Board of Education at its 14th meeting held in January 1948 recommended the appointment of a commission to examine the prevailing system of Secondary Education in the country and to suggest measures for its reorganization and improvement. In view of these considerations, the Government of India set up, the Secondary Education Commission in 1952, under the Chairmanship of Dr. A. Lakshmanaswami Mudaliar.

**KOTHARI EDUCATION COMMISSION (1964-66)**

Kothari Education Commission, 1964-66, was the sixth commission in the history of commission in India. The Five Years Plan, started after independence helped the growth of the country in many areas. However, the execution of these plans expresses the inherent weakness due to which the expected success was not being achieved. Education appeared to be one of areas which indicated many problems that needed our efforts for immediate solutions. To improve the educational set up the government constituted two commissions after independence which we have discussed earlier. The recommendations of these two commissions could not be succeeded in its full implementations. Consequently, the defects in the area of education persisted. In order to remove these defects, the government had to appoint a new education commission to advise the government on national pattern of education along with general principles and policies for the development of education at all stages.

**NATIONAL POLICY ON EDUCATION**

The National Policy on Education (NPE) is a policy formulated by the Government of India to promote education amongst India's people. The policy covers elementary education to colleges in both rural and urban India. The first NPE was promulgated in 1968 by the government of Prime Minister Indira Gandhi, and the second by Prime Minister Rajiv Gandhi in 1986. The government of India has appointed a new committee under K. Kasturirangan to prepare a Draft for the new National Education Policy in 2017. The main objectives behind this policy are free and compulsory education, development and protection of all the Indian languages, equality of educational opportunities, identification of gifted children, provision of work experience and national service scheme, science education and research, education in agriculture and industries, reform in examination system, part time education and correspondence curriculum, expansion of literacy and adult education and sports and games.

**MODERN EDUCATION AT PRESENT**

Modern day education is aided with a variety of technology, computers, projectors, internet, and many more. Diverse knowledge is being spread among the people. Everything that can be simplified has been made simpler. Science has explored every aspect of life. There is much to learn and more to assimilate. Internet provides abysmal knowledge. There is no end to it. One can learn everything he wishes to. Every topic has developed into a subject. New inventions and discoveries have revealed the unknown world to us more variedly.

**CONCLUSION**

The Indian education system has to pass many ups and downs since the early ages. The vast changes and development have mainly occurred during the pre – independence or British era. Some of which contributions are till now continuing in the present education system.

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**“LIFE SKILLS EDUCATION”: AN EFFECTIVE TOOL FOR EMPOWERING TEACHERS AND STUDENTS**

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**ABSTRACT**

*Today's world witness global challenges like communal hatred, terrorism, economic disparities, materialism, health hazards and human value crises. Un-employment, fear of job security, job sustenance, cut-throat competition in academics are some of the major concern for youth and students. Inability to tackle emotions, conflicts, frustration, anxiety act as catalyst for undesirable behaviour. To overcome this, we need a socially responsible education system which not only support but also inculcate such skills that enable students to live a better life.*

*Life skills are those competencies that assist people in functioning well in the environment in which they live. Life Skills have been defined by WHO as “Ability for adaptive and positive behaviour that enable individuals to deal effectively with the demands and challenges of everyday life.”*

*Life-skills education refers to a behaviour change, or behaviour development approach designed to address balance of three areas: knowledge, attitude and skills. – UNICEF*

*It has been globally proved that Life skill education have a positive effect in empowering the individuals to manage issues and challenges effectively in their life. This paper will throw light on need and importance of life skills education also methods and approaches to teach life skills.*

*Keywords: Life skills, Life skills education, Global Challenges, Empowering Teacher and students*

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**INTRODUCTION**

Teachers role in education used to be confined to a defined curriculum, specific instructions on how to teach and standard teaching methods for all students. With time this role evolved from beyond just executing lesson plan to a multifaceted role. Their job is to counsel students, help them learn how to use their knowledge and integrate it into their lives so they will become valuable members of society. Teachers are encouraged to adapt learning methods to each individual student's learning needs, to challenge and inspire them to learn. The role of a teacher is clearly more than just planning and executing lesson plans. The role of teacher has grown beyond than just being an instructor to be a facilitator of knowledge.

Today's world witness global challenges like communal hatred, terrorism, economic disparities, materialism, health hazards and human value crises. Un-employment, fear of job security, job sustenance, cut-throat competition in academics are some of the major concern for youth and students. Inability to tackle emotions, conflicts, frustration, anxiety act as catalyst for undesirable behaviour. To overcome this, there is need of a socially responsible education system which not only support but also inculcate such life skills that enable students to live a better life.

**LIFE SKILLS AS PRESCRIBED BY WHO**

Life skills are those competencies that assist people in functioning well in the environment in which they live. Life Skills have been defined by **WHO** as “*Ability for adaptive and positive behaviour that enable individuals to deal effectively with the demands and challenges of everyday life.*”

Life skills are those abilities which help individual to grow in physical, mental and emotional aspects and to be competent to face challenges and difficulties in life. Following are the **Ten Core life skills as prescribed by World Health Organisation:**

1. **Self-awareness-** It is an ability to identify one's own strengths, weaknesses, desires and dislikes. Developing self-awareness can help us to recognize when we are stressed or feel under pressure.
2. **Empathy-** To have a successful relationship with our loved ones and society at large, we need to understand and care about other peoples' needs, desires and feelings. Empathy is the ability to imagine what life is like for another person.
3. **Critical thinking** - It is an ability to analyze information and experiences in an objective manner. Critical thinking can contribute to health by helping us to recognize and assess the factors that influence attitudes and behaviour, such as values, peer pressure and the media.

4. **Creative thinking**–It is a novel way of seeing or doing things that is characteristic of four components – fluency (generating new ideas), flexibility (shifting perspective easily), originality (conceiving of something new), and elaboration (building on other ideas).
5. **Decision making** –It helps us to deal constructively with decisions about our lives. This can have consequences for health. It can teach people how to actively make decisions about their actions in relation to healthy assessment of different options and, what effects these different decisions are likely to have.
6. **Problem solving**- It helps us to deal constructively with problems in our lives. Significant problems that are left unresolved can cause mental stress and give rise to accompanying physical strain.
7. **Interpersonal relationship skills** help us to relate in positive ways with the people we interact with. This may mean being able to make and keep friendly relationships, which can be of great importance to our mental and social well-being. It may mean keeping, good relations with family members, which are an important source of social support. It may also mean being able to end relationships constructively
8. **Effective communication** means that we are able to express ourselves, both verbally and non-verbally, in ways that are appropriate to our cultures and situations. This means being able to express opinions and desires, and also needs and fears. And it may mean being able to ask for advice and help in a time of need.
9. **Coping with stress** means recognizing the sources of stress in our lives, recognizing how this affects us, and acting in ways that help us control our levels of stress, by changing our environment or lifestyle and learning how to relax.
10. **Coping with emotions** means involving recognizing emotions within us and others, being aware of how emotions influence behaviour and being able to respond to emotions appropriately. Intense emotions like anger or sadness can have negative effects on our health if we do not respond appropriately.

#### NEED FOR LIFE SKILLS EDUCATION

*Life-skills education refers to a behaviour change, or behaviour development approach designed to address balance of three areas: knowledge, attitude and skills.*– UNICEF

Life skills are essential for a well-balanced life. They are necessary in order to maintain equilibrium between personal and professional life of teachers and for personal and academic life of students. Knowledge of life skills empower individuals to translate knowledge, attitude and values into abilities.

To survive the ever-increasing pace and change of modern tech-savvy life that has a predominant impact on our education, professional and personal lives, teachers and students need life skills to cope up with stress and emotions such as frustration, fear, anxiety and similar.

Life skill education strengthens teacher pupil relationship as well as pupil -pupil relationship. It helps in achieving desirable behavioural changes in students. Socialisation process among learners improves due to life skill education. It leads to meaningful interaction among teachers, learners and school community which in turn bring about a healthy school environment.

Development of life skills enhances critical and creative thinking abilities which in turn helps in effective decision making and problem solving. Life skills are essential for the promotion of healthy child and adolescent development; primary prevention of some key causes of child and adolescent death, disease and disability; socialization; preparing young people for changing social circumstances

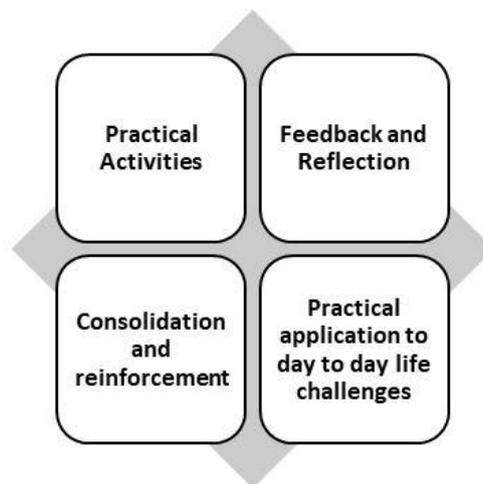
Life skills education contributes to basic education; gender equality; democracy; good citizenship; child care and protection; quality and efficiency of the education system; the promotion of lifelong learning; quality of life; the promotion of peace.

**The National Curriculum Framework (NCF) 2005** has emphasised on constructive learning experiences, and on the development of an inquiry-based approach, work-related knowledge and broader life skills.

**Central Board of Secondary Education (CBSE), in 2005, introduced life skills education as an integral part of the curricula through Continuous and Comprehensive Evaluation (CCE)** for classes 6 to 10 and has developed life skills manuals for teachers teaching classes 6, 7 and 8.

#### METHODS AND TECHNIQUES FOR INCULCATING LIFE SKILLS

The methods used in teaching of Life Skills builds upon the social learning theory and on what we know of how young people learn from their environment; from observing how others behave and what consequences arise from behaviour. It involves the process of Participatory learning using 4 basic components:



Following methods are proved to be beneficial in inculcating Life skills in learners directly or indirectly :

- **Class discussions:**The class examines a problem or topic of interest with the goal of better understanding an issue or skill, reaching the best solution, or developing new ideas and directions for the group.Provides opportunities for students to learn from one another and practice turning to one another in solving problems.
- **Brainstorming:**Students actively generate a broad variety of ideas about a particular topic or question in a given, often brief period of time.Allows students to generate ideas quickly and spontaneously. Helps students use their imagination and break loose from fixed patterns of response
- **Role plays:**Role play is an informal dramatization in which people act out a suggested situation. Provides an excellent strategy for practicing skills; experiencing how one might handle a potential situation in real life; increasing empathy for others and their point of view; and increasing insight into one's own feelings.
- **Educational games and simulations:**Students play games as activities that can be used for teaching content, critical thinking, problem solving and decision making and for review and reinforcement. Simulations are activities structured to feel like the real experience.
- **Case studies:**Teachers present a case or dilemma andthe students come out with suggestions to solve the caseor conflict posed. Teacher should ensure that enough timeis provided to the students in groups to discuss and studythe case and present the views.
- **Story telling:**The instructor or students tell or read a story to a group. Pictures, comics and photo novels, filmstrips and slides can supplement. Students are encouraged to think about and discuss important (health related) points or methods raised by the story after it is told.
- **Debates:**In a debate, a problem or issue is presented to the class, and students must take a position on resolving the problem or issue. The class can debate as a whole or in small groups.Provides opportunity to address anissue in depth and creatively

## CONCLUSION

It has been globally proved that Life skill education have a positive effect in empowering the individuals to manage issues and challenges effectively in their life. To be successful in their personal and professional lives teachers as well as students need life skills education. It helps them to be independent,multitasking,resourceful and self-confident.it helps them to think critically and creatively, to take effective decision and solve problems, build healthy relationships, communicate effectively and cope up with stress and emotions. Life skills education is an effective tool for empowering teachers and students to act responsibly, think critically and creatively, take initiative and helps them to sustain in this highly competitive era. Life skill education is beneficial for an individual as well as society, benefits such educational, social, cultural, economic and health related benefits enhance the prosperity of society.

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**A COMPARATIVE STUDY OF CONTINUOUS COMPREHENSIVE SYSTEM OF EVALUATION AND UNIFORM SYSTEM OF ASSESSMENT**

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**ABSTRACT**

*Evaluation is a very significant aspect of modern system of education. It influences the students' achievement motivation and future prospects. Continuous Comprehensive Evaluation (CCE) system was implemented by CBSE in 2009. Continuous and comprehensive evaluation refers to a system of school-based assessment of the students throughout the year on a continuous basis. It is comprehensive as it covers all aspects of students' development. It comprises formative and summative assessment of the students. Formative assessment of 40 marks includes assessment of Class work, homework, assignments, project work and unit tests. Summative assessment (60 Marks) is based on two term end examinations. These marks are later converted to grades in accordance with 9 point grading system.*

*Recently, certain changes have been made in the evaluation system. CCE pattern has been discontinued and Uniform System of Assessment has been introduced from classes VI to X in all CBSE affiliated schools from 2017-18. This system aims to bring uniformity in evaluation system in all CBSE affiliated schools. Under this system 20 marks are allocated for Periodic Assessment and 80 marks for End Term Exam. This paper aims to make a comparative analysis of the erstwhile Continuous Comprehensive Evaluation (CCE) system and the present Uniform System of Assessment with a view towards bringing further improvements in the system.*

*Keywords: Continuous Comprehensive Evaluation, Uniform System of Assessment*

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**INTRODUCTION**

Evaluation is a very significant aspect of education system and plays a major role in deciding the future career progression. It also has a great impact on students' confidence and achievement motivation. Continuous Comprehensive Evaluation (CCE) system was implemented by CBSE in 2009 till class X. The system also made Class X board optional for students. Continuous and comprehensive evaluation refers to a system of school-based assessment of the students throughout the year on a continuous basis. It is comprehensive in the sense that it covers all aspects of students' development. It comprises formative and summative assessment of the students. Formative assessment includes assessment of Class work, homework, assignments, project work and unit tests. Summative assessment is based on two term end examinations. Maximum Marks a student can score- 40(formative assessment) + 60(summative assessment) = 100 Marks. These marks are later converted to grades.

Recently, certain changes have been made in the evaluation system. CCE pattern has been discontinued and Uniform System of Assessment has been introduced from classes VI to X in all CBSE affiliated schools from 2017-18. This system aims to bring uniformity in evaluation system in all CBSE affiliated schools. Under this system 20 marks are allocated for Periodic Assessment and 80 marks for End Term Exam. The periodic assessment has 10 mark test based on syllabus covered till announcement of test date, five marks for notebook submission and five marks for subject enrichment activities, which include activity-based learning.

**NEED OF THE STUDY**

The decision to do away with the CCE pattern has evoked a mixed response and fuelled the speculation that boards will bring back a lot of pressure and stress on students. Following are some important questions which must be answered:

1. What were the reasons to change the Continuous Comprehensive Evaluation (CCE) system?
2. Why were the Board Exams for Class X reintroduced?
3. Was the system not evaluating the students properly?
4. Were there some strengths in CCE system, which should still be continued?
5. What features of the new system of evaluation i.e. Uniform System of Evaluation are different compared to C.C.E system?
6. Which system- C.C.E or Uniform System of Assessment is more beneficial for students?

Only after critically analyzing the various aspects of CCE and Uniform System of Assessment, steps should be taken to incorporate the strengths of both these systems of evaluation to make the present system more effective. The present study is a step in this direction.

**OBJECTIVES**

- (1) To analyze in detail the various aspects of Continuous Comprehensive Evaluation (CCE) system.
- (2) To study in detail the various aspects of Uniform System of Assessment.
- (3) To identify the strengths and limitations of CCE system of evaluation.
- (4) To identify the strengths and limitations of Uniform System of Assessment.
- (5) To make a comparative analysis of the Continuous Comprehensive Evaluation (CCE) system and Uniform System of Assessment
- (6) To enlist suggestions to further bring improvements in the present Evaluation System being followed in CBSE affiliated schools.

**CONTINUOUS COMPREHENSIVE SYSTEM OF EVALUATION**

CBSE had introduced the system of continuous and comprehensive evaluation (CCE) in 2009 and implemented it from academic session 2010-2011. Board exams that were earlier compulsory for all class X students have been made optional. Continuous and comprehensive evaluation refers to a system of school-based assessment of the students *throughout the year* on a continuous basis. It is comprehensive in the sense that it *covers all aspects* of students' development. The new system of evaluation comprises formative and summative assessment of the students. This assessment is conducted over two terms namely first and second term of an academic session.

*Formative assessment* - Class work, homework, assignments and project work are assessed twice in each of the terms. Each evaluation carries 10 marks. So a maximum of 20 marks are awarded in each term. Thus 40 marks are awarded under formative assessment. Distribution of marks is given below in a concise manner:

I term- Maximum Marks-10+10 = 20 Marks

II term- Maximum Marks-10+10 = 20 Marks

Total Marks (under Formative Assessment) = 40 Marks

*Summative assessment*- It is based on term end examinations. At the end of the first term, a term end exam of 30 marks is conducted. At the end of the second term, a term end exam of 30 marks is conducted. Thus a maximum of sixty marks are awarded under summative assessment. Distribution of marks:

I term- Maximum Marks- 30 Marks; II term- Maximum Marks- 30 Marks

Total Marks (under Summative Assessment) = 30+30= 60 Marks

Thus, students can score a maximum of 100 marks in the following manner:

Maximum Marks = 40(formative assessment) + 60(summative assessment) = 100 Marks

In this system, students are awarded marks for their performance and these marks are later converted to grades. Nine point grading system is followed to evaluate the students of classes IX and X. In this grading system there are nine grades corresponding to a range of marks.

The practice of declaring compartment or fail has been discontinued. The results of candidates are declared in two categories:

- (i) Eligible for qualifying certificate (QUAL)
- (ii) Eligible for improvement of performance

All candidates even if they have failed in all subjects have five chances to improve their performance without having to repeat a year.

It also includes assessment of co-scholastic and co-curricular areas which include a wide range of aspects ranging for life skills and values to physical education. These are assessed on a 3 point grading scale.

**Strengths of C.C.E are as follows**

- The content covered in one semester was not asked again in the next semester so it was easier to study.
- It was good for those students who were unable to perform well in academics as they could realize their potential and got good grades through other activities.
- Formative assessment conducted on a continuous basis provided regular revision.

- The system catered to overall personality development of students as it gave weightage to both scholastic and co-scholastic aspects.
- There was more flexibility in terms of wide range of activities from which certain activities could be selected for evaluation
- It gave more opportunities to pass the exams as compared to marking system
- There is lesser stress and anxiety due to no detention policy and board exams made optional. Dropout rate is reduced. Students need not dropout due to fear of failure in exams. Even if a student fails in all the subjects, he is given five chances to improve his performance.

**Weaknesses of C.C.E are as follows**

- Constant scrutiny of activities, home-work, projects and academics throughout the year put them under lot of pressure.
- Too much burden was there for teachers as not only lot activities had to be organized and evaluated but also lot of records had to be maintained.
- This system did not provide thorough revision as once the first semester exams were over, students didn't review that portion again.
- Students were more relaxed as under this system as they knew that they couldn't be detained. Also, they got marks for other activities and didn't take exams very seriously.
- Many of the activities, projects and models were copied from internet or even bought from the market. Such malpractices on part of students not only helped them gain good marks without any effort but also caused deterioration of values
- More time was spent on evaluation rather than teaching leading to lowering of standards.
- Competition was lesser, as many students got the same grade. The toppers who put in more efforts were not able to get due recognition and felt demotivated.
- There was scope for biasness and subjectivity in giving grades, especially on the criteria of values.
- Lot of time was spent in co-curricular activities, so lesser time was available for teaching.
- This system is being adopted in schools under CBSE. Many other boards in India have different evaluation system. The performance of students being assessed in different ways can't be compared. This creates problems at the time of admission for higher studies on the basis of class X results.

**UNIFORM SYSTEM OF ASSESSMENT**

Uniform System of Assessment has been introduced from classes VI to X in all CBSE affiliated schools from 2017-18. This system aims to bring uniformity in evaluation system in all CBSE affiliated schools. Under this system, there are two semesters. 20 marks are allocated for Periodic Assessment and 80 marks for End Term Exam in each semester. The periodic assessment has 10 marks for periodic tests, five marks for notebook submission and five marks for subject enrichment activities, which include activity-based learning. These marks are further converted into grades.

Board Exams have been reintroduced for Class X. The format of assessment is same for classes IX and X. Students getting marks 32 and below are considered failed. Co-Scholastic activities include Work Education, Art Education and Health and Physical Education which are graded on a 3 point grading scale

**COMPARATIVE ANALYSIS: CONTINUOUS COMPREHENSIVE SYSTEM vs. UNIFORM SYSTEM OF ASSESSMENT**

The philosophy behind CCE was good but the way it was being implemented led to a lot of flaws. After a critical analysis, the major weaknesses identified under C.C.E, which have been removed under Uniform System of Assessment are as follows:

- 1) The CCE system had increased the pressure and workload on teachers. The paper work and record keeping had increased at the cost of quality of teaching. This loophole has been removed under Uniform System of Assessment where documentation is reduced and teachers can focus on improving the quality of teaching
- 2) Students were also pressurized under C.C.E due to continuous scrutiny of their assignments, activities, unit tests, projects, presentations and end term exams. Under Uniform System of Assessment there are lesser number of activities.

3) Also, no detention policy under C.C.E made average students relaxed as they were able to scrape through without a thorough study of the scholastic areas. Fear of failure in Class IX and Board Exams in class X under Uniform System of Assessment has made students take studies more seriously in these higher classes.

4) There was some variation in the criteria of evaluation being followed by schools under C.C.E system. But the Uniform System of Assessment has brought uniformity in the system.

However, the C.C.E system also had some merits, which were not continued under Uniform System of Assessment. These are as follows:

1. In C.C.E, weightage given to a wide range of co-curricular and co scholastic activities led to overall personality development of students. Also adequate emphasis was laid on life skills and values. However, these important aspects are not given much emphasis under Uniform System of Assessment
2. Stress of board exams and fear of failure was removed which made learning more joyful under C.C.E. But with reintroduction of Board Exams and Pass/Fail system, students are again under undue pressure to perform well.
3. Weightage to Formative assessment was 40% under C.C.E while it is only 20% under Uniform System of Assessment. This may lead to lack of consistency and regularity amongst students on a continuous basis and more burden during end term exam in the present system.

### CONCLUSION

To conclude, both the C.C.E system and Uniform System of Assessment have their own strengths and limitations. Hence it is suggested to make the following modifications in the present system to overcome its loopholes:

- Some modifications should be made in the board exam system to give 50% weightage to internal assessment and 50% weightage to board exams to reduce its phobia and stress.
- Life skills and values should be given more emphasis.
- Weightage to Formative Assessment should be at least 30% to make students consistent throughout the year.
- To make learning joyful , enhance the practical skills , problem solving skills and equip them better to face life situations , present system should incorporate more practical activities related to daily life situations

It is recommended that these features should be incorporated in the new system of evaluation being implemented from 2017-18 session so as to make the present system more effective and beneficial for the students.

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**TEACHER EDUCATION: A STEP TOWARDS SUSTAINABLE DEVELOPMENT**

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**ABSTRACT**

*The world has been undergoing a major shift with respect to environment and the global climate. Countries are now focusing on environmental and climatic issues in order to move towards sustainable development. The concept of sustainable development was defined in 1987 by the Brundtland Commission earlier called as United Nations World Commission on Environment and Development. Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Out of the 17 Sustainable Development Goals (SDGs) adopted by the global community, quality education is ranked fourth - and is considered instrumental for achieving the success of all other 17 SDGs. The role of education is primary in creating awareness about the need for sustainable development. It is only when the young generation will show concern for a better global environment, that actual measures can be taken in that direction. This paper attempts to understand the concept of sustainable development across the world and how teacher education can play a major role in educating student teachers in this direction.*

*Keywords: Sustainable development, environment and global climate, teacher education.*

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**INTRODUCTION**

In 1987 the United Nations World Commission on Environment and Development released the report 'Our Common Future', commonly called the Brundtland Report. It explored the ways in which both political and public participation can come together and manage environmental resources efficiently and effectively for achieving sustainable human growth, progress and survival. The report included what is now one of the most widely recognized definitions of sustainable development. According to the report,

Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts:

1. The concept of 'needs', in particular, the essential needs of the world's poor, to which overriding priority should be given; and
2. The idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs.

- World Commission on Environment and Development, Our Common Future (1987)

After the Brundtland Report was released and published, the Brundtland commission held an international conference to track the progress made by respective nations towards Sustainable Development. This is what led to the United Nations Conference on Environment and Development, which became historically famous as the 'Earth Summit', in Rio de Janeiro, in 1992.

The **Decade of Education for Sustainable Development (DESD) 2005-2014** was an Education for Sustainable Development (ESD) initiative of the United Nations. Teaching and learning for Sustainable Future is a UNESCO program for ESD, ensuring professional development of pupil teachers, teachers and curriculum developers. All Teacher Education Institutions, therefore are in more than one way related to this.

Education for sustainability is the practice of learning how to achieve global and local sustainable communities.

The objectives of the DESD are to:

- Facilitate networking linkages, exchange and interaction among stakeholders in ESD;
- Foster increased quality of teaching and learning in ESD;
- Help countries make progress towards and attain the Millennium Development Goals through ESD efforts;
- Provide countries with new opportunities to incorporate ESD into education reform efforts.

The UN Decade of Education for Sustainable Development took place from 2005 to 2014, with the goal of emphasizing education in all its forms (formal, non-formal and informal) as an indispensable element for achieving sustainable development. In November 2014, as the official follow-up to the DESD, UNESCO launched the Global Action Programme (GAP) for ESD with the overall objective to scale up action on ESD worldwide.

Two basic and very important objectives of GAP on ESD are:

- Reorienting education and learning so that everyone has the opportunity to acquire the values, skills and knowledge that empower them to contribute to sustainable development; and
- Enhancing the role of education and learning in all relevant agendas, programmes and activities that promote sustainable development.

#### **HOW TEACHER EDUCATION CAN HELP IN SUSTAINABLE DEVELOPMENT :**

Education, both formal and informal, is one of the main agencies to help towards achieving the goals of the concept of sustainable development. It is through carefully designed educational programs that the required teaching-learning opportunities can be created in **teacher educational institutions (TEIs)** for our young student teachers of today. They can be sensitized to think about not only saving the present environment from deterioration but also about conserving it for the future.

Some of the important components of the curriculum for teacher educational institutions, that must be integrated with the overall educational program in TEIs are :

1. Recycling of wastes : Information can be provided about the possible waste recycling techniques to students by TEIs and colleges and creating ways to implement these ways in the institutions itself.
2. Improved sanitation in slums : Sensitising student teachers about the actual situation of slum areas can be done by arranging for visits to slum areas. Inculcating of the need for better sanitation facilities in slums can be done effectively by such educational activities.
3. Reducing carbon footprints : Student teachers can be made aware of depleting ozone levels in the atmosphere and its harmful effects. They can be adequately informed about ways to reduce the carbon emissions so as to reduce the detrimental effects on the environment at present and also in future.
4. Climate protection awareness: Holding special lectures and workshops by environmentalists for explaining to student Teachers, how and why the climate is undergoing drastic changes. Talks on Global Warming and other such related issues can be held. Students can be told how they can help in climate protection.
5. Save water campaigns: Student teachers can be sensitized about the judicious use of water to prevent its wastage.
6. Biodiversity preservation : students can be sensitized why it is important to preserve all species in the ecosystem. Visits to biodiversity parks such as the Yamuna Biodiversity Park can be arranged.
7. Swachhata Abhiyan : Under the Swachh Bharat Abhiyan campaign, measures can be taken by students for a clean environment.
8. The Energy and Resources Institute, TERI, took the following initiatives in schools of Goa:
  - i. The GREEN Olympiad: is a programme open to all schools across the state of Goa that tests the environment quotient of school students.
  - ii. Awareness campaign on waste segregation: A source segregation campaign in association with Margao Municipal Council and Goa Pollution Control Board was undertaken in 2008.
  - iii. Project STARS : Sustainability Tracking, Action and reporting in Schools, In association with the Dempo Group of Companies, STARS seeks to inspire and encourage schools to practice the principles of sustainability by focusing on its environmental and socio-cultural performance.
  - iv. Project SEARCH (Sensitization, Education and Awareness on Recycling for a Cleaner Habitat): A programme that encourages students to recycle dry (inorganic waste) in schools and homes was carried out in around 20 schools across the state of Goa from 2013-2016.

Similar programs and projects can be initiated in TEIs also to prepare better informed teachers for the future

#### **CONCLUSION**

India is the only country to have passed one of the landmark judgments passed by the Supreme Court of the country directing all education boards to include environmental education (EE) as part of the formal education system at all levels, including our **Teacher Education Institutions (TEIs)**.

Besides the different ministries of the GOI, a large number of government and non-government Organizations are diligently working to promote ESD. Most notable amongst them are Centre for Environment Education

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(CEE) which is the nodal agency for implementing UNDESD in India; The Energy and Resources Institute (TERI); Bharati Vidya Peeth (BVP); Centre for Science and Environment (CSE); World Wide fund (WWF); National Council for Science Museums (NSCM) and National Council of Education, Research and Training (NCERT).

Teacher Education certainly plays a key role in making the world on a larger scale, towards Sustainable Development , as well prepared and well informed teachers will then be able to meet the needs of the 21<sup>st</sup> century, extremely effectively.

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**ASSESSMENT OF LEARNING THROUGH AUDIO-VISUAL MEDIA - A STEP TOWARDS INCLUSIVE EDUCATION**

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**ABSTRACT**

*This paper looks at the issue of school inclusion by referring to the concept of Universal Access to Education. It focuses on the strong potential Audio-visual media to avoid any kind of discrimination among students. The paper also discusses that teachers play a fundamental role in capitalizing the opportunities offered by new technologies to support the full inclusion of all students in mainstream education systems. In this perspective, to view the Universal Access to Education as a concrete and reachable goal, teachers need to be aware of the technology potential and they must be able to acquire the suitable knowledge and operational skills to choose and use appropriately this type of resources.*

*Another matter discuss in this paper is about the role and impact of Audio-visual media which helps in making inclusive education effective. Educational research provides strong evidence that Audio-visual media provides both a medium and a powerful tool in supporting inclusive practice. It provides wide-ranging support for communication, assisting many learners to engage with learning, including those who are hard to reach, and helps to break down some of the barriers that lead to under-achievement and educational exclusion.*

*The basic idea is, in fact, that the process of inclusion can be fostered by means of new technological tools, but in turn it requires changes and modifications in educational contents, approaches, structures and strategies.*

*Keywords: accessibility, inclusion, best practices, educational multimedia, universal access, resources, audio-visual media, teachers, schools*

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***“Democratization of knowledge indicates knowledge for anyone, anytime, anyplace.”***

***-APJ Abdul Kalam***

**INTRODUCTION**

**Inclusion** in education is an approach to educating students with special educational needs. Under the inclusion model, students with special needs spend most or all of their time with non-disabled students. Implementation of these practices varies. Schools most frequently use them for selected students with mild to severe special needs.

All students, irrespective of their sex, race, color, ethnic or social origin, genetic features, language, religion or belief, political or any other opinion, membership of a national minority, property, birth, disability have the right to have equal opportunity in education and to be considered as being an integral part of the learning community. Recognition of this right has recently given rise to the concept of “inclusion”, which has gradually substituted that of “integration”.

Inclusion is actually a much stronger concept which refers to “the right to belong to the mainstream” leaving behind the idea that only few learners have “special needs”, the social model of inclusion rather suggests that all students as individual learners present their own peculiar characteristics and have their own specific educational needs. Such a perspective implies a Copernican revolution which brings all students at the very heart of the educational process whilst the school is required to adjust and change in order to enable each of them to participate in the life of the school to the best of their abilities.

“Inclusive education - according to UNESCO - means that the school can provide a good education to all pupils irrespective of their varying abilities. All children will be treated with respect and ensured equal opportunities to learn together. Inclusive education is an on-going process. Teachers must work actively and deliberately to reach its goals”.

Inclusion should, then, be regarded as a long-lasting process which requires time, effort, competence and strong conviction by all those involved in students' education, first and foremost, by teachers.

- Inclusion is less about children with disabilities and more about the education system is designed and implemented so that all children belong and receive a quality education.
- Teacher's attitude towards learners with a disability is paramount for integrating them into inclusive environments.
- The key role of teachers in giving birth to and maintaining a truly inclusive classroom is unquestionable, but such an important mission also requires that suitable, effective and barrier-free educational means should be employed.

From this perspective, technology resources are promising; there are grounds for maintaining that they help most students overcome barriers to learning, thus increasing their school achievement, together with their autonomy, willingness and self-esteem.

Indeed, educational research provides strong evidence that: "Technology is both a medium and a powerful tool in supporting inclusive practice. It provides wide-ranging support for communication, assisting many learners to engage with learning, including those who are hard to reach, and helps to break down some of the barriers that lead to under-achievement and educational exclusion".

In the following, it is argued that documenting the accessibility of educational multimedia products and offering access to best practice can (may) help teachers to make effective use of technology tools in order to support all students' full inclusion. We begin with an analysis of main teachers' wants/needs to this respect, and then explore the benefits of audio-visual aids.

First of all we will discuss about the qualities/essentials/features of the good audio-visual aids and then need to understand the principles of using the audio-visual media.

#### **Features of Good Audio-Visual Aids**

- \* They should be meaningful & purposeful.
- \* They should be accurate in all respects.
- \* They should be simple.
- \* They should be cheap.
- \* As far as they should be update.
- \* They should motivate the learner as well as to the teacher also.

Audio Visual aids or Devices or technical devices or technological Medias or learning devices that helps the teacher to clarify, establish, co-relate & co-ordinate accurate concepts, interpretations, appreciation and enable him to make learning more concentrate, effective, interesting, inspirational, meaningful, vivid etc. The Audio – Visual Aids always helps in competing the triangular process i.e. Motivation, Clarification and Stimulation.

#### **Principles of Audio Visual Aids**

For effective teaching to take place a good method must be adopted by the teacher. The teacher is always free to choose effective audio visual aids in the class room. Of course there are also certain principles of Audio – Visual Aids in teaching methodology. They are as follows:

##### **i. Principle of Selection:**

- a. The age level
- b. Other personality angles
- c. They should have specific educational values
- d. They should help in the realization of learning desired objectives.

##### **ii. Principle of Preparation:**

- a. As far as possible, the local material should be used in the preparation of aids.
- b. The teacher also must receive training in the preparation of aids.
- c. The teacher him/herself can prepare some aids or can take help of students also.

iii. **Principle of Physical Control:** This is concerned with the arrangement of keeping aids safely and also to facilitate to their lending to the teachers for security.

iv. **Principle of Proper Presentation:**

- a. Teacher should carefully visualize the use of teaching aids before their actual presentation.
- b. They should be well acquainted themselves with the use & manipulation of the aids to be shown in the class room.
- c. The aids should be displayed properly. So that, all the students can see it, observe it, and can derive maximum benefits from it.

v. **Principle of Response:** This is the important principle. This tells the teacher guide the students to respond actively to the audio visual stimulus so that they derive the maximum benefits in learning.

vi. **Principle of Evaluation:** This Principle stipulates that there should be continuous evaluation of Audio Visual Aids materials & accompanying techniques in the light of desired objectives.

The aims of teaching with technological medias is clearing the channel between the learner and the things that worth learner. The teacher must "show" as well as "tell". The Audio –Visual Aids provides significant gains in informal learning, retention and recall, rethinking and reasoning, activity, interest, imagination, personal growth & development.

Here are the most important values of the proper use of Audio Visual Aids which defines its clear impact on inclusive education:

- i. **Best Motivator:** They are the best motivator. The students' works with more zeal & interest.
- ii. **Clear Image:** Clear image takes place when we, touch, handle, experience it.
- iii. **Variety:** "mere Chalk & Talk" do not help. Audio –Visual Aids give variety & provide different tools in the hands of teacher.
- iv. **Freedom:** When Audio –Visual Aids are employed, there is a great scope for children to move about talk, laugh & comment upon. Under such atmosphere the students work because they want to work, & not because the teacher wants them to work.
- v. **Opportunities to Handle:** Many students always get a chance to handle the aids.
- vi. **Helpful in Attracting the Attention:** Attention is the true factor in any process of learning & teaching Audio – Video Aids helps the teacher in providing proper environment for capturing as well as sustaining the attention and interest of the students in class room.
- vii. **Savings in Energy & Time:** Due to effective implementation of "principle of Presentation", a good deal of energy & time of both the teacher & students can be saved.
- viii. **Realism:** The Audio –Visual Aids gives the real touch to the learning situation.
- ix. **Encouragement to healthy class room interaction:** Audio-visual aids through variety of stimuli, motivational, provisional of active participation of students, a good experience always encourage healthy class interaction between teacher and the learners.
- x. **Scope of education as a mass scale:** The audio-Visual aids like radio, tape, television etc. always plays role in spreading mass education.
- xi. **Positive environment for creative discipline:** A balanced, rational, scientific use of Audio – Visual Aids develops, motivates, experience, attract the attention of the students and provides a variety of creative outlets for the utilization of their tremendous energy & keeps them busy in class room work.

This overall classroom environment becomes conducive to creative discipline. Grossly, we can say that there are various types of Audio – Visual Aids i.e. traditional as well as modern aids of audio-visual aids. But at the same time it is important to take into account that the Audio-Visual Aids do not play role up to disseminate the information, data, facts, clues but also they influences the mentality, psychology, grasping level of the students in the class room. On the other hand they greatly motivate, inspire the teachers to adopt the latest, creative, innovative aids. The scope of audio-visual aids is not only up to procuring & make presentation. Of, course it is technically part of teaching. But other side also it conveys us that it is a tool to know through effective communication in triangular process i.e. Motivation, Stimulation, and Clarification. Apart from this it is also

important that to think about difficulties & problems in the use of aids. There are certain problems like lack of enthusing for the use of teaching aids teacher, non-availability of aids in school, lack of facilities for the use of aids-electricity, room, furniture etc., lack of training on the part of teacher in the use of aids, costly nature of aids, lack of storage facility & non availability of suitable teaching aids in the regional languages.

### CONCLUSIONS

Many children are still excluded from, and within, education for a variety of reasons. In this paper we have addressed the issue of promoting e-inclusion through e-learning by discussing the role and impact of audio-visual media aimed at helping teachers to make effective use of technological educational products.

Since inclusion requires new approaches to teaching and learning (Lacey, 2006) as well as the use of valuable, new, suitable and barrier-free tools it's fundamental to give teachers appropriate advice and support to face this challenge.

The basic idea underpinning the discussion is, in fact, that the process of inclusion can be fostered by means of new technological tools: it requires, in turn, changes and modifications if required in educational contents, approaches, structures and strategies.

Teachers play a key role at these ends: innovation cannot cross the school's threshold without their deep and active involvement and the educational effectiveness of any technological means mainly depends on the choices they make, in order to take a significant step forward, e-tools need to be carefully selected and their use needs to be appropriately planned and conceptually well integrated in mainstream activities.

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**SKILL DEVELOPMENT IN INDIA****Dr. Sushma Rani<sup>1</sup> and Swati Chaudhary<sup>2</sup>**HOD<sup>1</sup> and Research Scholar<sup>2</sup>, Department of Education, Lingaya's Vidhyapeeth University

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**ABSTRACT**

*We have started Digitalization of education and try to educate each citizen of India digitally so skill development is important to propagate digitalization of each field. If we have well skilled population, sufficiently equipped with knowledge is not only necessary to sustain economic growth, but is also an important for integrated growth in every field because literate and skilled citizens able to stand for benefit most from the employment opportunities which provide growth to our India. Skills and knowledge are the driving forces of economic growth and social development for any country. Nowadays India has approximately over 460 million internet users, India is the second largest online market after China. By 2021 there will be about 635.8 million internet users in India. Therefore it is important to give them right direction to use internet and develop their skills. In this paper author focused on Professional ethics of teachers in schools, Non-profit organizations in societies and communities. Fundamentally, the Author has find that teachers are not enough digitally literate and Non-profit organizations are not ready to work on ground level even government wants to create a manufacturing-hub only. This paper based on descriptive research with qualitative and quantitative research method and higher secondary school teachers and ngo's are targeted population.*

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**INTRODUCTION**

Education system makes expectation and it should by no means aim at creating simple advertises. Over a period of time lots of alters have take placed in dissimilar zones of economy including the education system. Education zone different any other zone has seen numerous phases in its development. From Guru-Shishya method of accomplishing the class in open garden under the trees to locked class room lectures, presentation type of teaching with the help of laptops touch-screen projector to online notes for teachers and students, at the present instantaneous Whatsapp communications is the exhortation among the learners. Whatsapp has increased the position of individual genuine prescribed signifies of communication among the students and the teachers. Indian subcontinent is included of different population belonging to diverse national and cultural clusters. Away from each other from these differentiations, the mainly noticeable divergence that creates a through impact on the Indian education system is the variety in purchasing power and affordability of the Indians. This paper is aimed at investigating the nature and capability of the teachers in modern education process in India. Digitalization means alteration of the entire information kinds (texts, sounds, visuals, video and other data from various sources) into the digital language. Discussing the observable fact of digitalization it should be note down those different analysts and predict specialists consider change of education procedure into digital phase as the twisting point in the history of education. The United Kingdom is supposed to be the first in the world to introduce required software engineering and IT education in the program for schoolchildren aged 5 - 16 years in 2015. The stated approach was accepted by the European Union. EU 2020 education improvement approach, accepted in 2014, centers on digital technologies. This research paper appeared to reflect remarkable accomplishments in IT region with its center purpose being combination of state-of-the-art IT-solutions in education institutions' activities across EU.

**OBJECTIVES**

1. To the study of availability of mobiles, laptops and other smart gadgets.
2. To the study of importance of Digitization in Education
3. To find out the challenges in skill development
4. To the study of digital literacy rate in teachers at higher secondary level.

**LITERATURE REVIEW**

• **Digital Strategy for Schools 2015-2020 ENHANCING TEACHING, LEARNING AND ASSESSMENT:** The Digital Strategy for Schools provides a rationale and a Government action plan for integrating ICT into teaching, learning and assessment practices in schools over the next five years. This Strategy builds on previous strategies in the area of ICT integration and it takes cognizance of current education reforms that are already underway within the education system at primary and post primary level. This Strategy focuses on the schools' sector and the proposed actions are designed to embed ICT more deeply across the system to enhance the overall quality of Irish education. Care has been taken, in developing the Strategy, to ensure that the actions align with and complement strategies and initiatives to

support digital learning in the further education and higher education sectors. In developing this Strategy, the Department adopted an evidence-based approach. A Census Report was initially conducted to provide base-line data on the levels and usage of ICT by teachers and schools. A raising from this research a consultative paper, Building towards SLearning with the launch of a public consultation phase. One hundred and twenty-four (124) submissions were received from various organizations and individuals on the content of the consultative paper and these views were further augmented by face-to-face meetings with a number of stakeholders groups.

- **The role of e-learning, the advantages and disadvantages of its adoption in Higher Education by Nelly Abaidoo and Valentina Arkorful:** earning involves the use of digital tools for teaching and learning. It makes use of technological tools to enable learners study anytime and anywhere. It involves the training, delivery of knowledge and motivates students to interact with each other, as well as exchange and respect different point of views. It eases communication and improves the relationships that sustain learning. Despite some challenges discussed, the literature has sought to explain the role of e-learning in particular and how eLearning has made a strong impact in teaching and learning. Its adoption in some institutions has increased faculty and learner's access to information and has provided a rich environment for collaboration among students which have improved academic standards. The overall literature which explains the advantages and disadvantages of e-learning suggests the need for its implementation in higher education for faculty, administrators and students to enjoy the full benefits that come with its adoption and implementation.

- **E-Learning in Rural India by Ms. Swati Yadav and Dr. Anshuja Tiwari:** has been said that development of any society depends on its access to information and the same is applicable to rural India too. E learning can work wonders in this direction and help the socially marginalized community to attain their entitlements. Launch of Digital India Program is a welcome step in this direction. It is anticipated that with dedicated leadership, willpower and control and an integrated framework comprising of the government, technology industry and society, E-learning interventions in the rural areas will undoubtedly pave way towards sustainable growth.

- **E-LEARNING TECHNOLOGY FOR RURAL CHILD DEVELOPMENT by Lect. S.K.Nayak and Dr.Kalyankar N.V.** they said Education is essential for everyone. The increased rate of literacy will push the nation towards development. E-learning is a useful way to provide education. Considering India's rural areas, problems create difficulties to implement the e-learning system but strategies can be developed and implemented. Before the actual implementation of e-learning system, the understanding of different components and their functions is necessary. A policy should be developed to implement the functions and to maintain the quality of system. With introduction of Web Based Education at school level rural children and youngsters will grow as "Computer kids". Their exposure will get increased due to which the Knowledge level will get definitely improved. Web-Based Learning adds human support through on-line tutor, thereby extending the scope of what can be effectively taught into many new subject areas. It will enhance the quality of education in our country at all levels i.e. Primary, Secondary and Higher Education. Computers are reshaping children's lives, at home and at school, in profound and unexpected ways. Common sense suggests that we consider the potential harm, as well as the promised benefits, of this change. E-learning technologies have great potential to spread learning however, the benefits of these technologies have to reach the rural masses of India, and otherwise they will be one of the causes of the Digital Divide. Development in the 21st century will be determined, to a large extent, by the thought, action and imagination of young people. This in turn, is shaped by the education system.

- **Role of e-Learning in a Developing Country like India by Deepshikha Aggarwal,** has been said that "In a market such as India where the concept is still new, one crucial element that will make a difference in generating a good response is marketing. This not only holds true for segments such as government and education, but for the corporate sector as well. Experts are of the view that there needs to be a mindset for the adoption of e-learning. The other point is content. If content providers are giving off-the-shelf content, there should be scope for customization since each organization has its own needs. Regions without university education can access universities in other regions via the Web, a solution much cheaper than building university infrastructure. In underdeveloped countries, e-learning can raise the level of education, literacy and economic development. This is especially true for countries where technical education is expensive, opportunities are limited, and economic disparities exist. However, one of the problems with e-learning in India is the lack of course content, especially outside the mainstream focus areas of IT education, English-language content, and tutorial-like courses. There will be high demand for people who can develop multi-lingual courseware that addresses various topics. The social implications of online learning center around one primary requirement that students need to feel a part of the class, regardless of where they are located physically or geographically. The

—missing of connection to the other students in the class and with the institution can impact the success of an online student. Bottom line: the Indian market is still young, but it will continue to adopt the concept of e-learning in order to meet its communication needs and seize business opportunities".

• In “**Empowering Indian Citizens Through Technology, September 2015**” ASSOCHAM suggested “To realize the vision of promoting inclusive growth through empowerment of citizens, it is important to reach out to citizens in the remotest of locations and make them part of India’s growth story. Globally, technology has been the greatest enabler in causing disruptive change. India’s story is no different, and the use of digital technologies to educate and empower citizens is being seen as a game-changer. Given India’s vast expanse and differences in demographics across the nation, there is also a vast difference in the level of adoption among the citizenry.”

### **METHODOLOGY**

According to researchers and educationists, very shortly digital layout will eradicate the require for handwriting lectures and speech, when every student will get all the materials and will be capable to progression them on a real-time basis and work interactively. The entire texts will be accessible online and stored in a digital ‘cloud’ (Apple iCloud alternative), which will sensibly remove some negative results related to absence from school. In accordance with the nature of the present study, quantitative and qualitative Method was used for the collection of information. The tools were administrated upon the sample and the descriptive data was collected by the investigator. Qualitative and quantitative method is concern with present situation, event, and practices with relationship among variables. These methodologies have been classified differently by various authors.

### **FINDINGS/ RESULTS**

In this research paper we find that teachers are not enough literate to digital literacy at higher secondary level. Teachers are feeling over saturated and overloaded with digitalized education. Demanding digital technologies access in education increases a number of sensible issues. Same like with the other innovations, the world of online technologies is associated with certain contradictions and unforeseen circumstances. For instance parents, who want their child to spend less time at the computer, should change their mind, since education process modernization presupposes the opposite. According to Lego analysts “Each education situation and each child is unique; therefore parents and teachers should determine how much time their child can spend in front of a computer. Therefore it’s vital to interactively find solution regarding correct “digital” behavior of a student and teachers work out “digital activity rules”. Although this statement is directly related to video games, teachers presentations for classrooms it can be applied to any “digital” activity, so much the more, as it was stated above, we face the tendency of ‘binding’ the games and education, especially in higher secondary schools.

According to the findings teachers should know about current technologies related to Education and also capable to use educational applications those are easy to access on smart phones and laptops. Another issue in this circumstance is wide-ranging digitalization of student’s life, forecasted by various scientists and educationists. Today digital technologies are not available in rural areas therefore mostly teachers and students are not enough literate by the technologies. At the same time the society demands turn to rise, forcing us to adapt to the 21st century progress. Nowadays the ability to adapt to new technologies is a success prerequisite, as stated in the 8-th issue of newsletter of global recruiting company Heys. (Digital Dawn, 2015).

Currently Khan Academy is a multi-field global education institution with numerous administrative and more than 80 teachers, actively engaged in their activities with wide range of classes: from online lectures and seminars for students of the academy to extensive archive of special digital records, used as a huge digital library. The key feature of the Academy is a simplified form of participation and presence at classes (personal presence, distant online or extra-mural offline). This academy concept was established when Sal Khan worked as hedge fund analyst in California, and in between was engaged in online teaching of people from all over the country. At a certain stage he collected enough records and his colleagues from Google advised him to upload these records on YouTube channel. Soon after Khan received feedback from people from all over the country and from abroad, particularly from Singapore, who asked for more uploads. The channel turned to be the starting point for today’s Khan Academy.

Today Khan Academy is a large organization with its base comprising more than 400 million lessons for students in 28 languages. In 2015 the number of languages reached its peak point according to statistical data, with more than 2.5 billion users connected to the Academy’s server. And finally more than 50000 teachers worldwide have cooperated with the Academy since its establishment. But the point is to be noted that it only limited to urban areas not for rural areas because there is no availability of smart gadgets and digital literacy educators as well.

Technologies have today redefined the conservative role of the teacher. No longer does a teacher enjoy a positive knowledge remaining over the taught. In fact, the knowledge gap is speedily narrowing between the teacher and the taught. Present teachers will require reinventing themselves by embracing technology and continuously developing to remain ahead of the knowledge curvature.

They will have to contact to their students and play catalysts for transferring information into knowledge. Application of academic perceptions in genuine life circumstances, make sure worldwide absorption and creating a vigorous and favorable learning environment will be challenges that innovative technologies can never overcome.

## **DISCUSSION**

However it should be noted that the stated education digitalization trend in India may soon raise numerous challenges for Teachers and schools. First it's digital separate between provision of information gadgets to teachers, who make lively use of them, and conventional approaches to studies. Therefore, digitalization has both realistic followers and unconvinced challengers. Thus, Y. Shikova considers that new explanations will personalize the education procedure, adjusting the program to a student's person requires. If a technology contributes to better understanding, memorizing, knowing or using any content, it's worth considering and implementing, even if it presupposes fundamental changes in academic activity. Alexander Sidorkin is however more skeptical about it, stating that Indian education digitalization process embodies major challenges; thus educational resources digitalization (for instance, tutorials) doesn't keep up with informatization of education process. The education lacks initiatives related to intensification of education communicative component using information technologies, as well as basic ideas. This area requires sustained flow of breakthrough ideas and venture projects (Internet and education, 2015). The aforementioned innovative tendencies will govern education development in terms of globalization and, as it was stated above, will influence all sides of education and will be followed by major changes in academic activity, i.e. class work and in classrooms. Classroom activities of the future will not represent a typical picture of a teacher in front of its students, sitting at desks arranged in perfect rows. Introduction of innovation digital technologies will change not only teaching form and tools, but its environment as such.

## **RECOMMENDATIONS**

### **1. Teachers should be permanent at their positions**

For the most part of the teachers in schools in rural areas are run by the government. They assign ad hoc teachers, instead of permanent ones, who are poorly paid as compared to the huge remuneration of a full-time Trained Graduate Teacher (TGT).

Furthermore, promising career views, which is pretty a motivation booster, is just about nothing for the non-permanent teachers. This leads to dissatisfaction, eventually resulting in a lack of teachers because they move away to more permanent jobs.

### **2. Lack of Responsibilities**

Lack of responsibilities of teachers and school authorities has raised the rate of absenteeism. School Development and Management Committees (SDMCs), comprising parents and members of the local community, have been entrusted with the responsibility of overseeing teachers and their duties. However, research suggests that the committee has hardly seen success.

### **3. Teachers should not take burden of non-teaching duties**

Additionally, non-teaching duties like appointment in invigilation often keep teachers away from schools and classrooms. Moreover, teachers often have to report for duty far away from their home. With an insufficient transportation system in rural India, the distance only adds to their despairs and often consequences in absenteeism.

### **4. Freedom from Teachers' Eligibility Test**

Some states have freed from candidates from Teachers' Eligibility Test (TET) as only 20 per cent of the candidates obvious it. This wrong move, in an effort to rapidly fix the matter of lack of teachers, has depreciated the feature of education in the states even further. However, quality of teachers is a most important concern not only in these states, but across the whole country.

### **5. Teacher training should emphasized on digital skills**

There are many private teacher-training institutes in India, but the quality and lack of emphasis on digital skills in the training they provide is unsatisfactory. Continuous professional development is a motivator for teachers, and adequate awareness is required in this regard.

**CONCLUSION**

We might state that modern educational system faces creative crisis. Class work and lessons do not contribute to students' personal initiatives to learn something new, establish objective connection between their knowledge and the real world, use their imagination to look for nonstandard answers to standard questions instead of using stereotypic models. Therefore the classroom of the future should not be a place of knowledge transfer, but a place of investing in the mind of students, focusing on creativity and innovation and not on repeating ready-made opinions or mechanical response to test questions. The stated approach to education will force us to reconsider curricula and integration of conceptual and actual innovations. New curricula should stipulate not only obligatory transfer of facts, but focus on students' reaching certain objectives, namely creativity, imagination and teamwork irrespective of team members' location. Finally, it should be noted that today's global education has faced major transformations, caused by further integration of new digital technologies in academic activity and is actively searching for efficient implementation models, which will compromise with traditions and innovations.

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**EFFECT OF INNOVATIVE DIGITAL INSTRUCTIONAL STRATEGIES ON CLASS PERFORMANCE OF PUPIL TEACHERS**

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**ABSTRACT**

*The most important tool of effective teaching learning process is teaching techniques. The use of innovation and digital equipment in the teaching processes has made learning process very simple, easy and student friendly. Digital innovation has revolutionized the instructional strategies for a sustainable development. Student teachers of today will become qualified teachers tomorrow and the demand for present time is that they should be trained with not only traditional learning methods but also trained them with new digital instructional techniques. Explain the differences between traditional learning methods and innovative techniques and bring awareness of new technique is the aim of our study.*

*The purpose of this exercise is to invigilate the outcomes of Digital instructional strategies on the performance of the teacher's students. This experiment was conducted on a teaching subject Life Skill Education of fourth semester of teacher education program. A sample of 50 students was selected randomly out of 100 students of Semester IV in a teacher training college. Two groups of 25 students each were made. Pre -test was given to both the groups and the results were recorded. One group was taken as a control group which was taught the subject by the teacher who used conventional method of teaching while the other i.e. the experimental group was taught by the teacher who used innovative digital teaching techniques. After two week time of teaching, a post- test was conducted.*

*Keywords: instructional strategies, teaching leaning process, experimental group, pre-test, post test.*

***“The art of teaching is the art of assisting discovery”—Mark Van Doren***

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**INTRODUCTION**

Today's Society is Information Centered Society and the Information and Communication Revolution combined all the people of the world together. This change on the world stage has meant the educationists need to reorganize the entire education process and place the innovation in education. Before the advent of the digital age the teachers were dependent on books and libraries only for reading and teaching. But in current time Technical development has begun a new age of information revolution and education dissemination. Through pressing a button you can gain knowledge about anything, in such a way to calm the curiosity of the children and to make them aware of the new dimension of knowledge is the biggest challenge for today's teachers

**NEED OF STUDY**

Today in most of the school's, the classroom teaching is not limited to Chalk –n- Talk methods. Here the emphasis is given to the interaction between the teacher and students. With the use of digital technology, hard-to-hard subject matter can be explained to students in a simple and interesting form. The innovative techniques included educational videos, power point presentations, movie screening, online lecture, e-learning and online training are being included in classroom teaching. Twentieth century is recognizing by revolution in communication technologies. The advancement of information technology change entire teaching learning process and its affected students as well as teacher too. In today's time, professional competitiveness of teachers is increasing continuously, all the school wants skilled teachers and because of the increasing responsibilities of the teachers in the changing environment getting a good job opportunity is become difficult that's why knowledge of the innovative digital instructional strategy of student teachers is essential for their personal and professional growth.

**SOME INNOVATIVE DIGITAL INSTRUCTIONAL STRATEGIES AND THEIR EFFECT OF STUDENTS LEARNING PROCESS**

- **Educational Videos** Use of educational videos during classroom has improved engagement level of students. Visual content inhence memory and students ability to retain new information. Relevant videos keep student more alert, motivated and focused on particular topic.
- **Mobile Learning:** Mobile learning and BYOD are becoming popular in digital classroom. It enable students to engage with their Multiple device like Tablet, Laptops, smart phones expand the boundaries of learning own comfort.

- **E-Books and Digital Content:** E-Books and Digital Content are enormous for teachers. They are cheaper than the text books and can be updated regularly to provide updated content.
- **Interactive Learning:** student engagement in an interactive environment open new horizons of learning and understanding. Availability of data makes it rich, easy to understand and relate.
- **Process outside of the classroom:** Stimulators bring virtual reality into the classrooms use of periscope or live streaming which offers opportunities to observe various culture and lives around the world.

**OBJECTIVE**

- To study the performance of pupil teacher.
- To compare the performance of experimental group and controlled group.

**HYPOTHESES**

- There is no significance difference between the performance of the student taught by digital technique and the student taught by conventional method.
- There is no significant difference between mean score of experimental group and controlled group.
- There is no significance difference between clarity of conceptual knowledge of student between experimental group and controlled group.

**DELIMITIZATION**

For this study we consider only 100 teacher students of forth semester of teacher training collage. This study organized for a particular subject Life Skill education

**SAMPLE**

Sampling 50 student were selected by random sampling out of the total population of 100 students of semester IV of teachers training program .Out of these 50 students again systematic random sampling was done to divide them into two groups of 25 students each. Pre-test was taken. Now one group is the experimental group and other one is called controlled group.

- **Controlled group;** the controlled group was take as a constant and taught by traditional (lecture and discussion) method.
- **Experimental group** Experimental group was taught by the teacher using following digital instructional strategies.
- Power point presentation
- Educational video
- E-Books and digital content
- Personalize Instruction

**METHODOLOGY**

According to the nature of objective of study experimental method is more suitable. For further process we divide our sample into two groups excremental group and controlled group

- **Controlled group:** The controlled group was take as a constant and taught by traditional (lecture and discussion) method.
- **Experimental group:** Experimental group was taught by the teacher using Digital instructional strategies.

**TOOL USED**

The researcher has used the teacher-made achievement test to collection of data and fulfillment of the objective of the study.

**STASTICAL TOOLS**

- MEAN
- STANDERD DEVATION
- T-TEST

**EXPREMENT**

The duration of the experiment was two week in the month of February 2019. According to the planner made by researcher three topics were taken from Life skill Education. Namely Core Life Skill, Key Issue and Concerns of Adolescent students in emerging Indian context. Learning to live together with other living beings. These three topics were divided into two week .initially both the class room were set on the same standard pattern later the researcher rearranged the excremental classroom with modern equipment. After two week time, post test was conducted from those three topics. A remarkable difference was observed between the scores of the two groups.

**RESULTS**

**a) PRE-TEST RESULTS**

S.NO	Control Group Score	S.NO	Experimental Group Score
1	7	1	10
2	11	2	9
3	15	3	14
4	27	4	24
5	10	5	15
6	17	6	11
7	19	7	21
8	16	8	13
9	6	9	16
10	14	10	17
11	24	11	20
12	15	12	19
13	18	13	15
14	15	14	16
15	20	15	19
16	17	16	18
17	14	17	3
18	19	18	16
19	22	19	23
20	21	20	27
21	12	21	10
22	24	22	26
23	14	23	16
24	9	24	13
25	23	25	11

**b) STATICS**

	SCORE	CONTROLLED GROUP N=25	EXPERIMENTAL GROUP N=25
1	MEAN	16.36	16.08
2	SD	5.36	5.52
3	VARIANCE	26	31
4	T-TEST	.33	

**INTERPRETATION**

Pre –test result display a clear similarity between the control group and the experiment group. the mean score are matching;i.e16.36 and 16.08.The value of standard deviation quite similar and variance shows that the scores are equally distributed in the two groups. And the value of t- test is .33 at 0.05 level of significance and this value is less then 1.96 .it means the null hypothesis that there is no significance different between performance of controlled group and experimental group is accepted.

**POST TEST RESULT**

S. No	CONTROL GROUP	S.N.o	EXPERIMENTAL GROUP
1	16	1	24
2	11	2	17
3	22	3	26
4	6	4	29
5	14	5	28
6	17	6	27
7	9	7	25
8	13	8	29
9	23	9	24
10	18	10	20
11	14	11	28
12	15	12	14
13	5	13	25
14	21	14	22
15	12	15	18
16	15	16	16
17	8	17	27
18	11	18	20
19	20	19	26
20	13	20	28
21	19	21	29
22	11	22	23
23	27	23	24
24	10	24	21
25	2	25	28

**STATISTICS**

S. No	SCORE	CONTROLLED GROUP N=25	EXPERIMENTAL GROUP N=25
1	MEAN	14.08	24.41
2	S.D	5.96	4.38
3	VARIANCE	35.57	19.24
4	T-TEST	6.74	

**INTERPRETATION**

- According to the results of post-test there is a large difference between controlled groups mean score and experimental group mean score .The value of mean in controlled group is 14.08 and the value of mean in controlled group is 24.41 and value of standard deviation is 5.96 for controlled group and value of standard deviation for experimental group is 4.38 value of T-TEST is 6.74 at 0.05 level of significance and its value is greater than 1.96,its means the null hypothesis “There is no significant difference between mean score of experimental group and controlled group” is rejected.

By the score of posttest the null hypothesis “There is no significance difference between the performance of the student taught by digital technique and the student taught by conventional method” is also rejected and also we concluded the level of students performance of teaching with the help of digital instructional strategies is much better then teaching by traditional methods and clarity of conceptual knowledge is far batter by using digital instructional strategies.

**CONCLUSION**

With the observation of result of pre- test and post -test conclusion is very clear that digital teaching methods is better than traditional methods and it increases students interest in classroom teaching .clearly of concept and they will be retained longer as compared to those taught with traditional method

With the help of this study researcher recommended that the teaching would be highly effective if the researcher use innovative digital instructional strategies. Hence innovation in digital instruction strategies is very vital tool

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for teacher's students not only their personal development but also their professional competency and career growth.

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**EDUCATIONAL POLICY FOR SUSTAINABLE DEVELOPMENT IN INDIAN SCHOOLS**

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*“Addressing the widespread acceptance or tolerance of corporal punishment of children and eliminating it, in the family, schools and other settings, is not only an obligation of State parties under the Convention. It is also a key strategy for reducing and preventing all forms of violence in societies.”*

*Committee on the Rights of the Child, General Comment No. 8*

**ABSTRACT**

*The use of different forms of punishment in the name of disciplining children is the universal and perhaps a global phenomenon where the incidences of children being punished are globally visible. Perpetuation of violence on children has become a routine culture in the school where powerlessness of the children is consistently misused. The act of punishment has been seen as a common and spontaneous culture of a school. It has been routinized in such way which needs our attention. The use of punishment does not provide children a welcoming environment but even become a significant pushing factor to drop out from the school. The act of Punishment caused by discrimination indicates low status of children in educational context. Largely impacts of different forms punishment has been understood psychologically but this paper to some extent attempted to understand the culture of punishment as a social phenomenon where culture of silence, culture of fear and culture of discrimination and control as socially embedded reality of our education system has been explored. This Paper is based on Secondary Data where theme based analysis from existing literature has been done. An attempt has been made to highlight the negative impact of punishment and discrimination on children. Punishment is seen as an illegal practice which represents unequal power relation between oppressor and the oppressed which further causes discrimination and raise inequalities among them.*

*Keywords: Corporal Punishment, School, Discrimination, Educational Participation, Learned helplessness*

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Each and every child has an equal opportunity to learn and live with dignity but the reality with which child encounters in the school atmosphere denies to avail equal opportunity to live with dignity. Empirical evidences of many of the studies showed the prevalence of various forms of discrimination and punishment not only create hurdle in children's opportunity to access schooling but also hampers their social, emotional, physical, mental and educational development. Punishment is seen as an illegal as well as dangerous tool in the hands of the teachers and other members of the school through which they manifest discrimination and unequal treatment on children of different race, caste, class, gender and religion.

The establishment of National Commission for the Protection of Child Rights and enactment of Right to Education of Free and Compulsory Act (2009) are some of the essential stepping stone to prohibit 'verbal, physical, mental harassments and different forms of discrimination' from our school system under Section 17(1),17(2), 8 and 9 of Right to Education Act (2009). But the crude reality as revealed from the secondary data sources is that even after the enactment of the RTE Act (2009), children are continuously subjected to different forms of punishment and discrimination in various educational institutes in general and schools in particular. Studies reported that children faced discrimination based on socio-economic disparities. Children are humiliated on account of their religious and linguistic differences. A study on 'Inclusion and Exclusion of Students in the Schools and Classroom in Primary and Upper Primary Schools' conducted particularly in six states by Ministry of Human Resource Development in 2011 highlighted the fact that children coming from socially disadvantaged group reported the prevalence of social exclusion in the school premises. Gender and caste based discrimination were higher in their everyday realities. It indicated that schools are seen as social institutes which not only propagate stereotypes but also strengthen the social taboos prevalent in the society. The whole attempt of punishment is largely seen as the inherent politics to keep children of poor and disadvantaged group to remain outside the school environment which negates children's equal rights of participation and other educational opportunities. The practice of punishment completely negates the constitutional principles of human rights. It not only violates the child's right to freedom but also curb child's right to life with dignity.

**BAN ON CORPORAL PUNISHMENT**

Corporal punishment under Right to Free and Compulsory Act (2009) indicates that physical punishment, mental harassment and discrimination not only create hurdles to the right of the child to education but also violate the right to life with dignity. Article 21 of the Constitution, which protects the right to life, has been

modified to include the right to education for children under 14 in Article 21 A, and the right to life with dignity can come only when education shall be the part of life. Corporal punishment, not only violates the child's right to freedom but also curbs child's right to life with dignity. Fear of being subjected to corporal punishment influences the child's right to education as well as the culture of fear not only discourages the children's desire to learn, but may also result into the drop out of the child from the school.

Right to Education Act, (2009) under section 17 (1) and 17 (2) read the provisions to prohibit 'physical punishment' and 'mental harassment' as follows

Clause 17: Prohibition of physical punishment and mental harassment to the child– (1) No child shall be subjected to physical punishment or mental harassment.

(2) Whoever contravenes the provisions of sub-section (1) shall be liable to disciplinary action under the service rules applicable to such person.

Whereas Section 8 and 9 of the RTE Act, (2009) specifically ensures that "child belonging to weaker section and the child belonging to the disadvantaged group are not discriminated against and prevented from pursuing and completing elementary education on any grounds".

The UN Committee on the Convention on the Rights of the Child defines corporal punishment in General Comment No 8 which India has been signatory to as "any punishment in which physical force is used and intended to cause some degree of pain or discomfort, however light. Most involve hitting ('smacking', 'slapping', 'spanking') children, with the hand or with an implement – a whip, stick, belt, shoe, wooden spoon, etc. But it can also involve, for example, kicking, shaking or throwing children, scratching, pinching, biting, pulling hair or boxing ears, forcing children to stay in uncomfortable positions, burning, scalding or forced ingestion (for example, washing children's mouths out with soap or forcing them to swallow hot spices). In the view of the Committee, corporal punishment is invariably degrading. In addition, there are other non-physical forms of punishment that are also cruel and degrading and thus incompatible with the Convention. These include, for example, punishment which belittles, humiliates, denigrates, scapegoats, threatens, scares or ridicules the child."

#### **ESTABLISHMENT OF LEGISLATION AGAINST CORPORAL PUNISHMENT CANNOT BE CONSIDERED AS A SUFFICIENT CONDITION**

The section 17 (1) and 17 (2) prohibits physical punishment and mental harassment but failed to define the comprehensible definition of the physical punishment and mental harassment. Does it include sexual offenses in the Act as per the Protection of Children from Sexual Offenses Act, 2012? This is difficult to figure out what are different forms of mental and physical punishment does RTE Act (2009) incorporate? Who will ensure the complete ban of the corporal punishment? What will be the mechanism through which complete ban of the corporal punishment can be achieved? If anyone was found practicing corporal punishment what will be the procedures through which individual can make a complaint? The Act specifies that the disciplinary action will be taken against the person for practicing corporal punishment, but it has not defined that what will be these disciplinary actions? Since the disciplinary actions are not defined explicitly in the Act it leaves the scope to the individual based on their understanding to interpret the provisions according to their convenience. Provisions in itself ambiguous, it leaves the scope to the audience to interpret accordingly. The provisions do not clearly propose that what educational, administrative, social, legislative measures the state and central government will take to eliminate the practices of corporal punishment particularly from the school setting? How will the state and central government will examine the implementation of the provisions in the educational settings?

A country like India, where corporal punishment is socially approved and socially sanctioned practice how would the concerned local authorities or even state and central government will bring attitudinal change among the parents, teacher and administrative staff of the school? The ban on the punishment under RTE Act is an essential and significant stepping stone, but the provisions are made in such a way that it does not enforce a complete ban on corporal punishment. It neither criminalizes corporal punishment nor impose standardized penalty on teachers or on school authorities for practicing corporal punishment in the school. The lack of intention to penalize school teachers and managements reflects that corporal punishment has been considered as the naturalized everyday reality of the school children. Corporal punishment has been largely seen as the acceptable tool to discipline.

Establishment of legislation can never be a sufficient condition. As Peter Newell also mentioned that "prohibiting all corporal punishment requires the removal of all justification and defense of 'reasonable' punishment or 'lawful' correction, so that children have the same protection as adults." There are many cases

of corporal punishments in school, which go unreported. Does the school provide a friendly environment where a child can make a complaint against the perpetrator? Is there anyone with whom the child can talk confidentially? The answers to most of these significant issues which regularly emerge in the schools are NO. The strong Redressal mechanism is a much needed measure to be taken in schools so that children do not suffer the pain alone in silence.

### **SOCIAL REALITIES IN SCHOOLS IN INDIA- MAJOR HEADLINES**

Studies reported the children faced discrimination based on socioeconomic disparities. Children were humiliated on account of their religious and linguistic differences. A study on 'Inclusion and Exclusion of Students in the Schools and Classroom in Primary and Upper Primary Schools' conducted, particularly in six states by Ministry of Human Resource Development in 2011 highlighted the fact that children coming from socially disadvantaged groups reported the prevalence of social exclusion in the school premises. Gender and caste based discrimination were higher in their everyday realities. SC girls were asked to sweep the floors. The teacher used derogatory remark based on their caste, gender and socioeconomic conditions. Children were made to follow caste and gender based tasks in the school. Children from well off family were reported that they prefer to go back home during lunch hours instead of eating in the school with their other classmates. Even some community denied having school meal if the cook was not of their own community. Discrimination based on gender, Caste, religion, regions were highly prevalent in the schools.

Schools were seen as social institutes which not only propagate stereotypes, but also strengthen the social taboos prevalent in the society. Schools are more interested to preserve and maintain the social orders of the society. The school acts as social institutions that legitimizes the social inequalities and maintain the status quo. A study, 'Child Abuse in India-2007' conducted by Ministry of Women and Child Development, Government of India reported that every two out of three school children faced corporal punishment.

Another study 'Eliminating Corporal Punishment in Schools' conducted by the National Commission for Protection of Child Rights in the year 2009-2010 in seven different states i.e. Andhra Pradesh, Delhi, Orissa, Rajasthan, Tamil Nadu, West Bengal and Madhya Pradesh over 6,632 children of age group 3-17 years. These children were from different types of schools and belonging to different socioeconomic background. Children across different states reported that experiencing one or the other form of punishments are their everyday reality independent of the place and the type of school they study. Findings revealed that only nine children denied of experiences of any kind of punishment in the school setting while 99.86% of children acknowledged that they have received one or the other form of punishment in schools. This study revealed the very important fact that the type of schools (Central school, State run Schools or Private schools) does not create much difference). This indicates that children are subjected to experience punishment independent of the kind of school they study. Children reported the experiences of all three types of punishment, i.e. 'Direct Punishment' - where the body act as the site to inflict pain, 'Verbal punishment' and 'Posture punishment'. Fostering posture punishment is one of the most humiliating punishments where a child has been subjected to experience public humiliation by remaining outside the classroom or asking to stand up on the desk. It generates a sense of shame among children. Children come under the notice of other. It has been reported that children were largely beaten up by a cane. Cane as traditionally can be seen as an instrument to control and threaten the children. This report indicates that 57.5% of children were severely injured as the result of the continued practices of brutal punishment. Boxing of ears (57.4%), made to stand with hands up (42.7%), squatting (41.4%), hair pulled (21.6%), made to stand on one leg (15.2%), wringing the nose (6.8%) and hands wrung (19.2%), mental characteristics/ derisive adjective (81.2%) and caste and community based (10.1%), Slapped on the cheek (69.9%), fingers pressed with pencil in-between (12. %) and getting tied to a chair / table (1.2%) and getting electric shocks (0.4%) etc. were some of the popular forms of practices experienced by children in school settings. Usage of cane, scale and hand were the regular instrument to inflict pain among children. This report discarded the gender based notion that girls are less beaten up in school settings than boys. In fact girls equally reported the experiences of punishment in schools similarly as their male counterpart. 16.2% girls and 15% boys of the state run schools reported that they were not allowed to use toilets on the school premises. Hair pulling was certain practice which was highly practiced in case of girls than boys. Children reported that they were punished for various reasons like for 'academic reasons' like for being unable to do homework, for not bringing class notes, textbooks, for being unable to answer the questions asked, for being unable to put a finger on the text while reading etc. Secondly, children were also punished for performing 'child like behaviour'. They were punished for talking with classmates, for making fun, for secretly eating in the classroom, for being late in coming from the toilet. Children also reported that they were denied to use the toilet. They punished for breaking the norms and rules of the school like not wearing the proper uniform, for missing classes, for running

away from the school etc. They were also punished arbitrarily when the teacher was angry she hit children for no reason.

It is apparently visible for the findings of the above study that the children were not only beaten for their poor academic performances, but also for not being able to fulfil the teacher's demand such as being unable to bring a notebook, being unable to complete homework etc. This indicated that the school acted as a space which legitimizes the culture of abuse in the social sphere. It was found that the school concerned authorities as well as teachers were frequently using abusive language while dealing with undesirable behaviour of the students. These verbal abuses also included derogatory remarks related to the caste and gender of the child. Under Scheduled Castes and Tribes (Prevention of Atrocities) Act, 1989, the Caste and tribe based abuses have been completely banned, but the practices of verbal abuses and discrimination on account of their caste and gender are still prevalent in the school setting. In the above mentioned study children of age group between 3-5 years suffered severely under verbal abuse category. 82.2% of children of age group 3-5 years reported that they were given derisive adjectives based on their mental characteristics even though they were unable to comprehend them fully. 10.1% of children between the age group 3-17 years experienced caste and community based abuses. Children were considered as incapable to learn since they do not possess the similar environment at home with those classmates who come from well off families. Children reported their helplessness and somehow showed their vulnerability to oppose the unequal, unpleasant and painful treatment experienced by them.

In order to increase the intensity of the pain children were asked to remain in a same posture for a longer period of time. The report analyzed verbal abuses into five categories i.e. Based on mental characteristics, caste and community based, relationship abuse, animal based and threatening phrases. With the repeated practice of verbal abuse teachers or the other personnel of the schools not only labels the child into a certain category but also fosters further discrimination based on caste, class, gender, race of the child. The language of the child again became the marker of discrimination. Teachers need to act as the enabling role or facilitator in order to integrate the child's language in the classroom, but in reality teacher is performing the role of prejudices promoter where the teacher is promoting stereotypes inside the classrooms as well as in the mind of the children. Teachers are asked to bridge the gap between the child's home and school language by using the child's mother tongue as the medium of instruction in primary classes as per the recommendation of N.C.F (2005) under the principle of three language formula. Child's use of his or her own language need to be encouraged and integrated in the classroom.

There is legal, constitutional provision to dissent and completely negate use of caste based derogatory remarks but our schools on large were found practicing and abolishing the constitutional principles. Existing literature indicates that these humiliating practices could severely hamper the child's own self image and child's own understanding of his own self concept.

It is visible from the findings of the above study that teachers were largely insensitive towards the socioeconomic background the students. The teacher acted as an oppressor in the classroom who not only suppress the child's biological need to use the toilet, but also victimize the child for being unable to perform according to the established norms and regulations of the school. Child's inability to perform well in the class resulted in a harsh punishment. Unable to bring books and stationeries in the school considered as disrespect towards teacher's authority and further penalized the child. The act of punishment begins at a very tender age of the child. Children were hit by dusters, chalks, sticks, bottles, books, pens. Objects or resources which can be used as the teaching-learning aid or supportive aid in the process of a child's learning, was used as the tool to hit the child.

It can be drawn from the existing literature that children were found most vulnerable participant in the school where least attempt has been made to understand the consequences of the punishment on the children. Different schools may have different infrastructure, fee structure, classrooms and other amenities, but the kind of experiences children were subjected to within the school premises were found more or less similar in nature.

#### **A PUNISHMENT USED AS AN INSTRUMENT TO CREATE FEAR AMONG CHILDREN**

Various studies and reports of newspaper articles indicated that Indian classrooms completely deny children to act like a child. Inappropriate behaviour considered as disobedience and uncivilized. Children are demanded to perform all the tasks of school without questions. Children were asked to submit themselves fully to the school authorities where children are expected to behave like an adult. Children are not treated as children instead they are seen as a body and it is the task of the school authority, particularly the teacher to exercise full control over the child's body and mind. Incidences of electric shocks and beating children with chalks and duster indicate

that any object available in the school premises meant to facilitate child's learning, are used as an instrument to inflict pain on the child's body.

The school consistently negate the space where children's problem can be heard. If the child is unable to perform the required rules or order of the school, the child is under constant threat. Schools are functioning under rule based regulating institution where any mistake or negligence on the behalf of children will be under the subject of harsh punishment. The teacher acts as a governing agency of the institution or performs the role of surveillance where the entire effort of the teacher and principal is to inspect the child's behaviour completely. The entire act of exercising control over children by beating them brutally must not be justified by any argument. It is completely negating children's right to study in a fearless and welcoming environment.

### **SCHOOL ACT A SPACE WHICH IMPARTS THE SKILLS TO BECOME A CONFORMIST**

Existing studies on corporal punishment indicates that school trains the children in such a manner that right words are coming from teachers and students need only to internalize those right words as the words of God. The culture to object the teacher's authority are rarely practiced or even encouraged in the school environment. The school consistently found as an institute which is interested to produce conformist rather than encourage becoming a critical thinker.

Indian classrooms are not considering child as the equal partner for their own learning instead they are in power relations with the teacher where the teacher is the authority figure who constantly monitors the children and children passively accept the continued interventions of the teacher over their minds and bodies. The powerlessness of the children is highly misused. Fear of being punished prevents the child to live life with dignity. It not only impacts on the child's mental health, but also impacts their social behavioural patterns. Kumar (2016) in his book 'Education, conflict and Peace' also says that teacher's demand on children to rote memorize answers and reproduce the same, this practice undermines the whole idea of the constructivist pedagogic approach to learning where children need to provide adequate space in the classroom where the child can explore, create and construct the knowledge of her own. Teacher at the same moment unknowingly kill the curiosity of the child if teacher creates the fearful environment where questions asked by students receive discouragement in the form of punishment.

The whole attempt can be seen as the inherent politics to keep children of poor and disadvantaged group to remain outside the school environment. Largely the culture of silence is the appreciated culture in the classroom, the most silent class considered as the best class of the school. Any attempt to ask a question is considered as the disrespect to the teacher. The school does not enforce the opportunity to question and learn collaboratively with other peers since this whole idea of collaborative learning disrupts the popular culture of silence in the class. The most important aspect here comes that the teacher whose class has been maintained with complete silence is considered as the best teacher. The basic responsibility of the teacher is to maintain pin drop silence in the classroom where there should not be any disruptions or loudness. Even the parents were also found being complaining if the teacher does not beat their child. The whole objective of the teacher is to maintain strict behaviour with children where leniency or friendliness in the nature of treatment with children is never encouraged. The entire role expectations from the teachers also lead them to behave arrogantly to some extent. Sinha (2009-2010) argues this accepted culture of silence in the classroom and highlights that this norm of silence classroom not only prevent 'Quality Education' which National Curriculum Framework (2005) talks about but also discourage the culture of questioning and learning from others.

### **SNATCHES AWAY THE CHILDHOOD OF THE CHILDREN IN THE NAME OF DISCIPLINING THEM**

Often the classroom interaction between teacher and students are not guided by democratic ideas, but it is the imposition of the teacher's power onto the children which snatches away the childhood of the children. The above findings explicitly highlighted that corporal punishment was the continued reality irrespective of their type of school, age and gender. Corporal punishment is the regular common practice to correct the child's undesirable behavior. Teacher instead of acting as a support system for children to learn, were found in most of the cases as impatient in dealing with children. Fear of being punished impact on the children's dignity at a very early age. Various studies reveal that school authorities do not trust on the child's potentialities to learn. The school has been seen as a violent space which inculcates culture of fear among children.

### **CHILDREN ARE SOCIALIZED TO ACCEPT THE PUNISHMENTS ARE MEANT FOR THEIR BETTERMENT**

The NCPCR Study (2009-2010) revealed that that children themselves justified the act of punishment by the teacher. It has been mentioned largely that punishments are means for their betterment and well being. Children

approved their submissions to the teacher's authority. It has been internalized among children that punishment will lead them to perform better in their lives. They are socialized in such manner that the teacher is there to correct them for their betterment. Anyone who disrupts this pre established culture of the classroom are either thrown out of the classroom or penalized for upsetting ritual of a classroom. This whole scenario reflects how children are treated in a classroom and kind of perceptions and attitude we hold towards them. Even fixed timetable, fixed curriculum, seating arrangements, morning assemblies, examinations and observations could be seen as the mechanism to maintain complete control over them. Children's movements within the class are even restricted through tables and desks. These desks create hurdle in their free movements. This is a systematic attempt to maintain control over their bodies and minds. But we cannot forget that there are marked differences between crime and discipline, between terror and penalization and cannot allow schools the perpetuation of violence in the name of disciplining children.

The fear of being evaluated inculcated in the minds of children, which in a way creates barrier towards their inner urge to unfold their natural capacities and potentialities. The teacher performs the role of a judge; she not only judges them, but also further labels them as good, average, poor etc. Children are expected to legitimize the perpetuation of violence and support when the teacher penalizes them. We need to reflect towards the politicization of legitimized culture of violence and introspect our own traditional understanding about who the child is? The orthodox, traditional, and biased understanding of children needs our serious reflections. Various constructive theory highlights on the very fact that children are actively involved in the process of knowledge construction and findings saddens us that this principle of active knowledge construction is highly negated in our Indian classrooms. The culture of silence has social sanction where an agency of the child in her own learning is culturally negated.

#### **SOCIAL ACCEPTANCE**

Punishment as a mean to control children manifests culture of insensitivity and violence. The significant question comes here when it comes to violation of the child's rights. It is problematic that punishments clearly violate the rights of the children, but how did it go unnoticed? In most of the studies and reports it has been highlighted that the larger section of the society did not find corporal punishment as the severe problem which children face during their schooling. Even it has been identified that parents as well as teachers and the respective school authorities are least interested in taking essential efforts to abolish corporal punishment completely from the school. Punishment has been considered as the normal behaviour and if the teacher does not punish the child on her inappropriate behaviour, the teacher is considered as the weakest teacher who seriously lacks the skills to manage a class. It is the sole duty or the responsibility of the teacher to punish the child for their misconduct and keep full surveillance on her. The culture of punishment has socially been reinforced. Punishment enjoys social approval. It is believed that children need constant intervention from the adults.

Punishment has been culturally embedded in our Indian schooling system. The child has been doubly victimized since parent themselves disrespect the child's voice and deny to hear her. Sinha (2010) says that this indicates irresponsibility on the part of the parent since children out of fear fail to dialogue with parents about the kind of humiliation and disrespect, child faces in the school which further lead them to submit to violence. Children not only support the act of punishment by being submissive, but also internalize the very fact that the growing up is all about punishments and justify the act of punishment. They consider punishment as the part of their growing up where submission without question is the only way to become a good student or a good citizen. Foucault in his book 'Discipline and Punish: The Birth of the Prison' (1975) specifically talk about the inherent politics behind punishment and discipline-the politics here is to convert the individual's body as a 'docile submissive body' that remain disciplined and submissive towards societal orders and established norms. Teachers to the larger extend justify the act of punishment. For them the meaningful transaction could only be achieved when the class is under control and silent.

Kumar (2010) Teachers somehow find it difficult to cope with adverse working conditions of the school. They feel overburdened with the overcrowded classes. But in a way victimizing children for structural difficulties can never be justified. Children are no longer responsible for overcrowded classrooms and increased workload. There is no study which reveals that punishment brings positive outcome. Children are more vulnerable and the use of punishment symbolically represents their law status in the society, it signifies that adult world does not consider them as the equal member of the society. They are somehow left behind when it comes to policy making and considering it in their voices. There are laws for protection of the child's right in almost every state, but the social attitude towards children legitimizes use of punishment. According to Newell "Some adults believe that their religion gives them a right or even a duty to use corporal punishment. The international human

rights instruments uphold the right to freedom of religious belief. But belief cannot lead to practices which breach others' rights, including their right to respect for their human dignity and physical integrity. Violence of any kind cannot be dignified or justified by reference to religion." Children to the great extent acquired the learned helplessness. When children are punished in front of the other onlookers (parents, peers, teachers, principals, relatives, friends, etc.) It becomes the part of their growing up experience. They internalize that receiving punishment in front of anyone is the normal ritual and in a way teachers or parents prepare the children that punishment is the necessary and normal ritual where there is nothing problematic. The loss of the dignity with freedom become ritualized act. Punishment has so embedded in the school culture that it has never seen as sudden or something shocking. Kumar(2016) mentions that the culture of punishment has become a normal activity of our Indian classroom. It is not only socially sanctioned but also culturally practiced. The existence of corporal punishment is socially approved practice. And it has been expected from the teacher to fulfil her moral duty to perform violence on children in order to correct their deviant behaviours. The teacher enjoys this moral responsibility and never thinks back to lose her chance to exercise it. It is the moral obligation on teachers to control children. It is usually believed that children do not know and it is the task of the teacher to impose information in the mind of the child. Freire in his book 'Pedagogy of the oppressed' (1972, 47) rightly said that "The teacher confuses the authority of knowledge with his own professional authority, which he sets in opposition to the freedom of the student. The teacher is the subject of the learning process, while the pupils are mere objects."

Children are domesticated in such a manner that they adapt to the other authoritarian agencies of the school and loose her inner consciousness of being an equal change creator of the society. This is well intended act of the teacher where she suppresses the students and compels students to allow oppressions. Broadly the idea is to create passive and ignorant citizens of the country who speaks and thinks less. The culture of fear basically legitimizes the culture of ignorance and passivity. The child learns that it is the teacher who is always right, therefore the child usually depends on the teacher in his or her own learning. The child has been trained in such a way that the adult world is full of knowledge and the adult's constant intervention is always right, even if the kind of interventions which adults provide harms the child. Adult supervisions become very necessary and the child does not resist it.

### **TRAINING OF UPCOMING TEACHERS**

The increasing number of private B.Ed. And DIETs institutes in today's scenario largely producing teachers with faulty concepts and false knowledge base. These private higher education institutes are largely functioning on the principle of commercialization and money making ideologies where they are found less interested in producing teachers who can further ensure better quality education in schools. The aim of education is not meant only to maintain the academic culture with moralistic overtone through harsh punishments, but to challenge the existing structures based on the principles of inequality and uniformity. The over the imposition of the culture of correction need a pause and our consistence reflection. Are our education system meant for correcting deviant behaviours and reproduction of more or less uniform individuals? Why is there so much stress on correcting the behaviours and making the child to follow the established rules and norms? Cannot we appreciate the plurality in our thinking pattern instead of fostering the principle of singularity and similarities? These are certain question which can be used as a mechanism to stimulate the thought process.

The curriculum should be designed in such a way which ensures that the teachers need to be reflective and apt enough to deal with the issues of inequality, social diversities and learning abilities. Children should be treated sensitively where teachers function is to acknowledge different needs of the children instead of applying one uniform principle over all of the students. The issues like corporal punishment which acknowledge social sanction need to address carefully. The consistent pressure on the teacher to make children perform well, sometimes lead teachers to take harsh measures to fulfil the parental and societal expectations need to be greatly challenged and the entire idea of performing well in exams needs our greatest attention. The dangers of punishment and its consequences need to be discussed. Alternative measures could be strategized to deal with disciplinary issues. There is no one size fit for all formula to deal with disciplinary issues instead different approaches should be used differently with different issues.

### **CONCLUSION**

School has become a site where there is a perpetuation of violence, which legitimizes the culture of fear and generates ignorant minds. There are all good with papers and legal provisions, but when it comes to Indian classrooms the reality is difficult to even imagine. Children are at the lowest strata; they are consistently ignored and neglected. School again becomes the site which negates the voices of children and violates their rights in each successive day. It is ironical that one who is helpless (teacher) is oppressing the other helpless (children)

and creating the crowd of helpless individuals and thus in a way school legitimizes the learned helplessness and learned powerlessness among so called dependent individuals.

Public interventions need to be encouraged where children should be encouraged to raise their voice against any form of punishment. They should be encouraged to make complaints against violation of their rights instead of accepting punishment as the naturalized everyday phenomenon. National Commission for Protection of Child Rights (NCPCR) and State Commission for Protection of Child Rights (SCPCR) need to address this issue with great care where immediate suspension and actions against teachers or school management should be taken. School Management Committee (SMC) needs to be involved in the matter of addressing issues related to corporal punishment and sexual harassment in the schools. Teacher students' relationships should be based on the principle of humanity and equality, where the teacher needs to be sensitive towards children and address their needs and respect their childhood. The teacher need to inculcate the values of non-violence among children instead of violence which further lead to the perpetuation of violence. The teacher should acknowledge the just principles while dealing with children where children from any socioeconomic background should be treated with respect, and efforts need to be made to ensure that the rights of every child should not be curbed. The sole purpose of the law is not only to prohibit practices of corporal punishment, but also to transform the attitudes of the teachers, parents and other involved members. The strong message need to be given to the respective members that punishment would not be tolerable. We will be unable to prohibit corporal punishment until or unless we do not bring attitudinal change. What we need is a comprehensive awareness to discourage corporal punishment. There is an urgent need to improve the quality of teacher training transactions and curriculum. The working conditions of the schools and the teachers need to be improved further. The elimination of corporal punishment is the social struggle which needs collectiveness in our efforts against the social evil which further can collectively challenges the socially approved biased mindsets of many of us. Corporal punishment does not only rob child's opportunity to learn with dignity but also influence their ability to learn to a great extent.

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**DIGITAL INNOVATION IN HIGHER EDUCATION**

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**ABSTRACT**

*Higher education is an optional final stage of formal learning that occurs after completion of secondary education. Often delivered at universities, academics, colleges, seminaries, conservatories and institutes of technology. Higher education is also available through certain college level institutions, including vocational schools, trade schools and other career colleges that award academic degrees or professional certifications. The right of access to higher education is mentioned in a number of international human rights instruments. Higher education includes teaching, research, exacting applied work and social services activities of universities. Higher education is important to national economies, both as an industry, in its own right and as a source of trained and educated personnel for the rest of the economy. for getting good results in the field of higher education requires digital innovation. Digital innovation is changing the education landscape at breakneck speed. Digital innovation is the application of new technologies to existing education problems or practices. Today, digital innovation is at the heart of every organization, we need to digitize internal operations to do things better, faster and cheaper, find new products and services to higher education. Innovative use of digital technologies increases the competitiveness of our higher education. It is the foundation of our future welfare as a nation. Thus we as a government must create favourable conditions for digital innovation to thrive. We need to adapt our regulations, remove obstacles to digitalisation and secure a first class digital infrastructure offering communication services of high quality. Universities have among the most demanding customers in the world, students. As digital natives, their expectations are set by the digital experiences they get every day. To meet those expectations universities need to ensure that they can deliver a compelling and immersive digital experience. This paper will show how digital innovation is necessary for quality higher education.*

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**INTRODUCTION**

India is a developing country and to achieve our goal we have to strength our higher education system. The continuing growth of the middle class in India has led to increased demand for higher education and we know that this demand cannot be met by the Indian higher education system. although the Indian government is planning to establish new universities and colleges in the near future, these will not be enough to provide places for all students who seek higher education .

Education is very important factor for the development of a country. We should make it appropriate according to the time and changing scenario of the world. Education provides an opportunity to reflect upon the social, economic, cultural and moral issues facing by a human being. India needs to focus on education for more educated and efficient people to drive our nation. In the world, there are many Indian who well known for their capabilities and skills. To develop India as a digital nation or to become a prosperous partner in global development, India has to strengthen higher education with *Digital Innovations*. As the world goes digital, higher education needs to follow along. Digitization will affect every activity, interaction, transaction and outcome at higher education institutions. Higher education is changing within today's digital economy and digital transformation and technology are creating this change. While the changes to higher education affect learning models and other aspects of an institutions, they also disrupt economic aspects in the business component of the school. Technology is also helping to make education more available and affordable to a wider variety of students. New forms of online education are competing with traditional higher education institutions. With the cost of traditional colleges rising, more students may opt for the lower cost and greater flexibility of online options, so colleges must find ways to complete with these alternatives.

While digitization is creating changes that higher education must respond to it. It can also help institutions adapt to new business models. digitization can provide support for changing management and staffing models. Institutions can use advanced analytics and artificial intelligence to come up with new workforce and staffing structures. Ideas for improving finances include changing the model to hire more adjacent faculty. Create automated support and use shared support staff.

Institutions can use also Big Data to shape their models and reduce costs for students. Many students go to college longer than they need to, technology can reduce this problem. Big Data can show institutions, advisors and educators when students through new systems. Measures like these can improve success rates and help students go through faster, which can streamline the system and reduce tuition costs for students. Colleges can

also use technology to complete with online education alternatives. They can create a blended learning experience that uses both classroom and mobile learning. This increase flexibility while also offering benefits of an in-person experience and the credentials of established institutions. They can also offer a progressive learning experience enhanced by technology and advancements. Institutions can use data and predictive insight to improve operations and management. This can help institutions keep up with changes and remain competitive. Educational institutions can be reluctant to progress since education and research generally take precedence over running the business. Also many colleges and universities tend to prefer traditional, tried and true approaches. He explains that shifting the perspective of the institutions can help it move forward with technology. After all, digitization can improve learning and research just as much as the business model.

Overall, the shape of the higher education field and higher education economics are changing with digitization and technology. Institutions are facing economic changes and they need to respond to these to remain competitive. Technology can help them adapt while supporting new models that provide growth and competitiveness.

### **HIGHER EDUCATION INSTITUTIONS FACE BARRIERS TO CHANGE**

Structure, culture and resources as the top three barriers to bring innovative solutions to their campus. In the face of these challenges, strong, transparent and supportive leadership is critical. In institutions where the chief academic officer really puts some teeth behind an initiative, some resources- whether its money or people or purchasing something that will help make a difference, that's when really expedite the change. Reimagine Education is a prestigious competition rewarding innovative initiatives aimed at enhancing student learning and employability. Technology, social change and the increasing cost have presented multiple challenges in higher education. It has added emphasis on the need to be innovative in an educational culture that tends to be wary of change

### **HIGHER EDUCATION NEEDS TO CHANGE**

Commonly said that , innovation is now prerequisite for survival. There is no doubt that higher education transformation is already underway, with every university leader indicating they are at least part way through their digital journey. *First of all.....it's not a matter of how to use new technologies within the current educational structure, it's a question of how the digital revolution is requiring a change in the structure and educational model..* Higher education needs to change but the innovations must align with institutions missions and need not always be revolutionary. A matter of fact that the old model will not service the future needs of educating the world and that it needs to fundamentally change or risk being made redundant. Students place a much higher priority on technologies to support internships and pathways to employment. Students and all others are agree on the importance of focusing on technology innovation that leads to improvements in the student experience. Digitising content, automating administrative processes and integrated systems might be considered 'digital hygiene' factors these days, however there seems to still be plenty of opportunity for transformation in this space. The main focus of digital innovation is create a more efficient and interactive student portal. Students are interested in alternative ways of learning as part of their university experience, although the current cohort are less interested in undertaking blended or fully online programmes.

### **STATE OF INNOVATION IN HIGHER EDUCATION**

Higher education experts reveal how their institutions approach digital transformation and what it takes to lead a successful project. Universities are focusing resources and manpower on improving outdated practices and technologies on campus with the latest innovations. A recent report from learning house and the online learning consortium surveyed academic administration in order to understand what university decision maker are really looking for right now and implementation strategies. "survey results show-many survey respondents and interviewees either called out technology specifically or gave examples of innovations that required new technology; some even equated innovation with technology.

While the implementation of new, cutting-edge tools is essential for planning an innovation agenda on campus, decision makers should understand the nuances of what innovation means for higher education institutions in order to make informed decision about campus integration.

- **What is higher education innovation-** when surveyed about what innovation actually means to higher education institutions, the only thing administrations could agree on was that there is no formal definition. "The implementation of new initiatives to drive growth , increase revenue, reduce cost, differentiate experience or adjust the value proposition." However the term innovation broke down into two distinct categories; problem solving and evolution. A university looking to solve problems may invest in education technology that alleviates some of the pressures of everyday tasks, while those looking to evolve may be more interested in technology that embraces new ways of learning campus.

➤ **Listen to user needs and create a plan-** while 50 percent of surveyed institutions said they are on the leading edge or fast followers in technology innovation. It is essential to have an idea before diving into a digital solutions project. One way is to understand the needs and wants of all players within the institution, from students to administrators, to create the most effective innovation strategy and sometimes students lend a significant voice to that strategy. Students drive innovation in actuality and probably in one of the more powerful ways because they shared their experiences that they have in one classroom with the faculty members in another classroom.

**Necessities of Digital Innovation in higher education**— Educators from all grade levels are coming to realize the benefits of digital innovation in classroom. Typically, education is one of the last industries to make extensive change, holding on to antiquated methods and practices. But through the digital transformation and the rise of educational technology, teachers have begun making drastic changes to their instructions, assessments and at much faster rate than expected. These current trends are making headlines in higher education because of the ways in which they are impacting student learning.

- **Augmented Reality/ Virtual Reality/ Mixed Reality** -Gone are the days where students are expected to sit quietly at their desks. Educational technology is succeeding in making learning collaborative and interactive. Augmented, virtual and mixed reality are examples of transformative technology that enhance teacher instruction while simultaneously creating immersive lessons that are fun and engaging for the student. Virtual reality has the capability of bringing the outside world into the classroom and vice versa. The idea of combining AR/VR/MR is highly anticipated.
- **Classroom Set Of Devices-** universities and colleges are moving away from BYOD or bring your own device and students no longer have to go to the technology lab for access to a computer or laptop. Recent years have shown an increase in classroom sets of computers that was made possible in part by federal funding. today's pervasive online environment poses exciting possibilities, ones that necessitate students are properly educated on Cyber Safety and individual responsibility.
- **Redesigned Learning Spaces-** Educators have since realized their classrooms must mimic the workforce, which has inspired them to create collaborative-friendly spaces to facilitate student learning. The onboarding of technology has supported their endeavor. 21<sup>st</sup> century classrooms are Smart Desks instead of individual seating. Students are going on virtual field trips instead of merely reading from a text, they are creating media instead of just looking at it. The redesigned learning space is laden with integrated technology, which means students aren't just using these things, but they are understanding how to use them in order to achieve a specific goal. colleges and universities are creating more informal campus learning spaces because they understand the importance creating and collaborating 24/7, not just when class is in session.
- **Artificial Intelligence-** The use of AI in higher education has already proven useful. Australia's deakin university used IBM Watson to create a virtual student advisory service that was available 24 hours a day, seven days a week. Another use for AI includes chatbots. Because chatbots are equipped with natural language progression, they have the human capability of answer questions about homework, helping students through a paperwork process like financial aid or paying bills and easing the workload of the people who would normally serve these roles. Other applications of AI in education include personalizing learning, evaluating the quality of curriculum and content and facilitating one-on-one tutoring with the use of Intelligent Tutoring Systems. Digital innovation doesn't aim to replace teachers, only to complement them.
- **Personalized Learning-** We are able to personalize learning more now than ever. Blended learning gives more responsibility to the student, as it involves less direct instruction from the teacher and more discovery based methods of learning. Blended learning is an example of how students can control certain elements of their learning by making decisions about things like where and at what pace they move through material. Adaptive learning technology collects information about student behavior as they're answering questions and then subsequently uses that information to provide instant feedback in order to adjust the learning experience accordingly. Educational tools with adaptive Sequences continually analyze student data in real-time and make split second decisions based on that data. It automatically changes what comes next in a sequence, be it altered content or a different order of skills, in response to how student a student is performing.
- **Gaming-** playing and learning collide when classrooms utilize gaming as an instructional tool. Gaming Technology makes learning difficult subject matter more exciting and interactive. As the digital innovation

progresses, it is quickly being used to enhance educational games in every discipline. Virtual game worlds provide a unique opportunity to apply new knowledge and make mission-critical decisions, while identifying obstacles, considering multiple perspectives and rehearsing various responses. Because these games are designed to provide immediate feedback, students are intrinsically motivated to keep playing them, honing skills throughout.

New digital innovation models are exciting and offer previously unthinkable possibilities to students, but they require constant IT support. As educational institutions and colleges continue to jump on the bandwagon and adopt these digital transformation trends, we must consider the current paradigm for technology instruction and move toward a team-based approach. As student expectations increase, responsiveness to those needs must increase as well.

### **CONCLUSION**

Digital Innovation has come to play a pivotal role in virtually every area of education and we were delighted to see a very high standard of submission once again for the digital innovation in teaching or research category. The adoption of new digital approaches or infrastructure has led to innovation in research or modernised and enhanced the student experience and whether an innovation could be scaled within the institution. Reimagine Education is a prestigious competition rewarding innovative initiatives aimed at enhancing student learning and employability. Technology, social change and the increasing cost have presented multiple challenges in higher education. It has added emphasis on the need to be innovative in an educational culture that tends to be wary of change.

Digital innovation has driven major changes in the world of higher education. That world is now a true marketplace, offering students more options than ever. Those students approach their university experience as consumers, looking for the best return on their investment of money and time. As fees continue to rise at both traditional and nontraditional schools, students have clear expectations about the quality and convenience of the digital tools offered by their schools.

Site based student information systems were built to support traditional administrative and academic frameworks and are periodically upgraded in an attempt to accommodate new demands. They typically require a large investment of IT funds and staff and create complex subsystems for students to manage, with multiple accounts and logins. Under this kind of system, students still struggle with completing paperwork, scheduling and handling tasks such as financial aid and advising, which may have to be managed in person. Along with expecting the same level of digital convenience they're used to in daily life, these students are looking for specific tools to make it easier to manage all aspects of college life.

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**SKILL DEVELOPMENT IN TEACHER EDUCATION**

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**ABSTRACT**

Developing skills is a prerequisite in which a person's knowledge is made to move his abilities efficiently in one direction and to work efficiently. He does any work in his style that gets attracted by other people. Skill the ability to use one's knowledge effectively and read to execute our plans with success there are many skills needed by students that are essential to learning.

Not only will these skills prepare our for our next level of education, they will also help we succeed at our current level. Some student skills include: such as Accountability, Analyzing information, Communication, Critical thinking, Digital literacy, follow direction Imagination, Initiative, Organization, Problem solving , Reading Time management Writing etc. There are many skills that assist a person in personal development . These skills can improve our life in various areas.

Personal life skills include: Adaptability Caring Common sense Cooperation Adaptability Curiosity Flexibility Friendship Initiative Integrity Patience Sense of humor communication Stress management etc.

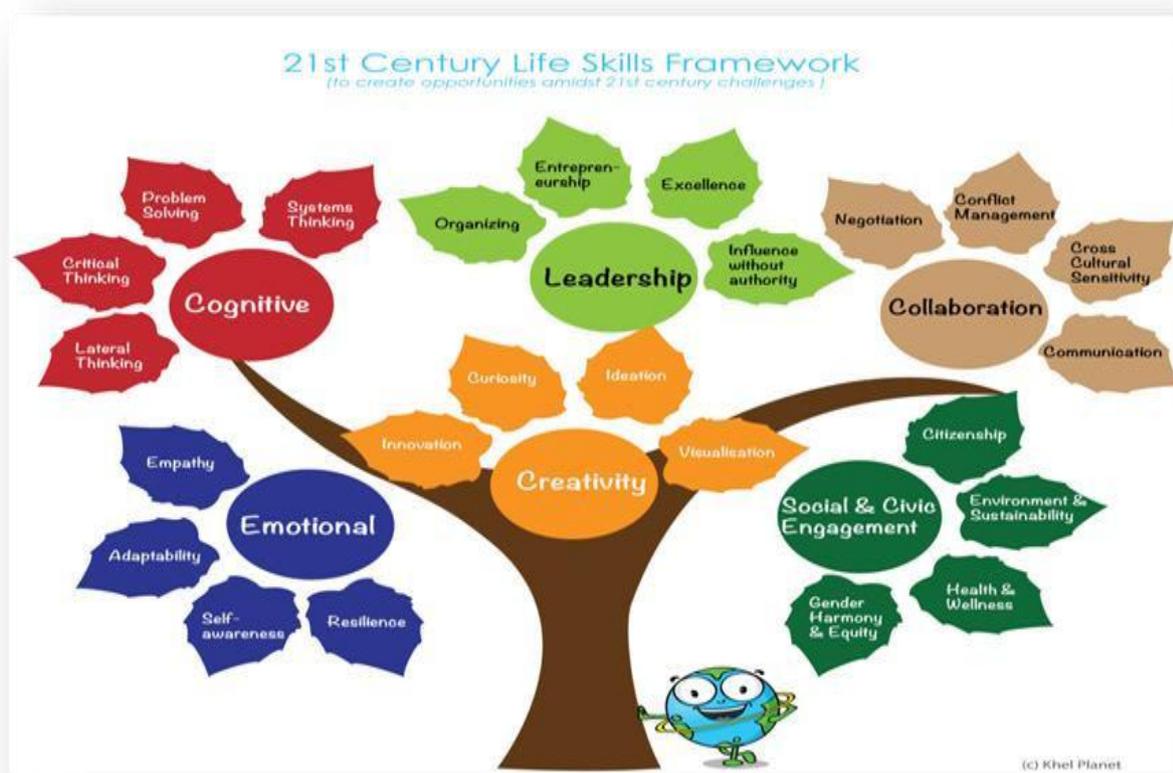
Keywords: Life skills. Teaching skills Conceptual skill, Interpersonal skill, Communication skill, Decision making skill, Problem solving skill

**INTRODUCTION**

A talent development is a capability to hold out a task with determined result typically at intervals associate quantity of your time energy each. Skill can be general and specific .three broad categories of skill are suggested and these are technical, human and conceptual

Life talent that's necessary or fascinating for full participation in lifestyle. Life skills are abilities for adoptive and positive behavior that enable human to deal effectively with demands and challenges of life this .this concept is also termed as psychological competency

In following figure there are six type of life skills – cognitive, leadership, collaboration, creativity, and collaboration, emotional and social &civic engagement which need in 21st century.



Any talent that's helpful in our life will be thought of a life talent. Tying our shoe laces, swimming, driving a automotive and employing a laptop area unit, for many individuals, useful life skills. Broadly speaking, the term 'life skills' is typically used for any of the talents required to deal well and effectively with the challenges of life.

Certain skills could also be additional or less relevant to you reckoning on your life circumstances, your culture, beliefs, age, geographic location, etc. However, in 1999, the World Health Organization identified six key areas of life skills:

- **Communication and interpersonal skills.** This broadly describes the skills needed to get on and work with other people, and particularly to transfer and receive messages either in writing or verbally.

**Decision-making and problem-solving.** This describes the skills required to understand problems, find solutions to them, alone or with others, and then take action to address them.

- **Creative thinking and critical thinking.** This describes the ability to think in different and unusual ways about problems, and find new solutions, or generate new ideas, coupled with the ability to assess information carefully and understand its relevance

- **Self-awareness and empathy,** which are two key parts of emotional intelligence. They describe understanding yourself and being able to feel for other people as if their experiences were happening to you.

- **Assertiveness and self-control.** These describe the skills needed to stand up for yourself and other people, and remain calm even in the face of considerable provocation.

- **Resilience and ability to cope with problems,** which describes the ability to recover from setbacks, and treat them as opportunities to learn, or simply experiences. It is also true that different life skills will more or less be relevant at different times your life.

For example: • when at school or university, you'll need to study skills. These may include understanding how to organize yourself for study, do research, and even write up a dissertation or thesis. These are not skills that everyone will need, but writing skills are likely to be useful in a variety of careers and jobs.

When buying a house, you may need to employ negotiation skills, and you will certainly need plenty of patience and good temper. These skills are probably to be high on your 'essential life skills' list if you have got children!

- You'll need to work on your employability skills to get a job, and will also need to think about how you apply for a job, and how you might cope in an interview;

- When you have a job, you may need to develop leadership skills, especially if you need to lead teams or groups;

- When you start a family, you'll need parenting skills.

You may also find that time management and organizing skills become much more important. However the most important life skill is the ability and willingness to learn by learning new skills, we increase our understanding of the world around us and equip ourselves with the tools we want to measure a additional productive and fulfilling life, finding ways to cope with the challenges that life, inevitably, throws at us.

Most people associate learning with a formal education, but learning can, and should, be a lifelong process that enhances our understanding of the world and improves the quality of our life.

### **TEACHING SKILLS**

The teaching skills area unit outlined as a gaggle of teaching acts or behaviours meant to facilitate students learning directly or indirectly.

Teaching skill Teaching offers the chance to change other people's lives permanently for the better. As an educator you'll be able to facilitate to develop somebody's subject information and perhaps even their mind and temperament.

Teaching is an incredibly rewarding thing to do and good teachers are needed everywhere: in schools and college classrooms to educate the young, as well as in the workplace and other settings to teach adults and colleagues. One-on-one lecturers could tutor somebody during a specific subject or for his or her wider personal development. However, teaching anyone also can be wearing, stressful and demanding. It is a responsibility and any slip is extremely visible.

People's minds and motivation vary a great deal and teachers have to find many different ways to connect with their students. Teaching is not always recognized for being the difficult task that it is in terms of status or financial reward. As well as subject data, there square measure another, more general qualities that teachers need

As well as subject data, there square measure another, more general qualities that teachers need.

**1. Enjoy communicating your understanding to others.** There is positively a performance part to most teaching. Our section on social skills, together with effective speaking, covers this in more detail, and there is a great deal of overlap with presentation skills.

**2. Have confidence.** Students will need the confidence to look calm and professional even when tired and stressed.

**3. Have great organizational skills.** Have you ready for the session and done any marking in time? Have you unbroken what's required for anyone within the cluster World Health Organization was away? If you are part of a teaching organization, have you feedback results to any interested colleagues?

**4. Work effectively in groups.** In a faculty or faculty, you will be a part of a gaggle that teach at your level or inside your subject. If so, you'll need to agree between you what's to be educated and the way to handle any difficulties.

**5. be able to deal with conflict.** There could also be students World Health Organization have to be compelled to be told to figure tougher, or a disagreement between students that you simply have to be compelled to facilitate to delineate

**6. Motivate the students to do their best.** This may need encouragement and/ or criticism, and probably a bit of both at different times.

**7. Empathies with Students.** If you'll see that your student's square measure exhausted, there may be no point in trying to teach a very complicated topic. You need to make a sense that you simply square measure all operating along towards identical goal. This means building up trust and rapport.

**8. Give feedback immediately.** Whether this takes the shape of comments on performance or marking written work, it needs to be constructive. Offer praise yet as criticism whenever doable and tell your students however they'll improve.

## CONCLUSION

Thus, we say that the existence of life skills in the constantly changing environment is an essential part of being able to face everyday challenges..... To cope with the increasing speed and transformation of modern life, it is necessary to deal with the ability to deal with stress and frustration. At the same time, the teachers will be encouraged to create a positive learning environment should protect the management and require appropriate discipline techniques. In our daily life, teachers and students are both good at teaching skills in a healthy environment.

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**EXPLORING FACTORS INFLUENCING ONLINE BUYING OF UNIVERSITY STUDENTS****Mamta Chawla<sup>1</sup>, Dr. Mohammed Naved Khan<sup>2</sup> and Dr. Anuja<sup>3</sup>**Research Scholar<sup>1</sup> and Associate Professor<sup>2</sup>, Department of Business Administration, AMU, Aligarh  
Associate Professor<sup>3</sup>, AIMA, Centre for Management Education, New Delhi**ABSTRACT**

*Huge growth in online buying is witnessed, led by China, India and other countries in the region.*

*Previous studies have highlighted that demographics played important role while considering buying online. Specifically students, even in the developing countries have been found as one of the early adopter segments in adopting new products and ideas. The research study examines online buying behavior of university students and the factors as drivers. Online survey has been conducted through structured research instrument to collect insights about student's preference and spending over internet. Statistical technique Principal Component Analysis was employed in the study and four important factors were extracted. These are termed as "Conscious choice", "product features", "pleasant buying experience" and "Delivery Risk".*

*Keywords: Online Buying, Exploratory Factor Analysis, University Students, India. JEL Classification: M31, L81, L86, D12*

**INTRODUCTION**

Not only developed western-countries but even Asian countries, with poor infrastructure and low Internet penetration rates, are equally adopting online buying. With the largest population of youth in the world coupled with increasing disposable incomes of the rising middle class, India is 5th largest retail market in the world. (money.livemint.com). Internet is user friendly, fast and enable access to information from anywhere around the world with no time limitation. For young students apart from being a source of academic information, it also allows to socialize with friends and family (Otuola, 2013). Numerous research work highlighted that the rate of internet usage in India is growing at very fast speed especially among younger generation in urban areas (Naik and Sankaranarayanan, 2014). Internet has empowered students with lots of information and encouraged buying online. Especially buying habits formed during early age are more likely

to be continued in the later part of the life as well. Further, students also play an important role as 'influencer' in the family buying. Therefore, current study focuses on the factors influencing online buying behavior of University students in India.

**BACKGROUND FOR THE STUDY**

Indian online retail sector is facing surge of online retailers resulting into increased competition. From grocery to electronics and even jewelry is available online and it is expected that number of online buyers will cross 120 million by 2020 (ASSOCHAM 2018). Established players like Future group, Tata's CLIQ (economictimes.indiatimes.com) and Reliance's AJIO into fashion e-retailing are to name a few foraying into e-commerce (Business-standard.com). As reported by IBEF (India Brand Equity Foundation)-

Online retail business is the next generation format which has high potential for growth in the near future. After conquering physical stores, retailers are now foraying into the domain of e-retailing. E-commerce is expected to be the next major area supporting retail growth in India. The industry is projected to touch US\$ 100 billion by 2020 growing from US\$ 30 billion in 2016. With growth in the e-commerce industry, online retail is estimated to reach US\$ 70 billion by 2020 from US\$ 3 billion in 2014

Amazon's Jeff Bezos expansion strategy for Indian market is a sign of huge potential in this industry. (economictimes.indiatimes.com). Even Indian top-retailer Defense Canteen has announced to go online (timesofindia.indiatimes.com). Furthermore the dynamics of online buying are different from offline buying. Apparels is one of the product category occupying maximum share of online retail sales followed by computers and consumer electronics (money.livemint.com) The drivers that engage a consumer and continue buying online have been researched thoroughly by number of scholars, to provide basis for future strategy formulation.

Interestingly, most of the primary online buying research studies used young students as a major proportion of the sample studied; either considering the segment as most representative of online buyers and/ or due to easy accessibility. But, it is worth mentioning that the student population is one of growing market segment that numbers of brands are targeting. Therefore, current research is directly addressing the requirement to gain insights into the online buying behavior of university students only. Main rationale for selecting segment is the potential power of this segment to form one of the opinion leaders in exploring and continuing with online for

retail shopping. In addition to increased internet penetration rate, easy availability of hand held devices i.e. smart phones, tablets has empowered this segment to influence the market trends. The likelihood of developing loyal customers by establishing initial retailer-customer ties, provided strong rationale for exploring this consumer group, and their behavioral intentions for online shopping (Makhitha and Dlodlo, 2014). Thus following research paves direction to undertake current research:

- What is current level of online buying of university students?
- What are the factors influencing their online buying?

### REVIEW OF LITERATURE

Considering that the aim of this research is to study online buying behavior of university students in India and to be diligent, it is impractical to include all the factors available in the literature in one research. Furthermore, the literature review suggests that there is no one particular element that has great influence on online purchase intentions and continuation but there are common constructs found e.g. TAM constructs are most extensively used as determinants of online buying (Jain, Goswami and Bhutani, 2014). Previous studies indicate that online buying behavior is influenced by number of factors. The most common constructs studied have been borrowed from different theories and models; which are discussed in the following section.

Most of the TAM models have been utilized in the present study. Technology Acceptance Model (TAM) is the most cited model (Cha, 2011) which explains adoption of Information Technology through adopting Theory of reasoned action (TRA- Fishbein and Ajzen, 1975). It is specific to information system usage which is dependent upon six variables namely: “perceived usefulness”, “perceived ease of use”, “attitude towards use”, “intention to use” and “actual usage” (Davis, 1989). Here “perceived usefulness” (PU) is defined as the degree to which a person believes that a particular system would enhance his or her job performance; “perceived ease of use” (PEU) is defined as the degree to which a person believes that using a particular system would be free of effort; “attitude towards use” is the user’s evaluation of the desirability of employing a particular information system application. “Behavioral intention to use” is a measure of the likelihood of employing the IT application. Davis (1989) asserted that PU and PEU represent the beliefs that lead to IT acceptance. Empirical tests suggest that TAM constructs predict intentions and usage. But it is assumed that usage is volitional, that is, there are no barriers that would prevent an individual from using an information system. Although, there are many factors preventing a person from using an application such as perceived user resources (Kieran et al., 2001) and perceived behavior control (Ajzen 2002).

Various TAM extensions have also suggested in the literature as TAM is the most parsimonious and generic model that is used to study both initial and continued IT adoption (Hong, Thong and Tam, 2006). Wixom and Todd (2005) extended TAM into ExTAM model. Another important extension is referred as TAM2 (Venkatesh and Davis 2000), which includes subjective norm as significant influencing PU and behavioral intention. Kim (2012) integrated model TAM with initial trust belief. Other studies examined relative strengths of the associations between the individual independent variables and online buying intention clearly indicated that Customer Service, Trust and Reliability can explain much of the variation in online buying intention (Johar and Awalluddin, 2011).

Perceived risk is another most used construct in the similar studies, defined as the subjective belief of consumer suffering a loss in search of a desired outcome (Jain, Goswami and Bhutani, 2014). It has stronger correlation with willingness to shop online than convenience (Zhou, Dai and Zhang, 2007). According to previous findings perceived risk has a negative influence on buying attitude towards online shopping (Pi et al., 2011). Various risks associated with online shopping behavior are categorized as- financial, product performance, psychological, physical and time/ convenience loss (Wani and Malik, 2013).

Trust has been identified as another variable playing an important role in building intention to buy and rebuy (Al-maghrabi and Dennis, 2012; Kaihong, 2012; Ibrahim et al., 2013; Liat, Shi Wuan and Wuan, 2014; Mou and Jason Cohen, 2014). Moreover, to overcome the inherent limitation of employing different Information System-adoption models, construct of trust, perceived risk and security concerns have been strongly established in the online buying literature.

Trust is critical in the online shopping context because the buyers and sellers normally complete the transaction through website and might not necessary meet each other face to face. The buyers, therefore, will be worried that their personal information and money will be transferred to third party without their knowledge. In addition, trust is important because it allows social control and provides buyers reason about reliability, capability and honesty of possible business partners. Thus, it is a challenge for businesses that engaged in e-

commerce to ensure that consumers have sufficient trust in order to attract them to purchase online (Yao & Li, 2009). Kim, Chung and Lee (2010) proposed that consumers will most likely to purchase online, if the website is perceived as trustful. In the context of online health services, study on university students in South Africa; it was reported that trust dimensions were influencing consumer attitudes and intentions (Mou and J Cohen, 2014)

Perceived trust has been reported as positively influencing intention, adoption and continuation behavior. Other related and equally important, extensively studied predictor variables were- risk (having inverse relation) and privacy and security concerns. Online security concern varies over the product category bought online (Cha, 2011). The literature on online buying dominates with the studies that emphasis that trust will increase if the online buyer believes buying and vendor positively and favorably. In contrast, trust will decline if the online buyers do not believe the trustworthiness and reliability of online medium and vendor thus resulting into lowering of continuation intentions to buy online.

Hedonic Motivation is linked with consumers who have experiential shopping behavior. These motivation been studied in the similar studies of students. Hedonists not only gather information to shop online but also seek fun, excitement, arousal, joy, festive, escapism, fantasy, adventure, etc. (Monuwe et al., 2004 cited in(Jain, Goswami and Bhutani, 2014)). Hedonic shopping motivation refers to the enjoyment of shopping for its own sake, the pursuit of fun, novelty, and excitement while shopping (Kim and Eastin, 2011). These characteristics match with the profile of university students, in the context of building positive attitude towards online buying. Hedonic shopping orientation as aspect of enjoyment had a significant positive relationship with attitude toward online shopping.

Another similar concept used in research is termed as “Recreational Shopping Consciousness”, as it is perceiving shopping as a pleasant activity and buying just for the fun of it (Park and Gretzel, 2010). Recreational shopping motives were reported to be positively influencing perceived usefulness. Contrastingly, in a Malaysian study, hedonic consumers reported to have no significant effect with attitude toward online shopping whereas utilitarian motives are found (Delafruez et al., 2009) which are termed as perceived usefulness.

Online Buying Behavior refers to the actual buying by university through Internet, for which they can use their laptop or university PC or tablet or smart-phones or any combination of all these devices. The demographic characteristics like age, gender, stay- status, pocket money, current stream of education are used as control variables which influence various constructs on which online-buying-continuing-intentions of students depends.

Subjective Norms is defined as the perceived social pressure that most people who are important to him/her think he/she should or should not perform the behavior in question (Ajzen, 1991; Fishbein and Ajzen, 2011; Cameron et al., 2012). SN have been found to be strongly influencing intention to buy online (Turan, 2012) (Cha, 2011).

Product Characteristics Research studies focusing buying of different products online (E. Keisidou et al., 2009) e.g. books, travel, grocery (Hansen, 2005), electronics (Kim and Forsythe, 2010; Liu, Forsythe and Black, 2011; Bashir, 2013), e-ticketing (Sulaiman, Ng and Mohezar, 2008). Three major types of product: search, experience, and credence goods (Luo, Ba and Zhang, 2012). Search products are those that can be evaluated from externally provided information. Experience products, on the other hand, require not only information, but also need to be personally inspected or tried. Credence products are those that are difficult to assess, even after purchase and use (Brown, Pope and Voges, 2003) (Cha, 2011).

“Tactility” is to examine/ test, in terms of touch and sight, a product (Alkailani, 2009). Findings for this construct were found to have contrasting results in different cultural environments e.g. Chinese were not much concerned about the lack of face-to-face contact or the inability to touch and feel tangible products or credit as against Americans (Gong, Maddox and Stump, 2012). Study comparing online buying intention of “real” vs. “virtual” items reported different criterion employed for each by online buyer (Cha, 2011). Moreover, there is no uniformly accepted standard product classification available (Keisidou et al., 2009) so far in the context of online buying. For virtual items PEU, PU, enjoyment and security were not found significant, hence different strategies were proposed for both types of items.

In a Malaysian study it was reported that cheaper prices and wider selection were among dominant factors motivate to shop online (Delafruez et al., 2009). Contrastingly, Indians were reported to be influenced with variety and easy access to the wide range of merchandise (Wani and Malik, 2013).

Online Buying Experience is another important construct studied in the current study as its unique which includes impression formed during navigation to placing an order, making a payment which can be advance

online payment or at the time of delivery, then to receiving the product. Only “online experience” is formed during navigation and doesn’t guarantee making a transaction (Zhou, Dai and Zhang, 2007). The factors significantly influencing continuation reported to be previous purchase experience i.e. satisfactory level and perceived risk with regard to the consumers’ confidence level and trust in online shopping (Ibrahim et al., 2013). In another words, satisfied “online buying experience” can be used as a strong predictor of continuance (i.e., continuance to buy) intentions even more than “perceived usefulness” because the effect of the latter decreases over time (Zhou, Dai and Zhang, 2007).

**RESEARCH METHODOLOGY**

A thorough literature review about the methodology adopted in the past guided the basis for the present study. Quantitative research is adopted using online survey method. Online survey is broadly accepted in online buying studies as being most relevant and resource efficient. This pilot study is part of the doctoral research work and utilized items from previous studies. Google Forms has been used for data collection and SPSS (Statistical Package for Social Science) software, version 19 for data analysis.

**SAMPLE DESIGN**

Non- probability convenience sampling procedure was used to share instrument with the University students studying in Delhi NCR. The rational for choosing University students studying in Delhi NCR is that they spend considerable time in browsing information over internet and are more likely to buy online. The target students comprised of only internet user University students, majorly studying BBA, B.Tech and MBA, even if they may or may not buy online. Delhi NCR is targeted in the previous as well as here students are coming from different parts of the country for higher education. Research instrument was administered during last week of February. Only 168 responses were considered out of 210 for statistical analysis.

**MEASURING INSTRUMENT AND DATA COLLECTION**

Number of recent studies, focusing on students internet usage and online buying behavior, identified in the literature(M, Selvaraj, & Panchanatham, 2014; Otunla, 2013)(Fang, 2014)(Liat, Shi Wuan and Wuan, 2014)(Makhitha, 2014)(Knežević, Jaković and Strugar, 2014) (Hossain, 2010)(Al-Swidi, Behjati and Shahzad, 2012)(Devi and Roy, 2012)(Chowdhury and Ahmad,

2011) (Saprikis, Chouliara and Vlachopoulou, 2010)(Simeonova et al., 2010)(Alyami, 2013)(Lee and Ngoc, 2010)(Saeid, 2010) The instrument employed in the current study contained measuring items adapted from above mentioned previous studies as pre-validated and suggested limited bias and errors. The research instrument contained 51 items excluding questions on demographics and online buying behavior. A five-point Likert scale was used to understand level of agreement ranging from 1- “Strongly Disagree” to 5- “Strongly Agree”. Question on preferred “online payment method”, “major items bought online” etc. were also asked. Research instrument was mailed to all the students enrolled in the section for collecting responses, who further shared the form link to their student friends.

**RELIABILITY AND VALIDITY**

Cronbach alpha coefficient value is the well accepted statically calculation of reliability for the social science instrument. According to Nunnally (1978), Cronbach alpha coefficients of less than 0.50 are deemed unacceptable; those between 0.50 and 0.69 are considered as being adequate, whereas those above 0.70 are regarded as being acceptable in social science enquiry. The sub-scale reliability values ranged between 0.598 and 0.784, while the standardized Cronbach alpha value for the entire scale was established at 0.785, indicating an acceptable level of internal consistency among the scale items (Makhitha and Dlodlo, 2014). Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy score (0.815) was well above the recommended 0.5 level (Malhotra, 1999).

**Table-1: KMO and Bartlett's Test**

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.836
Bartlett's Test of Sphericity	Approx. Chi-Square	2076.716
	Df	231
	Sig.	.000

**Sample Composition**

The sample consisted of 51% male and 48% female. Similarly age cohort in the University students was mostly in the age group of 18 to 23 years 75%. Out of which 16% Hostlers, 69% live in owned house and only a small 1% lives in friends place. As expected from a University student Delhi NCR, most of them were getting a good pocket money to spend i.e 19% getting Rs.3001 to Rs.5000/- and 29% getting more than Rs.5001/-.

**Table-2: Sample Demographics**

Characteristic	Group	Cases	Percentages
Gender	Male	92	48.7
	Female	97	51.3
Age	18 to 20 years	76	40.2
	21 to 23 years	67	35.4
	24 to 26 years	18	9.5
	27 years and above	28	14.8
Current Living Status	Own/ family house	131	69.3
	Hostel	31	16.4
	In friend's house	2	1.1
	Sharing a room or in a PG	25	13.2
Personal monthly average pocket money/ Income	Less than Rs 1000	21	11.1
	Rs 1001 - Rs 3000	76	40.2
	Rs 3001 –Rs 5000	36	19.0
	More than Rs 5001	56	29.6
Current Education stream	BA/ BBA/ BCom/ Other Non Technical Courses	16	8.5
	BTech/ BE/ Other Technical Courses	79	41.8
	MA/ MBA/ MCom/ Other Non Technical Courses	81	42.9
	MTech/ ME/ Other Technical Courses	13	6.9

Out of total 189 respondents 88 percent reported of buying online. Thus for identification of factors driving online buying through Factor Analysis is possible with 168 as the sample size. It is noticeable that a 61% of respondents are shopping from two or more years but in terms of monthly transaction almost fifty percent shop twice or less, highlighting online buying is still not too popular among students. Moreover in terms of amount 49% reported of spending less than

Rs.5000 in the last six months and Cash on delivery is preferred by most. But overall 60% preferred more than one mode of payment out of – card payment, online payment and cash on delivery (CoD). Moreover, in certain cases CoD is not applicable e.g. for recharges, bill payments and reservation etc. Most of them were using more than one device for buying. Interestingly, none of them reported about using tablets for buying. Following table presents major findings of the online buying habits of the sample respondents in detail:

**Table-3: Sample Descriptive: Online Buying Behavior**

	Group/ Categories	Cases	Percentages
Online buying	Yes	168	88.9
	No	21	11.1
Length of Online buying	For Less than 6 months	17	9.0
	Between 6 months to 1 year	10	5.3

	1 to 2 years	23	12.2
	2 to 4 years	41	21.7
	For more than 4 years	77	40.7
Frequency (monthly) of	Once in two months	46	24.3
Online buying	1 to 2 times	46	24.3
	3 to 4 times	65	34.4
	5 to 6 times	3	1.6
	More than 6 times	8	4.2
	Preferred Device Online	Mobile	33
buying	Laptop	11	5.8
	Personal Computer	4	2.1
	Tablet	0	0.0
	More than one device	120	63.5
Spending (In the last 6	Less than Rs.5,000	49	25.9
months) Online buying	Rs. 5,001- Rs.10,000	80	42.3
	Rs. 10,001- Rs.15,000	9	4.8
	Rs. 15,001- Rs.20,000	9	4.8
	Above Rs.20,001	21	11.1
Payment Method in Online	Cash on Delivery	40	21.2
buying	Net Banking	3	1.6
	Debit Card	5	2.6
	Credit Card	6	3.2
	More than One Mode	114	60.3

**RESULTS AND ANALYSIS**

Exploratory Factor Analysis is performed to find out the factors responsible for online buying by the university students. As presented in the Table.1 KMO for online buying was 0.836 supported by Bartlett’s test of Sphericity of 0.000. As suggested by Hair et al. (1995) criterion, four factors have been identified using the

Eigen value criteria that suggest extracting factors with an Eigen value of greater than 1.0. The rotated factor matrix is displayed in Table-4.

The rotated Component Matrix resulted into four factors, which are proposed dimensions of online buying of university students. Out of 51 items total 22 items have been retained with factor loadings greater than 0.5. The identified four factors, explained 63 percent TVE (See Appendix-I). The extraction method used was principal component analysis in SPSS with Varimax rotation which has been widely accepted as a reliable method of factor analysis.

**Table-4: Rotated Component Matrixa**

	Component			
	1	2	3	4
I read online review of the product before buying	.827			
I select online stores, which I believe are honest	.806			
Online shopping prepares my shopping list( the cart option)	.757			
I feel that the online vendor is trustworthy	.699			
I received my product which I ordered from the site	.675			
There are no time restriction in online shopping	.651			
The website treats me as a unique person and responds to my specific need	.624			
I prefer to buy Branded Products online		.837		
For me brand is more important than discounts		.783		
I feel safe in my transactions with the website/online store		.777		
I do a product feature and price comparison before shopping online		.768		
I shop online as I get user/expert reviews on the product.		.767		
Online shopping gives the facility of easy price comparision. (Hence, price advantage)		.701		
My experience with online buying was better than what I expected.			.731	
Shopping online is enjoyable.			.699	
Information searching on the internet is fun rather than tedious.			.680	
I received my product by the time promised by the company			.560	
I prefer free shipment over discount			.502	
I use online shopping for buying products which are otherwise not easily available in the nearby market or are unique/new			.494	
I hesitate to shop online as there is a high risk that received items may not work properly.				.866
I might not receive the product ordered online.				.808
I am not sure about the authenticity of branded product sold online				.711

**DISCUSSIONS**

Descriptive analysis highlighted the important aspect of University online buying in terms of majority of them was buying online. Yet, the rate of buying was low with a small number of transactions per month and a small spending. The possible reason can be easy availability of products offline or can be lack of trust. EFA resulted into identification of four factors influencing online buying, which can be categorized into four constructs. Factor one termed as “Conscious choice” in which students check online review, form opinion about online stores trustworthiness, and prepare online shopping-list, anytime access, enjoy personalized experience and lastly utilise experience of product delivered at home. Factor two can be named as “product features” related in which they are checking brands, detailed product information, expert recommendations and comparison. Third factor can be named as “pleasant buying experience”, which includes liking for internet browsing, timely delivery at doorstep, availability and satisfactory past experience. Forth factor can be named as “Delivery Risk” which includes genuine-branded product risk, working of product risk and risk of receiving as ordered.

Contrastingly in a recent Indian study Mann (2017) identified five most important motives of youth to buy online- convenience and time-saving, new trend and fashion, product variety, better price and offers and lastly information depth (Maan, Kumar and Rani, 2017). Another study revealed four determinants namely- Anxiety (related to privacy, security, trust etc.), Ease of use (convenience, process ease, comparison etc.), Usefulness (time saving, different brands, enjoyment etc.) and lastly Price (lower prices and discounts). Risk was common important determinant, as in an online-health services study, on university students in South Africa, risk is not found sufficiently high to deter usage intentions (Mou and J Cohen, 2014). Whereas, in an Indian study Perceived Risk is found as most significant factor affecting online buying behavior (Jain, Goswami and Bhutani, 2014). In a recent comparative study, Indian consumers showed higher perceived risks as compared to UK-online buyers (Wani and Malik, 2013).

**CONTRIBUTION, LIMITATIONS AND FURTHER RESEARCH**

The strength of the current research lies in exploratory nature and application over university student segment. Current study in hand report, as an important source of knowledge, explores on prevailing patterns and few underlying factors influencing University student’s online buying, studying in Delhi NCR in particular. These insights can be utilized by online marketers and website designers targeting this youth population to be more effective. Thus, results can be helping in formulation of the marketing strategies. Academically findings of the present research can be utilized to frame new hypotheses to better map online buying behavior of university students in India.

However, the study has a limitation in that its results are restricted to University students, studying in Delhi NCR only. Further study attends only online buying and cannot be related to student buying behavior as such. And, although the sample size of 168 respondents may have been adequate for inferential statistical analysis, it may not present a true representation of the prominence of University students buying online, nationally. Furthermore, as of any self-reported survey the responses- bias cannot be ruled out. But this research provides sufficient platform for conducting a more detailed Nation-wide research to identify underlying currents of online buying behavior of University Students in India.

**CONCLUSION**

Online buying behavior of university students in India is different from offline buying. Current research attempts to explore nature of online buying behavior of university students to identify factors influencing. A thorough review of available literature pave way to identify most common constructs utilized by the researchers to explain the phenomenon in different context- online buying behavior of youngster etc. The primary research conducted in the current study helped to identify major four factors based upon statistical analysis technique- exploratory factor analysis. These factors are termed as “Conscious choice”, “product features”, “pleasant buying experience” and “Delivery Risk”. The most important factor is found to be “pleasant buying experience”. Thus, online marketers should concentrate on strategies to build better buying experience starting from navigation to order placement and ending till receiving the ordered product.

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Appendix-I-Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.520	29.636	29.636	6.520	29.636	29.636	4.419	20.086	20.086
2	4.599	20.904	50.540	4.599	20.904	50.540	4.101	18.641	38.727
3	1.601	7.275	57.815	1.601	7.275	57.815	3.060	13.910	52.636
4	1.200	5.453	63.268	1.200	5.453	63.268	2.339	10.632	63.268
5	.923	4.197	67.465						
6	.838	3.810	71.275						
7	.762	3.463	74.738						
8	.688	3.128	77.866						
9	.612	2.780	80.646						
10	.582	2.647	83.293						
11	.534	2.428	85.721						
12	.495	2.251	87.972						
13	.406	1.843	89.816						
14	.368	1.672	91.488						
15	.322	1.463	92.951						
16	.290	1.320	94.271						
17	.262	1.190	95.461						
18	.258	1.175	96.636						
19	.235	1.066	97.702						
20	.217	.989	98.691						
21	.175	.795	99.485						
22	.113	.515	100.000						

Extraction Method: Principal Component Analysis.

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**ABSTRACT**

*Finance, specifically, in corporate terms, the system of internal control regarding the procurement and effective utilization of funds post identification of feasible investment opportunities pertaining to profitability promotion that adequately compensate for the cost and risk borne by the business undertaking/enterprise. Capital market, in India, has been significantly contributing towards the facilitation of moderate and long term finance provision from the surplus units to the deficit units. A Developing economy like India needs a growing amount of investor savings to flow to corporate enterprises. The level of equity market participation of the retail investors has been increasing over the past few years that evoked the need of studying the socio-economic profile of the retail investors, factors influencing the investment behaviour of retail investors, examining the trading practices of retail investors in equity markets, factors affecting the risk assumption abilities alongside the problems faced by retail investors. Historical evidences based upon secondary facts support the undertaken scope of the study. A comprehensive study involving macro-economic parameters influencing the primary and secondary securities market trends, corporate fundamental factors, technical indicators and investor's behaviour patterns were carried out to understand the performance of Indian capital market in recent times. The research elicits the opinion of the retail investors on the policy making of capital market thereby suggesting certain measures to the policy makers for the protection and promotion of investors.*

*Keywords: Financial market, Stock Exchange, Primary and Secondary Markets, Capital markets.*

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**INTRODUCTION**

Tracing the origin of finance, there is substantiation to demonstrate that it is as old as human life on earth. Originally a French word, it was adopted by English Speaking communities to mean "the management of money" which is in the modern era organised as a branch of economics. According to academicians, "finance is the procurement and effective utilisation of funds. It also deals with profits that adequately compensate for the cost and risk borne by the businesses". Finance, the science of money management and the actual process of acquiring the adequate quantum of required funds encompasses the oversight creation and study of money, banking credit, investments, assets and liabilities that makeup financial systems. Basic conceptuality of finance comes from one of the fundamental theories i.e. time value of money. Since individuals, businesses and government entities need funding to operate, the field is often separated into three main sub-categories: personal finance, corporate finance and government finance. Creating physical assets with the money, carrying on operating business activities and acquiring financial securities are all commitments of monetary resources at deferent times with an expectation of economic returns in the future. Internal controls/checks maintained in the work place are set off rules and regulations framed at the inception stage of the organisation and is altered depending upon businesses requirement with better futuristic decisions involving quantitative analysis of the organisation serves as an indicator of sectorial growth and desired returns. The fund raising process involves a number of stages, during the course of which a company appoints pivot financial advisors to deliver the objectives and goals of the company with having an access to a network of contacts including financial institutions, private equity investors, venture capitalists and debt financing investors.

**LITERATURE REVIEW**

Investors need to make rational decisions for maximizing their returns based on the information available by taking judgments free from emotions (Brabazon.T, 2000). Investors often want to hold a stock until it goes back up to the price paid for it no matter how long it takes. Successful investors' decision is based more on the desire to avoid that awful feeling associated with admitting mistake and overcome these adverse psychological influences (Iyer B and Baskar RK, 2002). The acknowledgement of emotionality and their empirical results suggest that the demographic factors influence the investor's investment decisions (Shanmugasundaram V and Balakrishnan V, 2010).

**RESEARCH METHODOLOGY**

The research paper is an attempt of exploratory research based on the secondary data sourced from journals, internet, articles, literatures, newspapers, previous research papers. The research design employed for the study is of descriptive nature. Focusing on the determined objectives strictly, the research design was adopted to have

greater precision and in-depth analysis of the research study. Available secondary data was extensively used for the study.

### **OBJECTIVES OF THE STUDY**

The contribution of Indian capital market towards the provision of medium and long-term finance to the deficient units.

To trace the retail investor's participation in the equity capital market over the past few years.

To study the socio-economic profile of the retail investors, investors buying behaviour and practices.

To assess the fundamental and technical factor for understanding the recent performance of the Indian capital market.

The hurdles commonly faced by small retail investors in the Indian capital market prior to arriving at an investment decision.

To recommend for the enhanced participation of the retail investors towards the contribution in strengthening the financial deepening process in India.

To highlight the steps taken by the government to strengthen the retail investor's capital base.

### **FINANCIAL MARKET**

The financial market is a broader term describing the mechanism, where trading of securities including the equities, bonds, currencies and derivatives occur. Some large financial markets including the New York stock exchange, NASDAQ, Tokyo stock exchange, London stock exchange and the forex markets trade trillions of dollars of securities on an intra-day basis. Financial market prices may not indicate the true intrinsic value of a stock due to macro-economic forces. The prices of securities are heavily reliant on informational transparency by the issuing company to ensure efficient and appropriate prices are set by the market. A financial market consists of two major segments: a) Money market and b) Capital Market.

### **MONEY MARKET**

Money market is a market for short-term funds, which deals in financial assets whose period of maturity is up to one year. The Indian money market consists of RBI (the leader of the money market), commercial banks, co-operative banks and other specialised financial institutions like (NBFCs) Non-Banking Financial corporations, LICs, UDIs etc., Operating in the Indian money market.

Money Market Instruments: Call Money, Treasury bill, Commercial Paper, Certificate Of Deposit, Repurchase agreement.

### **CAPITAL MARKET**

Capital market is an institutional arrangement for borrowing medium and long-term funds which provides facilities for marketing and trading of securities. It constitutes all long-term borrowings from banks and financial institutions, borrowings from foreign markets and raising of capital by issuing various securities such as stocks, debentures, bonds etc. It consists of two different segments namely primary and secondary market. The primary market deals with fresh securities and therefore, also known as new issue market; whereas the secondary market provides a place for purchase and sale of existing securities and is often termed as stock market or stock exchange.

### **PRIMARY MARKET**

The arrangement which facilitates the procurement of long-term funds by companies via making fresh issue of shares and debentures is usually done through private placement to financial institutions or by making public issue. The well-established legal procedure involving a number of intermediaries such as underwriters, brokers, etc. which form an integral part of the primary market, for e.g. Public sector undertakings such as ONGC, GAIL, NTPC and the private sector companies like TCS, jet-airways and so on.

### **SECONDARY MARKET**

Stock exchanges/stock markets across the entire globe constituting the well-versed and booming financial markets enabling the financial depth/Deepening to ensure the trading of deferent matured security instruments facilitate the mobilising of surplus funds from capital holders to deficit units. In the innovative era, most developed economies, the growth pattern of which depends upon the supply leading condition exaggerate the economic growth process resulting in a fast paced financial deepening. While in contrast, the developing or less developed economies depending upon the demand following conditions basically follow the pattern of strengthening the financial markets and trading in secondary market to result in a stabilised and promoted

economic growth. Required regulatory norms, stringent and transparent practices, information symmetry, globalised interconnections have all created a competent global environment. New York stock exchange, NASDAQ, London stock exchange, Tokyo stock exchange are the leading stock market indices evoked the competitiveness through technological advancements and easier compliance trading thereby generating more liquidity and velocity of securities dealing. BSE SENSEX, NSE (Nifty 50) in India, serve as the economic barometer and quantitative index to signify the prosperous growth in the external market to support the social external infrastructure.

#### **FACTORS RESPONSIBLE FOR GROWTH OF INDIAN CAPITAL MARKET**

- Growth of stock exchanges(BSE 1875, NSE)
- Development of financial institutions (Mutual Funds, Venture Capital Funds, Index Funds, Pensions funds etc.)
- Easier Compliance and growth in merchant banking services.
- Effective role of credit rating agencies (ICRA, CRISIL, Fitch India pvt.ltd.)
- Stricter corporate governance norms, enhanced transparency, stringent regulations, advent of newer security instruments, feasible investment avenues, magnified interest protection policies for investors.
- Setting up of National Securities Clearing Corporation (NSCC).

#### **CAPITAL MARKET FUNDS VS DEPOSITORY INSTITUTIONS LOANS**

In the capital markets case, intermediation occurs through the exchange of wide array of instruments including common and preferred equities, convertible bonds, corporate bonds, mortgage-backed securities, and other asset-backed securities. In the depository institutions case, intermediation differs in three important respects. First, the investor does not have a claim on the ultimate beneficiary of the funds. Second, the price of this claim does not typically fluctuate in response to the shifts in supply and demand. Third, the investor can not normally sell this claim to a third party. An important difference is that with a regular bank loan the lending is not securitized. Another difference is that lending from banks and similar institutions is more heavily regulated than capital market lending. Furthermore, bank depositors and shareholders tend to be more risk averse than capital market investors.

#### **ROLE OF RETAIL INVESTORS IN THE CAPITAL MARKET**

Retail investors play a prominent role in the capital market along with the foreign institutional investors and domestic financial institutions. But, it is deplorable that the household investors park their savings only 2% to 3% in capital market, perhaps because they have burnt their fingers in the market scams, manipulations and also on account of the higher volatility. No study about the securities market will be complete without the mentioning of investors and stakeholders particularly the retail investors. Retail investors are advised to trade with an abundant caution and with limited amount of capital to undertake the risk. As retail investors look for long-term investment in converse to the FIIs, FFIs, QIBs and HINs play for short-term gains, the government and its various agencies must look after the interests of the retail investors for building up the strong economy. There is growing concern about the safety and integrity of capital market at the international level so as to make the stock market safer, transparent and devoid of frauds and scams. Today, Indian securities market is one of the most robust and vibrant securities market in the world with latest technology, shortest settlement cycle, paperless transactions and screen based trading system, better corporate governance and faster dissemination of information. Although, price manipulations, increased volatility, repeated scams, ineffective corporate governance norms etc. have been the main reasons for keeping the retail investors away from the securities market. Safety of the invested money, liquidity of the instruments and return on the investment are the pivotal objectives while investing. A strike is needed to balance between raisers of capital and the interests of investors.

#### **FINANCIAL INNOVATIONS AND DEVELOPMENT IN INDIAN CAPITAL MARKET**

NSE pioneered the commencement of internet trading which led to the wide popularisation of the NSE in the broker community. The abolition of fixed charges in the form of commissions has intensified competition among the brokers, the creation of asset backed securities, reduced amount of equity required for working capital and further reduction in the financing cost. The development of scripless trading and book entry settlement with reduced back office paperwork has led to the reduction in transaction cost. Capital market insurance solutions offer a promising means of funding protection for even the largest potential catastrophes. Unit linked insurance plans (ULIP) - the capital market linked insurance products are the new best selling instruments in the insurance market. NSE also conducts online examination and award certification, under its programmes of NSE's certification in financial markets (NCFM). Currently, certifications are available in 9

modules covering different sectors of financial and capital markets. The introduction of committees for IPO issues regarding the mismanagement of funds. The facilitation of the process of demutualisation and corporatisation of stock exchanges and launching of the electronic order matching system for trading in gilt edged securities on its negotiated trading system allowed capital market to boom. Allowing MFs to float Gold Exchange Traded Fund Schemes which have permitted to invest primarily in gold and gold related instruments and guidelines for private placement of debt by listed companies

### **CHALLENGES IN THE DEVELOPMENT OF CAPITAL MARKETS**

The proper functioning of capital markets requires the several preconditions classification into 3 groups: sound macro-economic policy, strong institutional and legal setting and a well-functioning financial infrastructure. Without this precondition, the government efforts to develop local capital markets are bound to fail, resulting in shallow markets and duped investors and therefore generally advisable to sequence financial reforms such that these conditions are sufficiently in place before local capital markets are established.

### **BENEFITS TO THE RETAIL INVESTORS FROM THE CAPITAL MARKETS**

Wisely taken investment decisions putting into consideration the viability of the company, critical analysis of its fundamentals, past financial performance, management structure, business environment, market competitiveness and other macro environment factors turns out to be desirable and fruitful.

**Capital Appreciation:** It entails the difference between the purchasing and selling price of a share of a company which signify the capital gain.

**Dividend Payment:** A sum of money agreed upon by the directors of a company to be paid on proportional basis from the company's profit in a given financial year.

**Bonus Issue:** Incentive, entailing a shareholder to acquire additional shares from the company without necessarily paying for these shares.

**Participation in the Rights Issue:** Investors are opportune to participate in Rights issue of the company where the price is usually lower than the prevailing market price.

**Participation in Decision Making:** Right to attend annual general meeting of the company thereby participating in its decision making and exercising voting rights.

**Banking collateral and social security benefits:** Share certificates serve as collateral to obtain bank loans for individual use or business development. Buying of stocks could be used as individual preparation towards personal pension plan, therefore having an opportunity to considerably invest in the stock market during earlier age.

### **CHALLENGES FACED BY THE RETAIL INVESTORS**

**Inadequate Capital:** The small investor with less capital invested in the stock market trades for himself, not for a company. Although, small investors generally invest in stocks, mutual funds and index funds, investment choices available like options, futures, forwards and swaps are usually too complicated and expensive for small investors.

**Cost:** Small investors' lower degree of negotiating power allow brokerage firms too charge a higher percentage of management fees on small accounts thereby meaning a higher return for the year to break even. Funds, especially index funds, have very low annual fees.

**Diversification:** As a small investor, it's harder to build own diversified portfolio due to limitation of available resource to spread across various industries or companies.

**Information:** One other disadvantage from the small investor's point of view is the information asymmetry. Professional investors have research staffs that are constantly providing them with up to date information. As a small investor, it can feel one step behind our competitors. However, the internet has made a big dent in this disadvantage.

### **FINDINGS**

Analysis states a strong negative correlation between the number of listed fixed income products available to retail investors and depth of retail trading activity. There has been a higher degree of substitutability between listed fixed income and equity products. In fixed or partly negotiable fee model environments, reductions in brokerage fees are strongly positively correlated with increase in trading activity. Reduced trading fees in a market with a non-negotiable fee model has a positive influence levels of trading activity increase in cost-to-trade are associated with declines in depth of retail activity as there is a significant negative relationship

between increase in clearing fee and levels of trading activity. Moving from a fixed to a negotiable or even partly negotiable fee model has the effect of reducing cost-to-trade.

### **SUGGESTIONS**

The outcome of this research leads to the suggestion that the regulators must include the role of behavioural dimensions in its awareness campaigns due to the criticality of these factors in investment decisions. It is recommended that the investment analyst must incorporate behavioural factors in their analytical model qualitatively. The media must create awareness about the behavioural dimensions that are equally important like technical factors. This research also recommends appropriate measures to address the genuine apprehensions of the retail investors. There is need to increase the retail investor participation and this could be done by increasing the financial literacy and awareness, expanding the number of issues, providing diverse investment options, training and increasing the reach of intermediaries, enhancing investor protection measures, simplified norms and cost-effective services.

### **CONCLUSION**

The small investor's attitude towards debt instruments needs change, and that this will be impossible without a radical overhaul of the small savings schemes in India. There seems to be widespread misconception about pooled investment vehicles that needs to be removed as investments such as mutual funds can really fulfil the entire range of risk appetite for small investors while increasing the depth and width of primary and secondary debt capital markets. Finally some suggestions regarding market innovations in terms of a derivative product (Counter Party Risk Protection

Security) that may help allay small investors concerns while transacting in corporate securities and help fuel growth in these markets.

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**AUTOMATION IMPACT ON INDIAN STEEL INDUSTRY**

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**ABSTRACT**

*With the increased competition and demand in the global market, automation is becoming the necessity. Through the adoption of more efficient and advanced technologies, the increase in productivity in the manufacturing sector is effective in merging economic, environmental, and social development objectives. In the Indian steel industry modernization, a very important role has been played by automation for making it possible to compete in global market. The main advantage the Indian Steel industry is having the availability of domestic raw material and low labor cost. In the present work an attempt has been made by literature review to identify the automation parameters and their effects on the Indian Steel Industry*

*Keywords: Automation, Indian Steel Industry, Government Policies, Technological Advancements.*

**1. INTRODUCTION**

Indian steel industry has entered into a new developmental stage and on the world chart, India is at fifth place among countries producing highest crude steel. Per capita steel consumption is an indicator of the economic growth of a country. Due to the globalization of Indian economy and development of the industries using steel as raw material like automobile industry, railway, defense etc. in the country, the steel consumption in India is also increasing. The main advantage for the Indian Steel Corporations is that the availability of the domestic raw materials and low labor wages as compared to the rest of the world.

Going through the history, modern Indian steel sector started way back in 1907 when Tata Iron and Steel Company established its plant and the steel production started in India in 1913. After the liberalization of Indian economy and removal of large number of controls in 1991-1992, an era of development has been experienced in steel industry and as consequences India became the fifth largest crude steel producing country with China on the top. The use of new sophisticated automatic control techniques and opening up the steel sector to private sector in India made it possible to compete in the world market.

**2. STUDY AREA**

The present work focuses on the literature review on the automation and co-relating the advancement in automation with the development of the Indian Steel industry. Considering the domestic and global scenario of steel industry by studying the various reports published by Indian Government a comprehensive study is made to find the effects of automation on the Indian Steel corporations.

**2.1 Objectives of Research Study**

The paper focuses on the decision variables which the enterprises consider while automating its production system. An attempt has been made to segregate the decision variables from the available literature into three broad classifications which are: Internal variables, External Variables and competitive Variables.

**2.2 Evolution of Frame Work**

With the globalization of markets after World War II, the competitiveness in the global market has increased and there is increasing demand of good quality products. The literature on automation is reviewed under three cardinal dimensions which are Internal Scanning, External Scanning and Competitive Positioning. Eleven major parameters are explored under these three cardinal dimensions as shown in the Figure 1

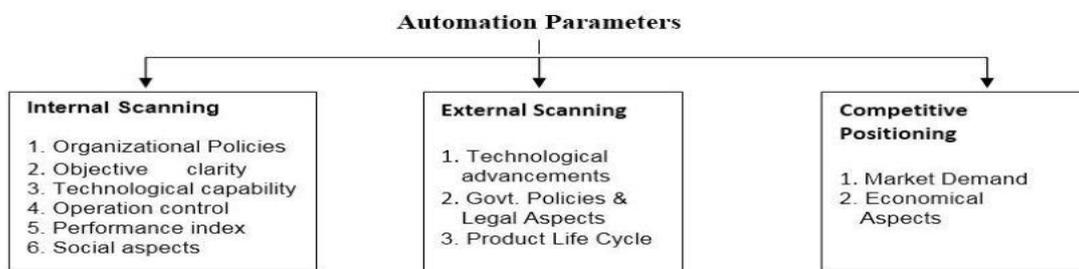


Figure-1: Decision Variables of Automation

**2.3 Exploratory Decision Variables from Literature Survey**

Total 42 number of research papers are scanned for exploring the variables of automation and the following 11 major parameters were explored from these papers under the 43 decision variables as shown in the Table 1 with the references given.

S. Adjuvant

**Table-1: Explored Parameters of Automation**

S. No.	Adjuvant dimensions	Decision Variables	Research papers
1	Organizational Policies	1. Organizational Structure 2.Firm size 3. Company’s strategy and goals	2,4,11,13,14,19,29
2	Objective clarity	4. R&D expenditure to sales ratio 5. Industrial standards	4,12,15,37
3	Technological capability	6. Innovation cycle 7. Safety 8. Engineering & material database 9. Interrelation between production units	1,4,5,6,8,9,11,12,13,14,18, 22,23,26,28,33,34,35
4	Operation control	10. Remote calibration 11. System accuracy 12. Supervision 13. Integration 14. Modeling	1,3,6,8,10,12,13,17,19,20,2 123,25,27,31,32,34,35
5	Performance index	15. Productivity 16. Price recovery factor 17. Yield 18.Throughput 19. Turnover	4,5,9,15,16,21,24,36
6	Social aspects	20. Labor force 21.Labor productivity 22. Motivation	4,7,10,16,19,21,22,26,36,3 7,38
7	Technological advancements	23. Hardware, Software and System ware 24. Neural Networks and Artificial Intelligence 25. Adaptability 26.Opacity	1,6,7,8,10,14,18,21,26,27,2 8 31,33,34,35,40,41
8.	Govt. Policies & Legal Aspects	27 Govt. Policies 28. Labor unions 29. Environmental awareness 30. Unemployment 31.Vocational education 32. Direct &indirect labor cost 33. Manufacturing pro activeness	1,2,4,17,19,22,23,25
9.	Product Life Cycle	34. Product Variety 35. Customer Services 36.Demand	3,4,5,7,8,11,15,18,26,38
10.	Market Demand	37. Market development 38.Market share 39. Competition 40.Integration of production & business studies	2,4,15,16,21,23,24,29,34,3 7,39,40,42
11.	Economical aspect	41. Sales per employee 42. Budgeting 43. Profits	2,11,12,14,17,22,24,27,28, 29,37,39,42

Table 2 shows the distribution of focus of research study over a span of time. The time span is divided into four parts and number of research articles studied is divided according to the parameters of automation given in Table No.1

Table-2: Distribution of Focus of Research Study over a Span of Time

S. No.	Adjuvant dimensions	Before1980	1980-1989	1990-1999	2000-2010
1	Organizational Policies		4	2	1
2	Objective clarity		1	2	1
3	Technological capability	2	8	3	5
4	Operation control	3	6	4	5
5	Performance index		2	4	2
6	Social aspects	4	3	2	1
7	Technological advancements	4	6	1	4
8.	Govt. Policies & Legal Aspects	1	2	4	1
9.	Product Life Cycle	2	1	5	1
10.	Market Demand		2	6	2
11.	Economical aspect		5	5	1

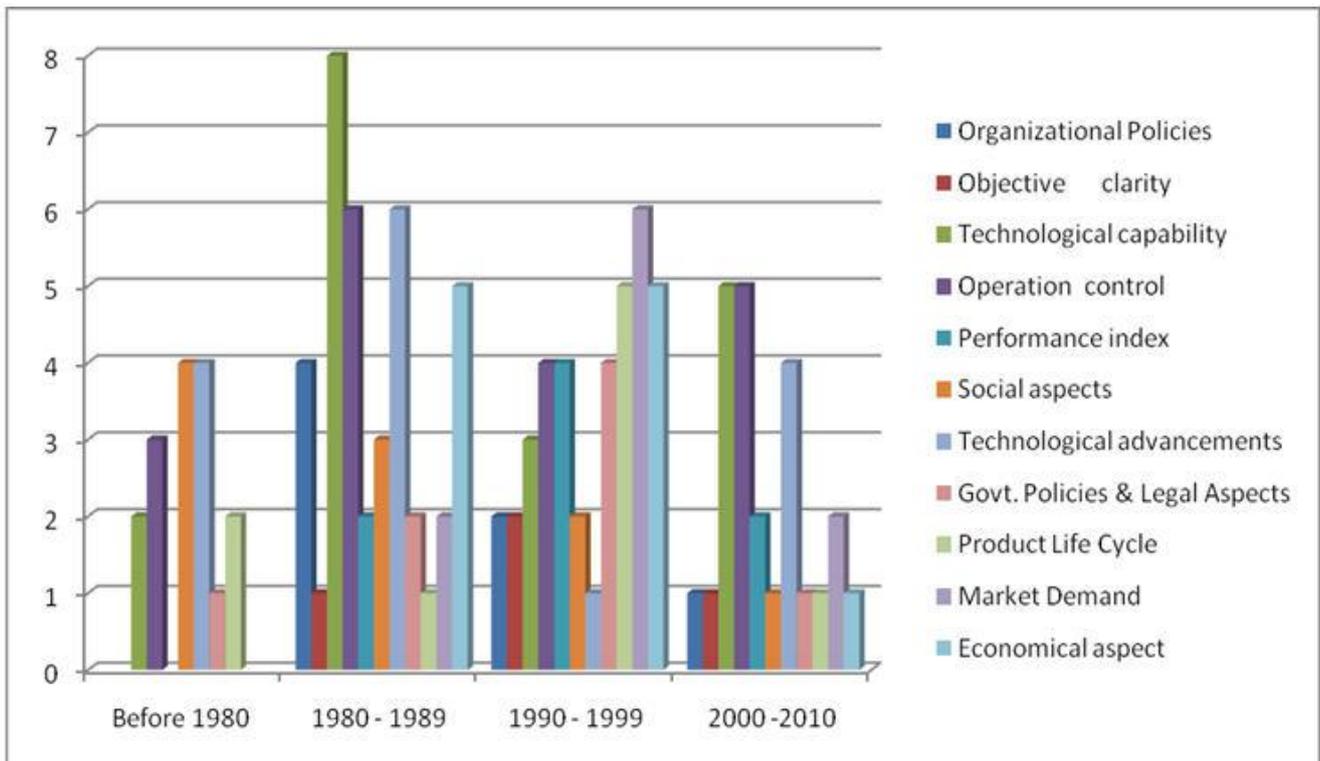


Figure-2: Graph of Focus of Research Study over a Span of Time

**3. CONCLUSIONS AND DISCUSSIONS**

From Table 2 and Figure 2 it can be concluded that before 1980 the main focus of the research was on the technological advancements and the effect of automation on the society and workers. In the decade of 80's the research had shifted to the technological capabilities and technological innovations so as to renovate the previous production system. Beside this the budgeting of the automation projects and profits were also studied during this period of time. But in 90's beside the technological advancements, the market behavior also was also studied to find the effects of the process of automation. Govt. and legal aspects

also played a major role during this decade. But during 2000-2010 technological advancements and capabilities and operation control were the major research topics. Over the period 2002 to 2007 the production of steel in India has increased by a compounded annual growth rate (CAGR) of 8 percent. In comparison to world average, projected growth in India is higher. Whereas in India consumption of steel per capita is far below the average of world and that of developed countries. The major changes in Government policies after the liberalization of Indian economy which caused the automation and development of Indian steel sector are:

1. Removal of large plant capacities that were reserved for public sector;
2. Elimination of restrictions on export;
3. Reduction in import tariffs from 100 percent to 5 percent;
4. Decontrol of domestic steel prices;
5. Encouraging the foreign investment, and giving high priority to the steel industries foreign investments.
6. Replacement of freight equalization scheme with system of freight ceiling.

The automation has affected the manpower requirement. For example in Rourkela Steel plant the manpower has declined from 21680 in 2006-07 to 19455 in 2009-10. Although for same period of time the labor productivity has increased. It is observed that due to automation introduced in Blast furnace, Steel Melting shops and reheating furnaces the output has increased by about 8-10% and in rolling mills the output has increased by 15% (Rajat Kumar Panigrahy, Ashok Kumar Panda and Srikanta Patnaik, 2011).

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## NIFTY 50: RISK &amp; RETURN ANALYSIS

Dr. Parul Bhatia<sup>1</sup>, Arpita Aggarwal<sup>2</sup> and Deeksha Khanna<sup>3</sup>Assistant Professor<sup>1</sup> and Student<sup>2,3</sup>, Apeejay School of Management, New Delhi**ABSTRACT**

India is one of the emerging and developing economies which have seen a lot of development in the stock market i.e. from the era of physical trading to online trading of shares. This has also increased the level of risk which the investors are facing. Due to which risk and return analysis is of utmost importance for an investor to look while investing in a developing market. Theoretically, it has been believed that risk and return in a stock market displays direct relation that if the risk rate is high then returns will also be high and vice-a versa. Therefore, in this study, to check whether the above stated relation exist the data of fifty stocks of the NIFTY 50 index with the market index for a period of 10 years starting from September 2009- June 2018 has been taken and the study is made on the daily basis data. NIFTY 50 has been used because it is one of the two main stocks indices in India which comprises of 50 stocks from 12 different industries. Further the tools used for the study includes measuring yearly average returns for the stock, beta, correlation between the risk& return and graphical analysis. The study made from the above tools will help us specifically establishes the relationship between market risk and return from a stock which shall be helpful for investors to plan their portfolios as per the market risk (beta values).

*Keywords: Beta, Nifty 50, Return, Market Risk*

**1. INTRODUCTION**

Investment is the action of putting money in someone's pocket in order to earn profits. But in finance, Investment got a broader perspective. It is broadly divided into two categories: financial investment and economic investment. Financial investment market deals with the investments made in financial instruments like shares, bonds and debentures etc. Whereas economic investment deals with those investments which are made with a purpose to create wealth in future, it includes investments in commercial and real estate properties

Therefore, we can say that in today's market an investor is surrounded by a number of options available to him for investment. But with the emergence of investment options there are rising expectations and risk in the market, which needs to be analyzed carefully before making an investment. That is why Risk and return analysis is of foremost importance with the Today's era markets which is not only developing but are emerging as a complex affair to study i.e. why if any investor wants to invest in a market or in any particular stock he/ she need to analyse various factors before investing. Risk and return are the main factors which are of the most important while making an investment decision.

Talking about the Return, it is the extra benefit or income earned by an investor after sacrificing their current income or consumption. Returns are measured in terms of regular income or capital appreciation. Whereas on the other hand, Risk can be defined as an uncertainty associated with any investment which deviates the amount of expected return from an investment. It is broadly divided into two categories: Systematic risk and Unsystematic risk. Systematic Risk is also known as Market risk or Undiversible Risk which are beyond the control of the company such as Inflation rate, Interest rate and Government Policies. Whereas Unsystematic Risk are known Diversible risk which are within the control of the company such as Interest Risk, Business Risk and Financial Risk. There are two common measurements of investment risk i.e. Alpha and Beta.

Beta is the historical measure of volatility which explains how an asset i.e. stock or a portfolio moves versus an index whereas Alpha is the historical measures the assets return on investment versus to the risk adjusted expected return. Depending upon the investor's reaction, volatility can be a blessing or a curse which means that if the investor is selling in a panic when everyone else is also selling then volatility can be a curse and it can be vice versa i.e. if investor anticipate volatility, it can be a blessing for him which can lead to a good investment. The key in this approach is that an investor should stay focused on buying investments with a margin of safety that means being disciplined in approach of buying and selling.

Further various models and procedures are being used by different – different investors to understand the risk and return.

When we compare with the world, India has a higher level of volatility in equity markets. Stock market risk is the tendency of stock prices to decrease due to the change in value of the market risk factors. Until now, Banking and financial services sector funds have accelerated on generating superior risk adjusted returns, they

suffer from the risk of portfolio concentration as a single stock accounts for equity portfolio in some gear. Depending upon the financial performance of the issuers and general economic, political, tax and market conditions, the market value of the investments will go up and down. Equity investment includes high risk at the same time it earns higher return unusually high returns may not be sustainable. The RBI i.e. Reserve Bank of India has taken the control of the banking industry; it is adversely used as the tool to control the external problems like inflation, interest rate, and money supply. Due to this, it reduces the real investor's interest as there is a high instability in the share price.

Though generally the objective of an investor is to earn higher returns in a competing market, as he/she is sacrificing their current consumption to earn additional returns or benefit in the upcoming future. Now, to achieve higher return it is said that investor needs to bear higher level of risk and vice-a-versa. So, to understand or check whether the above relationship exists our study investigated the Nifty 50 scrips movement behaviour from 2009 to 2018. In this study we have analysed the relationship between risk and return of the market with the particular company's stock for a period of 10 years.

## **2. OBJECTIVES OF THE STUDY**

- To analyse risk and return traits of nifty 50 stocks.
- To find the relationship between returns and risk with beta and standard deviation.
- To study individual returns of sample stocks on daily basis.
- To find out the best performing stocks on the basis of average returns.
- Comparing and Analysing the stocks of all the companies by graphical analysis of Average Returns and their beta values thus finding which companies are performing good according to the market.

## **3. LITERATURE REVIEW**

Literature Review summarizes the information from other researchers who have been studying the risk & return relationship from different environments. Following researches have been found to be extremely helpful in our research:

“B. Vijayalakshmi (2017) in her Study on Risk and Return Analysis of Selected Industries in India analyzed the risk-return relationship on individual securities and portfolios of NSE stocks. From the study made it was concluded that in both the cases of investment i.e., investment in individual securities and portfolios the relationship that exists between risk and return remains positive. Positive relationship means higher the risk, higher the return and vice-a-versa.”

“Dr. S Poornima and Swathiga P (2017) made study on the stocks of two different sectors i.e. Automobile and IT industry. Under these five stocks of each industry were analyzed to find out their risk and return with the help of CAPM (Capital Asset Pricing Model). And from the study made, it was analyzed that in the automobile sector the returns were high with low risk whereas in the IT industry the risks were high giving less return.”

“Surya Narayan (2011) studied the selected securities of Gulf market viz. Muscat Securities Market (MSM) to analyze the risk and return on the securities. The study was conducted for the period of six months on thirty securities in total of banking, manufacturing and services sector. Average returns from the securities, beta and correlation of individual securities were measured with the market index. And from the analysis made the result carried out was that during the period immediately after the global financial crisis the securities with less risk performed better.”

“Dr. S. Krishnaprabha1, Mr. Vijayakumar (2015) in their Study on Risk and Return Analysis of Selected Stocks in India found that the Pharmaceutical sector, FMCG sector (fast moving consumer goods) and IT sector gives high return with a low risk whereas in the banking and automobile sector the returns as less with the high risk. Further the Alpha of the FMCG, pharmaceutical sector and IT sector is found positive indicating the movement in the stock return is independent to the market return and is giving profitable returns.”

“Joseph Lakonishok and Alan C. Shapiro (1985) in their Study on Systematic Risk, Total Risk and Size as Determinants of Stock Market Returns analyzed the stock market returns and the other variables for a period of 19 years from 1962 to 1981. In which it was concluded that only size of the market affects the stock return not the risk variable.”

“Glenn N. Pettengill, Sridhar Sundaram and Ike Mathur (2009) in their Study on the Conditional Relation between Beta and Returns found out that positive relation between the return and beta can be seen in the case of expected returns rather than realized returns. Also, in the case of highly market negative returns inverse relationship exists.”

“Seha MTinic, Richard RWest (1984) in their Study on Risk and Return : January vs. the rest of the year studied the relationship between expected return and risk from 1935 to 1982. From the study made out they found out that a positive relationship between risk and return can be seen in the month of January whereas in the remaining eleven months risk premium is significantly not different from zero.”

Ali Argun Karacabey (2001) in their Study on Beta and Return: Istanbul Stock Exchange Evidence studied the data of Istanbul Stock exchange for a period of 11 years from 1990-2000. From the study made out they found that there exists a conditional relationship between beta and returns which can be used by investors and portfolio managers for making investment decisions.

Dr. T. Manjunatha made a study on how risk and return move in India market with the construction of portfolios. The study was made on Nifty stocks for the time period of 14 years and 6 months i.e. from 1st Jan 1996 to 30th June 2010. Conclusion derived from the study made was that in Indian market one can maximize the returns and minimize the risk by adding a greater number of stocks into their portfolios.

Rajesh P N carried out a study on the risk and return analysis of Indian market. He had analyzed the daily stock returns of Nifty and Nifty Junior for a period of 6 years and concluded that in Indian markets there exists no risk premium.

Yakov Amihud from New York University did research on risk and return relationship in which he introduces two econometric methods in order to improve the efficiency of the estimation which will lead to provide more powerful test statistics i.e. joint pooled cross-section and time-series estimation and generalized least squares. By using these techniques, he found that there is a highly significant relationship between average portfolio returns and systematic risk.

Pankunni.V from Kerela studied the relationship between beta and equity returns of the different stocks of listed in BSE for 15 years. In her research test of linearity between the beta and equity returns is attempted in order to know whether the market price and value of stock coincide. In the study she found that there is a significant relationship between the two but the relationship cannot be exactly found as linear. It was also studied that high beta stocks are earning more returns and both under and overpricing is found.

Kapil Chowdhry did the research in order to find the validity of CAPM for the Indian Stock Market in which he took 278 companies out of 500 companies listed on BSE through which it was found that there was no support evidence in providing the relationship between higher risk & return. But the study did not find any support of evidence on the ground of listed facts in contrast there was evidence in disproving the viability of CAPM in Indian context. So, in addition to that, the study conducted the test in order to investigate whether the CAPM captured all the aspects of reality by including residual variance of the stocks. The result which was obtained by the test conducted for the above did not clearly reject CAPM. In the light of the above findings, in his study he concluded that beta is not sufficient to determine the expected returns on securities or portfolios.

#### **4. SCOPE OF THE STUDY**

The dimensions of the study revolve around nifty 50 stocks for risk-return analysis for a period of 2009 to 2018 through which daily analysis is done of each stock. The period of 2009 to 2018 has been selected as that was the period after recession and this study investigates the performance of the stocks after that period till today i.e. 2018 so as to know how these stocks have been performing according to the market.

#### **5. RESEARCH METHODOLOGY**

For the study we have taken the securities of NIFTY50 Index companies which are mentioned below:

- Adani Ports and Special Economic Zone Ltd.
- Asian Paints Ltd.
- Axis Bank Ltd.
- Bajaj Auto Ltd.
- Bajaj Finance Ltd.
- Bajaj Finserv Ltd.
- Bharat Petroleum Corporation Ltd.
- Bharti Airtel Ltd.
- Bharti Infratel Ltd.

- 
- Cipla Ltd.
  - Coal India Ltd.
  - Dr. Reddy's Laboratories Ltd.
  - Eicher Motors Ltd.
  - GAIL (India) Ltd.
  - Grasim Industries Ltd.
  - HCL Technologies Ltd.
  - HDFC Bank Ltd.
  - Hero MotoCorp Ltd.
  - Hindalco Industries Ltd.
  - Hindustan Petroleum Corporation Ltd.
  - Hindustan Unilever Ltd.
  - Housing Development Finance Corporation Ltd.
  - I T C Ltd.
  - ICICI Bank Ltd.
  - India bulls Housing Finance Ltd.
  - Indian Oil Corporation Ltd.
  - IndusInd Bank Ltd.
  - Infosys Ltd.
  - Kotak Mahindra Bank Ltd.
  - Larsen & Toubro Ltd.
  - Lupin Ltd.
  - Mahindra & Mahindra Ltd.
  - Maruti Suzuki India Ltd.
  - NTPC Ltd.
  - Oil & Natural Gas Corporation Ltd.
  - Power Grid Corporation of India Ltd.
  - Reliance Industries Ltd.
  - State Bank of India
  - Sun Pharmaceutical Industries Ltd.
  - Tata Consultancy Services Ltd.
  - Tata Motors Ltd.
  - Tata Steel Ltd.
  - Tech Mahindra Ltd.
  - Titan Company Ltd.
  - UPL Ltd.
  - UltraTech Cement Ltd.
  - Vedanta Ltd.
  - Wipro Ltd.
-

- Yes Bank Ltd.
- Zee Entertainment Enterprises Ltd.

Information about the same has been taken from secondary data sources i.e. Website of NSE.

Then for the research purpose we have calculated the daily returns, average returns, beta values and correlation between the individual stock and market returns.

Further two methods were used for the study which are:

1. Graphical representation and analysis of average returns and beta.
2. Correlation Analysis

In order to conduct the research through the above-mentioned methods, the variables studied are as follows:

Measurement of daily and average returns With the help of the daily close price of the individual securities we have calculated the daily and average returns.

Formula for the same is:

$$\text{Daily Returns} = (\text{Close price of the current day} - \text{Close price of the previous day}) / \text{Close price of the previous day} * 100$$

$$\text{Average Returns} = \text{Total of daily returns} / \text{No. of days}$$

Measurement of Beta values

Beta is a measure of systematic risk which most of the investors use to analyse the overall risk in the securities and to plan their investment portfolio.

It is calculated as follows:

$$\text{Beta} = \text{Covariance} / \text{Variance of the market}$$

Measurement of Correlation Values

Correlation measures the relationship between two and more variables. In this study, we have calculated the correlation between the returns of the individual securities and risk associated with them i.e. their beta values.

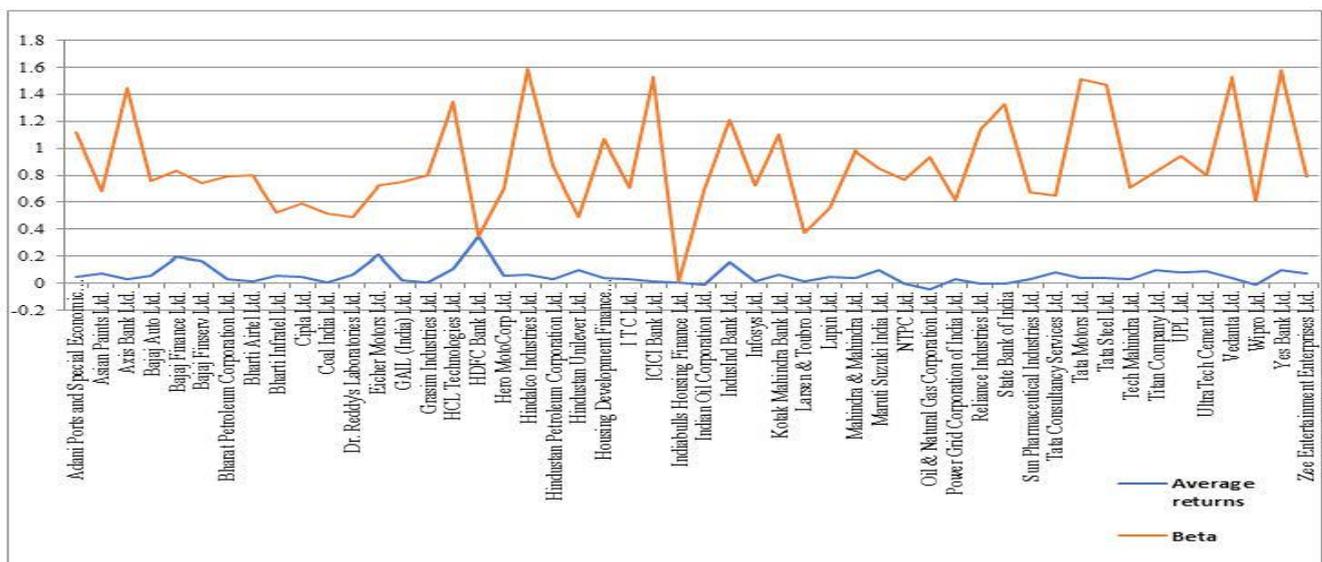
A positive correlation states direct relationship between the variables whereas negative defines the indirect relationship. Correlation is measured with the help of function in excel.

Statistical Tools Used for Analysis

Microsoft Excel 2016 has been used for the purpose of analysis.

**6. DATA ANALYSIS**

In the first method of graphical representation we have constructed a graph representing average returns and beta values of all the companies taken. The graph which we have prepared is shown below.

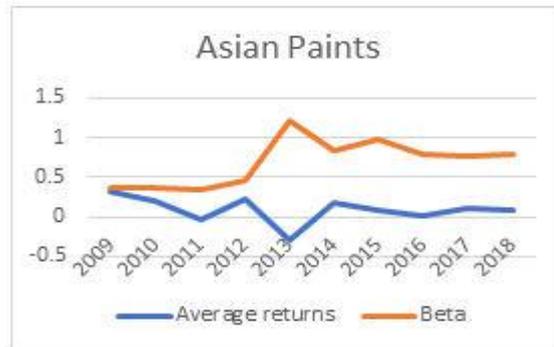


Now after analysing the movements in graphs regarding the risk and return values it can be interpreted that most of the companies are showing the positive risk-return relationship. As the risk is rising, returns are also increasing and vice-a-versa.

For example: In Bajaj Finance Ltd, Eicher Motors Ltd., Yes Bank ltd. etc.

But still there are companies such as Asian Paints, Bajaj Finserv, HDFC Bank etc. which are not showing the direct relationship between risk and return. They are found to be moving in the opposite directions at some points and their correlation is also negative. So, to understand the reasons behind the opposite movements we have further analyzed the individual companies. The analysis made is stated below: exceptional cases have been discussed below:

**1. Asian Paints Ltd.**



In the case of Asian Paints, it can be noticed that even with the rise of beta there is no rise in the average return.

Even at some points average returns are moving opposite to that of the risk, especially in the year 2011 and 2013. Reason for the low average return during the year 2011 was the closing of two major plants by company which gave a negative message in the market and share price of the company fall drastically. Then in 2013, Asian paints declared a stock split in the ratio 1:10, which reduced the stock price and hence the returns.

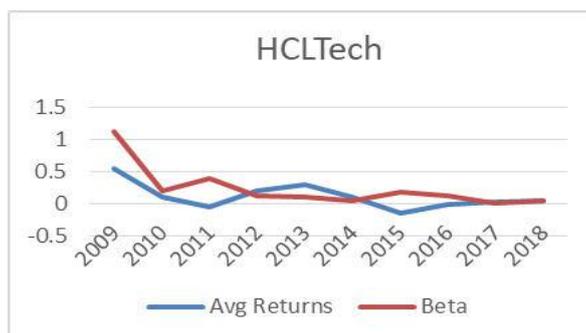
**2. Bajaj Finserv Ltd.**



In the case of Bajaj Finserv Ltd. we can see that in the year 2009 & 2010 risk and returns were moving in the same direction but then in 2011& 2013 reverse situations were noticed.

The reason behind the falling average return was announcement of 100% dividend in 2011 and issuance of right shares in 2013. And after 2013 as well returns were almost same or stable with the rising risk in the market

**3. HCL Technologies Ltd.**



In the case HCL Technologies Ltd. risk and returns from the very starting were seen to be moving in opposite directions. The reason behind the same was the company performing less profitable in the rising risk market. In 2011, there was a 83% decline in the net profit of the company. Then in 2015&2016 as well net profit of the company fall from the expected one which posed a adverse effect on the average returns.

**4. Hindustan Unilever Ltd.**



In case of Hindustan Unilever Ltd. it can be seen that the risk were continuously rising but the returns were stable or almost one and the same over the period of last 10 years. It means that even if the Hindustan Unilever was not able to earn the risk premium but it maintained its average return or share price in the risk market.

**5. TCS**



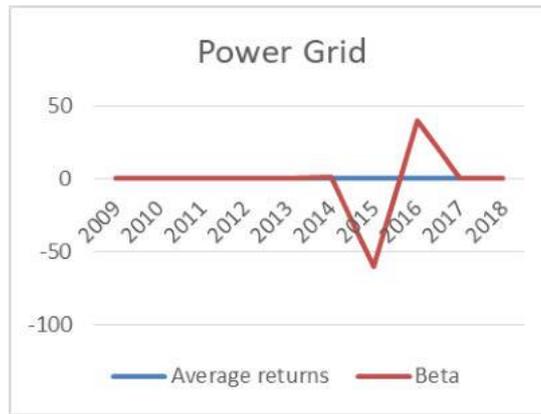
In the case of TCS, it can be noticed that with the rise of beta i.e. risk measure there is sufficient rise in the average return. Even at some points beta is reduced over the years but still average returns are moving positive to that of the risk, especially from the year 2013 and 2016. In 2018 even, the risk taken by the company was very minimal even though the company was earning sufficient returns. As India’s largest IT outsourcer, TCS is always been at the top among the other IT companies i.e. Wipro, Infosys etc. TCS has recently announced in the bonus shares for its shareholders in the ratio 1:1. There were some ups and downs in the IT a sector for some period but then TCS were able to recover from that and is performing at a stable level in the market as compared with competitors. According to financial express, in January this year shares of the company have made an all-time high on NSE.

**6. SBI**



In the case of SBI, again no direct relationship between beta and return can be laid down. At some points there was rise in the beta measure but return either fall down or remained the same. In 2014, SBI gains after 1:10 stock split came into effect through which it became easy for the investors to acquire the stock at a low price and also improves the liquidity position. Though in 2014 the returns did not change till 2015 but it showed it’s after effect in further years. This is the reason that after this period the returns for the company rose again. Though beta value also rose but there were adequate returns also.

7. POWER GRID



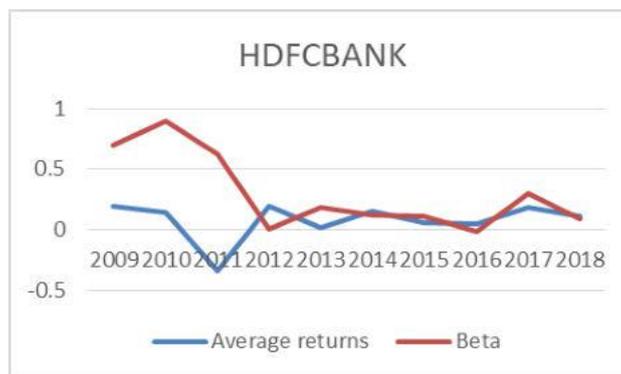
Power Grid is performing which is clear from the above graph. In 2009, the subsidiary named Power System Operation Corporation Limited was incorporated by the company which lead to negative returns as it was the time that the company was not able to focus on its main function which lead to negative returns. In 2013 the Company received its international rating from S&P and Fitch rating, for the first time. After that even company was not taking much risk but was able to earn some amount of return.

8. ONGC



From the above graph, we can see that average returns and beta of the ONGC are somewhat moving in a same direction. After 2011, with the rise in the risk there is a hike in the returns as well, stating a direct relationship of risk and return.

9. HDFC



As the 23-year-old organization, HDFC is the India’s second largest private sector lender and after observing its performance over the years, India has identified HDFC as DSIB (Domestic Systematically Important Banks) which made it the organization which is too big to fail. As can be seen in the graph above, the bank has performed very well during the period 2014 to 2018 i.e. higher the risk and higher the returns. The reason that the bank earned negative return during the period of 2011 was stock split in company’s share in the ratio 1:5 but after that period HDFC managed to earn adequate returns. Now, in the graphical representation method though we have tried to analyzed risk and return relationship through the movements of the average returns and beta values. But still to understand the relationship more precisely correlation Analysis is also made in the study. Under this correlation between average return and beta of each company is measured. The table of the correlation values is shown as below:

Company Name	Correlation	Company Name	Correlation	Company Name	Correlation
Adani Ports and Special Economic Zone Ltd.	0.469298659	Hero MotoCorp Ltd.	-0.0245994	Oil & Natural Gas Corporation Ltd.	0.177646177
Asian Paints Ltd.	0.656357436	Hindalco Industries Ltd.	0.1380642	Power Grid Corporation of India Ltd.	0.222943463
Axis Bank Ltd.	0.234547326	Hindustan Petroleum Corporation Ltd.	0.05400378	Reliance Industries Ltd.	0.890479849
Bajaj Auto Ltd.	0.832785799	Hindustan Unilever Ltd.	0.24876219	State Bank of India	0.193026392
Bajaj Finance Ltd.	0.616576636	Housing Development Finance Corporation Ltd.	0.33933062	Sun Pharmaceutical Industries Ltd.	0.781401678
Bajaj Finserv Ltd.	0.381000357	I T C Ltd.	-0.3793463	Tata Consultancy Services Ltd.	0.483558345
Bharat Petroleum Corporation Ltd.	0.003159554	ICICI Bank Ltd.	0.73111386	Tata Motors Ltd.	0.258919498
Bharti Airtel Ltd.	0.052333901	India bulls Housing Finance Ltd.	0.02078348	Tata Steel Ltd.	0.38175551
Bharti Infratel Ltd.	0.062446102	Indian Oil Corporation Ltd.	-0.3384091	Tech Mahindra Ltd.	0.619452305
Cipla Ltd.	0.384816875	IndusInd Bank Ltd.	-0.00662	Titan Company Ltd.	0.290673594
Coal India Ltd.	0.300573657	Infosys Ltd.	-0.2149568	UPL Ltd.	0.279367928
Dr. Reddy's Laboratories Ltd.	0.113764029	Kotak Mahindra Bank Ltd.	0.29873894	UltraTech Cement Ltd.	0.340462875
Eicher Motors Ltd.	0.039132288	Larsen & Toubro Ltd.	0.12652764	Vedanta Ltd.	0.387152473
GAIL (India) Ltd.	0.18482822	Lupin Ltd.	-0.0955026	Wipro Ltd.	0.107117804
Grasim Industries Ltd.	0.139665773	Mahindra & Mahindra Ltd.	0.10824042	Yes Bank Ltd.	0.148519477
HCL Technologies Ltd.	0.665160304	Maruti Suzuki India Ltd.	0.29774787	Zee Entertainment Enterprises Ltd.	0.498331415
HDFC Bank Ltd.	-0.187467	NTPC Ltd.	0.2091768		

Now from the above table we can see that scrips of 24 companies out of 50 are showing positive correlation value which indicates a direct risk and return relationship whereas rest of the 26 companies are having negative correlation. The reason behind the negative correlation in most of the companies is due to negative average return in them. And negative average return is an outcome of the stock split announced by these companies. But if we look into the returns and risk data of these companies keeping aside the returns of the stock split year they are indicating a direct relationship. Therefore, after analyzing the correlation data as well it can be interpreted that scrips of the Nifty50 index are undertaking direct risk and return relation.

### CONCLUSION

From the study made on risk and return relationship on the scrips of NIFTY50 Index it was found that most of the companies are having a positive relationship amongst the two i.e. with the rise in the risk factor their returns are also seen to be increasing and vice-a-versa. Though there were some exceptional cases as well in which risk and returns were moving in the opposite direction but that was due to the stock split majorly.

Therefore, after executing the whole study we have concluded that the scrips of blue-chip companies work on the positive risk and return relationship model.

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**TECHNOLOGY AND ITS APPLICATION: INTRODUCTION TO ROAD NAVIGATION**

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**ABSTRACT**

*Technology can be described as the application of scientific knowledge for real-world situations or collection of techniques, skills, methods, and processes used in the production of goods or services. Navigation can be explained as a technique of monitoring and controlling the movement of a vehicle from one place to another. Road navigation typically uses a satellite navigation device to get its position data which is then correlated to a position on a road. When new directions are needed routing can be calculated. Road navigation basically uses maps, landmarks, and in recent times known to be as computer navigation. Computerized navigation majorly depends up on GPS for current location information, a navigational map database of roads and navigable routes, and uses algorithms related to the shortest path problem to identify optimal and alternative routes to reach the destinations. In India, road navigation has experienced a boom during the decade 2010-2020 majorly due to introduction of smartphones and rapid growth of automobile industry. In fact, navigation is just not limited to starting point to destination journey, but has also made us filled with information related to services like petrol stations, restaurants, hospitals, tourists spot etc. Moreover, navigation is currently on a path where we would have autonomous cars which will entirely be functional on navigation systems. Road navigation has indeed made our daily life easy and is also continuing to mesmerize us with its immense applications in the real world.*

*Keywords: Technology, Road Navigation, GPS*

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**INTRODUCTION**

Road navigation is not a new technology for our world. It was first invented in 1961 by Hidetsugu Yagi in Japan. He designed a wireless-based navigation system which was intended for military- use. Apparently, it was failed because the technology was expensive, maps were inaccessible, batteries were primitive, display was poor, and the processing power could not meet up to the level of expectation. From 1966 onwards, various giant automobile manufactures like General motors, Toyota, Mitsubishi, Acura, Honda, Nissan, Mazda, BMW etc. entered the navigation industry and created remarkable history.

Road maps are based on vector database which can be explained as a representation of the world using points, lines, and polygons. Vector database are beneficial for storing data that has discrete boundaries, such as country borders, streets and land parcels.

**Concept of Road Navigation**

1. Form of Way (FoW) – FoW is the type of road depending up on its physical form and topography. Following are the types of FoWs without which navigation would never have been existed.
  - a. Dual Carriageway – It is the road with opposite direction of traffic flow with a physical barrier or divider in between whose length must be 40m at least.
  - b. Single Carriageway - It is the road with opposite direction of traffic flow with no physical barrier or divider in between usually divided by a painted line at center of road.
  - c. Roundabout – A circular barrier with the length of 8m in diameter, the traffic flow should be in one-way and should have at least 2 navigable roads.
  - d. Small Slip Road – It should have one-way traffic and is made to smoothen the traffic flow. Usually made to avoid 1 crossing and the physical barrier should have the length of 7.5m at least on one side.
  - e. Major Slip Road – It is designed between 2 roads crossing each other at different levels. They are usually found at the entry or exit of main roads/ highways. It is also known as ‘ramp’.
  - f. Freeways – These are the roads without speed limit which can be accessed by a ramp because either they are either elevated or depressed with minimum length of 2km.
  - g. Service Roads – These are the roads which originate from a freeway and gets merged in the same freeway. They are made to provide services like food courts, public convenience, fuel stations, automobile repairs etc.
2. Functional Road Class (FRC) – It is a method used for the classification of roads based upon its importance which critically depends up on the structure, purpose, use, road network and the construction of the road.

Following are the 10 categories of FRC which have been ranked in ascending order depending up on their functional importance.

- a. FRC 10 (Motorways) – These are the roads with highest importance as they connect at least 2 countries or regions. They are officially designated.
  - b. FRC 20 (Major roads of higher importance) – They are like FRC 10 but are not officially designated. They usually connect northern – southern or eastern – western extents within a country.
  - c. FRC 30 (Other major roads) – Roads which are used to travel among different states or regions.
  - d. FRC 40 (Secondary roads) – Roads like FRC 30 but are of lesser importance as they connect lesser important regions.
  - e. FRC 51 and FRC 52 (Local construction roads and Local roads of other importance) – These are local roads within FRC 40 connecting local areas.
  - f. FRC 60 (Local Roads) – These roads connect minor settlement in rural areas
  - g. FRC 70 (Local road of minor importance) – Roads like FRC 60 but connects more remote areas.
  - h. FRC 80 (Other Roads) – These are the footpaths, cycle tracks, stairs. In-short those roads which cannot be used by the vehicles.
3. Net 2 Class (N2C) – It is the classification of roads into categories as per the FRC values.

<b>FRC</b>	<b>N2C</b>
10	1
20	1
30	2
40	3
51	4
52	4
60	5
70	5
Unpaved/ Unmetalled Roads	6
Restricted/ Closed Roads	7

- 4. Vehicle Types – In road navigation, there are 7 types of vehicle, namely: Passenger Car, Residence, Taxi, Public Bus, Medium Truck, Heavy Trucks and Private Bus.
- 5. Grade Separate Crossing (GSC) – It is a crossing marked to differentiate roads at different level from ground level. Considering ground level as 0, the roads crossing over the flyovers will be at level 1 or at -1 in the case of underpass.
- 6. Maximum Dimension – It is the size, weight, length, and axle weight of the vehicle to the capacity of road.
- 7. Positional Accuracy – It is the accuracy used to build the source with relation to the real world in terms of GPS reading.
- 8. Speed Restriction – It is the maximum speed legally allowed to drive on a road which depends up on vehicle type, direction, weather and time.
- 9. Lanes - If the line is broken, you can overtake. If the line is continuous, overtaking is bit risky, hence not recommended. If the line is double it must not overtake as it is highly dangerous traffic violation.
- 10. Point of Interests (PoI) – It is the landmark important for guidance and mapping.
- 11. Anchor Points – Location of a legitimate position of a house numbers, anchor point acts as a location point for houses on a street for geocoding accuracy level.

**OBJECTIVES OF THE STUDY**

- 1. Awareness towards navigation maps
- 2. Purpose of using navigation maps
- 3. Scope of autonomous driving in India
- 4. Limitations of navigation maps

**METHODOLOGY**

A questionnaire was prepared with 10 questions and was distributed among family, friends and colleagues. The questionnaire majorly consisted of questions which was related to awareness of people regarding navigation technology, frequency of usage, application, technical know-how, future scope in India and limitations. The survey was shared digitally among all the respondents through WhatsApp application. WhatsApp was selected as a mode of filling up the questionnaire because it is an application used by almost everyone and to get prompt response is convenient for both respondent and surveyor. A sample size of 101 responses were recorded which gave dynamic answers as per respondent(s) understanding. The sample size was irrefutable of any specific age, but preference was given to the age of 18+ years because it is the legal age of driving in our country. The questionnaire was kept as simple as possible so that it doesn't take a lot of time and people can understand the question in one-go without any assistance.

**FINDINGS AND DISCUSSIONS**

As discussed above, Navigation can be explained as a technique of monitoring and controlling the movement of a vehicle from one place to another. Road navigation typically uses a satellite

navigation device to get its position data which is then correlated to a position on a road. When asked about the awareness regarding the navigation technology, 99 (98%) out of 101 responded that they are conscious about the navigation technology but the remaining 2 (2%) were not sure about the navigation technology.

Whilst studying the frequency of usage of the navigation technology in the day-to-day life, it was really astounded to see that out of 101 responses, 69 (68.3%) of the respondents are the occasional navigation user and 29 (28.7%) are the daily navigation user. The occasional users are comfortable with their daily commute from home to office and vice-versa which does not require the use of navigation on the daily basis. On the contrary, while travelling to new places other than usual ones, occasional users prefer navigation maps to cut-down the time to search routes for reaching at their destinations. Most of the occasional users also use this technology only in local areas of their destination to reach the exact spot and prefer to travel along main roads/ highways without maps. On the other hand, 28.7% of the daily navigation users mainly comprised of the people who use cab facilities like Uber, Ola to check the route. Daily users also had newly-started drivers who rely on navigation so that they don't make wrong directional judgement while concentrating on driving. There is a very small proportion of the respondents who are the rare navigation user which happens to be only 2 (2%) and 1 (1%) do not use the navigation technology at all.

According to the Psychology, every person is different and so is their priorities, preferences and decisions. The similar trend was observed while studying the main purpose of the respondents for using the navigation technology. Out of 101 responses, 48 (47.5%) use navigation technology just to check the alternate route because as a matter of fact, there are always more than one route to reach a destination, but it completely depends on the users what exactly they seek in a route like less traffic congestion, scenic beauty, preferring/avoiding toll roads, route with minor attractive spots etc. All these factors sum up to give a reason for finding the best alternative which is suitable to the user. Almost 25 (24.8%) samples use the navigation technology to check the traffic condition on their route to reach their destination. By doing this practice they get two options: (a) to see alternative route before starting their journey and (b) to wait till the congestion dissolves and the traffic moves smoothly and then they start their journey. Out of 101 responses, 20 (19.5%) are the ones which are completely dependent on the navigation maps to reach their respective destinations. It won't be wrong to say that these respondents cannot go out without navigation maps. It is good that these proportion of the people are completely utilizing the navigation technology. Some of them also use them very frequently to learn the routes so that they can be less dependent on these maps in the mere future. A small portion of 6 (5.9) respondents use the navigation technology just to check the near-by services like restaurants, fuel stations, medical assistance, automobile service, tourist spots, banks/ ATMs etc. at their location or on the route. 2 (2%) of the respondents do not use the navigation technology at all. It is quite possible that these are the respondents who are not aware about this technology as discussed above.

Navigation is a technology which is easily accessible by everyone. This trend can be easily seen on the application of this technology through various modes. 91 (90.1%) out of 101 responses are in the favor of using this technology through their smartphones. It is the cheapest and the most mobile way to use the navigation technology and it is one of the reasons that people prefer to settle for cheaper car models which offer in-built navigation because in today's time everyone has a smartphone so why to spend extra when you already have a solution in your pocket. A very small proportions of 3 (3%) respondents have purchased special navigation devices for their vehicles and 3 (3%) have in-built navigation system in their vehicle's infotainment system.

Again, it is completely depending on the personal preferences and comfort. As per the responses, 4 (4%) of the respondents do not use maps at all.

Everyone has their own comfort while driving their vehicle. While asking their way of using navigation technology I got many dynamic responses. Out of 101 samples, 50 (49.5%) respondents are comfortable in seeing the maps. Reason being that the user prefers to anticipate the route before reaching the decision point so that they can change the lanes while driving. 29 (28.7%) of responses are in the favor of listening to the directions rather than seeing the map. They prefer to give visual importance and alertness to driving than to see the maps. Almost 17 (16.8%) respondents prefer to get directions from the co-passenger. The co-passenger guides the driver from the personal knowledge or with the help of navigation systems. In short, it is the co-passenger who directs the driver. Only 1% of the respondent are in favor of listening and seeing the map, this is quite unsafe method because 2 of the senses i.e. visual and audibility is focused on map rather than on driving but if the respondent is comfortable we must appreciate it but should not encourage it. A sum of 3 (3%) of the samples do not use maps at all neither on daily or occasional basis. Last but not the least there is a 1 (1%) respondent who does not drive at all so for him/her the way of using navigation technology is as good as nothing.

It was very shocking to see that there is not much difference among the responses when people were asked with their preference for the plan of action if they are off their track. Out of 101 responses 54 (53.5%) respondents are in the favor of using the navigation technology to reach their destination or at least on right path in case if they are off-track. These people have full faith in the science and technology and believe that this technique will try to get them out because it the reason why this technology has been developed. On the other hand, 44 (43.6%) people prefer to ask the local people rather than trusting the navigation maps. When reason was asked for the same, most of them replied that it is the maps which made them off-track hence they prefer the old-school method of asking directions from the other to be on right path. A small proportion of the respondents of 2 (2%) give priority to their gut feeling for the direction on the occasions when they are off-track. They neither trust the maps, nor do they ask the people for right direction. Similar is the condition of the remaining 1 (1%) of the person who has responded none of the above, probably it is the one who is not aware about navigation technology and perhaps do not practice it.

One of the important questions asked in the questionnaire was if the respondents are satisfied with add-on features of navigation systems other than just providing directions. The outcome was quite expected that 97 (96%) out of 101 respondents are completely satisfied by the features other than to just provide with the direction. These respondents enjoy the features of alternative routes, traffic forecast, multiple destinations on same route, services along the route, shopping etc. A small share of 4 (4%) respondents believes that there is scope of further improvements. They are happy with the features provided by the navigation maps but they think that the technology should change as per the growing demand.

An autonomous car is a vehicle that can sense the nearby environment and can move with limited or no human input. The first automated car was developed in 1977 by Japan's Tsukuba Mechanical Engineering Laboratory. It was asked by the samples that, as per them, might this technology be successful in India or not. Out of 101 responses, 36 (35.6%) of respondents have a positive sense that the technology of autonomous car will not only should come in Indian markets but will also prove to be a huge success. On the other hand, 16 (15.8%) respondents are negative regarding the concept of autonomous cars in India. They think India is not ready for such complex technology especially where traffic violations are very common. Moreover, it is also believed that this technology will be very expensive for a common man, so it makes no sense even if it is introduced, it will be a huge flop. Large proportion of 51 (50.5%) of the samples think that it might be successful. They have confidence that since, human involvement in the work like driving would decrease, so will be the occasion of traffic congestions and accidents would come down. They are ready to welcome the technology and see how it performs in Indian conditions. It will be too early to decide it for them if it will be a success or not but majority of them hope that it just might work out of India.

This is the section when it was asked from the sample that if they are aware of such blessing-like technology that how does it operates and what makes it work. Principally, navigation systems need GPS connection which gets synchronized by at least 4 satellites to get the position in 3-dimensions (east, north and altitude). These satellites produce thousands of algorithms per second to provide us with distance, estimated time, and altitude from the sea level. In our smartphones, we do not have GPS, but a technology called A-GPS (Assisted GPS) which needs a data connection or internet connection which is connected to a server. The server can supply data, so the GPS doesn't have to wait to receive them from the satellites and it can also send an approximate location derived from cellphone towers. 55 (54.5%) out of 101 have a fair idea that how does the navigation

systems works. 36 (35.6%) respondents are not sure if the knowledge regarding the technical know-how is correct and enough to understand this technology. 10 (9.9%) samples are not at all aware of how this technology works. They prefer to enjoy the service rather than to know its working principle and concepts.

### CONCLUSION

If I summarize the above study, I can easily conclude that majority of the selected samples 98% are well-aware about the navigation technology. These are the people who prefer to use the navigation technology only at the time when it is required or occasionally rather than using it daily. It was also found that a large group of people were segregated on the purpose of using the maps as half of the respondents used navigation maps just to check alternate routes where as some of them used just to check the traffic condition before leaving for their destination and some needs

this technology just like a car needs fuel. 90% of the total respondents prefer to use navigation technology through their smartphones rather than opting for in-built systems in cars or special GPS systems because they are more convenient to use. Almost 50% of the respondents prefer to look at the maps while driving, followed by listening the instructions and then asking the co-passenger to guide them with directions. It was surprising to see that 53.5% of the respondents trusts the navigation technology in case if they are lost while driving because it is the main purpose of this technology but a proportion of 43.6% of the people give upper hand to asking for the direction from the people than relying on maps reason being there are many places which are not available on these navigation systems. It was very remarkable to see that 96% of the respondents are satisfied with the add-on information provided by the navigation technology other than mere directions. 50% of most samples thinks that autonomous vehicular technology might be successful in India. From the study it was found that the people are ready to welcome this new hi-tech, but the main concern is if the country could provide the conditions needed by the technology to sustain. Last but not the least, almost 90.1% of the respondents have at least some idea that how this navigation technology works. It was nice to see that people are aware regarding the technical know-how. Henceforth, it can finally be concluded that the study was successful in achieving all its objectives which were mainly: awareness towards navigation maps, purpose of using navigation maps, scope of autonomous driving in India and limitations of navigation maps

### LIMITATIONS

It is accepted worldwide that nothing is perfect. This implies on the navigation technology as well. There are many problems which people encountering while using navigation technology. From this survey, it can be easily depicted that majority of the respondents (90%) prefer to use navigation systems in their smartphones, hence, most of their problems are related to poor network which results in lack of accuracy, hanging of maps, GPS signal lost, etc. some of the responded also mentioned that navigation maps are fine on main roads and highways but they are not suitable for narrow areas. It was also found that many times navigation technology uses long route/ congested route which causes users to get late. It was also found by the users that maps many times makes us cross from the city's congestion and avoid the by-passes. Many times, users' needs alternate route, but the navigation map insist on 'U' turn and stick to the route shown by it. For interior and remote places, maps are not much useful either those areas are not digitized, or they are not updated.

### RECOMMENDATIONS

Apart from these limitations, respondents have also provided some possible suggestions for improvements like maps should be updated frequently because in major cities the road construction is carried out on large scale, so maps fail to give diversion routes. People have also mentioned that if technology allows us to know the road conditions (paved/ unpaved) and alerts if any while driving it would be more useful in limiting the speed as well as would alert us for caution. Last but not he least a suggestion was also provided by keeping women safety in mind that it should mark if the areas/ roads as safe or not based on time and situation with a proper safety indicator method.

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**TEACHERS IN SEARCH OF NEW PERSPECTIVE: EXPECTATIONS AND RESPONSIBILITIES**

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**ABSTRACT**

*The teaching profession has become more complex and demanding. The changes demand improvements in the working conditions, salaries and states. In the development of teachers' competence an appropriate use of new information technologies should be used as a powerful tool in the educational process. The individual teacher should be given professional autonomy to allow him/her to determine programmes, teaching method etc. so that best educational objectives may be achieved.*

*Along with expectations, teachers also have lots of responsibilities. Teaching is work of the most demanding sort, for teachers must make dozens of decisions daily, command a wide body of knowledge and to learn to react instantly, and be disposed to act wisely in difficult situation. And while there are principles and precepts, skill and techniques, to guide the work, teaching is also an activity with artistic aspects, a craft calling for reflection and judgement.*

*Keywords: Teachers, Teaching Profession, Expectations, Responsibility*

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**INTRODUCTION**

We each remember the great teachers who touched our lives, kindled our interest and pressed us to do our best. We hold powerful images of such teachers. They exhibited a deep caring and love for children. They conveyed a passion for the subjects they taught, captivating their students with that passion. They emphasize teaching's external aspects, not its inner workings. They approached their work with creativity and imagination, striving constantly to improve. As committed professionals, they were proud to be teachers. The images of teaching that we share are deceptive as well as compelling. If we fondly recall the great teachers of our past, we also typically see teaching as a humble undertaking. It concerns itself with the least powerful age group in society. It involves such seemingly routine activities as arranging seatwork, lecturing, reviewing and responding to students' effort, and disciplining their behaviour. Accomplished teachers realize that higher order thinking is the hall mark of successful learning at all levels. There can be no neat division of teaching labour along a basic to advanced skills continuum. All teachers must concern themselves with higher order skills, with the executive functions of reasoning, and with students' capacities to monitor their own learning. Accomplished teachers constantly assess and adjust their practice to maintain fidelity to students and to subjects, to knowledge and to skills, and to basic and advanced functions. Professionalism in teaching entails the ongoing pursuit of these unities. Hence, teachers regularly find themselves confronting hard choices- sometimes sacrificing one goal for another, sometimes making compromises. If the role of a teacher is to teach, the role of a student must be to learn. However, it has been agreed that learning is not only an exercise in reading and reciting facts, but in gaining a deeper insight of events and situations.

**TEACHERS' IMPORTANCE**

The importance of a teacher as an architect of our future generations demands that only the best and the most and competent members of our intelligentsia be allowed to qualify for this noble profession. It is unfortunate to find that generally the worst and the most incapable people of the society find their way into this profession. Anyone who fails to find an opening in any other walk of life gets into this profession and recklessly plays with the destiny of the nation. An important reason for this is understood to be the poor salaries of our primary and secondary teachers which are no better than that of clerks. A large number of our teachers is therefore, frustrated and uninterested. They have to go for part-time jobs to meet their basic needs. Again, the teaching profession also does not enjoy due respect in the society. The primary and secondary teachers are particularly at a disadvantage. Their status is lower than that of doctors, engineers, advocates, civil servants; even lower than that of semiliterate and illiterate traders. It would therefore require great commitment for an intelligent individual, however fond of education and training he may be to forsake the career of a doctor or engineer in favour of teaching. Therefore, while selecting good teachers, it must be borne in mind that better opportunities, prospects and perks are offered to the teachers.

**EXPECTATIONS OF TEACHERS**

When we speak of good teachers, it means that a teacher must be a model of faith and piety and should have a fairly good knowledge. A teacher should consider it his duty to educate and train his students and should feel responsible for it. He should feel that his students have been entrusted to him and he should avoid any breach of

the trust the society has reposed in him, he should be able to be a sociable person with his roots in the society, people should take him as their well-wisher and a sincere friend who cares for their children. It should be ascertained at all cost that a candidate for this profession has a natural acumen and aptitude for teaching.

Teachers need to actively participate in the social activities in a positive way and know the art of teaching with a deep insight into child psychology. Always dealing with the students in a just manner not losing any self-control is an important part of being a teacher, respecting their students, feelings, ego and trying to understand and resolve their difficulties with grace is important in being a teacher. He should be able to smile in the face of bitter criticism on his opinions, and should not feel ashamed or humiliated to accept his mistakes wholeheartedly. He should be proud of his culture, his national dress and his national language. He should be a missionary, a mentor, a reformer and a guide besides being a dedicated tutor. In other words, he should be a perfect teacher and a perfect educationist

### **DUTIES & RESPONSIBILITIES OF TEACHER**

The Teacher Must: -

- Attend the morning assembly daily on time.
- Address the students on moral principles, social and environment issues.
- Follow the conduct rules notified in CCS (Conduct) Rules 1964 & CCS(CCA) Rules 1965
- Maintain the Teacher's Diary regularly with the lesson plan.
- Reach the class on time for teaching.
- The teacher must evaluate the students from time to time
- Teachers who are also faculty in-charges will conduct regular meetings and discuss the methods to improve the performance of students in the subject.
- Teachers must make best use of the TLM money and Pupils' Welfare Fund to develop relevant teaching learning material.

#### **1. KNOWLEDGE OF THE SUBJECT**

- To have expert knowledge of the subject area
- To pursue relevant opportunities to grow professionally and keep up-to-date about the current knowledge and research in the subject area

#### **2. TEACHING**

- To plan and prepare appropriately the assigned courses and lectures
- To conduct assigned classes at the scheduled times
- To demonstrate competence in classroom instruction
- To implement the designated curriculum completely and in due time
- To plan and implement effective classroom management practices
- To design and implement effective strategies to develop self-responsible/independent learners
- To promote students' intrinsic motivation by providing meaningful and progressively challenging learning experiences which include, but are not limited to: self- exploration, questioning, making choices, setting goals, planning and organizing, implementing, self-evaluating and demonstrating initiative in tasks and projects
- To engage students in active, hands-on, creative problem-based learning
- To provide opportunities for students to access and use current technology, resources and information to solve problems
- To provides opportunities for students to apply and practice what is learned
- To engage students in creative thinking and integrated or interdisciplinary learning experiences
- To build students' ability to work collaboratively with others
- To adapt instruction/support to students' differences in development, learning styles, strengths and needs

- To vary instructional roles (e.g. instructor, coach, facilitator, co-learner, audience) in relation to content and purpose of instruction and students' needs
- To maintain a safe, orderly environment conducive to learning
- To comply with requirements for the safety and supervision of students inside and outside the classroom

**3. ASSESSMENT**

- To define and communicate learning expectations to students
- To apply appropriate multiple assessment tools and strategies to evaluate and promote the continuous intellectual development of the students
- To assign reasonable assignments and homework to students as per university rules
- To evaluate students' performances in an objective, fair and timely manner
- To record and report timely the results of quizzes, assignments, mid- and final semester exams
- To use student assessment data to guide changes in instruction and practice, and to improve student learning

**4. PROFESSIONALISM**

- To be punctual and be available in the university during official working hours
- To comply with policies, standards, rules, regulations and procedures of the university
- To prepare and maintain course files
- To take precautions to protect university records, equipment, materials, and facilities
- To participate responsibly in university improvement initiatives
- To attend and participate in faculty meetings and other assigned meetings and activities according to university policy
- To demonstrate timeliness and attendance for assigned responsibilities
- To work collaboratively with other professionals and staff
- To participate in partnerships with other members of the university's community to support student learning and university-related activities
- To demonstrate the ability to perform teaching or other responsibilities, including good work habits, reliability, punctuality and follow-through on commitments
- To provide and accept evaluative feedback in a professional manner
- To create and maintain a positive and safe learning environment
- To carry out any other related duties assigned by the department chairman

**5. GOOD BEHAVIOUR**

- To model honesty, fairness and ethical conduct
- To model a caring attitude and promote positive inter-personal relationships
- To model correct use of language, oral and written
- To foster student self-control, self-discipline and responsibility to others
- To model and promote empathy, compassion and respect for the gender, ethnic, religious, cultural and learning diversity of students
- To demonstrate skill when managing student behaviour, intervening and resolving discipline problems
- To model good social skills, leadership and civic responsibility Teachers are committed to students and their learning Accomplished teachers are dedicated to making knowledge accessible to all students.

They act on the belief that all students can learn. They treat students equitably, recognizing the individual differences that distinguish one student from another and taking account of these differences in their practice. They adjust their practice based on observation and knowledge of their students' interests, abilities, skills, knowledge, family circumstances and peer relationship.

Accomplished teachers understand how students develop and learn. They incorporate the prevailing theories of cognition and intelligence in their practice. They are aware of the influence of context and culture on behaviour. They develop students' self-esteem, motivation, character, civic responsibility and their respect for individual, cultural, religious and racial differences.

1. Teachers recognize individual differences in their students and adjust their practice accordingly.
2. Teachers have an understanding of how students develop and learn.
3. Teachers' mission extends beyond developing the cognitive capacity of their students.
4. Teachers treat students equitably.

Teachers are responsible for managing and monitoring student learning. Accomplished teachers create, enrich, maintain and alter instructional settings to capture and sustain the interest of their students and to make the most effective use of time. They also are adept at engaging students and adults to assist their teaching and at enlisting their colleagues' knowledge and expertise to complement their own. Teachers command a range of generic instructional techniques, know when each is appropriate and can implement them as needed. They are as aware of ineffectual or damaging practice as they are devoted to elegant practice. They know how to engage groups of students to ensure a disciplined learning environment, and how to organize instruction to allow the schools' goals for students to be met. They are adept at setting norms for social interaction among students and between students and teachers. They understand how to motivate students to learn and how to maintain their interest even in face of temporary failure. They employ multiple methods for measuring student growth and understanding and can clearly explain student performance to parents.

- Teachers call on multiple methods to meet their goals
- Teachers orchestrate learning in group settings
- Teachers place a premium on student engagement
- Teachers regularly assess student progress
- Teachers are mindful of their principal objectives
- Teachers work collaboratively with parents

#### **Teachers in search of new perspectives**

- While the psychological and material situation of teachers differs greatly from country to country, an upgrading of their status is essential if 'learning throughout life' is to fulfil the central function assigned to it by the Commission in the advancement of our societies and the strengthening of mutual understanding among peoples. Their position as master or mistress in the classroom should be recognized by society and they should be given the necessary authority and suitable resources.
- The concept of learning throughout life leads straight on to that of a learning society, a society that offers many and varied opportunities of learning, both at school and in economic, social and cultural life, whence the need for more collaboration and partnerships with families, industry and business, voluntary associations, people active in cultural life, etc.
- Teachers are also concerned by the imperative requirement to update knowledge and skills. Their professional lives should be so arranged as to accommodate the opportunity, or even the obligation, for them to become more proficient in their art and to benefit from periods of experience in various spheres of economic, social and cultural life. Such possibilities are usually provided for in the many forms of study leave or sabbatical leave. Those formulae, suitably adapted, should be extended to all teachers.
- Even though teaching is essentially a solitary activity, in the sense that each teacher is faced with his or her own responsibilities and professional duties, teamwork is essential, particularly at the secondary level, in order to improve the quality of education and adapt it more closely to the special characteristics of classes or groups of pupils.
- The Commission stresses the importance of exchanges of teachers and partnerships between institutions in different countries. As is confirmed by current activities, such exchanges and partnerships provide an essential added value not only for the quality of education but also for a greater receptivity to other cultures, civilizations and experiences.

- All these lines of emphasis should be the subject of a dialogue, or even of contracts, with teachers' organizations which go beyond the purely corporatist nature of such forms of collaboration: over and above their aims of defending the moral and material interests of their members, teachers' organizations have built up a fund of experience which they are willing to make available to policy-makers.

**Teachers know the subjects they teach and how to teach those subjects to students**

Teachers have a rich understanding of the subjects they teach and appreciate how knowledge in their subject is created, organized, linked to other disciplines and applied to real-world settings. While faithfully representing the collective wisdom of our culture and upholding the value of disciplinary knowledge, they also develop the critical and analytical capacities of their student. Accomplished teachers command specialized knowledge of how to convey and reveal subject matter to students. They are aware of the preconceptions and instructional materials that can be of assistance. They understand where difficulties are likely to arise and modify their practice accordingly. Their instructional repertoire allows them to create multiple paths to the subjects they teach, and they are adept at teaching students how to pose and solve their own problems.

- Teachers appreciate how knowledge in their subjects is created, organized and linked to other disciplines.
- Teachers command specialized knowledge of how to convey a subject to students.
- Teachers generate multiple paths to knowledge.
- Teachers appreciate how knowledge in their subjects is created, organized and linked to other disciplines.

**Teachers think systematically about their practice and learn from experience.**

Without personal and professional reflection, teachers cannot grow. Whether it is continuing their education in a formal setting, attending workshops, or examining educational journals, studies, and books, teachers must continue to move forward in their own education. We can only imagine what the future of our students will look like and we must be innovative in our thinking to help prepare them. It is our duty to initiate and welcome change, even when it takes us out of our comfort zone. When we make educated decisions based on action research and reliable data, we give all students the opportunity to grow.

Teachers are models of educated persons, exemplifying the virtues they seek to inspire in students- curiosity, tolerance, honesty, fairness, respect for diversity and appreciation of cultural differences and the capacities that are prerequisites for intellectual growth: the ability to reason and take multiple perspectives to be creative and take risks and to adopt an experimental and problem solving orientation.

Teachers draw on their knowledge of human development, subject matter and instruction, and the understanding of their students to make principled judgements about sound practice. Their decisions are not only grounded in the literature, but also in their experience. They engage in lifelong learning which they seek to encourage in their students. Striving to strengthen their teaching, accomplished teachers critically examine their practice, seek to expand their repertoire, deepen their knowledge, sharpen their judgement and adapt their teaching to new findings, ideas and theories.

**Teachers Are Members of learning communities**

Accomplished teachers contribute to the effectiveness of the school by working collaboratively with other professionals on instructional policy, curriculum development and staff development. They can evaluate school progress and the allocation of school resources in light of their understanding of state and local educational objectives. They are knowledgeable about specialized school and community resources that can be engaged for their student's benefit, and are skilled at employing such resources as needed. Teachers find ways to work collaboratively and creatively with parents engaging them productively in the work of the school

- Teachers contribute to school effectiveness by collaborating with other professionals.
- Teachers work collaboratively with parents
- Teachers take advantage of community resources.

There are some expectations of teachers from National board to enhance the Role of the Teachers

- Teachers are facing so many changes, which lead to contradictory demands on them from society. These changes demand improvements in the working conditions, salaries and status.
- In the development of teacher's competence an appropriate use of new information technologies should be as a powerful in the educational process.

- Measures must be taken to increase the number of women in the post of responsibility in educational sector.
- Where education is decentralized, steps have been taken to ensure sufficient financial resources to guarantee equality between regions, municipalities, etc.
- The individual teacher should be given professional autonomy to allow him/her to determine programmes, teaching methods etc so that best educational objectives may be achieved.
- Many reports show that the workload of teachers has increased during recent years. From this prospective serious step must be taken to review class size and working hours.
- Teacher's salaries have decreased in most countries. In order to ensure that teachers obtain decent salary and to retain good teachers in the profession there is a need to upgrade teacher's salary.
- There is a need to increase the status of teachers as they play a key role in all educational systems and the quality of education is determined by the quality of teaching in the classroom.
- All teachers must receive initial preparation for the profession at higher education level before starting to teach. Teachers must also receive regular in-service training, which will allow them to incorporate new developments in their teaching.

### **CONCLUSION**

Teachers employ technical knowledge and skill, yet must be ever mindful of teaching's ethical dimensions. The primary mission is to foster the development of skills, disposition and understanding, while responding thoughtfully to a wide range of human needs and conditions. They must acquire and employ a repertoire of instructional methods and strategies, yet remain critical and reflective about their practice, drawing lessons from experience. Teachers' professional responsibilities focus on instructing the students in their immediate care, while they participate as well in wider activities within the school and in partnership with parents and the community. Teachers also have the responsibility to question settled structures, practices and definition of knowledge; to invent and test new approaches; and, where necessary, to pursue change of organizational arrangements that support instruction. As agents of the public interest in a democracy, teachers through their work contribute to the dialogue about preserving and improving society, and they initiate future citizens into this ongoing public discourse. In the development of its assessment procedures and certification standards, the National Board has sought to represent these ideals faithfully and comprehensively.

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**EMPHASIS OF DISTANCE EDUCATION FOR DEVELOPING HUMAN RESOURCES IN INDIA:  
WITH SPECIAL REFERENCE TO IGNOU.**

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**ABSTRACT**

*The objective of this paper is to analyze the emphasis of distance education in for developing human resources (HRD) in India. The paper has been divided into three parts. First, part discusses the relationship between distance education and development of human resources in general and conceptual context & particular in India. Indian rank in HRD corresponding to other countries has also been highlighted in this part. Second part highlighted how distance education helped to learners to bring changes economically as well as socially in their personal life & social life as well. After getting degree from distance education institution i.e. Indira Gandhi National Open University (IGNOU) in this paper how they get benefit in their life. And the third & last part we discuss the futuristic model of distance training for the job learners with special reference of IGNOU in India.*

*Keywords of the study: Distance education, Education & Training, IGNOU.*

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**INTRODUCTION**

Distance education can play a crucial role in the economic development of a country by meeting human resources as per its needs. This system can cater to the requirement to those who are on the job. Their knowledge can be updated through continuing education programs. Due to the low level of education among the labor force in developing countries like India, its work efficiency and productivity is also low particularly in primary sector of the economy. The quality of the labor force is a very important consideration, when we look at the human resource development in a country. This is influenced by the development of education and training and the availability of professionals and facilities like doctors, teachers, hospitals, schools and colleges etc. In terms of quantity, this is very low in comparison to those who complete secondary and higher secondary education. Besides quantitative expansion of tertiary and professional education in the country, one of the important tasks of distance education has been to upgrade the quality of both instruction and output at the secondary and higher stages of education. Though, it is not an easy task through formal system alone.

Research evidences show that continuing education can improve work efficiency and productivity, and, thereby, contribute to economic growth. *Both work efficiency and productivity, besides a certain required level of education; depend upon training and orientation of human resource. These types of activities would include on-the-job training, upgrading courses, awareness courses etc., which are possible easily through distance education only.* On the other hand, this system can raise the employment opportunities in many ways, as it helps develop the necessary skills, attitude and motivation to match opportunities to fresh job seekers as well as self-employment.

**NATURE OF TRAINING AND EDUCATION IN THE WORKPLACE**

- Demand for skilled labour has risen significantly as a result of globalization and changes in technology and the organization of work. The process of skill development in the informal sector in a developing countries is more important since formal training institutions do not have the capacity to train all those who want to acquire skills, and few of those who want to acquire skills have the means to afford formal training.
- International labour organization estimates, over the next ten years the growth rate of the world's labour force will slow down, there will be still some 460 million new, young jobseekers. Only 3% of them will be in all parts of Europe and North America. Two-thirds will be in Asia.
- The ability to learn, to transform existing knowledge into new knowledge, is a source of competitive advantage of increasing significance. In such enterprises, daily learning has become an integral part of the job. Part of such learning relies on the exchange of tacit knowledge among employees.

**INDIA'S SCENARIO**

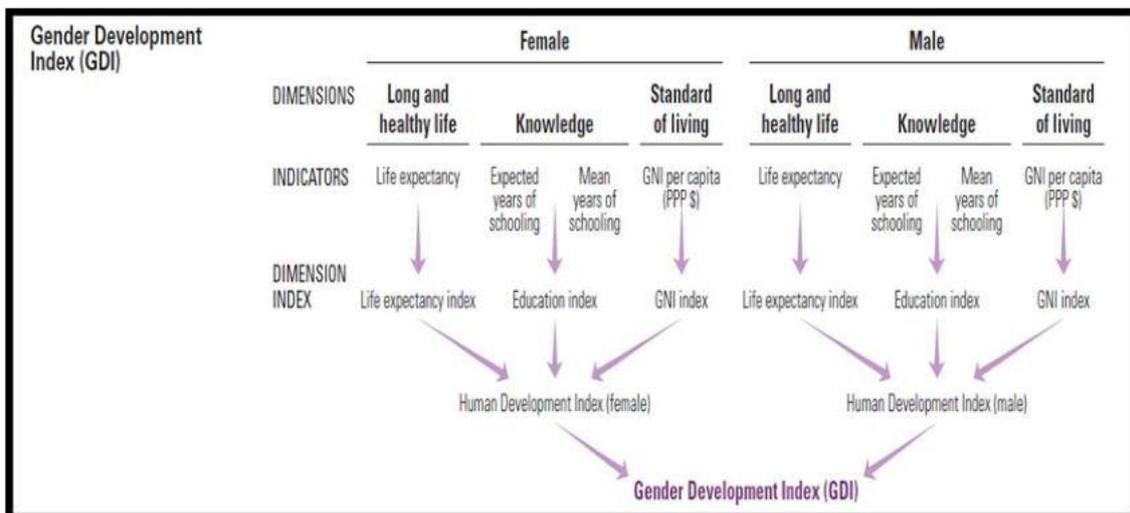
Since independence, there has been significant progress in human development in the country as reflected in broad indicators such as the improvements registered in educational attainments, health coverage, and in provision of basic social infrastructure. India ranks 115<sup>th</sup> out of 162 countries in terms of the UNDP are Human Development Index (HDI) and are classified in the group Medium Human Development with HDI of 0.571 in 2001. India's comparative position on Human and Gender Development is presented below. Though the overall

index on gender related development has improved in 2001 as compared to 1992, it is still low in comparison with the country’s human development levels (GOI, 2002).

Sr.No.	Country	Human Development Index		Gender Development Index	
		1992	2001	1992	2001
1	Norway	0.933	0.939	0.911	0.937
2	Australia	0.927	0.936	0.901	0.935
3	Sri Lanka	0.704	0.735	0.66	0.732
4	China	0.594	0.718	0.578	0.715
5	Indonesia	0.637	0.677	0.591	0.671
6	<b>India</b>	<b>0.439</b>	<b>0.571</b>	<b>0.401</b>	<b>0.533</b>
7	Pakistan	0.483	0.498	0.36	0.466
8	Bangladesh	0.364	0.47	0.334	0.459

Source: Government of India (2002), Economic Survey, 2001-02.

Table-1: Gender Development Index Parameters



Above table no 1 shows the Gender Development Index(GDI),

How GDI hierarchy flow works.

**Table 2: India’s global position on human and gender development**

The Table 2 indicates that India requires alternative strategy to increase its HRD ranks. Distance and ICT. This system can spread necessary awareness among those whom such awareness might help education can influence the quality of human resources in the areas of health, nutrition, education, large number of uneducated people, particularly women. In the process, distance education will call for interaction among people belonging to different areas of operation such as teachers, technologists, learners, administrators and other functionaries. This will enhance the possibilities of interfacing education with other aspects of social life.

**Role of Indira Gandhi National Open University in Human Resource Development of India**

In 1970, the Ministry of Education and Social Welfare organized a seminar on 'Open University' in collaboration with the Ministry of Information and Broadcasting, the UGC and the Indian National Commission for Cooperation with UNESCO. After the seminar recommendation, an open university in India has been established on an experimental basis. Starting in 1974, the government of India appointed an eight-member working group on the open university, the leading role was given to G. Parthasarathi, the then Vice-Chancellor of the Jawaharlal Nehru University.

The working group recommended establishing an open university by an act of parliament as early as possible. They recommended that the university should have jurisdiction over the entire country so that, once it is fully developed, any student even in the remotest corner of the country can have access to its instruction and degrees (Working Group Report, 1974).

The working group suggested several measures to be followed in instructional and management processes of the Open University which included: admission procedure, age relaxation, preparation of reading materials, setting

up of core group scholars in different fields, setting up of study centres, vehicle of curricular programs, live contact with teachers and so on. On the basis of the recommendations of the working group, the

Union Government prepared a draft bill for the establishment of a National Open University, but due to some reasons the progress was delayed.

In 1985, the Union Government made a policy statement for establishment of a national open university. A Committee was constituted by the Ministry of Education to chalk out the plan of action of the national Open University. On the basis of the report of the Committee, the Union Government introduced a Bill in the Parliament. In August 1985, both the Houses of the Parliament passed the Bill. Subsequently, the Indira Gandhi National Open University came into existence on 20 September 1985, named after the late prime minister.

In 1989, the first Convocation was held and more than 1,000 students graduated and were awarded their diplomas. IGNOU audio-video courses were first broadcast by radio and television in 1990 and IGNOU awarded degrees received full recognition by the University Grants Commission in 1992 as being equivalent to those of other universities in the country.

In 1999, IGNOU launched the first virtual campus in India, beginning with the delivery of and Information Sciences courses via the Internet.

The President of India is the Visitor of the University. The Board of Management is the principal Computer decision making body of the University. The authorities of the University include Board of Management, Academic Council, Finance Committee, Planning Board, Research Council, Distance Education Council and Schools of Studies. The overall functioning of the University is managed by these statutory authorities.

As per the IGNOU Act, the University shall Endeavour to advance and disseminate learning and knowledge by a diversity of means, including the use of any communication technology, to provide opportunities for higher education to a larger segment of the population and to promote the educational well being of the community generally, to encourage Open University and Distance Education systems in the educational pattern of the country and to coordinate and determinate the standards in such systems.

As of 2011 IGNOU has served over 3 million students in India and 40 other countries abroad. These are UAE, UK, Qatar, Kuwait, Oman, Bahrain, Saudi Arabia, Seychelles, Mauritius, Maldives, Ethiopia, Namibia, Kenya, Myanmar, Vietnam, Singapore, Indonesia, Malaysia, China, Nepal, Sri Lanka, Kyrgyzstan, Afghanistan, Fiji, France, Ghana, Gambia, Sierra Leone, Madagascar, Liberia, West Indies, Samoa, Lesotho, Malawi, Switzerland, Nigeria, Mongolia and Zambia.

IGNOU has 21 schools and a network of 67 regional centres, 2667 study centres, and 29 overseas centres (in 15 countries). Approximately 20% of all students enrolled in higher education in India are enrolled with IGNOU. IGNOU offers 226 academic programs comprising courses at certificate, diploma and degree levels.

**Table-3: Learners Profile in IGNOU**

Sr. No.	Convocation date	Total awards distributed	Sr. No.	Convocation date	Total awards distributed
1	21-Feb-89	1171	11	04.03.2000	53328
2	27-Apr-91	3807	12	03-Mar-01	62369
3	25-Apr-92	4907	13	21-Mar-02	78074
4	05-May-93	4444	14	22-Feb-03	81931
5	16-Apr-94	7580	15	21-Feb-04	74603
6	06.05.1995	9246	16	05.03.2005	71298
7	11.05.1996	12301	17	18-Feb-06	75174
8	08.03.1997	16149	18	17-Mar-07	111699
9	07.03.1998	25080	19	16-Feb-08	101346
10	14-Mar-99	33119	20	15-Mar-10	135000
			21	12-Apr-13	158387
<b>TOTAL</b>					<b>1121013</b>

According to above Table no 3, at present, around **1121013** students are on rolls in IGNOU. Of the total enrolment, 75.85% are from urban areas and rest of them belongs to rural areas. About 43.94% are unemployed and 42.86% are employed. Rest of the learners did not inform their status may be those were self employed or doing studies.

**RESEARCH EVIDENCE**

The author of this article conducted a study on 'Distance Education and Job Market of IGNOU Graduates' during 2010. The study examines to what extent to which distance education programs helped the development of human resource development in India. Some of the objectives of the study were intended to:

- Role of IGNOU degree in Indian job market;
- Examine how IGNOU programs facilitates learners job performance and
- Necessity of IGNOU degree for obtaining job.

**SAMPLE SIZE METHODOLOGY**

Survey research method was followed for the conduct of the study. The reference period of the study was from March 2007 to March 2010.

**DATA COLLECTION**

Data for the study were collected from two sources:

- (a) Published records;
- (b) Questionnaire administrated to sample learners.

**TOOLS**

The structured questionnaire was administrated for IGNOU students. A sample of 3500 successful graduates and post graduates who have successfully completed their degree during March 2007 to March 2010 were selected.

**FINDINGS**

The study which was conducted to examine the extent of IGNOU programs help in the development of human resources based on 1750 (50%) respondents. Analysis of data related to the objectives of the study led to the following findings.

**STATUS OF RESPONDENTS BEFORE JOINING IGNOU**

- ◆ A large percentage (52.98%) were doing regular job and 13.16% were studying in formal schools and colleges. Some of them (5.79 %) were doing both part time job as well as doing their studies. 9.57% of them were unemployed, 14.53 % were self employed and 3.97 % did not responded.

**Learner's objectives to enroll with IGNOU programs and utilization of degree**

- ◆ A large percentage of the respondents (50.59%) informed that their objective to enroll with IGNOU was to continue education while 36.23% who responded to get job. 9.32% respondents informed that their objectives were to get promotion, while 1.86% said their objective was social reasons. Rest of the respondents did not specify their objectives but any how managing their higher studies as well as many other distance courses. Most of the respondents informed that their objectives were fulfilled. And this is the achievement for distance education system.

**Learner's status after completion of program from IGNOU**

- ◆ *Of the 60.23% respondents who were on the job, 23.12% joined further education and 11.36% got increment.*
- ◆ *19.56 % respondents who were regular students, only 17.92% of them got job and 29.05% were self-employed.*
- ◆ *Of the 11.65 % respondents who were indulge in part time job, 53.62% of them opted for PG program, 33.43% got job.*
- ◆ *Among 14.97 % unemployed people some around 63.73% joined for further education program, 34.76% get job and 12.94% not satisfy with the distance education.*
- ◆ *Among 15.73% self employed people, only 33.07% were opted for further education and from them only 12.22% were interested to do job. Others are continuing with their business.*

**To what extent degree from IGNOU was necessary to get job.**

Those respondents who were unemployed and doing part time job before joining IGNOU programs and got regular job and promotion informed that:

- ◆ to become graduate was necessary to get job and promotion in their respective enterprises;

- ◆ it was one of the prerequisite for the job.

**To what extent IGNOU degree facilitates job performance**

- ◆ Most of the respondents (48.40%) informed that it helped a great deal to facilitate job performance;
- ◆ Few respondents (21.0%) informed that it helped partially.

**Learner’s views**

- ◆ Many of the respondents informed that the curriculum of various IGNOU programs was relevant and enabled him to acquire skills in their concerned fields.
- ◆ Other respondents informed that the study materials of IGNOU were high standards in terms of quality. The foundation course having positive impact on skill development because the contents of the study materials were relevant to their jobs.

**Success stories**

- ◆ Rajinder Kumar from Jhajjar (Haryana) informed that he was Assistant Teacher (JBT) in Government School. After completion of B.Ed degree from IGNOU, he got Post-Graduate Teacher position.
- ◆ Ravi Nair from Mumbai informed that IGNOU degree is helpful for his self-development and he can now communicate in English as well.
- ◆ Surindra Devi from Himachal Pradesh informed that degree from IGNOU helped in her personality development and in gaining knowledge.
- ◆ One of the respondents informed that degree from IGNOU helped him to become self-employed. Now he is running a magazine called ‘Yug Manas’

It has been established from the above evidences that distance education helped to everyone. It helped to unemployed, self-employed and employed learners to bring changes economically in their personal life.

There is possibility of relationship between training and solving of business problem. Training has to do with the target groups acquiring knowledge, skills, and attitudes that are useful to them immediately to improve performance on the job. On the other hand, education deals with the acquisition of knowledge, skills, and attitudes too, but not necessary for immediate improvement of performance on the job (Zane L. Berge, 2001). Distance training is also cost-effective as comparison to traditional classroom training as shown in the following Table 1. However, Constantine Osiakwan and David Wright’s (2001) study shows that total cost of Remote Access Distance Training (RADL) is higher than the total cost of classroom-based training (CBT). But, the profits from RADL are higher than the profits from CBT, since it is possible to charge students a higher price for RADL than the CBT. RADL is a distance training systems, in which students study at their workstations, which are connected to a training center via audio and computer links.

**Table-4: Comparison of Distance Training Costs V/S Traditional Classroom Training**

Distance Training			Traditional Training		
Distance training source	Average costs per participant In US \$	Class duration	Class room presenter	Average costs per participants in US \$	Class room duration
Tele learning	30	6 hours	Senior Manager (1)	40	8 hours
Online	10	6 hours	Mid Career Instruction (2)	55	8 hours
Self Paced Compute based	12.21	6 hours	Junior Instructor	20	8 hours

**Note: Actually delivery cost does not include course development cost.**

Source: Jo. L Longnecker (2001) Attracting, training and instructors for distance learning at the US general account office, Zane L. Berge (eds.) Sustain Distance Training, San Francisco: Jossey-Bass.

According to Table no 4, It has been proved from the studies conducted by Zane L. Berge (2001) and Constantine Osiakwan and David Wright’s (2001) that distance training is cost-effective and profit generating.

**FUTURE PROSPECTS**

But this system could not meet the needs of those employers (public and private sectors) who have demanded skilled labor due to globalization and changes in technology in their respective organization and those who require daily learning, which has become an integral part of their job performance.

**TARGET GROUP**

Due to increasing diversification of the economy together with acceleration in economic growth has resulted in structural changes in the nature of the job market. As per the 55<sup>th</sup> Round (July 1999-June-2000) of the Survey on Employment conducted by the National Sample Survey Organization (NSSO) reveal that employment in absolute numbers was 397 million (in both organized and unorganized sectors). Of the total 397 million 28.11 million i.e. 7 percent employment was in organized sector.

Trends in organized sector employment reveal that employment in this sector has been declining due to slowing down in employment in public sector. This could be attributed to restructuring programs of the public sector, and the ban on recruitment in many State Departments/Institutions as part of the ‘economic drive’ to reduce government expenditure. The annual growth rate of employment has been increased in private sectors since 1995. However, this growth rate in private sector employment did not affect the slowdown in public sector employment since the private sector share of employment in the organized sector was only one third. Therefore, the growth rate in organized sector employment is now dependent on employment growth in the private sector.

**Manpower in the Public Sector by Branch**

India’s employment in the public sector by industry has been presented in the following Table 5.

**Table-5: Employment in the public sector by Industry**

<b>Branch</b>	<b>2000 (In Millions)</b>
Central Government	3.27
State Government	7.46
Quasi-Government	6.32
Local Bodies	2.25
<b>Total-1 (public sector)</b>	<b>19.31</b>
Private Sector	8.70
<b>Total –2 (organized sector)</b>	<b>28.11</b>
Employment in un-organized sector)	368.89
<b>Grant Total</b>	<b>397</b>

Source: Government of India (2001-2002) Economic Survey of India.

The above table 5 prevails that the bulk of manpower in organized sector consists in State and Quasi Government sector. Among the total labour force, women constituted about 17.2% of the organized sector (public and private sector). Among rural women workers, a majority of them are employed in agriculture as labourers and cultivators. In the urban areas, women workers are primarily employed in unorganized sectors such as household industries, petty traders and services, building and construction etc.

**Table-6: Growth of Employment by Sectors**

<b>Industry</b>	<b>% of employed workers</b>
Agriculture	59.8
Mining and Quarrying	0.6
Manufacturing	12.1
Electricity Gas etc.	0.3
Construction	4.4
Trade	9.4
Transport, Storage & Commn	3.7
Financial Service	1.3
Community Social & Pers. Services	8.4
<b>Total Employment</b>	<b>100.0</b>

According to Table no 6, there is a need for curriculum design in all the above industries. If we think to train all employees for their daily knowledge up gradation and the process of skill development, the existing class room

training methodology do not have the capacity to train all of them. Department of Personnel Training (DOPT), Government of India (GOI) had already initiated strategy in public sector. The Federation of Indian Chambers of Commerce and Industry (FICCI) recently organized a seminar on 'E-learning: Transforming corporate workshops', as an effort towards creating awareness on the benefits of e-learning in corporate environment. E-learning has emerged as a successful tool to impart education and training in a need based manner using various forms of media.

### **IGNOU-DOPT INITIATIVE**

The DOPT, Government of India has planned for the use of distance education methodology in a large scale to train the trainers. Three batch of the trainers have been trained in IGNOU (India) and UKOU (U.K) on designing self-learning material, audio/video, interactive multimedia on macro media director and online training through Web city. These packages are further developing training strategies, with the

support received from State Government and DOPT, Government of India, for wider State level and National level implementation as respective areas of specialization.

### **NEED FOR STRATEGIC PLANNING**

There is a need for strategic planning for the futuristic model.

- There should be planning board/committee. The members should be represented from Center and State Governments (public sector) and from FICCI and CII (private sector).
- Identify the goal of distance training programs
- Conduct an organizational analysis:
  - To find out opportunity for training and education database of participants
  - To find out the basic infrastructure
  - Provide accountability for the use of training resources
- Implementation an Evaluation **Perspective Model**

There is a need for the hour to have effective networking between all the existing online resources. This does not require additional resources but proper and effective utilization of the existing resources. For instance: Government of India had already initiated some projects in this direction. Project Initiated by the Department of Information Technology, Ministry of Communication and Information Technology, Government of India are:

1. **National Resource Centre for Online Learning NCST, Mumbai-URL: [www.ncst.ernet.in/vidyakash](http://www.ncst.ernet.in/vidyakash)**
2. **Virtual Campus Initiative for IGNOU One-year PG Diploma in IT-URL: [www.ignou.ac.in](http://www.ignou.ac.in)**
3. **Developing Web Based Digitized Collection for Distance & Continuing Education in IT-A Demonstrative Project on Internet Based Online Interactive Courseware IIT Delhi- URL:[www.iitd.ac.in/courses](http://www.iitd.ac.in/courses)**
4. **Design and Development of Internet Enabled Multimedia Courseware for a Virtual University, Pilani- URL:[bits-pilani.ac.in](http://bits-pilani.ac.in)**
5. **Development of Interactive Multimedia Information Services over a Hybrid Internet and Broadcast Digital TV networks IIT Kanpur, URL:<http://www.iitk.ernet.in>**
6. **Developing Web Based Intelligent Interactive Tutoring (web IIT) IIT Delhi- URL:[www.iitd.a.c.in/courses](http://www.iitd.a.c.in/courses)**
7. **Design and Development of Component Based Functionality in E-learning tools C-Dac, Hyderabad URL:[www.cdach.ernet.in](http://www.cdach.ernet.in)**
8. **Multimodel Digital Distance Education for IT & Other Critical Technologies, School of Educational Technology Jadavpur University, Kolkota.- URL:[www.jadavpur.edu](http://www.jadavpur.edu)**

### **SUGGESTION AND RECOMMENDATION**

- ◆ The existing training centers of IGNOU, State Open Universities (SOUs) and Correspondence Institutions (CCIs) should be used for support centers. Training facilities should be provided to these centers. Easy approachable to all the learners so that they can easily opt for any courses as per their requirement.
- ◆ Staff Training & Research Institutes of Distance Education (STRIDE) i.e. IGNOU should design and develop training package to train staff and faculty of these institutions. This will uplift the level of productivity.

- ◆ The training curriculum should be designed as per needs. The ICT should be used in to make optimum use of distance training programs. The basic information about the curriculum/programs should available on Web. be
- ◆ Possibilities for in-service training through distance mode should be explored for employees who are working in different occupation. Separate courses should be designed for sector wise workforce, so that a large numbers of human resources get benefited according to their need.
- ◆ STRIDE should develop programs for training and development of all the DTIs staff through Internet. Web-based training system can be developed which will provide interactivity among different students of the program from different locations in the world.

## CONCLUSION

The emphasis of distance education is very good for developing human resources in India, and it is very much helpful in human resource development. The above study helped to acquire skill and enrich professional development in their concerned areas. Peoples are very much interested to do distance education for their good working life, it shows that distance education is developing the human resources in India. Row tree (1998) comments that **“Most of the research over the last twenty years or so suggests that media do not differ greatly in their potential for helping people to learn. What makes a difference is not the medium itself but how well it is used and how keen the learners are to hear. Nevertheless, even if most media can do most things reasonably well, each does some things better than others”**. The planning of distance education seriously takes into account the human resource needs of the country on the one hand, and tries to base the design and development of educational programs on the other hand. Besides, provisions in support of the principles of lifelong education, training and updating (both in-service and pre-service) are made part of the continuing education programs, and should be considered as regular activities of a distance teaching institution.

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**A STUDY ON AWARENESS OF OPEN EDUCATIONAL RESOURCES AMONG PRE- SERVICE TEACHERS**

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**ABSTRACT**

*UNESCO (2000) organized the Forum on the Impact of Open Courseware for Higher Education in Developing Countries. Open educational resource (OER) was one of the outcomes of the forum. The open educational resources are those resources that can be used for non-commercially purpose without the obligations of the copyright and is available for free. It implies that the teachers can use open educational resources for their teaching. The use of these freely available digital resources by the teachers is a compelling need of this digital world as the ethos of teaching and learning has transformed. The open educational resources include learning resources like courseware, content module, learning objects, online learning communities, etc. and teaching resources that provides teaching support to the teachers like free software, digital teaching aid, books, courses, etc. In India many such government initiative are taken to develop the open educational resources like digital content, courseware, online community support, and knowledge networks. The present study aims to explore the awareness of these open educational resources among pre-service teachers. The study adopted a survey method. The sample of the study comprises of the pre-service teachers enrolled in the B.Ed. programme at Lingaya's Lalita Devi Institute of Management & Sciences. The results of the study revealed that many of the pre-service teachers have a very limited awareness about the term open educational resources and they do not understand the broader concept of open educational resources.*

*Keywords: OER, Pre-service teachers, Awareness*

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**INTRODUCTION**

Open educational resources (OER) are defined as teaching, learning and study resources that make use of suitable tools, such as open licensing, to permit their free reuse, constant improvement and repurposing by others for learning purposes. Open educational resources contain full courses, course tools, elements, textbooks, streaming videos, examinations, software, and any other tools, resources or procedures used to support access to understanding or that have an influence on teaching, learning and research.

The emphasis of OER is on the probability of taking innovative work from other providers and being able to familiarize and repurpose it to produce a new learning resource. In this sense, open means free to access and free to transformation. It is for this motive that one of the central features of an OER is the liberal licensing (e.g. Creative Commons), which enables this process.

**The general features of OER are**

- They can be any type of learning means used in an educational situation.
- They are frequently, though not completely, offered in a digital set-up.
- The digital set-up allows the reprocess, sharing, revision and repurposing of the resource for an altered learning setting than the original one.

**What OER are as well as are not OER are not just “Stuff on the Web”**

It can be seen from the explanations above that OER can be a widespread variety of educational resources – full courses, course resources, components, textbooks, streaming videos, examinations, software – which are usually offered in a digital set-up. As OER can be many kinds of resources, the question frequently asked is: what is the difference between “stuff on the web” and OER (Thomas, 2010)? Or more precisely: when is a Wikipedia page an OER?

A Wikipedia page is open allowing to the most widespread definition of open; it is also a resource. Though, it can only be an OER if it is used within a precise learning organization as an educational resource (Falconer et al, 2013: 63): “An OER can be a course, element, lesson, webpage, exercise or multimedia clip, but it must have a definite pedagogical purpose/setting” (McGreal, 2014: 51).

Wikipedia does have a clear educational course, which stimulates the use of Wikipedia content in learning settings.

On the contrary, there is the question of whether open data is an OER. Although, open data may permit reuse, distribution, revision and repurposing. It is a source of evidence, but its purpose is not directly instructive. In this sense, it is not inevitably an OER. Nonetheless, open data may be used as a learning resource in a learning setting; in this instance it would be OER.

### **OER are diverse from “Learning Objects”**

The essential difference between OER and other features of digital learning is their openness and lack of restraining patent, which enables the reuse and repurposing of the educational resources (Butcher and Hoosen, 2012). This leads to the benefits of division and teamwork.

The notion of enabling the division of digital resources is not new, and it is a typical of information resources offered in a digital set-up that they can be simply distributed with negligible costs once they have been established. In contrast to Reusable Learning Objects (RLO), OER believers and practitioners highlight the potential for sharing prevailing content over the design of context-neutral components for learning. In other words, it is argued that while the RLO improvements were concentrated on the mechanical side of instructional scheme, OER are much more focused on purely how to make prevailing content more open for entree and hence more handy (Kernohan and Thomas, 2012; Lane and McAndrew, 2010: 960).

### **OER are different from “Digital Learning Resources”**

Since allocation and reuse is such an essential aspect of OER, it has become common to pay attention to the “four Rs” of OER (Hilton et al., 2010; Wiley, Bliss and McEwen, 2014; Wiley, 2009):

- Reuse – to use the work exact. This is basically an issue of easy entree to existing resources.
- Review – to modify or change the work.
- Remix – to combine the work (precise or changed) with other works.
- Rearrange – to share the exact work, the revised work or the altered work with others.

### **The present status of open educational resources**

As we arrived the new era, the amount of learning content freely accessible on the Web was large and rising exponentially. With some exclusions, the resources were dispersed, were hard to find and use, and lacked the permits essential to ensure their quality. But despite the apparent confusion, many university librarians predicted that digitized collections of resources would be a major, if not the foremost, method for future library collections. Formerly at a 2002 UNESCO-sponsored, Hewlett-supported meeting of established and emerging world participants, the term “open educational resources” was invented. The acceptance on the OER conception since 2001 by international administrations, colleges and universities, specific faculty, and supporters in the open-source concept has been unusual. UNESCO, for example, has comprised the application of the OER conception as an aim in its current two-year plan. Some administrations and other international governments—the World Bank, OECD, the International Association of National Academies of Science, the Commonwealth of Learning, the European Union, and the European Organization of Open Universities—have also recognized the possible effect of OER and declared their concern in and support of it.

### **Scope of OER in Teacher-Education Programme**

1. Extended access to learning: Learners everywhere in the world can access OERs at any time, and they can access the material continually.
2. Scalability: OERs are easy to allocate broadly with little or no cost.
3. Expansion of class resources: OERs can increase textbooks and lectures where insufficiencies in information are marked.
4. Improvement of regular course content: For instance, multimedia material such as videos can supplement text. Offering information in multiple designs may help students to more simply learn the material being taught.
5. Rapid circulation: Information may be distributed rapidly (especially when compared to information printed in textbooks or journals, which may take months or even years to become accessible). Quick accessibility of material may increase the suitability and/or significance of the material being offered.
6. Less expense for learners: The use of OERs instead of outdated textbooks or course packs, etc. can considerably reduce the cost of course resources for learners.

7. Showcasing of improvement and ability: A wide viewers may learn of ability research interests and expertise. Possible students and contributors may be overwhelmed, and student and faculty employment efforts may be improved.
8. Links for alumni: OERs deliver an outstanding way for alumni to stay attached to the institution and continue with a program of lifelong education.
9. Constantly improved resources: Unlike textbooks and other stationary sources of information, OERs can be enhanced rapidly through direct editing by users or through solicitation and integration of user response. Trainers can take a current OER, adjust it for a class, and make the altered OER available for others to use.

### **Significance of OER in Teaching and Learning**

The importance of OER is broadly classified into Institution's perspective, Educator's perspective and Learner's perspective. The institution's perspective consist of refining recruitment by helping students find the right courses, increasing teamwork among students, faculties and other, interesting alumni as life-long learners and improving the public image of the institution.

The educator's perspective includes maintaining a record of teaching improvements allowing others to build upon them, nurturing connections with coworkers around the world, gaining publicity through improved status and leaving a legacy after leaving university.

The learner's perspective includes retrieving high-quality resources from some of the best academia in the world, appealing in informal learning, where permits are not needed, saving money on expensive necessary textbooks and learning through efficient materials that are significant to current issues.

### **Impact of OER on Teacher's Training**

Though there is not a great deal of study in respect to student achievement as new textbooks are accepted, there has been an emphasis on student achievement when OER are accepted. Studies have confirmed that no harm has happened as a consequence of the use of OER and that learners are performing at least as well as they did with the outdated resources. They have also shown improved student maintenance and student achievement using OER. Nonetheless, one would think if 50 percent of learners who never purchase the text now have access to resources, and wouldn't the achievement rates with early and constant access to resources be higher.

### **Requirement of Teachers' to know OER**

The use of OER leads to development in learner presentation and satisfaction. OER creates different customs and approval patterns than other online resources. It also lead to more fair access to learning, attending a broader base of learners than outdated education. The usage of OER is an effective way for enlightening retention for at-risk learners. It hints to critical reflection by professors, with indication of improvement in their preparation. OER acceptance at an institutional level leads to financial aids for learners and/or institutions.

### **Shortcomings of OER**

Ever since many OER sources allow any user to generate an explanation and post material, some resources may not be appropriate and/or precise. OER material is formed to stand alone, and meanwhile self-learning operators may access the material outside of a classroom setting, they will miss out on the argument and teacher response that describe for-credit classes and that make such lessons useful and appreciated.

While struggles are being made to make OERs accessible in multiple languages, many are only accessible in English, restraining their effectiveness to non-English speakers. Moreover, not all resources are traditionally suitable for all viewers. Some learners may have trouble using some OERs if they have a slow or unreliable internet association. Other OERs may require software that learners don't have and that they may not be capable to afford.

### **LITERATURE REVIEW**

Dominic Orr, Michele Rimini and Dirk Van Damme (2015) talks about OER in the perspective of educational programme and training. It compares and contrasts OER to other usually discussed modernizations in education: learning matters, digital learning resources, open data, Massive Open Online Courses (MOOCs), and open learning. It then goes on to describe how OER offer a special type of modernization possible capable of supporting new methods of teaching and learning. In contrast to other studies of OER, this report takes the opinion that OER should be reflected in the context of key challenges for educational organizations at present.

Christopher B. Mugimua (2010) in his article presents outcomes of creation and distribution method of open education resources (OERs) to support pre-service and in-service educators in Uganda and other African countries. It highlights the opinions of educators and the authoring team of the effect of their participation in

materials formation and distribution on their practice and professional progress. It also presents teachings learned during the growth and implementation method and the best practices for repeating this outreach program in Uganda and beyond. This article also shares perceptions into how the OERs can increase or contribute to effective lessons and learning particularly in under-resourced school circumstances in Africa, and also shares understandings on best practices on producing the authoring team of OERs.

Leigh Blackall (2008) in his article looks at what starts an open educational resource and studies the concerns and benefits to an educational organization that is moving to contribute in open educational resource improvement and to accept more open educational practices. It labels the primary steps in these ways being made by the Educational Development Centre at Otago Polytechnic, a tertiary educational and vocational training association in Southern New Zealand.

James J. Tuite (2018) said Open Educational Resources (OER) is supported as a means of creating high-quality educational resources easily obtainable on digital platforms to learners and teachers, generating a revolution in the distribution of educational materials and decreasing one cost barrier for higher teaching. Though, existing models of OER appear unmanageable with the re-establishment of supplementary materials being delivered “for profit” and funded for by learners. The achievement of MOOCs as a disturbing digital platform is inspected, and several other approaches are recommended including a partnership model and a discipline-specific funding model on existing platforms to guarantee the highest quality learning at the lowest potential cost to all learners.

### **THE STUDY**

In India many such government initiative are engaged to improve the open educational resources such as digital content, courseware, online community support, and information networks. The current study aims to explore the awareness of these open educational resources among pre-service teachers. The purpose for selecting this is that they are free to use. They offer the instructional support to the pre-service teachers for various courses. The objective of the study is to explore the awareness of alternatives to texts while retaining instructional quality.

### **METHODOLOGY**

The study adopted a survey method. The sample of the study comprises of the pre-service teachers enrolled in the B.Ed. programme at Lingaya's Lalita Devi Institute of Management & Sciences.

#### **Research objectives**

- To explore the awareness regarding open educational resources among the pre-service teachers.

#### **Participants and Setting**

The sample for the study is consisted of 50 students enrolled in B.Ed. programme for the academic year 2017-2019 at Department of Education, Lingaya's Lalita Devi Institute of Management & Sciences having awareness about the Open Educational Resources (OER).

#### **Tool and data collection**

A questionnaire having open and closed ended questions is constructed. The open ended questions aimed to explore the awareness of Open Educational Resources among pre-service teachers. The close ended questions are aimed to explore the knowledge of pre-service teachers regarding various digital learning content such as E-books etc. The questionnaire is circulated to all the 50 participants through Google form.

### **FINDINGS AND DISCUSSIONS**

The data collected shows that 54% of the respondents are familiar with the term open educational resources and 46% of the respondents were not aware of the term. The diagrammatic representation of selection of the sample is shown in Figure 1.

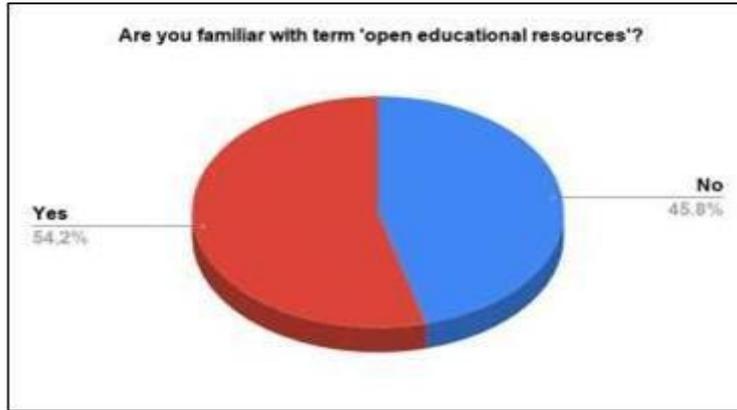


Figure-1: Percentage of respondents familiar with the term OER

From the above data, the further questions were asked related to certain free digital resources of OER. This is shown in the following table representing digital resources on the web that are copyright free.

Table-1: Free Digital Resources on the web

S. NO.	Free Resources	% age of respondents
1.	E-books	87.5
2.	E-Pathshala	91.7
3.	FOSS	37.5
4.	MOOCS	66.7
5.	NPTE & Swayam	66.7
6.	NROER	54.2

The awareness regarding different forms of free and open digital resources on the web that are copying free are shown in Figure 2.

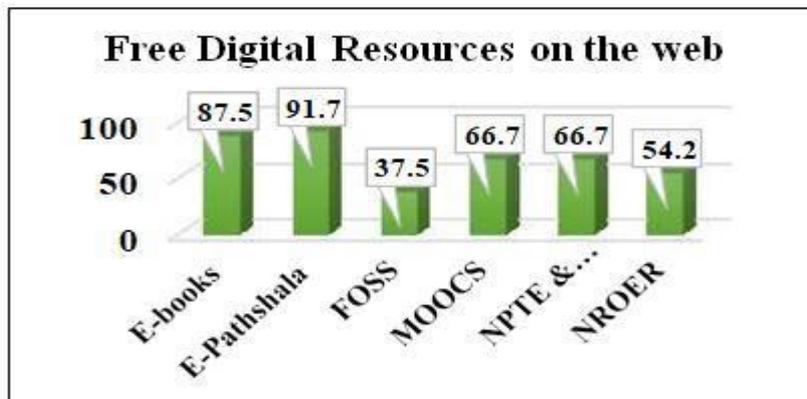


Figure-2: Free Digital Resources on the Web

The graphical representation in Figure 2 illustrated that majority of the participants have awareness regarding E-pathshala (91.7%) and the participants have least awareness regarding the FOSS (37.5%).

The 54% of the participants who are aware about the term ‘open educational resources’ were further inquired about the source from where they came to know about this term. The responses of the participants are shown in figure 3.



Figure-3: Sources of OER

As shown in figure 3, out of the total sample only 1% students have heard about OER from brochures, seminars and workshops, 2% from open universities and educational institutions, 3% from their friends and colleges/institutions, and 4% have heard it from the internet and digital media.

The 54% of the participants who were aware of the term were also asked to express their understanding about the open educational resources. Some of the commonly occurring responses are as follows:

- “OER is freely accessible books useful for teaching, learning, and research purposes.”
- “It a type of educational materials available for teachers as well as for students.”
- “It is available in various language and can be accessed by large population.”
- “OER is accessible to all.”
- “OER is a type of education which can be reused and modified.”
- “OER is a free online reading material and no regular classes are required for it.”

The responses given by the 54% participants highlights that they have a limited understanding of open educational resources. Majority of them only considers the digital material available on the web as OER. They fail to see the broader concept of open educational resources i.e. the OER not only includes digital material but courseware, FOSS, e-networks and all there resources that comes with copyright free license.

### CONCLUSION AND RECOMMENDATIONS

The paper have attempted to show that open educational resources plays an essential role in supporting professional development of teachers. The findings of the study revealed that pre- service teachers have a very narrow understanding about OERs and they fail to recognise that open educational resources include various kinds of resources which comes with a free copyright license and is not only limited to the digital content.

#### Certain recommendations on the OERs are as follows:

- The ICT course in the B.Ed. programme must talks extensively about the Open educational resources
- The B.Ed. programme must have the provision for hands of training of the various OER like FOSS, open courses, etc.
- Workshops and induction programmes can be conducted to provide exposure to the teachers.
- Republishing of modified resources should be encouraged by educators as per the convenient of the pre-service teachers.

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**DYNAMIC LEADERSHIP IN SCHOOLS THROUGH DIGITAL SYSTEM TO ADDRESS STUDENTS CONCERNS- AN INITIATIVE TO INTEGRATE TECHNOLOGY AND COUNSELING**

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**ABSTRACT**

*School is a complex organisation which has amalgamation of multi dimensional relationship between administrators-teachers, teachers-teachers, teachers-students and teachers-parents. An effective leadership has to take care of all dimensions to make school as an organisation grow and develop. Effective School leadership is easier to talk about in the abstract terms than to accomplish in reality. The educational institutions are meant to be centers of learning and development enabling a student to be independent, empowered and conscious of its responsibility. The schools and institutions form the backbone of any society and nation. Among many of its responsibilities, the schools need to assure safety and security to its students.*

*This research paper intends to explore the school practices of discipline, pedagogy, curriculum and assessment with a view to bring effective leadership focused on research of opinions and perceptions of stakeholders about students security and safety in the schools.*

*The findings of the qualitative research undertaken reveals that the stakeholders of the education process, i.e students, parents, teachers and administrators agree on a digital system of counseling for the redressal of students concerns to be used in schools, for a better, safe, non threatening and fear free learning environment in schools. This will act as whistleblower in the education system with non directive technique of counseling, driven and triggered by the participants of the education process.*

*This paper is a qualitative study of the school practices and suggests qualitative measures to improve the education system across all levels and counselling with a digital access tool of information, prompting the online input of views on any student concerns, by all the stakeholders in the education process.*

*Keywords: Digital Information System, online access, discipline, pedagogy, leadership, whistleblower, stakeholders*

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**INTRODUCTION**

“Children are sick of being called ‘the future’. They want to enjoy their childhoods, free of violence, now”. Paulo Pinheiro, 2007, UN General Assembly

“All children have a right to be protected against neglect, maltreatment, injury, and trafficking, sexual and physical abuse of all kinds, torture, exploitation, violence and degrading treatment.”

The Child Rights Charter 2003 of India-Article 21 "Right to life"

School is a place of teaching and learning where students engage in learning and teachers involve them in instructional process enabling them to develop fully, enhancing all aspects of their personality. In achieving these aims, school often tend to slacken and are not able to provide a total fear free environment.

The quality of the teacher-student relationship is of primary concern in providing such an environment. Effective teachers strive to develop a positive relationship with every students in the classrooms, and seek to promote positive relationships and a sense of community among the students themselves. Teachers develop social problem-solving and decision-making skills among students, establish and maintain close communication with each student's parents or caregivers, and work hard to garner the parent's support, provide academic instruction and activities that motivate learning, frequently monitor student behavior and respond immediately to signs of misbehavior, use praise and rewards strategically to maximize effectiveness in improving behavior while minimizing the risk of diminishing intrinsic motivation, by using praise and rewards in an informational rather than controlling manner are the effective teachers.

The common wisdom today is that school principals should be instructional leaders. But most principals face a major stumbling block, they don't know what instructional leadership means or how to do it. Effective school leaders are needed in thousands of schools and educational institutions across this country and world today.

**RATIONALE OF THE STUDY**

Some of the traits of effective and dynamic school leaders today are required to be both good administrators and good instructional leaders. Leaders need to have an explicit vision of what their school might be like and an

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optimist attitude. Leaders are the transformers and can bring positive changes in the school climates. A successful leader has to draw an inclusive plan to draw in parents, community members, school administrators, students and teachers to develop a larger school community and share the responsibilities.

William Parret and Kathleen Budge (2009) discovered that sustained school improvement usually began when leaders focused on essentials. These leaders rallied the staff to address basic questions and tasks. School leaders look beyond the usual boundaries of what is permissible and welcome nontraditional thinking and leaders.

Chanda Kochar (2017) in her article has mentioned some of the traits of a dynamic leader. A leader is required to be a system thinker. He is required to take care of all the people working under him. The entire organization should work as a centralized unit and problems related to all need to be solved by a leader. In terms of operations, a leader has to ensure that there is equal contribution from all. It is only a leader and his ways that can make this a possibility. She also believes that, a leaders should ensure that every individual works to the best of his abilities no matter what group or team he is working for. At the same time, he should keep the organizational strategy at the broader level in mind before taking any decisions. Precisely, a leader is supposed to take charge of resolving all brainstorming sessions resulting due to conflicts in views at the organizational level. Another important parameters described that a leader is expected to have integrity in his approach. This is because only then would he be able to set an example for his followers. Once the leader is honest in his own ways, his team would work to the best of its capabilities.

Not to forget perhaps the most important attribute a school leader can possess is the unquenchable thirst for knowledge. As John F. Kennedy said, "leadership and learning are indispensable to each other."

With strong domain knowledge, a leader is supposed to ensure that any deficiency in terms of talent and expertise in the organization is sorted with immediate effect.

Leaders in the schools settings have the prime task which is to guide their schools to better teaching and learning. Every effort has to be synchronized to achieve that prime goal. Leaders are responsible to make conducive environment to enable better teaching and learning.

With the advent of the Right to Education (RTE) Act in 2009 which states free and compulsory education to all children in the age group of 6-14 years; the role of school leader has greatly diversified. He is the person in charge of a school unit to comply with the guidelines and deliverables enshrined in the RTE. The Act casts a duty that the child belonging to weaker section and the child belonging to disadvantage group are not discriminated against and prevented from pursuing and completing elementary education on any ground. It is not just about complying with the RTE, it the duty of the school leaders to ensure the social harmony, inclusiveness and equality within the school premise. When it comes to equity and inclusiveness, it touches upon all genders of all castes and classes and children with different abilities.

Further, within the context of education, the process of inclusion involves strengthening the capacity of the education system to reach out to all learners, involving restructuring of the culture, policies and practices in schools so that they can respond the diversity of students in their classrooms. As an approach, inclusive education ensures not only the presence of all students in education in an inclusive classroom, but also assures their participation and achievement (Maheshwari and Shapurkar, 2015). Inclusion is therefore, not a category but a philosophy (Bailey, 2005). UNESCO views inclusion as "a dynamic approach of responding positively to pupil diversity and of seeing individual differences not as problems, but as opportunities for enriching learning" (2005).

The study aimed at exploring the school practices of discipline, pedagogy, curriculum and assessment with a view to bring effective leadership for inclusion based on research of opinions, responses and perceptions of stakeholders about students security and safety in the schools.

#### **OBJECTIVES OF THE STUDY**

1. To study the background of discipline practices in schools of India.
2. To explore the discipline practices at different stages of school in district Faridabad of Haryana.
3. To find out the opinion of students, teachers, parents and administrators towards school practices at different stages of school in district Faridabad of Haryana.
4. On the basis of the responses and opinions, suggesting a platform to address concerns of the students.

#### **METHODOLOGY**

This study is a qualitative research using interviews, questionnaire and focused group discussion for the students. The study also includes opinionnaire for collecting opinions of the teachers, parents and

administrators. It is also quantitative research using percentage analysis of discipline practices at different stages in school. The data was analyzed in the light of objectives both quantitatively and qualitatively.

**POPULATION**

The population under my study consists of students of different stages, that is, upper primary, secondary and senior secondary from school in District Faridabad. It also includes their teachers and parents as participants of the study.

**SAMPLE**

The researcher selected 120 students from 2 schools, 60 students from each school and 20 students from the classes VI, IX, and XI. The students of both gender will be selected equally for the study.

**Table-A: Sample of stakeholders and participants of the study**

Schools	Grades			Students	Teacher s	Parents
	VI	IX	XI			
S1	20	20	20	60	6	10
S2	20	20	20	60	6	10
Total	40	40	40	<b>120</b>	<b>12</b>	<b>20</b>

In order to explore the discipline practices at different stages of school in district Faridabad of Haryana, a sample of two schools was selected from schools of Faridabad district in Haryana state. A random sample of students was drawn from the students of two schools from the district. A semi structured questionnaire with the open ended questions and yes/no type questions was posed to the participants of the schools. Amongst those students, students which have a high and or a low negative perception towards discipline practices/ discipline will be selected for the in-depth interview and focused group discussion.

**TOOLS**

**Questionnaire**

A structured questionnaire in Hindi named as "Anushasan Prashnawali" was posed to the participants with "yes/no/rarely" options. Open ended questions were also used in the questionnaire to find the type of discipline practices , if any being inflicted on students. The responses of the questionnaire were tabulated and then analyzed using percentages.

Opinionnaire: An opinionnaire with questions was posed to the teachers and administrators. It will comprise open ended questions, to probe them on indiscipline issues and challanges faced by them in the classroom.

Focused Group Discussion: A focused group discussion with the students was conducted. The same was recorded through videography and the recording was documented. The researcher used observation as a tool to record students non-verbal cues. The students emotions and feelings was also be recorded.

**Analysis and Interpretation**

Out of students, teachers and parents of two schools , 87 % stakeholders suggested use of online App to address student concerns of school related violence and disciplinary practices . These stakeholders include students, parents and their teachers. The semi structured questionnaire was used to collect data from students and parents. The opinionnaire and focused group discussion was used to collect information from students and administrators about their own practices.

The data was qualitatively analyzed in the light of objectives. The participants in the study press for the implementation of mobile app as online whistleblower to raise concerns related to school, for which the redressal timeline to resolve issues and concerns of the students should be fixed to be 24 hours. This App should be functional as the centralised system similar to RTI , Right to information redressal system and should be implemented by the school authorities in collaboration with an autonomous body at the center.

The findings of the study enlighten the expectations of the stakeholders to redress their concerns on the school practices on discipline, safety and security concerns of their child, the evaluation and assessment partnership in the school and also on the use of technology to combat the issues of common platform to share the concerns.

**CONCLUSION**

The Indian economy has been developing and showing positive signs on various economic indicators. India is emerging as a global superpower but what forms the basis and what creative individual to contribute to this development is a proper Holistic education which still has lots of issues that need immediate attention.

A lot has been done ensure each citizen has proper access to education but from time to time there have been issues of grave concerns. The ever increasing population to India has put a lot of pressure on the existing systems especially the government schools that lack appropriate administration, funding and infrastructure. Considerable factions of the population do not have proper access to standard education due to higher cost of education. The curriculum followed in the schools promotes reading and mugging up chapters to score higher, it still lacks on the creative front. The teachers especially in the rural areas are not adequately trained.

In the past few years in the news there has been reports of negligence by the school administration, incidences of rape and murder of students, harsh disciplines and student suicides. A very back it was reported in the media that the midday meal give to the students as part of the government program was adulterated and had resulted in many students falling sick to a level that they had to be admitted in hospitals. Recently a student from a renowned private school was murdered by his school mate. A five year old girl was reported to be raped by the school peon. Two girls committed suicide when they were rebuked by the teacher for bunking the class. And to add to the horror a few days back 88 girls were forced to undress as a discipline. Such incidents time and again have shaken the trust in the education system.

The educational institutions are meant to be centers of learning and all round development enabling and individual to be independent and conscious of its responsibilities and duties. The schools and Institutions form the backbone of any society. Among many of its responsibilities the schools need to assure safety and security to its students. The parents entrust the respective Institutions with great trust. But recent incidences urgently call for the scrutiny of existing administration and practices.

There is a need for awareness program that call for active participation of parents in their child's learning process. The parents need to ensure that their child is free from any form of fear that includes curriculum and examination base fear and also fear of any daily School activities. A child undergoes through a lot of stress the pressure as part of the schooling process. In such times it's the duty of the parents to support and help their children to cope up and enjoy the process. The parents need to be caring and regularly access the daily school experience of their children and take appropriate actions in anything unusual is found. Even the child needs to be aware the empowered to recognise and report as sort of negative behavior.

In the wake of recent events the government has issued legal guidelines to ensure safety and security of the students that include installing of security cameras, security audit of schools and limited access to outsiders. As per the new rules it is also required for the staff of undergo police verification and proper training to protect students from any form of abuse. It is also mentioned to organise orientation programmes and training for the school stakeholders to make sure that the guidelines are efficiently implemented at the ground level. The respective authorities need to continuously scrutinize the schools and assess them to ensure that the institutions execute their responsibilities properly and ensure proper legal framework are in place to ensure a constructive learning environment. The respective boards of education need to assess their approaches to learning time to time and adapt to the needs and circumstances of the students.

The issues can be addressed through proper collaboration between the government, institutions and parents. The objectives, values and practices to education need be revisited, properly understood and implemented with set goals that imports knowledge in a healthy, safe and constructive environment to the students. The key of safe and secure future is to ensure safe and secure learning to the students who are the future.

The researcher attempted to pen down the statements of the stakeholders urging the need of a common platform been shared through the use of an APP which can be easily accessible through mobile phones by all the participants of education process.

The participants in the study air their views for the implementation of mobile app as online whistleblower to raise concerns related to school, for which the redressal timeline to resolve issues and concerns of the students should be fixed to be twenty four hours. This App should be functional as the centralised system similar to RTI, Right to information redressal system and should be implemented by the school authorities in collaboration with an autonomous body at the center.

The Digital India campaign launched by Hon'ble Prime Minister can be encashed leverage in implementing common platform for schools in sink with government portals working together for redressal of common concerns of safety, security and school disciplinary action practices(SDAP) aiming to provide a safe learning environment.

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**A STUDY ON DIGITAL INNOVATION IN EDUCATION****Suraj Kumar<sup>1</sup> and Priyanka Tyagi<sup>2</sup>**<sup>1</sup>Department of Education, Saraswati Institute of Management & Technology, Kumaun University, Nainital<sup>2</sup>Assistant Professor, Lingaya's Lalita Devi Institute of Management & Sciences, New Delhi

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**ABSTRACT**

*When it comes to online learning in education, the model has been pretty straightforward - up until the early 2000s education was in a classroom of students with a teacher who led the process. Physical presence was a no-brainer, and any other type of learning was questionable at best traditionally education is centred on sources such as schools, teachers and print media. The learners reached the information sources by enrolling with schools, teachers and libraries. Prior to the digital era, information was not accessible by the majority of people, and even those accessed were unable to obtain current information with respect to today's context. The modern society wants to know the information as it happens and when it happens, and the world is moving from an information society to a knowledge society. Thus education is given the highest priority and brainpower is becoming the most valuable asset of an organization. Advances in digital technology have opened up many avenues of learning. Technology has made information accessible / transmittable from anywhere and by / to all groups of people. Education has reached most parts of the world and ICT has become an integral part of human life. This paper describes the process of generation, creation and acquisition of knowledge through the technology. The use of ICT to manage and organise explicit knowledge is highlighted. The paper also describes how technology is used to access and apply such knowledge. The paper relates how these technologies have been used in education and its impact in general. Using examples the paper highlights some of the changes that has taken place in the Indian education sector.*

*Keywords: Digitization, Cloud Learning, Education, Digital Education, Technology etc*

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**I. INTRODUCTION**

Owing to the steady economic growth and globalisation, education in India is no longer just a teacher talking to a bunch of students in a classroom. With more than 370 million internet users and hundreds of local as well as global business tycoons willing to invest in the future of education, online education in India has picked up pace. In fact, the e-learning market in the country is estimated to be worth more than \$3 billion. India is now the third largest online market for education in the world. This enables people to take better advantage of the resources available online. We have more than 1 million registered schools and 18,000 higher education institutions. However, 4 percent of children never start school, 58 percent don't complete primary schools, 90 percent don't complete secondary school and only 10 percent go on to college. What is going to happen to the 90 percent? This is where start-ups like Khan Academy enter the market with meticulously curate content, even in Indian languages, based on NCERT textbooks. In fact, online education helps people get access to a world-class learning experience when traditional higher education is simply not possible due to financial or personal constraints. Some may also suffer from physical or mental disabilities that make learning in a classroom impossible. For these students, online courses, specialisations and degree programs can offer an incredible opportunity to continue their education and build careers for themselves. These days, employers look for more than just the basic skill set in their employees, they look for a long-term relationship with the organisation. Often, appraisals and promotions are awarded on the basis of rescaling. This is where companies like Embibe and Simplilearn enter the picture with their courses for mid-level professionals. Similarly, UpGrad, which was launched in July 2015, also aims to create a flexible, industry-relevant learning experience for professionals. Alumni from respected business schools like IIT, Wharton, and UCLA also participated in this education revolution with their own venture called Slide Rule, through which they claim to help people discover the best online courses available in every subject.

**II. BASIC DIFFERENCE BETWEEN DIGITAL EDUCATION AND THE CLASS ROOM EDUCATION**

Gone are those days when classroom training was restricted to textbook learning, teachers using the blackboard to explain things and students writing down notes in copies. The traditional teacher-centered methods of teaching and task-based approaches to learning focused more on making notes and memorization. However, it's no more chalk and talk in most schools. Classroom teaching has become more and more interactive nowadays with the use of digital methods such as PPTs, video presentations, e-learning methods, practical demos, online training and other digital methods or platforms.

**III. ADVANTAGES OF TEACHER-LED CLASSROOM TRAINING**

This is an efficient method of presenting a large volume of study material to students.

1. It is a personal, face-to-face type of training.
2. Everyone gets the same information at the same time.
3. It is cost-effective.

**IV. HOW DOES DIGITAL EDUCATION BENEFIT THE CHILD?**

1. Interactive: Interactive: With digital education, classroom teachings have become more fun and interactive. Children tend to be more attentive. They are not only listening but also viewing it on the screen which makes their learning all the more effective. Here, sounds and visuals go hand-in-hand which is easy for the child to grasp.

2. Attention to details: Interactive Online presentations or practical sessions in educational content through interactive screen time help the students to pay more attention to details which enable them to complete their activities on their own.

3. Learn at his pace: Many a times, a student hesitates to ask a question to his teacher in classroom training. But with digital education, even if he does not understand anything at one go, he can attend the recorded sessions to clear his doubts. Technology enables a student to learn at his own pace

4. Learn at his pace: Many a times, a student hesitates to ask a question to his teacher in classroom training. But with digital education, even if he does not understand anything at one go, he can attend the recorded sessions to clear his doubts. Technology enables a student to learn at his own pace

5. External guidance: With online education, students can even further connect with distant counselors and faculty to seek guidance or resolve queries

**V. EMERGING TRENDS OF DIGITAL EDUCATION**

Digitalized classroom/Flipped Class rooms a growing Trend A complete revolution in the way we learn today has been brought by Technology. Teachers teaching in the classroom can capture the students and the full strength in the class by digital screens, thus facilitating each child to get the same base content and input from the teachers. This feature of digital era has increased the Student engagement as it combines various instructional styles. Each student gets in contact to world-class education, which is not easy to impart by the traditional white chalk and black board teaching. This new learning is more interesting, personalized and enjoyable. With this technological inclusion in the school teaching the students feel studying as enjoyable, easy, competent and above all interesting. The aim of a teacher however should be to create such an atmosphere which makes every student want to study.

**1. Video based learning.**

Video-based learning as a part of digital marketing has geared up in Indian Education Sector and has made education engaging, entertaining and exploring. It enables learning with a pedigree of learning out of leisure with creativity, fun and entertainment on cards via the wonderful Apps, podcasts, videos, interactive software, e books and online interactive electronic boards. Children are excited and operative with interest to manage the showcase via their intelligence, exploring the weak techno skills of teachers and assist them in public with pride and honour and recognition.

**2. Massive open online course (MOOCs) & other distant learning programs**

A massive open online course (MOOC) is an online course aimed at unlimited participation and open access via the web. India is considered to be the biggest market for MOOCs in the world after the USA. Since the population of India is huge, massive open online course (MOOC) are said to be gateways for a lot of Indians in terms of bringing an educational revolution. Online distant learning programs give a great opportunity to avail high quality learning with the help of internet connectivity.

**3. K12 sector Game based learning**

K-12 School is a terminology used as Kindergarten through XII grade. Various start-up companies have been the contributor for this sector. Today the world is of Y-generation people who are acquainted with the technological developments taking around them, and they are also surrounded with the required skills and abilities. K-12 creates the game based learning environment, which enables the learner to easily get the word of education in India and give us a better self-trained Y generation.

1. Screen time help the students to pay more attention to details which enable them to complete their activities on their own. Quick completion: Using tabs, laptops or notepads, instead of pens and pencils, motivates children to complete their
2. Tasks quickly. Vocabulary: Active online screen time helps students develop language skills. By reading eBooks or accessing study
3. Materials online, they learn new words and expand their vocabulary. Learn at his pace: Many a times, a student hesitates to ask a question to his teacher in classroom training. But with
4. Digital education, even if he does not understand anything at one go, he can attend the recorded sessions to clear his doubts. Technology enables a student to learn at his own pace. User-friendly: The best thing about digital education is that it is user-friendly. You can very well access your curriculum
5. Wherever you are. You can learn on the go. Even if you miss certain classes, you can access the class notes and download files from the school website. Learn on his own: Also, nowadays, online study materials are easily available. Even if the entire education system is not
6. Digitalized, yet students can leverage the power of digital content depending upon their capabilities. So students, can access exclusive online study modules of various subjects, which help them to enhance their knowledge even without a teacher. External guidance: With online education, students can even further connect with distant counselors and faculty to seek

## **VI. MEDIA FOR EXPLICIT KNOWLEDGE**

Explicit knowledge could be represented using different media. Text, graphics, animation, sound and video are the media to represent them [3]. Unlike the traditional media in forms of books information stored digitally can be preserved without any forms of distortion and they can be accessed easily and quickly from any part of the world.

### **1. Text**

Text is one of the most effective components of representing knowledge. The words embodied as text, convey a powerful message and this has been widely used in handwritten and print media. Most data and information is represented through this medium. It is impossible to convey an unambiguous message without text. To convey a message effectively the message should be specific, definite, concrete and precise. Selection of suitable fonts and size is important for legibility and aesthetic effects. Learning is concerned, summarized text is used to identify the important points and detailed descriptions are for explanations and subsequent supplementary reading.

### **2. Animation**

Animation adds impact to a present unlike text and graphics these are day time based media. The visual imp animation is to harness the learning Animations usually take forms like object across the screen, user-con movement of an object, bitmap flipped full animation files. Authoring tools are to create such objects.

### **3. Sound**

All forms of verbal communication use Technology has been used to transmit across the universe. Teacher's voice ha the primary focus in delivering know Sound could be represented using com and MIDI (Musical Instrument Interface) and digital audio are the two file types used in multimedia system multimedia system requires the use of s music or special sound effects. When u education, speech should be short and integrated with other media. Impact on Academicians: Today's educational technology has almost forced a greater engagement between faculty and students and among students. It is helping faculty to focus more on the learning environment for their students. But it has also changed the way colleges do business. In the 1980s, when I was at Palomar College, we moved away from in-person registration lines to phone-in registration—and then, in the 1990s, to online registration. But are we ready for this where we focus more on ranks in university than what we actually know and can deliver. Indian education regulatory system puts a limitation on the scope of digital education. Students are worried about their grades and restrict themselves to the prescribed curriculum, faculties are in hurry to complete the syllabus, management concern is to secure top ranks in the university. An online degree or course is still not recognized in India. Online education in India has another major challenge that there is no proper grooming of the students on soft skill and personality development dueto which it has less preference in job market. Main objective of education is empowerment .Smriti Irani introduced apps to empower students and parents. But is this objective met? Putting NCERT books online is certainly appreciated but most of the apps still remain only a hype which prove to be useful for digital natives but not by digital immigrants.

Future of Digital Innovation in Education In India, while education technologies appears to have been taken quite seriously by many state governments and by certain private sector initiatives, most of these programmes are aimed at preparing students for the job market. In addition, the programmes are software- acentric, i.e. they emphasise the learning of a specific set of software tools. There is an urgent need to demystify this technology and de-emphasise the learning of specific tools. A balanced generic curriculum, where computers are relegated to their due place as tools, and where they extend the horizons of other subjects is a must. To enable technology in India, computer based learning system must be introduced from the junior level so that the students become computer savvy from very young age and are not afraid of using Education Technology when actually needed.

#### **4. Internet**

Internet provides a cost effective global network backbone. It connects users from anywhere, as long as they have access to the web. This has allowed users to host information on their computers and make them available for others. Such computers need to be dedicated for that purpose as users will be searching for information at different times. These sites are called web sites and they are connected to the web on 7x24. This technology intends to provide unrestricted access to information. An educational institute will publish all information relevant to the public through their web sites. This technology has made information accessible as it happens and people access them at any time they want to do so.

#### **5. Video Conferencing**

Telephone allowed voice communication among distant personnel. This has evolved not only to view a live video of the person but also to connect to a number of people. Although the technology is costly it is been used for scheduled meetings involving people internationally. Universities having campuses events involving these universities and w some local and overseas institutions already made use of this facility. V conferencing facilities are also available other places such as distant learning centre.

#### **VII. CONCLUSION**

Over the last five years computers have been introduced to most educational institutes although its ratio to a student is very high. By making the educators aware of the available technology and some taking initiatives to implement them, some forms of reforms may take place. Whatever Sri Lanka do with respect technology requirements the world will be flooded with information and some people will use them effectively. They would be the people who have developed their skills to the level of finding problem-relevant information and interpreting and applying them in solving of problems.

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**DIGITAL JOURNALISM: SOCIAL MEDIA MONITORING AND CHALLENGES****Sudeep R P Sonawane**

Multinational Print Media Editor and Writer

**ABSTRACT**

*'Digital Journalism: Social Media, Monitoring and Challenges' must give readers clarity on mother of all journalism – the print media or the newspaper. Readers must know the traditional media's development and its success over 400 years since the debut of the first printed pamphlet. It is necessary because traditional media pre-dates digital or social media by centuries. Its long presence gives new age media the advantage of learning, copying and adapting a successful model.*

*Daily, weekly newspapers, periodicals, journals, radio and television have successfully delivered news, features, opinions, and commentaries supported by photographs and statistical data to large audiences worldwide. People all over the world accept the conventional media as a reliable tool to read, hear and watch news. Digital journalism challenges this set pattern. Indeed, innovation and digital technology have redefined broadcasting, receiving, processing text and images. Content providers now deliver news instantly across continents. Consumers receive content in attractive digital formats on their gadgets. Postmodern man's creativity continues to redefine media business further. This places digital journalism at a higher level. Without a doubt, the old media faces many challenges, even extinction.*

*Clarity on rules, methods and technology used by the old media to deliver news will help readers understand a critique on new media journalism. This would help to assess and judge new age media, its practitioners and their credibility. This paper briefly mentions traditional media's successes in supplying news, commentaries, advertising, and marketing commercial content as well as political and war propaganda seen during the first and second World Wars.*

*This paper delves on the pros and cons of conventional media versus new age media – paper versus touch screen. The author lists threats to old media from social media. It talks about credibility, relevancy and longevity of old media. He discusses freedom of speech, right to information, rules, legislation, legal issues and protecting an individual's privacy. The paper does not make a case to muzzle freedom of speech and expression, but to protect other fundamental rights of citizens, public and private entities by ensuring their right to privacy and protecting personal data while doing digital journalism.*

*Keywords: Digital Media, Journalism, print media, social media*

**1. History of printed newspapers, radio and television**

Definition: Reputable dictionaries define a newspaper as, "a paper printed and distributed usually daily or weekly and contains news, articles of opinion, features, and advertising<sup>1</sup>".

Printed newspaper starts in Europe in the 17th century. It replaces handwritten news-sheets delivered to the local community. German journalist Johann Carolus publishes Relation aller Furnemmen und gedenckwürdigen historien (Collection of all distinguished and commmorable news), the world's first printed newspaper in 1605 (Refer Table One on page two). The World Association of Newspapers confirms this as the world's first newspaper.

Over centuries various newspaper owners and editors nurture the business of writing news, printing technology and methods of delivering newspapers to readers. The 20th century is unarguably the Age of Newspapers. From Europe to Asia and the Americas it remains the primary source information, though the radio and television challenge its supremacy in the second half of the century.

Guglielmo Marconi first broadcasts radio signal from Ireland to Canada in 1901. The radio gradually develops into a refined gadget to listen to news, music, and songs since radio station 8MK broadcasts the first radio news programme on August 31, 1920 from Detroit, Michigan. By the 1950s, almost every country has radio broadcasting channel. Governments own, control and manage radio stations<sup>2</sup>.

TABLE ONE

No.	WORLD'S OLDEST NEWSPAPERS	YEAR, PLACE, COUNTRY	FOUNDER/PUBLISHER	LANGUAGE
1	Relation aller Gunemmen un gedenckwürdigen Historien	1605, Strasbourg, Holy Roman Empire	Johann Carolus	German
2	Avisa Relation oder Zeitung	1609, Wolfenbittel, Holy Roman Empire	Lucas Schulte	German
3	Courante uyt Italien, Duytslandt, &c. (Weekly) (World's first broadsheet newspaper, folio size)	1608, Amsterdam, Holland, Dutch Republic	Edited and published by Caspar van Hilten	Dutch
4	Nieuwe Tijdinghen (Antwerp Gazette)	1620, Antwerp, Spanish Netherlands	Abraham Verhoeven	Dutch
5	La Gazette, originally Gazette de France	May 30, 1631, Paris	Theophraste Renaudot	French
6	Milano	November 28, 1640, Duchy of Milan	Malatesta Family	Italian
7	Bologna	June 28, 1642, Bologna, Papal States	Lorenzo Pellegrini	Italian
8	Post- och Inrikes Tidningar (Post and Domestic Times) Daily. Oldest currently published newspaper in the world. On January 1, 2007 it went online. www.poit.org	1645, Stockholm	Svenska Akademien (owner)  Horace Engdahl (Publisher)	Swedish
9	Oxford Gazette, renamed London Gazette in 1666. Oldest English broadsheet newspaper still published. www.thegazette.co.uk It is the 16 <sup>th</sup> oldest newspaper in Europe.	November 7, 1665.  As London Gazette from February 5, 1666.	Henry Muddiman. Current owner the British Government	England

10	Berrow’s Worcester Journal. First published as Worcester Post-Man then to Worcester Journal and then to its current name. www.berrowjournal.co.uk	1690, Worcester. From Oct 11, 1753 as Berrow’s Worcester Journal.	Founder Stephen Bryan (Worcester Post-Man). Bryan sold it to Harvey Berrow in 1748. Newsquest Media Group	England
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India, too, keeps pace with the pioneers. The Indian Broadcasting Company starts two radio stations in 1927. The Bombay station starts on July 23 and Calcutta station on August 26. The 1960s and ‘70s see radio stations expand rapidly, especially after FM stations start as an alternative to the Short Wave (SW), MW and LW formats.

According to data published by www.unesco.org there are around 44,000 radio stations worldwide<sup>3</sup>. AM/ FM radio accounts for 86% of the total time adults, between ages 25 and 54, spend listening to the three main audio platforms<sup>4</sup>.

Television broadcasting today enjoys a level that early 20th century inventors like Scot John Logie Baird, German Max Dieckmann, American Charles Francis Jenkins and Kenjiro Takayanagi, the father of Japanese television could not have imagined.

Russian scientist and Professor of Electricity Constantin Dmitrievich Perskyi<sup>5</sup> coins the word ‘television’. He first uses it in a paper he reads (in French) to the International Electricity Congress at the International World Fair held in Paris on August 24, 1900.

In 1930, The British Broadcasting Corporation (BBC) uses Baird’s invention for its first television broad- cast service. On November 2, 1936, BBC broadcasts the world’s first regular high-definition television service<sup>6</sup>. BBC broadcasts a 405-line broadcasting service using Emitron that EMI engineers, led by Isaac Shoen- berg, develop.

As years go by, early forms of televisions progress to cathode–ray tubes then transistors, digital, LCD, LED, OLED, Quantum dot, and HDR.

Research and development makes still and moving images hardware better. These make broadcasting fast, efficient and viewing television a wonderful experience to global audiences.

Watching entertainment, history, discovery, food, travel and tourism, news, features and panel discussions on high-grade televisions with large screens, backed by Dolby surround sound, is a pleasant experience that hand-held phones cannot match. A group of people can watch sport or news (refer table) on television and simultaneously discuss with one another while munching snacks and sipping drinks. A phone isolates the user. It engages one user and one of his hands. The advantage being he/she can watch live feed anywhere because the device uses wi-fi or telecom operator network signal to receive content without cables, unlike television.

**2. History of social media**

The digital world is much older than most people imagine. British mathematician and mechanical engineer Charles Babbage<sup>7</sup> originated the concept of a digital programmable computer in the middle of the 19th century, but he failed to build it. Around 100 years later, In 1953 International Business Machines (IBM) invents 701, its first electric and mass produced computer.

In 1973, Dave Woolley, a 17-year-old student at the Computer-based Education Research Laboratory (CERL), the University of Illinois, US, invents Talkomatic a multi-user chat room application on PLATO System<sup>8</sup>. Talkomatic becomes popular among online users of PLATO.

In the same year, CERL staff invents TERM-Talk, an instant-messaging application. Two users of PLATO communicate instantly by typing characters at the bottom of their terminals.

Later that year, Woolley develops PLATO Notes that enables conferencing and bulletin board forum to communicate with users. Three years later in 1976, Notes expands to enable any user to create a ‘notesfile’ on any subject. PLATO Notes serves as the inspiration for Lotus Notes. Former PLATO users Ray Ozzie, Len Kawell, and Tim Halvorsen develop it.

In 1980, Bulletin Board System (BBS) emerges as one of the earliest known forms of social media. Experts continue to develop the popular tool up to the late 1990s. Around the same time, many use Internet Relay Chat (IRC), and many continue to use it.

In the 1980s Operating Systems (OS) with a Graphical User Interface (GUI) emerges. OS such as Windows 95 and Mac OS become popular because they are easy to use. This sets the stage for early social media platforms to develop.

Information and Communications Technology software development speed up in the 1980s and 90s. British scientist Tim Berners-Lee<sup>9</sup> invents the World Wide Web in 1989. It is central to the development of the information age and is the primary tool billions of people use to communicate with each other on the Internet. Hardware innovation does not lag far behind. Larger and heavy computers make way for lighter and thinner ones. Personal computers become faster and smaller in the 1980s and 1990s. Large processors make way for smaller and faster chipsets. The phrase obsolete technology becomes common as development progresses rapidly. The Pentium series reiterates this. A series of Pentium<sup>10</sup> microprocessors such as 086, 186, 286, 386 and 486 produced by Intel arrive and disappear as quickly as they arrive in the early 1990s. Experts rate Pentium microprocessors higher than atom and Celeron series, but far below the core i3, i4, i5, i7 and i9 and the Xeon series. Computers and computing have refined exponentially in the last two decades. Today's generation may wonder what are Floppy Disk Drives, CDs and DVDs because they are obsolete now.

Instant messaging platform such as AOL Instant Messenger (AIM) debuts in 1997 (Discontinued December 15, 2017). MSN Messenger (1999), later known as Windows Live Messenger, adds competition as the industry grows. Wikipedia arrives in 2001. The 21st century welcomes innovative social media platforms such as Friendster, Orkut, Tagged, Flickr, Myspace<sup>11</sup> and Facebook<sup>(12) (13)</sup>. Writing commentaries and opinion articles, curiously labelled as blogging by the IT community, gains popularity.

Social media platforms that survive the threat of obsolescence now thrive, even as new ones appear sporadically. This includes popular blogs, instant messaging servers, and various social-networking platforms such as Facebook, MySpace, LinkedIn and Twitter. With advances in smartphone technology, almost all social media services now have their own mobile applications.

### **3. Traditional media: advantages and disadvantages**

Traditional media has grown from scratch. From sign language, using homing or carrier pigeons<sup>14</sup> for relaying messages to its modern face, the traditional media continues to expand. Its modern forms include letters, postal mail, newspapers, telephone, radio, and television. Speed is common to old and new media. In ancient era athletic runners delivered king's messages. Then man became smarter and trained pigeons to deliver messages to remote villages. Man's pursuit of excellence has added speed to everything. He added exponential speed to the digital world through inventions and algorithms. Two people separate by miles speak instantly on the telephone, thanks to Alexander Graham Bell. Radio and television added more speed, clarity and images to communicate across continents. It is slow and limited in reach. Although not impervious to malpractice or misuse, traditional media has wider acceptance. Proof is the large number of readers or subscribers, mainly because the print media has a longer presence of over four centuries. Its practitioners have developed it so much that people accept newspapers, radio and television as their primary sources of news.

### **Digital media: advantages and disadvantages**

Digital media has many facets. It is Internet and applications based. Using secure hypertext transfer protocol, it virtually exists in public domain, and its best feature is being interactive. A user accesses online content on the Internet using a computer, laptop, tablet and feature phone. The digital platform makes it sophisticated and fast. Many people use it simultaneously to communicate instantaneously with one another.

Digital platform beats conventional media comprehensively. Data transfer speed, multiple format support, presentation and compatibility with different types of gadgets give it a great edge. Text with artistic fonts, backed with images and statistical graphics, make it attractive. It has several advantages. Besides personal one-to-one correspondence or communication, multiple users can do the same instantaneously. It has added myriad opportunities and innovative methods to communicate and interact while doing online business, marketing products and services. Its various forms include email marketing, social media marketing, content marketing, Search Engine Marketing and Search Engine Optimisation.

The Internet's biggest advantage is being a fast, virtual and receive-and-read anywhere alternative to traditional form of physical distribution of newspapers, magazines, audio and video content. It significantly lowers cost of buying content. However, its access cost is high because consumers need expensive laptops, tablets or

feature phones to read, hear and watch content. The consumer pays thrice. He first buys a gadget. Next, he pays for data plan to telecom service provider and then pays subscription fee to content providers.

Digital media's best feature is anyone who has money can buy a digital device, Wi-Fi or 4G service and pay to read or watch videos. This is its fatal flaw. With millions of people using digital devices, there is a virtual tsunami of data online. News, genuine or fake, travels fast. Consumers cannot verify whether the information is genuine or fake. Digital media is destructive. False information destroys a person's character, reputation, and even ruins him/her financially. Radicals and terrorists abuse it to further their agendas and carry out mass killings.

Despite the potential threat of abuse, trolling, bullying and cybercrimes, the Internet, search engines such as Google, Bing, browsers like Chrome, and Explorer, private and public websites are here to stay. Experts will continue to further develop social sites like Facebook, Messenger, WhatsApp, Snapchat, Twitter, Instagram and several other phone-based applications.

### **Paper versus screen: practitioners, credibility and reputation**

Can one say, 'newspapers and magazines publish reliable news, and social media content is unreliable? Or, is it the other way around? What standards back reliability? Intelligent readers ask many such questions because they seek the truth and reliability of the source of information, whether published by traditional or social media.

The logo of one of India's oldest newspaper, The Times of India, says, 'Let Truth Prevail'. Other Indian newspapers, as well as all over the world, espouse similar lofty ideals. This shows publishers and newspaper owners have the intent to publish the truth, but do their editors and reporters strive to fulfil this ideal in all news reports they write and edit?

Many newspapers owners and their editors practised good morals in their journalism in the first half of the 20th century, and perhaps, many do even today. Loads of evidence supports this claim. There are good and bad editors. We must accept many publishers and editors have an agenda to push. We must concede many editors are pliable and subservient to their owners. They push company agenda by conniving with a coterie of reporters. There are corrupt reporters too. They either work individually or with cliques on the News Desk. Unethical journalists distort facts, suppress truth, and peddle lies on all topics - be it business, crime, social, cultural, religion, political and war propaganda to tell a different story.

#### **5.1 The practitioners**

Traditional media wins this race by a great distance. Many faultless reasons support this claim. Practitioners of this media usually come with university education. These days many come with degrees from journalism colleges. These well-trained journalists come with qualifications to write news reports, editorials, commentaries, analyses and features on many topics.

They have the competence to write high-quality reports on a wide range of topics. Chief Reporters often assign beats to them such as politics, government, administration, municipalities, legislation, law, crime, business, banking, finance, insurance, share and money markets, corporate, commerce, industries, science, technology, defence, aviation, education, health, environment, the performing arts, music, culture, human rights, labour, foreign affairs and sports.

Many journalists often write on more than three or four subjects. However, editors often delegate special beats to reporters because the vastness of the subjects mentioned above calls for specialisation. This is where a professional newspaper reporter beats an untrained citizen who practises social media journalism. The untrained citizen's only qualification to 'write news' and commentaries - known by the silly nomenclature of 'Blog' on the social media - is having a feature-load cell-phone and little else.

#### **5.2 Credibility**

An average citizen, skilful only with hand-held gadgets cannot match a professional news reporter's credibility and competence. He/she does not have the qualifications and the training honed in a newsroom to write quality news reports on various topics.

A young newspaper reporter writes news based on the principles learned in journalism schools. Experienced senior editors further guide young reporters in the newsroom. Reporters write news conforming to the basic format of Who, What, Where, When, Why - known as the five Ws in journalism. The crucial point here is the 'Who'. For example, a journalist reporting an accident will confirm the number of people dead and injured by validating the data. He/she will quote a police officer, fire brigade official and spokesperson of the hospital to confirm the number of dead or injured people. This 'who' gives credibility to the news report that cellphone brigade can never match.

A citizen's hopes of journalism begin and end with a hand-held gadget. He/she does not know how to write a report, what to write, and who to quote. His/her news is amateur work that lacks credibility. The only redeeming feature here is the video captured by his/her phone camera. Does aiming phone camera to the incident site need special skill? Even here, the well-trained newspaper photographer or television channel videographer beats citizen 'journalist' by the sheer quality of equipment and technical expertise.

### **5.3 Reputation**

Among thousands of media people, a few stand out in the crowd of mediocrity. Their consistently good work published or broadcast over many years earns them universal acceptance and builds reputation. Newspaper readers and television audiences recognise and identify many outstanding journalists by their name as a brand, rather than the newspaper or the channel where they work.

Public uploading content on social sites do not deserve such appraisals. Barring a few exceptions, the majority upload rubbish or copied content with their 'analyses'. Their only claim to fame is the number of 'likes' and subscribers. This is neither a measure of their success, reputation, nor does it certify their work. The few exceptions are usually journalists who have quit mainstream media and started their own channels on YouTube.

## **6. Monitoring and Challenges**

The Internet and cellphone-based social media applications pose many challenges. Lawmakers and governments face the difficult task of ensuring the right to express freely and protecting the rights of individuals, public and private institutions. Freedom of speech does not give anyone the right to target, malign, terrorise, ethnic profiling, racially abuse and pass derogatory comments on a person. Whether a particular religion, supporting a political party, culture, work, business, sport, cinema and music, everyone has the freedom to choose, practice and follow it.

New possibilities for free speech provided by the Internet have also been used to undermine people's human rights<sup>15</sup>. A section of amateur and paid practitioners of digital media are irresponsible and reckless. Sounds harsh, but it is the truth. They blatantly violate the spirit of free speech by spreading canards, strangely called trolls these days, under the cover of fake names that social media enable users to create and use. They pose many serious threats to targeted individuals, groups and institutions. Lies, fake news, deliberately disseminated wrong, abusive and offensive information either text, audio or video films via social media can damage reputation, integrity and malign character of public figures, citizens, public and private companies. Yes, it has many advantages, if practised responsibly, but, bad people outnumber good people so it does more harm than good. The disadvantages outnumber the advantages. This is why many countries are mulling strict regulatory norms to rein in the rogues who cause mayhem on social media. Several independent activists and various other groups in the world favour regulating social media for the greater good of the world.

### **6.1 Accountability**

Owners of [www.regulatesocialmedia.org](http://www.regulatesocialmedia.org)<sup>16</sup> insist, "Social media companies must be accountable to the democracies that make their businesses possible". In a commentary on the negative impact on social media, the authors say technology companies Google, Facebook, Twitter, SNAP and others are "hardly regulated and hardly accountable". The commentary goes on to say, "While these platforms present new opportunities to connect people around the world, they also create attack surfaces for bad actors that wish to spread misinformation, encourage terrorism, engage in online harassment, steal personal data, restrict free speech and suppress dissent. The age of unregulated social media must end. Now is the time to have these discussions before we end up with misguided rules."

### **6.2 Regulation**

In a commentary titled 'Do we really need to start regulating social media', published by [www.forbes.com](http://www.forbes.com) on July 30, 2018, Andrew Arnold argues US lawmakers are not the only ones pushing for "imposing new regulation on social media. In the United States, many legislators strongly suggested imposing some powerful regulations during the Facebook hearings. He makes a strong case for regulating social media, saying, "Some of the strongest proponents of social media argue that it is a matter of public interest to regulate social media. They say that regulating it may be as important as regulating tobacco or alcohol. Social media, they argue, empowers large corporations to control the flow of information. As long as they can afford to saturate social media feeds with posts that curate the information they want, anyone standing in opposition to that is essentially steamrolled because they don't have the resources to counter that."

## **7. What are governments all over the world doing to regulate social media?**

Public debate, dissent, hate-speech, online financial crime, terrorism and myriad other issues put intense pressure on governments to regulate the Internet and social media. It remains a complex administrative and

legal process for most countries. It is more difficult for democracies or societies that practice free speech. It is much easier for totalitarian regimes, dictatorships and kingdoms to muzzle contrary view or dissent.

In a paper titled ‘How countries are regulating Internet content’<sup>17</sup>, Professor Peng Hwa Ang<sup>18</sup> of Nanyang Technological University, Singapore, says, “There is not one universal model for Internet content regulation. Ultimately, each country’s regulation of the Internet is driven not by technology or law, but by the culture of the society. Each country has its own specific concerns and it is this rich variety of concerns that adds to the diversity of the Internet”.

Here below are few countries that enforce some form of the Internet or digital media regulations.

**7.1 The United States**

The Federal Communications Commission regulates all electronic communications in the US. The US has the most advanced regulations in this area. This is clear from the legal provision that says banning critics from social media is violation of the First Amendment. The US is currently debating whether a public official can legally suppress dissent or criticism by banning dissenters from social media pages administered by the public official. The country’s legal system is so advanced that it does not even spare its president. President Donald Trump recently appealed against the US District Court in New York decision that said ‘the President engaged in viewpoint discrimination when he blocked individuals from his social media account because they posted tweets that criticised him and his policies’.

Some key US federal laws cover the following infringements:- Communications Decency Act. It regulates indecency and obscenity in cyberspace. Computer Fraud and Abuse Act; Copyright Act; Children’s Online Privacy Protection Act; Electronic Funds Transfer Act and Electronic Communications Privacy Act that prohibits interception of wire, oral and electronic communication.

**7.2 British lawmakers push to rein digital gangsters**

British lawmakers added impetus to the move to regulate social media on February 18, 2019. A report<sup>19</sup> on fake news and disinformation on social media sites, released after one and a half year investigation by British Parliament’s Media Committee, urges tougher rules on Facebook to deter it from acting like “digital gangsters” and internationally violating data privacy and competition laws. The report slams Facebook saying, “The site’s structure seems to be designed to ‘conceal knowledge of and responsibility for specific decisions’. It is evident Facebook intentionally and knowingly violated both data privacy and anti-competition laws. Companies like Facebook should not be allowed to behave like ‘digital gangsters’ in the online world, considering themselves to be ahead of and beyond the law.” The report also accuses Facebook Chief Executive Officer Mark Zuckerberg of showing contempt for the UK Parliament by declining numerous invitations to appear before the committee. Refer Table 7.2.A.

<b>7.2.A BRITISH MEDIA PANEL LISTS SIX POINTS TO CHECK DIGITAL GANGSTERS</b>	
1.	Technical companies must have a code of ethics.
2.	Independent regulator should monitor them. Take legal action, if needed.
3.	Reform UK’s electoral laws and rules on foreign involvement in elections.
4.	Social media should remove sources of harmful content, including disinformation.
5.	Tax technical companies in UK to help fund any new regulator set up to oversee them.
6.	UK antitrust regulators should carry out a ‘comprehensive audit’ of the advertising market on social media.

On the day British lawmakers released their report, New Zealand government announced plans to levy new tax on Google and Facebook.

### **7.3 Indian Government's position on social media**

The Government of India does not regulate content on social media. It is committed to freedom of speech, expression and privacy of citizen, the Minister of State for electronics and IT S S Ahluwalia told the Parliament<sup>20</sup> on July 17, 2018

Replying to a question on fake news, the minister said, "The government does not regulate content appearing on social media sites, and law enforcement and security agencies may take action on specific case-to-case basis as per law in force."

The minister admitted many people misuse social media. "All sections of society access these platforms. The virtual and borderless nature of cyberspace helps this. Anyone can open account in any name including fake name from any part of the world, thus leading to misuse by some persons," he said.

Earlier in April 2018, the Ministry of Information and Broadcasting had issued an order to regulate digital media. The ministry had formed a ten-member panel to frame guidelines for websites. Cyber and media law experts had criticised this move because the panel did not include any representative from digital media and legal expert.

On March 24, 2015, India's Supreme Court<sup>21</sup> quashed Section 66A of the Information Technology Act terming it "unconstitutional in its entirety". "Police misused this section in various states to arrest innocent people for posting critical comments about social and political issues and political leaders on social networking sites<sup>5</sup>."

### **7.4 Global clampdown on social media**

Many countries have either banned or blocked and later revoked the ban on social sites. Main reasons include broadcasting negative text or audio-visual political content against ruling governments and dictators by the opposition party and dissenters. Other reasons include offensive content against particular religion, race and caste.

Afghanistan, Armenia, Bangladesh, Brazil, China, Eritrea, Finland, Germany, Indonesia, Iran, Libya, Malaysia, Morocco, North Korea, Pakistan, Russia, Sudan, Tajikistan, Thailand, Tunisia, Turkey, Turkmenistan, UAE, Uzbekistan, and Venezuela have banned or blocked Google, YouTube, Facebook and other sites for broadcasting content perceived objectionable either to the government or affected parties. Many of these countries revoked the ban after some time.

### **8. Does misuse of social media call for official monitoring and regulation?**

Like eminent social media experts, I am convinced overseeing, regulating and deterring people with wrong motives who misuse social media is crucial for an equitable society. It is easy to suggest, but difficult to do, given the complexities involved.

The 21st century social media has access to high technology. People can easily access online text, audio, images and video producing and editing software. Armed with these tools, people can easily alter text, audio and video content to spread lies and fake news.

Speed is the real danger of social media unlike a newspaper. At first glance, the consumer cannot find out whether the content he/she reads on a hand-held gadget is genuine or fake. Naïve consumers forward such content instantly without verifying. The irresponsible actions destroy victims. Besides distress, mental trauma and anger it inflicts monetary loss, damages family and professional relationships by sowing doubts through lies, incites violence, arson and affects a society's peace and prosperity.

Malicious and unintentionally inaccurate content broadcast by traditional media such as newspapers and radio, too, affects victims, however, its scope and impact is nowhere near the damage that social media inflicts.

For instance, a person reads some contentious news in the newspaper early morning. He/she may choose to tell a friend at workplace or marketplace, perhaps, three or four hours later in the day while social media tells thousands of people in an instant. It is like a nuclear chain reaction that is unstoppable once detonated. It spreads exponentially. This makes monitoring, policing and legislating laws to ensure justice to victims and punishing people indulging in online vilification campaigns through social media very complex and difficult.

### **9. Watchdog necessary to control social media tsunami**

I strongly make a case for an official regulator, monitor or a watchdog to control the tsunami of social media that is currently freely flowing in all directions in India as well as the world. This suggestion is not against freedom of speech or muzzling social media. I reject freedom of speech that destroys an individual's character, reputation and social status based on lies and hatred. Social and economic justice is the right all Indians enjoy

just as the constitution guarantees freedom of expression to all. Many people abuse the advancements made by information and communications technology. An official watchdog or a regulator empowered by laws passed by the parliament is necessary to control and deter such people. Just as worldwide legal systems enacted new laws to curb and deter new crimes, social media needs laws to protect the rights of victims and deliver justice to them.

#### 10. Conclusion: Why digital journalism needs a regulator?

Advanced societies enforce laws that are fair to all. As societies evolve further, new laws or amending existing ones could help provide legal cover to users and victims of developments. Innovation often impinges unforeseen results. Rather than establishing a regulatory authority, review of the Intermediary Guidelines Rules<sup>22</sup> can be used as an opportunity to devise a mechanism that protects free speech while also effectively dealing with illegal content on the Internet in India as required<sup>23</sup>.

I am not suggesting something impossible. Governments have a responsibility to pass new laws to protect victims' rights. Lawmakers can do it. India, too, can propel digital innovation as a tool for sustainable development. India has traditional precedent for inspiration. Not long ago, women in villages would gossip about another person. Gradually, the tale would go around the village and at some point many people would discuss it openly. Senior people would raise the bogey of 'gaon ki eezut' (honour or reputation of the village). Finally, the village panchayat<sup>24</sup> (council) would call for a meeting, under the ubiquitous banyan tree circle, to discuss and arbitrate the contentious issue. If a village council can probe an issue triggered by gossip, why can't we do this in the 21st century? We cannot deny the many benefits of social media, if used responsibly. In its current unregulated avatar, it is just an efficient tool to broadcast 'gossip' and unverified content. The major difference being it is far more dangerous than two village women gossiping about, say a love affair of the local school-master with a young teacher, because it travels globally!

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**CROWDFUNDING AS A MODE OF FINANCING FOR ENTREPRENEURIAL DEVELOPMENT  
IN INDIA****Surbhi Gosain**

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**ABSTRACT**

India has been witnessing a rise in the number of new enterprises and young entrepreneurs. The entrepreneurship development is gaining momentum in India with various entrepreneurial development programmes (EDPs) introduced by the central and state governments. The accumulation of funds is the most important factor for starting an enterprise. The rise in number of young entrepreneurs with no previous experience has increased the competition among such entrepreneurs to secure funding for their venture. Moreover, securing funds is the most difficult for ventures which do not have profit maximisation needs such as social or innovative projects. Crowdfunding is a mode which has provided a solution for such ventures. Crowdfunding is a process of collecting a small amount of funds from different persons, collectively called a Crowd. The term crowd may comprise of friends, relatives or complete strangers who want to contribute. Crowdfunding is a recent trend in India with the emergence of more and more crowdfunding platforms. The objective of this study is to explore the Indian crowdfunding industry in the light of entrepreneurial development in India. The study is exploratory in nature. The study is based on qualitative data available in various journals, newspaper, reports and the major crowdfunding platforms. The study emphasizes on the process of crowdfunding which has emerged as a method adopted by various individuals to start their ventures. More and more people are opting for crowdfunding to collect money for their individual needs or for different projects. This method of financing has proved to be beneficial at large for social ventures and NGOs as well. The study specifically highlights the benefits and shortcomings of crowdfunding with respect to the entrepreneurial development in India.

*Keywords: Crowdfunding, Entrepreneurship, Entrepreneurial financing, Entrepreneurial development.*

**INTRODUCTION**

Entrepreneurship development has taken a paradigm shift with many new entrepreneurs coming with out-of-the-box ideas. Various government initiatives have created a market for these ideas. Some of these breakthrough ideas include app-based coaching tutorials, cab bookings, travel bookings and food delivery. With the launch of government schemes such as 'Make-in-India' and 'Startup India', entrepreneurship got a new boost. The development of entrepreneurs leads to the overall development of the economy of the country. Due to the rise in the number of entrepreneurs and a volatile business environment, gathering funds for starting a venture has become a difficult task. To start a business an entrepreneur has to compete with other entrepreneurs in order to secure funds. The limited access to the capital during the early stages of a venture becomes a roadblock to the entrepreneurial dreams of many individuals. Crowdfunding is a new mode for entrepreneurial financing. It involves the generation of finances in the form of small contribution by a large number of people. Like other sources of financing, crowdfunding too has some advantages and limitations but it has successfully evolved into a well-established mode of financing.

**SIGNIFICANCE OF THE STUDY**

This paper tries to explore the crowdfunding industry in India in the light of entrepreneurial development. It attempts to highlight the various source of entrepreneurial financing and how crowdfunding has evolved as an alternate mode of financing.

**OBJECTIVES OF THE STUDY**

The objectives of the study are as follows:

1. To understand the concept of entrepreneurship and entrepreneur.
2. To explore the entrepreneurial development scenario in India.
3. To identify various sources of entrepreneurial financing.
4. To understand the concept of crowdfunding as a source of financing.
5. To have an overview of the crowdfunding scenario in India.

**RESEARCH METHODOLOGY**

The study is exploratory in nature. This study primarily uses secondary data to analyse the current status of crowdfunding as an alternative mode of entrepreneurial financing. The secondary sources include the articles, reports, research papers in various journals and open sources. An effort has been made to explore the various aspects of crowdfunding and its relationship with entrepreneurial development in India. The study also uses data given on the website of the various crowdfunding platforms to analyse the rules and policies adopted by different crowdfunding platforms.

**LITERATURE REVIEW****Entrepreneurial Development in India**

Entrepreneurial development is important for any country for the purpose of economic development and growth. With the movements like 'Start-up India' and 'Make in India', entrepreneurship has received much needed boost. These movements have brought the process of entrepreneurship to the forefront in India with incubation centres or entrepreneurship development cells opening in educational institution across the country. Various students are opting for entrepreneurship as their first choice and are taking the role of the innovators. These young entrepreneurs are seen as future employers. Therefore, entrepreneurship not only gives the entrepreneurs a chance to earn their livelihood but at the same time create employment opportunities for other individuals as well. Entrepreneurship can be used as a way of eradicating inequality and poverty in society by structuring changes and promoting growth (Naudé, 2010).

The choice of becoming an entrepreneur is not easy. It involves many issues and challenges which must be overcome in order to start a venture. Some of the common challenges faced by all entrepreneurs are societal pressure, financial difficulties, technological issues, availability of resources and incompatible policy framework (Santhi & Kumar, 2011). There are various types of entrepreneurs in India based on their area of operation, gender and motives, for example rural entrepreneurs, women entrepreneurs and social entrepreneurs. These entrepreneurs face different kinds of challenges in addition to the common challenges faced by all entrepreneurs in India. Though several schemes and incentives are introduced by the central and state governments for the benefit of the young entrepreneurs there is still a long way to go. In, 2016 India was positioned at 98<sup>th</sup> place with a score of 24.9. The reason for a low rank was rigid rules and bureaucratic hindrances prevailing in the country (Ács, Szerb, & Autio, 2016). In 2017, India scored 25.8 with a rank of 68. Moreover, India was positioned at a 13<sup>th</sup> place in the Asia-pacific region (Ács, Szerb, & Autio, 2017). This indicates a jump in the entrepreneurial efforts undertaken in the country but there is still a need to create an environment which provides more support and better infrastructure to the entrepreneurs. In 2018, India was ranked at 68<sup>th</sup> position on Global Entrepreneurship Development Index which ranks 137 countries on the basis of their attitude and potential towards entrepreneurship in their countries. India was scored 28.4 whereas the USA which got the 1<sup>st</sup> rank was given a score of 83.6 and United Kingdom, ranked 4<sup>th</sup>, was scored 77.8 (Ács J. Z., Szerb, Lafuente, & Lloyd, 2018). This gives an idea of the difference between the entrepreneurial ecosystems in India and other developed nations.

**Sources of entrepreneurial financing**

An entrepreneur requires funds both for capital investment and working capital. Finance is the most prominent necessity for starting a new venture. It is not only required for the commencement of the business but it is also required for operating the business on a day-to-day basis. Therefore, an entrepreneur must plan in advance financial arrangement for his/her venture. Some sources of entrepreneurial financing are as follows:

**1. Personal investment**

Personal investment is the amount of money which the entrepreneur put into the venture from his/her own pocket. It is also referred to as internal funding since no outside person is approached for funds. An entrepreneur is the first investor of his/her venture with full control and no profit sharing.

**2. Venture capitalism**

Venture capital is the form of finance provided by investors who have experience in financing enterprises. These investors are called venture capitalists and are generally firm rather than a single person. They prefer to fund projects which are highly innovative. Venture capitalists not only provide with funds but also provide their expertise in setting up the venture (Ho & Wong, 2007). They often help with a pre-existing network of experts which may provide marketing assistance, technological aid and helps in recruiting top professionals. They play the role of mentor to the entrepreneurs (Denis, 2004). They are ready to assume more risk in return of high stakes and more control in decision making in the venture. Venture capitalists invest in those ventures which shows a higher growth rate. In return of their investment, they take a part of the equity in the venture and thereby having voting rights in the decision-making process (de Bettignie, 2008).

### **3. Angel investment**

Angel investors are the individuals with high net worth who are willing to invest in new ventures. They provide seed money to the entrepreneurs who have somehow set up their ventures so that they can run their business. They are good for ventures in their early stage (Denis, 2004). They are capable of providing the amount of funds more than friends and family but less than venture capitalists. They bridge the gap between personal investment and venture capital (Ho & Wong, 2007). They can guide the entrepreneurs on the basis of their own experiences but cannot provide greater expertise as in case of venture capitalists. In return of their investment, they take a share in profit and seat on the entrepreneurial team. Dilution of control is less in comparison to venture capital.

### **4. Bank loan**

Acquiring loans from the bank for starting a business is the most common practice adopted by various entrepreneurs. Bank loans require some tangible assets to be kept as collateral with the banks. This is often a problem as many young entrepreneurs from lower and middle-class families lack such collaterals. Moreover, banks provide loans to those ventures for which they believe that they will have a potential market in future. Availability of bank loans is hindered by the information asymmetry (Ho & Wong, 2007). This creates a difficulty for the projects which are highly innovative and have not been tested before.

### **5. Business incubators**

They are the organisations which provide the entrepreneurs with the funds for setting up a business along with giving shape to their ideas. Incubators are the entities that help in developing the prototype of the product or blueprint for running your business, specifically in case of technology-driven ideas. In return for their assistance, they can either take a part of equity or profit (Block, Colombo, Cumming, & Vismara, 2018). They are basically helpful for students who have innovative ideas and are need of professional assistance to convert that idea into a commercial activity.

### **6. Crowdfunding**

Crowdfunding is the process of pooling money by different individuals towards the fulfilment of common intention. It is a method of organising funds from a wide range of individuals (Mollick, 2014). The number of investors in crowdfunding is not limited to just a few individuals or a firm but it involves generating funds from various people who may or may not have any connection with each other or the entrepreneur.

Experience of entrepreneurs along with their educational qualification, gender and nationality also has an impact on the availability of external finance. Zaleski (2011) highlighted that investors prefer those ventures which have a competitive edge over others in their respective areas. It has also been noted that ventures run by male entrepreneurs are more preferred by outside investors than the ventures founded by females. Entrepreneurs with previous entrepreneurial experience are able to attract investors easily.

## **DATA ANALYSIS**

### **What is Crowdfunding?**

This process of financing in entrepreneurial development is gaining momentum. The concept of crowdfunding is based on the notion of gathering people belonging to different walks of life to finance a venture in which they have a shared belief. In crowdfunding, entrepreneurs instead of approaching the venture capitalists, angel investors or banks, approach the common people who lack knowledge about investing in a business proposal (Frydrych, Bock, Kinder & Koeck, 2014). These common people rely on their intellect and emotions while making the investment decision (Burton, Khavul, Siegal & Wright, 2015). In the case of crowdfunding, the funders contribute into the project in exchange for a sample product, services or appreciation or credit (Pathak & Kaur, 2016).

This concept of organising activity by taking a monetary donation from the public is not new rather it has been prevalent since centuries all across the globe. However, this phenomenon has developed into an organized form in the past few years. In recent times, it has been used as a way of promoting innovative and unique ideas. It has also been proved useful in case of social ventures which otherwise face difficulties in raising funds through traditional financing methods. Crowdfunding was adopted as a new method of financing for setting up ventures after the revolution in internet technology (Rossi, 2014). The term 'crowdfunding' was coined in the year 2009 by Michael Sullivan after he failed at incubating a video blog (Castrataro, 2011). With the emergence of web 2.0, the crowdfunding process went online from offline. This revolution of raising money through online web platforms paved the way for the popularity of this financing method. Over the years, crowdfunding has been adopted for more and more technologically innovative projects apart from being used for artistic and social projects.

**Different models of crowdfunding**

On the basis of these returns, crowdfunding can be diversified into four different models which are – Reward-based, equity-based, donation-based and debt-based. In reward-based crowdfunding, the funders are treated as first buyers of the product (Mollick & Kuppaswamy, 2014). Such type of crowdfunding is generally opted by the technology-driven ventures which take it as an opportunity to test their prototypes and arrange for the working capital at the same time (Rossi, 2014; Frydrych et al., 2014). Debt-based crowdfunding where entrepreneurs raise funds in the form of a loan at a flexible rate of interest (Mollick & Kuppaswamy, 2014). However, interest is not always mandatory and funders will only get back what they have contributed. Another model of crowdfunding is the donation model where the crowd act as donors for social ventures (Flanigan, 2017). Donation-based model is an easy way of collecting money for philanthropic, cultural or artistic projects. The recent development in the crowdfunding industry is the emergence of the equity-based model. In the equity-based model, investors get a stake in equity in return for their contribution. This model requires the formulation of rules and regulations as it involves the interest of shareholders and the concerns of investor protection due to the monetary return on investments (Burton et al., 2014).

**Mechanism of crowdfunding**

All types of entrepreneurs can opt to crowdfund as the decision of funding a particular venture lies in the hands of the crowd. The institution of crowdfunding consists of three stakeholders -entrepreneurs, crowdfunding platforms and the crowd. The term ‘crowd’ signifies the people who invest in the projects. They are also called donors, funders or project backers. Moreover, the terminology used for entrepreneurs in the crowdfunding market is creators, initiators or fund-seekers. The venture or the idea is denoted by the terms ‘Fundraiser’ or ‘Campaign’. Crowdfunding platforms are the websites which allow the entrepreneurs to develop and display their campaigns or fundraisers. They act as the interface between the crowd and the entrepreneurs.

There are different crowdfunding platforms which follow different policies. The rules and regulations vary from platform to platforms but the basic working mechanism behind the whole crowdfunding process is the same. The process of raising finances through crowdfunding begins with the selection of the appropriate crowdfunding platform. The entrepreneurs should choose the platform based on the type of the venture and the crowd following the platform. After the selection of the platform, the entrepreneur should design the fundraiser or campaign. Designing the campaign is the process which must be undertaken with utmost care and diligence. Campaign designing involves writing a product description explaining the idea and the motive behind the idea to the potential funders, attaching required videos and images, entrepreneur’s details, required an amount of funds and the time for which the campaign is open. The success of the campaign primarily depends upon the design of the campaign. Once the campaign is approved by the platform, it goes live to the audience of the platform i.e. the crowd. Campaigns are displayed on the platforms for the given period of duration. Funders can make contributions to the desired campaigns. A campaign is live on the platform for funding only to the duration which is mentioned in the campaign. The duration is specified in the form days left to the closing of the campaign. Funders can contribute to the campaign until it is live on the platform. On closure of the campaign, no contributions can be made. If the campaign has reached its goal i.e. the number of funds required, then it is termed as a success otherwise it fails (Jhaveri & Choksi, 2016; Gosain, 2017). Different platforms follow different rules over the issue of the funds collected during the live campaign. There are two approaches to deal with the funds collected – ‘All-or-Nothing’ or ‘Keep-it-all’. In the case of ‘all-or-nothing’, an entrepreneur is eligible to get the funds collected only if the campaign was a success and has reached its target amount. In the case of ‘keep-it-all’ approach, the entrepreneur will get the entire amount collected while the campaign was live even if the targeted goal is not achieved (Flanigan, 2017).

**Benefits and Limitations of crowdfunding**

Crowdfunding not only provides funds for setting up an enterprise but also enables an entrepreneur to test the viability of an idea and future of the venture. Crowdfunding allows an entrepreneur to establish a direct connection with potential future customers. The crowdfunding has its own benefits along with a chance of raising funds for a venture which are as follows:

**1. Demand forecasting:**

Crowdfunding enables an entrepreneur to judge the future of a venture. The number of funders contributing to a campaign gives an estimation of the future demand for the product (Agrawal, Catalini & Goldfarb, 2014). The funders are considered as future customers for the product.

**2. Marketing tool:**

The success of the crowdfunding campaign is associated with the social presence of the campaign which is dependent upon the size of the social network of the entrepreneur. Social network enables the crowd to verify

the profiles of the funder and improve the trust factor (Mollick, 2014; Frydrych et al., 2014). The entrepreneurs are required to share their campaigns across their social networks to create a web presence which ultimately helps in promoting the venture.

### **3. Low-cost capital:**

Other financing sources like venture capital, angel investor and banks charge a higher cost for the capital provided by them. Crowdfunding provides the capital for early-stage ventures at a cost which is comparatively lower than other sources of finance (Agrawal et al., 2014). In crowdfunding, the funds are collected from many people in the form of small contribution. Campaigns also provide a vast amount of information and future prospects about the project which may increase the interest of funders in the project. This leads to a low-cost capital.

### **4. Feedback:**

Feedback is another positive feature of crowdfunding. Crowdfunded projects have a vast number of investors which often provides feedback to the entrepreneur. This acts as a mechanism through which an entrepreneur can improve his/her plans, product designs, service quality or presentation (Agrawal et al., 2014). Funder's involvement enhances the shared interest in the project and social identification which in turn creates a wider base of potential customers (Belleflamme, Lambert & Schwienbacher, 2010; Ricardo, Sicilia & Lopez, 2018).

### **5. Social entrepreneurs:**

Donation-based crowdfunding is a good way of generating funds for non-profitable causes (Mendes, 2016). The traditional sources of finance prefer ventures with a profit motive. They are interested in such projects which can yield returns on their investments. However, with the emergence of crowdfunding NGOs and social entrepreneurs can raise funds for the causes which are beneficial to the society (Flanigan, 2017).

### **6. Women entrepreneurs:**

It has been noted that crowdfunding campaigns initiated by the women entrepreneurs are more successful than male entrepreneurs (Frydrych et al., 2014). It is more difficult for women entrepreneurs to access funds through traditional modes of financing due to societal pressures and gender bias.

Apart from these incentives of crowdfunding, there are other benefits as well. Crowdfunding also helps in establishing a brand image for the product from a very early stage. Further, funders apart from contributing the funds may also show interest in being the part of the entrepreneurial team. This adds to the workforce and talent to the young enterprises (Belleflamme, Omrani, & Peitz, 2015). Crowdfunding has opened investment opportunities for various inexperienced entrepreneurs who are often rejected by venture capital, angel investors and banks (Beaulieu, Sarker, & Sarker, 2015). Crowdfunding has proved to be beneficial for entrepreneurs who cannot provide collateral to the banks. Moreover, it provides an easy channel for communication with potential customers via social media (Gerber & Hui, 2014). Crowdfunding does not lead to dilution of control over the venture. It helps in creating a community for the product (Valanciene & Jegeleviciute, 2013).

Apart from the advantages crowdfunding also has certain limitations which are as follows:

#### **1. Risk of theft of idea**

Crowdfunding platforms are accessible to each and every one. They are public domain sites. The entrepreneurs are required to put all the necessary information in the campaign which is to be displayed on the crowdfunding platforms. Thus, there exists a risk of theft of idea and imitation (Agrawal et al., 2014). Moreover, many of the entrepreneurs lack copyright over such ideas and hence are at disadvantage of idea theft.

#### **2. Lack of professional assistance**

Venture capital or angel investors provide the entrepreneurs with a plethora of professional assistance and adds to their competences. When an entrepreneur opts for crowdfunding they do not have access to such assistance (Agrawal et al. 2014). The future of their venture depends entirely upon their own competences and networking. Crowdfunding limits access to the resources and well-established networks (Beaulieu et al., 2015).

#### **3. Public failure**

Crowdfunding is all about the public. Every information related to a campaign is available in public forum. This implies that even the failure of the project is known to everybody. Therefore, entrepreneurs may have a psychological impact of having a public failure which may also have an adverse effect on future funding (Kshetri, 2018).

Crowdfunding is still evolving with many countries identifying it as an alternative mode of finance. Crowdfunding lacks a proper structure especially in developing and underdeveloped countries. It is considered a

risky option due to lack of formulated regulations (Beaulieu et al., 2015). Another challenge in crowdfunding is to keep account of all the investors as many of them contribute anonymously (Valanciene & Jegeleviciute, 2013). Though crowdfunding has certain limitations as compared to other modes of finance but it still is an effective way of raising funds for creative, innovative and talented entrepreneurs.

### **Crowdfunding Industry in India**

Crowdfunding industry in India is in developing stage. The first crowdfunding platform was launched in 2010. Although there are four different models of crowdfunding only two are prevalent and operational in India. These two models are reward-based crowdfunding and donation-based crowdfunding. Since equity-based crowdfunding model incorporates risk of fraud and investor protection, therefore, it requires legalisation and validation from SEBI. Thus, there are no legal and valid equity crowdfunding platforms in India. There are several crowdfunding platforms operational in India which are as follows:

- **Ketto**

Ketto is a donation-based crowdfunding platform which was launched in 2012. It allows individuals, corporates and NGOs to raise funds through their platform. The individuals and corporates charge 5% of the amount of fund raised or Rs. 2000 whichever is higher. They charge young NGOs 5% of the amount of fund raised whereas established NGOs are charged at the rate of 6%. In addition to this, all entrepreneurs have to pay 3% as gateway charge and additional applicable taxes. It follows 'keep-it-all' model. Ketto provides the entrepreneurs with services of fundraising experts and marketing and advertising support (Join the ketto community today, n.d.).

- **Wishberry**

Wishberry is the first crowdfunding platform of India which was launched in 2009. It is a reward based crowdfunding platform. It provides consultation services, marketing and PR services and backers management tool. It follows the 'all-or-nothing' approach and charges the campaigners 10% of the amount raised only if the target is achieved, plus taxes. They also charge an additional price for consultation and marketing and PR services.

- **Milaap**

Milaap was launched in the year 2010. It has both donation-based as well as debt-based crowdfunding model. The fee charged by the platform ranges from 5% to 13.5% depending upon the package an entrepreneur choose. The platform provides three different packages with each offering different sets of services. Some of these services are campaign managers, multiple fundraisers, real-time support, promotional support, content creation and check pick-ups.

- **Impactguru**

Impactguru is a donation-based crowdfunding platform launched in 2014. The fee ranges from 5% to 12% depending upon the range of services provided by the platform. In addition to this 3% payment gateway fees is also charged. Some of the services provided by the platforms are promotional and marketing support, content creation, and customised strategy and campaign managers.

- **Fuel A Dream**

It is reward-based crowdfunding platform which was launched in 2015. It allows an entrepreneur to choose either 'all-or-nothing' or 'keep-it-all' approach. It charges Rs. 3000 as processing charge for a campaign along with a 6% contract charge for 'keep-it-all' campaigns. However, they waive the processing charge for group campaigns for social and charitable causes and charge 9% contract charge if the campaign adopts 'keep-it-all' approach.

- **Crowdera**

Crowdera is a global crowdfunding platform and has launched its operation in India in November 2015. It follows 'keep-it-all' approach. Crowdera does not charge any fee from entrepreneurs for its basic package apart from minimal transaction charges. It also provides premium packages which are however charged \$7 or \$17 per month depending upon the range of facilities offered.

- **Catapoolt**

It is reward-based crowdfunding platform which was launched in 2012. It offers the users services such as marketing, incubation, endorsement and distribution and sales apart from generating funds. They charge a fee of 10% on the amount of funds raised plus taxes. It follows 'keep-it-all' approach.

**CONCLUSION**

Entrepreneurship is a significant sector for the growth and development of any country. It not only creates new enterprises but also provides a boost to the economy. Creation of new enterprises leads to the creation of many employment opportunities. It also increases the production output and provides the people with a wide variety of commodity. Thus, the development of entrepreneurs is essential for the development of the nation. India has adopted various measures for the development of young entrepreneurs and to make entrepreneurship a mainstream occupational choice. Reward-based crowdfunding has been used by many young entrepreneurs to introduce innovative products into the market. Further, Crowdfunding gives an equal chance for women to arrange funds for their entrepreneurial ventures. Women are also choosing to crowdfund for the purpose of empowering other women.

Crowdfunding is a newly formalised mode of financing which has been adopted by entrepreneurs all across the world. This mode of financing is crowd-driven and allows the potential stakeholders of the venture to be the investors. As per the Global entrepreneurship index (2017), Product innovation is the strongest pillar for entrepreneurship in India with a score of 0.74 followed by competition and process innovation with a score of 0.65 and 0.59 respectively. The crowdfunding is a mode of financing which supports the product as well as process innovation better than any other modes of financing. An improvement of 10% in the conditions for the entrepreneurial sector of India can add \$3.3 trillion to the economy. The report concludes that the risk capital score of India is 0.17 which is very low as compared to other developing nations. Risk capital score depicts the financing of entrepreneurial ventures. Crowdfunding has still not reached its full potential in India. It has a great scope in a country like India With a large population base which can be converted into potential crowd funders.

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**RADIO AS A POLITICAL COMMUNICATION TOOL: A STUDY OF 'MANN KI BAAT' SHOW****Dr. Manasvi Maheshwari**

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**ABSTRACT**

*Radio has always been a medium of common man. It is easily accessible and economical to use. The penetration of radio is 92% area of the country and it reaches 99.19% of total population of India and it has been the most effective and powerful tool for mass communication.*

*Realising this importance of radio as a mass medium the BJP Government under the leadership of PM Mr Narendra Modi has initiated a new concept of Radio show that helps the government to connect with a wider audience hassle-free.*

*"Mann Ki Baat" as the name suggests 'to speak about public's opinion' is a show where the country's prime minister talks about different issues and problems that the citizens of the country are facing while using radio as a medium of communication.*

*The research focuses on how radio is used by the political leader as a medium of communication. The objectives of the study are; to study the use of radio as a communication medium by a political leader, to analyse the content of Mann Ki Baat show, to explore the perception of the listeners towards the show, to find out the importance of the show amongst the youth.*

*The study will be an exploratory research. The researcher will do content analysis of the show and will conduct a survey to find out perception of the listeners. The region of the study is Delhi NCR.*

*Keywords: Mann Ki Baat, Radio, Political Communication, Narendra Modi*

**I. INTRODUCTION**

Radio has been considered powerful tool of mass communication despite of rise in social media and emergence of digital age. Radio still holds a strong presence as a tool of communication especially in developing countries where internet and electricity issues are yet to be resolved. Its unique features make it stand ahead of all available medium of communication. All India Radio, the public broadcaster in India has reach of 99.19% of total population. Radio has enough potential to reach and influence listeners. Radio is a cost effective medium and if utilised properly can help in development of the country.

The studies have shown that if power of radio is used for political communication, not only will it increase the reach of the political message but can also influence the opinion and views of a large section of the society.

PM Narendra Modi has explored the power of radio. He is the first Prime Minister of India who has tried to reach his countrymen through radio through his monthly show *Mann Ki Baat*. In his unique show he has tried to inform and educate listeners. The first episode of *Mann Ki Baath* was on aired on AIR, 3<sup>rd</sup> October 2014. In the first episode Mr. Narendra Modi made a reference to the auspicious festival that commemorates a new beginning and indicated the importance of cleanliness in India. The show is aired across 422 radio stations and is backed by the official website [www.narendramodi.in](http://www.narendramodi.in) and [MyGov.in](http://MyGov.in) which is a citizen engagement social media platform. The 50<sup>th</sup> episode of *Mann Ki Baat* was aired on 25<sup>th</sup> November 2018.

The Prime Minister has clarified at various platforms that the show is not a political agenda or has nothing to do with politics but it is about people's aspiration. He has said that the show is reflecting people's views and concerns. Therefore, in this research, content analysis of 10 episodes of *Mann Ki Baat* has been done and survey of listeners has been conducted to understand role of *Mann Ki Baat* show.

**1.1 About Mann Ki Baat Show**

*Mann Ki Baat* is a radio show/programme hosted by Prime Minister of India, Narendra Modi. It is one of its kinds show wherein Prime Minister addresses the nation on various topics of national and social importance. The show is aired on All India Radio, DD National and DD news. Through this show the prime minister tries to connect with the common man and inform them about various schemes and initiatives of the government and also allows them to be a part of this show by sending their messages and audio clips through various government websites like My Gov App and Narendra Modi app. The first episode of the show was launched on 3<sup>rd</sup> October 2014 and till now there have been total 53 episodes that have gone on air. In the show the prime minister talks about taboo in the society, praises the good work being done by the citizens of the country to improve the society that helps in the development of the country. He also gives examples of achievers in various

fields and provides awareness about various schemes and laws that are made for the countrymen. All the shows that have been aired till now are available on different online platforms and can be accessed for free. Various websites also provide the script for these shows both in English and Hindi language.

## 2. Literature Survey

Researcher reviewed more than 30 research papers and articles on the format, content and relevance of *Mann Ki Baat* Show. The various researchers have mentioned about the relevance of radio as a medium to connect to large number of audience. The studies also conclude that the *Mann Ki Baat* show is one of its kinds and gaining popularity among the common people. Some of the excerpts are given here.

“In nations where Internet and electricity are limited, radio is the strongest medium for connecting isolated communities. Radio has the potential to reach further than newspapers and television, both in terms of audience numbers and geographical reach. Radio can be used as a platform for linkage and exchange between policy makers, government bodies, communities and researchers. There are potential benefits of linking radio with other forms of media such as the Internet and mobile phones. Radio has the ability to raise awareness and stimulate social change amongst the target audience. At a larger level, the *Mann Ki Baat* exemplifies a new method of communication. It is direct, it is wide in its reach and it is soft in the nature of the message. It is in tune with the 'Modi way' of doing things reaching out to the people without barriers.” (Shreeraj Gudi, Shreevatsa Gudi 2017)

(Abhijit Majumder, 2018) “In that way, it is a lot more intimate mass medium. The PM, perhaps mindful of that, has chosen for radio issues that resonate in the household like cleanliness, examinations and career, drug addiction, girl child, farmers, Siachen soldiers, handloom, festivals, yoga or gas subsidy. The topics are almost out of a modern Sangh pracharak's "vyakti nirman" kit, made to shape an individual's relationship with family and society. But in all this lie seeds of Modi and the RSS idea of nationalism. The radio show gently plants ideas of a stronger, more cohesive nationhood. Modi has not tried to hide his disappointment with and mistrust of mainstream media. While with social media he cut out journalists and started reaching the message directly to the people, with radio, he becomes his own messenger for even those who do not have a cell phone or a TV set.”

Siraj Quraishi, the Ex-Deputy Director General Doordarshan, India in the e-paper Greater Kashmir points out the importance of the programme *Mann Ki Baat* “To lend it widest reach and deepest penetration, the programme is aired by all stations / channels of AIR simultaneously. In order to boost the thrust further, the programme is repeated in all the regional languages of the country.... In order to cater to isolated, rural and less developed regions, Radio was chosen as the medium. Some channels of AIR have considerable footprint overseas as well.”

The paper establishes that public service broadcasting can be used efficiently to fulfill its prime purpose of “informing, educating and entertaining” the audience in the country. Public service broadcasting can be revived by government initiatives to gain the attention of the public which can then be accentuated by the internet. It can be a vital instrument to combat health issues by endorsing yoga and also recuperate home based textiles such as Khadi which facilitates self-reliance. The content brought by opinion leaders such as Prime Ministers can be recycled to generate higher revenue to public service broadcasting media to revive its lost glory of the past as both AIR and DD have the highest reach in India.” (Meghana, H. R. (2016).

Sripathy (2015) has shown how radio is a very effective tool. It also signifies about highlights and future of the *Maan Ki Baat*. However, it has not put anything related to effect on masses, their expectations and how to make show a better opportunity for development of intimacy between the leader and general population.

Jitendra (2017) in *dailyexcelsior.com* has given glimpse of how *Mann Ki Baat* show is concerned with health and well-being of the masses along with its agenda to spread awareness among people about current scenario. It has also worked as a driving force in achieving the objective of how the show is working for wellbeing of masses by not only having a show but also implementing the ideas talked and discussed in the show. This show has also made us understand that not only masses need to be fit but also the people who are the leaders need to be swift and fit with the current news. All this comes into effect when a leader who is responsible for a country's progress is enthusiastic about the same. (Dr. Jitendra. 2017)

## 3. Research Design

The study is an exploratory research. The tools used for data collection were survey using questionnaire and qualitative and quantitative content analysis.

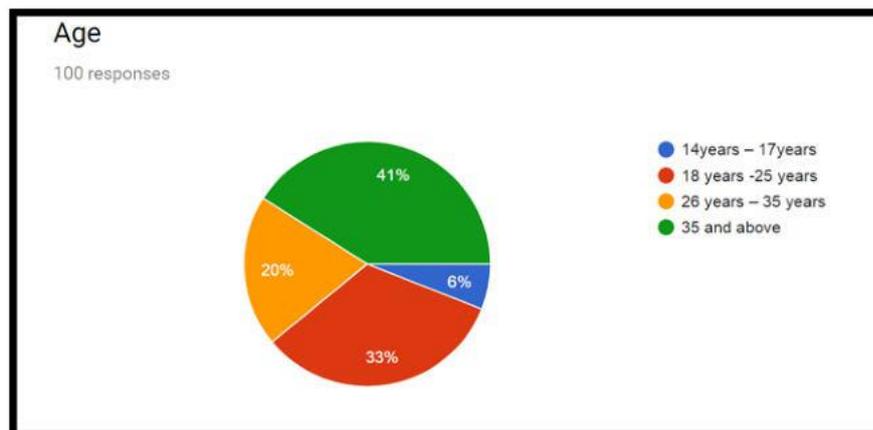
To analyse the content of *Mann Ki Baat* show content analysis of the 10 episodes have been done. The episodes from the month of January to October 2018 were analysed on mentioned parameters. After listening to the show, following parameters were developed for the content analysis:

1. **Issues highlighted:** It was observed that in every episode some of the issues of National or Social importance were highlighted by the PM. He raised concerns and discussed importance of the subject matter. He gave information and created awareness as well.
2. **Famous Personalities mentioned:** In every show PM mentioned about famous personalities of sports, history, politics, science and technology, etc. to cite some examples or discussed about their role in nation building. These people are the one who have contributed in some way for the growth of the country.
3. **Festival/days of National/Social Importance:** In *Mann Ki Baat* show it was observed that in every episode PM has discussed about the important days, festivals, celebrations etc. He has wished people on the occasion, encouraged them to celebrate the day such as Yoga Day, Science Day, Doctor's Day etc.
4. **Mentioned about Narendra Modi App/My Gov App** – The PM has also spoken about Narendra Modi App/My Gov App on the show. He has invited feedback through the App, mentioned about people who have posted their comment or suggestion on the App or any service available on the App.
5. **Government Schemes:** The PM has time and again promoted government schemes on the show. He has informed, created awareness and educated people about the new schemes and their benefits.
6. **Listers' Feedback Source:** The most important part of the any show is the feedback system. In this show also PM mentions name of the listeners who have written to him through Apps, emails, letters, phone call. In his show he always mentions about the source that how people have connected with him.
7. **Appreciation:** It has been observed that PM on his show has always appreciated the efforts of common man who are working for the welfare of the society and nation. He mentions their name, role, contribution.
8. **Picked up topics raised by listeners:** In the show PM ensures that he picks up topics or issues raised by listeners.

To explore the perception and importance of the show survey was conducted using questionnaire. The sample size was 100 and area of study was Delhi NCR. Sampling technique used was simple random sampling. It was ensured that respondents have listened *Mann Ki Baat* show at least once.

#### 4. Data Collection and Analysis

##### 4.1 Survey



**Fig. 1: Age of the Respondents**

The respondents were of all age groups starting from 14 years and above.

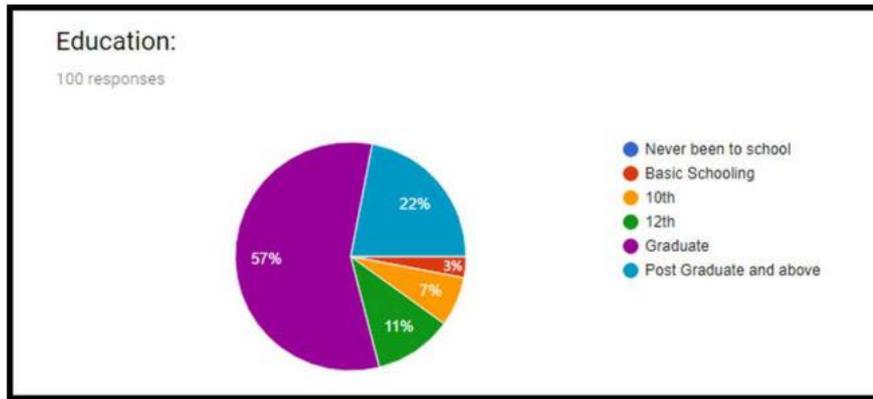


Fig. 2: Education of the Respondents

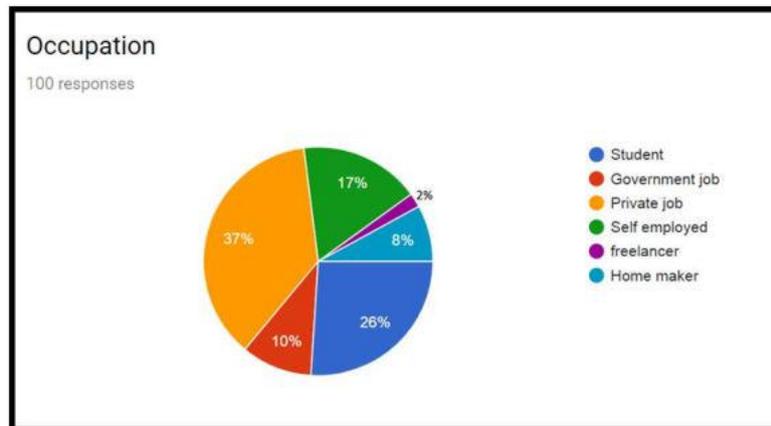


Fig. 3: Occupation of the Respondents

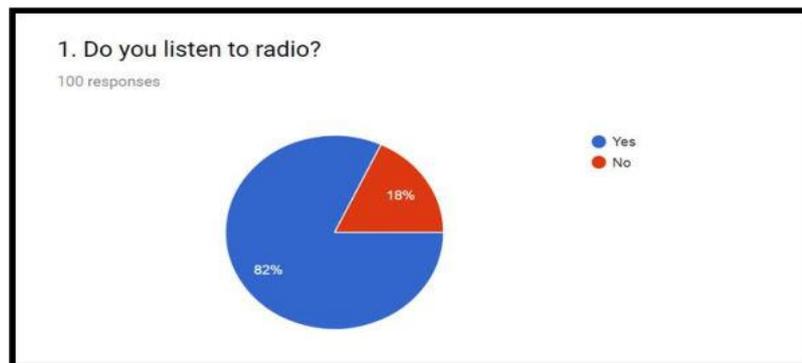


Fig. 4: Respondents listening to radio

82% of the respondents listen to radio whereas only 18% of the respondents don't listen to radio which clearly signifies that radio is still the most wide and large communication medium.

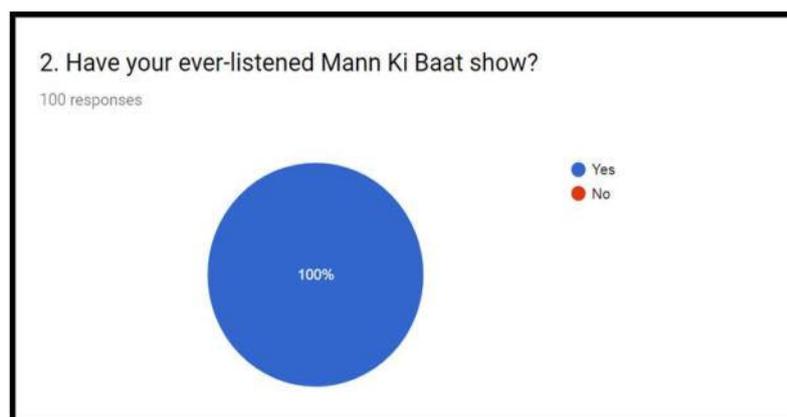
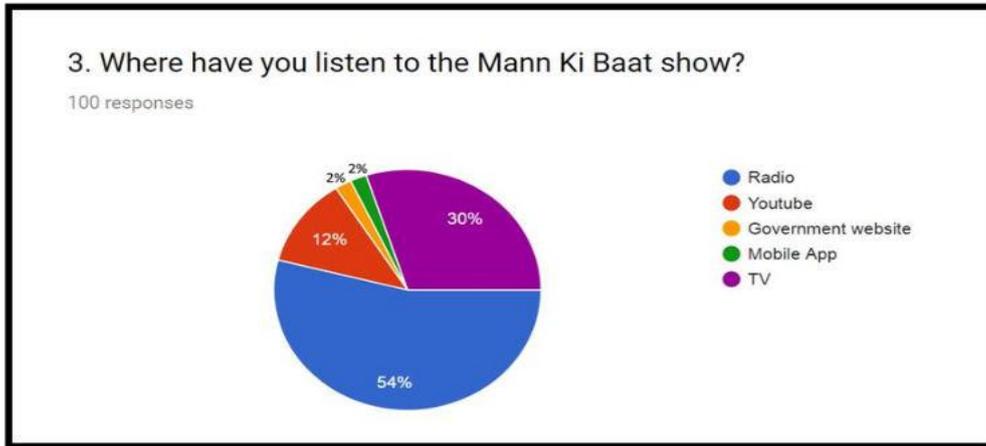


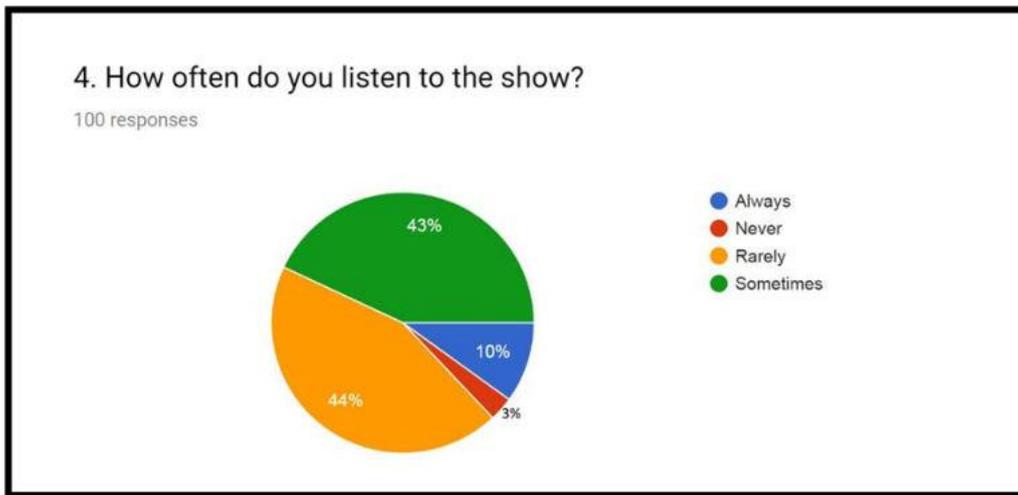
Fig. 5: Respondents have listened *Mann Ki Baat* show

All the respondents have listened to the Mann Ki Baat show atleast once.



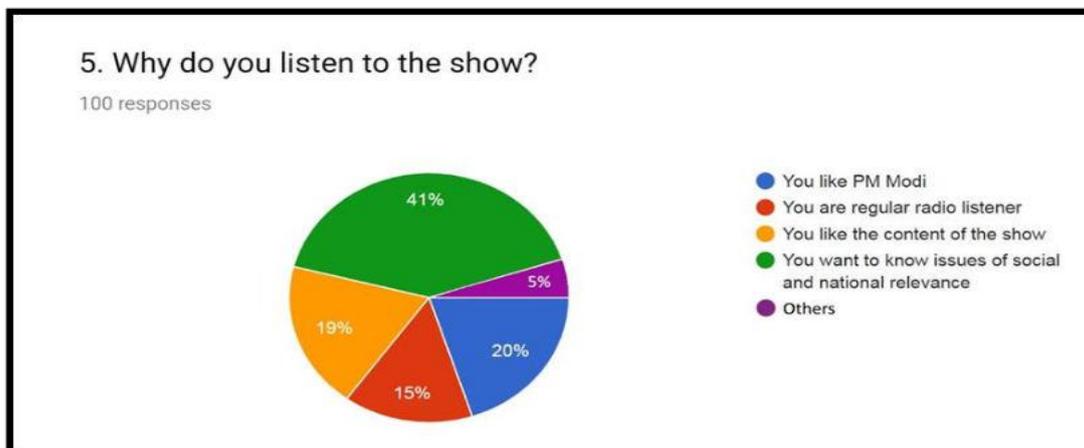
**Fig. 6: Where have the respondents listened the *Mann Ki Baat* Show?**

54% of the respondents listens the show on radio and 30% of the respondents listens it on television which shows that radio and TV are the two most preferred medium by the people for listening the show.



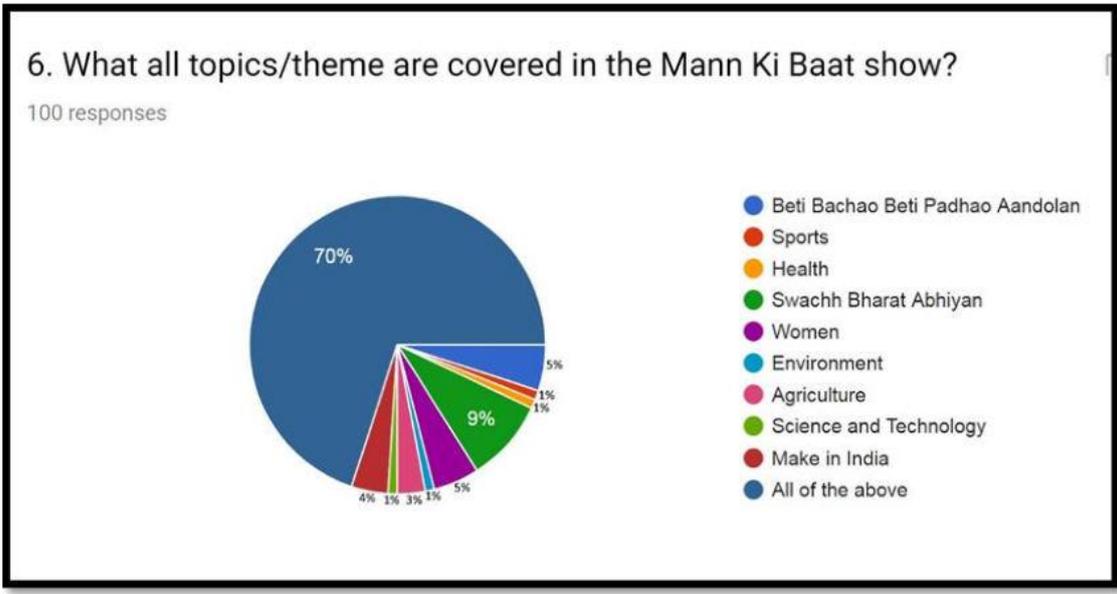
**Fig. 7: How often does the respondents listened the *Mann Ki Baat* show**

43% of the respondents listen to the show sometimes and a large 44% of the respondents listen to the show rarely. Only 10% of the respondents listen to the show always.



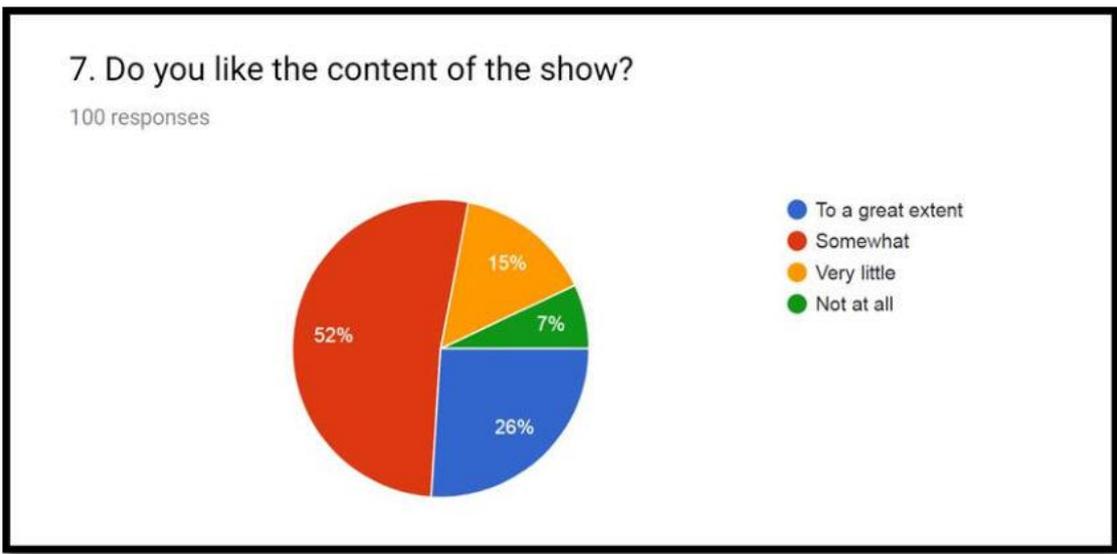
**Fig. 8: Why does the respondents listen the *Mann Ki Baat* show**

41% of the respondents listens the show to know the issues of social and national relevance, 19% listen because they like the content of the show, 20% listen because they like PM Modi, 15% listen the show because they are regular radio listener.



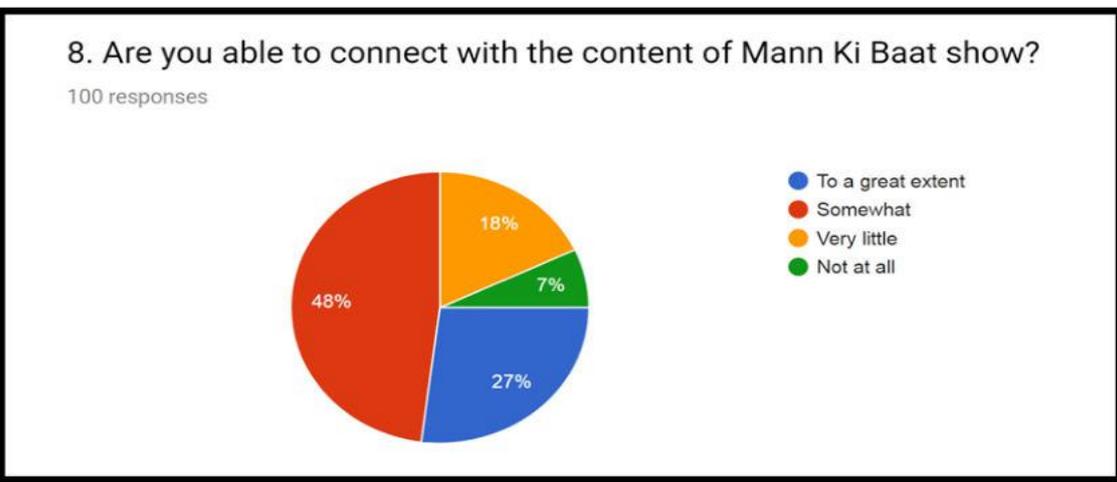
**Fig. 9: What all topics are covered in the Mann Ki Baat show**

70% of the respondents said All the mentioned topics were covered on the show.



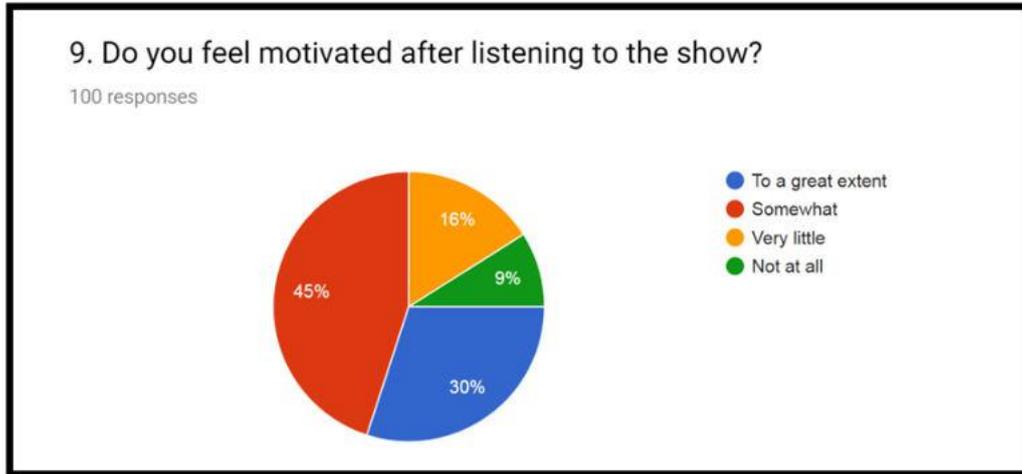
**Fig. 10: Does the respondents like the content of the show**

52% of the respondents says that they somewhat like the content of the show, 26% like the content to a great extent and 7% of the respondents does not like that content at all.



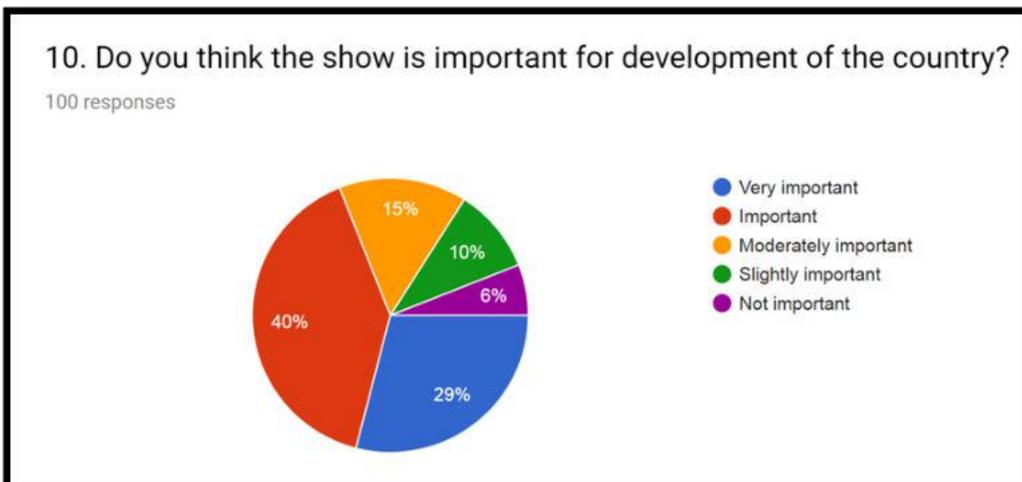
**Fig. 11: Are the respondents able to connect with the content of the show**

48% of the respondents said that they somewhat feel connected with the content of the show and 26% says that they feel connected to the content of the show to a great extent whereas 7% says that they do not connect with the content of the show at all.



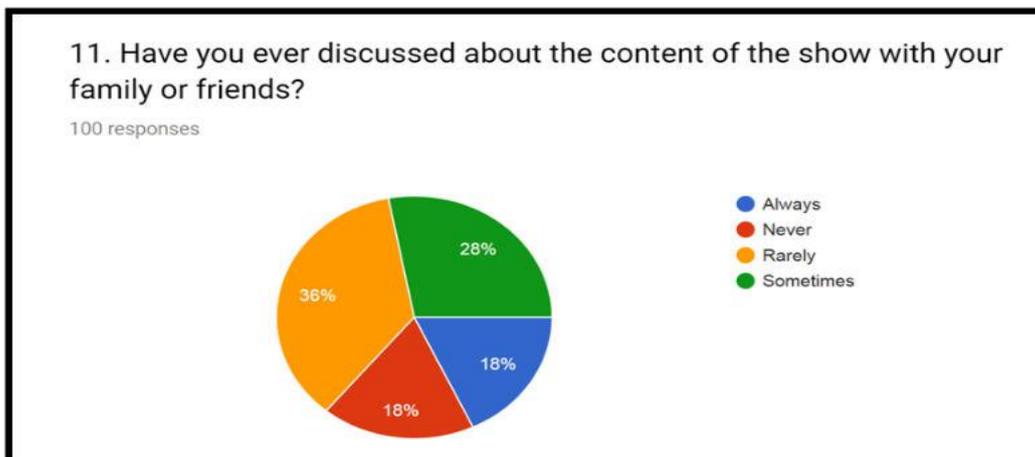
**Fig. 12: Does the respondents feel motivated after listening to the show**

45% of the respondents feel that they feel somewhat motivated after listening the show and 30% feels motivated to a great extent whereas 9% respondents said that they not at all feel motivated after listening the show.



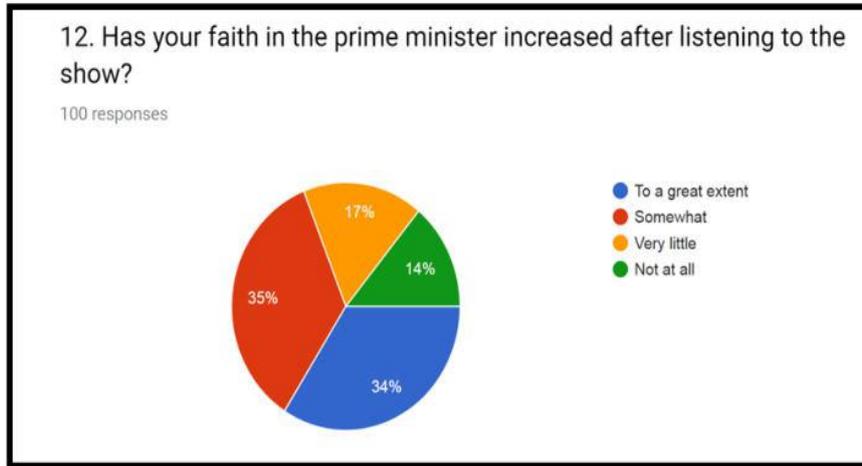
**Fig. 13: Does the respondents think that the show is important for development of the country?**

40% of the respondents said that the show is important for the development of the country whereas 6% replied that the show is not at all important for the development of the country.



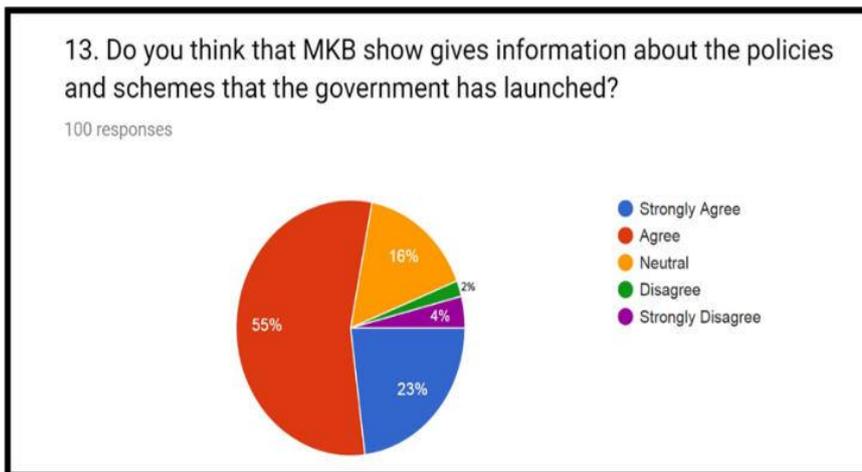
**Fig. 14: Have the respondents discussed about the show with their family or friends**

36% of the respondents have rarely discussed about the content of the show with their family or friends whereas only 18% always discusses about the content of the show with their family or friends.



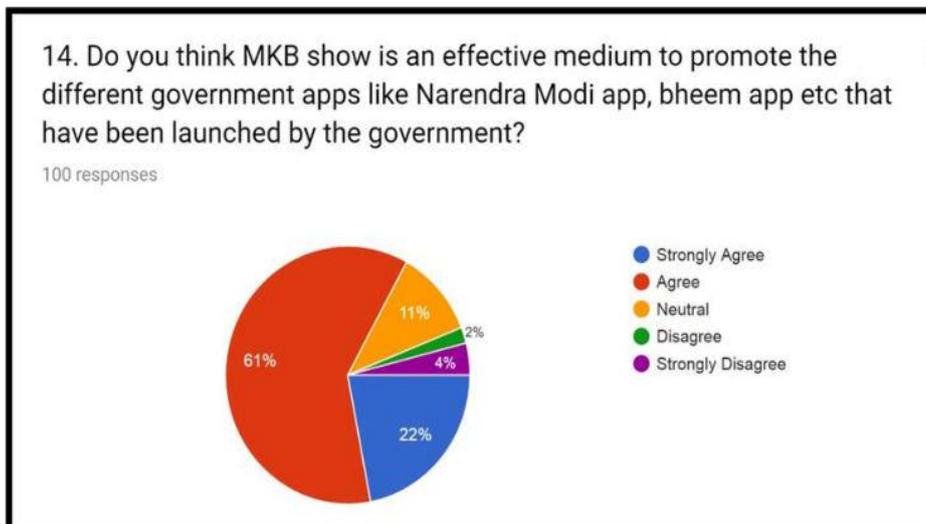
**Fig. 15: Have the respondents faith in Prime minister increased after listening the show**

35% of the respondents said that their faith in prime minister has somewhat increased after listening to the show and 14% says that faith in prime minister has not at all increased



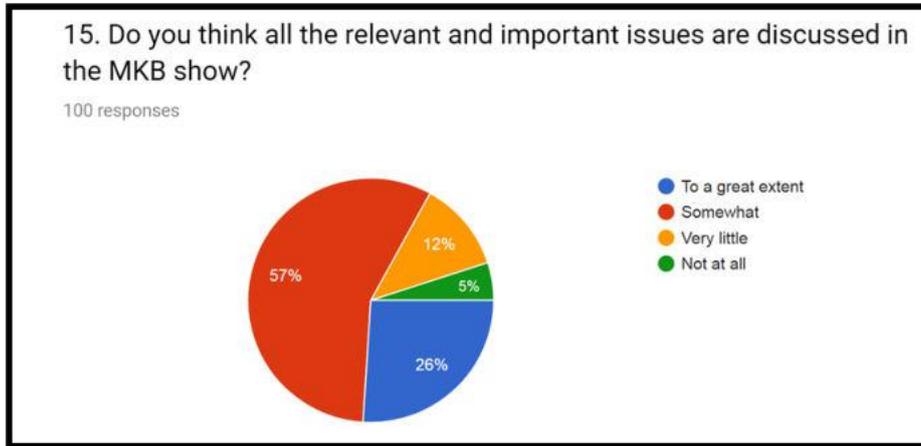
**Fig. 16: Does the respondents think that the show gives information about the policies and schemes that the government has launched?**

55% of the respondents agree that the show gives information about the government policy and schemes whereas 4% of the respondents strongly disagree with that.



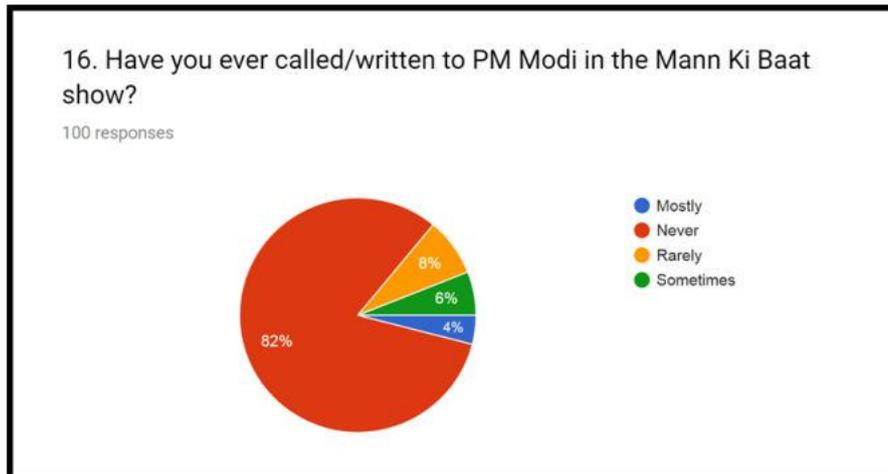
**Fig. 17: Does the respondents think that the show is effective medium to promote government apps**

61% of the respondents agree that the show is effective medium to promote government apps whereas 4% respondents strongly disagree with that



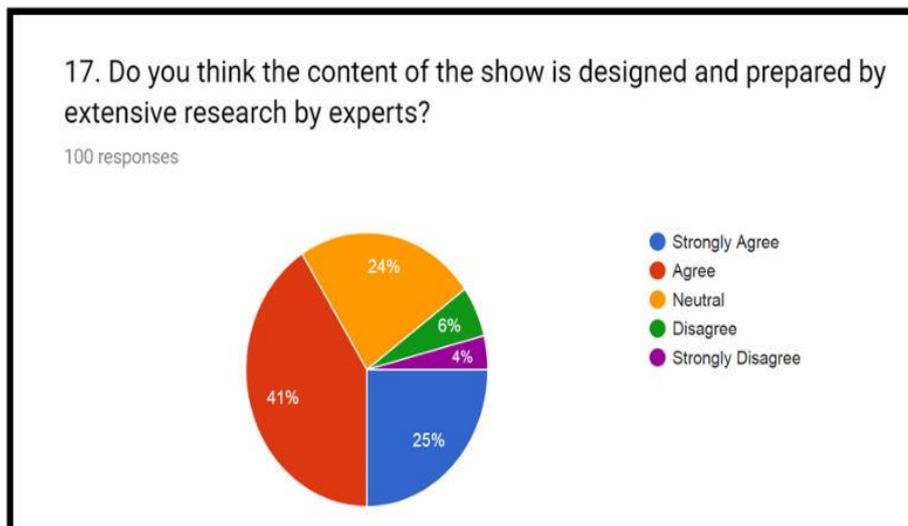
**Fig. 18: Does the respondents think all relevant and important issues are discussed in the show**

57% of the respondents think that important issues are somewhat discussed in the show whereas 5% respondents says that important issues are not at all discussed in the show



**Fig. 19: Have the respondents ever written/called to PM Modi in the show**

82% respondents have never written/called on the show whereas only 4% of the respondents mostly call/write to PM Modi in the show



**Fig. 20: Does the respondents think the content of the show is designed and prepared by extensive research by experts?**

41% respondents agree that content of the show is designed by experts whereas 4% strongly disagree with that.

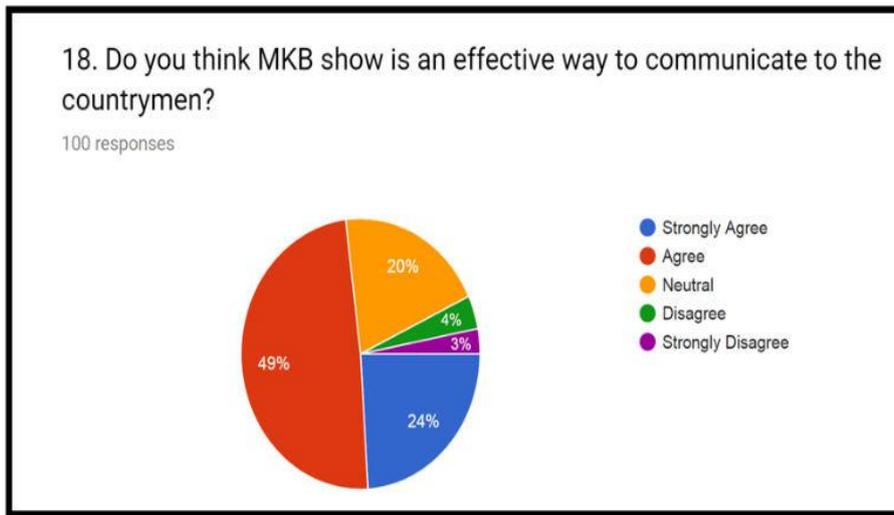


Fig. 21: Does the respondents think that the show is an effective way to communicate to the countrymen?

49% respondents agree that the show is an effective way to communicate to the countrymen whereas 3% strongly disagree with that.

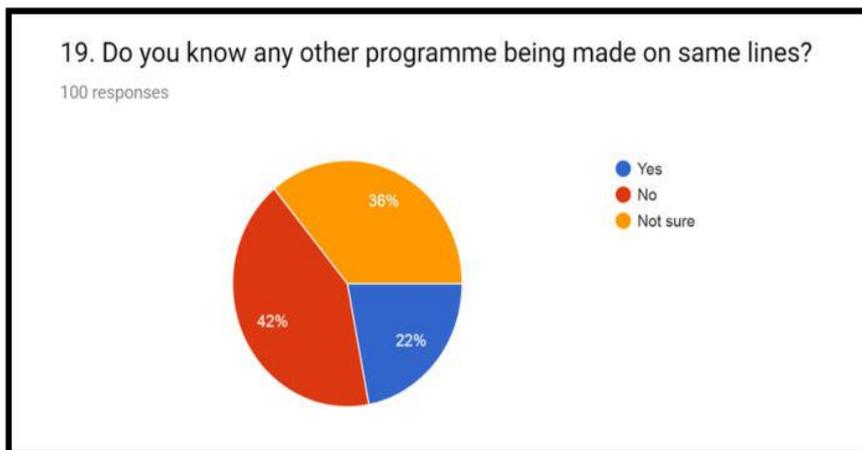


Fig. 22: Does the respondents know any other programme made on same lines?

42% respondents says that they don't know any other programme made on same lines whereas 22% says that they know other programmes made on same lines

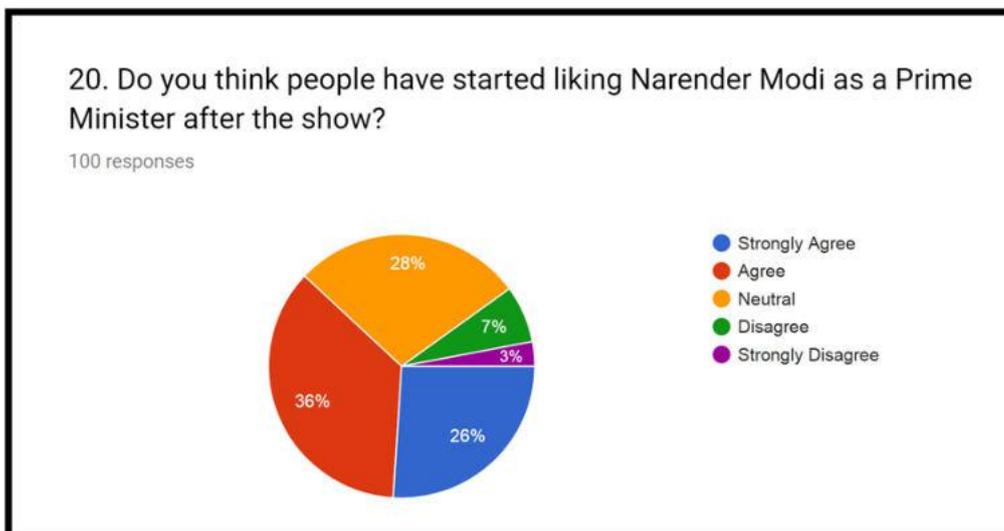


Fig. 23: Does the respondents think that people have started liking Narendra Modi as a Prime Minister after the show?

36% respondents agree that people have started liking Narendra Modi after this show whereas 3% strongly disagree with that.

**4.2 Content Analysis**

The qualitative content analysis was done on various parameters covered in the show. The parameters were developed after listening to all the 10 episodes. **Table 1** shows which all parameters were present in the episode starting with January 2018 to October 2018. The ✓ shows presence of the parameter.

Date	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct
Highlighted Issues of National/Social importance	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Famous Personality mentioned	✓	✓	✓	✓	✓	✓	✓			
Festival/days of National/Social Importance	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Narendra Modi App Mentioned	✓	✓	✓			✓		✓		
My Gov. App Mentioned	✓		✓			✓		✓		✓
Government Schemes	✓	✓	✓	✓				✓		
Listener’s Feedback Source	✓	✓	✓	✓	✓	✓	✓	✓		
Appreciation to common man	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Picked up topics raised by Listeners through App/ Call/Letter/Email	✓	✓	✓	✓	✓	✓	✓	✓		✓

**Synopsis of 10 episodes of Mann Ki Baat Show:**

Episode Parameters	January 2018	February 2018
Highlighted Issues of National/Social importance	<ol style="list-style-type: none"> <li>Women Empowerment, Nari Shakti, Rani Laxmi Bai, Women Fighter Pilots</li> <li>Health Care affordable</li> <li>SBA</li> <li>Padma Awards for common man</li> </ol>	<ol style="list-style-type: none"> <li>Artificial Intelligence</li> <li>Recycle Garbage</li> <li>Waste Management</li> </ol>
Famous Personality mentioned	<ol style="list-style-type: none"> <li>Kalpana Chawla’s achievements</li> <li>Mahatma Gandhi</li> </ol>	<ol style="list-style-type: none"> <li>CV Raman</li> <li>Aryabhata</li> <li>Jagdish Chanda Bose</li> </ol>
Festival/days of National/ Social Importance	<ol style="list-style-type: none"> <li>Republic Day celebrations</li> <li>Pravasi Bhartiya Diwas</li> </ol>	<ol style="list-style-type: none"> <li>National Science Day</li> <li>National safety Day</li> <li>International Women’s Day</li> <li>Holi Wishes</li> </ol>
Narendra Modi App	Mentioned	Mentioned
My Gov. App	Mentioned	Not Mentioned
Government Schemes	<ol style="list-style-type: none"> <li>Pradhan Mantri Jan Aushadhi Yojna, Jan Shakti Kendra, Amrit Stores</li> <li>Clean Morna River (SBA)</li> </ol>	<ol style="list-style-type: none"> <li>NDMA praising</li> <li>Aapda Mitra</li> <li>BIMSTEC</li> <li>SBA</li> <li>Gobar Dhan</li> <li>Trash Mahotsav by Raipur MCD</li> <li>Women involvement in SBA – Jharkhand</li> </ol>

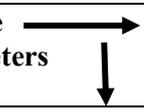
		Campaign 8. Elephanta gets Electricity
Listener's' Feedback Source	1. Mentioned about Letter from App 2. Mentioned name of listeners	1. Phone Call Recorded 2. Comment on App 3. Took name of listener
Appreciation	1. Common Man's effort	1. Raipur municipal cooperation
Picked up topics raised by Listeners through App/Call/Letter/Email	1. Nari Shakti & women empowerment 2. making healthcare affordable 3. Clean morna river under SBA	1. Artificial intelligence 2. Road safety

Episode Parameters	March 2018	April 2018
Highlighted Issues	1. Visit of ASEAN countries 2. Swastha Bharat	1. Commonwealth games winners 2. Fit India – Akshay Kumar 3. Water Harvesting
Famous Personality	1. Mahatma Gandhi 2. Baba Saheb Ambedkar	1. Rabindranath Jayanti
Festival/day of National Importance	1. Ram Navmi 2. Yoga Day	1. Ramzaan 2. Budh Purnima
Narendra Modi App	Comment on App	Not Mentioned
My Gov. App	Mentioned	Not Mentioned
Government Schemes	1. Jan Aushadi Kendra 2. Ayushman Bharat Yojna 3. New AIIMS being opened 4. TB free India 5. MBBS seats increased 6. Make in India 7. Smart City Mission 8. Urban Mission 9. Gram Swaraj Abhiyan	1. SBA internship 2. Doordarshan Programme 3. Good News India
Listener's' Feedback Source	Mentioned name of listeners	Mentioned name of listeners
Appreciation	1. Common Man's effort 2. Meghalaya farmers	1. Commonwealth participants 2. Common people on Fit India 3. Uttarakhand farmers
Picked up topics raised by Listeners through App/Call/Letter/Email	1. Promote Sanskrit language 2. Ground Water depletion 3. Keep water for birds during summer 4. Health of youngsters 5. Letters from farmers	1. Talking about Rabindranath Tagore's philosophy of living

Episode Parameters	May 2018	June 2018
Highlighted Issues	1. Praising Girls for voyage and climbed Mt Everest 2. Fit India – Kohli and Bollywood 3. Indoor and Outdoor Games importance 4. Beat Plastic Pollution	1. One year of GST 2. India vs Afganistan test match 3. How people are getting benefit from government launched schemes
Famous Personality		

Festival/day of National Importance	1. World Environment Day 2. International Yoga Day 3. Eid	1. International Yoga Day 2. DOCTORS DAY 3. Guru Nanak Jayanti 4. Shyama Prasad Mukherjee birthday
Narendra Modi App	Not Mentioned	Mentioned twice
My Gov App	Not Mentioned	Mentioned
Government Schemes	Not Mentioned	Not Mentioned
Listener's' Feedback Source	Phone call from Listener	Phone call from Listener
Appreciation	1. Six women commander on voyage 2. Common people on climbing Everest 3. Common Man's effort	1. Appreciating Indian & Afghanistan cricket team 2. Common Man's effort
Picked up topics raised by Listeners through App/Call/Letter/Email	Fading away of indoor and outdoor games like pithoo, Kho Kho etc and then also singing a POEM	1. Importance of doctors 2. Shyama Prasad birthday 3. Visit to Maghar in Gujarat

Episode Parameters	July 2018	August 2018
Highlighted Issues	1. Teenage football player stuck in cave 2. Poet Neeraj ji passes away 3. Students go to college 4. Smart Gaon app – 2 guys from America 5. Praising winners of world athletic championship	1. Kerala disaster and NDRF appreciation 2. Life of Atal Bihari Vajpayee 3. Most productive parliament session 4. Congratulating winners of Asian game Jakarta and praising sports 5. Safe construction of houses to prevent damage from natural calamities
Famous Personality	1. Lok Manya Tilak – death anniversary 2. Chandreshekhar Azad – paying him tributes	
Festival/day of National Importance	1. Ganesh Chaturthi	1. Rakshabandhan 2. Sanskrit day 3. Teachers day
Narendra Modi App	Not Mentioned	He said 'Many people'
My Gov. App	Not Mentioned	He said 'Many people'
Government Schemes		1. Lok Sabha - 21 bills passed 2. Rajya Sabha - 14 bills passed 3. bills for beneficial of youth and backward class 4. OBC commission was made 5. amendment bill to secure rights of SC and ST 6. criminal act amendment bill for strictest punishment 7. rape guilty - min sentence of 10 years 8. raping girls below 12 - death sentence 9. Triple Talaq bill passed by Lok Sabha but not Rajya Sabha
Narender Modi Website	Not Mentioned	Not Mentioned
Listener's' Feedback	1. Phone call from Listener	1. Phone call from Listener

Source		2. Comment on App
Appreciation	1. Common Man's effort 2. Winners of world athletic championship	1. Winners of Asian games
Picked up topics raised by Listeners through App/Call/Letter/Email	1. Visit Vithoba temple in pandharpur	2. Atal Bihari Vajpayee life 3. Safe construction of house
<b>Episode Parameters</b> 	<b>September 2018</b>	<b>October 2018</b>
Highlighted Issues	1. Praising the soldiers of country 2. Air force appreciation and women in air force 3. Abhilash tomy health concern 4. Talking about Gandhi and his work 5. Linking Gandhi's mantra with today's scenario 6. SBA success story both nationally and internationally 7. Hosting biggest sanitation convention of the world 8. 25 years of NHRC 9. Run for unity – tribute to sardar sahib birth anniversary ( brief talk )	1. Run for unity, talking about sardar sahib work and also statue of unity 2. Infantry day and sardar patel link 3. 2 line tribute to Indira Gandhi death anniversary 4. Praising sports by congratulating and meeting winners para games and summer youth olympics 2018 5. Successful Fifa under 17 world cup in India 6. Men's hockey world cup 2018 to be in India...praising hockey 7. Self 4 society' portal launched by myGov and IT and electronic industry 8. To adopt tribal tradition in our life for sustainable development 9. Stop burning purali in farming fields to stop pollution by taking example of Punjab farmer 10. Hundred years of world war end 11. Nor-East wins Oscar in arming sector 12. Wishing every one for month of festivals i.e. November
Famous Personality	Not Mentioned	Not Mentioned
Festival/day of National Importance	1. Air force day 2. Gandhi Jayanti 3. Birth anniversary of lal bahadur shastri 4. Navratri wishes	
Narendra Modi App	Not Mentioned	Not Mentioned
My Gov. App	Not Mentioned	Mentioned
Government Schemes	Not Mentioned	Not Mentioned
Listener's' Feedback Source	Not Mentioned	1. Comment on App
Appreciation	1. Soldiers of country 2. Women in air force	1. winners of para games and summer youth olympics 2018 2. Common Man's effort
Picked up topics raised by Listeners through App/Call/Letter/Email		1. To adopt tribal tradition in our life for sustainable development

## 5. Result and Discussions

The content analysis has revealed that a common style of presentation has been followed in all the episodes of Mann Ki Baat show. The format is such that, PM Modi starts the programme by highlighting issues of national and social importance such as women empowerment, water management, importance of fitness, waste management, importance of sports, pollution etc.

Out of 10 in 7 episodes PM mentioned about achievements of famous personalities such as Kalpana Chawla, Mahatma Gandhi, Lokmanya Tilak, Chandrashekhar Azad, Baba Saheb Ambedkar etc. He also talked about the special day or event happening in the following month such as Air Force day, Gandhi Jayanti, World environment day, International Yoga Day, Eid, Ram Navmi, Pravasi Bhartiya Diwas etc

The common topics mentioned in majority of episodes are sports, yoga, science, women power, fitness and health etc. In the show he has often heard talking about various policies, programmes of government like Aapda Mitra, Gobar Dhan, Pradhan Mantri Jan Aushadhi Yojna, Clean Morna River (SBA), Gram Swaraj Abhiyan with the aim of creating awareness and propagating his schemes. Even survey reveals that 78% of respondents think that Mann Ki Baat show creates awareness about government policies.

In the survey 83% respondents also said that the show is a good platform to promote government Apps and content analysis also showed that 6 out of 10 episodes PM mentioned about the MyGov App and Narendra Modi App.

In the survey 62% respondents also said that people have started liking Narendra Modi as Prime Minister of the country after watching/listening he show and 69% respondents said their faith in Prime Minister has increased after watching/listening the show that clearly shows that the show is improving the Prime Minister's image in the minds of the people and it can be said that the show is being used as a PR tool to build a good public image of the prime minister.

According to the content analysis and survey conducted, it has been observed that the show follows a structured format that includes talking about famous personalities of the country, mentioning the festivals of the following month, pinpointing issues of concerns like women empowerment, fitness and health, sports etc to arouse interest of the listeners.

The Prime Minister subtly conveys his message and promotes mobile applications launched by the government that includes MyGov App and Narendra Modi App. He also talks about various government policies and schemes that have been launched. All the topics are carefully chosen, and achievements are highlighted that builds positive image of the ruling government. The show has been used as a platform to share success stories of the ruling government, highlight their achievements and act as a PR tool to the Prime Minister.

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Khan, M. R., Islam, A. F. M. M., & Das, D. (1886). A Factor Analytic Study on the Validity of a Union Commitment Scale. *Journal of Applied Psychology*, 12(1), 129-136.

Liu, W.B, Wongcha A, & Peng, K.C. (2012), “Adopting Super-Efficiency And Tobit Model On Analyzing the Efficiency of Teacher’s Colleges In Thailand”, *International Journal on New Trends In Education and Their Implications*, Vol.3.3, 108 – 114.

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Simchi-Levi, D., Kaminsky, P., & Simchi-Levi, E. (2007). *Designing and Managing the Supply Chain: Concepts, Strategies and Case Studies* (3rd ed.). New York: McGraw-Hill.

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- **Electronic sources should include the URL of the website at which they may be found, as shown:**

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- **Unpublished dissertation/ paper:**

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Holloway, M. (2005, August 6). When extinct isn't. *Scientific American*, 293, 22-23.

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Mr. Vijay Pal Gusain

## Chairman Message



It is with great pleasure that our Lingayas Llaita Devi Institute of Management and Sciences has hosted the “National Conference on **Digital Innovation: A Tool for Sustainable Development**” on the 30<sup>th</sup> March, 2019. Like all our programs international and national, we will receive immense insight through the topics related to Digital Innovation through the participations of faculty members, policy makers, researchers and industry veterans from across India. I believe with this we not only have a further reach but we will have a more transparent, and systemic system that will come into play – advancing all who are invested in making our educational system a sustainable one. I implore you all to take time to read through to all the paper submissions put forth for this conference and would also like to thank all the organisers of this conference for giving each of its participants a platform to voice their thoughts and have ideas not just shared but concerns and vulnerabilities dealt with through this gathering.

**BEST WISHES**

With profound regards

**Dr. Picheshwar Gadde**

Chairman, LLDIMS, New Delhi

## Director Message



The 'National Conference on 'Digital Innovation: A Tool for Sustainable Development' organized by Lingaya's Lalita Devi Institute of Management and Sciences, New Delhi, India on March-30<sup>th</sup> - 2019. In today's digitization era, digital innovations have a great potential to meet the 2030-agenda for sustainable development. The global blue print for dignified, peaceful and prosperous life for human well being is perhaps the greatest challenge across the economies are facing. To speedily achieve the sustainable development goals, civil societies, private and government sectors are evolving digital ways in translating their vision into national development plans and strategies. The conference calls the scholars, researchers, academicians, students, to come together with their diverse unique digital innovative thoughts that help the nation policy makers to deliver societal goals in a more effectual way.

The economies today have to ensure that this growth powered by globalization reaches to the bottom of the pyramid and rests on sustainable practices. This is where governance intersects growth and globalization Also in this highly challenging economic scenario, the future prosperity of India through its industry growth is solely dependent on contemporary adoption to practices and its fruitful outcome. The National Conference outlines the practical utility and factor in the sustainable development of India.

I assure you that the editorial team has taken due care and diligence in selecting the research papers and articles on various topics and will continue to do so in future as well.

**Prof. (Dr.) K. K. Garg**  
Director- LLDIMS, New Delhi

## **Additional Director Message**



On behalf of Lingayas Lalita Devi institute of Management and Sciences, I would like to welcome you to the National Conference on Digital Innovation: A Tool for Sustainable Development. The growing technological advancement with each passing day provides a challenge to people of all walks of life, be it Academicians, Research Scholars, Students industrialists, professionals etc. This Conference was visualised with the objective for providing a common platform to foster exchange of ideas on how best digital technology can be utilised in making India sustainable in all fields.

I am hopeful that the in depth discussions by the distinguished delegates in the conference would be proved to be fruitful and would have a positive and long lasting impact on the field of digital innovations. The overwhelming response to our call-for papers indicates the popularity of this conference and confirms that technology is indeed an inseparable and indispensable part of our life; hence everyone is enthusiastic to voice out their viewpoint on it. I would like to express my thanks to all authors for their outstanding contributions. My heartfelt thanks to the members of the program board for their competent evaluation of the large number of submissions and selecting the best paper. It was not an easy task Likewise I would also like to express my appreciation to the advisory committee for its valuable suggestions as well as to the invited chairs for their careful preparation of the invited sessions. We wish to thank the organizing committee for their hard work in planning the conference.

**Best Wishes**

**Dr. Pranav Mishra**  
Additional Director | IQAC Coordinator

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**SUSTAINABLE MOBILITY**

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**ABSTRACT**

*Cities modernization is guided and shaped by human interactions and by the physical infrastructure. Mobility and accessibility are two main part and parcel of the Transport system. The transport sector is showing a transition from a 'hardware-centered' approach (vehicles, roads, general infrastructure, etc.) to a user need-driven 'mobility as a service' approach. But the vehicles we use in order to battle climate change needs incremental improvements. To Develop transport on the track of sustainability, we should work in the direction to make energy efficient changes, transforming to renewable energy and more sustainable modes of mobility, and increase smartness at every level of the system. This paper gives a brief review on understanding sustainable mobility and accessibility, challenges that the environment faces due to fast-growing tertiary sector, transport systems, and urbanization. The paper also thrives to review various initiatives taken by the governments on urban planning towards sustainable urban mobility and outlines a few solutions to have a combination of smart and sustainable mobility.*

*Keywords: Mobility, Accessibility, Sustainable mobility, Urban planning*

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**OBJECTIVE**

This paper gives a brief review and focuses

- To understand sustainable mobility,
- To study the challenges that the environment faces due to fast-growing tertiary sector, transport systems, and urbanization.
- To look upon the initiatives taken by the governments, non-government and other organization on urban planning
- To find out comprehensive solutions of current scenario and innovative technologies to make mobility sustainable in future.

**INTRODUCTION**

Mobility and accessibility are two main part and parcel of the Transport system. In words of Ilan Solomon. and Patrica.L Mokhtarian,1998 Mobility is the demand for activities and travel, where the costs are an integral part of the demand. Travel can be an activity when a person travels for enjoyment and satisfaction whereas travel is derived demand when a purpose is attached to travel i.e. reaching a destination. On the other hand, Accessibility is the ultimate goal of most transportation, it is an activity in itself as it is not just a means to access destination (Litman, 2003).

In the recent global era, urban areas around the world, in both developed and developing countries, have become increasingly automobile-centered and less sustainable. Urbanization and demographic changes, including rapidly aging populations, are just two of the megatrends that will have a significant global impact. Traveling decisions of the population are based on residential, activity locations and their work. It is also a physical outcome of interactions between cultural backgrounds and physical needs of a particular society and the potential of land activity. (Chawla,2012). Today's transport system is quite different from that of a past few decades, these systems are evolving continuously and rapidly. Transport is seen as an enabler for people mobility and logistics. The development of information and communication technologies has supported the shift of standard. The vehicles we use in order to battle climate change needs incremental improvements. Transport system should be renovated and considered as a whole. Efforts should be made in combining smart mobility with low-carbon energy. Cities across the world strive to meet urban sustainable mobility by improving public transport, encouraging non-motorized modes, creating pedestrian zones, limiting the use of private cars, and reduce by automobile dominance. Ideas of automobile restraint that were unthinkable just a few years ago are now being taken into consideration or even is adopted in many urban areas around the globe.

**CHALLENGES**

Michael Thompson (1977) provides a useful breakdown of the ways in which most people are dissatisfied with the transport systems of their cities. He has given seven problems of urban transport that are related with each other. They are Traffic Movement and Congestion, Public Transport Crowding, Off-Peak Inadequacy of Public

Transport, Parking Difficulties, Traffic noise, Difficulties for Pedestrians, Environmental Impact, Atmospheric Pollution. This startle pace of urbanization has been contributing to personal motorization exponentially that drastically adds on to carbon footprints and polluting the environment, which resultingly causes many critical health issues to humans and other living organisms. (Giduthuri, V.K.,2015)

Climate change, urbanization, urban sprawl, security issues, unfavorable demographics (aging, blood pressure, brathing problems etc), open markets and digitalization of the operating environment make utmost to improve the whole transportation senario. The uncontrollable growth of cities increases challenges for city planners and those dealing with transportation. To respond to the said problem in fast-growing cities, investments in sustainable alternatives are essential in achieving socially inclusive, economically efficient and environmentally friendly measures.

### **SOLUTIONS**

Urban planning and management could be an efficient tool both for reducing the overall impact of urbanization on the regional environment and for improving conditions of transport system. National and local governments must work together to create environmentally, economically and financially sustainable urban transport systems (Tsay & Herrmann, 2013). Government extends Central Financial Assistance to Urban local Bodies and includes the improvement and innovation in urban transport planning and management through Mobility Plan , Unified Mass Transit Authority , Dedicated Urban Transport Fund at state and city level, Transit Oriented Development Policy, Parking Policy and Advertisement Policy, city specific Special Purpose Vehicle for managing public transport, Traffic Information and Management Control Centre (TIMCC), etc., Bus prioritization at intersections, dedicated/demarcated lanes for buses, Designate a nodal department for urban transport and Mechanism for periodic revision of public transport fares (Lohia, 2011).

Information and communication technology will play an important role in changing the whole transport system. For ignoring traffic, wi-fi traffic lights also known as smart traffic lights can be used which will intimate the truck drivers way before about when the signals turn red on a certain traffic light so that they can move to adjust their speed limits accordingly and can avoid idling on traffic signals and wasting fuel. These kinds of technologies are already being used in cities like San Jose and Las Vegas (claimed by The University of California; which is a pioneer on climate research, renewable energy, and environmental sustainability). Accordingly, intelligence will be embedded at all levels of the systems like in the vehicle with its subsystems, in the surrounding infrastructure, in the energy supply, in the management systems and in the services delivered by the system. Internet of Things (IoT) will make communication between all components of the system possible, thus enabling a completely new level of optimization and automation. (Nils-Olof Nylund and Kaisa Belloni, June 2014)

Improving and renovating transport system considered as a wiser step to define criteria for performance rather than to indulge for a certain technology. A vehicle can be the mode of future transport say for the battery electric vehicle, the fuel cell vehicle or some other technology. A combination of electric propulsion, renewable fuels and other environment friendly innovation may make a sustainable future. (Nils-Olof Nylund and Kaisa Belloni, June 2014). Improvement in public transport is now increasing characterized by innovative planning combined with the use of modern technology in major metropolitan cities of India. For instance, all modes of public transport, including Bus Rapid Transit system (BRTS) and metro rail are resorting the use of Compressed Natural Gas (CNG). Public service vehicles in the capital run on CNG for over a decade now. This policy introduced in 2002 under the directions of the Supreme Court of India is implemented now effectively and as a result, the capital became relatively free of diesel smoke. The Government of India has launched the Jawaharlal Nehru National Urban Rene Nehru National Urban Renewal Mission (JNNURM) JnNURM strives at creating economically productive, efficient, equitable and responsive Cities by a strategy of updating the social and economic infrastructures in cities. It also aims to provide basic services to Urban Poor and wide-ranging urban sector reforms to strengthen municipal governance. (GoI,2005).

Pardo (2010) had given four measures for sustainable urban transport, namely, 1) public transport, 2) subway and light-rail system, 3) metro and urban light-rail system and 4) non-motorized transport.

### **PUBLIC TRANSPORT**

This measure leads to the development of high-quality public transport systems including mass transit systems. A specific public transport mode called Bus Rapid Transit (BRT) has been popularly implemented in recent years due to its cost-effectiveness, relatively short time consuming and high quality of service along with the increased capacity to move a large number of passengers.

**Subway and light-rail systems:** This is one of rapid, cost-effective and environmentally friendly urban passenger transport. Many megacities in developing countries are also considering the construction, modernization, and expansion of urban light-rail systems.

**Metro and urban light-rail systems:** This system is not very cost effective to construct and maintain but can result in significant long-term economic, social and environmental benefits. Various researches and studies analyzing investment in urban public transport infrastructure and services have given a result that in the long term the sum of public benefits exceeds the investment costs by far. Urban public transport systems are more attractive to commuters and more economically feasible for operators if they offer the option to travel from any point in the city to any other point. This can be done through the expansion of the network and through intermodal connections.

**Non-motorized transport:** It is also referred to as “Active Transport”, it essentially refers to walking and cycling as well as related infrastructure, policies, and education

Fast-moving ways are influencing urban-mobility systems around the world. The distribution of energy systems will make a difference as modes of transportation come to rely more on electricity as a source of energy. (Shannon,2017) suggested some trends which are likely to have a larger impact on the development of smart and sustainable mobility in cities. They have shared mobility, Autonomous driving, vehicle electrification, Connectivity and the internet of things, Public transit, Infrastructure and Regulation of transport system. These trends will have a profound influence and their effects could be reinforced and multiplied.

Truck Platooning is also an increasing trend where two or more trucks in a convoy using technology of connectivity and fully automated driving systems. The trucks or the vehicles arranges them in a set and maintains a close distance between each other. This technique of platoons has a great potential to make mobility more economically efficient, environmentally sustainable and much safer in coming years. Such kinds of truck platoons lower down the fuel consumption and carbon footprints on the environment as driving slower and together reduces the friction and this reduces the air drag by a great amount. The platooning technique make roads safety a bit easier task as the breaks of these platoons are quite automated and immediate in nature as in the platoon truck following the lead truck only takes one-fifth of the time a human would need to react. Platooning increases the efficiency of mobility as it uses roads more effectively in delivering merchandises and services faster and reducing traffic jams.

We have to convince people in general and people in the commercial sector, to make sustainable choices that integrate all stakeholders in the actions that are needed. It can be done by Encouraging individuals, families, and communities to adopt “Green Travel Habits that would make travel less polluting and sustainable. Today, we are at a crossroads for a paradigm shift that will encourage renewable energy, ultra-efficient vehicles, cooperative systems, smart mobility services, and overarching optimization. (Nils-Olof Nylund and Kaisa Belloni, June 2014)

## CONCLUSION

When it is decided to build the new system, it should be considered to switch from the traditional hardware-oriented approach to a system based on user demand and mobility services.

Cities are required to be planned in more concise way to address sustainable urban mobility properly. A strategic plan for sustainable mobility is needed to achieve a better quality of life that builds on existing planning practices and with consideration to urban mobility.

To reach all the goals regarding climate change, energy and service level, we cannot just work on a single element of the system, we need a systemic approach to mobility. We should have to consider the system as a whole. Efforts should be made to spread awareness among the people regarding the importance of existence of sustainable mobility. Green Travel Habits must be inculcated in the behavior of cities

As we all are aware that one size does not fit all, it means that one single vehicle technology, energy carrier or even ICT service platform cannot cover all the mobility needs. It should be accepted that a mix of technologies will help, and accordingly it should be decided which application a certain technology is best suited. Certain combinations of policies can work hand in hand and give rise to synergies, leading to impacts greater than the sum of their individual parts.

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**IMPACT OF SOCIAL MEDIA ON YOUTH**

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**ABSTRACT**

*With the advent of internet life has become easy and convenient now we can send and receive any message within few seconds. Social media has brought the world together making Marshall McLuhan's concept of 'Global Village' true. The exchange of information and the flow of information has become free and over the top. Although social media has brought ease to life yet it has certain reverse effects as well. These days everyone is busy in their social media or in virtual reality rather than being concerned about their surroundings this attitude has resulted in isolation and loneliness of the modern people. This research will focus on studying the negative as well as the positive effects of social media or social networking sites on the youth. To accomplish this study, survey method will be used and data will be analyzed based on the questionnaire filled by the respondent.*

*Keywords: Social media, SNS, Youth and Digital media.*

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**INTRODUCTION**

With the advent of internet, communication has become fast and easy. In India as the access of internet is available with high speed and arrival of pocket friendly smartphones has increased the dependency on global communication than ever before. Gone are those days when use of application was considered as wastage of time. Social Networking Sites are overlapping in all spheres of life. Modern day people rely on SNS from communication to business expansion. The involvement on social media has increased over the decade from email, WhatsApp, Twitter on visiting cards. The users of social media are not restricted to youth only but all age groups. It has eased life in many ways. Now one doesn't need to go to any IST booth to make international calls but can simply use SNS to make calls or video calls. Such platforms are not only for communication but also used for information, education, cultural identity, self identity etc. Peer groups on such platforms are providing a platform to exchange of ideas among like-minded people. With one click, anyone can get to know about the happenings around him which was beyond reach decades back. The involvement on activities on SNS enables one to create cultural identity and exchange of cultural and social values. One person sitting in any part of the world can now read, learn and share any information and ideas with others in the second part of the world. Internet has become an effective tool for advertising and marketing in modern days. Business expansion and communication is taking help from social media to reach to its target audience. Social Media also has great importance in developing relationships as it provided different applications and platforms where people of interest can meet and interact accordingly. On the same time, applications of social networking enables people to utilize the global services for business purposes by online meetings and online education program for the spread of education among the need.

However, every coin has two sides; similarly internet has certain adverse effects on users. As it's an open platform, share of information on social media lacks authentication and verifications. Much of the content to which users are exposed is not checked for facts and user is presented with virtual reality which may vary significantly in real world but such exposure will have similar impact on user. The user often believes to the information shared and acts accordingly. Mob-lynching happening in India has its riots in wrong information made viral on social media and belief of users in the same. Additionally, there is addiction of social media seen among users who spend maximum of the time on SNS than in socializing among people around. According to doctors, excessive use of mobile phone is causing sleeplessness among people along with issues related to cervical and spine. Apart from this, the students often indulge in use of social media so much that they start neglecting their routine life. This study is going to evaluate the adverse effects of social media on Youth as youngsters ate the maximum among the users of social media.

**REVIEW OF LITERATURE**

**Ali, Asad & Iqbal, Anam & Iqbal, Kanwal. (2016).** Social media plays great role in learning and job opportunities. However, teenagers often use social media for the purpose of communication with friends and family. The study discussed that the use of social media causes various health issues among users. Additionally, the users need to be well versed with social and cultural values of the state to communicate effectively.

**Bhardwaj, Akashdeep & Goundar, Sam & Avasthi, Vinay. (2017).** The study finds similar findings to the studies done in the relevant area previously. The researcher found that there is relevance of social media with cultural development, building self-identity, technical skills and developing relationships.

**Juszczyk, Stanislaw. (2015).** The SNS are becoming an integral part of day to day life as we rely on global network for different functions like work, information, communication, and education. . While using the internet, we are exposed to objective reality which occurs in different way but is perceived by the users. Such communication may impact different sectors of life like private life, social, cultural, economic and intellectual. If there is a monitoring of the use of internet, it can contribute in positive growth of the private life. There is a need to get the youth ‘unplugged’ to bring a balance between virtual reality and real world.

**Siddiqui, S. &Singh, T. (2016).**The researchers found that the growth of technology is booming the use of social media by everyone in daily life. It has different impact on different people. As a student, it enables the candidate to increase his knowledge and collaboration and in business, it helps in accomplishing business objectives and increasing sales. However, social media has certain negative impacts on people like wrong information may lead to education failure and wrong advertisement may affect the productivity. Social media can also poke in someone’s privacy along with certain provoking content; it may aggravate the involvement in inappropriate activities.

**Khurana, N. (2015).** The study was objected to study the effectiveness of social media. The SNS offer the youth a platform to study, interact and share ideas. It helps them in getting updated with happenings around them. But SNS has certain adverse effects on youth like excessive use of social media drags them away from studies. The sites which are used are not often credible for information. The users are often involved in virtual reality and activities happening online rather than involvement in events happening around them.

**RESEARCH OBJECTIVES**

The research objectives of the study are as followed:

- 1. To analyze the impacts of use of social media.
- 2. To analyze the negative impacts of social media.

**RESEARCH METHODOLOGY**

To accomplish this study, survey method is used. In this study, sample selection is done by random sampling. A questionnaire was served to 200 youths aging 18-30 from Chandigarh. The data is analyzed in percentile form.

**DATA ANALYSIS & FINDINGS**

**1. Do you use social networking sites? Yes/No**

In response of the given situation, all the respondents answered ‘yes’ which signifies the access and use of social media sites by every individual.

**2. How many social networking sites do you use?**

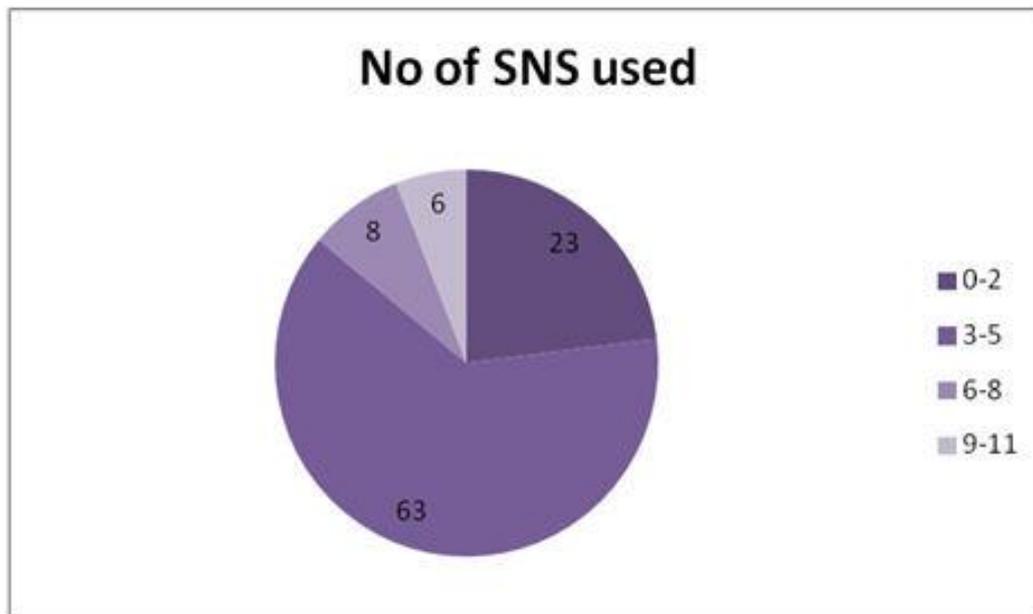


Figure-1: (Number of preferred SNS by respondents)

It becomes clear that 63% of the respondents used 3-5 SNS followed by the users of 0-2. Only 6% of the participants reported using more than 9 social sites. This trend reflects the popularity of various social networks among the users.

3. How many hours do you spend on social networking sites on an average in a da

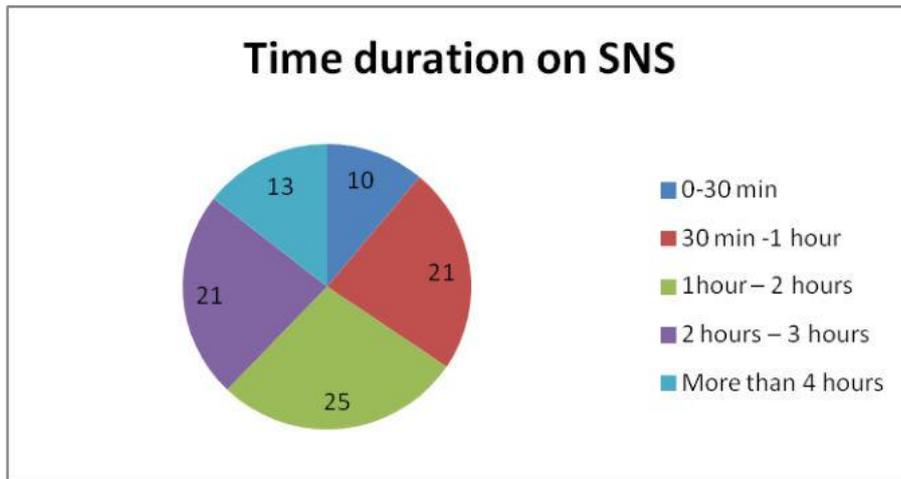


Figure-2: (Time duration spend on SNS by respondents)

25% of the participants reported the use of social site for 1-2 hours daily however users of more than four hours a day were third last in the percentage with 13%. Duration of 2-3 hours is spent by 21% users which is equal to the least time spending users on SNS with 0-30 minutes in a day. It shows that on an average, 3 hours are spent by almost 50% users on daily basis on social media.

4. Why do you use these social networking sites?

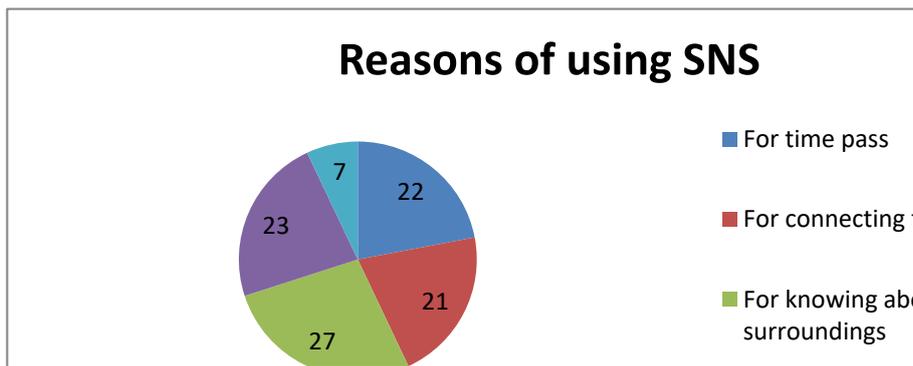


Figure-3: (Reasons of using SNS by respondents)

27% of the respondents reported to use social media for getting to know about the happenings in their surrounding followed by 23% users who refer to SNS for getting latest updates in trends. 22% of the users use social media because they find it a good way to pass time. Only 21% people use SNS for the purpose of communication and least is the use of SNS due peer pressure.

5. What are the personal benefits of using social networking sites?

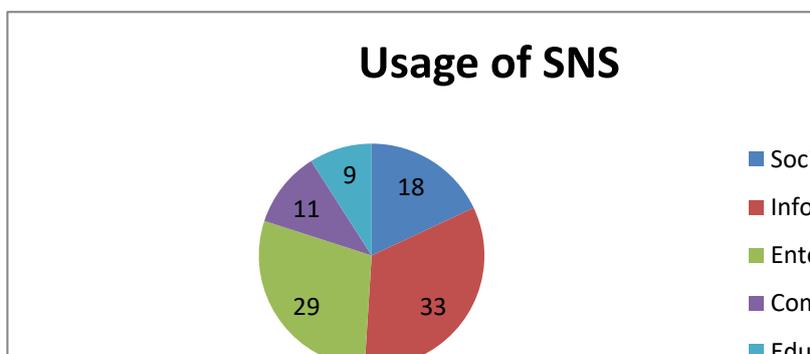


Figure-4: (Usage of SNS)

33% respondents use social media to share information followed by users for entertainment purpose with 29%. Use of social media is at the least with 9% users only. For the communication, only 11% respondents rely on social networks whereas for socializing with others only 18% users use the SNS.

6. Do you check your social networking profiles before going to bed?

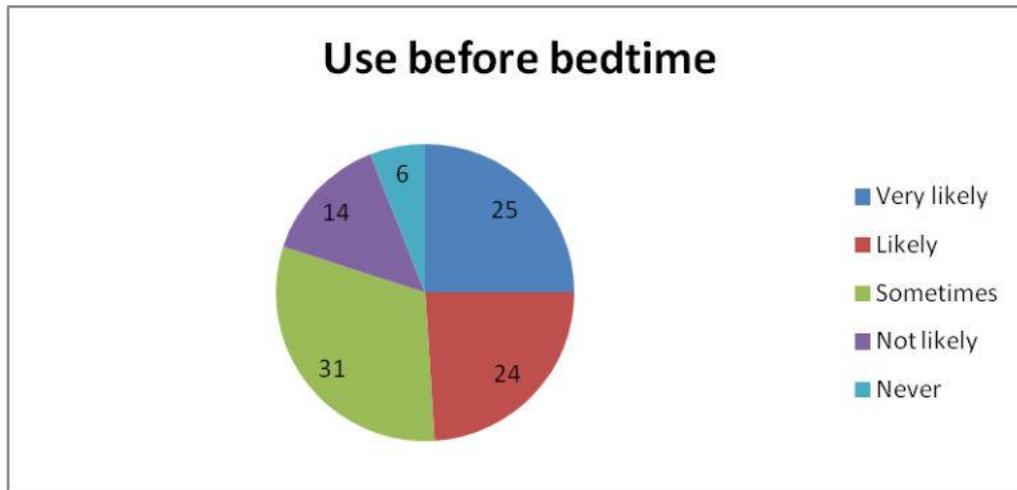


Figure-5: (Use of SNS before bedtime)

In the study, it is found that only 6% are the users who have never used SNS before sleep however 25% users most often use the social media before going to sleep followed by 24% of the users who use it on frequently, 31% are the respondent who reported the use of social media sometimes before sleep. This shows the frequency of being active on social media by the users at the time of relaxing.

7. Do you visit your SNS without any intention for activity?

- a. True
- b. False

In the response, 63% respondents accepted that they visit their social media apps or profile for specific reason whereas only 37% respondents reported to use SNS for an intentional activity. This trend reflects the tendency of addiction of using SNS by the users.

8. Are you surprised with the time duration you spend on SNS daily?

- a. Yes
- b. No

In the response, 40% users were surprised with their time duration spent on social media on daily basis. 60% users showed no surprise on their time utilization on social media.

9. Have you ever ignored your family activity for using SNS?

- a. True
- b. False

In the response, 19% participants accepted to neglect the family time for the sake of using SNS whereas 81% respondents feel that they have never ignored family activity for the use of SNS.

10. Have you ever ignored your study or assignments for using SNS?

- a. Yes
- b. No

In the response, 63% respondents counted not to ignore their studies for social media whereas 37% users accepted the negligence they play in using social sites on the stake of their studies.

**CONCLUSION**

In the nutshell, it can be said that social media has become an integral part of daily life; this study was focused to study the impacts of social media. It is clear from the study that every respondent is active on social media varying in the availability on different social media sites. The use of social media varies for different purposes and duration on an average goes to 3 hours a day by the respondents, Effective use of SNS is not seen as very few respondents reported to use the SNS for education purpose. The majority of users rely on social media for entertainment and communication. It is also seen that sometimes the respondents ignore family and their studies as well due to their deep interest in the global networking. All in all, it is seen that along with positive aspects of

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social media being a platform for sharing information, education it also has certain antagonistic effects on users like negligence in family, education, and excessive use by spending more than four hours a day on using social media.

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**PUBLIC OPINION ON ISSUE OF JAMMU AND KASHMIR AND TERRORISM**

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**ABSTRACT**

*With bilateral talks between India and Pakistan going sore due to border infiltration and government upping its ante against terrorism, a lot has changed in Jammu and Kashmir under current government. While some agree and fully support government for surgical strike and insurgency operations, opposition and many others criticize government for oppressing and harassing the local people. And hence a need arises to study what youth in general think about issues related to Jammu Kashmir such as plebiscite, Article 370, terrorism, separatism and army actions. The study was conducted by gathering primary data from university students through questionnaire using survey method. Also opinions of students on their social media accounts were analyzed for further insights regarding the issue.*

*Keywords: Jammu & Kashmir, Terrorism, Public Opinion, Article 370*

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**INTRODUCTION**

The Kashmir problem came into being almost with the independence of the country. Though 50 years have passed, the problem still remains unsolved. The Kashmir continues to remain a source of friction between India and Pakistan. With history of wars, border infiltrations and ceasefire violations, the relations between the two nations have only gone downhill. The position at the present is that the armies of the two countries still confront each other along the border line. While Pakistan continues to demand Kashmir on one hand, India on other hand continues its fight against infiltration and unrest in Kashmir. Both countries are spending huge amount over their armies in Kashmir. But no solution of the problem seems to be in sight in the near future.

In more recent times, there has been considerable deterioration in the situation in Kashmir. The Pakistan trained subversives have infiltrated into the valley in large numbers. The slogan of "Independent Kashmir" has been used to misguide the people. Pakistan has tried its best to politicize the problem and win international support for its point of view. But violence still continues, life in the state is still insecure and thousands have migrated from the valley into Jammu, Delhi and other parts of the country. With focus on recent developments such as ban on Pakistani Artists, Uri Attack, Surgical Strike, statements on Pakistan occupied Kashmir, unrest due to Article 370 and impasse on Indus Water Treaty, this study was conducted to find out general perception of youth on such critical issues.

**OBJECTIVES**

- To study the views of respondents on interference of Pakistan in Jammu and Kashmir.
- To study the views of respondents on Article 370
- To find out the biggest problem of Jammu and Kashmir according to the viewpoint of respondents.
- To study the views of respondents on India's stand on PoK (Pakistan occupied Kashmir).
- To study the views of respondents on surgical strike.
- To study the views of respondents on recent Pakistan artists ban.
- To study views of respondents on Pakistan importing terrorism.

**RESEARCH METHODOLOGY**

1. Type of sampling- Convenient sampling was used for the study.
  2. Sample size- The number of respondents that were taken for the study were 97. The sample that was selected were students from Makhanlal Chaturvedi University.
  3. Geographical area- The geographical area chosen for the study was campus of Makhanlal Chaturvedi University. The students of various departments of Makhanlal were taken as sample. Following were the departments from where sample was taken-
    - Department of Electronic Media.
    - Department of Computer Science and Applications.
-

- Department of Journalism.
  - Department of Management.
  - Department of Mass Communication.
  - Department of New Media Technology.
  - Department of Public Relations and Advertising Studies.
  - Department of Communication Research.
4. Age group- The range of age varied from 17 years to 55 years. The various age groups taken for the study were -
- 17-20
  - 21-24
  - 25 and above
5. Tools of data collection- For the study self designed and standardized tool according to the study were taken. Questionnaire was prepared and later filled by respondents.
6. Statistical techniques- The researcher used SPSS (Statistical package for Social Sciences) to analyze the data. Since it was descriptive study hence descriptive analysis was carried and the required tables were extracted from output yielded by the computer. Accordingly the analysis was carried out.

**PROCEDURE**

The scale was distributed and administered on students of various departments of the university. Each respondent was approached personally and was requested to fill up the questionnaire. Respondents were given the liberty to take their time for completing their questionnaires. The confidentiality of their responses was assured.

**RESULTS**

According to the objectives of the study, the data was collected and is analyzed. On analysis following results were obtained-

**Table-1: Showing Demographic variables**

S. No.	Demographic variables	Frequency	Percentage
	<b>Age(in years)</b>		
1	17-20	24	24.7
2	21-24	63	64.9
3	25 and above	10	10.3
	<b>Gender</b>	Frequency	Percentage
1	Male	42	43.3
2	Female	55	56.7
	<b>Educational Qualification</b>	Frequency	Percentage
1	Graduate	31	32.0
2	Post Graduate	54	55.7
3	M Phil	9	9.3
4	Working	3	3.1

Table 1 shows the data related to demographic variables. 64.9% of the respondents were in the age group 21-24 years. 24.7% were in the age group 17-20 years and 10.3% respondents were in the age group 25 years and above. Out of all the respondents who filled the questionnaire 43.3% were males and 56.7% were females. A staggering 55.7% of the respondents were post graduates, 32.0% were graduates, and 9.3% were M Phil students. Only 3.1% of the respondents were working (Doctor or professor).

**Table-2: Showing Response to statements having dichotomous variable**

S.NO	Questions	Frequency	Percent
1	<b>People blaming terrorism on Pakistan</b>		
	Yes	82	84.5
	No	15	15.5
2	<b>People who think winning trust of J&amp;K people will solve terrorism</b>		
	Yes	44	45.4
	No	53	54.6
3	<b>People who think India should focus on getting back the POK</b>		
	Yes	61	62.9
	No	36	37.1
4	<b>People who think Pakistan will retaliate after surgical strike</b>		
	Yes	73	75.3
	No	24	24.7

Table 2 shows responses to statements having dichotomous variable. On being asked whether they blame Pakistan for terrorism, 84.5% respondents replied in affirmative while only 15.5% felt the other way. When respondents were asked whether they think winning the trust of Jammu and Kashmir people would help solve terrorism issue, 54.6% respondents felt that it wouldn't help and rest 45.4% felt that it would help the cause. 62.9% respondents felt India should focus on getting Pakistan Occupied Kashmir and rest 37.1% felt that India should refrain from such action. 75.3% respondents thought Pakistan would retaliate after Surgical Strike and 24.7% felt that Pakistan won't do so.

**Table-3: showing responses to statements having dichotomous variable**

S.No	Statements	Yes	No	Can't Say
1	Modi has more political willingness than previous politicians in terms of terrorism issue	76(78.4%)	8(8.2%)	13(13.4%)
2	Can Pakistani artists be compared to terrorists	12(12.4%)	80(82.5%)	5(5.2%)
3	Cultural, economic and sports ties should not continue in times of border tensions	47(48.5%)	37(38.1%)	13(13.4%)
4	Pakistani artists should be banned from television and film industry	26(26.8%)	62(63.9%)	9(9.3%)
5	India's 'No first use' policy in terms of nuclear weapons is not correct	40(41.2%)	40(41.2%)	17(17.5%)
6	India's withdrawal from SAARC Summit was successful in isolating Pakistan	68(70.1%)	7(7.2%)	22(22.7%)
7	Snapping economic ties with China would make it retreat from helping Pakistan	63(64.9%)	21(21.6%)	13(13.4%)
8	India should stop the flow of Indus river to Pakistan	50(51.5%)	40(41.2%)	7(7.2%)
9	India is right in raising Baluchistan issue	79(81.4%)	6(6.2%)	12(12.4%)
10	Uri attack has broken the patience of India regarding cross border terrorism	83(85.6%)	8(8.2%)	6(6.2%)
11	Surgical strike have proven that India is intolerant to terrorism	73(75.3%)	15(15.5%)	9(9.3%)
12	India's action has built its negative image on world platform	17(17.5%)	79(81.4%)	1(1.0%)
13	India should neglect Pakistan and focus on development of country	34(35.1%)	56(57.7%)	7(7.2%)
14	Surgical strike is not a correct step of India	13(13.4%)	81(83.5%)	3(3.1%)
15	India's defense action is affecting the GDP growth	35(36.1%)	38(39.2%)	24(24.7%)

Table 3 shows responses to statements having dichotomous variables, 78.4% respondents believed Narendra Modi has more political will than his predecessors and rest 8.2% feel that he doesn't. 12.4%. On being asked whether Pakistani artists be compared to terrorists 82.5% respondents said 'No' while only 12.4% respondents

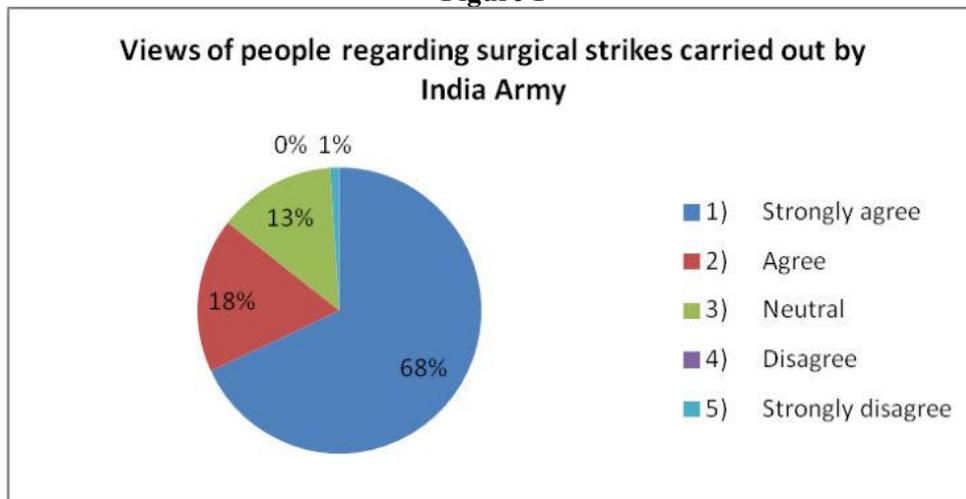
felt that they are comparable to terrorists. 48.5% respondents agreed that cultural, economic and sports activities should not continue in times of border tensions and 38.1% disagreed with the statement. 26.8% respondents agreed that Pakistani artists should be banned from television and film industry and a majority of 63.9% felt that they should not be banned.. 41.2% respondents felt India’s ‘No first use’ policy is wrong and another 42.2% felt that it is correct. 17.5% were not clear in their choice on this policy. 70.1% respondents felt India’s withdrawal from SAARC Summit was successful in isolating Pakistan while 21.6% felt that it wasn’t so 64.9% respondents agreed that snapping economic ties with China would make it retreat from helping Pakistan and 21.6% said it wouldn’t help the cause. 51.5% respondents felt that India should stop the flow of Indus River to Pakistan and 41.2% respondents felt that India shouldn’t do this. 81.4% respondents agreed that India is right in raising Baluchistan issue and only 6.2% felt the other way. 85.6% respondents feel that Uri attack has broken the patience of India regarding cross border terrorism and 8.2% don’t feel that way. 75.3% respondents agreed that surgical strike have proven that India is intolerant to terrorism and 15.5% didn’t agree with the statement. 17.5% respondents agree that India’s action has built its negative image on world platform while 81.4% respondents felt that this was not the case. 35.1% respondents believe that India should neglect Pakistan and focus on development of country and 57.7% think otherwise. 13.4% respondents agree with the statement that surgical strike is not a correct step by India and 83.5% think that surgical strike is a correct step. 36.1% respondents feel that India’s defense action is affecting the GDP growth and another 39.2% feel that it is not affecting the growth.

**Table-4: Showing Views of people regarding surgical strikes carried out by India Army**

Views	Frequency	Percent
1) Strongly agree	66	68.0
2) Agree	17	17.5
3) Neutral	13	13.4
4) Disagree	00	0.0
5) Strongly disagree	1	1.0

Table 4 shows views of people regarding surgical strikes carried out by India Army. 68.0% respondents strongly agree with the action and 17.5% just agree. 13.4% respondents were neutral on the issue. Only 1.0% strongly disagreed and 0.0% disagreed with the action.

**Figure 1**



**Table-5: Showing Views of people regarding whose intervention they wouldn’t prefer**

Intervention	Frequency	Percent
1. Army	4	4.1
2. United Nations	17	17.5
3. United States	14	14.4
4. Pakistan	62	63.9

Table 5 shows views of people regarding whose intervention they wouldn’t prefer. A majority of 63.9% s think there should be no interference from Pakistan in Kashmir issue. 14.4% think United States and 17.5% think United Nations should have no interference in the Kashmir issue. Only 4.1% respondents didn’t agree with the intervention of army.

Figure-2

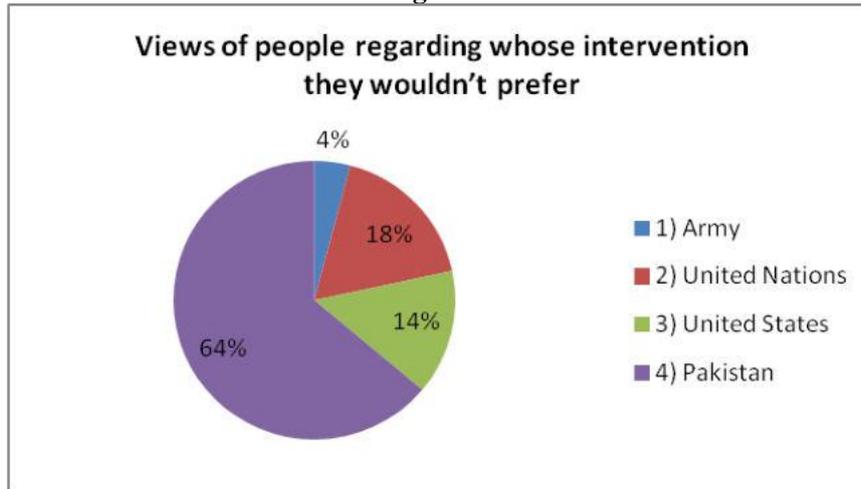


Table-6: Showing Views of respondents regarding strategy of Modi to expose Pakistan in context of Baluchistan

Strategy of Modi to expose Pakistan in context of Baluchistan	Frequency	Percent
1) Stop Pakistan from raising Kashmir issue	32	33.0
2) Stop cross border infiltration	43	44.3
3) It would do nothing	22	22.7

Table 6 shows views of respondents regarding strategy of Modi to expose Pakistan in context of Baluchistan. 33.0% respondents think it would stop Pakistan from raising Kashmir issue, 44.3% respondents feel that this would stop cross border infiltration and 22.7% respondents feel that it would do nothing.

Figure 3

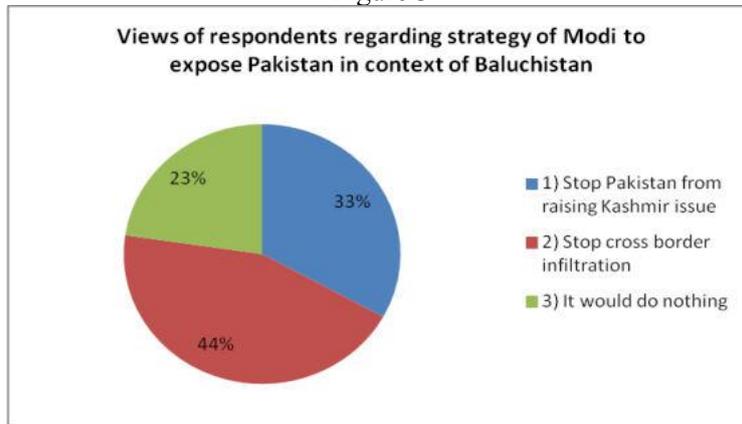


Table:- 7 Showing Biggest issue of Jammu and Kashmir right now

Issues	Frequency	Percent
1) Terrorism	51	52.6
2) Armed Force Special Powers Act	7	7.2
3) Curfew	1	1.0
4) Separatism	8	8.2
5) Ceasefire violation	3	3.1
6) Pakistan Occupied Kashmir	4	4.1
7) Unemployment	3	3.1
8) Misguided youth	17	17.5
9) No trust of people on government	3	3.1

Table 7 shows biggest issue of Jammu and Kashmir right now. 52.6% respondents think terrorism is the main issue of Jammu and Kashmir right now. 7.2% think Armed Force Special Powers Act, 17.5% feel misguided youth and 8.2% feel separatism is a major issue in Jammu and Kashmir. Only 1.0% agree that curfew, 3.1% agree that ceasefire violation and no trust on government and rest 4.1% agree that Pakistan Occupied Kashmir is the biggest issue right now.

Figure-4

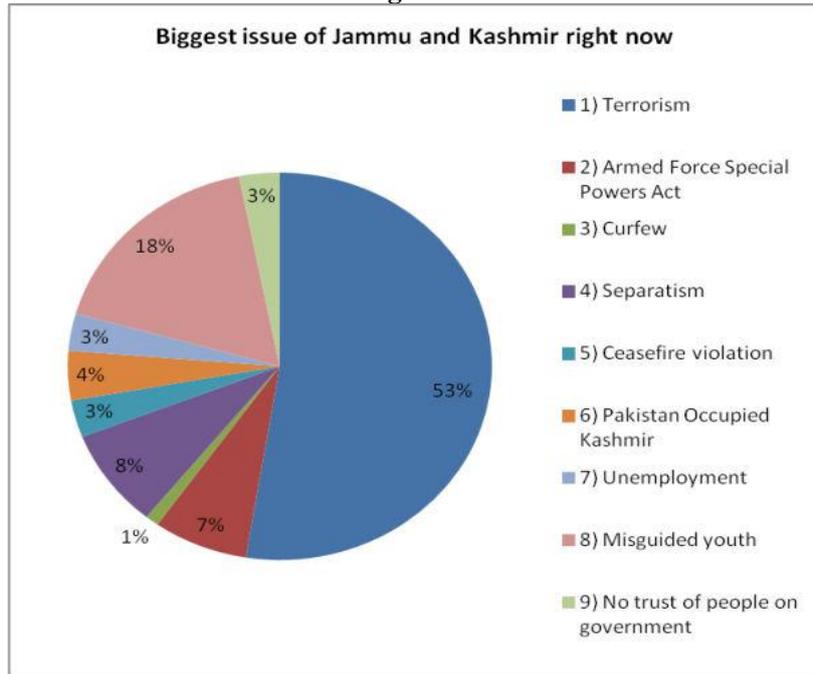


Table:- 8 Showing Consequences of scraping Article 370

Consequences	Frequency	Percent
1) More unrest in valley	27	27.8
2) More movement and settlement ensuring stability in the region	25	25.8
3) Protests by politicians of Jammu and Kashmir	23	23.7
4) Other consequence if any	22	22.7

Table 8 shows consequences of scraping Article 370. 27.8% respondents think that there will be more unrest in valley, 25.8% respondents think it would cause more movement and settlement ensuring stability in the region, 23.7% feel it would lead to protests by politicians of Jammu and Kashmir and rest 22.7% feel there could be other possible consequences.

Figure-5

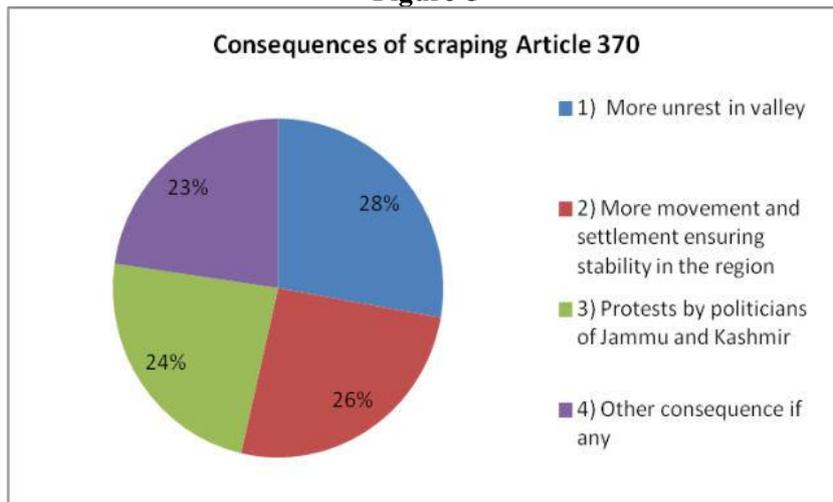
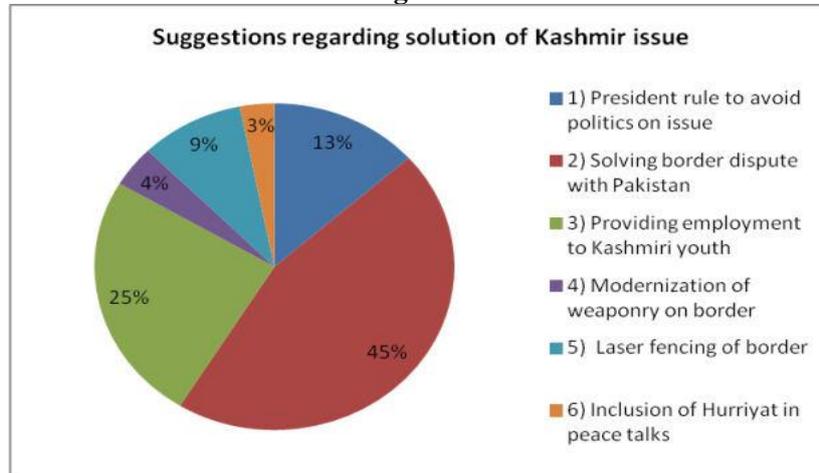


Table:- 9 Showing Suggestions regarding solution of Kashmir issue

Suggestions	Frequency	Percent
1) President rule to avoid politics on issue	13	13.4
2) Solving border dispute with Pakistan	44	45.4
3) Providing employment to Kashmiri youth	24	24.7
4) Modernization of weaponry on border	4	4.1
5) Laser fencing of border	9	9.3
6) Inclusion of Hurriyat in peace talks	3	3.1

Table 9 shows suggestions regarding solution of Kashmir issue. 13.4% respondents agree that there should be President rule to avoid politics on issue. 45.4% feel solving border dispute with Pakistan can do the trick. 24.7% respondents think that providing employment to Kashmiri youth would help. 4.1% respondents believe that modernization of weaponry on border would be the right way. 9.3% respondents think that laser fencing of border would be correct and rest 3.1% respondents believe that inclusion of Hurriyat in peace talks would help.

Figure-6



## INTERPRETATION AND DISCUSSION

For the study, the students of Makhn Lal Chaturvedi University were requested to fill the questionnaire. Later the data was entered on SPSS and then analyzed. This gave following interpretations:

- Most of the respondents who filled the questionnaire were females.
- A majority of the respondents blamed Pakistan for terrorism. Only half of the respondents thought winning trust of J&K people will solve terrorism and another half thought that it won't solve the issue. Most respondents feel India should focus on getting back the Pakistan Occupied Kashmir. On being asked whether Pakistan will retaliate after surgical strike majority of respondents thought that Pakistan would do so.
- Most respondents replied in affirmative on being asked whether Modi has more political willingness than previous politicians in terms of terrorism issue or not. Also respondents showed their clarity of mind when most of them said that Pakistani artists can't be compared to terrorists. But respondents were divided in their opinion when they were asked whether cultural, economic and sports ties should continue in times of border tensions or not. Respondents were broad minded as most thought that Pakistani artists shouldn't be banned from television and film industry.
- There was division of opinion when respondents were asked whether India's 'No first use' policy in terms of nuclear weapons is correct or not. Most respondents think India's withdrawal from SAARC Summit was successful in isolating Pakistan. Also they thought snapping economic ties with China would make it retreat from helping Pakistan
- Half of the respondents felt that India should stop the flow of Indus River to Pakistan so as to teach them a lesson. Most respondents felt Uri attack has broken the patience of India regarding cross border terrorism. Not just this most respondents also think surgical strike have proven that India is intolerant to terrorism
- Only a few respondents felt that India's action has built its negative image on world platform. Also there were few takers for the idea that India should neglect Pakistan and focus on development of country which was surprising as most wanted Pakistan Occupied Kashmir back and that India should teach Pakistan a lesson.
- Marginally low number of respondents felt that surgical strike was not a correct step by India and there could be chances of revenge being taken. There was division of opinion when respondents were asked whether India's defense action is affecting the GDP growth or not.
- Respondents were clear in stating that they wanted no interference from Pakistan in terms of Jammu and Kashmir issue. Only few agreed with concept of no intervention from United States and United Nations which shows that they want US and UN to take interest in Kashmir issue and help India solve it. Most were supportive with the idea of Army interference in Kashmir so as to maintain peace there.

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- A majority of respondents felt India is right in raising Baluchistan issue as it would stop cross border infiltration and deter Pakistan from raising Kashmir issue.
  - On being asked about the biggest issue of Jammu and Kashmir in present times, half of the respondents agreed that terrorism is the biggest issue of Jammu and Kashmir right now. And there were few takers for issues like Armed Force Special Powers Act, Pakistan Occupied Kashmir, separatism, unemployment, misguided youth and no trust on government. Surprisingly respondents felt curfew and separatism is not a major issue for Jammu and Kashmir which doesn't match with views of people of the country.
  - There was no clarity in minds of respondents when they were asked about consequences of scraping Article 370. This was expected as most of them had no idea about Article 370 on being asked verbally and just ticked the options as a wild guess.
  - Most of the respondents didn't keep up with the rage of common people regarding Pakistan as half of them felt that only solving border dispute with Pakistan would help. There were few takers for ideas like President's rule, providing employment to Kashmiri youth, modernization of weaponry, laser fencing of border and inclusion of separatists.

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**DIGITAL MEDIA & SUSTAINABLE DEVELOPMENT- A CASE STUDY ON “MOTHER DAIRY”  
WEBSITE COMMUNICATING CSR ACTIVITIES**

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**ABSTRACT**

*Corporate Social Responsibility engagements by Corporations in India is not new now. It is well accepted phenomenon and the acts and regulations envisaged in the Companies Act. 2014 (CSR regulations act.), the Government of India, Ministry of Company Affairs. Almost all big corporate companies are now engaged with many CSR activities in the fields of Education, Health, & Environment Protection by spending their profit share.*

*Objective: - But how these companies are reporting these CSR activities to their stakeholders and consumers is the matter of investigation and this topic of research study will analyse the activities of CSR done by the Corporation “MOTHER DAIRY” based and incorporated in Delhi NCR area and analyse as its engagement of CSR communication with case study method.*

*Companies communicating their CSR activities hesitate to use all mainstream media as it is notion that CSR activities are charity work and doing so would term as advertising and publicity. The literature reviews done for this study have made it clear that CSR communication build up the trust among the stakeholders of the company and finally encourage the company doing CSR for more engagements for not just to their brand image but also it boosts the sustainable development efforts and goals in the collaboration with the government agencies.*

*In India, the companies doing CSR activities do not adopt pro-active approach for the reporting CSR, but they adopt re-active approach i.e., inhibitive approach and it does not help achieving sustainable development goals finally as stakeholder’s involvement not possible without communicating through various media of communication.*

*In the above context it is found in the literature reviews for this study that most Indian companies communicate (report) their CSR engagements on their website and via digital media. The case study of Mother Dairy website has made it clear that all CSR Policy of this company have been described on the website of the company, but its communication of CSR activities have been done through various media but mostly on digital news websites or its own website.*

*Method- Case study is used to find out how digital media and companies’ websites are used to report CSR activities in India by the Corporations.*

*Possible Outcomes: - the study aim to find out whether the CSR activities done by companies are helpful in sustainable development goals. As CSR communication and reporting to the stakeholders are done by companies only via limited media vehicles, the involvement of people, society and stakeholders of the companies is the limited and not much for achieving sustainable development goals. Because, CSR and sustainable development focuses upon three key areas- Health, Education & Environment or in other terms- People, Planet and Profit, and if number of stakeholders of the companies are limited for these goals, it means the corporate companies are not doing responsible business and do not follow business ethics and shy away doing involve more numbers of people or stakeholders and thus try to escape for spending more profit on corporate social responsibility activities to achieve the sustainable development goals.*

*Keywords: Sustainable Development, Stakeholders, CSR activities, CSR communication, Ethical Business, Digital Media, Website of Companies.*

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**INTRODUCTION**

Digital Media has become now a part of lifestyle and necessary tool of communication in our everyday lives. To reach the goals of “Sustainable Development” not only the government but the corporate companies also need to engage in “Corporate Social Responsibility” activities. After making the legislation of CSR in Indian Parliament, CSR Act.2013 & CSR Regulations, 2014, many companies now have engaged themselves in various CSR activities like health awareness, health camps, education schools, charity work, environment protection, renewable energy sources, etc.

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But to sustain these efforts, there is the need of continuous flow of communication among society members or stakeholders of companies and that will give the boost to these companies to make the strategies and invest more fund in CSR activities.

**What is CSR?**

Corporate Social Responsibility is not just a philanthropic or charity work done by the companies but it is also a tool for any corporate company for doing the responsible business and at the same time creating the positive impact on the consumers or society members or stakeholders of the company through its activities on social needs like health, education and environment related necessities and helping the government for these social issues by spending their profit share. In this process, it can work like a catalyst or morale booster for the companies to invest more in social causes and social development and expect the consumers connectedness with their corporate brands. Finally, in this way, CSR engagement create the Sustainability Scenario in all spheres of development process.

Thus, CSR can be defined as the duty of Corporate Companies by doing ethical business for contribution to the society, economic development and improving the quality of lives of their workforce- employees, their families and the whole society at the large. In fact, in this process, companies directly contribute into efforts of the Government for the sustainable development of the society and the nation at large. First time, the term- Corporate Social Responsibility was coined in 1953 in the publication of “Bowen’s Social Responsibility of Businessmen”. The World’s Business Council for Sustainability Development (WBCSD) defined CSR as “the continuous commitment by the business organizations for behaving ethically and contributing to the economic development while improving the quality of life or their workforce as well as their families, local communities and the society at large.”

In fact, corporate social responsibility is a comprehensive set of policies, practices and programs that are integrated into business operations, supply chains and decision making in the entire organization. Indian Parliament in its the Companies Act. 2013, clause 135, promulgates that all companies having an annual turnover of Rs.1000 crore or more or net worth of Rs.500 crore or more; or net profit of Rs.5 crore or more must implement CSR policy. The act enables the government to make it compulsory for the companies for spending 2% of their average net profit in the previous three years on various CSR activities mentioned in CSR regulations act. 2014, like Health, Education and Environment issues pertaining to society and country’s sustainable development process.

In the context of India, CSR policy and its implementation has become necessary but the corporate companies in India are still have to realise that CSR engagements are not only necessary for their business growth but also for building trust among their stakeholders and sustainable relationships with them and in this process, the CSR contributes into sustainable development of the society and the country at large.

**KEY AREAS FOR CSR ACTIVITIES-**

Considering CSR Activities just for charity or donations is the biggest mistake for any company in this highly business competitive environment. In fact, Indian companies should see as the integral part of corporate strategies that enable to enhance the brand image of the company. Now, CSR has been emerging as the valuable strategy for any company to survive in the competitive business environment.

There are several new factors are responsible for promoting CSR like, globalization, advancement in communication, sustainable development, governance, leadership, competitive advantage and ethical culture.

Indian corporate companies are involved these days in many CSR activities like Health issues- Hunger, Malnutrition, healthcare and sanitation ; Day care centres for children for underprivileged sections and specially abled children; Education for underprivileged sections for the society, granting of scholarships, financial assistance for education, Gender equality and empowerment of women, care for senior citizens, environmental protection and sustainability, protection of national heritage , arts and culture, philanthropies, rural development, adopting villages, and in natural calamity and disaster helping the government.

**REPORTING CSR ACTIVITIES AND SUSTAINING THE STAKEHOLDER RELATIONSHIP: -**

The Goals of Sustainability can be achieved when the reporting or communication of CSR activities are done for the consumers or stakeholders. The stakeholders or society members only can be associated or connected to corporate companies when they will communicate through various media about various CSR activities and only then the goals of sustainable development could become much easier. The key of CSR is “To Give Back” to the society, to take care of underprivileged ones by spending out of their profit from responsible and ethical business.

Even, corporate companies in India now have started to report or communicate about their CSR engagements via various media of communication but maximum companies are using one major media, digital media and their websites of companies. They do stay away from using all media like Newspapers, News magazines, T.V. channels, Radio, Films. The main reason behind this is the notion that corporate social responsibility activity belongs to charity or donations, it is not for publicity and communicating openly through various media would term it as publicity. And here the chain of sustainable development process gets broken as the notion behind this prevent to use CSR as a tool for branding and profit, so no more profit share are spent by the companies for CSR activities and thus, efforts for sustainable developments goals get hampered.

**OBJECTIVES OF THIS RESEARCH PAPER: -**

The prime objective of this research study is to find out whether corporate companies in India report or communicate their CSR activities to their stakeholders or consumers on digital media. The following are the key objectives behind this study-

1. To find out to what extent the corporate companies in India report their CSR activities on digital media platforms;
2. To find out, to what extent companies in India use all digital media platforms like News portal, News websites or only their official websites;
3. To find out what kinds of CSR activities are reported in detail on the digital media platforms;

Now, there is a need of clarification that the old perspective on CSR emphasized on Corporate Philanthropy which means charity for Social, Cultural and Religious purposes, while Modern Perspective emphasized on long term interest of stakeholders and sustainable development.

The objective of this paper is also to find out that why and how CSR communication is a necessary tool for any organization in order to achieve the sustainable development goals and for good governance in the society and the country by connecting the stakeholders and consumers to the company.

**METHOD OF THE STUDY**

Corporate companies in India now have realized for reporting their CSR activities in present time. To achieve the objectives of this study, the case study method is adopted here. Almost all corporate companies perceive the same notion for CSR activities, so it was found suitable the case study of one corporate company as a sample to arrive on the conclusions for the companies in India in this research study. "Mother Dairy" company has been selected as One Sample for the study and its region of the sample is Delhi NCR. The Data of this study will be primary as the company has given all data related to its CSR activities on their company websites.

For this study, primary data from the company website and secondary data in the literature reviews have been taken into consideration.

The data related to CSR engagements available on the website of the company, Mother Dairy, have been analysed for deriving the conclusions of this research study. Mother Dairy, the company has made available its all CSR related policy data, program data on the official website. Generally, the companies are supposed to provide the links of all other data of their CSR engagements communicated on other digital platforms on their websites. But what is the general status of all corporate companies in this regard, will be investigated and analysed by analysing the Mother Dairy CSR data on the digital media and on the official website.

**CURRENT SCENARIO OF CSR IN INDIA- A REVIEW**

The need of undertaking Corporate Social Responsibility by companies has been introduced in Section 135 of Companies Act, 2013 (official website MCA, Govt. of India). This section requires to read along with Companies (Corporate Social Responsibility Policy) Rules, 2014 and Schedule VII to the Act. Section 135 (website, MCA, Govt. of India) and it envisions that-

- (1) Those company having net worth of rupees five hundred crore or more, or turnover of rupees one thousand crore or more or a net profit of rupees five crore or more during any financial year shall constitute a Corporate Social Responsibility Committee of the Board consisting of three or more directors, out of which at least one director shall be an independent director.
- (2) The Board's report under sub-section (3) of section 134 shall disclose the composition of the Corporate Social Responsibility Committee.
- (3) The Corporate Social Responsibility Committee shall – a) formulate and recommend to the Board, a Corporate Social Responsibility Policy which shall indicate the activities to be undertaken by the company

as specified in Schedule VII; b) recommend the amount of expenditure to be incurred on the activities referred to in clause (a); and c) monitor the Corporate Social Responsibility Policy of the company from time to time.

- (4) The Board of every company referred to in sub-section (1) shall, – a) after taking into account the recommendations made by the Corporate Social Responsibility Committee, approve the Corporate Social Responsibility Policy for the company and disclose contents of such Policy in its report and also place it on the company’s website, if any, in such manner as may be prescribed; and b) ensure that the activities as are included in Corporate Social Responsibility Policy of the company are undertaken by the company. (5) The Board of every company referred to in sub-section (1), shall ensure that the company spends, in every financial year, at least two percent of the average net profits of the company made during the three immediately preceding financial years, in pursuance of its Corporate Social Responsibility Policy: Provided that the company shall give preference to the local area and areas around it where it operates, for spending the amount earmarked for Corporate Social Responsibility activities. Provided further that if the company fails to spend such amount, the Board shall, in its report made under clause (o) of sub-section (3) of section 134, specify the reasons for not spending the amount. Explanation. – For the purposes of this section “average net profit” shall be calculated in accordance with the provisions of section 198. Accordingly, every company – private company or public company, beyond the thresholds specified below is required to constitute CSR Committee: Net worth of Rs.500 crore or more; or Turnover of Rs.1000 crore or more; or Net profit of Rs. 5 crore or more during any financial year.

The Board of every company referred above shall ensure that the company spends, in every financial year, at least two per cent of the net profits of the company made during the three immediately preceding financial years in pursuance of its CSR policy.

Schedule VII of Companies Act, 2013 describes activities to be undertaken as CSR following:

1. Eradicating hunger, poverty and malnutrition, promoting preventive health care and sanitation and making available safe drinking water;
2. Promoting education, including special education and employment enhancing vocation skills especially among children, women, elderly, and the differently abled and livelihood enhancement projects;
3. Promoting gender equality, empowering women, setting up homes and hostels for women and orphans; setting up old age homes, day care centres and such other facilities for senior citizens and measures for reducing inequalities faced by socially and economically backward groups;
4. Ensuring environmental sustainability, ecological balance, protection of flora and fauna, animal welfare, agro forestry, conservation of natural resources and maintaining quality of soil, air and water;
5. Protection of national heritage, art and culture including restoration of buildings and sites of historical importance and works of art; setting up public libraries; promotion and development of traditional arts and handicrafts;
6. Measures for the benefit of armed forces veterans, war widows and their dependents;
7. Training to promote rural sports, nationally recognised sports, Paralympic sports and Olympic sports;
8. Contribution to the Prime Minister’s National Relief Fund or any other fund set up by the Central Government for socio-economic development and relief and welfare of the Scheduled Castes, the Scheduled Tribes, other backward classes, minorities and women;
9. Contributions or funds provided to technology incubators located within academic institutions
10. Which are approved by the Central Government
11. Rural development projects

Corporate Social Responsibility (CSR) is a concept whereby companies besides their profitability & growth also consider the interest of society and environment, by taking responsibility for the impact of their activities on stakeholders, environment and all other members of the public sphere. CSR is not same as philanthropy/Charity because CSR is not a selfless act of giving and companies derive long term benefits from the CSR initiatives. Globalization, Governments, Inter-Governments bodies (e.g. U.N., OECD, ILO) Advancement of communication technology, Awareness among stakeholders are some of the various factors which affect the CSR policy of companies.

Triple Bottom Line approach developed by John Ellington in 1997 represent the relation among Corporate, Society and Environment and how it works towards corporate sustainability.

### **LIMITATION OF CSR POLICY IN INDIA AT PRESENT**

No incentive if company pays more than 2% of net profit. Carry forward of such a contribution not being mentioned under the provision of CSR. It means if any of the company not able to spend 2% of average profit in any financial year so that expenditure not being carry forward for next year. Company does not have adequate profits or is not in a position to spend prescribed amount on CSR activities, the directors would be required to give suitable disclosure/reasons in their report to the members. It is not clear whether the Section 25 companies or charitable organizations set up by them would be included towards CSR. Contribution to the Prime Minister's National Relief Fund or any other fund set up by the Central Government for socio-economic development and relief and welfare of the Scheduled Castes, the Scheduled Tribes, other backward classes, minorities and women; provides a safe guard for companies which are not taking CSR initiative.

In the above perspectives of CSR guidelines given by Government of India, there is a need of examining how these CSR engagements or activities connect or relate to society members as consumers and stakeholders. Also, how the companies get morale boosting for engaging more themselves in CSR activities.

The answer lies in interactions and communication process among the corporate companies, governments and stakeholders that pave the way of sustainable development. In our research study, how the corporate companies are communicating to their consumers or stakeholders and what media of communication they are using, have been investigated through the case study of one sample company- Mother Dairy.

### **DATA ANALYSIS**

This study has chosen 'Mother Dairy' corporate company in the field of consumer food products as the sample of the universe and the website of this company as the digital media communication has been chosen for the data analysis.

Our study of data analysis given on the website of Mother Dairy has found that 'Mother Dairy' based its corporate office in Delhi NCR, India, has not separate page for CSR & Sustainability on the company's official website. The company states on its website about its CSR Policy statement, vision and mission, CSR scope and objectives. The company has also mentioned how its CSR board committee will implement CSR engagements. Finally, Mother Dairy, also mentioned on the website about reporting of CSR activities by the tool of annual board report in meeting and reveal this report to the public.

The Company, Mother Dairy, has not bothered about the various CSR activities or programs it organized in public for social causes on its official website. Why? The reason is obvious that the CSR policy of Mother Dairy does not assume CSR as the activity for sustainable development process, so CSR communication has not been given any place in the policy of the company.

Although, Mother Dairy has been communicating its various CSR activities- like Green Initiatives taken by the company for saving tons of plastic and using alternate resources through other medium of communication like it published via news report in "Business Standard", an English Daily, 20 July, 2013, but why the company has not posted this event on its official website. It is question marked on the intentions and assumptions of CSR initiatives implemented by Mother Dairy. Here, the company should have done better when it would have adopted CSR communication in the CSR policy.

The company has begun its safe and nutritious food for everyone in the society and its report was posted on the website of FSSAI which government website in the form of report is.

The company implements very few corporate social responsibilities programs occasionally but its report to only government agencies and only few coverages in print media do not make aware the general public about Mother Dairy's CSR engagements. So, here the company, Mother Dairy, lacks the vision in its policy regarding CSR and its communication to all stakeholders.

Mother Dairy website does not describe all CSR engagements and do not disclose what budget they have spent on it in the last three financial years. It is not proper following the regulations of CSR act. 2014.

Clearly, Mother Dairy, do not believe in using CSR activities as their strategic tool and for using in their brand enhancement. Even, the company is not following all rules related the CSR act.

The company has mainly focused on Health-related issues and safe and nutritious food campaigns which gives the way for advertisement for their products. These small camps and outlets when World Food Day organized

by Mother Dairy are very small initiatives of CSR taken by the company. But what about other CSR activities like Health, and Environment, and more?

Sometime company has organized campaigns for traffic awareness programs which was commended in media. But the surprising facts are Mother Dairy do not want to report or communicate all these widely on proper platform. Why? The answer lies in the intention and policy lack of Mother Dairy which prevents it to use CSR as the tool for brand enhancement and the tool for sustainable development process.

Digital media are now so accessible to all sections of society and the company can make its reach to all its stakeholders by using the tool of CSR, communicating CSR activities on various digital media website. But surprisingly, when Mother Dairy has not given on one digital media platform, its own website, enough report, various programs listing, budget spent, then what is the point? Mother Dairy will think of other digital media platforms like news media website, social media website like Facebook, twitter, etc.

There is certain kind of inhibitions the companies like Mother Dairy adopt while reporting or communicating about CSR. In the way, it is the kind of Reactive Approach of CSR communication the companies adopt while reporting their CSR engagements. Mother Dairy has not even bothered to use digital media as the tool for reaching to consumers and stakeholders and connect them for their company brand. The reason is not so simple. It is fear and inhibitions the company has for not communicating openly about CSR activities. But, in fact, it is wrong assumptions, wrong fear, and when Mother Dairy remove this fear and inhibition and do proactive approach CSR communication its stakeholders base will be more strengthened, and they will contribute more towards sustainable development process.

#### **DISCUSSION & CONCLUSION**

This study has focused upon the CSR reporting and communication done by Mother Dairy company in the last two financial years. The annual reports of the company in PDF form were found posted on various government websites, but the company has not dedicated any separate website for CSR engagement. It reflects the inhibitions of the company, Mother Dairy.

The above data analysis reflects that Mother Dairy has posted though the policy of CSR (posted on its website) but did not mentioned regarding the uses of various media platforms to communicate its CSR activities to its consumers, stakeholders and to the society.

This research study has proved that the Sample company- Mother Dairy, has not revealed to the public or society about its expenditure on CSR engagements. The company assume that they have submitted their report of CSR to the ministry of Company affairs in its annual general meeting of board and it is published in newspapers and is enough for stakeholder's connectedness with the company, No, it is wrong assumptions. When the companies do proactive communication on CSR openly among public media platforms the image of the company gets boosted among consumers and they support good causes for which the company engage in CSR programs.

Digital media presently give the opportunity for any company to connect consumers and stakeholders for taking support and spending their profits on CSR actually gives more return in future.

So, our study finds that Mother Dairy, has not conceptualized the CSR communication as a tool, using digital media as a tool for reporting CSR and communicating to consumers and in this way, the company is lagging to contribute towards sustainable development goals of the society and the government.

The objective of this research study- to find out why corporate companies do stay away from communicating their CSR activities in various media to their stakeholders conclude that the companies do hesitate for the public scrutiny and questions from media for their expenditure on CSR programs and details of the CSR engagements among public and to its stakeholders.

The study also gives the conclusion that corporate companies do not have honest intentions while taking on CSR and Sustainability programs in their business policy.

#### **RECOMMENDATIONS**

This case study derives some suggestions for the corporate companies and the governments in order to achieve the goals of sustainable development-

**First**, the Government (ministry of Corporate affairs), corporations, and experts and educationists in CSR field should come on common platform where the notion of CSR as a just charity or philanthropy could be replaced by CSR as "Business strategic tool", as tool for sustainable development goals and the tool for brand enhancement of corporations in India.

**Second**, the Government must come up with more stringent laws and regulations to make sure the corporate companies spend the minimum 2% of their net profit on corporate social responsibility activities and for sustainability programs to achieve goals of sustainable development in India.

**Third**, Corporate leaders and expertise must think over the concept of linkage of CSR and Sustainability programs with brand image of the company and must think the CSR expenditure as the investment for further creating more stakeholders in favour of the company.

**Fourth**, Corporate companies must emphasize upon the CSR communication by using various media channels and platforms and adopt pro-active approach of communication for reaching to all stakeholders and create ethical business environment in order to achieve sustainable development goals.

### LIMITATIONS OF THE STUDY

As the research topic suggest, our study was limited to one aspect of CSR, i.e. digital media communication for CSR activities. For the study, case study method was adopted and there are some limitations in case study method for the research. Only one sample in our research delimit the scope of our study and the results may vary for different segments of corporate companies. But, generally, as far as CSR communication is concerned, our literature reviews suggest that corporate companies do adopt negative and re-active approach and inhibit while reporting and communicating their all details of CSR activities.

This research study can be further investigated using “triangular method” and using two research methods to come arrive on more clear conclusions.

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**FUTURE OF MOBILE JOURNALISM IN INDIA**

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**ABSTRACT**

*Mobile Journalism (MOJO) is new trend in Indian media industry. The term MOJO has been in use since 2005. This term was originated at the fort myers news-press and then gained popularity throughout the Gannett newspaper chain in United States. MOJO is a solid proof that shows how media industry is changing rapidly. Prof. Marie Elisabeth Mueller says, "other media formats will die if they don't change." Basically Mobile journalism is a cheaper tool in comparison to recording by camera. It is very easy to cover stories with mobile phone however sometimes it is very challenging also. This is very small device so it does not attract security attention as a traditional film crew. MOJO made process of working very smooth. Researches reveal that nowadays cost cutting is an important factor in media houses all over the world. So MOJO is becoming very popular in TV Media Industry. In India, NDTV has initiated to cover many stories on mobile phones. Mobile phones are replacing TV also. Young generation is taking information on mobile phones. This a great tool for social media. In Journalism, this is useful because of its portability. Mobile phone is very easy to handle and to operate. This is all in one instrument for TV Journalism. JV journalist believe in MOJO because many things are done easily on mobile phones- recording the event, editing, sending, contact, taking information from internet, watching the news etc. Citizen journalists are also using mobile phones as MOJO. This research paper is focused to know the future of MOJO in India.*

*Keywords: Media industry, MOJO, recording, Fort Myers News-Press*

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**INTRODUCTION**

Now smart phone is not only a device for talking or exchange of messages but this has multi-faces use and MOJO is one of them. This has changed the definition of video production. Video production is time consuming and not so easy. It needs involvement of so many people.

MOJO is very helpful form to make video production at low cost. This is the reason why this is gaining popularity in media. This is faster, flexible and affordable also. This motivates journalists to work with their smart phones. Now mobile phone is very important equipment in media industry. This has changed the entire face of TV media.

The internet has helped media industry too much. Because of internet people are accessed to media easily. In the age of internet, the role of mobile phone has increased.

As per International Journalists Network website, "Mobile journalism (mojo) is a new workflow for media storytelling in which reporters are trained and equipped for being fully mobile and fully autonomous. Journalists, media companies and broadcast corporations are aware that there are several benefits of doing things this way."

**BACKGROUND**

Mobile news publishing involves many means of distribution, from customised news alerts by SMS or MMS to mobile news sites and convergent mobile news applications. Rima Marrouch writes: "Mobile phones are a crucial piece of equipment changing not only the way readers and viewers consume the news today but also sometimes the way the content is being produced. Mobile phone with a camera capacity is a product of the mid-1990s; video capacity came a few years later. Today, there are around six billion phones around the world, many of them smart phones. There was a moment in the recent history of journalism when mobile journalism (also called mojo) seemed to be the next big thing. The use of content recorded with a mobile phone kicked off with the iraqi invasion in 2003. Footage shot on a mobile phone were also important during the madrid bombings and in tsunami coverage. The peak of this type of media production content came during the 2005 london bombing."

**OBJECTIVE**

- To find out the importance of Mobile Journalism in present time.
- To know its role in future
- To know the reasons why it is why it is being adopted in media.
- To know more uses of mobile journalism in India.

LITERATURE REVIEW

MOJO is in early stage in India. Therefore very few researcher are focusing on this topic however research work on MOJO is going on all over the world.

Sajid Umair of National University of Sciences and Technology (Pakistan) has written a very good research paper with the title- ‘Mobile Reporting and Journalism for Media Trends, News Transmission and its Authenticity.’ In his research paper he analyses- “Mobile reporting is defined as generating reports using mobile phone cameras and digital cameras. Most of the mobile reports are citizens generated. Whenever an incident happens, citizens capture live and send it to reporting authorities or share it on social media. Social media i.e. twitter, facebook are the most common and largest means of spreading any news or incident. Before the advent of these platforms, only radio and news channels were the basic source of incident reporting. Nowadays, more content related to any incident can be found on internet rather than TV channels and radio channels. Mobile technology has changed broadcast journalism rapidly.”

Nishant Nayyar has written a write up titled ‘Mobile Journalism – the new trend in Media.’ He analyzed many factors- “MOJO is doing more than just changing how news is gathered, packaged and distributed by professionals. It is also democratising the role of reporter. For example, the video streaming applications make it possible for almost anyone to broadcast an event live, with little or no editorial filter. The whole content is so raw and original that any independent journalist or a blogger has the opportunity to create news. But this journalism threatens the big media houses who are accustomed to vetting and analysing every story before it goes public. Reporting has always been a collaboration between the journalist and their sources. But with the introduction of MOJO, the scope of the sources has been altered altogether.”

A research article- ‘Mobile Journalism as Lifestyle Journalism; Field Theory in the integration of mobile in the newsroom and mobile journalist role conception’ written by Gregory Perreault and Kellie Stanfield has many angles- “Mobile journalism is one of the fastest areas of growth in the modern journalism industry. Yet mobile journalists find themselves in a place of tension, between print, broadcast, and digital journalism and between traditional journalism and lifestyle journalism.”

‘Mobile journalism and the deprofessionalization of television news work’ is a research article written by Justin C. Blankenship. He has pointed out- “Mobile journalism, whereby a single reporter must write, shoot, and edit their own news stories, is a rapidly growing trend among local television news organizations in the United States and around the world. Using qualitative case study methodology, specifically in-depth interviews and observation, this study compares “mobile journalists” with journalists working within a traditional television news crew, in which a reporter concentrates on the writing and interviewing aspects of newsgathering and a videographer concentrates on the audio/video production.”

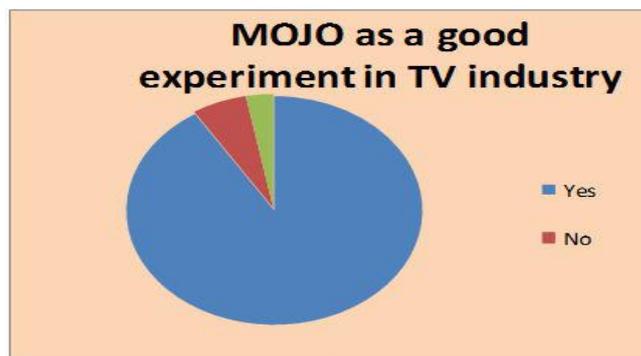
METHODOLOGY

This is an analytical study. As primary data, a survey has been conducted to know why mobile Journalism is becoming popular. Near about 200 TV journalists including MOJO journalist were part of the survey. Apart from this, secondary data from different sources as research papers, articles published in journals, magazines, newspapers, websites have been collected.

Analysis & Discussion

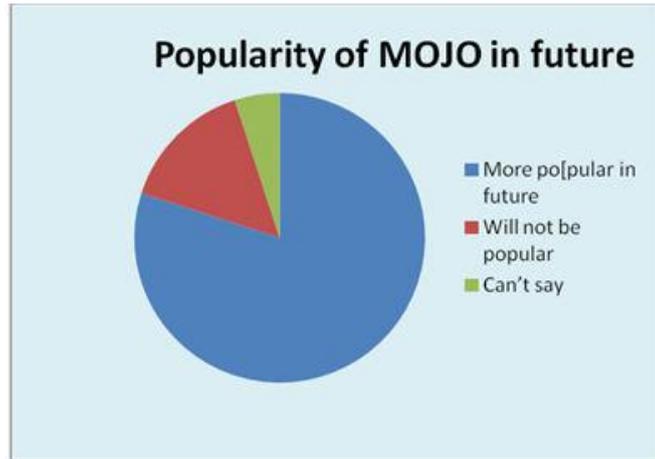
1. Do you think that MOJO is a good experiment in TV industry?

- (i) Yes-----91%
- (ii) No-----06%
- (iii) Can’t say-----03%



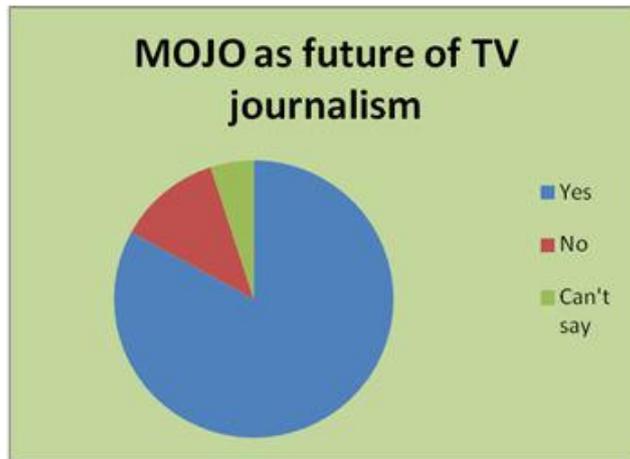
2. What is your opinion about the popularity of MOJO in future?

- (i) This will be more popular-----80%
- (ii) This will not be popular-----15%
- (iii) I can't say-----05%



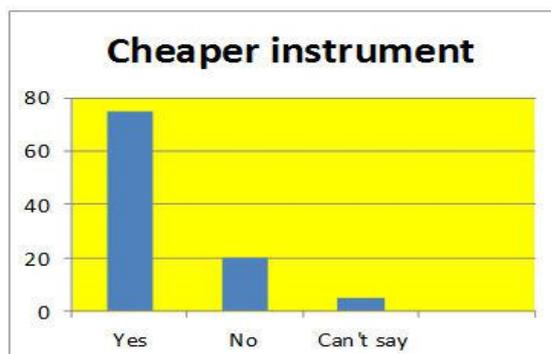
3. Do you agree that MOJO is future of TV journalism?

- (i) Yes-----83%
- (ii) No-----12%
- (iii) Can't say-----5%



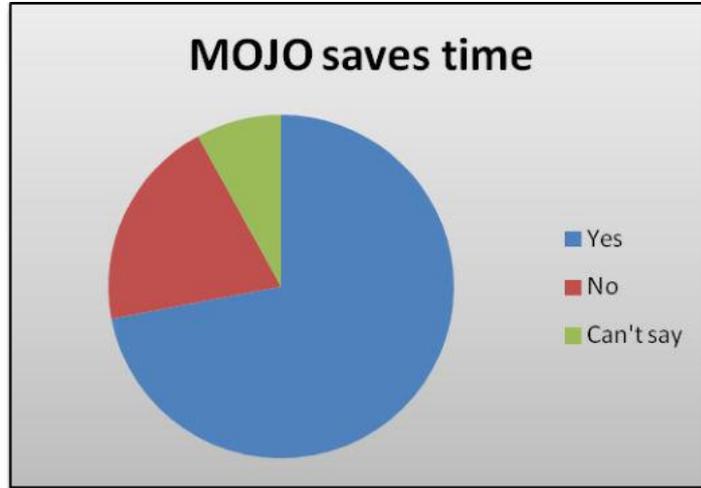
4. Do you think that MOJO is used in TV channels in India because this is cheaper instrument in comparison to heavy video cameras?

- (i) Yes-----75%
- (ii) No-----20%
- (iii) Can't say-----5%



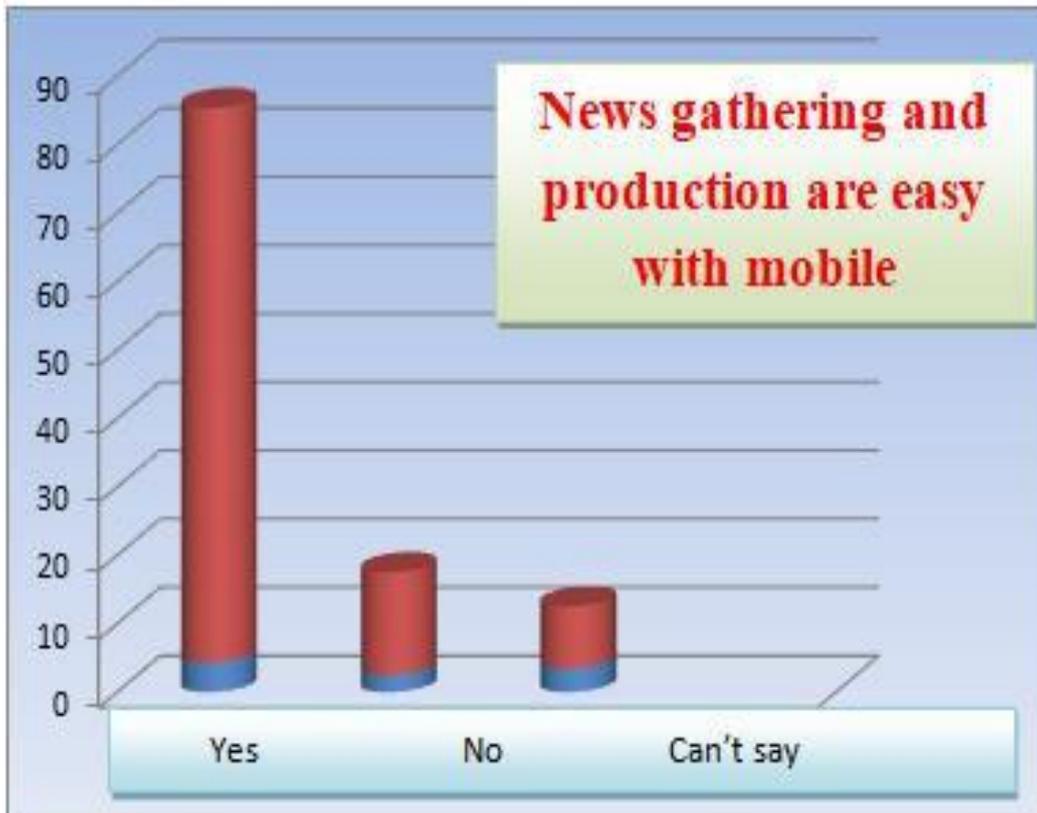
5. MOJO is suitable for TV journalism because this saves time. What is your opinion?

- (i) Yes-----72%
- (ii) No-----20%
- (iii) Can't say-----08%



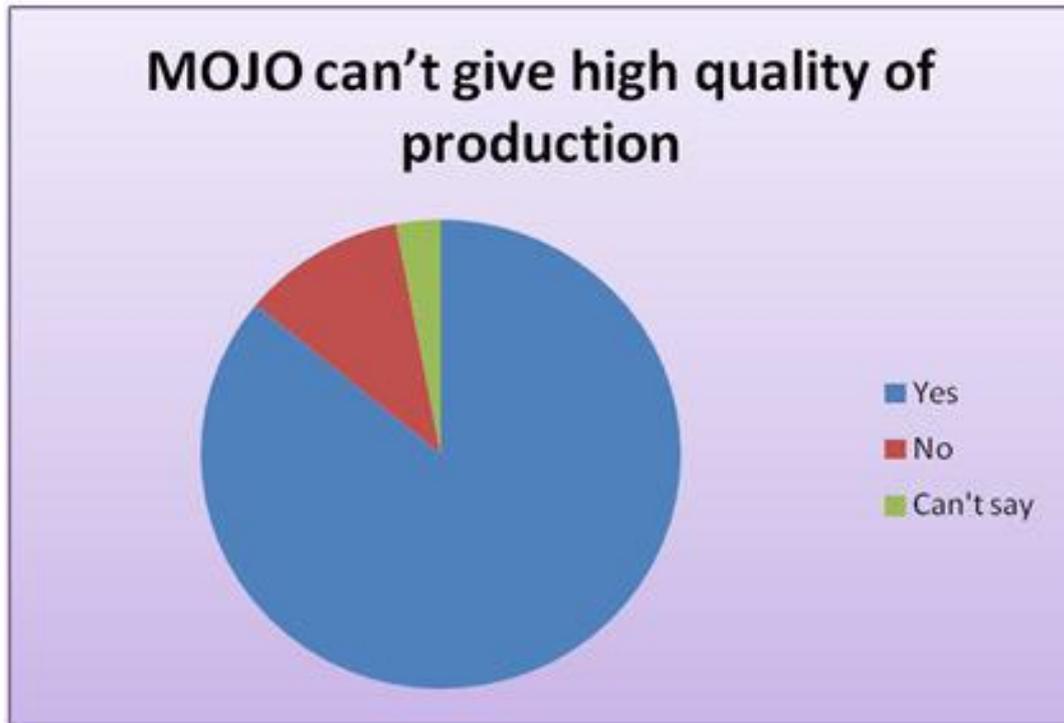
6. Do you agree that news gathering and news production are easy with mobile?

- (iv) Yes-----81%
- (v) No-----15%
- (vi) Can't say-----09%



7. MOJO can't give high quality of production. What is your thinking about this?

- (i) Yes-----86%
- (ii) No-----11%
- (iii) Can't say-----03%



### FINDINGS AND CONCLUSION

A survey was conducted to know many questions about MOJO. TV and mobile journalists participated in the survey. On the basis of analysis of survey report, followings are the results:

- 91% people think that MOJO is a good experiment in TV industry.
- 80% people think that MOJO will be more popular in future.
- 83% journalists agree with the point that MOJO is future of TV journalism.
- 'MOJO is used in TV channels in India because this is cheaper instrument in comparison to heavy video cameras.' This is the opinion of 75% journalists.
- MOJO is suitable for TV journalism because this saves time. 72% journalists think so.
- 81% journalists agree that news gathering and news production are easy with mobile.
- 86% people say that MOJO can't give high quality of production? What is your thinking about this?

MOJO will be more popular in India. This has many features- low cost, easy to handle, time saving, money saving etc. In spite of these all, sometimes it does not maintain quality.

### MANAGERIAL IMPLICATION

Advanced technology of mobile phone will change the working style of journalists and the nature audiences to consume content. This research will be very helpful for media people, reports, video editors and audience also. The media houses can manage their costs after reading this research paper. This study can help citizen journalists also.

### LIMITATIONS AND RECOMMENDATIONS

The video from a mobile phone camera can be almost identical in quality. So this is a problem with MOJO. There are many other challenges to keep in mind:

- Mobile phone quality
- Lens quality
- Steady shots
- Audio
- Light
- Frame.

Another research work can be conducted to know the opinion of audience.

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**INDIAN HINDI CINEMA PROMOTIONS AND MARKETING THROUGH DIGITAL MEDIA**

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**ABSTRACT**

*Advanced media is PC mediated innovation that permits us distinctive manifestations and sharing of thoughts, considerations, data, profession intrigue and numerous different things as articulation through the PC arranges. Its web-based application and encourages the improvement of informal online organisations by associating the client's profile. Facebook, Twitter, and other versatile applications are assuming a critical job in film advancement. Film advancement has been currently considered as essential as real the creation of the film. The film has additionally begun using the capability of new media entirely as far as showcasing and advancements. It has utilised the new press just as web-based life gathering to make individuals mindful of the film and to drive them towards the theatre. It is where a positive meeting are accessible. Presently through electronic media, it's conceivable to make everything likely just in a single tick, and it will reach to the correct target gathering of people. Computerised media creates as an essential piece of the excellent target film going a group of people.*

*Keywords: Four P's of Film Marketing, Digital Media, Film Promotion, YouTube, Facebook, Twitter.*

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**INTRODUCTION**

Computerised media advancement is a procedure for improving digital media like YouTube, Instagram Facebook, Twitter. It is a procedure of picking up consideration through various social locales. For example, Facebook is a social site where anybody can share, as and remark on photographs, recordings though twitter resembles where short messages are distributed. In contemporary time numerous movie producers and promoting organisations are utilising distinctive social locales for the fabulous guarantees of their item. For a similar reason, current movies are going to use these social locales to advance their films at a quick pace. Recordings are intended to influence the gathering of people. Film industry makes a film and needs the group of onlookers to pay and watch them. In contrast to different types of innovativeness, it is hard to anticipate slants in the motion picture industry. As the film business is profoundly unstable, the way toward disseminating and showing film has progressively moved toward becoming as vast as the original film making process. Marketing as a field of training, however combative, is considered continuously as enormous as the real creation of the item. Like each other part, the motion picture industry is likewise holding onto showcasing as its first segment like the original film making process. Advancement is a fundamental piece of any discharge as it includes high budgetary hazard. Without legitimate showcasing of a motion picture, a motion picture with ridiculous plots, characters, sets neglect to draw in a group of people. Showcasing, more or less, is selling and promoting. With time, it has reshaped its fringe to incorporate fulfilling client needs, advancing items productively and making esteem loaded trade with clients. Supporting hence is to put the correct thing at the convenient spot and at the perfect time. The '4 P's' are the components of promoting and most likely the best-known method for concocting a showcasing plan. They are an item, value, advancement, and spot.

**4PS CONCEPT APPLIED TO THE FILM INDUSTRY****I. PRODUCT**

The film is considered as an item that is expected to fulfil its takers, for example, gatherings of people. A fruitful advancement and advertising plan of the motion picture should begin with making the substance, for example making the film. A dynamic content bolstered by an original screenplay is in the core of film advancement as it chooses the last gathering of people who are heading out to watch the motion picture in theatres. Albeit different components are essential in promoting the system, the item film ought to be considered as most noteworthy in illustration the consideration of the crowd.

**II. PRICE**

For a group of people, the estimating structure is the thing that he pays in the performance centre for a ticket. Components too which result in many returns for the maker, the wholesaler, and even the critical, innovative ability. Parts incorporate Theatrical discharge schedules<sup>[1]</sup> Territories and market segments<sup>[2]</sup> Revenue parts, rates and request of instalment Promotion and so on. Promotion spending plans Besides there is a broad scope of valuing structures, for example, showy tickets, aggregate 4-divider rentals, title rentals, title deals, exceptional discharges, membership administrations, celebrations, DVD composes, downloads, postponed communicates, pay-per-see, licenses, packaged arrangements, link stations and now films and recreations on mobile phones, on iPods, on electronic bulletins and so on.

**III. PROMOTION**

- ❖ Advancement for movies takes numerous structures:
- ❖ Print publicising (notices and promotions in papers and magazines)
- ❖ Trailers (screened at films and on Television/radio)
- ❖ Web destinations (counting Facebook 'fan' pages)
- ❖ Marketing — books, shirts, sustenance, soundtrack <sup>[L]</sup><sub>SEP</sub>CDs, PC amusements, toys, vehicles, cell phones, whatever can be related to the brand of the film.
- ❖ Viral Videos

**IV. PLACE**

With the appearance of innovation, the 'Spot' isn't constrained to the theatre or conventional transmission. Presently it is open effectively through an assortment of modes like pay per see through direct-to-home communicate, over the web, through person to person communication destinations, mobile phones and other handheld gadgets, co-marking and marketing, music CDs and DVDs, etc. The computerised renaissance has opened plenty of stages, systems and organisations than any time in recent memory as RSS channels, Blogs, devoted sites, diversion destinations, portable applications and so on to get the motion picture 'Item' as and when required.

**YOUTUBE IS THE BIGGEST PLATFORM FOR FILM PROMOTIONS**

A short time later, the motion picture is made, the maker of the film sees how to advance the, so it gets along nicely in the cinema world. YouTube is the most noteworthy computerised media stage that connects with a large number of a gathering of people who watch recordings every day. A YouTube crusade is a savvy method for elevating the motion picture to a focused on a set of a group of people. The promotion that relates the storyline or the in the background features can be shared on YouTube to catch the eye of the watchers. These days different films are being advanced on YouTube before their discharge. The enhanced visualisations, music and the dynamic voice that relates the storyline trap the group of onlookers while viewing the promotions. The public interview recordings where the performers share their encounters while making the motion picture, computer games where the players experience the characters in the film, blame in the movie are different ways one can hold the consideration of its gathering of people. Sharing such substance on YouTube has turned into a primary device for getting a presentation for the new discharge. Promotion of the following motion picture in the performance centres is not adequate to make an imprint in the cinematic world. Computerised media bolsters in alluring the watchers in the film and produces energy around it before it discharges.

**FAMOUS PEOPLE PROMOTION MOVIE ON FACEBOOK & TWITTER**

Crafted by motion picture advancement on Facebook isn't merely restricted to computerised advertisers. Indeed, even big names who are a piece of the motion picture utilise the advanced media stage to interface with their group of onlookers. The watchers of today need to know everything identified with the motion picture performing artists and the creation of the film. Facebook and Twitter help the on-screen characters to draw near to their fans. The fans pursue the VIPs Facebook profiles notwithstanding amid the days the film is being made. Bringing in the group of onlookers amid the creation of the film, uncovering data identifying with shooting areas, looks and outfits is a conventional method to catch their advantage. Famous people's Twitter profiles additionally go far in creating interest and interest in the motion picture. By connecting with the group of onlookers amid the creation of the film, giving them a chance to encounter the story, making inquiries, fun exercises, or by sharing one's very own inclination about the motion picture' the VIPs can help in motion picture advancement on Twitter.

**FILM PRODUCTION FOR PROMOTION**

We turned to Hub Spot for a few statistics to help outline exactly how popular video promotion has become.

- ❖ The Video is projected to claim more than 80% of all web traffic by 2019.
- ❖ Adding a branded video to promotion emails can boost click-through rates by 200-300%.
- ❖ Embedding videos in landing pages can increase conversion rates by 80%.
- ❖ 90% of customers report that product videos help them make purchasing decisions.
- ❖ Digital promotion expert James Mc Quivey estimates that a single minute of video content is the equivalent of 1.8 million words.

- ❖ A third of all the time people spend online is dedicated to watching videos.
- ❖ According to YouTube, mobile video consumption grows by 100% every year.
- ❖ 64% of customers are more likely to buy a product online after watching a video about it.
- ❖ 87% of online marketers are currently using video content in their digital promotion strategies.
- ❖ Video ads now account for more than 35% of all ads spending online.
- ❖ 59% of company decision makers would rather watch a video than read an article or blog post.

### **REASONS FOR FILM PROMOTION TODAY**

The five benefits of video promotion are as follows:

**1. Video content advances brand commonality:-** As per Hub Spot, 80% of clients recall a video they've viewed in the most recent month. Video advancement is very visual and sound-related, which is by all accounts the way to its prosperity – it's simple for most clients to recall than content based substance. A client who recollects your video advancement content perceives your image, which at last means more deals for you. Remember; clients will usually like and share recordings they appreciate, which will extend your online reach. The way to making your recordings as paramount as conceivable is guaranteeing you're keeping them by your image character. Keeping hues, text styles, logos and tone the equivalent in your video advancement as they are in your sites and articles. Even though recordings accomplish things composed substance doesn't, clients should also now be acquainted with the style and organisation of your image's online records.

**2. Video advancement – Boost your site's SEO:-** 65% of organization chiefs visit the source site subsequent to survey a marked video. Along these lines the quality and pertinence of video advancement substance can drastically improve your site's SEO by directing people to your landing page. Video can likewise upgrade your transformation rates: Hub Spot reports that 39% of organization leaders contact the suitable outlet subsequent to review their marked video. The expansion of video to your site and substance will improve your organization's SEO esteem and lift your navigate rates significantly.

**3. Marked Video substance can help support your image message:-** By using branded video in your computerized advancement procedure, you have the ideal apparatus to improve your image's message and make your voice heard. Straightforward highlights like plan and marking, to further developed highlights like voice and substance, video advancement is the ideal method to fortify your image personality and ensure that your clients know your identity.

**4. Marked Video substance can be streamlined for all gadgets:-** A standout amongst the most noteworthy patterns driving the advanced advancement train is a responsive plan. An organization whose content doesn't perform well on a given gadget or program loses traffic and endures diminished transformations accordingly. Luckily, video content is fit for utilization on all gadgets, extending from PCs to cell phones. This grows the video's scope and makes it more easy to understand and purchaser cantered.

**5. Branded video content is just waiting to go viral:-** Ongoing insights propose 92% of individuals who devour portable recordings share them with others. This ramifications of this is stunning, which means video content has a higher offer rate than practically all different kinds of material out there. Figures from Simply Measured demonstrate that video is shared 1,200% more than connections and content joined. Rendering to Diode Digital, 60% of watchers will participate in a video posted before a content post. Since of this, video content is an integral asset for any brand that needs to extend its achieve on the web or appreciate more extensive groups of onlookers. Because of its viral nature, straightforward availability and implicit esteem, marked video generation emerges as the most intelligent approach to approach content advancement in 2018 and past. Customized substance can really affect your gathering of people, and the proof proposes video advancement is the most ideal approach to accomplish this. The capacity to make feeling driven deals is the mystery of its prosperity – clients need to feel directly about their decision and video advancement when done effectively, is the most ideal approach to make this inclination.

### **SIGNIFICANCE OF COMPUTERIZED PROMOTION IN FILM INDUSTRY**

The film business is normally on an articulation out of new and propelled advancement methods to advance a motion picture and focus on a mass gathering of people. Today film advancements have gone past discharging the mysteries and trailers for the film in the theatres. The advancement group spends tremendous endeavours to plan very much organized film advancement procedures with the goal that they can get the gathering of people lining up to purchase the tickets. Advanced advancement in the film business is turning into a successful

method to get the group of onlookers included and build up a solid individual association with them. Computerized advancement scope includes live gushing of music dispatches, Google joint with the group, advanced media challenges, motion picture based amusements, computerized ads on YouTube and so forth. The best advantage of utilizing this medium is that the supportiveness of the system can be easily moderate utilizing execution related measurements. This assists the advanced advancement specialists with making quick choices for the arrangement so they can diminish expenses and increment the viability of the advancement battles.

### CONCLUSION

Online networking, in the ongoing situation, is viewed as a distinct advantage as opposed to passing pattern as a result of its intuitive power. Meeting of various parts of the press is a present pattern in the field of correspondence. Joining alleged customary media with new computerized correspondence gets a progressively viable outcome on the gathering of people. Bollywood big names are currently moving towards computerized media stage for advancing their movies. They post about their up and coming motion pictures from their own Facebook, YouTube, Instagram or Twitter record to get a more and more extensive crowd. Advanced media is currently effectively and logically utilized for the advancement of Hindi film. Bollywood film makers figured it would enough to promote on advertisements, TV and print media. Be that as it may, with the presence of multiplexes, films keep running in theatres for scarcely one to about fourteen days. In this manner an advancement Hindi film through computerized media has anticipated significance. This stage is additionally useful to make advancement increasingly alluring without spending a lot on it; this even the reality why movie producers depend on computerized media stage to advertise their film. Blogging and Twitter is another case of advancing movies by lead performers by Hashtag something what they compose on their divider. The flashed messages over Blog and Twitter make individuals eager to go to the performance centre to watch the motion picture. Executives and makers additionally share their motion picture making encounters and difficulties they needed to experience through computerized media stage; they transferred behind the scene of the film. This was the most energizing method for motion picture advancement in computerized media. The outcome turns out as high ticket deals.

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**THE ROLE OF DIGITAL MEDIA IN THE ACADEMIC DEVELOPMENT OF JOURNALISM AND MASS COMMUNICATION STUDENTS, DELHI**

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**ABSTRACT**

*In the millennial days, the digital media has gained its credibility in different fields like development, business, education etc. There is no doubt that digital media plays an important role in student's life. Digital media is a boon in this era as it continuously grows and made the things easier for everyone. Students from every field rely on digital media and spend their maximum time on it. The digital media is witnessing a change from traditional talk and chalk method to newly invented concepts. This study mainly focused on the students of journalism and mass communication and their academic development in the wide presence of digital media. This research assesses the impact of digital media on the academic development of journalism and mass communication students. The first objective of this research is to study the awareness level of digital media amongst journalism and mass communication students. Second objective is to identify for which reason journalism and mass communication students use digital media. Third objective is to study how the students use digital media for educational purposes and fourth objective is to study why they using digital media to develop and showcase their skills. The quantitative research method used in this study with the help of questionnaire tool for finding the above objectives.*

*Keywords: Digital media, Academic, Development, Journalism, Mass communication, Student*

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**INTRODUCTION**

Now-a-days the significance of digital, Internet-based information and communication systems in education and training is increasing rapidly. The digital media platforms are increasingly used in all the areas of education and have requirements and consequences for the individual and society as a whole. Digital media is becoming the need of the hour with more and more businesses whether educational or non-educational ones entering into the world rapidly. It plays a very important role in today's scenario where everything is technology based, digital media gives us the assurance of instant information, less amount of time and it is easily available for everyone.

The academic sector for students has seen changes over the years, but in the last few decades, the digital technology has completely transform the way students learn in the classroom and it even introduced the learning method beyond the classrooms. All the way from primary school up to university, students are introduced computing skills and are encouraged to have their own laptops, giving them instant access to all sorts of information. In simple words, digital media developed a world where everything is easily available whether it is entertainment or education. Especially the youth which is known as the internet generation is too much into the digitalization and adapt the new technology very quickly. Hence, the contribution of digital media in the academic development for the students of every field is absolutely commendable.

The students of journalism and mass communication are using the digital media for every possible purpose which directly helps them to develop in their academics as well as enhance their skills and talent. Now their worldwide future is developing through the communication, collaboration and innovation, all of which are dependent on the digital media.

**OBJECTIVES OF STUDY**

- To study the awareness level of digital media among journalism and mass communication students.
- To identify for which reason journalism and mass communication students use digital media.
- To study how the students use digital media for educational purposes.
- To study why students using digital media to develop and showcase their skills.

**RESEARCH QUESTIONS**

On the basis of objectives, there are the following Research questions:-

- What is the awareness level of digital media among the students of journalism and mass communication?
  - Why do the students of journalism and mass communication use digital media?
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- What are the reasons for using digital media for educational purpose?
- Why are the students using digital media to develop and showcase their skills?

### REVIEW OF LITERATURE

Glhan Wikramanyake (2005) stated in his research study digital media is a “key component” of education. He found that students show keen interest in learning through digital media and enhanced their skills by their effective effort in the new form of learning. He highlighted that the technology will engross the whole world very soon in a way that become the most used problem solving medium.

Professor Dr. Linda Steiner (2012) wrote his thesis on topic “Social media instruction in journalism and mass communications higher education”. He examined that in what ways social media is being utilising at university level journalism program throughout the country. This research largely concludes that many journalism programs are lacking in social media instruction, use and implementation. Main findings are categorized by curriculum changes at the undergraduate and graduate levels, social media presence of journalism programs throughout the country, top ten journalism programs and their instruction and utilization of social media, best educational practices in social media. He also suggested that the programme should pay more focus on new technologies and skills.

Aisar Salihu Musa, Mohd Nazri Latiff and Nur Salina Ismail (2015) according to their study the usage of social media has been increased at a great speed in the higher institutions. The popularity of social networks changed the way of communication, interaction, investigation and socialisation. Their study was based on the student’s awareness and the usage of social networks among the students of mass communication. Their study claimed that the majority of using the social networks for the collection of data and information and also for the interpersonal communication. According to their study, “Nowadays the students are too much into the social networking and it is really difficult to find the student who is not aware of social media and have at least using one social networking site”. Social media plays an important role in the life of students and their day to day activities revolve around the social media platforms. It also stated that social networks can be used in a beneficial way as the respondents also used it to support their academic activities and also to make friends from far places, report and share information, conduct researches and socialize themselves in the learning aspect. The study stated that the educators of mass communication should introduce the courses of social media in the same field for the mass communication students so that they can devote their most of the time for the study purpose instead of other activities which can be more beneficial for their development in education sector. So that’s how the role of digital media in the development of mass communication students has the great impact.

Raymond Owusu Boateng and Afua Amankwaa (2016) in their research paper stated that the rapidly rising of social media is significantly influencing the academic life of students. The title of their research is “The impact of social media on student academic life in higher education” in which they found out that at least every student makes use of one social media or in other words students are more inclined towards their social media appearance. Their study revealed that the participants are in support of the idea of social media and also agree that it creates a great impact in their academic performance. They also highlighted that social media has been accepted by higher institutions making it a platform where students connects with teachers, fellow students and other higher authorities.

Norazilah Saubari and Mohammad Fazli Baharuddin(2016) conducted the research on the digital literacy awareness among the students in which they stressed on the ways of developing the knowledge performance towards by practicing good skills to deal with appropriate digital tools and also aware with different digital tools which can be used in digital literacy. They highlighted in their study that digital literacy is generally used in the real life for knowledge seeking purpose. The main advantage of digital literacy is that students gain knowledge, information and develop skills even without getting bore which simply indicates that monotony cannot be the barrier in the digital literacy. Students find it more interesting and willingly want to participate in the internet based activities because of the video, animation and sound provided. They also emphasised on the other tools of digital technology like it provides good search engines and other digital platform which is beneficial for both academic and other skills aspects. Their study mainly highlighted that the digital literacy made the things interesting for the students to seek knowledge which can less the burden and increase the willingness to participate in the new technology learning method.

Mohammad Faizil Baharuddin (2016) wrote in his research that digital media especially online surfing, social media develop the various skills, increase the knowledge practice, boost the good communication skill and also disseminate and practicing real information seeking method without having monotony. From the internet based tasks students indulged more because of the video, animation and sound provided. Digital technology also

facilitates good search engines which student can explore, like Google translator, wikis, online dictionaries and even more. However, to fully utilize the digital literacy, the student must master the technology skills. Students must put an effort to explore the digital content sites to gain information for a specific purpose. Students need to know the right way to use the technology, such as skills of writing, knowing a little bit about the interface search engine, ways to use the systems and using the social media. Thus, this study has highlighted the on-going and growing concern for students to aware about the digital literacy which can less your burden for knowledge seeking approach and the new technologies learning method.

Apoorva Trivedi and Rajshree Srivastava (2018) in their research article “An impact of digital technology on academic sector” stated that at a very large scale technology made the various things easier and reduce the hard work which was contributed by the students to gather unlimited written books and journals for acquiring knowledge .They also stated that new technology provides the huge amount of information and helps in learning the new things with the innovative way especially on handy devices and cell phones which means new technology has the easy accessibility. In the article, they also highlighted the teacher’s performance based on technology thus, not only for students but technology plays an important role in teacher’s job also. Students who want to achieve master’s degree and higher education but facing physical and geographical barrier, advance technology made it possible for them to achieve it easily.

**RESEARCH METHODOLOGY**

Quantitative method is chosen for this research. Data was collected using primary data set through the distribution of questionnaire through Google forms among the journalism and mass communication students.

**DATA COLLECTION**

The research made a comprehensive study of various secondary data available which described the digital media academic growth in mass communication field especially in education. The study also employed primary research method and a survey has been conducted on Delhi journalism and mass communication students by employing Questionnaire.

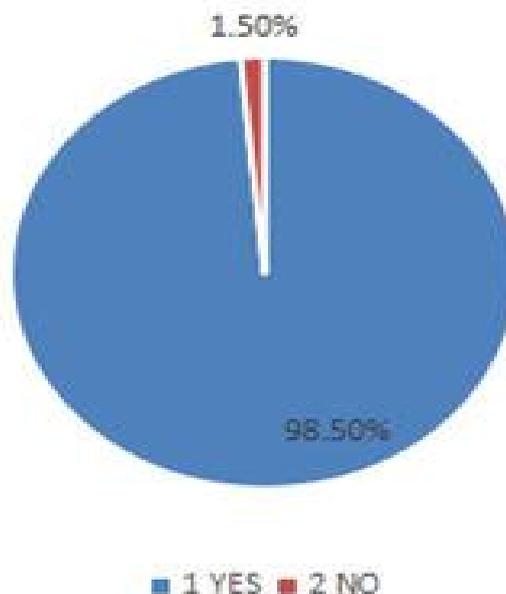
**SAMPLE DESIGN**

The study employed Survey methodology in the form of questionnaire distributed through snow ball sampling method. Google forms were sending to 250 respondents but only 205 responses received through Google forms.

**RESULTS AND FINDINGS**

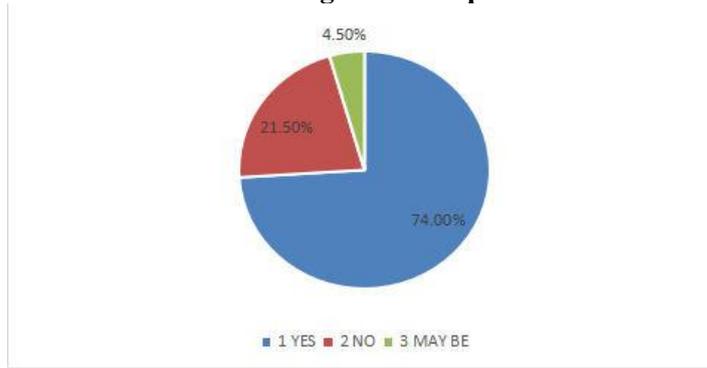
The questionnaire have distributed among 250 students of journalism and mass communication, out of them researcher have received 205 responses and in which 2 respondents skipped some questions so the researcher got 203 responses from the respondents. The demographics were 50.7% (n=103) females and 49.2%(n=100) males. The majority of the respondents were varied from 20 and 22 years old and 33.3% (n=67) respondents were in the range of 21 years old.

**Question 1: Do you use digital media?**



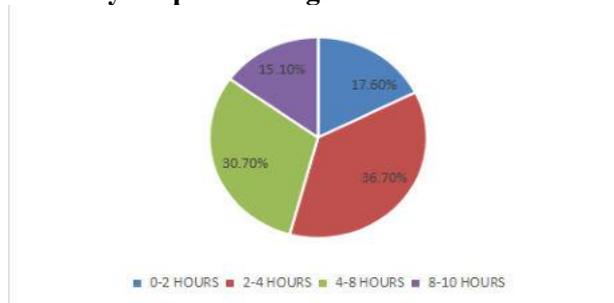
The above data reveals that, 98.5% of the respondents use the digital media while only 1.5% does not use digital media. This clearly shows that the majority of the respondents use the digital media.

**Question 2: Are you well aware of different digital media platforms?**



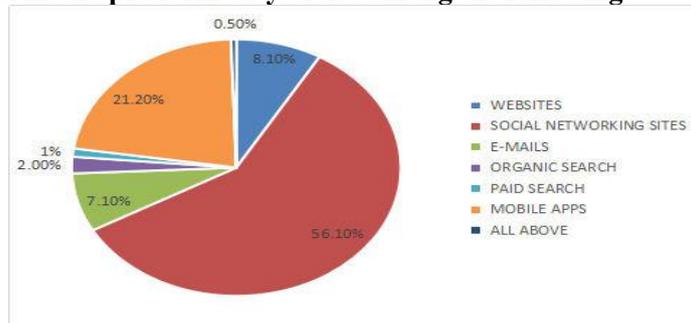
The above data reveals that 74% of the respondents are well aware of different digital media platforms while 21.5 % of the respondents are still in doubt and 4.5% of the respondents are not aware of different digital media platforms. So this shows that the majority is well aware of different digital media platforms.

**Question 3: How many hours do you spend on digital media?**



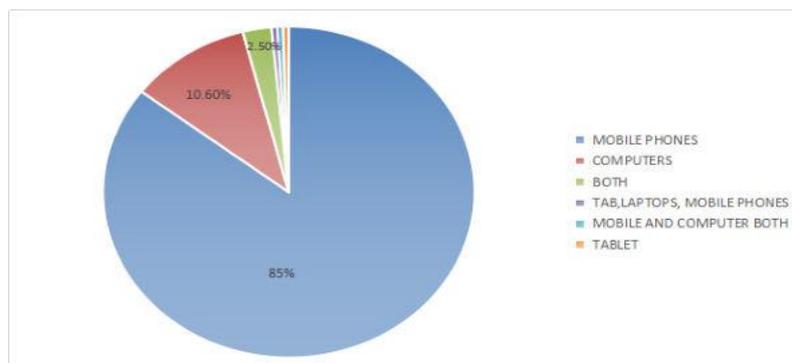
The above data shows that 36.7% of the respondents spend 2-4 hours on digital media , 30.7 % of the respondents spend 4-8 hours , 17.6 % of the respondents spend 0-2 hours and 15.1% of the respondents spend 8-10 hours on digital media. So the majority of the respondents spend 2-4 and 4-8 hours on digital media.

**Question 4: Which digital media platform do you use among the following?**



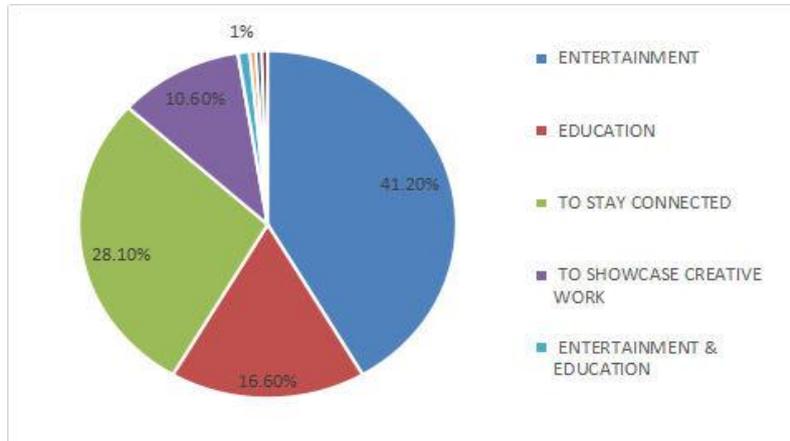
This data reveals that, 56.1% of the respondents use social networking sites while 21.2% of the respondents use mobile apps and 7.1 % of the respondents use E-mails. This data clearly demonstrates that social networking sites are most used platform among the other digital media platforms.

**Question 5: How do you access digital media?**



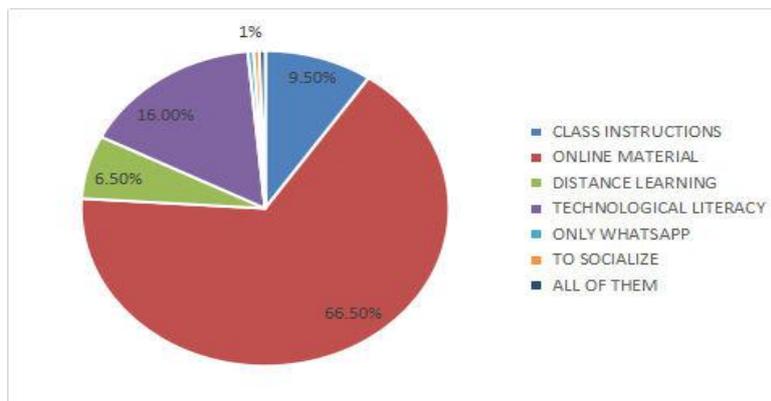
The above data indicates that 85.4% of the respondents access the digital media through mobile phones whereas 10.6 % of the respondents access the digital media through computers and 5% of the respondents access the digital media through both the devices so the study indicates that the majority of the respondents access the digital media through Mobile phones.

**Question 6: Why do you use digital media?**



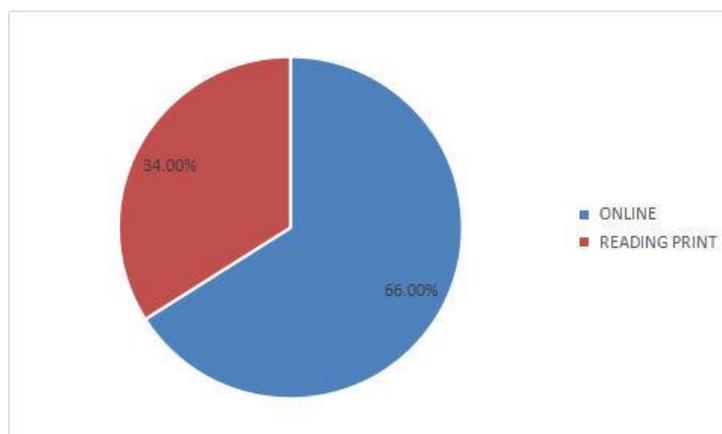
The above data indicates that 41.2% of the respondents use digital media for the Entertainment, 28.1% of the respondents use digital media to stay connected, 16.6% of the respondents use digital media for the Education and 10 % of the respondents use digital media to showcase their creative work So that reveals the majority used digital media for the entertainment purpose and also to stay connected.

**Question 7 : How do you use digital media for educational purposes?**



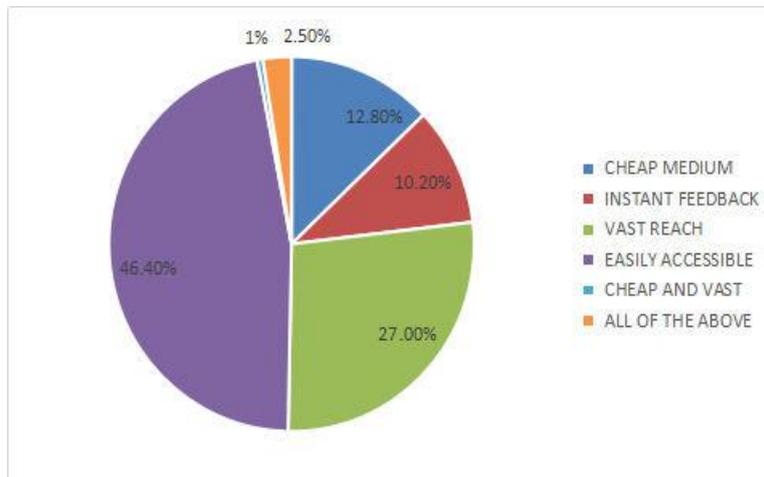
The above data shows that 66.5% of the respondents use digital media for educational purpose to gather online material, 16% of the respondents use digital media to get aware with technological literacy, 9.5% of the respondents use digital media to socialize and 6.5% of the respondents use digital media for distance learning. So this data shows that majority of the respondents for educational purpose to gather the online material.

**Question 8: According to you, from which medium students learn better?**



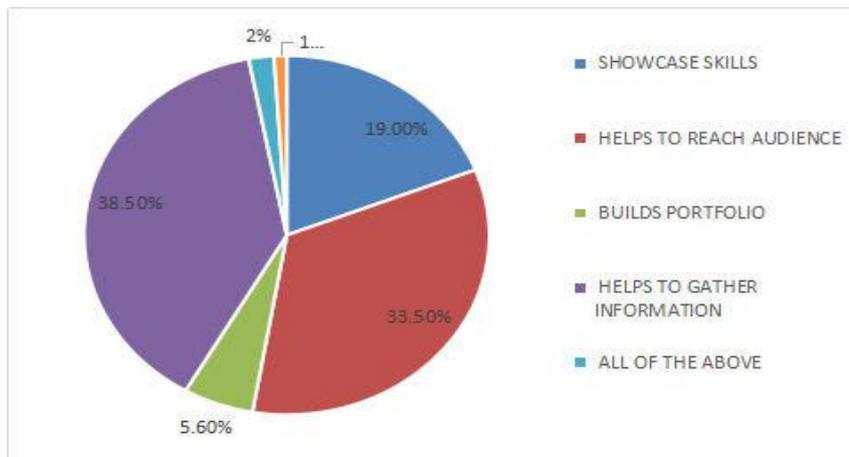
According to the data 66% of them think that students learn better from online whereas 34% of the respondents think that students learn better from reading print. So this clearly shows that according to the majority of respondents, students learn better from online.

**Question 9: Why do you use digital media to develop and showcase your skills?**



The above data reveals that 46.4% of them use digital media to develop and showcase their skills because of easy accessibility, 27% of them use it because it has the vast reach, 12.8% of the respondents use it because it is a cheap medium and 10.2% of the respondents use it because of the instant feedback. So the majority use digital media to develop and showcase their skills because of the easy accessibility.

**Question 10: Why, it is important to you as a mass communication student to have digital media presence?**



The above data reveals that out of 195 of the respondents, 38.5% of them as a mass communication student think that digital media presence is important because it helps to gather information, 33.8% of them think that digital media presence is important because it helps to reach audience and 19% of them think that it is important because it gives the platform to showcase the skills. But the majority of mass media students think that digital media presence is important because it helps to get information as well as it helps to reach audience.

**Question 11: Why do you think as a journalist and mass communication student that digital media has an important role in development?**

The main purpose of this question was to give the respondents an opportunity to explain the reasons deeply that why they think as a journalism and mass communication students that digital media has an important role in development. The data shows that out of 203 respondents, 109 responded to this question and the majority of the respondents point out the main reasons i.e. information, education, entertainment, easy accessibility and take less time. Some respondents gave these following responses:-

“Due to its accessibility and variety of options to use it for, a lot of people are connected to digital media and so to make a change or development everything is just one click away.”

“We as a journalist have the responsibility of informing the masses be it good or bad so the information

“We give as a bigger stake on the field of development and that is why it is our moral duty to safeguard it.”

“Through digital media we can showcase our skills to the vast audience and also gain knowledge in very cheap cost.”

“Because digital media helps in every aspects whether it is education or entertainment. It is more easy, convenient and affordable medium for getting updated and also helps in learning the things in a very effective and interesting manner.”

“Well I think that digital media has very important role in development especially in a country like India as it provides a great reach and a greater audience than other mediums which is very crucial in the terms of communication and thus through digital media people can be educated and made aware about various development policies and processes. Also it plays vital role in a person's individual development as regular interaction with people from all around the globe and regular exchange of cultural knowledge through various shows, conversations platforms and programs, grooms an individual for the outer world”

### CONCLUSION

The digital media plays a crucial role in the development of every aspect. It portrays the great impact in the academic development of journalism and mass communication students. The aim of this study was to demonstrate the role of digital media in the academical development.

The study concluded that the students of journalism and mass communication use digital media on daily basis and also well aware of different digital media platforms so these findings clearly indicate that the awareness level among these students are quite high. The findings also indicate that most of the student use social networking sites among various different digital platform and also this study shows that the main reasons behind using the digital media are entertainment, education and to stay connected. So this concluded that digital media has been considered as the major source of entertainment, education and connectivity. According to this survey, most of the student use digital media for educational purpose in order to gather online material and also for technology literacy. This study has highlighted that students learn better from online and the growing concern for using the digital to develop and showcase their skills as it has the easy accessibility and also the vast reach.

The conclusions show that digital media is the need of an hour and it has the great influence on the student's life. According to the students of journalism and mass communication, they are using these platforms for the wide variety of reasons which include not only learning but also showcase the creativity and talent on the digital media platform. So digital media has the outstanding role in creating and shaping the life of students.

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**A STUDY ABOUT THE ATTITUDE OF WORKING JOURNALISTS TOWARDS MOBILE JOURNALISM (MOJO)**

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**ABSTRACT**

*With the advent of each new technology, major shifts are taking place in the field of Journalism. Mobile Journalism (Mojo) is one of those technologies which are shaping the process of newsgathering and disseminating. This study aims to understand the attitude of working journalists of broadcast and digital media towards the Mobile Journalism in India and its future in the digital era. The objective of the research is to find out whether the Mojo is taken as a serious kind of journalism by working journalists? Does Mojo adversely affect the quality of production? and Is it considered helpful for the future of journalism in the digital era? A review of the available research literature suggests that it is basically an emerging kind of lifestyle journalism, being used by a few journalists. Those journalists who use mobile for news production purposes are never less in expertise. Since these journalists do not use traditional production technique, the question of de-professionalization occurs? This study, therefore, examined whether the Mobile Journalism (MoJo) is considered as a serious news gathering technic by journalists working in electronic and web media outlets in India. And if they find Mojo something that is de-professionalizing the news content, along with its future in mainstream Journalism. To conduct the study, survey method was used as the design of the study, with the sample size of forty (40) journalists from eminent media organizations such as ABP News, India TV, Zee News etc. in India. A google docs questionnaire was sent to the respondents by mail, and responses were collected to find out the attitude and opinion of the journalists about Mobile Journalism in India. The finding of the research suggests that Mojo is moving from lifestyle form of journalism to serious journalism but predominantly it is not a serious kind of journalism practice. Only 20% of journalists think that MoJo is de-professionalizing of TV news work, so it is not only fancy & steady but also dependable. Around 75% journalist consider Mojo as part of their job and they use Mojo as an important and influential tool to gather speedy information and disseminate the same. The study, therefore, finds that the future of mojo is radiant and promising, it is of great help for the journalists, it does not make journalists unskilled and thus according to journalists Mobile journalism will have a prominent effect on the human future as well.*

*Keywords: Mobile Journalism, Journalist, News Production*

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**INTRODUCTION**

How reporting is changing around the world. “why an Indian TV station went all in one smartphone newsgathering?” Although this headline published in an online website "Media shift" put in front of us a question on the Indian newsgathering system and at the same time it is also providing an insight of an Indian newsroom that converted into a smartphone driven newsroom.

Not only in India or Asia region, but across the world, mobile journalists are collecting and reporting news stories with little more than a smartphone in hand. This piece was originally published on IJNET, It is a part of a series that was examining- How people take mobile journalism? How they define mobile journalism? How mobiles are adding to the reporting? How traditional newsrooms are adapting to mobile? How citizen contributions are increasing? And how mobile is improving journalism practice in a more advanced form...?

In fact, the smartphones, which has enabled the modern journalist to cover the story entirely based upon a little device are the result of a major technological shift. This technology has directed many other shifts in Electronic News Gathering process. The headlines and the research on the usage of the mobile phone in the newsroom for electronic news gathering is a kind of mobile revolution in the newsroom. It is a revolution in the way the day to day news is being gathered, processed and disseminated.

Journalism is a field that is entirely related to the communication process, and in the digital era it need rather speedy and instant communication which is possible only through the use of digital technologies which enables the producers to encode the message in seconds and ensure the high speed. It also requires instant transmission without any delay in terms of time, quality and content. For being a mobile journalist, a reporter need not carry a heavy camera, editing crew, and broadcast devices. Just one mobile phone with internet connectivity. That is all which is needed to be a mobile journalist.

Since the beginning of Journalism as a field and as a discipline, whether mission or profession, journalists have been using the then latest available technology at hand, to perform the task of content multiplication and

distribution of message among the various audience groups. Over time, many advanced technologies have brought huge changes and turnovers in the way the message is being collected, produced, encoded, distributed and consumed. Technologies are becoming advance and they are replacing the older one. And today in the digital era smart mobile phones are on the apex of technologies being used by most of the journalists and they are presiding over the old hefty technologies which are in use from last decades. This shift in technology is both spanning and vague. It opens the way for easy communication strategies and techniques and also serves a handy communication outcome. It allows feedback and also felicitates ease of information as soon as possible. It put in front of us the question of the earnestness and solemnity of the brand new modish technology, which is thrilling. At the same time this practice also raises the doubts about the adverse effect of the inexperienced technology as well as, its future perspective in the course of time.

**What is a MoJo?:**In the words of GlenMulcahy Founder of Mojo *"Mobile Journalism is about empowering the individual storyteller to use whatever consumer technology they have available to them to make the best possible visual story that they can. I would like to think that Mobile Journalism definition can be extended to other mobile devices beyond smartphones, like DSLR cameras, laptops, GoPros..."*

A mobile journalist, often abbreviated as Mojo, uses only a mobile phone to gather and distribute news. That news can consist of text, audio, stills or video, or sometimes a combination of all these. Mojoes tend to work alone without any technological assistance from camera crew and edit machine expert. They even do not need Outdoor broadcast van to link the live coverage to the newsroom. Mobile phones are so common that it is easy to blend in with one, and they are so light they can be carried in a handbag or pocket(Quinn 2011). *"One of the things we did early on was to define Mojo: Mojo is editing on mobile phones as well as the shooting,"* Quinn said. *"It's also captioning, putting headlines and credits. Real mojo, true mojo is doing everything with a mobile phone."*

A video journalist, often abbreviated as VJ, sometimes works alone but tends to operate in a small team, often in pairs. Video Journalists tend to have a large amount of equipment and are more obviously journalists with heavy equipment. They stand out in the crowd and their camera person operate the camera for them. They are more noticeable in the crowd. Mojo is more discreet and often goes unnoticed. Although mobile journalism seems to be an attractive world today and is grasping the attention of news organizations as well as individuals working there, starting off it was not particularly easy. It was introduced as a tool of communication. When it entered in the world of technology, no doubt it was taken seriously but it was really far from the imagination of people that it might replace a whole lot of camera and crew from the newsroom & from the field. Nowadays it is an in thing, becoming a trend in the field of Video Journalism. The mobile phone which are now being used for journalism practice with a camera capacity is a product of the mid-1990s; Video capacity came a few years later. According to Statista, In 2019 the number of mobile phone users worldwide is forecast to reach 4.68 billion (Statista 2019). According to the International Communication Union (ICU) Today, there are billions of mobile phones around the world, many of them are smartphones. But there was a moment in the recent history of journalism when Mobile Journalism seemed to be the next big thing. (ICU, 2018)

## REVIEW OF LITERATURE

As mobile phones' cameras and audio recorders got better, the internet saw a gradual increase in the number of amateur videos uploaded to platforms like YouTube because now people have access to the alternative media without many restrictions. But at the same time, in some newsrooms, a few tech-savvy journalists saw the opportunity to use their mobiles as a reporting tool. *An experienced Mojo trainer Stephen Quinn said "I was taken by the technology when at first, I realized it was possible to stream live videos with a mobile phone,"* A convergence of cheap technology, fast broadband, and wireless networks, and a booming interest in citizen involvement in news will see a revolution in the way news is covered over the next decade. It is rare to find a journalist who does not have a mobile phone. Free software can turn most mobile phones into portable broadcast tools. (Quinn 2011)

John D. McHugh, a photojournalist who founded a start-up that gathers and verifies eyewitness media, remembers how mobile phones were being used in serious news collection as well. Björn Staschen, mojo trainer and head of NextNewsLab at German broadcaster NDR, said: "Mobiles could be used to capture a moment anytime and anywhere even during crowded events". The advent of the iPhone along with other mobile brands allowed for better image and sound quality, that were the basic element of any broadcast news coverage. It increased the possibilities for mobiles to be used as professional journalistic tools. However, many journalists who are already there in the profession from long back and has been habitual of using camera and crew for the reporting coverage and dissemination, continue to rely on non-mobile equipment in their daily work. For

example, some still edit on their computers. Mobile journalism is also seen as a broader style of journalism, which covers more areas than the regular journalism used to do.

It is increasingly difficult to think of a national or international news provider that does not distribute media rich news content via mobile (Westlund 2008). Al Jazeera launched its mobile offering in 2006. India news channels such as NDTV and India today are in the field of mojo.

Explaining the shift to mobile journalism ('MoJo'), which means reporters are expected to shoot and file stories on their smartphones, NDTV said,

"Like other news broadcasters around the world, NDTV is reorganising its newsroom and resources to focus on mobile journalism. NDTV has always been an early adopter of new technology and we are the first major network in India whose reporters are all trained in using mobile phones to shoot stories. This is not just about cost-cutting, though that is certainly, for us like any other responsible business an important factor in operations. Mobile journalism means reports are lightning-quick and much more efficiently produced – a priority for any news company. After NDTV's switch to this new model, other news networks in India are now experimenting with similar training." (bestmediainfo.com, 2017)

While some are welcoming the upcoming trending technology, many others are still in confusion about whether it is actually needed or just an adaption for the ease of reporting. Some experts are writing in favor of this technology and others are putting the question on its usage. Some also think that it is the reporting that matters, not the tool that has been used for reporting.

"[It] has very little to do with mobile phones," wrote Nick Garnett, a BBC journalist.

"It's about the reporter being mobile, not the equipment. Mobile journalism involves people realizing that they and the gear they carry are like a Swiss army knife, with lots of attachments. You choose the one you need."

Research also suggest that the mobile journalists study have less specialized expert knowledge. Also, though the mobile journalists felt that working outside a crew gave them greater autonomy, their increased use of work routines suggests they have given up some control to organizational needs. Additionally, there is evidence that these mobile journalists have allowed some encroachment by other professionals, specifically public relations professionals, in order to accomplish their work tasks within specified deadlines with limited time and resources. (Blankenship JC, 2016)

Mojos who are active in the field of journalism with their smartphones around the world see their mobile devices as a very powerful tool to produce quality journalism. Although there is no real consensus on the definition of mobile journalism, a growing community of mojos is experimenting with different applications. They are testing limits of Mobile as a tool of reporting and listening to how their audiences are engaging with this new form of journalism. Mojo is producing short films, documentary as an experiment in addition to mobile reporting. In India as well the mobile journalism entered with a very fast pace. Recently NDTV went all mobile, along with India today also launched its channel mobile task. So one can easily understand how mobile phones are changing journalism practice in the 21<sup>st</sup> century(Mediashift org, 2017).

## **RESEARCH QUESTION**

With the above-cited literature and in the age of digital communication and innovation this paper tries to find out what is the attitude of working Journalists towards Mojo.

The research questions are:

- What is the status of Mojo among working Journalists?
- Is mojo downgrading the quality of news work?
- Is mojo causing any kind of uncertainty in journalism?

## **RESEARCH METHODOLOGY**

**Method:** The study used a survey method to find out the answers to the research questions. The questionnaire was sent to the respondent online and the response was collected.

**Sample:** The sample for the study was 41 respondents. They all were selected by purposive sampling method as they were the people who were working in the field and well aware of the status of mojo. All of them were working journalist in the mainstream Indian media outlets. Most of the respondents were from television newsroom, but the study also covered some of the journalists working for the newspaper and online media.

**Procedure:**The respondents were asked question based upon four sets of information. At first, to find out do working journalist take Mojo as a serious kind of journalism or it is basically lifestyle journalism. Second, is mojo de-professionalizing news that is produced and disseminated.

Third, does Mojo is opening ways for the journalists to be unskilled. Fourth and the last section was about the present and future of mojo in India.

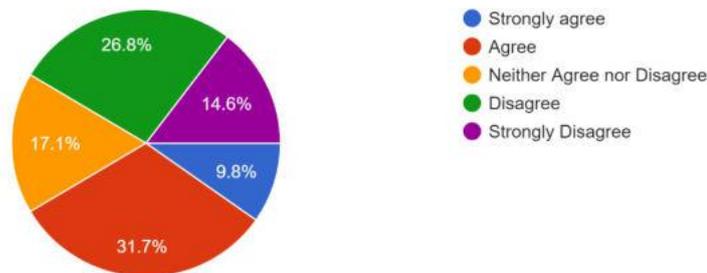
**DATA ANALYSIS AND INTERPRETATION**

**Lifestyle journalism or serious kind of Journalism:** In the first section of the questionnaire respondents were asked about two major things as Do they consider mojo as a serious journalism practice or for them it is a part of light mood lifestyle journalism. Out of 41 respondents, 41% agreed or strongly agree and stated that they find Mojo a lifestyle form of journalism. The % of the journalist who stated it as serious journalism was also 41 %. 17% journalist were neutral to the statement. So it can be concluded that according to the journalist working in news outlets are neither in favor and nor against the Mojo. No strong notion in favor or in against was found. (see- figure1)

**Figure-1**

Do you think that MoJo is a lifestyle journalism (not a serious form of Journalism)?

41 responses

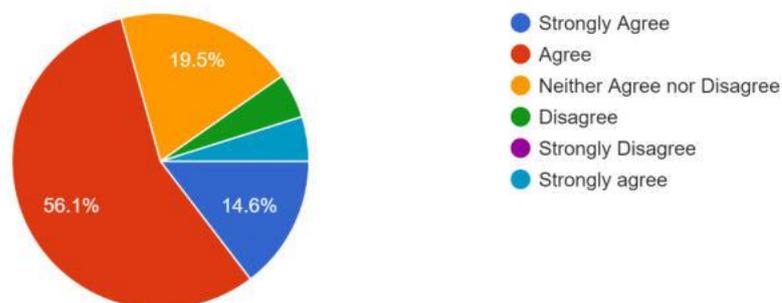


The second question in the first section was about mojo as a part of the journalistic role of the journalists. Do they consider using mobile as part of their day to day reporting techniques? Here only 7% journalist have disagreed and not even a single journalist was strongly disagree. 20 % were neutral about the statement and rest of the 73% journalist stated that they consider mojo as a part of their day to day journalism practice. (see-figure2)

**Figure-2**

Do you think mobile production is a part of your Journalistic role?

41 responses



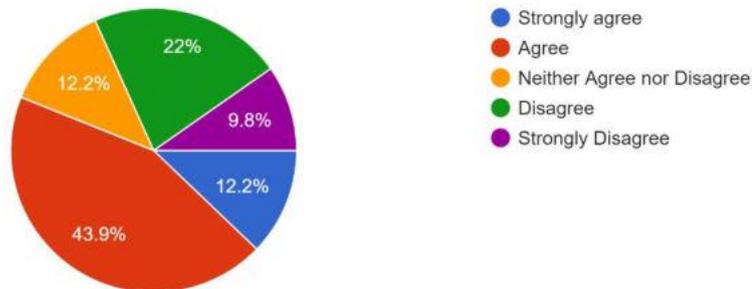
**De-Professionalization of News:** The next section dealt with the Mojo as a technology that is de-professionalizing news work, as handy footages are available through mobile they are being broadcasted. The quality of the work is being affected or is there any deterioration the professional news production techniques.

12.2 % of journalist were strongly agreed with the notion that mojo is affecting the news they produce. 43.9% agreed with the notion. 12.2 % neither agreed nor disagreed. Only a comparatively small percentage of news reporters were disagreed and strongly disagree with the notion. So it can be concluded that not the majority but most of the journalists find that Mojo effects their work. (see- figure3)

Figure-3

Do you think MoJo is affecting the news we see and produce?

41 responses

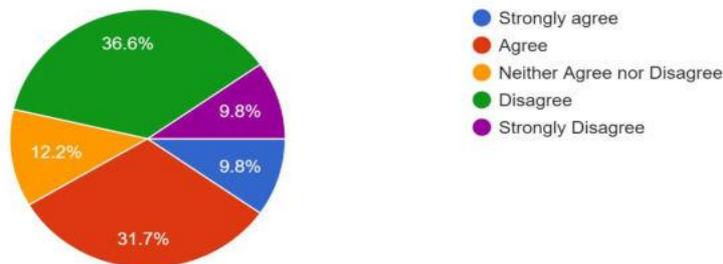


When asked about the Mojo as a reason for de-professionalizing news standard in current time 10% respondent said that they feel that the use of mobile phones in journalism practice is somehow de-professionalizing the TV news work. Many other as much as 32% were also agree with the notion and 12% were neutral. 10% were strong- disagree and 37% disagreed that it is de-professionalizing the news work. So its quite evident that the % of people for and against the notion are somehow near to equal but more of the respondent don't find it to be de-professionalizing news work. (see figure 4)

Figure-4

Do you think Mobile Journalism is de-professionalilzing TV News work?

41 responses

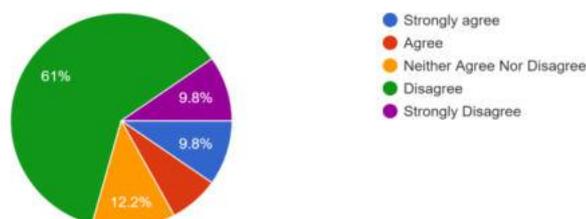


**Making Journalist unskilled and creating uncertainty in the news world:** When the question of the skill of journalists was asked there was strong disagreement with the statement that Mojo is making the journalists unskilled. Total of 71 % journalist said that mojo is not making journalists unskilled with 61% Disagree and 10% strongly disagree. Those who were of the notion that Mojo is making Journalist were comparatively less, as much as 10% agree and 10% strongly agree. Rest of the 12 % of respondents were neutral. So its quite clear that journalist may not use mojo as daily practice but they also don't find it as a means that is making the professionals unskilled. (see- figure 5)

Figure-5

Do you think MoJo is making our journalists unskilled?

41 responses

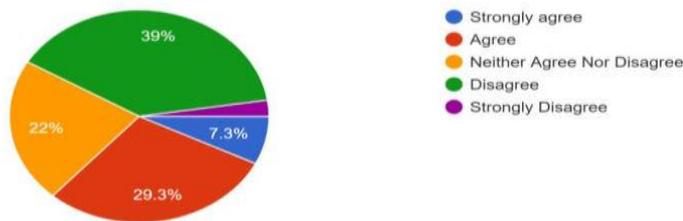


out of 41 respondents, only 7% stated that they feel that mojo is creating uncertainty in the news world. Other 29% agreed with the statement as well. 39% disagreed and very little strongly disagree. The percentage of respondents who were neutral about the statement was quite large with a share of 22%. So we can infer that journalists are not very much clear about its role in creating uncertainty in the news world still through the data majority is against the notion. (see- figure 6)

Figure-6

Do you think MoJo is creating uncertainty in the news world?

41 responses

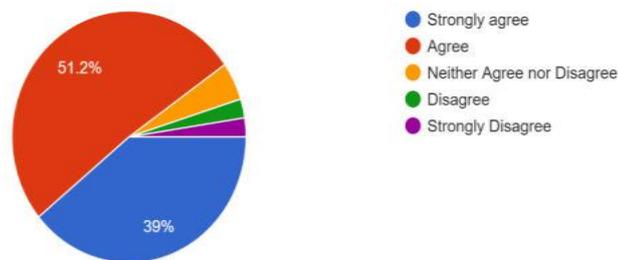


**Helpful for the present & future:** A group of more than 51% clearly mentioned that Mojo is of great use in the present digital scenario. 39% more strongly agreed with the statement. Rest who did not found Mojo helpful in a digital era of reporting was as less as 10% collectively. Now it becomes evident that most people agree that Mojo is really very helpful in the digital era of journalism. (see- figure 7)

Figure-7

Do you find Mojo helpful in the present digital era of Journalism?

41 responses

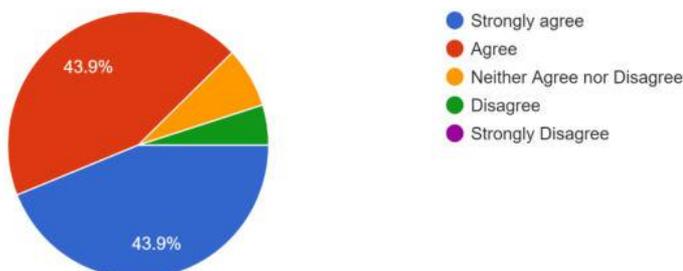


Again there was a strong notion in favor of the statement with as much as 88% were collectively agree and strongly agree that Mojo will be a great help for future journalist and its future as a tool of journalism is bright. A little percentage of journalists were having a doubt about that and were neither agree nor disagree. Not even a single- journalist was strongly disagreed about the role of Mojo as really great for future journalism. So we can say that Mojo is of great help and journalist don't have doubt about its usage in the near future. (see- figure 8)

Figure-8

Will MoJo be of great use in the future of Journalism world?

41 responses



**Findings of the study:** According to the journalist working in India mainstream media industry, and the questionnaire responses it was found that the mobile journalism is a field that is easy and new to the journalist, but they are welcoming this. Many journalists find it a very innovative and attractive technology for the newsgathering process, while others are doubtful about it, as a serious reporting tool. Mojo is no doubt a speedy and instant serving technology that matches its speed with the need of journalism and at the same time it makes the work of a journalist easy and quick, but as per the data somehow equal percentage of people were defending and opposing this technology as a serious journalism practice. Mojo has proven itself to be a trendy, fancy handy, far-reaching and modern technology. What is still left for it to prove itself as a serious, significant, consequential and weighty technology?

It is being used by journalists for speedy and easy communication, they find that it affects the news they report and produce. Some Journalist also said that it needs to be more professional, although it is not de-professionalizing news work still improvements are needed. Findings suggest that there were strong emotions related to the unskilled journalist and Mojo because most of the journalist disagreed that mojo is creating any kind of uncertainty or because of it the reporters are becoming unskilled. It was found that all the respondents were very confident about the future of mojo and its role in present journalism. Whether experienced journalist uses it or not, whether they find it to be lifestyle journalism but they have no doubts regarding its future in the journalism practice.

**Discussion:** Based on the above data interpretation and findings it can be concluded that mobile journalism in India is growing at a rapid pace. In fact, it has made its presence felt in the media industry. It has proved itself as an effective communication tool and that is why major TV station and online media outlets are relying heavily on the mobile for their broadcast. They have given the responsibility to gather, produce and disseminate news to the mojo. Journalists are using it in their daily newsroom practice and serving the masses with the news produced by the small camera and microphones of the smartphones. The small gadgets are making the process of news production quick and speedy and it is imprinting its significance in the mind of working journalists. Traditional media have been slow to respond to the fast pace for the need for the information, Now mobile and other handheld devices are becoming mainstream. Mobile is proving that it can improve media by participating in the news production process. Journalists have also realized that using mobile does not alter the sanctity of journalism.

**Limitation& recommendations:** One of the major limitation of the study was the sample size, as the sampling was purposive and data has to be collected from the working journalists only, in a short duration it was difficult to get better understanding about how they work using mobile in their day to day life. The data analysed here in the paper is based upon questionnaire and not personal interview, that definitely would have given better understanding of the field of mojo.

It is recommended for future researcher in this particular field to get better understanding by in-depth interview and to explore how Mojo actually work in the field, as well as it is also to consider what are the reaction of news-room decision makers on the filing of news produced via mojo.

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**EMERGING TRENDS IN SOCIAL MEDIA AND THE SCOPE OF MEDIA LITERACY**

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**ABSTRACT**

*With the emergence of digitalization has basically transformed the ways in which information, knowledge, and entertainment are created, distributed and accessed. The new media is rich with opportunities and jeopardies, particularly for youth. New Media or Digital Media has turned into a major source for millennials who have access to Digital Technology and basic skills to use it. Due to various digital mediums, they are contributing in an array of activities, including social networking, social bookmarking, blogging, vlogging, chatting, downloading music and other content, uploading and sharing their own creations and collaborating it with other users in different ways. As a result of these activities, diversity of ideas and perspectives have been created which is forming a spirit of digitally connected. Socializing digitally have facilitated communication. Although these activities have some positive aspects but apart from this it gave some behavioral changes among youth. Not only this it also effected their social behaviour and approaches. Seeing the present scenario of digital media, its information quality framework and its usage by youth, this review paper tries to find out what are the ways in which youth search for information online, how they assess information as well as their new levels of media literacy. A proper understanding of digital space would allow young users to access, analyze and evaluate the information. As the young generation is a major part of the society hence one should know what the impact of information is, they cater from the digital media. In the present scenario, media is shaping society and also affecting the perception. Exploratory research design has been chosen by the researcher and the research will be based upon secondary data. An analysis of selected literature at the intersection of Digital Media, Youth, Information Quality and their media literacy is done in this research paper, with which the researcher has tried to find out the resultant impact on their social interactions and social behavior.*

*Keywords: Digital Media, Media Literacy, Youth, Blogging, Social Bookmarking, Internet, Youth*

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**INTRODUCTION**

Since the Internet's nascence, there have been lots of technological inventions and upgradations of this medium. Due to these technological advancements many major changes caused in our daily lives, which can be easily felt across numerous areas, which includes education, shopping, entertainment, learning, banking, investing, etc. Not only this in the field of communication too, but many new developments have also been done which have boosted this domain and Social Media is one of them. It is an interpersonal web-based communication technology as per Kent and Taylor. Social Media has been defined in several ways. The definition of social media as a "platform to create profiles, make explicit and traverse relationships" by (Boyd & Ellison, 2008) has been cited over 13,000 times according to google scholar.

Social Media is a free medium and it does not need any specific skills to access. This comfort is also one of the significant factors which are encouraging people to create an account. The recent trends emerged in social media have given various options of communication to the youth. Gradually they are consuming information through these social mediums like WhatsApp, Twitter, LinkedIn, Facebook and Google +, etc to not only for communication but also for sharing ideas, thoughts, etc among each other. Apart from communicating, the young generation is also receiving lots of bits of information, news, etc and are getting updated.

This medium has a great impact on the public minds because not only users absorb the information presented on it but also, they can provide feedback to it directly. Not only this many user can also be influenced by the feedback or reviews which have been given by other users, but this can also affect anyone's individual opinion on various issues. Hence, this medium has its great importance among some groups or communities who are working to set some particular belief on some certain issues amidst the public.

According to the Digital Media and Society report, Digital Media is a type of a product or service which come through media, entertainment and information industry. These industries cover various digital platforms like websites, applications, digital content (e.g. text, audio, video, and images), etc which have access through various devices and from anywhere.

At present, digital media has turned out to be an endless source of every type of information and social media is one of the platforms which is used by youth to receive the data. Hence it is very important for them to become media literate. As literacy is the ability to read and write similarly the ability to access, analyze, evaluate and create media messages of all kinds is known as Media Literacy. The significance of media literacy is so much

that a media literate youth are better able to interpret the complex messages which they receive through various mediums like television, radio, newspapers, magazines, Internet, etc.

Many people observe that media literacy eases a way to understand the communication technology apart from this, media literacy also helps to know how the message is coded, generated, selected, interpreted and impact made on the audience. Besides, media literacy has become a pivotal point, as it has a set of guidelines to understand the sense of the mediated information and hence can also deliver evidence about how to analyse and understand the media and its messages – over here it refers to Social Media. The liberty of uploading posts on social networking sites must be properly filtered in a motto to safeguard the social values, especially for young generations who are still in search of individuality and hence they become a prime or soft target for malicious/terrorist groups through this medium. Media literacy as a tool will possibly aid young social media handlers to better comprehend the messages.

### REVIEW OF LITERATURE

1. Kuppaswamy, Shankar Narayan, P.B and Sunita (2010) quotes in, "The Impact of Social Networking sites on the Education Youth" in comparison to other genres, social network has more effect on education. The research also says that these social networking are very informal and diverts the user minds from their education but on the other hand they are helpful in communication, sharing, etc. It concludes that one – to – one communication sites has both positive and negative effect on youth, it depends on one's mindset the how it should be utilized.
2. K.Ramprathap, Dr.S.Rajaram, Dr.V.P.Sriram, Dr.S.B.Inayath Ahamed (2016), quoted that " Social Media has great importance among students. It has its impact both positive and negative. Some vigilant steps must be taken so that the adverse effect of social media can be controlled."
3. Media Education is very important for the budding generation as it is related with Democracy and participatory citizenship. It has become very vital to promote a knowledgeable, democratic and sustainable society. According to Barbro Oxstrand (2009) in "Media Literacy Education- A discussion about Media education in the Western countries, Europe and Sweden" there should more lessons related to media education hence teachers should work on it and enhance the knowledge of students.
4. "The dependency on social media to collect information and getting aware has increased among youth whether it is happening either in their circles, nationally or internationally. Not only they are using in positive aspect but also in the negative sense too" as per Rita Njoroge in "Impacts of Social Media among the youth on behavior change: a case study of university students in selected universities in Nairobi, Kenya"
5. Joshua Ebere Chukwuere, Precious Chibuikwe Chukwuere (2017), "The Impact of Social Media on Social Lifestyle: A Case Study of University Female Students" concentrated on the diverse effect of social media use both positive and negative due to advancements in modern technology. It encouraged students to work on various aspects of their lifestyle. But on the other hand, it also wasted their time and caused negative behavioral changes like disrespect to elders, using abusive language, etc.
6. Septyanto Galan Prakoso, Monika Sri Yulianti and Likha Sari Anggreni (2016), "The Importance of Social Media Literacy for Students in Globalization Age" quoted that "There is an information glut on social media which should be prevented. The Internet is providing various sort of content which can have an adverse effect on a youngster's mind easily, certain vigilant steps must be taken to filter all the content and information which is within the reach of youth. Media literacy can become a suitable solution to this issue since it will make youth aware about how to treat an information. By doing Media Literacy awareness programmes, the society will have proper vigilance over the cycle of information from source to receiver and vice - versa and will actively participate in deciding regulations in order to prevent the adulteration of the youth's mind.
7. According to Michael E. Hoffman (2016), In "New Media Literacy and Social Media Usage" Media Literacy gives people a tool to effectively analyze and evaluate the messages that they receive. They perceive the information, understand and evaluate it whether it is correct or not.

### OBJECTIVES

The major objectives of this research paper are:

1. To find out the emerging trends of social media among youth to cater to information.
2. To identify whether the youth is media literate or not.
3. To examine the impact on their social interaction and social behavior.

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**THEORETICAL FRAMEWORK**

The framework of this research paper is based on social impact theory. Ohio State University psychologist Bibb Latané explained that in social impact theory, Social Media provides strength in the form of a social community formed virtually whose opinion and information are important for the users. Social Media provides an enormous opportunity for the number of people in the influencing group. Social Media provides information and centers on the characters of the issue of how individuals should think about it. This research paper is based on this theoretical framework that how social media and its emerging trends are impacting the youth's mind.

**Research Methodology:** This research paper used exploratory research as its research tool. Exploratory research, as the name states, intends merely to explore the research questions and does not intend to offer final and conclusive solutions to existing problems. In exploratory research the main emphasis of research is always on exploring the each and every aspect of the problem which is to be catered by the researcher in their research work, it may or may not be possible that at the end of it researcher can provide a clear conclusion. Exploratory research always has an added advantage due to its nature of flexible and adaptability. To analysis researcher used secondary data.

**Interpretation:** It is clearly visible that social media is having its reach to every class of the society, and up to certain condition it provided a platform to masses to share their views and also to use it as a tool of alternative media but this is also perceived that this media is lacking in terms of authenticity of information and the reasons are also prominent. One cannot control the flow of information on social media and cannot easily check whether the information is fake or not. To understand the concept of media literacy and how it has become a significant entity in the media ecosystem researcher analyzed different researches on a similar base.

**Conclusion:** In this review paper the researcher tried to explore the emerging trends in social media like customizable chat box, more augmented – reality & face filters, social media benefitting business to a large extent, etc. It has become a common platform for information sharing. But there is no well-defined system which can help receivers to trace the authenticity of the information. In the present scenario, the youth is becoming media literate but a major has to be done on this subject as this issue has become vital around the globe. We as a responsible citizen need to take responsibility for checking what we see online. Facebook and Google also initiated to use fact check services and providing consumers an option to verify what they see and read online. Spending much time on social media has also affected the social behavior of youth. Its impact is both positive and negative. This platform has made them aware but has also hampered their attitude of social interaction. Undoubtedly, it's a crucial time, and it's not easy to verify the flow of information but audiences need to be conscious and they need to be participative in the process not only for receiving information but also, they need to verify the information before they share it further. Therefore, media literacy with respect to social media is significant.

In this perspective there are two key points that can be done to develop media literacy keeping Social Media in focus:

**A. Vigilance towards the flow of Information**

Digital Media can be personalized as per the user and their choice. It is understandable that no one is able to withstand the flow of information on the web. In the mainstream media, Social Media stands different in respect to other mediums on one note that users are free to consume and access any type of messages as per their choice and requirement, for example on television the content received by the receivers is according to the channel and programme producers but on the other hand such conditions are not applicable to social media.

**B. Active participation in deciding the guidelines for communication technology to decrease misinformation**

The information flow works very quickly due to easy access to social media. The messages can be easily shared and spread in no time. This is a benefit as well as a drawback too. Some preventions and guidelines should be made to have proper surveillance over the flow of information. Though, we can find out whether the information is correct or not.

More prominently, like all other great movements, media literacy must begin from the initial stage i.e. from parents, teachers, etc. They should begin to see that if that media is a requirement for their children, and hence the children should need to have a way of filtering in receiving messages. Proper education, not just restriction or control, is the path to help the young generation understand their choices and to help question the content presented by the media.

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**THE TREND OF READING NEWSPAPERS AMONG THE YOUTH IN 21<sup>ST</sup> CENTURY  
(A STUDY BASED ON YOUTH AND DAILY HINDI NEWSPAPERS OF VARANASI)**

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**ABSTRACT**

*The 21st century has changed the way of thinking as well as the behavior of the youth. Especially the lifestyle of the youth has been changed now. How the youth thinks, how they react and what their approaching patterns in today's era of internet and technology are a subject of study. This research paper tries the same thing in the field of journalism & mass communication. Especially try to know the trend of reading newspaper among the youth in the 21st century. The 21st century is the century of internet & technology, where youth is too much indulge on using Smartphone. Now everything is on their finger and easily available on one touch. This research tries to find out the solution of many questions related to the youth about daily Hindi newspaper of Varanasi. Like; Do the youth still have a trend to read the newspaper or not? Do they have newspaper readability or not? How much time do they spend on reading the newspaper in a day? Which types of news or content do they like most while reading the newspapers? Which daily Hindi newspapers are the most popular among them in Varanasi? How much they satisfied from the 21st century's daily Hindi Newspaper and their news and content? Etc. The research design of this research paper is exploratory cum quantitative deductive. For data collection, the online survey method has been used. In which the researcher used a Google form questionnaire & picked up a sample via an online survey through various online platforms, such as Facebook, WhatsApp, Messenger, and others. Area of the study is Varanasi, India. The universe of the study is all Youth of Varanasi. Data have been collected from both the source primary as well as secondary and analyzed through simple statistics.*

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**INTRODUCTION**

The fast advance of television a few decades ago and the Internet in the last decade has changed people's media consumption patterns. Different media are in a continuous time battle with each other. This is also true for news media. The traditional medium, like a newspaper, puts into an underdog position. This development earns more detailed research, especially among the future generation (**Wolswinkel, 2008**). This research has its focus on youth newspaper reading time, their favorite newspapers, their subject of interest in various news/content, their newspaper readability in a day, their opinion about daily Hindi newspapers of Varanasi and much more related to the topic. This research discusses the trend of reading newspapers among the youth in the 21st century because the researcher tries to know that today newspaper as a print medium is relevant or not. This is why because as a print medium newspaper played a very important role in history. Even in freedom moment it played a very revolutionary contribution to the country and make people patriotic and revolutionary.

All of the above it also serves us in many ways like by providing necessary information related to a various subject of interests. Newspapers are known for the provision of up-to-date information on local, state, national and international events. Newspapers often contain current and interesting information meant for the reading pleasure of the vast majority of readers of all ages and walks of life. As an important print medium of mass communication, newspapers provide the most current analysis, debate, and criticism of socio-political, economic, health and a host of other issues as information, education, and entertainment to the readers. The newspaper is, no doubt, one of the most widely-read periodicals available and accessible to all on a daily basis in print and electronic versions. As a mass medium, newspapers are useful for education, information, recreation, relaxation and entertainment (**Leo O.N. Edegoh, 2015**). This explains why (**Ojo, 2006**) think that newspapers are important because they carry current information and they keep the readers informed of events and happenings within and outside their immediate environments. (**Okunna, 1999**) reinforces this position by asserting that the newspaper is important in that it serves as a carrier of current information or news. The newspaper is important to everybody, particularly students and youths who are considered as the most active information-seeking group in any population for the obvious reasons of academic and other pursuits. The permanency attributed to print media, including newspaper has made information recall possible, and recall capability frees content from becoming transient and ephemeral (**N. Ezech, 2015**), since the audience of the media like youths remembers them and use them for academic and other purposes. Indeed, youths are supposed to be the most active users of newspapers as they constitute the most important information seekers in society. On the contrary, evidence from a large body of empirical literature seems to suggest that newspaper reading among youths is declining. (**Dominick, 2017**) notes that newspaper readership has been declining over the last couple of years. (**Udie, 2002**) also reports that the frequency of newspaper readership among Nigerian students

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is less than 50%. (Bigai, 2003) states that since the 1970s, the overall number of newspapers has declined due to non-readership. (Business Essay, 2009) has equally reported downward trend, in the past few decades, in newspaper readership in countries of the world including Europe and America.

#### THE HISTORICAL OVERVIEW OF READING

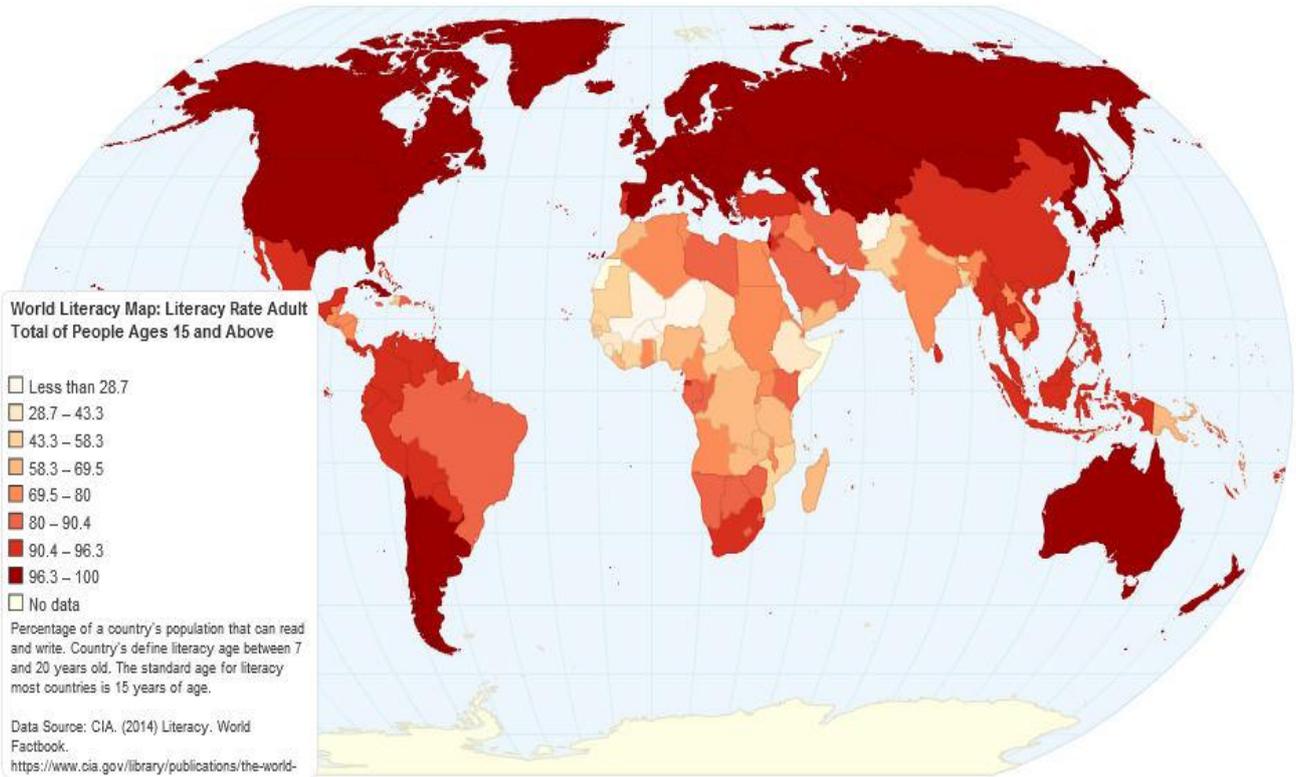
Reading is not a natural act, or as (Walter, 2008) (Wolf, Personal interview with Barry Cull, 2009) (Wolf, Proust and the squid: The story and science of the reading brain, 2008) explained it, there are no reading genes. Rather, reading is a cultural activity that has undergone profound changes since its inception. In the standard history of reading entitled orality and literacy (Walter, Orality and literacy : the technologizing of the word, 2009) pointed out that the earliest basic script dates from only about 6,000 years ago. Furthermore, the first full alphabet did not have its beginning until the Greeks developed their alphabet about 750 B.C. Putting this time frame into an individual perspective, Wolf poetically wrote that “despite the fact that it took our ancestors about 2,000 years to develop an alphabetic code, children are regularly expected to crack this code in about 2,000 days” (Wolf M., 2007). Providing insight into the cultural history of reading, Robert Darnton pointed out that up until the third or fourth century A.D., Europeans “had to unroll a book to read it (Darnton, The library: Three Jeremiads, 2010 ). Scrolls would eventually evolve into folded pages, which in turn eventually became gathered pages or the codex in which the book as it is recognized today. The popular writer Alberto Manguel has written that early Christians adopted the codex because they found it a convenient format for keeping their spiritual texts hidden from Roman authorities (Manguel, 1998). These early Christians were the forefathers of the men who later read and transcribed their religious texts in monasteries. Interestingly, these early scribes first did their work by reading out loud to themselves. Not until the ninth century did monastic regulations begin requiring silent reading (Manguel, 1998). By the thirteenth century, the practice of men reading silently and alone became commonplace. This shift to silent reading was a profound change, one that Darnton suggested: “involved a greater mental adjustment than the shift to printed text” (Darnton, The kiss of Lamourette: Reflections in cultural history, 1990).

#### IMPORTANCE OF READING

Reading is a cornerstone for success not just in schools, college or University but throughout life. Through reading, we acquire new knowledge and ideas, obtain necessary information, relax the minds, and improve our command of language and vocabulary. It also serves as a good companion and provides pleasure, expand our horizons and enrich our lives. We are fortunate as we can easily find libraries and bookshops throughout the country and we should know how to make good use of them. But sadly, this is not the case as many of our young people only visit the libraries and bookstores during examinations or in times of need. Reading has come to hold the most significant place in education as a means of communication in a highly literate society. The book is still very much part of people's lives in our modern society and in spite of the invention of the latest audio-visual materials, the book in its ordinary conventional form is still the most important means of communication ever invented. Reading is important for acquiring knowledge and information. The enrichment in knowledge would, in turn, enable one to present oneself more confidently. From the very young to the old and the sick, there are books to suit every taste (Inderjit, 2014). In their research with adult readers (Guthrie, 1984), found that reading contributes significantly to job success, career development, and the ability to respond to change. The importance of reading has resulted in much research work conducted to understand the nature of the reading habits of individuals. With the growing amount of digital information available and the increasing amount of time that people spend reading electronic media, the digital environment has begun to affect people's reading behavior.

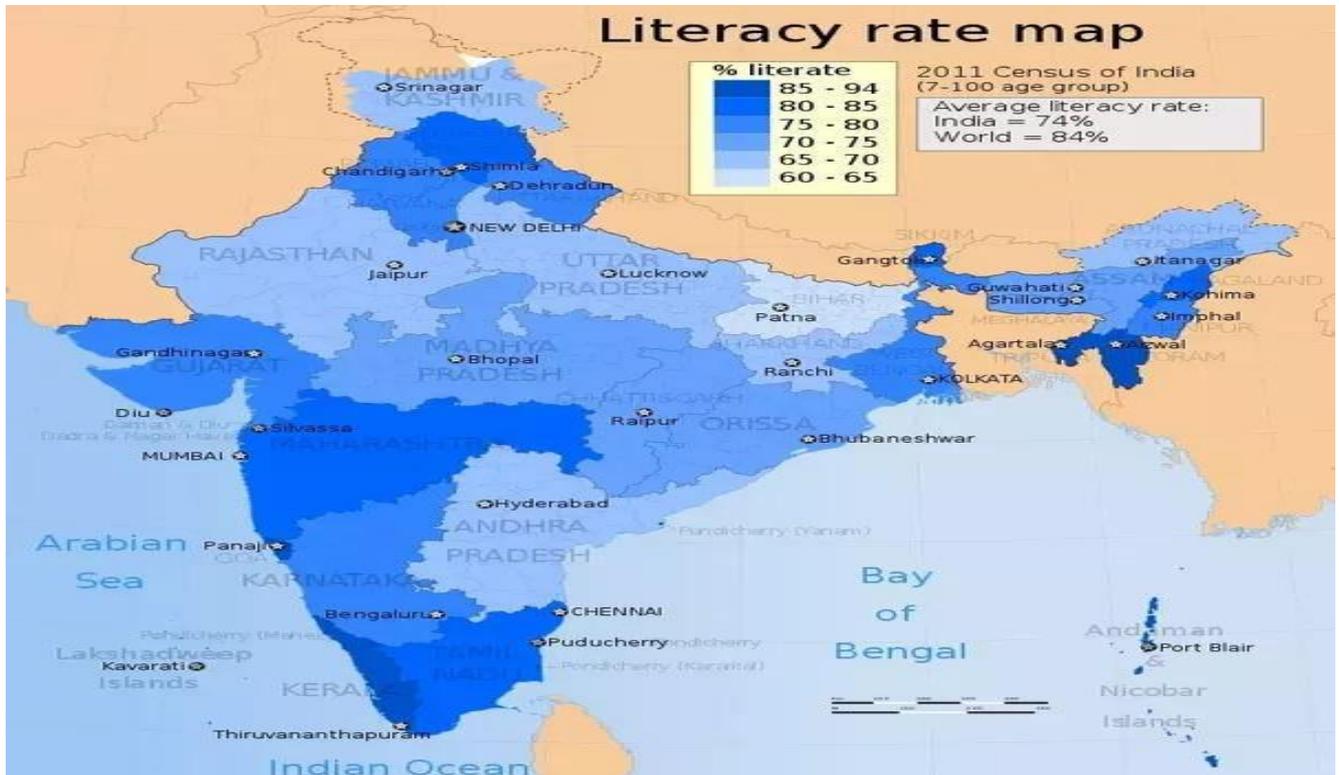
#### WORLD'S LITERACY RATE

If we talk about reading, we must talk about the literacy of the world as well as India. So let's catch up the data who reveals the scenario about the literacy rates. The CIA Worlds literacy map shows the literacy rate adult total of people ages 15 and above. Since this research focuses on the youth between 18 to 35. This data will help to understand the literacy rate of young adults as follows—



(World Literacy Map, 2014) India Literacy Rate

As the 2011 census of India Average literacy rate of India is 74%. This literacy rate shows the literacy of 7-100 age groups as follows—



(India Literacy Map, 2011) Understanding the Title of the Research- 'The Trend of Reading Newspapers among the Youth in 21<sup>st</sup> Century'

**Trend-** According to Merriam-Webster dictionary the word 'Trend' means 'The general movement over time of a statistically detectable change or something that is currently popular or fashionable'. According to Oxford Dictionary the word 'Trend' means 'A general direction in which something is developing or changing; a fashion'. The word 'Trend' is first known use in 1598.

**Read-** According to Merriam-Webster dictionary the word 'Read' means 'to utter aloud the printed or written words of'. According to Oxford Dictionary the word 'Read' means 'Have the ability to look at and comprehend the meaning of written or printed matter'. It is firstly known before 12<sup>th</sup> century.

**Newspaper-** According to Merriam-Webster dictionary the word 'Newspaper' means 'A paper that is printed and distributed usually daily or weekly and that contains news, articles of opinion, features, and advertising'. According to Oxford Dictionary the word 'Newspaper' means 'A printed publication (usually issued daily or weekly) consisting of folded unstapled sheets and containing news, articles, advertisements, and correspondence'. It is firstly known use in 1670.

**Youth-** According to Merriam-Webster dictionary the word 'Youth' means 'the time of life when one is young; especially : the period between childhood and maturity' or 'the early period of existence, growth, or development'. According to oxford dictionary the word 'Youth' means 'The period between childhood and adult age' or 'An early stage in the development of something'.

### **RELEVANCE & NEED OF THE STUDY**

The present era is going towards a digital revolution which affects everyone's life directly and indirectly. human being is now becoming dependent on digital and electronic machines and gadgets. Smartphone is one of them. Youth are getting too much involve with the help of Internet and Smartphone on various social networking platform. Do they have time to read the newspaper or not? is a question on which this research carrying out. The oldest mass communication medium the newspaper is now relevant or not in 21<sup>st</sup> century? This question also encouraged to perform this study. Since India has the world's largest youth population, with 356 million 10-24 year-olds, it becomes necessary to know the trend of reading newspaper among the youth in the present era. With this, it would be known that how much time youth is spending in a day for reading newspaper, which types of news/content are attracting the youth most and it is also that how much reading ability do the youth have?

**Problems of Research-** The problems of the research are mentioned below

- Whether the youth rely on a hard copy of the newspaper or E-paper to read news/content?
- How much time youth spend on reading the newspaper in a day?
- How many newspapers do the youth read in a day?
- Which daily Hindi Newspaper is most popular among the youth?
- Which types of news/content attract the youth most?
- Which types of News/content they are interested to read?
- How much are the youth satisfied with 21<sup>st</sup> century's daily Hindi Newspapers and their content?

**Objectives of the Study-** This research work following these objectives

1. To check whether most of the youth rely on newspaper or E-paper to read news/content.
2. To know the time duration spent by the youth to read newspapers in a day.
3. To check newspapers readability of the youth in a day.
4. To know the Daily Hindi newspaper preferences among the youth in Varanasi.
5. To find out the news/content preferences among the youth while reading the newspapers.
6. To know the interest of youth in various types of news/content while reading the newspapers.
7. To know the opinion of youth on 21<sup>st</sup> century's Daily Hindi Newspapers and their content by rating scale from very poor to very good.

**Hypotheses of the study-** This research study following these hypotheses

1. It appears that in the 21<sup>st</sup> century the youth rely on mostly E-paper for reading News/content.
2. It seems that youth are spending less time for reading newspaper in the 21<sup>st</sup> century.
3. It appears that youth's newspaper readability is very low.
4. It seems that Dainik Jagran is the most popular daily Hindi newspaper among the youth.
5. It appears that educational news/content is popular among the youth while reading newspapers.

## REVIEW OF LITERATURE

(Inderjit, 2014); In his research paper '*Reading Trends and Improving Reading Skills among Students in Malaysia*' published in the International Journal of Research In Social Sciences studied to show the readings trends and relate the importance of reading and conditioning this behavior towards a habitual way of life amongst Malaysian students. S. Inderjit also found that certain past and current research will be used as a platform to provide solutions to improve and increase the intensity of reading amongst Malaysians. The paper concludes that some of the methods of improving reading among students participation in classes, homework to improve reading comprehension developing the survey, question, read, recite and review (SQ3R) method and peer teaching.

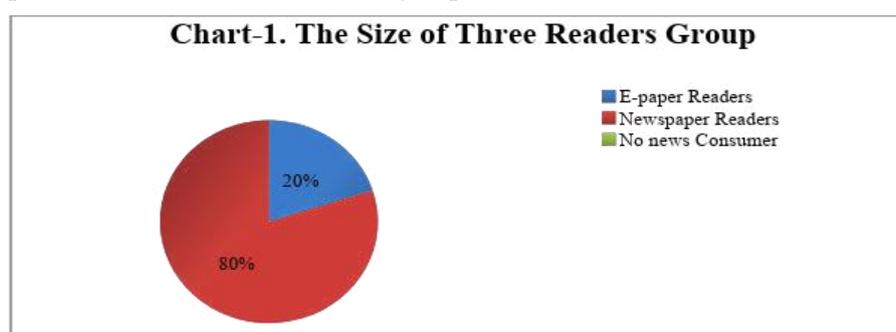
(Wolswinkel, 2008); In their research paper '*New Paper Reading: The Explaining Factors of Newspaper Reading Behavior of Young Adults*', he found out that newspaper reading does not depend on young adult's surveillance needs. Facilitating conditions are very influential in newspaper reading time. He also found that when newspaper reading is made easy to young adults, they tend to read them, regardless of their real interest in the news subjects.

## METHODOLOGY

Research Design of the study is exploratory cum quantitative deductive. For data collection, online survey method has been used. In which researcher used a Google form questionnaire & picked up a sample via an online survey through various online platforms, such as Facebook, WhatsApp, Messenger, and others. Area of the study is Varanasi, India. The universe of the study is all Youth of Varanasi. The homogeneity level of the universe was also seriously studied during the pre-test after study of homogeneous characteristics of the population and keeping in mind objectives and hypotheses of the study, researcher considered this sample size. Data have been collected from both the sources, primary as well as secondary. Data have been analyzed through simple statistics.

## RESPONDENTS

The research focuses on the youth of Varanasi city. In accordance with age categories in other newspaper research, the target group was defined as males and females between the age of 18 and 35 years. For administering the online Google form questionnaire, the respondent group consisted of 100 youth of Varanasi city (Gender: Females 65%, Males 35%; Education: Intermediate 05%, Graduation 45%, Post Graduation 40 %, and Ph.D. 10%). Data have been gathered via a Google form questionnaire. 1000 people of the target group were invited by Whatsapp, Facebook messenger to fill the google form questionnaire. During the two weeks period in February 2019, 100 respondents filled the Google form questionnaire completely (response rate was 10%). On the basis of filled Google form questionnaire by the respondents in news consumption pattern, the respondents were placed in one of the three reader groups, as can be seen in **Chart 1**.



In the above chart, it is clear that 80% of the youth read news through the hard copy of Newspapers while the rest of 20% youth rely on E-paper.

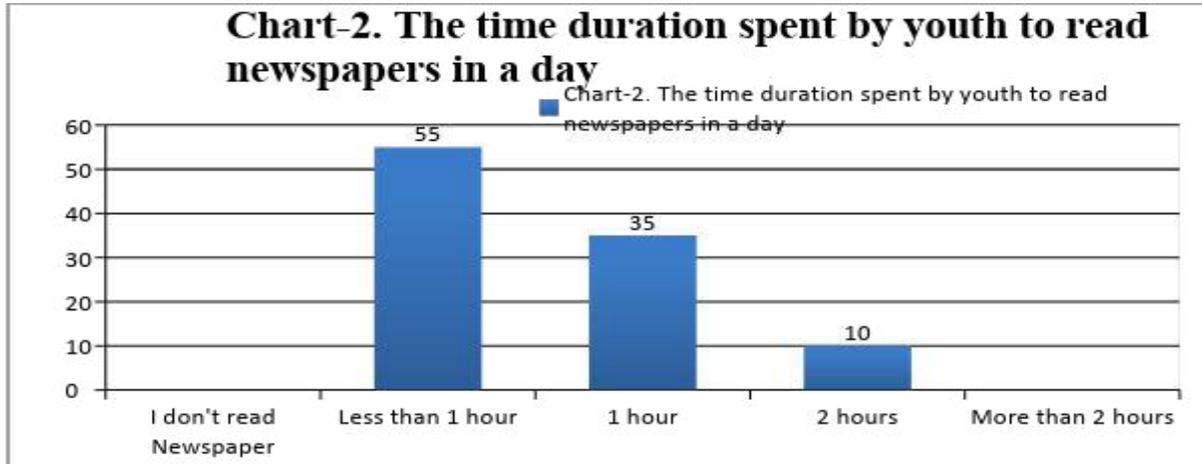
## LIMITATION OF THE STUDY

The limitations of the study are as follows—

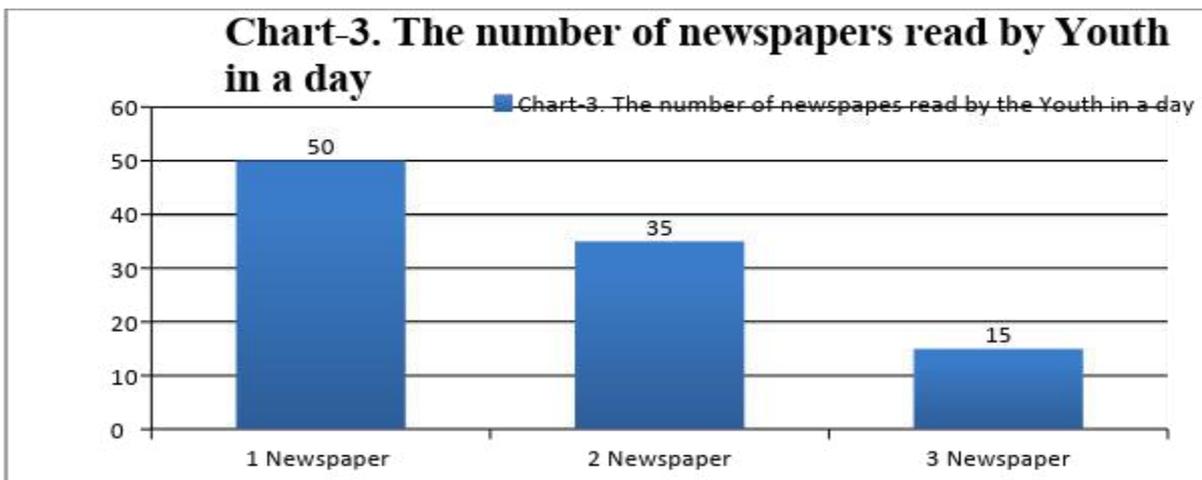
- In this research paper, the youth from 18 to 35 years old have been selected for sampling.
- 100 youth participated from Varanasi, India via an online survey.
- The research studies only about Daily Hindi Newspapers of Varanasi.
- Due to the constraints of time, certain topics have not been touched upon at all during the course of the study while some of them explored in a limited manner. An in-depth analysis may be further taken up on this topic.

**Data Tabulation, Analysis, Discussion & Interpretation**

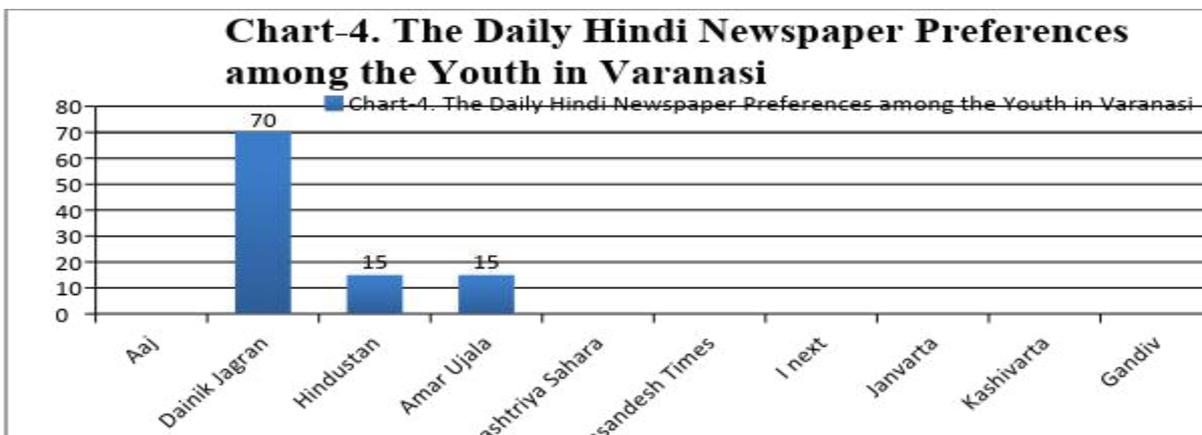
After the gathered data through online survey, there is data tabulation, analysis, discussions & interpretations is described with the help of charts as follows—



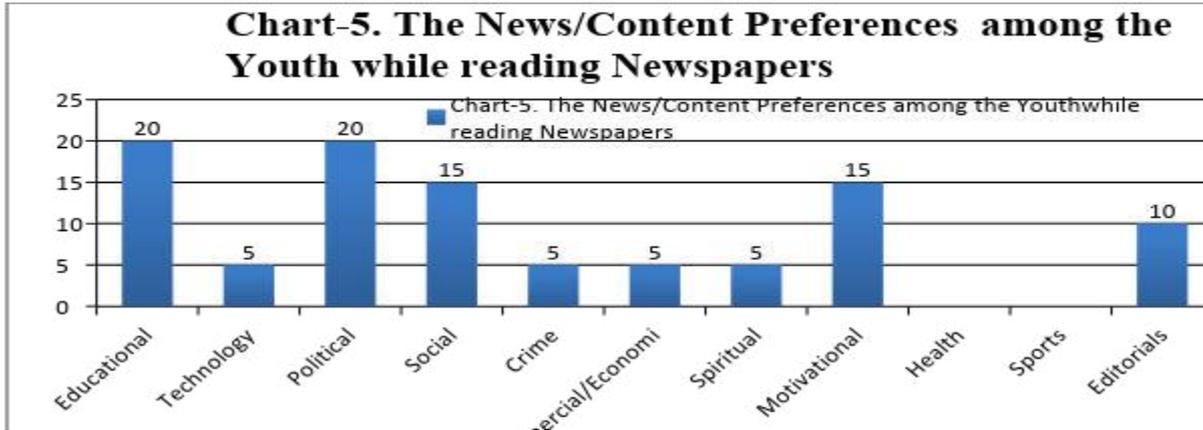
In the above chart it's clear that 55% of the youth read newspapers less than 1 hour, 35% youth read the newspaper 1 hour and only 10% of the youth take 2 hours for reading newspapers. It clearly indicates that youth are trying to spend much time on newspapers but still they're spending less time in about less than 1 hour.



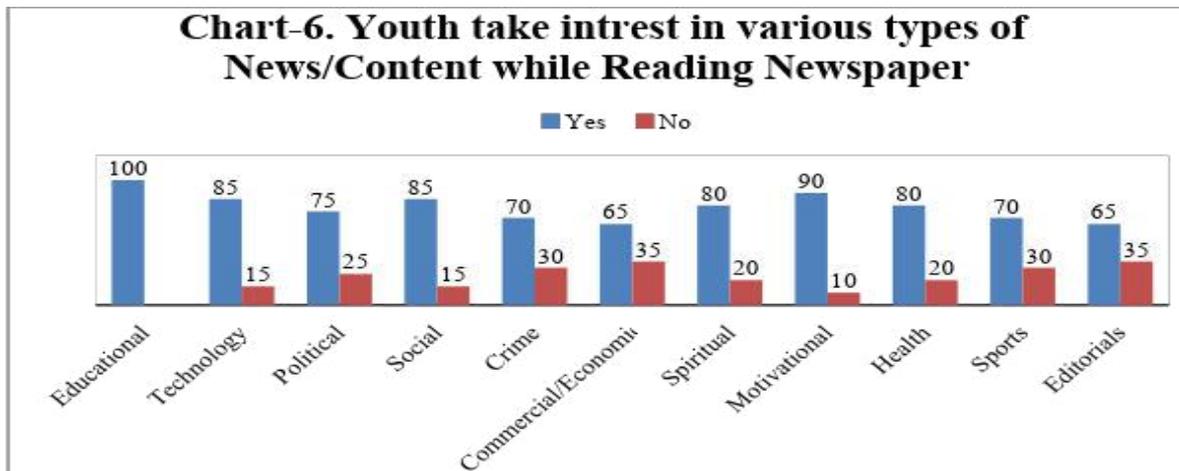
In the above chart, it's clear that 50% of the youth read only 1 newspaper in a day, 35% of youth read 2 newspapers in a day. 15% of the youth take an interest in reading 3 newspapers in a day. It shows youth newspapers readability that 50% of the youth are trying to read 2 or 3 newspaper in a day. It's a good sign of today's youth.



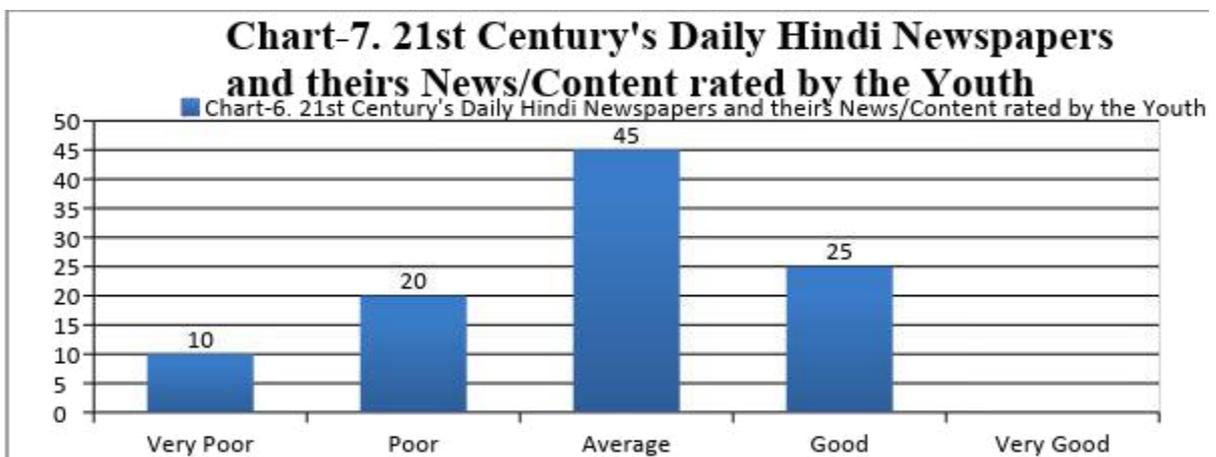
In the above chart, most of the youth (70%) prefer Dainik Jagran newspaper to read while Hindustan & Amar Ujjala both are at the second place with the preference among 15% of the youth in Varanasi. No, any youth has given preference to all the other daily Hindi newspapers of Varanasi. It shows that overall Dainik Jagran is the most popular daily Hindi newspaper among the youth.



In the above chart 20% youth prefer Educational and political news/content, 15% youth prefer Social and Motivational News/Content, 10% youth prefer Editorials while 5 % of the youth prefer technology, crime, commercial/Economics, and spiritual news/content while reading newspapers. No, any youth prefer health and sports news/content while reading newspapers. It shows that Educational and political News/Content is most popular among the youth.



In the above chart 100% youth read Educational news/content, 90% of Youth read Motivational News and content, 85% of youth take interest to read Social & technology related News/Content, 80% of youth take interest to read Spiritual & Health related news/content, 75% of youth take interest to read Political news/content, 70% of youth take interest to read Crime & Sports related news, and 65% of youth take interest to read Commercial/Economics related news/content & Editorials. It shows that Educational, Motivational, Social and Technology related news or content attract the youth most.



In the above chart, most (45%) of the youth give an average rating to 21st century’s daily Hindi newspapers and their news/content. 25% rated Good, 20% rated poor while 10% rated very poor to 21st century’s daily Hindi newspapers and their news and content. It shows that Most of the Youth (75%) are not satisfied with today’s daily Hindi newspapers and their news and content.

**RESULTS & FINDINGS**

1. Most of the youth (80%) read news through the hard copy of Newspapers while the rest of 20% youth rely on E-paper. Hence hypothesis1 is proved wrong.
2. Most (55%) of the youth read newspapers for less than 1 hour. It clearly indicates that youth are trying to spend much time on newspapers but still they're spending less time in about less than 1 hour. Hence hypothesis2 is proved.
3. 50% of the youth read only 1 newspaper in a day, 35% youth read 2 newspapers in a day. 15% of the youth take an interest in reading 3 newspapers in a day. It shows youth newspapers readability that 50% of the youth are trying to read 2 or 3 newspaper in a day. Hence hypothesis3 is proved somewhat wrong.
4. Most of the youth (70%) prefer Dainik Jagran newspaper to read. It indicates that Dainik Jagran is the most popular daily Hindi newspaper among the youth. Hence hypothesis4 is proved.
5. 20% of the youth prefer Educational and political news/content, 15% youth prefer Social and Motivational News/Content, 10% youth prefer Editorials while 5 % of the youth prefer technology, crime, commercial/Economics, and spiritual news/content while reading newspapers. It shows that Educational and political News/Content is most popular among the youth.
6. 100% youth read Educational news/content, 90% Youth read Motivational News and content, 85% of youth take interest to read Social & technology related News/Content. It shows that Educational, Motivational, Social and Technology related news or content attract the youth most. Hence hypothesis5 is proved.
7. Most (45%) of the youth give an average rating to 21st century's daily Hindi newspapers and their news/content. 25% rated Good, 20% rated poor while 10% rated very poor to 21st century's daily Hindi newspapers and their news and content. It shows that Most of the Youth (75%) are not satisfied today's daily Hindi newspapers and their news/content.

**CONCLUSIONS**

The whole research states that still in 21st-century youth are rely on a hard copy of the newspaper than E-paper. It shows the relevance of print media even in the internet era. Yes! No doubt youth don't spend much time for reading the newspaper but it's a good sign that at least they try to spend 2 hours for reading newspapers. The newspaper readability of the youth is much appreciable because 50% of the youth are trying to read 2 or 3 newspaper in a day. This is the other matter that rest of the 50% youth read only 1 newspaper in a day. Throughout the research, Dainik Jagran is the most popular daily Hindi Newspaper among the youth of Varanasi. From the research, it is found that most of the youth prefer Educational and political News/Content while reading the newspaper. It also shows that they're inclined towards politics as well as education with the same preference. The research also shows that Educational, Motivational, Social and Technology related news or content attract the youth most. These all are the subject of youth's interests. In this research, youth rated 21st Century's daily Hindi newspapers and their news and content and it's found that they are unsatisfied with it. Most of the students rated it average on a rating scale. No one finds that Today's daily Hindi Newspapers and their news and content are very good. This is the matter of thinking for daily Hindi Newspaper organizations of Varanasi.

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**MEDIA PREFERENCES OF YOUTH IN SPECIAL REFERENCE TO THE UNIVERSITY STUDENTS OF VARANASI****Shikha Singh**Research Scholar, Department of Journalism & Mass Communication, Mahatma Gandhi Kashi Vidyapith, Varanasi

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**ABSTRACT**

*India is one of the largest democracies in the world. And 'Media' is the fourth pillar of this exemplar democratic structure. As India has more than 50% of its population below the age of 25 and more than 65% below the age of 35, a detailed analysis of media preferences of the youth of the country becomes of utmost importance. This research paper studies the background conditions that influence the choices of people(youth in particular) related to media sources.*

*The sample size of the study is 45 students from different educational institutions of Varanasi, belonging to the age group of 15 to 29. The research has been conducted using survey method, using questionnaires. The universe of the study is all the Youth of Varanasi. Data have been and analysed through simple statistics.*

*Keyword: Media preferences, Youth, Democracy, University students, Varanasi*

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**INTRODUCTION**

Media is an essential component of human life. Multiplicity of availability of media sources creates the need of preference/choice/ selection. The traditional print/electronic or new social media are the available choices. The term "MEDIA PREFERENCES" is used to describe how people use the various organs of mass media and interpersonal communication. To further explain this it is necessary to discuss mass communication, which can be defined as "A system of communication where by messages are being dispersed to a heterogeneous audience simultaneously." This communication system uses various media i.e. print/electronic or new social media. According to the National Youth Policy 2014 "the age of YOUTH is between 15 to 29 years." While the United Nations considers youth as people between 15 to 25 years of age.

Media is a tool to acquire information. And like any tool, its use depends on the needs of the consumers. As it does not only entertains the youth but also educates, inform and sensitize the youth about the issues that affect their lives: Human rights, education, health, environment etc. The choices people make, whether to follow traditional or new(social) media is highly dependent on their requirements. While traditional media is more reliable and accessible, the internet is more up-to-date and extensive.

Next comes the economic considerations. For some people it's traditional media that's more affordable, and for others, social media is better within their reach. The rapid growth and expansion of telecom services in all parts of the country, has swayed the preferences of today's youth towards contemporary social media platforms.

The media preferences of present generation are also very much affected by their educational level and technical skills. The traditional media(newspaper and radio) and new media each has their own benefits for different educational fields. Thus the level of education of consumers directly influences their preferences among the available options of media sources.

**PROBLEM/SUBJECT OF STUDY**

The identified problem /subject for the purposed study is Media Preferences of Youth.

**OBJECTIVE OF THE STUDY**

1. To know the preferences/choices/selection of media as far as youth is concerned.
2. To study the youth characteristics and how they influence mass media preferences.
3. To show the youth as a potential active partner in the process of mass communication.
4. To what extent does educational level of youth affect their media preference
5. To what extent youth read newspapers rather than Television.
6. To what extent does youth prefer listening to Radio rather than other Mass Media channels

**REVIEW OF THE LITERATURE**

There have been many studies regarding media preferences among youth throughout the years. However, the reasons behind their preferences have not been studied thoroughly yet

**LOWISZ STEVE(2014)**

1. Today's more than 50% of people learn about breaking news through social media instead of reading a newspaper.
2. 55% of regular news readers say they read newspaper mostly on a computer or smartphone.

**Fayaz Ahmad Loan (2011);** conducted his research on ‘Media preferences of the net generation college students’. In his research he compared students' preferences between reading and electronic media devices, where, reading proved to be one of the top most activities only defeated by watching television and listening music. His work suggests that the electronic media is competing with traditional media on different fronts as social media surfing is also preferred by a good number of net generation students over reading.

**Dr Prabha Sanker Mishra (2016);** concluded that the presence of mass media in the life of present generation is very evident. Amidst various kinds of the mass media, people have the alternatives to choose the media as per their needs. The study suggests that the smartphone is highly preferred medium by the young people(60%). Television is the second most preferred medium(32.5%) and Radio is the least preferred medium.

**HYPOTHESIS OF THE STUDY:**

The Hypothesis of the study is:

1. Media preference is need based.
2. Media preference is based on economic consideration.
3. Media preference is based on educational level of youth.
4. Youth prefer listening to Radio to any other Mass Media channel.
5. Youth do not prefer listening to Radio to any other Mass Media channel.
6. Youth prefer the readership of papers to watching television.
7. Youth do not prefer the readership of papers to watching television.

**DATA TABULATION AND ANALYSIS**

**TABLE:- 1**

Needs	Newspaper(%)	Radio(%)	Television(%)	Smartphones/ Social media(%)
Entertainment	1	4	38	57
Education	23	10	8	59
News	30	12	17	41

Table 1 suggests that youth today selects media source based upon their needs. Though for all purposes, new media is comparatively more preferred.

**TABLE:- 2**

Economic Conditions	Newspaper (%)	Radio (%)	Television (%)	Social media (%)
Below avg	21	23	16	40
Avg	22	15	21	42
Above avg	16	1	20	63

According to Table 2, the economic considerations to the youth have an impact on their media preferences as well. Newspapers and social media has almost same popularity among all economic sections, where social media is always comparatively more popular. While there is a large difference in youth preferring radio and television on the basis of economic conditions.

**TABLE:- 3**

Education	Newspaper (%)	Radio (%)	Television (%)	Social media (%)
UG	33	9	18	40
PG	12	15	19	54
Others	17	15	11	57

Table 3 suggests that the education level of youth also affects their media preferences. New media is prevailing over other media sources in every category.

**RESULT & FINDINGS**

- Most of youth prefers smartphones/social media over other media sources for different needs. Newspaper is mostly preferred for news, while television is more preferred for entertainment purposes.
- The youth belonging to different economic groups, prefer new media over newspaper, television and radio. Radio is mostly popular among youth from below average economic background. While television is mostly preferred by the average category.
- The media preferences of all youth tends towards new media when compared to other options available.

**TESTING OF HYPOTHESES**

H1: The first hypothesis is *affirmed* by Table 1, showing that the media preferences of youth is need based.

H2: The second hypothesis is proved *true* by Table 2, because economic background of the youth is seen to affect their media preferences.

H3: The youth select their media sources as per their education level is proven *true* by the third table.

H4: This hypothesis is proven *wrong*, as radio is never seen to be the most preferred option of the youth in any of the given conditions.

H5: This hypothesis stands *true*.

H6 & H7: Youth prefers reading newspaper over watching television for education and news, while for entertainment purposes television is more preferred than newspaper. Thus in this case both the hypotheses remain *true* in different scenarios.

**CONCLUSION**

Thus we see the media preferences of youth is need based. It depends upon their economic background and education level. Though in each and every condition smartphones/social media is more preferred over all other media sources. Because mass media today, is not just a monologue anymore. With the advent of social media and increasing awareness among youth, media has become more of a discussion platform. The traditional media has either none or very few and tiresome feedback opportunities. While social media provides the option to not only gain information, but also contribute something new or just share their individual view point on a particular matter.

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**STATUS OF WOMEN IN RURAL INDIA****Hemangini Ameta**Assistant Professor, Department of Mass Communication, Pacific University, Udaipur

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**ABSTRACT**

*Women, a girl, a wife, a mother, a grandmother, overall woman is a key of a family. World can never be complete without a woman. Law is the set of rules enforced to govern the behavior of people. From the beginning of this world women is treated as a weaker section of the society and they are the victims of the crimes like rape, eve teasing, female infanticide, dowry, domestic violence, child marriage and acid throwing. They were only allowed to live beneath the shoes of their husbands and fathers. Laws are being made to secure the lives of the women from the violence of their families and societies, and to provide them with their rights of which they are the owners. This paper covers the aspect of women from past history to the present world. It shows how the law of our country has contributed its best to change the lives of women, to make them live with dignity and respect not as a slave.*

*Keywords: Legal status, Women rights, Domestic violence, Child marriage, Dowry, Eve teasing*

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**INTRODUCTION**

Legally a female is known as a woman after she has passed through her childhood and adolescence, i.e. basically after crossing the teenage a girl is a woman. Government of India has made several laws to provide equal status to women in our country and secure their lives from various violence and crimes. Constitution of India provides fundamental rights and fundamental duties to the citizens of India; each and every citizen of this country is equally entitled of these rights and duties. The Constitution of India guarantees to all Indian women equality.

**(1) EQUALITY IN RURAL AREAS**

Tangible proof of the relevance and effectiveness of Indian women's movements, is the fact that the issue of women's rights is today a central tenet of political and development discourse in India. Affirmative action for women's political participation, the implementation of major poverty alleviation programs through women's groups, the review of laws and regulations to ensure women's equality all demonstrate this recognition at the political level and at the level of policy. Nevertheless, there is no denying the facts documented in this report evidence of the huge gaps between Constitutional guarantees and the daily realities of women's lives. It is important to acknowledge these gaps, because the time has never seemed more appropriate to make a huge concerted effort to bridge them to identify and overthrow the barriers that prevent the realization of freedoms and equality for half of India's population. Of course, all women are not equal women belonging to the privileged and dominant classes and castes enjoy many freedoms and opportunities that are denied to men from subordinate and disprivileged groups. Gender inequality is not the only inequality in India women are unfree and unequal, but so are Dalits and Adivasis, members of subordinate castes and communities, landless people, displaced people, migrants, the homeless, disabled people and many other groups. Yet, women are at the bottom of the pile in every one of these groups the last man in Gandhiji's talisman, the poorest and most powerless individual, is actually a woman. Equality of freedoms and opportunities for this last woman can come about only through transformation in all the structures and systems that generate and perpetuate inequalities a transformation that would benefit every other subordinate group in society.

**(2) EDUCATION OF WOMEN**

Eliminating gender differences in access to education and educational attainment are key elements on the path to attaining gender equality and reducing the disempowerment of women. In recognition of the pivotal role of education in development and of persistent gender inequalities in access to education, the elimination of gender disparity in primary education is one of the Millennium Development Goals. The achievement of universal primary education has been a key goal of Indian planning since Independence. However, increasing access to primary schooling still leaves the twin questions of educational quality and school retention unanswered. Continued economic development cannot be sustained with a population that has merely completed primary school; it needs a dependable supply of highly educated and skilled human capital for which a high level of educational attainment of both women and men is necessary. However, ensuring a continued supply of skilled human capital to sustain economic growth is only one objective of reducing gender inequalities in educational attainment: the other is that education, particularly higher education of women, is a key enabler of demographic change, family welfare, and better health and nutrition of women and their families. Higher education has the potential to empower women with knowledge and ways of understanding and manipulating the world around

them. Education of women has been shown to be associated with lower fertility, infant mortality, and better child health and nutrition.

### **(3) MARRIAGE IN RURAL PARTS OF INDIA**

An early age at marriage of women is an indicator of the low status of women in society; at the individual level too, an early age at marriage for a woman is related to lower empowerment and increased risk of adverse reproductive and other health consequences (Mason, 1986; International Center for Research on Women, 2007). An early age at marriage typically curtails women's access to education and cuts short the time needed to develop and mature unhampered by responsibilities of marriage and children. Young brides also tend to be among the youngest members of their husbands' families and, by virtue of their young age and relationship, are unlikely to be accorded much power or independence.

An early age at marriage also has many negative health consequences for women. For one, early ages at marriage typically lead to early childbearing. Having a child when the body is still maturing increases the risk of maternal and child mortality. Further, women married very early are typically sexually immature and inexperienced, but are often married to much older sexually experienced men. This combination of early ages at marriage and large spousal age differences can put women at a higher risk of sexually transmitted infections including HIV (Bruce and Clark, 2004). Specifically, young women married early may be subject to a higher risk of infection because of prior sexual experiences of their older partners combined with their inability to negotiate safe sex due to their own young age and immaturity and, often, the large spousal age difference. This chapter presents the levels of and trends in the age at marriage for women and men and in spousal age difference.

### **(4) HEALTH AND AWARENESS**

The Women's health and nutritional status is inextricably bound up with social, cultural, and economic factors that influence all aspects of their lives, and it has consequences not only for the women themselves but also for the well-being of their children (particularly females), the functioning of households. Since the turn of the century, India's sex ratio has become increasingly favorable to males. This is in contrast to the situation in most countries, where the survival chances of females have improved with increasing economic growth and declining overall mortality. In India, excess female mortality persists up to the age of 30—a symptom of a bias against females. But there are wide disparities in fertility and mortality among states and, within states, between rural and urban areas. The substantially unfavorable levels of these indicators in the northern states of Bihar, Madhya Pradesh, Rajasthan and Uttar Pradesh in relation to most southern states reflects marked social and demographic contrasts between the "Hindi belt" and the rest of India. The southern state of Kerala, for instance, has achieved fertility and mortality levels approaching those of industrial countries (Improving Women's Health in India; 1996). This is the status of women health in India compared other countries in the world.

This son preference, along with high dowry costs for daughters, sometimes results in the mistreatment of daughters. Further, Indian women have low levels of both education and formal labor force participation. They typically have little autonomy, living under the control of first their fathers, then their husbands, and finally their sons. All of these factors exert a negative impact on the health status of Indian women. Poor health has repercussions not only for women but also their families. Women in poor health are more likely to give birth to low weight infants. They also are less likely to be able to provide food and adequate care for their children. Finally, a woman's health affects the household economic well-being, as a woman in poor health will be less productive in the labor force.

### **REVIEW OF LITERATURE**

To make the scheme successful in empowering rural women, it is very necessary that they should participate in large numbers in the Gram Sabha (open rural assembly) and voice their preferences and concerns regarding the implementation of government schemes, including, MGNREGS. The opportunity of right to livelihood should be properly made use of. Indian Constitution had not given the right to work as a justiciable right. But, it was in 2005 that the Indian Parliament passed the law on Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) to provide the right to work to Indian citizens of rural areas. Rural Indian women are stepping out of their private space and making a contribution in building infrastructure in the village, other than empowering themselves. The Government of India has provided an opportunity to rural women to live with dignity and honor and equal footing with the rural man. Earlier, the contribution of the rural women was invisible to the people with patriarchal mindsets. MGNREGS is trying to empower the invisible lifeline of rural community. For making their lives successful and meaningful, Indian rural women have also to put in 100 percent initiative. Otherwise, the scheme may fail as any other government project, with all its loopholes. If implemented successfully, it can become a role model for all developing countries.

Any developmental process is the expansion of assets and capabilities of rural women to participate in, negotiate with, influence, control, and hold the institution accountable that affect their lives. Skill development among rural women is the need of the hour so as to make them confident, self-reliant and to develop in them the ability to be a part of decision making at home and outside. Indeed it may not be wrong to say that still rural women are the most disadvantaged and neglected section of the society for they are economically backward. Therefore there is a need on the part of the government and civil society to enable improvement in the quality of life of such vulnerable sections of the Indian population.

More importantly the developmental process in India should give priority to welfare schemes and programs meant for scheduled castes and scheduled tribes" including women. These are the people who are economically backward; therefore, there is a need for sincere efforts on the part of the government to help improve the quality their life. The Social Assessment for the training and skill development clearly reflected that rural landless (mostly SCs and STs) form an integral part of poverty-ridden and marginalized groups. By empowering rural woman through education can thus enable them to live with dignity and self-reliance cutting across the barriers of customary biases and prejudices, social barrier of caste, class, gender, occupation and institutional barriers that prevent them from taking actions to improve their state both at the individual and collective level. Therefore, free education and necessary and employable skill development programs must be launched for rural students and women so as to make them self-reliant and economically independent. Furthermore, right to vote is meaningless unless rural women are made aware, educated and imparted skills to understand the order of the day and this can bring change in their lives, in the family and lastly transform the holistic tribal landscape of India, through education, legal awareness, and socio economic independence. Thus, there is no doubt that the rural women can acquire any developmental milestones (skills) only through education and thus can change their own destiny.

Today the reflections of modern life styles shown on the Indian rural society along with the rural women. Villages are changing their old look and accepting the new social changes. There are many causes responsible for rural social changes. The social process touch to the different feathers of rural society. May some changes are positive and some are negative. The education flow has been reached towards rural society and affecting on rural women. India is a country of villages as the majority of its population lives in villages and far-flung remote areas.

Women emerged in developmental process from the concept of equality. Any developmental process is the expansion of assets and capabilities of rural women to participate in, negotiate with, influence, control, and hold the institution accountable that affect their lives. Skill development among rural women is the need of the hour so as to make them confident, self-reliant and to develop in them the ability to be a part of decision making at home and outside. Rural women are the most disadvantaged and neglected section of the society for they are economically backward. Therefore there is a need of time for overall development of rural society.

The review of the status of women in India tells the story of a fall in the status of women to an abysmally low position from a relatively high status and nobility of the Vedic times. The fall in status has led to a socio-economic and religious-cultural deprivation of women. From the womb to tomb women are victims of violence and deprivations. The vulnerability of women in rural India and that too in Uttar Pradesh is worse compared to the all India levels. Of course, there are certain initiatives in the country, especially after the Independence towards raising the status of women. However, there are miles to go in order to reach the goal of gender equality. Apart from this general condition of gender inequalities, the situation seems more miserable in case of Dalit women. They are victims of a double deprivation. One, on the gender front, and the other on the caste front.

**Change is on** India is probably the most complex and diverse society, intricately knotted in age-old beliefs and practices. Hence few bold departures or courageous social reforms appear feasible. Yet, a woman's image and fate, which are most constricted in the current milieu, now surprisingly see the dismantling of many a shackle. More and more women are seen in schools and colleges and in more social and professional streams. It has been made possible both through positive discrimination policies and women's grit, along with a ready-to-assume-new roles attitude.

The internet and the social media have fuelled online women activism in a big way. Projects like Digital India promise to provide opportunities for e-learning and to open earning avenues for women. Meanwhile, in the hinterlands there's the real-life version of Gulaab Gang (a 2013 film in which a woman protagonist battles social injustice and creates a platform for abused women), with women in one of the most backward regions of

Uttar Pradesh getting together to build a historic movement to battle multiple forms of social biases and exploitation. It has expanded to include girls' education on its agenda.

### RESEARCH METHODOLOGY

This study has been done to analyze the present status of female in India. This research is a qualitative research. For this research, secondary data have used and data collected from some sources like previous research findings, news papers, some blogs and websites.

While it cannot be comprehensive, this report offers a broad picture of relevant development of women in India. The aim is to raise awareness, spark further discussion and stimulate the Media to increase the level of omen in rural parts of India. This report also indicates towards media to keep people's attention for women's status in india and discouraging the negativity in the society.

### CONCLUSION

The review of the status of women in India tells the story of a fall in the status of women to an abysmally low position from a relatively high status and nobility of the Vedic times. The fall in status has led to a socio-economic and religious-cultural deprivation of women. From the case study undertaken, it is observed that the present women in rural areas understand the current situation and they are becoming support to the family. But by providing necessary skills, alternative employment opportunities are challenges of women in the rural sector. Also low pay, absence of job security, long working hours are the main reasons for their slow growth in social status. The initiatives by the government will make all the women to stay ahead in all the activities. However, there are miles to go in order to reach the goal of gender equality. It is observed from the present studies that around 68% of the women can read and write at basic level. They are having sufficient freedom to save their earnings and improving their socio-economic status.

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**DIGITAL MEDIA- SHAPING THE FUTURE OF ADVERTISING**

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**ABSTRACT**

*Advertising has always followed the consumers and same is the case with the digital media. Over the past few years, with increased scope of digital media, the advertisers are able to reach much bigger audience. Almost every area of the business has been impacted by the digital media. It is actually changing the traditional marketing communication as consumers are increasingly using the digital media and turning away from traditional media. Even marketers today are changing traditional advertising approaches to keep up with current trends. In fact, advertisers are able to reach a much larger audience through digital media. This study offers the characteristics of digital advertising and why it works. It will also throw some light on consumer's perception towards digital advertising.*

*Keyword: Digital Media, Advertising, Consumers, Impact*

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**1. INTRODUCTION**

Digital advertising is defined as promoting goods, services or ideas to target consumers by using internet as the medium. Digital Media has provided the advertisers new techniques of capturing attention of target audiences with more scope for creativity and effectiveness hereby adding new dimensions to advertising world. 'Measurability is the most important dimension of digital advertising after convenience and spontaneity. It has facilitated the advertiser to determine the productivity of their advertising campaign by measuring the feedback fairly and accurately. Another important dimension is the convenience of modifying the content as and when required without being affected by time and place. Digital advertising has made it easier by creating well defined consumer groups so that the messages can be designed for specific segments of consumers. Moreover, digital advertising methods are quite cost effective. It has led to the reduction of transactions cost between advertisers and consumers. It is because digital advertising enables the advertiser to target the information to those consumers who actually value the information and are most likely to act on it. In Developed countries, digital advertising is attracting consumers as well as advertisers because of its numerous advantages over traditional methods of advertising. This is the reason that it has become a buzz world in marketing. Also, Rupert Murdoch has once said, "The Internet has been the most fundamental change during my lifetime and for hundreds of years."

**2. METHODOLOGY**

The research would be primary and secondary in nature. It would include review of various research papers, articles and websites.

**3. SAMPLING METHOD**

The sample size is 50 age group of 25-35. Samples were randomly selected from different offices as they are the digital media users and decision makers when it comes to making purchases.

**4. DIGITAL ADVERTISING IN INDIA**

Digital advertising has deep roots in other parts of the world. In India also it is spreading its sphere as the number of internet users are growing. Indian advertisers are interested in promoting their products, ideas and services online as they have realised the huge potential of digital world. Mentioned below is some of the statistics about digital media:

"2019 will witness a faster growth in digital and we are expecting digital to be at 20% media mix. As we are witnessing one in every three Indians digitally connected, we can expect the convergence of data, digital and content to deliver seamless and powerful solutions to brands as well as constantly adding inventive practices into the market," said Tushar Vyas, the president of growth and transformation at GroupM South Asia.<sup>1</sup> The Indian advertising industry is expected to touch Rs 776 billion, driven by smart phone penetration and subsequent spends on digital advertising, according to an industry report. The advertising industry is currently estimated to be Rs 559 billion and expected to grow at a compound annual growth rate (CAGR) of 32 per cent to reach Rs 189 billion by 2020, said the Dentsu Aegis Network-e4m Digital Report, which was released here today. According to the report, digital is expected to be the fastest growing medium of the advertising industry

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<sup>1</sup> <https://www.thedrum.com/news/2019/02/13/advertising-spend-india-set-14-growth-2019>

and may account for 24 per cent of the overall industry pie by 2020.<sup>1</sup> Digital advertising is set to grow at 31.96 per cent CAGR, with the market set to expand to Rs 24,920 crore (\$3.52 billion), according to the Dentsu Aegis Network Digital Report 2019. As of 2018, the size of the digital advertising market was around ₹10,819 crore (\$1.3 billion). Pegged at ₹61,878 crore (\$8.76 billion) in 2018, the Indian advertising market is estimated to grow with a CAGR of 10.62 per cent till 2021, to reach a market size of ₹85,250 crore (\$12.06 billion). Television and print media would continue to corner the largest share of media spends at 70 per cent aggregated followed by digital media at 17 per cent. Digital will contribute 29 per cent of the ad market size by 2021.<sup>2</sup>

Many advertisers still feel that though digital ad platforms are effective in increasing the sales; they do not match up to traditional media when it comes to brand building. They feel that brand building is largely happening through traditional ad mediums such as TV, newspapers, radio and outdoor rather than digital. But marketers are moving from purely old platforms to a mix of traditional and digital platforms as the digital media is all pervasive, growing and consumers are increasingly spending time on them. This is further explained by the below mentioned statistics.

Currently, the advertising expenditure on the digital advertising formats is led by social media (29%) followed by search (25%), display (21%) and video (20%). Digital Video is expected to have the fastest growth, with CAGR of 37% that will touch ₹ 5,545 crore by 2021.<sup>3</sup>

As consumers continue to spend more and more time on their smart phones, investments towards digital are rising. In 2017, 70 per cent of India's digital advertising budget was spent on mobile, wherein traditional FMCG and BFSI brands also saw uptake in something as advanced as programmatic spend. According to the 'Mobile Marketing Ecosystem Report 2018' by MMA and GroupM, the global growth of the media ad spends industry in 2017 was 3 per cent, whereas India saw a 13 per cent growth in FY 2018. On the mobile marketing front, 70 per cent of the Indian digital ad spends goes on mobile.<sup>4</sup>

## **5. BENEFITS OF DIGITAL ADVERTISING**

Online media has a great potential as information carrier as compared to other media. It offers higher selectivity among selected consumer group and advertiser is able to get a quick feedback which other traditional media fail to provide. The other benefits are:

- Digital ads reach very large number of potential buyers and even facilitate buyers to target absolute target audience.
- Interested consumers can act on the information online by clicking the pop-ups or banners. Whereas traditional media is usually one way.
- Internet as a medium knows no geographic boundaries and gives the advertisers a huge world wide audience to target at any point of time thereby expanding the company's market globally. Digital advertising works round the clock.
- Interactive nature of digital advertising gives the scope for greater flexibility, effective convergence of text, audio and graphics. Any information uploaded can be updated any time and with very less efforts.
- Digital media has no doubt superiority over other mediums and also enhances the customer company relationships as it facilitates the purchase decision and allows greater feedback than any other medium.
- Production and promotion of advertisements on digital media is cheaper than in traditional media as it doesn't involve printing and postal costs. Hence it saves time and money. Moreover there is also no loss in the quality over a period of time.

<sup>1</sup> [https://www.business-standard.com/article/management/indian-digital-advertising-market-to-grow-32-to-rs-189-billion-by-2020-118011601280\\_1.html](https://www.business-standard.com/article/management/indian-digital-advertising-market-to-grow-32-to-rs-189-billion-by-2020-118011601280_1.html)

<sup>2</sup> <https://www.thehindubusinessline.com/companies/indian-advertising-market-to-cross-10-billion-mark-in-2019/article26013810.ece>

<sup>3</sup> <https://www.livemint.com/Consumer/mNzRMHS1x4klGHKTI0Tb0M/Digital-ad-industry-to-grow-32-to-touch-24920-crore-by-20.html>

<sup>4</sup> <https://www.adgully.com/70-of-india-s-digital-advertising-budget-spent-on-mobile-report-82186.html>

## 6. REASONS FOR THE GROWTH OF DIGITAL ADVERTISING IN INDIA

### Onset of Smart Age

Indian advertising industry has flourished a lot after independence. It has grown from a mini business to a large scale industry employing millions. As of 2018, the Indian advertising market stands at Rs. 61,878 crore (\$8.76 billion) and is estimated to grow with a CAGR of 10.62% till 2021 to reach a market size of Rs. 85,250 crore (\$12.06 billion). The report highlighted that television and print take the largest share of media spends at 70% aggregated followed by digital media at 17%. Digital transformation is being adopted at a substantial scale, which in turn, is increasing the adoption of digital media at a rapid pace.<sup>1</sup>

### A swift change

Undoubtedly, the growth of Internet, social media and mobile users has given an impetus to digital advertising, but there are some other factors also. Digital media offers many advantages over traditional media which has fuelled the growth of digital advertising. Also the interactivity among advertisers and consumers, and the feedback has become a buzz word in today's world. This can only be practiced in digital advertising. Currently, 18% of all digital media is bought programmatically and has grown from 15% last year. The major reason for the growth are technological advancements, improvements in data science & analytics, implementation of algorithm to automate various procedures, better ad fraud detection and improved data policies & regulations. The rapid increase in the penetration of mobile devices and internet has led to 47% of digital media spends on mobile devices and is expected to grow at CAGR of 49% to reach spends share of 67% by 2021.<sup>2</sup>

### Rising interaction

Creativity is the key word in advertising and content is the prime force. But with the growth of digital media content has become the soul of advertising. It is the content only which actually influences the consumers. Along with the content the interaction among marketers and audience is an important factor in the growth of digital media. Consumers these days are too quick to share their feedback on Facebook, Instagram, Twitter and other social media sites. Marketers can more easily connect to the needs and wants of their consumers and get to know their feedback. They can very easily know the success and failure of their campaign and act accordingly.

### Other Factors of Influence

Demonetization slowed down the country and digital ad industry is no exception to it, though telecomm industry continued to grow with increased consumer base and greater customer satisfaction. Increase in the number of mobile phone users and 4G internet services will further attract more customers and will provide consumers with better experiences.

### Policy Matter

NDA Government at the Centre has started the Digital India campaign with full zeal. Under this programme, the government actively supports the digital media, digital advertising industry, and inculcates the digital temperament in the minds of young entrepreneurs for digital growth.

## 7. DATA ANALYSIS AND INTERPRETATION

**Table-1: Digital ads are informative**

	Percentage %
<b>Agree</b>	58.6
<b>Disagree</b>	24
<b>Not sure</b>	17.4
<b>Total</b>	<b>100</b>

58.6% of respondents feel that digital ads are informative whereas 24% don't find them informative and 17.4% are not sure about it. It gives a picture that majority of people feel that digital ads are informative.

<sup>1</sup> <https://bestmediainfo.com/2019/01/digital-advertising-to-reach-rs-25-000-crore-in-india-by-2021-dan-report/>

<sup>2</sup> <https://bestmediainfo.com/2019/01/digital-advertising-to-reach-rs-25-000-crore-in-india-by-2021-dan-report/>

**Table-2: Digital ads giving complete information about the product**

	Percentage %
<b>Agree</b>	41
<b>Disagree</b>	27.3
<b>Not sure</b>	31.7
<b>Total</b>	<b>100</b>

41% respondents feel that digital ads provide complete information about the product and they found them interesting. Whereas 27.3% feel that digital ads are not informative and 31.7% (a good number) are not sure in this regard. They sometimes get complete information and sometimes not. This hints that advertisers need to work on creativity if they want their consumers to be informed.

**Table-3: Digital ads help in finding the right product**

	Percentage %
<b>Agree</b>	40.8
<b>Disagree</b>	29.4
<b>Not sure</b>	29.8
<b>Total</b>	<b>100</b>

40.8% respondents feel that digital ads help in finding the right product for them by informing about the product whereas 29.8 are not sure about it. 29.4% believe that digital ads don't help them in finding right product as they find digital ads less creative and attractive.

**Table-4: Relevancy of digital advertising**

	Percentage %
<b>Relevant</b>	35
<b>Irrelevant</b>	25
<b>Not sure</b>	40
<b>Total</b>	<b>100</b>

As far as relevancy of digital ads is concerned 25% respondents don't find them relevant and 35% find them relevant. Rest is not sure about it. So, here again it shows that consumers are not very convinced about the digital ads.

**Table-5: Digital ads influencing buying decision**

	Percentage %
<b>Agree</b>	38
<b>Disagree</b>	33
<b>Not sure</b>	29
<b>Total</b>	<b>100</b>

On asking about the influence of digital ads on buying behaviour respondents gave a mixed response. 38% feel that digital ads influence buying behaviour whereas 33% are not influenced by the digital ads and 29% are not sure about it. This reflects that buyers are skeptical about the digital ads.

**Table-6: Skeptical about digital ads**

	Percentage %
<b>Agree</b>	39.7
<b>Disagree</b>	26.9
<b>Not sure</b>	33.4
<b>Total</b>	<b>100</b>

This table reflects the reason for not being able to get influenced by digital ads. Almost 40% are being skeptical about the digital ads and 33.4% are not sure about it. Only 26.9% disagree on this. This conveys that majority are being skeptical about digital ads.

**Table-7: Ignoring digital ads**

	Percentage %
<b>Agree</b>	40
<b>Disagree</b>	30.5
<b>Not sure</b>	29.5
<b>Total</b>	<b>100</b>

According to the above table 40% respondents agree on ignoring the digital ads whereas 30.5% don't ignore the digital ads. 29.5% were neutral about it.

**Table-8: Digital ads are distracting**

	<b>Percentage %</b>
<b>Agree</b>	40.3
<b>Disagree</b>	20
<b>Not sure</b>	39.7
<b>Total</b>	<b>100</b>

40.3% found digital ads distracting as they feel that they distract them from the content they are browsing and they avoid clicking them as they feel they might lead them to unknown sites. 20% don't find digital ads distracting whereas 39.7% were not sure about it.

**Table-9: Most trusted medium for advertisements**

	<b>Percentage %</b>
<b>Newspapers</b>	23.2
<b>TV</b>	28.3
<b>Radio</b>	18.2
<b>Outdoor</b>	10.3
<b>Digital</b>	20
<b>Total</b>	<b>100</b>

Above table clearly depicts that newspapers (23.2%) and television (28.3%) are still the preferred medium when advertising is concerned. Third medium is digital advertising with 20% respondents preferring it. Rest is radio (18.2%) and outdoor (10.3%).

**8. FINDINGS**

There is no doubt that digital advertising is growing at a very fast pace in India. It is actually changing the traditional marketing communication as consumers are increasingly using the digital media and turning away from traditional media. It is giving competition to traditional media but as far as consumers are concerned they are still skeptical about digital ads. Majority of viewers find digital advertisements informing and entertaining. They also feel that digital ads help in taking informed buying decisions and inform fully about the product. But somewhere down the line consumers don't trust digital ads completely. They sometime find them irrelevant, intrusive and annoying. Consumers have a view that digital ads many times distract them from the actual content they are watching and they knowingly don't click pop ups as they think it may lead them to some unknown sites. They still prefer newspapers ads and television ads over digital media. However this doesn't mean that digital ads are not trustworthy but it indicates that digital advertisements need to work more on creativity. It will take some time for them to take their place in the mind and heart of Indian consumers.

**9. CONCLUSION**

Advertising industry in India is moving towards digitization and automation. Digital media offers immense advantages over traditional media. There are ample of opportunities in the field of digital advertising along with many obstacles that are needed to be eradicated. India is undoubtedly going digital and so is the media as well advertising industry. It has numerous options available and is growing day by day. Digital media has deep penetration in urban cities and is also making its space in rural areas. It allows interactivity and more scope for creativity when compared with other media. But as far as traditional media is concerned especially newspapers and television, consumers still trust them. Consumers today are sceptical about digital ads. They feel that sometimes digital ads are intrusive, irrelevant and annoying. Though consumers have a feeling that digital ads are informing and entertaining but at times they distract them from the content they are watching. Here, it may be suggested that advertisers have to be more creative in the devising the content as it is the soul of advertisements. It took almost 10 years for television advertisements to make their space in minds of consumers. But today's consumers are highly informed and alert. And it is not an easy task for digital advertising industry to make its space in country like India having a complex demography with varied culture, religions, language and a great urban and rural division. Digital advertising is indeed the future but it will take some time.

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**USE OF RATIONAL, EMOTIONAL AND GREEN APPEAL: AN ADVERTISEMENT STRATEGY OF PATANJALI AYURVEDA LIMITED**

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**INTRODUCTION**

India is a fast growing economy and so its population, the increasing population results in generation of the demand for the fast moving consumer goods for their lively hood. Due to high demand in the Fast moving consumer goods (FMCG), they have been frequently purchased and used by the consumers. These goods are fast in consumption so the periodicity of its purchase is very high and regular and in small quantities. Many big corporate like Hindustan Lever, P&G, Colgate, Nestle, HUG, ITC etc. have the substantial share in the Indian market. Every family irrespective of the income, status, and size has a good consumption of the FMCG products and spends almost one fourth of their incomes in it. FMCG goods are those products that are purchased and consumed frequently, they are non durable and have relatively low price. The FMCG products can be classified into different categories according to the nature of their usage are as follows:

**Food and Beverages:** These are easily perishable items which should be consumed immediately. They have very short life span and shelf life. This category is divided into two parts foods part includes milk products, fruits, vegetables cakes, cookies, sugar, flour, biscuits etc. the beverages part includes tea, coffee, milk, soft drink etc.

**Personal and household category:** They are personal care toiletry daily use products, which are meant for personal hygiene. They are not meant for immediate consumption and their shelf life is more but governed by the expiry date of particular product. These category includes shampoo, toothpaste, soap, detergents, air fresheners, mosquitoes repellent creams, matchbox etc. Contribution of the FMCG sector in the economic development is significant and cannot be ignored.

**STATEMENT OF PROBLEM**

India being the country of many religions, cultures, languages and diverse geographical locations has tremendously emerged as the world second largest market in the world. In addition to this, the country has its own domestic requirements and demands to get fulfilled by the manufactures. The growing education level in India with the environmental gained consciousness the consumers are now demanding the healthy and affordable product to meet their requirement. Although the daily FMCG requirement are being fulfilled by the big corporates but the still the product with organic and environmental approach are real expensive to buy and use.

Patanjali has just filled this gap in India by introducing its organic and Desi product in affordable prices. Desi products are the Indian Made products that use the Indian species and herbs as their main ingredients, they have the more of the medicinal importance and usage but safe to use.

In a very short span of time Baba Ramdev established the Patanjali Ayurveda Limited in 2006 along with Acharya Balkrishna. The objective of establishing it was to promote the Ayurveda science in coordination with the scientific technology at the affordable prices.

Patanjali Ayurveda (PA) is the Indian fastest growing manufactures in India with its annual turnover is Rs.9000 crore + and will increase many folds in upcoming years.

The study focuses on the marketing and advertising strategies undertaken by PA, including the unique product mix that company used and the emergence of the new prominent appeal called Desi Appeal to attract the consumers emotionally.

The advent of the different advertising approach using Rational, emotional and Green appeal to attract the consumers has made the Patanjali Ayurveda Limited a big successful story, the big MNC's need to speed up their research and innovations in the Herbal and Ayurvedic studies to counter the competition in India.

**OBJECTIVES OF THE STUDY**

The objectives of the study are as follows:

1. To Study the Patanjali Ayurveda Limited (PA) as an emerging Desi Brand in India and world.
2. To understand the advertising approach of PA.
3. To identify and analyze the factors influencing the Patanjali as the successful brand.

**SIGNIFICANCE OF THE STUDY**

In India, FMCG is the fourth largest sector to contribute in the GDP. Easy access and changing lifestyles is the key to success for growth of this sector. The rising in the education level and environment consciousness leads to the increase in the demand of the Ayurveda products or Green products, As a result the growth of FMCG majorly, Patanjali Ayurveda has increased many fold with revenue of US \$ 1.57 billion in FY17. The company aims to expand globally in the next 5 to 10 years (1). By 2020, the revenue of this sector is expected to reach 2020 US \$ 104 billion.



Sources: IIFL

Keeping in view the growing demand in this sector and its future in India, and the success rate of the Patanjali Ayurveda being an Indian origin company, this study helps in understanding the present market scenario and different advertising approaches that helps in making the Patanjali a successful venture. This study would be relevant for the young entrepreneurs in establishing the new ventures and establishing their business positioning.

**RESEARCH METHODOLOGY**

This study is the part of the social science research that includes understanding and studying the different advertising approaches and their impact on the consumers. This study follows the Triangulation research approach which incorporates both the qualitative and quantitative aspects of the study to reach the conclusion. The qualitative and quantitative data is being collected and analyzed accordingly.

**DATA COLLECTION**

The recent advertising campaigns are used for the case study method, to identify and to understand the approaches, factors and strategies employed by the brand. To understand the influence of those strategies the sales figures and data were being used.

**DATA ANALYSIS**

Observation method is being used to understand and analyses the various factors and approaches that influence the positioning of the brand in the market and made the Patanjali a more accepted brand in India. Observation is done on the following aspects:

1. Product Positioning Strategy
2. Advertisement Appeal Strategy
3. Product Mix Strategy

Data analysis will be done on the data received from the various sources to understand the share of the brand in the FMCG market in India.

**PATANJALI AYURVEDA LIMITED: A CASE STUDY**

Patanjali Ayurveda Limited (PA) was established in 2006 by Baba Ramdev along with AcharyaBalkrishna. Its foundation has started in the year 1995 with the establishment of DivyaYogMandir Trust with the help of AcharyaBalkrishna with the objective to highlight the Ayurveda and Herbal science in the world. From that time Baba Ram Dev started teaching the Yoga through shivirs and camps.

It is noted that AcharyaBalkrishna hold the 92% stake in the company and rest 8% are with a NRI Scotland based couple Mr. Sarwan and SunitaPoddar. By the virtue of this fact Patanjali has the UK Trust of Patanjali in UK. (2)

The company is now the fastest growing FMCG firm in India with its total turnover of Rs.2000 crores in 2018 and estimated that it will touch Rs.10000 crores in the coming years.

It is now a multinational organization with its branch offices in countries like US, UK, Canada etc.

There are other institutions also under the big banner of Patanjali Ayurveda who has contributed by supplying manpower, raw material and technical advancement:

1. Organic Agricultural Farms
2. Patanjali Food & Herbal Park Ltd.
3. Patanjali Yogpeeth Trust
4. Patanjali Ayurvedic College
5. Yog Gram or Gaushala
6. Patanjali Chikitsalaya
7. Patanjali Herbal Botanical Garden

### **PRODUCT POSITIONING STRATEGY**

Company has always highlighted its objectives in the public using the mass media. The use of this strategy has helped them to position and project the company in the desired way. The objectives are:

1. To introduce and educate the consumers about the good effects of Yoga in their life.
2. Healthy approach towards life.
3. Introduction of the Ayurveda and Herbal products in coordination with the scientific approach.
4. Motivate a person to use Desi and Green product that does not affect the environment too.
5. To provide the environmental friendly and healthy product in affordable prices.

Patanjali Ayurveda (PA) has adopted the following approaches to position its brand in the market:

1. Baba Ramdev its own Brand Ambassador: Since the company has started its foundation in 1995 and Baba Ramdev had become the popular known face for the public as the yoga instructor and as the opinion maker. The launch of the product by such known and influential personality had created a credible image of the brand in the market.



2. Holistic Approach: PA had always kept a holistic approach towards the life and influences the same on its customers. These promote the brand as the well-wisher of the consumer with their overall development.



3. "PrakritikaAshirwad"- The slogan raised by PA for its products and ad campaigns means blessing of the Mother Nature. These promote the brand as the chemical free and environmental friendly herbal products.

# पतंजलि

## प्रकृतिको आशीर्वाद

4. Strategy of Fair price with best quality: It is one of the objectives of the company also. They provided the quality product in fair prices to its customers that win the customer's loyalty and increase the brand equity. PA cuts the middlemen and directly purchase the material from farmers has helped them to match the fair prices. Also, its own sister companies which are mentioned earlier like Patanjali Botanical garden, Patanjali Goshala etc. provides the raw material. These all facts are being highlighted by the company time to time.



5. Useful Product Segments: PA has all useful household segments which captures almost the entire range of product, leaving no room for other brands to act upon and to get its share disturbed.
- FMCG Products
  - Ayurveda medicinal products
  - Home care products

### ADVERTISEMENT APPEALS STRATEGY

Advertisement appeals are that basic approaches which company use to motivate its customers by activating their needs and finally influencing them to buy that product. "Appeal is one of the most important psychological element or device that drives the need and lead to the ultimate purchase" (3). There are many motives to buy the product which are approached by certain appeals, but basically there are three types appeals Rational, Emotional and Green Appeal. PA has successfully implemented the three appeals in perfect combination to promote their products in the market.

- Emotional Appeal: Emotional appeals are based on the emotions, feelings, relations, family and other psychological attributes. It is just opposite to appeals, which are based on logics and facts. (Preston, 1968; McEwen and Leavitt, 1976). PA has used health, emotions, security, and fear as the emotional approaches to influence the consumers.
- Rational Appeal: The concept of Rational appeal as the "utilitarian" or "value-expressive" approach (for convenience or specialty products) (Johar and Sirgy, 1991). This appeal approaches the logical and reasonable attitude of the consumer. PA has used 'Fair price policy and purity' as the capturing slogans in its ad campaigns.

**PATANJALI**  
*Prakriti ka Ashirwad*

### BE A SENSIBLE & SMART HOMEMAKER

Use Patanjali natural products in this sluggish phase of demonetization and save 25 - 50% and take pride in serving your country

**Do not play with lives of your innocent children and family, by falling prey to the glitzy advertisement, false propoganda and temptations**

What is good or bad for your children and family, will this be decided by any brand ambassador? Are these paid brand ambassadors scientists or specialists? Boycott those people who promote products by taking hefty fee of 20 to 25 crores, and use 100% pure and natural, low priced, world class quality Patanjali products.

All Patanjali products are made under my personal supervision. I along with teaching yoga in the early morning, selflessly take full responsibility of entire process from research to raw material to manufacturing. It is an open fact that Patanjali is not a corporate or a business house. Patanjali is not owned by a businessman. 100% profit of Patanjali is meant for service & charity. We have rendered services to the tune of thousands of crores of people and have taken pledge of creating employment for lakhs of people and prosperity to crores of farmers and serving 125 crore country men.

While multinationals take everything from our country, they carry away thousands of crores of rupees in the name of profit and royalty. As East India Company plundered our country for 250 years, likewise these multinationals are exploiting our country by selling their harmful and dangerous chemical products. Beware!

Has any of these companies done any service to our country like Patanjali does.

**Scientific facts about Patanjali's products:** There are more than 200 scientists working in ultra modern research facilities, where we do all kind of research and then make products for you • All our products are 100% pure and natural • Patanjali Atta is high-fiber, natural chakki wheat atta • Patanjali Honey has met more than 100 parameters of purity • Patanjali Ghee is free from any animal fat, vegetable oil or any kind of adulteration and artificial colors and meets more than 20 parameters of purity • Patanjali Kaschi Ghani pure Mustard Oil is free of chemical processing • Patanjali Biscuits have no maida, cholesterol and are trans-fat free • Patanjali Pulses are unpolished and full of protein • Kesh Kanti hair oil does not contain cancer causing Mineral Oil • There is no cancer causing SLS in Dant Kanti Junior meant for children • Dant Kanti Advance has mixture of 26 herbs for protection and long life of your teeth • Kesh Kanti Shampoo is prepared with precious herbs • In Patanjali's Herbal Home-care range, the dishwash contains ingredients like ash, neem and lemon, washing powder and bar has rose, neem etc, that not only cleans the clothes thoroughly but also protects your hand and expensive clothes.

By the end of January 2017, we shall provide you Rice Bran oil, Groundnut oil, Soyabean, Sunflower, Sesame and Coconut oil etc, which would be of physically refined virgin quality and made without any chemical process.

- Green Appeal: From its inception till date PA has positioned its products as the environmental friendly products. They are environmental friendly not only in its ingredients but also in their making too. PA uses their own herbal labs, fertilizers and pesticides free raw material to manufacturer their product. PA has always used this approach in their ad campaigns.

### Nature in Demand

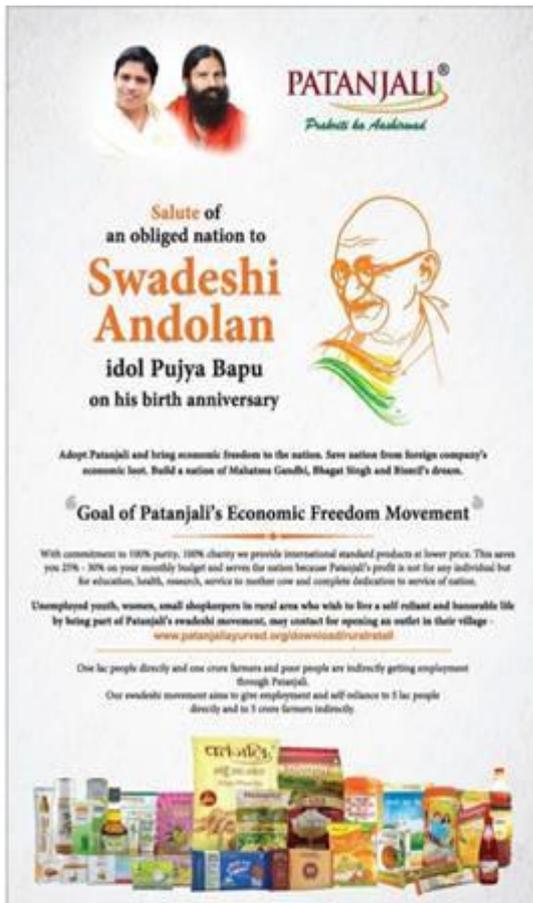
Ayurveda has gone from being treated with suspicion to gaining a wider acceptance, especially by young consumers

The success of yoga globally has given a fillip to all things natural and Indian

Companies have been able to build strong brands using ayurveda and natural ingredients

FMCG leaders like HUL and Patanjali have acquired their way into this market

- Swadeshi Appeal: Born and brought up in India, now progressing with more than Rs.20,000 crores of business in FY18, PA is mainly recognized as the Swadeshi brand. Baba Ramdev has not only used this appeal in very influential way in their ad campaigns but has also organized national level programs and speeches on National festivals like independence and Republic days, Gandhi Jayanti etc. Using the Ayurvedic approach and ingredients with herbal medicinal contents that are grown and widely used by the Indian households it has successfully become the Desi and Swadeshi brand. PA has influenced the people by using patriotic feelings in the consumers.



PA has used all the advertising appeals in an influential combination at the same time to capture the market in few years since its inception.

**PRODUCT MIX STRATEGY**

The traditional product mix includes the different P's of the marketing. PA planned and used all the P's very influentially as follow:

- Product: The purity and chemical free ingredients
- Price: Reasonably fair price as compared to other brands and best quality assured
- Place: Easy availability of the Patanjali products in all small and big cities. Dedicated retail stores under the banner of Patanjali stores had not only helped in the best availability of its product but launching of another segment to Retails outlets in the market.
- Packaging: Competitive packaging and placement
- Promotion: ad campaigns and other professional campaigns all through the country giving an assurance of best quality product without any preservatives with homemaderecipe and herbal medicinal value has mend the void created by the MNC's in India.

**PATANJALI AYURVEDA SALES & REVENUE GRAPH**

Patanjali has shown the tremendous growth since its inception. It has registered it annual turnover of Rs. 10,561 crores.

Year	Sales Turover (in crores)
2011-2012	446
2012-2013	850
2013-2014	1200
2014-2015	2006
2015-2016	5000
2016-2017	10561

Sources: (Business Today, Patanjali Revenue)



Sources: (Business Today, Patanjali Revenue)

The growth rate has steadily increased from 2011 to 2017 with almost 111% profit in FY17. Patanjali Ayurveda has been positioned at rank 4 in the most influential companies in India by Business Today group in FY17. (4)

### CONCLUSION

Patanjali Ayurveda being the Indian company has registered 111% profit during the FY2017-18. Though the company has now facing the decrease in the sales revenue in FY18 due to new tax system and poor distribution system but it has successfully positioned its product and raised its brand equity. Patanjali Ayurveda has not only survived the competition but has given a serious threat to the giant FMCG players of the world.

On the bases of the analysis and finding it has been observed that Patanjali has followed the combination of low prices, 'natural and pure' proposition and 'Swadeshi' positioning. The perfect blend of the three is the reason behind the successful story of Patanjali. It has used its own resources for the production and had influentially disseminated through their ad campaigns to its customers. Cutting the expense of the celebrity endorsement, Baba Ramdev himself has created the brand's credibility.

One of the biggest limitations of PA is that they have not able to match the demand supply factor. There is a huge gap in distribution system, which forced the customers to switch the brands as reported by the customers.

The other MNC's are now looking forward to use the same combination to hack the sales and new innovative ideas using herbal and Ayurveda essence to manufacture the required products in near future.

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**SOCIAL MEDIA EFFECTS ACADEMIC PERFORMANCE OF STUDENTS: A STUDY**

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**INTRODUCTION**

The advent of the internet in the 1990s led to major developments in the world of communication hence the introduction of social networking sites (SNSs). The coming into being of these sites revolutionized the world of communication and today we celebrate its improvements ranging from education to entertainment. The evolution of the internet has led to its usage as the best medium of communication whereby two-third (2/3) of the internet world's population visit social networking sites (SNSs) thus serving as communication and connection tools. These networking sites are referred to as social media (Boyd and Ellison, 2007). Social media exploded as a category of online discourse which enables people to create contents, share them, bookmark them and network at a prodigious rate (Jha and Bhardwaj, 2012). This has breached the gap that existed in communication where people had to rely solely on traditional methods such as letters and phone calls as a mode of getting in touch with friends and relatives. Today, communication is as easy as walking into a neighbor's residence to deliver a piece of information or vice versa through the use of social media. Social media is fast changing the public discourse in the society and is setting trends and agenda in topics that ranges from the environment and politics to technology and the entertainment industry (Asur and Huberman, 2010). The driving factors for adoption of social media are the progressively ubiquitous access, convenience, functionality, and flexibility of social technologies (Brown, 2010; Schroeder, Minocha and Schneider, 2010). These factors have made the adoption of social media very easy and have tremendously improved mankind's life by exposing him to different ways of creating and sharing information. An additional benefit of social technologies provided on the internet is that they are frequently free or require marginal investment, thereby eliminating a potential barrier to adoption (Brown, 2010). As we know, nothing interesting is ever completely one-sided, so it is for social media as it comes with both positive and negative effects. There is a correlation between social media usage and academic performance of students in universities. There have been various views and opinions which recognize four major advantages of social media use in higher education. These include; enhancing relationship, improving learning motivation, offering personalized course material, and developing collaborative abilities (Wheeler, Yeomans and Wheeler, 2008; Rifkin, Longnecker, Leach and Ortia, 2009). Also, Liccardi et al (2007), argued that students are socially connected with one another and therefore share their daily learning experiences and do conversation on various topics through social media whereas Kuppu swamy and Shankar (2010), reviewed that social network websites grab students' attention and then diverts it towards non educational and inappropriate actions including useless chatting. Research has proved the heavy presence of social media usage among students. Wiley and Sisson (2006), for instance argue that previous studies have found that more than 90% percent of tertiary school students use social networks. It is also found out that, students use social networking sites (SNSs) approximately thirty (30) minutes throughout the day as part of their daily routine life (Nicole, Charles, and Cliff, 2007). This shows the level at which students are patronizing these sites and this may bring along both positive and negative effects on students as far as their academic performance is concerned.

**STATEMENT OF THE PROBLEM**

The internet is today the most important source of information and the growing dimensions of the use of social media by students cannot be underestimated. It has been observed that students devote more attention and time to social media than they do for their studies and they cannot pass their examinations well if they do not learn (Osharive, 2015). Also, the study conducted by Maya (2015), revealed that media use contribute to lower academic performance, low self perceptions and less interest in college oriented carriers. Academic excellence plays an important role in an individual's life; be it in the family, at social gatherings, at workplace, in an institution or even among peers. Much emphasis is placed on academic excellence because of the role it plays in an individual's life as far as a successful life and respect is concerned in every part of the world. Due to this, many people are concerned with the ways that they can improve their academic performance (Kyoshaba, 2009). Studies have also revealed that social media affects students' use of English. They tend to use short-handwriting to chat with friends and get used to it thereby replicating the same errors during examinations (Obi, Bulus, Adamu and Sala'at, 2012).

Today students at all levels especially tertiary level have been engaged in the use of social networking sites (SNSs). This research therefore seeks to investigate the level of engagement of students of the different colleges into social networking sites and also determine the effect of their use on the academic work.

**OBJECTIVES OF THE STUDY**

1. To determine the level of exposure of students of Ghaziabad colleges to social media sites
2. To ascertain what students of Ghaziabad colleges use social media for
3. To ascertain how the use of social media has influenced the academic work of students of Ghaziabad colleges

**HYPOTHESIS**

The present study that will assess the effect of social media on students' academic performance presupposes the following:

1. Students use social media to communicate and study.
2. On average, students spend at least an hour a day for social media use.
3. The impact of social media on academic performance could be positive or negative at the same time.

**METHODOLOGY**

This part presents the methodology used. Discussed here are research design, the sources of data that includes the locale of the study and research population, instrumentation and data collection, and tools used for data analysis.

**RESEARCH DESIGN, SOURCES OF DATA, INSTRUMENTATION AND DATA COLLECTION, AND TOOLS FOR DATA ANALYSIS**

The study used the quantitative as well as qualitative methods of research. Descriptive research design was utilized to gain accurate profile of situation [16].

To support the study, information relevant to the study were obtained from both primary and secondary data. Primary data were acquired from the respondents of the study, 100 student respondents. On other hand, secondary data were obtained from previous studies, literatures, books, documents, and electronic materials related to the current study.

The instrument for data collection was the survey questionnaire, observations, review of previous studies and analysis. To gather data for the three research questions, survey, review of literatures and analysis were used. Survey questionnaires were floated to the respondents. It is a tool containing several questions to gather information from the respondents. The survey questionnaire contains clear and simple questions that enable the respondents to provide accurate information. Each item in the survey questionnaires are intended to answer the research subproblems. Google Formwas used to create the questionnaire for the respondents. Google Forms are amazing tool that is free and powerful, it is ideal for anyone who needs to gather information about almost anything. Google Forms is buried within Google Drive right beneath the word processor, spreadsheet and presentation apps [21].

The data that were gathered were collected, tallied and tabulated. These data were presented in graphs were analyzed and interpreted for the readers to understand better the results obtained. To determine the appropriate sample size, Slovin's formula was used [6]. There are 71 students actively using social media that are members of department's WhatsApp group. Slovin's formula is written as:

$$n = N / (1 + N e^2)$$

Where: n = number of samples

N = total population

e = error tolerance (0.05)

thus,

$$n = N / (1 + N e^2)$$

$$= 71 / (1 + (71 \times ((0.05)^2))$$

$$= 71 / 1.1775 = 60.3 \text{ or } 60$$

To answer the three research questions, statistical tools were identified. For first and second research question, aside from literature review, mode was used. For the third research questions, average weighted mean was utilized. The collected data were used to analyze the impact of social media on students' academic performance.

**Sample size**

A total of 100 samples were taken up by the researcher and the respondents belonged to different age group, gender and income class.

**Sampling**

The sampling procedure for data collection for the present study is through simple random sampling technique.

**Instruments**

Tool used for data collection was questionnaire.

**Respondents**

The respondents of the study were the male and female students of college from different age group.

**Procedure of data gathering**

The questionnaires were distributed among the college students of Ghaziabad

**Sources of data**

The present study is based on both primary and secondary data. The main sources of primary data are the people of Delhi, Noida and Ghaziabad City.

**Area of study**

The area of the study is Delhi, Noida and Ghaziabad

**SIGNIFICANCE OF THE STUDY**

Social networks are becoming more popular among university students and are a new way of spending free time and serve as a separate channel for finding the necessary information, both educational and entertaining. Therefore, it is urgent to examine the question of what effect social networks have on their users, in particular, how the use of social networks affects the academic success of students. This study will discover this information, giving the researchers an opportunity to explore and gain new knowledge. Furthermore, it can be used for future studies.

**LITERATURE REVIEW**

The concept of social media Social media continuously keeps changing and as such it is difficult to assign a fixed definition to it as Jacka and Scott (2011), argued that "there is no single recognized definition for social media". However some scholars have defined it in different perspectives over the past years. Kaplan and Haenlein (2010), defined social media as a group of internet- based applications that build on the ideological and technological foundations of Web 2.0 and allow the creation and exchange of user-generated content. The Oxford dictionary (2011), also defined social media as "websites and applications used for social networking". Another definition of social media is that it is a "communication channel which is very popular, extremely fast and broad, has proven to be highly effective, as well as trusted by billions of people , to share and discover content concerning individuals, brands, information, entertainment and knowhow" (Dearborn, 2014). One theme that all these definitions underpin is that social media involves some form of communication between individuals over the internet. Social media began in the late 1990s with the first recognized social media network called "SixDegrees " in 1997 and this technology enabled people to upload a profile and make friends. From 1997 to 2001 a number of community tools; Asian Avenue, blackplanet and MiGente began supporting various combination of profile and publicly articulated friend (Boyd, Danah, Ellison and Nicole, 2007). There has been tremendous improvement since this era and today 6 there exist uncountable social networking sites either developed for local use, specific purpose or international use. Kaplan and Haenlein (2010), classified social media into six (6) different categories as follows;

1. Collaborative project (wikipedia)
2. Blogs and micro blogs (twitter)
3. Content communities (youtube)
4. Social networking sites (FB, 2go, BB chat)
5. Virtual game World (world of war craft)
6. Virtual second world (second life)

This classification of social media into classes has been useful to scholars and individuals for easy identification and study of a particular social media type but today a difficulty may arise due the high proliferation of social media and one may wonder which group a new developed social media type fits into. Social media is considered to be the fastest growing web application in the 21 century and this rapid development is being backed by technological advancement (Heyam, 2014). Mankind has enormously benefited and continues to benefit from it and as such cannot underestimate its importance as far as communication is concerned.

Today, social media has taken a new dimension and has encouraged more participation through the introduction of mobile phones that support social networks applications. The use of mobile phones that are powered by Android applications to social network is termed as Mobile social networking. According to Humphreys (2007), in his study titled “Mobile Social Networks and Social Practices” social network applications have now been migrated from the computer to the 7 mobile phone, network information and communication can be integrated into the public space; and these new services that are developed for mobile phones allow users to create, develop, and strengthen their social ties.

## **MOST POPULAR SOCIAL MEDIA SITES**

### **1. Facebook**

This is the biggest social media network on the Internet, both in terms of total number of users and name recognition. Founded on February 4, 2004, **Facebook** has within 12 years managed to accumulate more than 1.59 billion monthly active users and this automatically makes it one of the best mediums for connecting people from all over the world.

### **2. Twitter**

This social media platform has more than 320 million active monthly users who make use of the 140 character limit to pass on information. Businesses can use Twitter to interact with prospective clients, answer questions, release latest news and at the same time use the targeted ads with specific audiences. Twitter was founded on March 21, 2006, and has its headquarters in San Francisco, California.

### **3. LinkedIn**

Founded on December 14, 2002, and launched On May 5, 2003, LinkedIn is hands-down the most popular social media site for professional networking. The website is available in 24 languages and has over 400 million registered users. LinkedIn is great for people looking to connect with people in similar industries, networking with local professionals and displaying business related information and statistics.

### **4. Google+**

While it's no Twitter, Facebook or LinkedIn, Google+ has its place among the popular social media sites. Its SEO value alone makes it a must-use tool for any small business. Launched on December 15, 2011, Google+ has joined the big leagues registering 418 active million users as of December 2015.

### **5. YouTube**

The largest and most popular video-based social media website — was founded on February 14, 2005, by three former PayPal employees. It was later bought by Google in November 2006 for \$1.65 billion. YouTube has over 1 billion website visitors per month and is the second most popular search engine behind Google.

### **6. Pinterest**

Launched in March 2010, Pinterest is a relatively newcomer in the social media arena. This platform consists of digital bulletin boards where businesses can pin their content. Pinterest announced September 2015 that it had acquired 100 million users. Small businesses whose target audience is mostly made up of women should definitely invest in Pinterest as more than half of its visitors are women.

### **7. Instagram**

Like Pinterest, Instagram is a visual social media platform. The site, launched on October 6, 2010, has more than 400 million active users and is owned by Facebook. Many of its users use it to post information about travel, fashion, food, art and similar subjects. The platform is also distinguished by its unique filters together with video and photo editing features. Almost 95 percent of Instagram users also use Facebook.

### **8. Tumblr**

Tumblr is one of the most difficult to use social networking platforms, but it's also one of the most interesting sites. The platform allows several different post formats, including quote posts, chat posts, video and photo posts as well as audio posts, so you are never limited in the type of content that you can share. Like Twitter, reblogging, which is more like retweeting, is quick and easy. The social networking website was founded by David Karp in February 2007 and currently hosts more than 200 million blogs.

### **9. Flickr**

Flickr, pronounced “Flicker,” is an online image and video hosting platform that was created by the then Vancouver-based Ludicorp on February 10, 2004, and later acquired by Yahoo in 2005. The platform is popular with users who share and embed photographs. As of October last year, Flickr had more than 112 million users and had its footprint in more than 63 countries. An average of a million photos are shared daily on Flickr.

**10. Reddit**

This is a social news and entertainment networking website where registered users can submit content such as direct links and text posts. Users are also able to organize and determine their position on the site's pages by voting submissions up or down. Submissions with the most positive votes appear in the top category or main page. Reddit was founded by University of Virginia roommates Alexis Ohanian and Steve Huffman on June 23, 2005. A decade later, the site boasts more than 36 million registered accounts and 231 million monthly visitors.

**11. Snapchat**

Snapchat is an image messaging application software product that was created by Reggie Brown, Evan Spiegel and Bobby Murphy when they were students at Stanford University. The app was officially released in September 2011, and within a short span of time they have grown immensely registering an average of 100 million daily active users as of May 2015. More than 18 percent of all social media users use Snapchat.

**12. WhatsApp**

WhatsApp Messenger is a cross-platform instant messaging client for smartphones, PCs and tablets. The app relies on the Internet to send images, texts, documents, audio and video messages to other users that have the app installed on their devices. Launched in January 2010, WhatsApp Inc. was acquired by Facebook on February 19, 2014, for about \$19.3 billion. Today, more than 1 billion people use the service to communicate with their friends, loved ones and even customers.

**13. Quora**

Capitalizing upon human curiosity is an ingenious idea that would lead to the creation and launch of Quora in June, 2009. The website, co-founded by two former Facebook employees, Charlie Cheever and Adam D'Angelo now claims that it received more than 80 million monthly unique visitors, with half of them coming from the U.S. So far, the question-and-answer website has managed to raise \$141 million in venture capital funds and while it doesn't look ready to go public yet, it's definitely a company to watch.

**14. Vine**

With over 40 million users, Vine is a rapidly growing video sharing social media app that allows users to share 6-second video clips with their followers. While this looks like a really short time for a video, businesses of all sizes are having tremendous success using the service. Vine was founded in June 2012 and later acquired by Twitter in October 2012, just before its official launch.

**15. Periscope**

Periscope is a live video streaming mobile app that was developed by Joe Bernstein and Kayvon Beykpour. The two started the company in February 2014 and later sold it to Twitter for \$100 million in March 2015. Four months after its March 2015 relaunch, Periscope said that it had surpassed 10 million accounts and in December the same year, Apple announced Periscope as the app of the year.

**16. BizSugar**

BizSugar is a social networking platform and niche resource for small business owners, entrepreneurs and managers. The site was created in 2007 by DBH Communications, Inc., a provider of award-winning business publications, and later acquired by Small Business Trends LLC, in 2009. The platform allows users to share videos, articles, blog posts, podcast among other content. It also allows users to view and vote on submissions by other members.

**17. StumbleUpon**

StumbleUpon is a discovery engine that finds and recommends content for its users. Come June 30, 2018, it will be moving to Mix. More than 25 million people use StumbleUpon for entertainment and information. In addition, more than 80,000 publishers, brands, and other marketers have used StumbleUpon's Paid Discovery platform to promote their businesses. StumbleUpon was owned by eBay from May 2007 to April 2009, when Garrett Camp, Geoff Smith and several investors bought it back. It is now an independent, investor-backed startup once again.

**18. Delicious**

This is a social bookmarking web service for discovering, storing and sharing web bookmarks. The site was founded by Peter Gadjokov and Joshua Schachter in 2003 and acquired in 2005 by Yahoo. By the end of 2008, Delicious claimed that it had bookmarked 180 million URLs and acquired more than 5.3 million users. The service was later sold to AVOS Systems in April 2011 who later sold it to Science Inc. In January this year, Delicious Media said that it had acquired the service.

### 19. Digg

Founded more than a decade ago (November 2004), Digg is a news aggregator with a curated front page that selects stories specifically for the Internet audience. The topics vary widely from trending political issues to science to viral Internet issues and anything in between. Digg supports sharing of content to other social media platforms such as Facebook and Twitter. In 2015, the company claimed that it had about 11 million active monthly users.

### 20. Viber

Viber is a Voice over IP (VoIP) and instant messaging app for mobile devices that was developed and released by Viber Media on December 2, 2010. The app also allows for the exchange of audio, video and images between users. As of April 2014, Viber had accrued close to 600 million registered users and 230 million active users.

### POSITIVE EFFECTS OF SOCIAL MEDIA ON STUDENTS' ACADEMIC LIFE

Students' academic life has moved to a different dimension since the introduction of these social media networks and several studies have affirmed that social media plays an important role on students in higher education including the study conducted by Wheeler, Yeomans and Wheeler, (2008); Rifkin, Longnecker, Leach and Ortia, (2009). In their study, they recognized four (4) major advantages of social media usage by students in higher education which included; enhancing relationship, improving learning motivation, offering personalized course material, and developing collaborative abilities. Indeed, social media has contributed greatly to facilitating learning in the 21st century. It is shown that a greater percentage of students including those at the PhD level commonly use social media to ameliorate their studies (Khan, 2010).

The answers to the causes of flexible studies today across the globe might not be far-fetched from the great contribution that social media platforms are providing when used judiciously. Even though, there have been other school of thought that states that social media is a nuisance to students' academic life such as Kuppuswamy and Shankar (2010), who argued in their study that social networks distracts the attention and concentration of the students toward learning and converts it towards non educational activities such as useless and unnecessary chatting, there have been several studies conducted afterwards whose findings are contrary to this claim. For instance, the study conducted by Jain, Verma, Verma and Tiwari (2012), titled "the impact of social networking in promoting education" revealed that students benefit from chatting with other students, teachers and external sources to acquire knowledge. Also, Yunus and Salehi (2012), argued in the same direction that students gained more vocabulary, improved their writing skills and reduced their spelling mistakes through social media usage.

In fact as an educational tool, social media enriches learning by giving both students and teachers the opportunity to connect in new and very exciting ways thereby encouraging flexible mode of learning. It is stated that flexible learning expands the choice on what, when and how people learn. It supports different styles of learning including E-learning which is highly patronized across the globe (Pappas, 2013). Other scholars; O'keeffe and Clake-pearson (2011), in their study also revealed that social media benefits students by connecting them to one another on assignments and class projects.

It is further buttressed in the study of Arquero and Esteban, (2013) and Selwyn, (2007) whose conclusions were that social media undoubtedly generate new opportunities to engage students in higher education as they are remarkably effective at connecting people and facilitating the exchange of information. It is clear and indisputable from these studies that social media usage in the educational sector cannot be underestimated since its introduction.

### NEGATIVE EFFECTS OF SOCIAL MEDIA ON STUDENTS' ACADEMIC LIFE

Davies and Cranston (2008), enumerated some of the risks associated with social media which included criminal activities such as identity theft and fake contacts which is prevalent today, sexual abuse or harassment and unsuitable advertising. On the same subject O'keeffe and Clakepearson (2011), also mentioned cyberbullying, online harassment, sexting, face book depression, and privacy concerns as some of the challenges associated with social networking.

**Cyberbullying:** cyberbullying is a category of bullying that occurs in the digital realm or medium of electronic text. "It is any behavior performed through electronic or digital media by individuals or groups that repeatedly communicates hostile or aggressive messages intended to inflict harm or discomfort on others" (Tokunaga, 2010). Cyberbullying is one the serious threat in the social media environment and has called for a number of studies to determine its causes. The causes of cyberbullying according to Calvete, Orue, Estevez, Villardon and

Padilla (2010), was significantly related with the use of proactive aggression, justification of violence, exposure to violence and less perceived social support of friends.

Privacy concerns: this is another concern that everyone involved in social networking is faced with. The rate at which people post or share fake information calls for alarm and it is difficult to ascertain that, what people say and post are truly who they are. Individuals' private information are publicly displayed on some of these social networks and malicious people take advantage and perpetrate all kinds of harassment. It is also argued that the privacy options offered by most social networking sites (SNSs) do not provide users with the flexibility needed to handle conflicts with individuals who have different conceptions of privacy (Preibusch, Hosier, Gurses and Berendt, 2007). Aside these effects, other studies conducted by scholars have also proved that social media can be detrimental to students' academic life if caution is not taken in its usage. For instance the study conducted by Obi, Bulus, Adamu and Sala'at (2012), titled "The need for safety consciousness among Youths on social Networking Sites" concluded that social media affects students use of English. They use short-handwriting when chatting with friends and unconsciously get used to it thereby replicating same errors during examinations. Even though one may argue that these are minor challenges, it is important to acknowledge the increasing rate at which these errors are replicated in the education sector and if care is not taken future generation may see it as a norm. Indeed a number of studies including but not limited to the 10 study of Kuppuswamy and Shankar (2010), Osharive (2015), Maya (2015), among others have revealed unequivocally that social media can be problematic to students' academic life if caution is not taken in its usage.

### **FINDINGS**

The primary motives for using social networks for them are the search for friends, classmates and communication with them. The time spent on informal organizations enables most respondents to compose their own particular relaxation time, and in addition get ready for exams. Most students spend around 20% of their time using social media. Almost half of those surveyed admit that using the social network helped them in their personal lives and communicating with friends, organizing leisure and in search of interest groups, some argue that social networks did not affect their way of life in any way, and only a few acknowledged that social networks had influenced on their free time, 10% caused addiction. Summing up, it should be noted that social networks, becoming an integral part of the students' full life, took up most of their free time. Having superseded the methods for correspondence, they replaced the understudies' leisure activities and verbal correspondence. The informal organization, and not the course book and the instructor, moved toward becoming for them the main colleague in anticipation of exams. Often the student does not have time to absorb the information received in the lessons. After all, in the phone or tablet screen, there are things much more interesting - correspondence with peers, news tapes, all kinds of social networks, and, of course, YouTube videos. Also, all the free time a student can spend on the Internet. Instead of doing sports, reading a book, chatting with their peers "live," preparing for lessons or just walking, he will spend time on social networks. Of course, this negatively affects their physical and intellectual development. Undoubtedly, in social networks, there are also things useful for the development of the student - a lot of educational groups on Facebook and educational videos from YouTube. In addition, communication with peers through social networks can help a student socialize, find new friends, discuss with them issues related to studies. In addition, in social networks, a child can relax for a while and get distracted from the everyday college routine.

### **CONCLUSION**

It is without doubt that social media is and will remain an important tool in human life as far communication is concerned. Today mankind is harvesting tremendously from its existence not only in mere communication point of view but also in most scholarly activities. Different forms of education including distance education has been widely patronized and facilitated to some degree through these social media networks. Acquiring information both locally and internationally from friends, lectures or experts is no longer a struggle as compared to the olden days and the internet is the ultimate master behind this success. "Social media is a useful servant but a dangerous master" and can also be "described as a two edge sword" and as such, users especially students must be alert about its dangers and be prudent in its utilization. The nature of social media as a useful servant but a dangerous master" and a two edge sword has been revealed in the findings of the study that, despite the benefits that students can harness from social media networks such as sharing of information, building relationship, partaking in group discussions from near and far among others, there is to some extent addiction and distraction of attention caused by the use of social media which could have serious consequences on the academic life of students.

### **RECOMMENDATIONS**

In the light of the findings, the following recommendations are made;

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1. Seminars should be organized in the various schools or faculties to enlighten students more about the possible implications of social media usage on their academic performance.
  2. Students should make sure that they use these social networking sites judiciously to ensure that they do not become detrimental to their academics.
  3. Teachers/lecturers can adopt new strategies by channeling assignments or discussions on social media platforms to help inculcate the habit of using these sites for academic work.
  4. Students must minimize the time they spend on social media to avoid being obsessed by these sites for unnecessary chatting.
  5. The university authority should also restrict access to certain social media sites that may be prone of distracting students' attention during school hours as a means of minimizing their use.

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**ASSERTIVENESS AND SELF-AFFIRMATION: A NEW PATHWAY TO UNDERSTAND  
CONSUMER BEHAVIOR**

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**ABSTRACT**

*The two important constructs borne from different literature in psychology namely self-affirmation and assertiveness could be used to understand and manage the complexity of consumer behavior. Self-affirmation refers to the process by which individuals attempt to cope with one kind of self-threat by affirming an unrelated aspect of the self, whereas assertiveness involves speaking and acting with power while maintaining respect for others. Moreover an assertive individual expresses his or her feelings and behaviors directly and honestly while respecting others. Such behaviors are relevant in several consumption contexts, including seeking information, initiating requests, and expressing dissatisfaction. An assertive consumer is more likely to stand up for his or her consumer rights, initiate and refuse requests and express justified anger and annoyance (Richins, 1983). So, this paper reviews the evidence for the protective benefits of both self-affirmation and assertiveness, describes the mechanisms by which each confers these advantages and considers the boundary conditions of each. We conclude with a call to researchers to explore empirically how and when these important interventions might be differentially beneficial to those who cultivate them and will pave a new way for understanding consumer behavior.*

*Keywords: Assertiveness, self-affirmation, consumer behaviour.*

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**INTRODUCTION**

Today the world is revolving around consumer. The policies, strategies are developed keeping in mind the picture of consumer. Everybody in this world is a consumer. Everyday of our life we are buying and consuming an incredible variety of goods and services. However, we all have different tastes, likes and dislikes and adopt different behaviour patterns while making purchase decisions. Many factors affect how we, as individuals and as societies, live, buy, and consume. External influences such as culture, ethnicity, and social class influence how individual consumers buy and use products, and help explain how groups of consumers behave. Earlier organizations and companies were interested in knowing and understanding the strategies of selling. But now world is witnessing the change in trend. Now organizations and companies are interested in understanding “the buyer” means the consumer. So here comes the role of psychology. The two different constructs borne from different literature of psychology namely assertiveness and self-affirmation could be applied for understanding the consumer behavior.

According to self-affirmation theory, individuals are motivated to maintain a global sense of self-worth by holding on to favorable self-conceptions and positive beliefs that one is a competent, adequate, and stable individual (Steele, 1988). Self-affirmation lead to confidence, and this confidence can increase or decrease persuasion depending on the circumstances. Assertiveness refers to way of communication in which a person expresses his thoughts and feelings without violating the emotions of others. The way a person communicates decides the attainment of goal. These two constructs have importance and relevance in understanding and managing the complexities of consumer behavior. Consumer behavior refers to a study of how individuals make decision to spend their available resources (time, money and effort) or consumption related aspects (What they buy? When they buy?, How they buy? etc.). The heterogeneity among people makes understanding consumer behavior a challenging task to marketers. The basic belief of marketing-oriented organization is that the consumer is the hub around which the business revolves. Therefore, understanding behavior of consumers is a key to the success of business organizations. Marketing personnel are constantly analyzing the patterns of buying behavior and purchase decisions to predict the future trends. Simple observation provides limited insight into the complex nature of consumer choice and researchers have increasingly sought the more sophisticated concepts and methods of investigation provided by behavioral sciences in order to understand, predict, and possibly control consumer behavior more effectively. Psychology, social psychology, and sociology are the disciplines most widely employed in this endeavor which has become a substantial academic industry in its own right. The field of psychology offers great insight on both the natural defenses that people maintain against persuasive messages and threatening information as well as the manner in which these defenses can be attenuated. The basic reason of studying consumer behaviour is to understand buyer and relate a consumer through this understanding, consumer behaviour is relatively a new discipline in the field of marketing and lot

of time and effort is being spent on this exercise. Since the behaviour of consumer is dependent upon psychological, cultural, social, economic, language, regional, religious, political and other factors. Thus study of consumer behaviour is interdisciplinary science. If one wants to study properly and significantly the behaviour of consumers one is required to study serious facts of life about thinking of consumers, his decisions and perceptions which influence his thinking and decisions like his education, culture, Income, climate, social status, society, physiology, psychology, region to which he belongs, his religion and the like. Consumer behaviour itself emerged as a distinct field of study during the 1960s. Consumer behaviour is said to be an applied discipline as some decisions are significantly affected by their behaviour or expected actions. The two perspectives that seek application of its knowledge are micro and societal perspectives. The micro perspectives involve understanding consumer for the purpose of helping a firm or organization to achieve its objectives. The people involved in this field try to understand consumers in order to be more effective at their tasks. Whereas the societal or macro perspective applies knowledge of consumers to aggregate- level faced by mass or society as a whole.

## **DEFINING CHARACTERISTICS**

### **Assertiveness**

Assertiveness is a skill that involves speaking and acting with power while maintaining respect for others. Instead of passively giving up power or aggressively demanding it (Wesley, Mark & Mattaini, 2008). It is the ability to express one's feelings and assert one's rights while respecting the feelings and rights of others. Assertive communication is appropriately direct, open and honest, clarifies one's needs to the other person. Assertiveness comes naturally to some, but it is a skill that can be learned. People who have mastered the skill of assertiveness are able to greatly reduce the level of interpersonal conflict in their lives, thereby reducing a major source of stress (Elizabeth Scott, 2006). It has been defined as "that complex of behaviors emitted by a person in an interpersonal context which express that person's feelings, attitudes, wishes, opinions or rights directly, firmly and honestly while respecting the feelings, attitudes, wishes, opinions, and rights of other persons." (Galassi and Galassi, 1977) According to these writers, assertion does not involve an undue or excessive amount of anxiety or fear. It represents the standing up for one's legitimate rights without violating the rights of others. The four basic components of assertive behavior are the ability to express emotions openly, the capacity to exercise one's rights, the confidence to stand up for oneself, and the freedom to choose when assertive behavior is appropriate. There should be some structured activities to help consumers develop trust in their ability.

Making the transition to a consumer dissatisfaction context, drawing upon the model of assertive behavior developed in Psychology and Mental Health and generalizing from the positive results of assertive training, what can be said about consumer complaining behavior? For one thing, it would be expected that the dissatisfaction experienced by a non-assertive consumer will produce undue anxiety so that the range of available remedy options becomes restricted. Since brand shifting, purchase or patronage termination, or total inaction are responses that do not require intercommunication, one would expect that complaining, which is an intercommunication initiated by the consumer, to be less likely a response of the non-assertive consumer. This is in contrast to the assertive individual who would not let possible unpleasantness prevent him from complaining to a company, if he thought that complaining was the appropriate course of action. According to the assertiveness model and the definitions of assertiveness/aggressiveness, the reactions to frustration would be based on different considerations for different individuals: Response of an assertive individual = (available alternatives and probable outcomes); Response of a non-assertive individual = (the amount of anxiety associated with the alternatives); Response of an aggressive individual = (the magnitude and intensity of frustration).

Only in assertive behavior are the consequences of the action fully considered beforehand. The aggressive person is more apt to consider the consequences after the action is taken, and the non-assertive person's main concern is to find a response with a minimal amount of intercommunication and anxiety. Consequently, one would expect that both assertive and aggressive individuals would be more likely than non-assertive individuals to complain to a company if dissatisfied with the product or service. If this is correct, it suggests some interesting implications for consumer policy.

### **Self-affirmation**

According to Self-Affirmation Theory (Steele, 1988) people are motivated to maintain a self-concept they experience as being "adaptively and morally adequate" (Steele, 1988, p. 262). When this self-perception is threatened, they can bolster or restore this experience of self-adequacy through self-affirmation. People can self-affirm through "explanation, rationalization and/or action" (Steele, 1988, p. 262). For example, they may think about their personal strengths, bring to mind their core values, reflect upon their important relationships, or act

in a way that demonstrates their moral or adaptive adequacy. Consumers attempt to preserve or enhance their self-images by buying products they believe agree with that self-image and avoiding products that do not agree. This is called consumer imagery. Consumers tend to shop in stores that have images that agree with their own self-images. Self-affirmation refers to “an act that demonstrates one's adequacy” (G. L. Cohen & Sherman, 2014, p. 337; D. K. Sherman, 2013) and is the process by which individuals attempt to “cope with one kind of self-threat by affirming an unrelated aspect of the self” (Steele, 1988, p. 263). Further, he argued that when one's self-concept is threatened in some way, individuals might strive to regain or maintain a strong sense of self, sometimes attempting to explain or rationalize their behaviors. This “self-affirmation system” is activated in response to threat and remains engaged until one's positive perception of self is restored. During times of threat, self-affirmation may help to provide a reminder of one's self worth and personal resources (e.g., G. L. Cohen & Sherman, 2014; D. K. Sherman, 2013). Importantly, individuals can regain this positive sense of self even without directly resolving the original threat; people can affirm other importantly held beliefs in contextually unrelated areas of the self and still feel relief. Thus, even if a threat is specific to one domain, self-affirmation can bring relief by reminding an individual of other importantly held beliefs to boost the global sense of self more generally.

### **Boundary conditions**

Consumers who are high in NC (need for cognition) are more likely to be responsive to the part of an advertisement that is rich in product-related information of description. They are also more responsive to cool colors. Consumers who are relatively low in NC are more likely to be attracted to the background or peripheral aspects of an advertisement. They spend more time on print content and have much stronger brand recall. Need for cognition seems to play a role in an individual's use of the Internet. "How do we make the market place work better so that consumers can make better decision about what to buy" If for social purpose has to reduce consumption of Liquor one has to find out through the research why people drink. When in our Country number of states prohibited drinking from time to time it was utter failure because prohibition was imposed without studying the psychology of drinkers. However in case of cigarettes when it is told that smoking is injurious for health and the absolute consumption of cigarettes has started declining. If prohibition was implemented affect the studying how often and what problems are faced by discontinuing drinking alcohol and what have been their response to their problems and their solutions might have been found, the result would have been more encouraging. Psychographic research studies life style of consumers to find out the markets for certain products like items of personal health care, cosmetics, items of family consumption like T.V., furniture in psychographic research consumers are registered to tell their and their house hold reaction about a particular product or service since there is full report on the subjects.

Just as good looks bestow an unconscious “beauty premium” on people, high aesthetics bestows an unrecognized benefit on consumer goods. Specifically, choosing a product with good design affirms the consumer's sense of self. Choice of a highly aesthetic product was compared with choice of products superior on other attributes including function, brand, and hedonics to show that only aesthetics influences a consumer's personal values.

How quickly an innovation spreads through a market depends to a great extent on communications between the marketer and consumers, as well as communication among consumers i.e., word-of-mouth communication. Thus this communication will include two types of communication: a. Communication between marketers and consumers b. Communication among consumers i.e., word of mouth. Consumer, behaviour is affected by a lot of variables ranging from personal, motivation, need, attitude and values, personal characteristics, socio-economic and cultural back ground, age, sex, professional statues to social influences of various kinds exerted by family, friends and society as a whole. Demographic factory like age, sex, incomes etc. of citizens are also having some influence of consumer's behaviour. Therefore, the study of consumer behaviour becomes essential. What factors influence our choices of consumption? How do consumption habits change as societies change? How do material values influence our relationships with other people? What impact does that have on our personal values? Consumer behavior can be explained as the analysis of how, when, what and why people buy. Consumers are looking for manufacturers who have social responsibility, and use packaging that can either be recycled or are made of recycled material. An effective, efficient and fair implementation of the consumer protection act is one of the conditions precedents for promoting the culture of good governance and thereby ensuring the better promotion and protection of the rights of the consumers. The heterogeneity among people makes understanding consumer behaviour a challenging task to marketers. Hence marketers felt the need to obtain an in-depth knowledge of consumers buying behavior. Consumers use mental short-cuts to help speed up decision-making. These what cuts and distort consumer's decisions. Short-cuts can include relying a labels our

brand names that are recognized, and being influenced by the way in which information of presented and the context in which a decision is made.

### CONCLUSION

The field of consumer behaviour covers a lot of ground. It is the study of the processes involved when individuals or groups select, purchase, use or dispose of products, services, ideas or experiences to satisfy needs and desires. It is evinced that consumers clearly weight up all the costs and benefits of their choices. Instead, purchasing decisions may be made automatically or habitually, are heavily influenced by an individual's emotions or the behaviour of others. Every consumer is different in behaviour from others in the sense of needs, wants, habits and income level of the consumers. The Behaviour of Consumer depends upon psychological, cultural, social, economic, religious, political and other factors. Study of consumer psychology is most important part of consumer behaviour research because it helps to know the attitude of consumer, his level of learning, knowledge, perception, personality, his motivation of buying a particular product of service. It helps to understand psychology of different types of consumer based on their age, sex, income level, education etc. The study of consumer's psychology helps marketers to segment the market and product good according to their requirement rather than thrusting same product on all. Most of the free time is spent in the market place, shopping or engaging in other activities. The extra time is usually passed in knowing and thinking about products and services, discussing with friends about them, and watching advertisements related to them. The usage of them significantly reveals our life styles. Since assertiveness constitutes a learned behavior (as demonstrated in the psychiatric and psychological literature), and if non-assertive individuals consciously limit their remedy options by avoiding complaining (as suggested by the assertiveness model and the empirical results reported in this study), it follows that consumers can be taught through assertive training to better handle conflicts with sellers and manufacturers. This applies to the aggressive as well as non-assertive consumers.

### DISCUSSION

It is well known that consumer policy cannot solely rely on consumer information (i.e., factual information about brand and product characteristics). It has to be complemented with consumer education (i.e., instruction on where to get and how to use available information) in order to have some impact. When both these methods fail to accomplish the desired goals, there are often calls for more consumer protection or market regulation. The assertiveness model suggests yet another way of improving the consumer's position in the marketplace. Its implication is that even well-informed, educated consumers may fail to effectively articulate their grievances because of undue aggressiveness or non-assertiveness. In such cases, it is clear that consumer information and education policies do not suffice, and protection and regulation may miss the mark. Since most consumer dissatisfactions are not voiced, and research has shown that about one in every five purchases results in some form of consumer problem (Best and Andreasen, 1977), assertive training for consumers may be a viable addition or alternative to current consumer programs. Assertive training for consumers does not mean expensive psychological counseling. Although there is, to our knowledge, no programs that are specifically tailored to consumers, many universities now offer courses in assertive training in their extension programs.

The persuasive effect of self-affirmation based on the idea that self-affirmation leads to confidence and this confidence can increase or decrease persuasion depending on the circumstances. Confidence can play different roles in consumer persuasion, affecting attitude change by different psychological mechanisms. There are a number of conceptual issues that need to be addressed with future research. Both the constructs offer new insight into the understanding of consumer behavior. The more empirical research is required so as to establish the efficacy of assertiveness and self- affirmation as intervention for understanding of various dynamics of consumer behavior.

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**PLAGIARISM IN BOLLYWOOD MUSIC & LAW**

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Plagiarism can be defined as “the wrongful appropriation, close imitation, or purloining and publication, of another author's language, thoughts, ideas, or expressions, and the representation of them as one's own original work”.

Plagiarism is a moral, ethical, & legal issue. It has been around for centuries, but the Internet and the subsequent proliferation of information have made the problem more serious. Plagiarism is taking someone else's work and passing it off as one's own. Many people think of plagiarism as copy another's intellectual idea or work.

**Dictionary definition is.**

1. To steal and pass off (the ideas or words of another) as one's own
2. To use (another's production) without crediting the source
3. To commit literary theft
4. To present as new and original an idea or product derived from an existing source.

**MUSIC AND LAW**

Music is the creation of human intellectual. It is the major way to convey ideas to the people. The lyrics, and composition of music equally influence human mind and it generate a heavy impulse on conscious and sub-conscious people mind. Almost peoples of the world we can find out the presence and influence of music and its impact. Like other intellectual properties music and all its kinds need legal protection. Therefore, the international as well as civic law gives recognition and protection to the authors and owners of musical works.

**.Definition of Musical work**

As per Sec.2 (p) of the Copyright Act, 1957 “musical work” means a work consisting of music and includes any graphical notation of such work, but does not include any words or any action.

In India copyright is recognized in original musical work under the provisions of Sec.13 (1) (a) of the Copyright Act, 1957. Subject to the provisions of this section and other provisions of this act, copyright of musical works shall subsist throughout India. Article 2(2) of the Berne Convention read with Article 2(1) gives the idea that the Copyright protection to a musical work can be permitted only to the work which has been reduced to material form.

**THE INDIAN FILM AND MUSIC INDUSTRY**

Bollywood had remained and shall remain one of the most popular genres of music in the Indian peninsula. Bollywood industry has also feel the importance of the same with years and hence the production houses are giving more importance to the composition of music of Hindi songs in a film. Bollywood Hindi songs are played back on varied Indian function like marriage, birthday parties, religious festivities, national patriotic festivals and more.

**EARLY DAYS OF MUSIC INDUSTRY**

Many of the negative features associated are the manipulation, monopolization, and homogenization which are the inherent concomitants of the large scale, expensive and centralized music industry. These factors have led to the downfall of the industry

Early days of music industry saw the rise of Gramophone Company of India (GCI) in 1908. The company under the control of EMI was the sole authority in this region with its subsidiaries HMV (His Master's Voice). Later HMV became the largest recording company in the world. GCI enjoyed during this time effective monopoly until the entrance of Polydor in 1960. The absence of effective competition enabled GCI to pay many of its artists poorly, and to pursue conservative and in many ways phlegmatic marketing practices (Joshi 1988, pg 149-151).

GCI also had regional subsidiaries like Marwari and Megaphone producing regional music. During the 1980's Venus record came into existence and a fierce battle started within the industry with the coming up of T-series with its subsidiary Super cassettes. Currently T-series is the market leader with Saregama and Yash Raj music following it. But still the market is controlled by a few players who are paying less to the composers who are also unlawfully not paying them the royalties and also buying their composition from them even though our law

states that the composer has a right over the song. In other countries like the US, all from the music composers, singers and lyrics writer enjoy equal status on the song and earn royalties which is not the scenario in India. Only the music companies and Producers are reaping the benefits. And also as the music companies are limited and have a monopoly over the market, composers have no choice but to create on an average 500 songs a year which is completely opposite of the west where they generally take out an album in 2-5 years and earn a lot through royalty payments and tours, so plagiarism is the only option left for the composers of our industry to create so many songs.

### **REGIONAL MUSIC IN HINDI MOVIES**

Film composers have often employed melodies from their native regions, Hemant Kr, Salil Choudhary, S.D.Burman, R.D.Burman and Anil Biswas all borrowed songs from their native Bengal, While GhulamHaiderpopularised Punjabi style music. In the dominant Bollywood Music, tunes were borrowed generally from folk music and moulded in such way that they shed their regional flavour and thus appeal to the Indian audience. Film composers avoided using melodies that was recognisable as regional. They changed it by adding some element like an instrument or during the sound recording.

Folk songs have been picked from Hariyanvi ragini, Bengali Jatra, Rajasthani Bhopa traditions, Manganhar performances, Nautanki of Western Uttar Pradesh, Gujarati garba music, Rasiya, Lavni and Muslim devotional Qawwali.

### **LAW IN INDIA**

1. Copyright subsists in original musical work and

- a. Includes any combination of melody and harmony, either of them reduced to writing or otherwise graphically produced or reproduced. An original adaptation of a musical work is also entitled to copyright. There is no copyright in a song. A song has its words written by one man and its music by another; its words have a literary copyright, and so has its music. These two copyrights are entirely different and cannot be merged.
- b. In cases where the word and music are written by the same person, or where they are owned by the same person, he would own the copyright in the song.

A copyright gives the right to do and authorize the doing of any of the following acts, namely-

- c. to reproduce the work in any material form;
- d. to publish the work;
- e. to perform the work in public;
- f. to produce, reproduce, perform or publish any translation of the work;
- g. to make any cinematographic film or a record in respect of work;
- h. to communicate the work by broadcast or to communicate to the public by loud-speaker or any other similar instrument the broadcast of the work;

“Musical work” means a work consisting of music and includes any graphical notation of such work but does not include any words or any action intended to be sung, spoken or performed with the music.

### **Term of copyright in published literary, dramatic, musical and artistic works**

Except as otherwise hereinafter provided, copyright shall subsist in any literary, dramatic, musical or artistic work (other than a photograph) published within the lifetime of the author until 62[sixty] years from the beginning of the calendar year next following the year in which the author dies.

*Explanation.* - In this section the reference to the author shall, in the case of a work of joint authorship, be construed as a reference to the author who dies last.

### **Performer’s right**

(1) Where any performer appears or engages in any performance, he shall have a special right to be known as the "performer's right" in relation to such performance.

(2) The performer's right shall subsist until 96A fifty years from the beginning of the calendar year next following the year in which the performance is made.

(3) During the continuance of a performer's right in relation to any performance, any person who, without the consent of the performer, does any of the following acts in respect of the performance or any substantial part thereof, namely :-

- (a) makes a sound recording or visual recording of the performance; or
- (b) reproduces a sound recording or visual recording of the performance, which sound recording or visual recording was-
  - (i) made without the performer's consent; or
  - (ii) made for purposes different from those for which the performer gave his consent; or
  - (iii) made for purposes different from those referred to in section 39 from a sound recording or visual recording which was made in accordance with section 39; or
- (c) broadcasts the performance except where the broadcast is made from a sound recording or visual recording other than one made in accordance with section 39, or is a re-broadcast by the same broadcasting organization of an earlier broadcast which did not infringe the performer's right; or
- (d) Communicates the performance to the public otherwise than by broadcast, except where such communication to the public is made from a sound recording or a visual recording or a broadcast, shall, subject to the provision of section 39, be deemed to have infringed the performer's right.

**39.95 Acts not infringing broadcast reproduction right or performer's right.** – No broadcast reproduction right or performer's right shall be deemed to be infringed by-

- (a) The making of any sound recording or visual recording for the private use of the person making such recording, or solely for purposes of *bona fide* teaching or research; or
- (b) The use, consistent with fair dealing, of excerpts of a performance or of a broadcast in the reporting of current events or for *bona fide* review, teaching or research; or
- (c) Such other acts, with any necessary adaptations and modifications, which do not constitute infringement of copyright under section 52.

#### **Other provisions applying to broadcast reproduction right and performer's right**

Sections 18, 19, 30, 53, 55, 58, 64, 65 and 66 shall, with any necessary adaptations and

Modifications, apply in relation to the broadcast reproduction right in any broadcast and the

Performers' right in any performance as they apply in relation to copyright in a work:

Provided that where copyright or performer's right subsists in respect of any work or performance that has been broadcast, no license to reproduce such broadcast shall take effect without the consent of the owner of rights or performer, as the case maybe, or both of them.

#### **BOLLYWOOD MUSIC/ INDIAN MUSIC INDUSTRY**

1. Peter Manuel (2001) in his book *Cassette Culture* cited that The song *TirchiTopiwale* composed by Kalyanji-Anandji and film maker Vipul Shah for the 1989 film *Tridev*, the song became phenomenally popular, partly for its tuneful melody, but especially for its conspicuous “breaks”. The passage, the essential “hook” of the song as itself plagiarized from a prior Latin rock hit by the Miami Sound Machine entitled “The rythm’sgonna get you.
2. Peter Manuel (2001) in his book *Cassette Culture* mentioned that Copyright law remains singularly lax with regard to cover versions. Western copyright law permits cover version only with the permission of the original copyright holder. Indian Law by contrast merely requires that the original copyright holder be notified of the production of a cover version and a nominal royalty 5 % be paid if more than one and a half minute tunes are employed. If the melody is used the rate is 2.5%.
3. Peter Manuel (2001) in his book *Cassette Culture* reported that an effective “open season” prevails with regard to foreign songs; the 1989 hit “HawaHawa” by Pakistani singer Hassan Jahangir, was parodied and covered by many labels like T-series, Venus and Western all claiming to be the copyright owner.
4. AnubheySawhney (2006) cited in his article “Bollywood music: If it's a hit, it's a rip-off” in TOI, the views of Intellectual Property Rights lawyer PravinAnand, “There's no difference between an idea and its expression.

If a concept is commercially-viable and somebody is lifting it to suit their purpose, they're liable. In fact, the beauty of the copyright law is that as soon as an original idea is penned, whether registered or not, it automatically comes under the protection of the copyright law.”

5. According to AnubhaySawhney (2006) “Bollywood music: If it's a hit, it's a rip-off” in TOI mentioned that an age-old trend, plagiarism in music has taken on a whole new meaning — if it's popular, it can't be original. Cases in point: Pal, pal (LageRahoMunnabhai), KaisiPaheliHai (Parineeta ), Dil Mein Baji Guitar (ApnaSapna Money Money), KyaMujhePyarHai (WohLamhe), Tu Hi MeriShabHai (Gangster) ...the list is endless.
6. AnubhaySawhney (2006) in his article “Bollywood music: If it's a hit, it's a rip-off” in TOI mentioned that the other new-composer-on-the-block who has the public humming almost everything he makes is PritamChakraborty. Sadly, all of Pritam's seemingly original scores have sources elsewhere. From HalkaHalkaNasha (originally Breeze from Saintes Maries by AbrarulHaque) to the recent KyaMujhePyarHai (originally TakBisakah by Indonesian group Peter Pan), he's guilty of 'sourcing' them all.
7. Hindimoviesong.net (2008) blogged that A.R Rahman has copied some Kenny G's song in his debut film Roja. More examples are- recent films like Shikhar, Chocolate & Aryan have songs copied from Van Halen, Rammstein& Pink Floyd.

Also some of the old songs of R.D Burman are copied from Spanish & Belgian music stuff and they were super-hit.

8. HarpreetOberoi (2009) recorded, “In remix albums the musical composition of the songs, notes and video is so changed that it appears new to the audiences and listeners. According to the copyright act if all the bars of notes are copied, only then it is infringement. This change in remix songs fall within the category of adaptation. So remix songs are eligible for copyright protection”.
9. PriyankaDasgupta (2010) reported that Assamese singer Kumar Bhabesh has alleged that Pritam's “ZorKaJhatka” number is copied from two of his numbers. “The mukhda” of “ZKJ” resembles my composition ‘Dehatilahilahi’ from the album, “Sunpahi”. The tune of the antara is a copy of my song, “Ruksana”, from the album “Roja”.
10. In an article of Hindustan Times (2011) Music composer Anu Malik alleges that PritamChakraborty has lifted the entire tune of his song, *Mohabaatnaamhaikiska...* from *Ajnabee* and used it in the song, *Character dheelahi...*The full tempo and tune has been ripped off.

## CONCLUSION

Bollywood music is mostly referred to as Indian music industry which is often a mistake. Bollywood music is a part of Indian music industry but of course a major part. And because of the changes of taste of the Hindi songs among Indian mass the Bollywood songs have also undergone huge changes. Due to globalization and advent of new technology many cases of plagiarism is coming in spot light in the Indian market, still such composers are getting work and are rewarded by the industry. Person of our country want the law to be stricter, producers of such case be punished severely and provision of royalty be provided in the copyright act, so that stake holder of the song be remunerated. Regional artists should be recognized for their work and be paid when a song made by them is used by the composer of our industry.

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**MEDIA EDUCATION IN INDIA: A QUALITY PERSPECTIVE**

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**ABSTRACT**

*Journalism education in India is framed in the higher education system, comprising of programs in the universities, both government-supported and media-backed private institutions, as well as in-service and short-term courses offered by press associations and other media organizations. They are offered at different levels from certificate to diploma to both undergraduates and postgraduates. Due to requirements of the media industry, there is a constant friction about the need to balance the academic and professional aspects in the curriculum. This has led to skepticism in the past about the relevance of formal media education. However, with globalization and growth of the media sector, there is an enhanced need for professionals. In the absence of practically relevant training the graduates are found in a helpless situation when they join the media organizations. Lack of trained teachers, infrastructural facilities and upgraded syllabus are the major hurdles in the way of sound mass communication teaching. Most of the departments are not getting latest books and professional journals due to financial constraints. They do not have well equipped audio-visual lab, computer lab, photo lab, close circuit television, Internet facility, departmental library and allied facilities.*

*Keywords: Journalism Education, Media Industry, Media Organization*

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**INTRODUCTION**

Media education in India is anchored in two dominant systems of media industry and education sector. While the education sector in India is much evolved and is overseen by Ministry of Human Resource Development (MHRD), the media industry per say is yet not very organized. Today, there are over 300 media or journalism schools at the university and non university systems. All these journalism and media schools offer courses at bachelor, master and postgraduate diploma and diploma levels encompassing all media including print, broadcast and internet. Only courses that fall under the University system are under the purview of the UGC (University Grants Commission) and or State Governments who both fund Universities and also lay guidelines on curriculum and systems (including faculty recruitment). Private Universities that have emerged in the last few years in India are also mandated to follow certain set systems and procedures set by the MHRD. Other non-university institutes or courses do not fall under any legal authority or need to follow any set standards. According to a UGC report 2, "Higher Education at a Glance", presenting vital statistics

pertaining to higher education from 1950-2013, there are 700 degree awarding institutions in total in the country. Of these 44 per cent i.e. 306 are state universities, 129 deemed universities (18 per cent), central universities and institutes of national importance are 6 percent and 10 per cent respectively. There are only 154 private universities accounting for 22% share. Out of these, UGC funds 39 central universities, 153 state universities, 24 deemed universities and 5420 colleges. In most of these Universities, the Journalism departments receive only a fraction of the funding from UGC. and Number of Institution Central State Private al

**Key Trends and Quality Issues**

The speedy growth of private institutions in recent times has also made this sector highly competitive. The situation gets further complicated by several uncertified course run by reputed media organizations. Several institutes also started these courses without having enough infrastructures. Teachers have little experience as academics or professionals. The Indian Media industry is expected to grow exponentially at 18.4 per cent. It is yet to create significant number of jobs in the market, also considering the number of students graduating from Indian journalism and media schools every year. The workforce demand for media and entertainment sector currently stands at 4.6 lakh, according to a study conducted by Media and Entertainment Skills Council (MESC) in 2013. It is estimated to grow at a CAGR of 13 per cent to 7.5 lakh by 2017. Given the nature of workforce demand in the industry, the focus of the media education is expected to be more on professional training. In this regard, MESC was formed to skill workforce to meet the growing Media & Entertainment Industry which is projected to grow to INR 1457 billion by 2016. According to the MESC Skills Gap Study report, there is sizable shortage of trained professionals that possess the relevant skills for jobs within each sub sector. "Due to the lack of a standardized knowledge infrastructure and practical training courses, employees in several occupations end up learning technical/ role-specific skills on the job. This leads to time and budget overruns at the employer end, and in one form or another, these organizations end up bearing the cost of training," according to the report. There are 17 regulatory bodies or councils that look into specific disciplines or areas of study such as AICTE, Bar Council, Medical Council of India, State Council of India, State Councils of Higher Education, and

University Grants Commission to name a few. Media education comes under the ambit of UGC as of now. Discourse on the need for a separate body that will provide accreditation to institutes offering journalism courses has been going on for long now.

#### **Necessity of an accrediting body and a network**

Almost Accrediting body that will keep a check on the quality standards of journalism institutes and departments. Some respondents said that the body should have a multi-faceted approach and without any bias look into the quality parameters of any institute/ course. There should be a Journalism Education Council in India similar to bodies such as the ICMR, ICAR, Bar Council and Medical Council. The purpose of the body could be to limit mushrooming of institutes without proper infrastructure and faculty. An accrediting body may not bring any change as similar efforts have been made in the past. There is no media professional body approved by government to regulate and audit the curriculum as well as other benchmarks to maintain the quality in media education. It was also suggested that a media professional body like MCI, ICSI, ICWA, NAAC, etc should be created to audit the curriculum for different courses as well as set quality standards of institutions.

#### **Methodology**

This paper captures the key findings from the study that aimed to document the state of journalism education and its challenges in India, and also to draw critical lessons both for policy and systems to introduce standards and quality parameters in this important education stream. A secondary research was used for this study. The secondary study mapped all the courses available online and on available publications for various courses (including nomenclature use) related to journalism and media studies in India. Information for faculty and facilities available in these institutes were also mapped. A total of 310 universities, institutes, colleges were mapped during this study using a variety of sources including the respective institute websites.

#### **Discussion on Findings**

Journalism education in India is still developing and though it has grown in size and importance, it is still not treated at par with other traditional disciplines of knowledge. This discipline is striving for an identity of its own and unfortunately, there have not been adequate efforts of either the academia, industry nor the policy makers to make gainful efforts towards the same. Issues facing media education in India relate to theory versus practice, the quality of faculty, updating curriculum and syllabus to keep pace with advancements in media technology, lack of research in media institutes and departments, reference books, modules not relevant in Indian contexts such as some of the mass communication theories. Based on the secondary the following findings and observations emerged.

#### **CONCLUSION**

Media education is at cross roads in India and faces very similar challenges as the higher education sector in India. While the controversial issues regarding standards and policy need regular debate, the faculty paucity is one area that can be immediately addressed. While the number of institutes and universities offering media education is increasing, the faculty dilemma is something that is still addressable. Focused attempts like research resources, networks, platforms for interaction with Industry and specialized training programs, can still help improve standards of education in this sector. This study identified skills and capacities that can be developed among faculty which in turn can directly impact media education in the country.

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**FAKE NEWS AND ELECTIONS****Geeta Arora**Assistant Professor, Lalita Devi institute of Management and Sciences, New Delhi

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**ABSTRACT**

Today's era is a technology-driven era. Information is shared from one person to another person by social media applications like - Twitter, Facebook, WhatsApp, etc. During the time of elections fake news are spread on social media and became major public concern in India. As Lok Sabha Election - 2019 is just around the corner in India and a billion of new people are registered to vote for first time, along with previously registered voters in the upcoming election fake news is started and spreading among folks like unstoppable fire. Currently, India is a developing country and has a large population base, due to this all web (internet) based companies see a very large and fast growth market, and this is the main reason for popularity of all social media platform and messaging apps in our country. Fake news plays a huge role in manipulating human mind and quickly changes their mindset as well as thought process within short period of time. Fake news is also responsible for creating violence in India and it became a worst nightmare for people, which is not a good sign for world's largest democracy. WhatsApp is one of the most popular and widely used social media platforms among all age group people in India, due to this reason some bad people are spreading fake news and false political message on this social media application. Now days, social media has become the part of elections campaigning. According to various media reports in India, WhatsApp is become the most favourite app to spread fake news in various groups and individuals and over 1-2 lakh groups and 50-80 thousand individual accounts are found which are 100% dedicated to spread false political messaging, hateful speeches, etc. to influence the large number of people. Fake news is a part of yellow journalism that consists of disinformation spread online through various social media sites. The biggest factor for successful fake news stories is the large amounts of unaware audiences are attached with various social media platforms. Fake news is generally used for creating a negative impact and fake image of individual or group of people in society.

*Keywords: democracy, manipulating, social media, campaigning.*

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**INTRODUCTION**

Fake news refers to the false information or propaganda. Fake news is made for manipulating people's mind and to spread it in the whole world by changing people thoughts very easily and so that it becomes popular. Fake news websites and channels put their fake content to mislead the large audience and spread misinformation on various social networking sites like - Facebook, WhatsApp, Twitter etc. Fake news is a report which is creating to gain attention, mislead, deceive or damage a person reputation easily and spread the false information very fast. Sometimes creator or distributors of fake news have some agendas like political, social, etc. Fake news is shaping people's behaviours and opinions. Fake news is the major concern in today's time because they affect people mind and their every day life. Fake news also defines as a news which is design and style as well as real news, but it is false and unauthentic. As, 17<sup>th</sup> Lok-Sabha election in India will held from 11<sup>th</sup> April 2019 to 19<sup>th</sup> May 2019 in all states on different-different schedule date, now every political party is trying to put fake news and false content everywhere to influence the people easily because is easy to spread on social media platforms, during the time of election every parties set an agenda or propaganda to defame or damage opposition party reputation. Fake news also creates conspiracy during the time of elections those benefits various political parties. Fake news effect is widely seen on the election voting because people are easily faith in false content and spread it very fast which makes it popular within short period of time on social networking platforms and websites like - Facebook, Instagram, Twitter, WhatsApp, etc. Fake news attracts more people attention than real news. Recently, Election Commission of India meets all social networking platforms representatives and Internet and Mobile association of India have agree with election commission to conduct the 'Code of Ethics' on social media for the 17<sup>th</sup> Lok-Sabha election polls. Social media platforms play a very important and biggest role in increasing and spreading fake news stories in all over the world during the election time. Fake news tradition was not new, in every election parties spread fake news on social media against their opposition party and manipulate human mind easily for catching their attention.

**Key trends and quality issues**

Fake news is still the biggest concern for social networking platforms as it is reaching to a lot of people and it effects people thinking in short span of time and people easily believe on the content which is not real. In today's world 75% population people use smartphones and connected on social media with various people which are unknown to each other that post forwarded message content and most of times the forwarded message

has the wrong and false information and due to spreading of this kind of messages, fake news becomes very famous and popular. Fake news is very famous at the time of election and sometimes creating violence in the society which is not good thing for the country future and welfares. Increasing of fake news in social media helps it to spread like a fire. India is biggest market for all social media platforms and their growth rate is very high, for example – Facebook, Twitter, WhatsApp, Tik-Tok, etc have very large user- base in India. During the time of election some political parties put fake contents on social media like false information, hateful speeches, comments etc., to defame other political parties and damage their reputation by changing the mindset of large amount of people. Fake news spread negativity around the world and its impact is not good for the society. Fake news is successfully spreading very fast because a lot of people could not identify whether it is true or not and generally put their more trust on the false content and easily believe on the fake news and false stories. In last few studies, it is revealed that WhatsApp is the most common platform for spreading wrong information and false information all over world.

### **Necessity of an accrediting body and a network**

The Information and Broadcasting Ministry of India has amended the guidelines for the accrediting body of journalists after the increasing and spreading of fake news in social media platforms. Press Council of India (PCI) and News Broadcasters Association (NBA) is selected for review of fake news, firstly they check the news and after confirming it from source, they allow the publication and the telecast of any type of news, the accreditation of journalists who are involved in creating and propagating fake news will be suspended for six months for the first time of violence, if same person or company found for second time violence, the journalists will be suspended for 1 year and in case of third time violence the journalists may lose or permanently cancellation of accreditation. These efforts are come to track and tackle the fake news comes from around the world especially on digital and social media platforms in India.

### **Methodology**

This paper captures the key findings from the study that aimed to highlight the state of fake news in India. Secondary research was used for this study. The secondary study mapped all the courses available online and on available publications for various courses (including nomenclature use) related to journalism and media studies in India. Information for faculty and facilities available in these institutes were also mapped. For example In India 17<sup>th</sup> Lok-Sabha elections are just going to start so WhatsApp put a lot of efforts to curb the problem of fake news. The messaging platforms launches the campaign to educate the people and its users for not misusing this platform and says that – “Share Joy, Happiness not the Rumours”. Facebook also launch a new Candidate Connect Feature in India that allows the Lok-Sabha candidates to share a 20 seconds long video with their messages to their users in India.

### **Discussion on findings**

Fake news is still reaching large number of people within a short period of time. Fake news is spreading every day, but during the time of elections the purpose of fake news is different. Fake news has a very negative impact on society, and it is not good for the development of the country. Social media platforms launch education campaign to educate and aware the people: use the social media but do not misuse or spread misinformation. WhatsApp and Facebook launch new campaign and features to curb the problem of fake news spread at the time of election. Apart of this Facebook has partner with Indian Media Organization to check the flag fake news stories in some of the regional languages like Hindi, English, etc.

### **CONCLUSION**

Fake news spread every time with the different purpose. Fake news easily gains trust of the people and sometimes false information are very eye-catching and it attracts the people very quickly. Social media plays a major role for the success fake news spreading in all over world.

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**FINANCIAL DETERMINANTS OF STOCK PRICES: A STUDY OF BOMBAY STOCK EXCHANGE (BSE)**

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**ABSTRACT**

*The present study is an attempt to identify the financial determinants of stock prices. The study considered the companies listed in Bombay Stock Exchange (BSE). There are various factors which affect the stock prices of the companies like economic, financial, and political and so on. In the present study, only financial factors (determinants) have been taken to identify the factors affecting the stock prices of selected companies. Data was collected for the period of 2014-2018. On the basis of review of past studies, six factors viz. earnings per share, dividend pay-out ratio, PE Ratio, net margin, return on equity and return on assets of 30 companies, were taken into study. Panel data least square regression model was applied to analyse the data. The results indicate that firms' earning per share, net margin and net income are having a significant impact on firm's stock price.*

*Keywords: Bombay Stock Exchange (BSE); Financial Determinants; EPS; Pay-out; Return on Equity; Panel Data Fixed Effect; OLS.*

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**INTRODUCTION**

Security market is assumed to be all about risk in return on investment. Rational investor wants to earn extra return on their investment by investing in security market. The stock prices follow a random walk pattern and can-not be predicted easily to earn extra or abnormal returns. Still an investor wants to analyse the determinants of stock prices and returns to find out the possible positive returns and to minimise the associated risk.

BSE Sensex is one of the most important stock exchanges in India. The index value of Sensex is determined by the share prices of BSE 30 companies. These 30 companies are the representatives of all the listed companies in BSE. Various theories suggest that the share prices are affected by numerous factors viz. Economic, Financial, Political, etc. There are many financial factors which affect the stock prices of securities such as return on assets, earnings per share, dividend pay-out ratio, return on equity, net income, net profit margin, size of the firm, etc.

**LITERATURE REVIEW**

Balan and Srinivasan (2017), in the study of determinants of share price in BSE, using multiple regression, found that DPS and sales are significant variables among various financial variables considered for study.

Sharif, et al. (2015), in the study of factors affecting share price in Bahrain Stock Exchange, during the period of 2010-2016, using regression, found that ROE, Book Value per share, DPS, Dividend Yield, PE and Firm Size are significant determinants of share price in Bahrain stock market.

Almumani (2014), in the study of determinants of share prices of banking stock in Amman Stock Exchange during the period of 2005-2011, by using ratios, correlation, linear multiple regression, found that Book Value, EPS, PE and Firm Size are significant determinants.

Menike and Prabath (2014), conducted a study to measure the impact of accounting variables on stock prices in Colombo Stock Exchange, Sri Lanka during the period of 2008-2012 and found that DPS, EPS, Book Value of share have significant impact.

Tandon and Malhotra, (2013) found that EPS, Book Value per share, P/E Ratio have significant impact in determining the share price in NSE. The study used correlation and multiple regression using the data of 2007-2012.

Gill, et al. (2012), conducted a study on American Firms and found that EPS, DPS, P/E Ratio are found significant in determining the share price of equity shares during 2009-2011.

Khan (2012), conducted a study on Karachi Stock Exchange and found that P/E Ratio, Dividend, GDP have significant relationship with share price during the period of 2000-2009.

Uwugbe and Agu (2012), conducted a study in Nigeria stock market on the determinants of share price during the period of 2006-2010 and found that dividend payout, financial leverage are strongly determine the share price.

Srinivasan (2012), found that DPS negatively affect the share price while EPS, P/E Ratio and firm size are the major determinants of share price in the study using panel data approach during the period of 2006-2011.

Sanju, et al. (2011), found DPS, P/E Ratio and leverage as significant factors affecting the share prices in India during the period of 2002-2009.

Sharma (2011), conducted a study on determinants of share prices in India during the period of 1993-2008 and found that DPS, EPS, Book Value per share significantly determine the share price.

Al-Shubiri (2010), conducted a study on determinants of share price movement in Jordanian Commercial Banks during the period of 2005-2008 and found a positive and significant impact of net assets value per share, Dividend percentage, GDP on market price of shares.

Dehuan and Jin (2008), conducted a study on firm performance and stock returns in Shanghai Stock Exchange during the period of 1996-2000 and found ROE, EPS, Profit margin, ROA, Sales and Total Assets Turnover have significant impact on stock prices.

Irfan and Sharif (2002), conducted a study on Karachi Stock Exchange on key fundamental factors and long run price changes during the period of 1981-2000 and found that payout ratio, size of firm, leverage and dividend yield are significantly affect the price changes.

In the developed nations numerous studies have been embraced to determine the financial determinants of the stock price. However in India few studies have been led on this issue.

After the intensive review of literature an attempt has been made to find out the financial determinants of stock price and following factors have been selected for the study:

### **STOCK PRICE**

A stock price is the price of the shares of an organisation or any derivative or financial asset at which it is traded in the stock exchanges. It is the price, a person is willing to pay to purchase the stock.

### **EARNINGS PER SHARE (EPS)**

Earnings Per Share (EPS) is profit available to equity share holders divided by no. of outstanding equity shares. EPS is one of the various parameters of financial performance. Higher the EPS, higher the growth of a company which results in increased market price.

$EPS = \text{Profit available to equity share holders} / \text{No. of outstanding Equity Shares}$ .

### **DIVIDEND PAYOUT RATIO**

Dividend payout ratio is an estimation of dividend paid out to the shareholders of the company in the relation to the net income. It can be found out by dividing dividend per share and earnings per share.

$\text{Dividend Payout Ratio (DPR)} = (\text{Dividend Per Share} / \text{EPS}) \times 100$

### **NET MARGIN**

Profit margin is also known as net profit margin, net margin or net profit ratio. Net margin is a significant indicator of profitability. It can be estimated by dividing the net profit by total revenue.

$\text{Net margin} = (\text{Net profit} / \text{Total Revenue}) \times 100$

### **PRICE-EARNINGS RATIO**

This ratio is used to find out whether the company is overestimated or underestimated.

$\text{P/E ratio} = \text{Share Price} / \text{Earnings per share}$

### **RETURN ON ASSETS**

This ratio emphasises on the profits that company can generate from its assets. It is a profitability ratio which measures that how efficiently a company's management is using their economic resources or assets in generating earnings.

$\text{ROA} = (\text{Net Income} / \text{Average Total Assets}) \times 100$

### **RETURN ON EQUITY**

ROE is an indicator which shows growth that company has earned using its investment. It is an essential measure of profitability of a business in relation to the equity.

$\text{ROE} = (\text{Net income} / \text{Shareholder's equity}) \times 100$

**RESEARCH METHODOLOGY**

For the purpose of the study, 30 companies of BSE Sensex were selected. The annual data of all the variables was collected from Yahoo Finance and Money Control for the period of 5 years i.e. 2014 to 2018. The Augmented Dickey Fuller (ADF) test was applied to check the unit root in the series and after checking the stationarity of variables, Panel Data Multiple Regression (OLS) was applied to find out the financial determinants of stock prices.

**OBJECTIVE OF THE STUDY**

The objective of the study is to find out the financial determinants of stock price of companies listed on BSE Sensex.

**ANALYSIS AND INTERPRETATION**

**Table-1: (ADF TEST)**

VARIABLES	Unit root test- Augmented Dickey Fuller test			
	<b>Stock Prices</b>	<b>Level</b>	0.0000	<b>1st difference</b>
	<b>t-statistics</b>	-5.242282	<b>t-statistics</b>	-14.444
<b>Dividend pay-out ratio</b>	<b>Level</b>	0.0000	<b>1st difference</b>	0.0000
	<b>t-statistics</b>	-12.11216	<b>t-statistics</b>	-10.3111
<b>Earnings per share</b>	<b>Level</b>	0.0000	<b>1st difference</b>	0.0000
	<b>t-statistics</b>	-5.514272	<b>t-statistics</b>	-14.9723
<b>Return on assets</b>	<b>Level</b>	0.0003	<b>1st difference</b>	0.0000
	<b>t-statistics</b>	-4.545276	<b>t-statistics</b>	-12.1415
<b>Return on equity</b>	<b>Level</b>	0.0000	<b>1st difference</b>	0.0000
	<b>t-statistics</b>	-5.289309	<b>t-statistics</b>	-11.2949
<b>P/E Ratio</b>	<b>Level</b>	0.0000	<b>1st difference</b>	0.0000
	<b>t-statistics</b>	-5.394638	<b>t-statistics</b>	-8.79062
<b>Net Margin</b>	<b>Level</b>	0.0000	<b>1st difference</b>	0.0000
	<b>t-statistics</b>	-5.165342	<b>t-statistics</b>	-12.5029

**INTERPRETATION**

In the above table, the variable were checked for unit root and it was found that all the variables are stationary at level as p-value of all are less than 5% significance level. The data processed for further analysis of multiple regression to find out the financial determinants of stock prices.

**Regression model**

A typical regression equation is as follows:

$$Stock\ price_{it} = \alpha + \beta_1 x_{it1} + \beta_2 x_{it2} + \dots + \beta_k x_{itk} + \epsilon_{it} \dots \dots \dots (1)$$

Where,

Stock price is the dependent variable

i denotes the number of companies and t denotes the time period

$x_1, x_2, \dots, x_k$  are the independent variables.

$\alpha$  s the constant term

$\beta_1, \beta_2, \dots, \beta_k$  are the slope parameters that represent the partial effects of  $x_i$  on y keeping all other factors constant

$\epsilon$  represents the unobserved factors that change over time and affect stock price.

$$S.P = \alpha + \beta_1 DPR + \beta_2 EPS + \beta_3 P.E + \beta_4 N.M. + \beta_5 ROA + \beta_6 ROE + \epsilon$$

Where,

S.P. = Stock Price

$\alpha$ = intercept

$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$  &  $\beta_6$  are regression coefficients

DPR= dividend pay-out ratio

EPS= earnings per share

P.E = Price earnings ratio

N.M= net margin

ROA= return on assets

ROE= return on equity

$\epsilon$ = error term

The study uses Least Square Regression Model to measure the significant impact of dividend pay-out ratio, earnings per share, net margin, price earnings ratio, and return on assets and return equity on stock prices.

Dependent Variable: STOCK PRICES

Method: Panel Least Squares

Table-2: (Regression model fixed effect)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-25.35122	85.50212	-0.296498	0.7673
Dividend pay-out ratio	0.138727	1.21492	0.114186	0.9093
Earnings per share	21.36026	1.135786	18.8066	0.0000
Net Margin	-62.55889	9.226883	-6.780067	0.0000
P/E Ratio	279.6232	42.51818	6.576556	0.0000
Return on assets	-33.00304	13.30781	-2.479975	0.0144
Return on equity	5.394197	4.773243	1.130091	0.2606
<i>R-squared</i>	0.77953	<i>Mean dependent var</i>		841.0835
<i>Adjusted R-squared</i>	0.769195	<i>S.D. dependent var</i>		1172.913
<i>S.E. of regression</i>	563.4928	<i>Akaike info criterion</i>		15.55665
<i>Sum squared resid</i>	40643085	<i>Schwarz criterion</i>		15.70729
<i>Log likelihood</i>	-1043.074	<i>Hannan-Quinn criter.</i>		15.61786
<i>F-statistic</i>	75.42954	<i>Durbin-Watson stat</i>		1.103157
<i>Prob(F-statistic)</i>	0.00000			

S.P. = -25.35122+ 0.138727 DPR+21.36026 EPS+-62.55889 N.M.+279.6232 P.E.+ -33.00304 ROA + 5.394197ROE

**INTERPRETATION**

In the above mentioned model, keeping stock price as dependent variable and dividend pay-out ratio, earnings per share, net margin, price earnings ratio, return on assets and return on equity as independent variables. On the basis of the result, it was found that Earnings per share and price earnings ratio have significant positive impact on stock price as p-value= 0.0000 and 0.0000 which is less than 1% means these are significant at 1% level and Net margin and ROA have significant negative impact on stock price as p- value= 0.000 and 0.0144 respectively which is significant at 1% and 5% respectively. Whereas DPR & ROE has no significant impact on stock price as p-value of these two are greater than the significance level (5%).

Together, all the factors explain 76.91% of stock price and remaining 23.09% is of the error term.

TEST II

Dependent Variable: STOCK PRICES

Method: Panel EGLS (Cross-section random effects)

Table-3: (regression model random effect)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	29.88246	124.927	0.239199	0.811
Dividend pay-out ratio	-0.145004	1.004974	-0.144286	0.885
Earnings per share	18.03344	1.335319	13.50497	0.000
Net Margin_	-42.73732	9.777015	-4.371203	0.000
P/E Ratio	242.5864	51.56166	4.704783	0.000
Return on assets	-19.13564	17.55967	-1.089749	0.277
Return on equity	-1.198739	5.742414	-0.208752	0.83
	Effects Specification			
			S.D.	Rho
Cross-section random			372.6139	0.446
Idiosyncratic random			415.072	0.553
	Weighted Statistics			
<i>R-squared</i>	0.61632	<i>Mean dependent var</i>		375.042
<i>Adjusted R-squared</i>	0.598335	<i>S.D. dependent var</i>		685.079
<i>S.E. of regression</i>	434.1834	<i>Sum squared resid</i>		2412994
<i>F-statistic</i>	34.26853	<i>Durbin-Watson stat</i>		1.46419
<i>Prob(F-statistic)</i>	0.00000			
	<i>Unweighted Statistics</i>			
<i>R-squared</i>	0.758082	<i>Mean dependent var</i>		841.083
<i>Sum squared resid</i>	44596903	<i>Durbin-Watson stat</i>		0.9692

Table 4 (Hausman test)

Correlated Random Effects - Hausman Test				
Equation: Untitled				
Test cross-section random effects				
Test Summary		Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random		18.058507	6	0.0061

**INTERPRETATION**

To check whether the preferred model is random effects or fixed effects, Hausman test is applied. From the above table it can be inferred that p-value is 0.0061 which is less than 0.05, therefore the preferred model is fixed effects and not random effects

**LIMITATIONS**

The results are limited to the selected stock exchange, selected companies and duration of the study. The results may vary with change in any or all criterion.

**CONCLUSION**

On the basis of the objective of the study to find out the financial determinants of the stock prices and the process to analyse the variables with the help of regression method it can be concluded that Earnings per share and price earnings ratio has significant positive impact on stock price and net margin and return on assets have significant negative impact on stock price whereas dividend pay-out ratio and return on equity have no significant impact on stock price.

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**DIGITAL ENTREPRENEURSHIP IN INDIA****Dr. Amit Verma<sup>1</sup> and Dr. Ankita Dhamija Nagpal<sup>2</sup>**Assistant Professor<sup>1</sup>, Department of Commerce, Kalicharan PG College, Lucknow  
Assistant Professor<sup>2</sup>, Lingaya's Lalita Devi Institute of Management and Sciences, New Delhi**ABSTRACT**

*Digitalization and the development of information and communication technologies (ICTs) are creating opportunities for new types of entrepreneurial activities in Indian economy. The digitalization takes entrepreneurs towards the Digital Entrepreneurship which is a social, economical and technological phenomenon, it can be considered as the joining of traditional entrepreneurship with an emphasis on leveraging new digital technologies in novel ways, such as social, mobile and analytics, all in order to shift the traditional way of creating and innovative way of doing business in the digital era.*

*The present study reveals about the Nature of Digital Entrepreneurship and Barriers to Digital Entrepreneurship in present globalised market place.*

*Keywords: Digital Entrepreneurship, Entrepreneur, Innovation, Start-up, ICT*

**I. INTRODUCTION**

Digital Entrepreneurship plays a significant role in the economic development of our country India. It is the most powerful weapon to fight against poverty and unemployment and acts as a catalyst for the economic prosperity of a nation and also contributes in national income, rural development, industrialization and export promotion etc. In Digital Entrepreneurship Entrepreneurs are able to work from remote areas, at different hours, from the home. It promotes gender equality, social and economic inclusion, and contributes to sustainable development, especially when new technologies are combined with the availability of open and public data.

**II. REVIEW OF LITERATURE**

Eric Ries (2011) in his *Lean Start-up Manifesto* stated that a start-up is a human institution designed to create a new product or service under conditions of extreme Uncertainty.

Steve Blank's (2013) famous definition of a start-up as a temporary organization searching for a repeatable and scalable business model. These references advocate a nature of high uncertainty and the quest for a repeatable and scalable business model in the core part of the definition.

The 'digital' component relates to what Parker et al. (2016) refer to as 'digital platforms' that "consummate matches among producers and consumers and facilitate the exchange of goods, services or social currency, enabling value creation for all through the digital landscape". Hence, digital start-ups and scale-ups are ventures that incorporate novel digital technology as a vital component of their business model and which could not feasibly operate without the internet-enabled platforms.

According to Yoo et al. (2010), digital innovation can be defined as the implementation of new combinations of digital and non-digital resources to produce novel products and processes. Because of the limited resources and knowledge available within individual firms, many firms seek to leverage external resources to generate digital innovations (Selander et al., 2010).

Innovation and entrepreneurship are often intertwined since many digital entrepreneurial ventures are based on digital innovation (Bessant and Tidd, 2007).

Digital entrepreneurship is one stream of entrepreneurship. The unique characteristic of digital entrepreneurship as per Davidson et al. (2010) is that digital entrepreneurship consists of three interconnected types of entrepreneurship: business entrepreneurship, knowledge entrepreneurship and institutional entrepreneurship. Digital entrepreneurship is a multi-faceted phenomenon that contains all three types.

Business entrepreneurship is the type of entrepreneurship whereby new ventures are created. This is the most popular type of entrepreneurship in the literature. Knowledge entrepreneurship involves the pursuit of opportunities based on information and knowledge to create a domain-related knowledge base and pursue new ventures related to this knowledge base. Consultants, journalists and academics are examples of knowledge entrepreneurs. Institutional entrepreneurship can be defined as the activities of actors who have interest arrangements and who leverage resources to create new institutions or transform existing ones. For example, the rise of E-commerce platforms, such as Amazon and Alibaba, has created a new form of retail market, which is an institutional entrepreneurship.

These three types of entrepreneurship are not exclusive. Instead, they are reinforcing. Davidson et al. (2010) posit that a successful digital entrepreneurship should combine business, knowledge and institutional opportunities. For example, Alibaba Inc, an Ecommerce company, is first a business enterprise, but at the same time, this enterprise contains important knowledge and institutional implications. Digital entrepreneurship pursues opportunities based on the use of digital technologies, while others pursue opportunities based on business, knowledge or institutions (Davidson and Vaast 2010).

## **II. METHODOLOGY AND OBJECTIVES**

The study is based on the secondary data which has been collected through government reports, books, research paper and websites etc.

The present study is based on following objectives:

- 1) To study the concept of Digital Entrepreneurship
- 2) To study the Barriers to Digital Entrepreneurship.
- 3) To provide the Suggestions to the Government of India

## **III. FINDINGS OF THE STUDY**

### **A) To Study the Concept of Digital Entrepreneurship**

Digital Entrepreneurship most commonly refers to the process of creating a new Internet enabled/delivered business, product or service. This definition includes both startups—bringing a new digital product or service to market—but also the digital transformation of an existing business activity inside a firm or the public sector.

Digital Entrepreneurship is referred as embracing new ventures and the transformation of existing business by creating and using novel digital technologies. Digital Enterprises are characterised by a high intensity of utilisation of new digital technologies (particularly social, mobile, and analytics) to improve business operations, invent new digital business models, sharpen business intelligence, and engage with customers and stakeholders through new digital channels.

### **B) Barriers to Digital Entrepreneurship**

The main barriers to digital entrepreneurship appear to include:

#### **i) Skills**

In many parts of India Entrepreneurs are not digitally skilled they are still on traditional Entrepreneurship. Skills issues are extremely important for digital entrepreneurship. From the ability identify the talent that is required and recruiting that talent, including across borders, to having the skills to identify new technology-enabled business opportunities either as a new venture, or by transforming existing business models, skills issues are key to successful digital entrepreneurship and even the successful conceptualization and implementation of most IT projects (in both the private and public sectors).

#### **ii) Infrastructure**

In many parts of the India, access to affordable, reliable, high-speed broadband infrastructure is still a problem.

#### **iii) Business environment.**

It is also essential to create a dynamic and competitive digital business environment and address concerns about digital entrepreneurship conditions in order to enable the creation of online services and applications. These factors also matter for entrepreneurship more generally, they are even more important in the fast changing and moving digital world, and for digital entrepreneurs in start-ups, smaller companies, and newer companies, in highly innovative sectors.

### **C) Suggestions to the Government of India**

It is vital to strive for consistency and harmonization of the rules governing digital entrepreneurship, while also limiting regulatory change and uncertainty going forward. We would like to provide some suggestions to the Government of India in respect of the Digital Entrepreneurship:

#### **i) Supply of appropriate skills**

Government of India should simplify and speed-up procedures for cross-border recruitment of talent and reduce the associated costs (e.g. related to immigration rules and formalities). Government should promote more interaction between the private sector and educational and vocational training institutions and organizations to ensure the skills supply better matches the skills needs in practice.

ii) *Market integration and demand aggregation:* Government should try Integrate markets for digital and online services by reducing fragmentation and other barriers, and help through the aggregation of demand where necessary to allow an increase in overall demand for ICT goods and services.

iii) *Promoting open standards and open data*: Government should also promote the creation of new digital services by ensuring open access to public data (e.g. weather, traffic, geography, public records, archives) to allow the creation of new and relevant localized digital content, services and applications.

iv) *Business life cycle*: Government should also Simplify and harmonize regulation in doing digital business, including across borders.

v) *Creating the best climate for success*: Government should promote digital entrepreneurship awareness and skills in schools, from early age and at all levels, including through the use of role models, technological skills, and especially combinations of technical and soft skills.

vi) *Enabling access to finance*: Government should promote access to finance for start-ups which is very important.

vii) *Fostering a competitive environment*: Government should reduce barriers to entry, and exit, where necessary is important in fostering a competitive environment and should help the diffusion of technology and reduce the power of incumbents.

viii) *Clarifying the rules for use of data*: Government should make a strict Rules for ‘ethical’ conduct around the collection, storage and use of data. It is also important to create trust in the online environment by providing a balance .

#### IV.CONCLUSION

Digital Entrepreneurship offer tremendous growth opportunities and reduce investment barriers by bringing new digital products and services to market. The greater emphasis must be placed on creating the right environmental conditions—including skills, business cycle regulations, infrastructure and access to capital—that enable digital entrepreneurs to be successful. Enabling digital entrepreneurship in our country is especially important as this allows for the creation of new markets, the exploitation of existing markets and integration into global value chains. The growth of Digital Entrepreneurship that match demand and supply for tasks also providing new avenues for people to offer their services regardless of their location which again helps in Sustainable Development.

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**SUSTAINABLE DEVELOPMENT THROUGH GREEN MARKETING**

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**ABSTRACT**

*Sustainable development can only be achieved when we do not harm our environment. For attaining our goal of sustainable development we can use the tool of green marketing in order to protect the environment from many types of harmful effects. Green marketing basically means the marketing of environment friendly products. Previously many concepts of marketing was there like product concept, production concept, selling concept, marketing concept but now what works is the green marketing concept or the societal marketing concept which means we must market those products which are environment friendly and not harmful to the society. There is no widely used definition of Green Marketing. Green Marketing has been defined differently by different persons as green, sustainable, ecological, environmental, environmentally – friendly marketing, environmental green marketing and sustainable green marketing, while in some cases difference in their content can be hardly find.*

*The Present paper makes an attempt to discuss the evolution and meaning of green marketing, the reasons for adopting green marketing, green marketing strategies, remarkable achievements of green business & India's initiative for green marketing.*

*Keywords: Green Marketing, Sustainable Marketing, Environment, Marketing*

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**MEANING OF GREEN AND SUSTAINABLE MARKETING**

Sustainable development can only be achieved when we do not harm our environment. For attaining our goal of sustainable development we can use the tool of green marketing in order to protect the environment from many types of harmful effects which our traditional marketing had. Green marketing basically means the marketing of environment friendly products. Previously many concepts of marketing was there like product concept, production concept, selling concept, marketing concept but now what works is the green marketing concept or the societal marketing concept which means we must market those products which are environment friendly and not harmful to the society. There is no widely used definition of Green Marketing. Green Marketing has been defined differently by different persons as green, sustainable, ecological, environmental, environmentally – friendly marketing, environmental green marketing and sustainable green marketing, while in some cases difference in their content can be hardly find.

In the year 1975 American Marketing Association (AMA) held the first workshop on “Ecological Marketing” the proceedings of which have resulted in the form of a book on green marketing entitled “Ecological Marketing”

According to AMA, “Green Marketing is the marketing of the products that are presumed to be environmentally safe”.

A mixture of traditional as well as green concept of green marketing includes all the activities which satisfy the human needs with minimal detrimental impact on the

Green Marketing, also alternatively known as environmental marketing and sustainable marketing, refers to the organizations' efforts at designing, promoting, pricing and distributing products that will not harm the environment.

This definition includes all the efforts of marketing in a manner which will not be proved to be destructive to the environment.

While defining green marketing it seems to be important to explain the meaning of green consumers also. In the words of Elkington (1994:93) green consumer is the one who avoids products that are likely to endanger the health of the consumer or others; cause significant damage to the environment during manufacture, use or disposal; consume a disproportionate amount of energy; cause unnecessary waste; use materials derived from threatened species or environments; involve unnecessary use of cruelty to animals; adversely affect other countries.

**REVIEW OF LITERATURE**

Kilbourne, W.E. (1998) discussed the failure of green marketing to move beyond the limitations of the prevailing paradigm. The author identified areas that must be examined for their effect in the marketing/environment relationship, namely economic, political and technological dimensions of the cultural

frame of reference.

Prothero, A. (1998) introduced several papers discussed in the July 1998 issue of 'Journal of Marketing Management' focusing on green marketing. This included a citation of the need to review existing literature on green marketing, an empirical study of United States and Australian marketing managers, a description of what a green alliance look like in practice in Great Britain, ecotourism and definitions of green marketing.

Prothero, A. & Fitchett, J.A. (2000) argued that greater ecological enlightenment can be secured through capitalism by using the characteristics of commodity culture to further progress environmental goals. Marketing not only has the potential to contribute to the establishment of more sustainable forms of society but, as a principle agent in the operation and proliferation of commodity discourse, also has a considerable responsibility to do so.

Oyewole, P. (2001) in his paper presented a conceptual link among green marketing, environmental justice, and industrial ecology. It argues for greater awareness of environmental justice in the practice for green marketing. A research agenda is finally suggested to determine consumer's awareness of environmental justice, and their willingness to bear the costs associated with it.

Karna, J., Hansen, E. & Juslin, H. (2003) interpreted that proactive marketers are the most genuine group in implementing environmental marketing voluntarily and seeking competitive advantage through environmental friendliness. The results also give evidence that green values, environmental marketing strategies, structures and functions are logically connected to each other as hypothesized according to the model of environmental marketing used to guide this study.

Sanjay K. Jain & Gurmeet Kaur (2004) in their study of environmentalism which had fast emerged as a worldwide phenomenon discussed business firms too have risen to the occasion and have started responding to environmental challenges by practicing green marketing strategies. Green consumerism has played a catalytic role in ushering corporate environmentalism and making business firms green marketing oriented. Based on the data collected through a field survey, the paper made an assessment of the extent of environmental awareness, attitudes and behaviour prevalent among consumers in India.

Donaldson (2005) in his study realized in the Great Britain that in general the ecological attitude of consumers changed positively. This study reported the strong faith of consumers in the known commercial brands and in the feeble behaviour referring to the "green" claims, which was the main cause behind the consuming failure to interpret their concerns beyond the environment in their behavior.

Alsmadi (2007) while investigating the environmental behaviour of Jordanian consumers reveals a high level of environmental conscience. Unfortunately however this positive tendency and preference in the "green" products did not appear to have any effect on the final decision, obviously because these consumers had a stronger faith in the traditional products and a small confidence in the green statements. The above obstacles were further strengthened by the lack of environmental conscience by a lot of enterprises and the existence of a large scale of prices for the same product, many of which included an impetuous estimate of environmental responsibility. The same phenomenon has been presented in other researches too (Ottman, 2004; Donaldson, 2005; Cleveland et al, 2005).

Brahma, M. & Dande, R. (2008), The Economic Times, Mumbai, had an article which stated that, Green Ventures India is a subsidiary of New York based asset management firm Green Ventures International. The latter recently announced a \$300 million India focused fund aimed at renewable energy products and supporting trading in carbon credits.

### **OBJECTIVES OF THE STUDY**

- To understand the evolution of Green Marketing
- To explain the reasons for adopting Green Marketing
- To discuss the green marketing strategies
- To discuss remarkable achievements of green business

### **RESEARCH METHODOLOGY**

This paper is based on secondary data. The data has been collected with the help of various books, journals, magazines and internet. The present study is an exploratory study. The scope of this study is limited to the reasons for adopting green marketing practices in India, green marketing practices which have been adopted in India for the purpose of achieving sustainable development and to discuss the remarkable achievements of the

country in this direction.

### **EVOLUTION OF GREEN MARKETING**

Environmental problems has got in the focus in 1962, when Rachel Carson's book, the Silent Spring was published and it draw people attention to the anthropocentric root and frightening extent of environmental problems, and blamed economic activities for them.

From the 70's ecological green marketing had been flourishing in developed countries. Ecological green marketing was the sport of the minority, and caused changes in the lifestyle of only a few consumers.

The term Green Marketing came into dominance in the late 1980s and early 1990s, began in Europe in the early 1980s when certain products were found to be harmful to the environment and society as a whole.

According to Peattie (2001), the evolution of green marketing can be divided into three phases; first phase was termed as "Ecological" green marketing, to help solve environment problems through remedies. Second phase was "Environmental" green marketing with focus on clean technology that involved designing of innovative new products, which take care of environmental and waste issues. Third phase was "Sustainable" green marketing, came into prominence in the late 1990s and early 2000 where it becomes necessary for companies to produce environmental friendly products as the awareness of such products is on the rise as customers are demanding eco-friendly products and technologies.

Beginning in the 1990s, the agenda of green marketing began to expand as new topics emerged related to individual's motivation, such as perceived consumer effectiveness, cooperative behaviors and strategic alliances<sup>4</sup>. However in the late 90's green developments had slowed down - the literature speaks about meeting with the Green Wall. On the other hand the negative attitude of the media toward green companies' trustworthiness, problems of green painting and the growing skepticism of consumers toward green advertisement meant burden. On the other hand cheap and easy green practices and solutions – especially those which caused cost reduction – had come to an end, so new steps towards being more green needed lot of investments and sacrifices from the firms. Moreover doubt emerged on the market related to what kind of products were proved to be as really green and the identification and reach of green consumer segment seemed to be very difficult in practice- similarly to the contradictory results of studies in this topic (Peattie 2001).

### **REASONS FOR ADOPTING GREEN MARKETING**

Due to various reasons like consumer beliefs are still in the evolving stage, demand is not well established; and even where it is, purchase behavior tends to be inconsistent, Implementation of Green Marketing is considered as the challenging job. Szillisi pointed out that from the 60s it became gradually evident that human intervention into the natural cycle to such extent has brought incalculable and irreversible consequences. To minimize environmental impacts by significant orders of magnitude requires the blending of good engineering with good economics as well as changing consumer preferences is the suggestion given by Arnulf Grublerr. There are many potent reasons responsible for the increasing demand of green marketing. Some of the reasons can be explained as below

**Strict Government Regulations** Tightening of emission norms in vehicles to minimize release of hydrocarbons into the atmosphere, Encouraging use of biodegradable materials through incentives, Issuance of various environmental licenses to control the production of by-products are some of the government regulations which force the companies to behave in environment friendly manner. The European Commission's "Green Package" of legislation on climate change and renewable energy represents a significant potential opportunity for European utilities, according to a report released by the Brattle Group and Trilemma UK. The green package sets targets that represent a step in the energy market: save 20% of energy, increase the share of renewable energy to 20%, and cut greenhouse gas emissions by at least 20%, all by 2020.

India took a series of legislations has been enacted in order to reduce pollution of water, air and other environmental resources. The aftereffect of which is that the refrigerator industry has shifted from chlorofluorocarbon (CFC) gases to more environmentally friendly gases. The Ban of plastic bags and prohibition of smoking in public areas and compulsion of CNG in buses and autorichaws are some of the important regulations of Indian Government to increase green in the country.

**Increased Goodwill of the Company** Successful marketing of green products will definitely help in the boosting up the company's image and reputation in the market. The increased goodwill of the company will definitely win customer's loyalty and the increased sales as well. Some of the first companies to benefit from gong green include Wal-Mart's Eco-store and McDonald's McRecycle. By doing so, these companies will eventually cut costs and gain a competitive edge compared to companies taking no actions (Kassaye, 2001).

**International Pressure** Several international agreements require nations to adhere to specified environmental standards. For example, under the Montreal Protocol, nations are committed to protecting the ozone layer by controlling the release of chlorofluorocarbons and halons. The Kyoto Protocol requires developed nations to reduce emission of greenhouse gas and outlines an agenda with regard to climate change. Similarly, the Basel convention provides guidelines regarding the generation, transportation and disposal of hazardous waste across nations.

**Increased Consumer Awareness** Consumer awareness towards green products have increased their demand and in turn motivated the companies and businesses to incorporate green alternatives to products and services. Statistical analyses of consumer behaviors have shown that customers are willing to pay a higher premium for a greener product (Czamowski, 2009). Recent polls report that 87% of U.S. adults are concerned about the condition of the natural environment (Phillips, 1999), 80% believe that protecting the environment will require major changes in current life-styles (Ottman, 1996) and 75% consider themselves to be environmentalists (Osterhus 1997). A 2009 Landor survey of the world's greenest brands in six nations has revealed some interesting facts. As per the report, consumers all over the world believed that it was important for companies to be green and despite economic concerns consumers said that they would spend more on green products. Consumers relied on a variety of sources to make their green purchase decisions. Hence consumer pressure is one of the most important factors which contribute in enhancing the green marketing in practice.

**Green a response to Competitor Initiative** As the market grows, more companies will attempt to dip into this green market segment to become the pioneer and dominant supplier (Hartmann, Ibanez, 2006). In the words of Polonsky (1994), at times firms may be forced to become more environmentally responsible because their competitors are taking major initiatives in that direction and using the fact as a marketing platform. For example, one Tuna manufacture stopped using driftnets the others followed suit. In the same manner Amway claims that its products are environmentally friendly. In the context of electricity industry in the U.S.A., Rader (1997) emphasized that it is not possible to have an effective green market unless and until there was a truly competitive market. For example, Xerox's "Revive 100% Recycled paper" was introduced in an attempt to address the introduction of recycled photocopier paper by other manufacturers.

**Green a commitment to Society** The Companies Act 2013, has made it obligatory for the companies to contribute a specified percentage of their profits towards Corporate Social Responsibility. The environmental responsibility is a part of every organizations commitment to society. Polonsky (1994) points out the instances of companies such as Walt Disney World, which have instituted environmentally responsible behavior in their processes and systems, but do not promote the fact externally. In the same manner Coca Cola have invested large sum of money in various recycling activities, as well as having modified their packaging to minimize its environmental impact and has not used this concern as a marketing tool. This proves that now firms started viewing greening as a part of their moral obligation toward the society.

**Green a Weapon to reduce Cost** While considering the short term, going green might mean higher costs but in the long term the benefits heavily outweighs the initial costs of going green. In order to reduce the high cost incurred in disposal of waste and by-products, such as poly chlorinated biphenyl (PCB) contaminated oil, businesses are forced to re-examine their inputs and production processes. In this direction they have started to use green or environmentally friendly raw materials or green technology, as a weapon to reduce cost to the company. Now firms also develop more effective production processes to reduce waste as well as the need for some materials. The search for cost reduction may lead companies to develop ways of recycling their waste or by products either for their own use or to be sold to other industries. Maruti Limited saved Rs. 26 crores in the first year after obtaining an ISO 14001 certification. At Jubliant Organosys Distillery at Gajraula, the treated wastewater is piped to farmers and CO<sub>2</sub> is sold to Cola majors.

### **GREEN MARKETING STRATEGIES**

There are many strategies through which we can achieve the objective of sustainable development through green marketing

**Recycling** An important way to go green and to be environmentally safe is Recycling. To help keep the environment clean, corporations could start from implementing green strategy in the office. Small changes in recycling habits for small or big companies can make a big difference in keeping the environment safe.

**Market positioning on consumer health and safety** Nowadays people have become more health conscious and prefer to consume only those products which are good for health and safe to use. "In India, around 25% of the consumers prefer environmental-friendly products, and around 28% may be considered health conscious. A study conducted by Alliance for Environmental Innovation and household product- maker S.C.Johnson found

that consumers are most likely to act on green messages that strongly connect to their personal environments. Specifically findings suggest that the majority of consumers prefer such environmental household product benefits as “safe to use around children”, “no toxic ingredients”, “no chemical residues”, and “no strong fumes” over such benefits as “packaging can be recycled”, “not tested on animals”. It can be said a good strategy to market the green product is to market position on the basis of consumer safety and health as these have been proved to be the key motivators driving the green building movement.

**Avoiding Green Marketing Myopia** In 1960, Harvard business Professor Theodore Levitt introduced the concept of “marketing myopia” in a now famous and influential article in the Harvard Business Review. Green marketing is expected to satisfy two objectives i.e. improvement environmental quality and customer satisfaction. Green marketing myopia is misjudging either or overemphasizing the former at the expense of the later. There are many examples like Whirlpool (in 1994) launched the “Energy Wise” refrigerator, the first chlorofluorocarbons (CFC) free cooler and one that was 30% more efficient than the U.S. Department of Energy’s highest standard<sup>13</sup>. But unfortunately the sale of “Energy Wise” languished due to its high price premium i.e. from \$100 to \$150 and also because of not offering additional features or new styles that consumers desired. Hence the best strategy for enhancing green marketing is to avoid green marketing myopia and manufacturing products by taking into account both the environment friendliness and consumer satisfaction also.

**Raise Consumer awareness through proper education** Majority of the people are not aware of green products and their uses. They lack a basic awareness of labels like ‘carbon neutral’, ‘carbon zero’, and ‘carbon negative’, ‘Green tariff’ and ‘100% recycled’. In one of the surveys conducted on green consumers the environmental Non-Government Organizations (ENGOS) were considered as providing credible information about environmental issues. For spreading the knowledge about green products various seminars and workshops should be organized. Various engaging and educational Internet sites about environmental products with the desired consumer value must be created as for example Tide Cold Water’s Interactive Website allows visitors to calculate their likely annual money savings based on their laundry habits, utility source (gas or electricity), and zip code location.

**“Green Washing” should be restricted** Information provision about greenness is a key component of green marketing. Clearly, firms should not advertise products’ environmental benefits unless such claims can be credibly substantiated. As the misleading communication and exaggerated product claims are more likely to deter consumers from buying a company’s products and open a business up to scrutiny. The key to successful green marketing strategy is clear communication and transparency, which can help to increase consumer loyalty and create a ‘feel good’ culture with companies.

**Organize Sustainability Audit** In order to ensure that the claims made by the companies are up to the standard of greenness a sustainability audit of each and every company must be conducted in relation to all the raw materials, water and energy usage, waste disposal and social partnerships. Social Responsibility Accounting is a good practice the business firms are adopting in practice these days.

**Compulsory Eco-Certifications** Expert third parties with respected standards for environmental testing (such as independent laboratories, government agencies, private consultants, or nonprofit advocacy organizations) can provide green product endorsements and/or “seals of approval” to help clarify and bolster the believability of product claims. The “Energy Star” label, is a common certification of electronic products consuming upto 30 percent less energy than comparable alternatives. Green Seal and Scientific Certification Systems emblems certify a broad spectrum of green products. In order to assure a product to be ‘green’ these eco-certification systems should be made compulsory in order to stop the companies from giving misleading information.

**Standardized minimum norms for ‘Green’** To have a social conscience as to what create green some minimum acceptable standard should be laid down so that there remains to be no confusion. Green management measures such as certified environmental management systems(EMS) or tools like life cycle assessment activities are considered to improve corporate environmental performance directly by mandating companies to introduce environmental goals and management structures as well as programs to achieve them (Coglianese and Nash, 2001; Johnstone, 2001)

## **REMARKABLE ACHIEVEMENTS OF GREEN BUSINESS & INDIA’S INITIATIVES FOR GREEN MARKETING**

Green Business in practice has shown remarkable achievements. Most of the ‘green’ companies such as the Body Shop, Patagonia, Aveda, Malden Mills, Johnson and Johnson and other, have shown that the principles of sustainable development and environmental protection can be good for public relations, employee morale and

sales. The “National Green Pages” published by Co-op America currently lists more than 2000 green companies. Organic food marketing has grown from a few funky local co-op to a \$7bn marketing segment. Natural care, health and beauty products reached \$2.8bn in sales in 1990 out of a \$33bn industry. Pollution-prevention programs at 3M, have saved \$875mn over the past 25 years. Du Pont has cut its emissions of airborne cancer causing chemicals almost 75% since 1987.

Toyota’s Prius is the first major consumer product that fits nearly all of the criteria for success in the green-consumer market place<sup>19</sup>. Prius registered a great success with a sale of 7, 57,600 cars by June 2007.

Apple, HP, Microsoft, IBM, Intel, Sony and Dell are the companies that have succeeded in their GM strategies. HCL has a comprehensive policy designed to drive its environment management program ensuring sustainable development. HCL is duty bound to manufacture environmentally responsible products and comply with environment management processes right from the time products are sourced, manufactured, bought by customers, recovered at their end- of- life and recycled.

Potato starch trays made by Dutch Paper Foam protect the iPhone launched by Apple Computers which equals 90% reduction in the carbon footprint compared to the plastic tray used in the past.

Indian Oil also aims at developing techno-economically viable and environment-friendly products and services for the benefit of the millions of its consumers, while at the same time ensuring the highest standards of safety and environment protection in its operation.

**Eco-mark Scheme** introduced by the Government of India in 1981 was a major step towards the promotion of green marketing in the country. Eco-labels provide information regarding the environmental performance of products. The basic objective of eco-labeling is to provide authentication to genuine claims regarding the environmental impact of products and processes by manufacturers. The eco-labeling schemes in several countries worldwide are given in the table

**Table-1: Eco-labeling Schemes in Various countries**

COUNTRY	SCHEME	COUNTRY	SCHEME
Austria	The Austrian Eco-Label	Netherland	Stiching Mileukeur (Ecolabel)
Canada	Environmental Choice	New Zealand	Environmental Choice
China	Green Mark	Singapore	Green Label
France	NF Environmental label Retour Brand	Sweden	Nordic Swan, Sito Eco-Declaration, Falcon/Good Environmental Choice, Environmentally – Friendly Office Programme (TCO’95)
Japan	Eco Mark	Switzerland	Swiss Energy 2000
Germany	Blue Angel TUV Rhineland	Taiwan	Green Mark
India	Ecomark	Thailand	Green Label
European Union	Eco-label	USA	Energy Seal, Green Star, Green Cross
Korea	Ecomark		

Source: Childs and Whiting 1998

The Eco-mark Scheme of India has the following stated objectives:

- To provide incentives to manufacturers and importers to reduce adverse environmental impact of products.
- To reward genuine initiatives by companies to reduce adverse environmental impact of products.
- To assist consumers to become environmentally responsible in their daily lives by providing them information to take account of environmental factors in their daily lives.
- To encourage citizens to purchase products which have less environmental impact
- Ultimately to improve the quality of the environment and to encourage the sustainable management of resources.

**RENEWABLE ENERGY**

Setting up Indian Renewable Energy Development Agency Limited (IREDA) in 1987 is one of the attempts of the Indian Government to reduce dependence on fossil fuels. IREDA facilitates with monetary and technical support to industries for pursuing projects related to solar, bio and hydro and wind energy.

At the customer end, only solar energy has found applications for retailing Green products. TATA BP Solar, a leading private enterprise to venture in this area, markets many solar products targeted at households under different brands. Vajra, for example, is its domestic water heating system. Similarly, Jugnu and TATADEEP are its brands for home lighting kits and lanterns respectively.

### **HOSPITALITY**

ECOTEL is a global certification for eco-friendly hotels. Most of the hotels in India are now becoming ECOTEL certified. Some of them are ORCHID Hotel (a 5 star hotel in Mumbai), Hotel Rodas (a 3-star hotel in Mumbai), Rain Tree (a 5-star Hotel in Chennai).

### **BUILDINGS**

In India, the Green Building Movement, spearheaded by the Confederation of Indian Industry (CII) - Godrej Green Business Centers, has gained tremendous impetus over the last few years. From 20000 sq ft in 2003, India's green building footprints now over 25 million sq ft.

The rating system - GRIHA - has been adapted by the government of India as the National rating system for rating green buildings. As much as 22,50,000 sq m of built up space (including schools, colleges, hospitals, offices, embassy, commonwealth games village, residences, IT parks, Metro station, integrated communities Goverdhan Eco Village) is registered under GRIHA and the number is increasing by the day. GRIHA has been mandated for all upcoming buildings of the Central Public Works Department. Minimum 3-star rating is in the process of getting mandated for all upcoming central government and public sector buildings.

### **CONCLUSION**

The ever increasing pollution and the harmful effects of the chemicals on the environment have raised the attention towards saving and protecting the environment from the detrimental effects of these pollutants. Green and sustainable marketing is a step towards resolving this issue. Sustainable marketing can be achieved through recycling, Market positioning on consumer health and safety, Standardized minimum norms for 'Green' Compulsory Eco-Certifications. Indian government has taken various initiatives like Eco-mark scheme introduced by the Government of India in 1981, Setting up Indian Renewable Energy Development Agency Limited (IREDA) in 1987 is one of the attempts of the Indian Government to reduce dependence on fossil fuels, the Green Building Movement, spearheaded by the Confederation of Indian Industry (CII) to promote green and sustainable marketing and also achieved success in this direction.

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**TESTING OF EFFICIENT MARKET HYPOTHESIS: A STUDY ON STOCK MARKET REACTION TO DIVIDEND ANNOUNCEMENTS**

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**ABSTRACT**

*This study examines the efficient market hypothesis by adopting Event Methodology to test weak form of efficient market hypothesis. Efficient market hypothesis theory holds that the stock markets are efficient and prices fully reflect all the available information. EMH implies that it is not possible for anyone to earn abnormal return by trading in the stock market and no investor could be able to outperform the market. Daily stock prices of 29 out of 30 companies of BSE sensex were collected to test Efficient Market Hypothesis (EMH). The data for one company was not available, hence not included in the study. The paper examines the stock price response to dividend announcements. The analysis includes the testing of individual company-wise Abnormal Returns (ARs), Average Abnormal Returns (AARs) and Cumulative Average Abnormal Returns (CAARs). The results show that there is no possibility to earn abnormal returns because of dividend announcements as there is no significant abnormal return near the event date.*

*Keywords: Efficient Market Hypothesis (EMH); Bombay Stock Exchange (BSE); Dividend Announcement; Stock Market Reaction; AR; AAR; CAAR; Event Study; T-test.*

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**INTRODUCTION**

There are various macroeconomic and microeconomic events which may impact the share prices of any company. Dividend announcement is one of the major events which are supposed to impact the prices of equity share. The Efficient Market Hypothesis (EMH) hold that the security markets are efficient and absorb every available information within no time hence, no one can outperform to earn abnormal returns because of any event and past pattern.

In India there are various stock markets but BSE is one of the major stock exchanges. The stock prices are assumed to be random walk as no one can predict the next movement. In case of efficient market, the future prices of the stock can-not be predicted with the help of technical analysis because every information of such analysis has been absorbed in the current market prices. When the stock prices follow random walk, it means the changes in the prices are independent from the past movements. Technical analysis is used to “identify the presence of weak-form of EMH” (Reilly and Brown, 2012). The semi strong-form of EMH encompasses the weak form hypothesis as historical information of market such as past stock prices and trading volume is public. FAMA (1991) coined a new term for the semi strong model—the event study. He uses event studies instead of semi strong-form to test “adjustment of prices to public announcements” (Nadig, 2014). In case of inefficient markets, some stocks may outperform and attract investors with positive sentiments while some stocks may underperform and create panic among the investors. The focus of the study is to test the efficiency of Bombay Stock Exchange with the help of EMH. In the present study, an attempt is made to test the efficient market hypothesis by considering closing prices of 29 companies listed in BSE Sensex over a period of time.

**LITERATURE REVIEW**

Sharma and Kennedy (1977) conducted research to study random walk model by applying run test and spectral analysis on data of three stock exchanges London, New York and Bombay stock exchange. The test data covered 132 monthly observations for each index for 11 year period. (1963-1973). Results reveal that all three stock exchanges have random walk movement.

Pinches et. al (1980) studied events like accounting changes, stock splits on the risk adjusted return of securities and concludes with their methodology that it directly affects the result of market efficiency.

Sanger and McConnell (1986) in their event study of over the counter stocks listed on the NYE and found that market is insensitive to variations in empirical methodology.

Jegadeesh and Titman (1993) studied the holding period return pattern based on past and found that the stocks performed well in past generates positive returns over the 3 to 12 months holding period.

Dow and Gorton (1997) studied the difference or connection between economic efficiency and stock market efficiency and found that stock price efficiency is not sufficient for economic efficiency.

Pandey (2003) analyzed three popular stock indices and tested the efficiency level in Indian stock market and the random walk nature of the stock market by using the run test and the autocorrelation function ACF for the

period from January 1996 to June 2002 and concluded that the series of stock indices in the India stock market are biased random time series.

Pradhan et al. (2009) tried to examine efficient market hypothesis in the context of global financial crisis with concern to Indian stock market by employing the unit root test on the sample of daily stock returns of National stock Exchange (NSE) and Bombay Stock Exchange (BSE). The sample period lies between January 2007 to July 2009. Results reveal that Indian stock market is not weak form efficient.

Dasilas and Stergios (2011) investigated the market reaction to cash dividend announcements for the period 2000-2004 employing data from Athens stock exchange (ASE). This paper examines both the stock price and trading volume response to dividend distribution announcements. Results indicate that there is a statistically significant market reaction on the dividend announcement day.

Gupta and Gedam (2014) tested the weak form of efficient market hypothesis using Runs test on stock price of selected companies has been taken from National stock exchange (NSE ) Companies over the period of 1<sup>st</sup> January 2014 to 31<sup>st</sup> march 2014. Four companies are selected each from Automobile Industry and IT industry and found that except Tech Mahindra, the stock prices are independent of the past prices therefore they favor random walk theory.

### **OBJECTIVES OF THE STUDY**

1. The Prime objective is to study the stock market reaction to the dividend announcements on the share prices of selected companies in the event window to find out whether the Semi-Strong form of market efficiency holds true or not.
2. To study the presence of abnormal returns during the days surrounding the announcement date.

### **RESEARCH METHODOLOGY**

The study considered 29 companies listed at BSE Sensex for the purpose of study because of the unavailability of data for one company. The closing prices of selected companies were collected from yahoo finance. One company named Sesa Sterlite Limited is now Vedanta limited and due to changes in name of company, required data of Sesa Sterlite was not available on yahoo finance and hence it was not included in this research. According to literatures and previous researches, it was observed that 200 prior and 20 after observations from event date are taken to see the impact of announcement of dividend. In the present study 190 observations prior event date and 10 observation after event date were collected to apply event methodology by using Microsoft Excel.

Reason for selecting these companies in study is that these companies represent all the listed companies in the BSE. To check efficiency, event methodology technique was applied. *T-test was also applied in MS-excel* to evaluate the reaction of market on dividend announcement event. Different Time periods were taken as dividend announcements dates were different for each company and accordingly closing prices were collected.

To test the semi strong market efficiency hypothesis, firstly expected returns are calculated using ordinary least square method and then abnormal returns are calculated by taking difference between the companies' actual return and expected returns. Average Abnormal return is computed by summing of all abnormal returns. This study is divided into three sections. First section analyses that whether the dividend announcements yields any significant Abnormal Returns in case of an individual company. Second section comprises of analyses that whether the dividend announcements yields any significant Average Abnormal Return and last part i.e. third part comprises of whether the dividend announcements yields any significant Cumulative Average Abnormal Returns.

### **RESEARCH PLAN**

There are two hypotheses that have been consider examining the randomness of the prices in weak form efficiency, these two hypotheses are:

#### **1. Null Hypothesis**

H<sub>0</sub>: BSE Sensex holds Semi Strong form of efficiency. It means that investors cannot make abnormal returns based on the Dividend announcement event.

To test above hypothesis, following sub-hypothesis are formulated:

H<sub>0a</sub>: The AR (Abnormal Return) of the sample firms are not different from Zero in the event Window.

H<sub>0b</sub>: The AAR (Average Abnormal Return) of the samples firms are not different from Zero in the event Window.

$H_{0c}$ : The CAAR (Cumulative Average Abnormal Return) of the sample firms are not different from Zero in the event Window.

## 2. Alternative Hypothesis

$H_1$ : Semi Strong form of efficiency doesnot exists in the BSE Sensex which means that investors can make abnormal returns based on the Dividend announcement event.

This study examines the efficient market hypothesis, by employing Event methodology technique by using *T-test* tool in Microsoft Excel software. Through Event Methodology *T-test* is used, it is a parametric test. *T-test* in Event methodology data is used to see the event date impact on market share price and also when sample size is small i.e, less than 30 *T-test* is applied. In this paper it is taken to judge the reaction of selected closing prices of Bombay Stock Exchange to the dividend declaration.

Daily return of both individual company and S&P BSE Sensex are calculated on basis of event date.

After calculating return of each company and market return according to respective date, Intercept ( $\alpha$ ), Slope ( $\beta$ ), R-square and Standard Error were also calculated. Explanation of each terminology:

$\alpha$  - Intercept parameter

$\beta$  – Slope parameter in the relation between dependent variable and independent variable.

**R-square** – The variance explained by independent variable to dependent variable.

These all above terminologies are calculated to help in calculation of Event window. Below formulas are mentioned for calculating

### CALCULATION OF EVENT WINDOW

**Expected return  $E(r)$**  or Normal Returns were calculated using the market model. For any Security  $i$ , the market model is calculated as

$$E[R_{it}] = \alpha_i + \beta_i R_{mt} + \varepsilon_{it}$$

Where,  $E[R_{it}]$  = It is the Expected Return on Security  $i$  on day  $t$ ,

$\alpha$  = Intercept,

$\beta$  = slope

$R_{mt}$  = It is the return on market index on the day  $t$ ,

$\varepsilon_{it}$  = It is the zero mean disturbance term.

To determine the market model parameters, Ordinary Least Square method has been used on the estimation window of 180 days prior to the Event Window.

- **Abnormal Returns (AR)** were calculated by using formula

$$AR = \text{Actual Return} - \text{Expected Return or } R_{it} - E[R_{it}] \text{ or } R_{it} - E[R_{it}]$$

Where,  $R_{it}$ , is the Actual return for the security  $i$  during the time  $t$ ,

$E[R_{it}]$ , Expected return is calculated using market model.

- **Cumulative Abnormal Return** is calculated by

CAR, is the sum of all **abnormal returns**.

- **T-test value** is calculated by using below mentioned formula

$$T\text{-test} = \text{Abnormal Return} / \text{Standard Error}$$

- **Average Abnormal Return(AAR)** is the average of abnormal returns of individual securities for each day before and after the event day in the event window and the AAR is obtained using formulae;

$$AAR_t = t/N \text{ where } t = -10 \text{ to } +10$$

- **Cumulative Average Abnormal Returns** is calculated by

CAAR is the sum of all average abnormal returns.

- **P-value** is calculated by using function

$P\text{-value} = \text{TDIST}(T\text{-test value, df,2})$

$P\text{-value}$  signifies if market is efficient or not at gives level of significance for this there are three types of signs are used in above analysis such as cross symbol (red color), right symbol (Green color) and exclamation mark symbol (orange color).

1. Cross symbol (Red color symbol) signifies that market is efficient and abnormal return cannot be earned.
2. Right symbol (Green color symbol) signifies that at 5% level of significance market is inefficient and abnormal return is earned.
3. Exclamation symbol (Orange color symbol) signifies that at 10% level of significance market is inefficient and abnormal return can be earned.

So Exclamation symbol (Orange color symbol) and right symbol (green color symbol) shows that market is not efficient and due to event (dividend announcement) market participant can earn abnormal profit therefore null hypothesis is rejected and cross symbol (Red color symbol) shows that market is efficient at which market participants can-not earn abnormal profit therefore null hypothesis is accepted.

**DATA ANALYSIS & INTERPRETATION**

**Table-1: Company-Wise Analysis of Abnormal Returns**

Event days	ITC			Reliance			HDFC Bank			INFOSYS		
	AR	t-test	p-value	AR	t-test	p-value	AR	t-test	p-value	AR	t-test	p-value
-10	0.020	2.111	0.036	0.008	0.751	0.454	0.004	0.565	0.573	0.017	1.338	0.183
-9	-0.008	-0.841	0.402	-0.006	-0.560	0.576	-0.013	-1.789	0.075	-0.017	-1.365	0.174
-8	-0.019	-2.032	0.044	0.003	0.284	0.777	-0.003	-0.473	0.637	-0.021	-1.676	0.095
-7	0.010	1.043	0.298	-0.006	-0.518	0.605	0.001	0.154	0.878	0.031	2.420	0.016
-6	0.002	0.203	0.839	0.001	0.056	0.956	-0.002	-0.234	0.816	-0.013	-1.057	0.292
-5	-0.002	-0.210	0.834	-0.014	-1.306	0.193	0.002	0.347	0.729	0.005	0.361	0.718
-4	-0.006	-0.674	0.501	0.006	0.517	0.606	0.002	0.283	0.777	-0.032	-2.542	0.012
-3	0.009	0.914	0.362	0.030	2.718	0.007	-0.004	-0.620	0.536	-0.028	-2.236	0.027
-2	0.002	0.211	0.833	0.004	0.368	0.713	0.000	-0.015	0.988	-0.006	-0.459	0.647
-1	-0.009	-0.893	0.373	-0.003	-0.268	0.789	0.010	1.348	0.179	0.026	2.021	0.045
0	0.018	1.924	0.056	0.011	0.953	0.342	-0.016	-2.209	0.028	-0.010	-0.763	0.446
1	-0.019	-1.982	0.049	-0.039	-3.547	0.000	-0.003	-0.379	0.705	0.015	1.179	0.240
2	0.018	1.898	0.059	0.009	0.811	0.419	-0.008	-1.083	0.280	-0.027	-2.144	0.033
3	0.005	0.559	0.577	-0.009	-0.820	0.413	0.002	0.223	0.824	-0.006	-0.452	0.652
4	-0.012	-1.251	0.212	-0.004	-0.331	0.741	-0.010	-1.422	0.157	-0.028	-2.247	0.026
5	-0.012	-1.272	0.205	0.008	0.755	0.451	0.007	0.928	0.355	-0.016	-1.278	0.203
6	-0.001	-0.152	0.879	-0.005	-0.481	0.631	0.012	1.745	0.083	0.012	0.987	0.325
7	0.003	0.353	0.725	0.004	0.343	0.732	0.000	-0.040	0.968	-0.022	-1.716	0.088
8	0.007	0.739	0.461	0.007	0.647	0.518	0.014	1.975	0.050	0.004	0.345	0.731
9	-0.001	-0.109	0.913	-0.002	-0.196	0.845	-0.011	-1.563	0.120	0.025	1.987	0.048
10	-0.005	-0.480	0.632	-0.005	-0.461	0.646	-0.007	-1.037	0.301	0.030	2.377	0.018

Event days	TSC			SUN PHARMA			DR. REDDY			BAJAJ		
	AR	t-test	p-value	AR	t-test	p-value	AR	t-test	p-value	AR	t-test	p-value
-10	-0.034	-2.183	0.030	-0.060	-3.293	0.001	0.002	0.133	0.895	-0.022	-2.190	0.030
-9	0.021	1.363	0.175	0.005	0.256	0.798	-0.005	-0.271	0.787	0.001	0.061	0.951
-8	0.000	0.031	0.975	-0.011	-0.614	0.540	-0.035	-1.960	0.051	-0.009	-0.872	0.384
-7	0.013	0.805	0.422	0.013	0.723	0.470	-0.004	-0.246	0.806	-0.009	-0.890	0.375
-6	0.000	0.002	0.998	0.026	1.396	0.164	0.013	0.727	0.468	-0.014	-1.388	0.167
-5	0.006	0.398	0.691	-0.022	-1.224	0.222	-0.002	-0.128	0.898	-0.012	-1.236	0.218
-4	-0.011	-0.730	0.466	-0.038	-2.074	0.039	-0.002	-0.127	0.899	0.006	0.605	0.546
-3	0.009	0.604	0.546	0.020	1.098	0.273	0.000	-0.021	0.983	-0.002	-0.184	0.854
-2	0.005	0.309	0.758	0.008	0.449	0.654	0.007	0.405	0.686	-0.002	-0.210	0.834
-1	0.023	1.478	0.141	0.013	0.688	0.493	-0.037	-2.060	0.041	0.011	1.117	0.265
0	0.003	0.211	0.833	0.002	0.112	0.911	0.061	3.454	0.001	-0.006	-0.565	0.573
1	-0.009	-0.603	0.547	0.062	3.376	0.001	-0.022	-1.262	0.209	-0.014	-1.371	0.172
2	-0.018	-1.159	0.248	0.005	0.280	0.780	0.004	0.235	0.814	0.032	3.215	0.002
3	-0.015	-0.963	0.337	-0.005	-0.300	0.764	-0.006	-0.335	0.738	-0.003	-0.316	0.752
4	-0.001	-0.060	0.953	-0.042	-2.319	0.021	0.005	0.288	0.774	-0.024	-2.360	0.019
5	-0.055	-3.499	0.001	0.009	0.513	0.608	0.002	0.125	0.901	0.001	0.076	0.940
6	0.003	0.209	0.835	-0.002	-0.091	0.927	-0.008	-0.474	0.636	0.004	0.433	0.665
7	0.023	1.445	0.150	-0.006	-0.331	0.741	-0.017	-0.938	0.349	0.008	0.766	0.445
8	0.005	0.295	0.769	0.024	1.288	0.199	0.001	0.032	0.974	-0.010	-0.959	0.339
9	0.009	0.543	0.588	-0.009	-0.489	0.625	0.034	1.933	0.055	-0.016	-1.615	0.108
10	-0.860	-54.840	0.000	0.079	4.344	0.000	-0.015	-0.856	0.393	0.053	5.297	0.000

Event days	ICIC			HDFC COR			L&T			ONGC		
	AR	t-test	p-value	AR	t-test	p-value	AR	t-test	p-value	AR	t-test	p-value
-10	-0.024	-1.557	⊗0.121	0.012	1.215	⊗0.226	-0.006	-0.568	⊗0.571	-0.006	-0.440	⊗0.660
-9	-0.009	-0.609	⊗0.543	0.007	0.703	⊗0.483	-0.003	-0.282	⊗0.778	0.014	1.097	⊗0.274
-8	0.010	0.640	⊗0.523	-0.005	-0.525	⊗0.600	-0.003	-0.288	⊗0.774	-0.013	-0.990	⊗0.324
-7	-0.013	-0.841	⊗0.401	-0.010	-0.942	⊗0.348	0.008	0.770	⊗0.442	0.008	0.627	⊗0.532
-6	-0.009	-0.601	⊗0.549	-0.018	-1.716	⊗0.088	-0.025	-2.447	⊙0.015	-0.008	-0.638	⊗0.524
-5	0.022	1.447	⊗0.150	-0.002	-0.164	⊗0.870	0.007	0.641	⊗0.522	-0.042	-3.176	⊙0.002
-4	-0.020	-1.314	⊗0.191	0.007	0.662	⊗0.509	0.003	0.283	⊗0.778	-0.054	-4.154	⊙0.000
-3	-0.026	-1.699	⊗0.091	0.001	0.108	⊗0.914	0.016	1.589	⊗0.114	0.038	2.910	⊙0.004
-2	0.021	1.351	⊗0.178	-0.003	-0.308	⊗0.759	-0.003	-0.332	⊗0.740	-0.003	-0.219	⊗0.827
-1	0.013	0.839	⊗0.402	-0.007	-0.679	⊗0.498	-0.006	-0.582	⊗0.562	0.002	0.149	⊗0.882
0	0.011	0.690	⊗0.491	0.008	0.810	⊗0.419	0.016	1.525	⊗0.129	-0.008	-0.611	⊗0.542
1	0.067	4.339	⊙0.000	0.013	1.253	⊗0.212	0.009	0.903	⊗0.368	0.009	0.675	⊗0.500
2	-0.011	-0.698	⊗0.486	0.008	0.818	⊗0.414	-0.010	-0.924	⊗0.357	-0.023	-1.780	⊗0.077
3	0.004	0.235	⊗0.814	0.000	-0.025	⊗0.980	-0.014	-1.314	⊗0.190	-0.005	-0.391	⊗0.696
4	0.001	0.092	⊗0.927	-0.008	-0.782	⊗0.435	0.006	0.563	⊗0.574	0.002	0.123	⊗0.902
5	-0.004	-0.251	⊗0.802	-0.005	-0.517	⊗0.606	-0.001	-0.053	⊗0.958	-0.012	-0.904	⊗0.367
6	-0.005	-0.326	⊗0.745	-0.008	-0.759	⊗0.449	-0.016	-1.530	⊗0.128	0.006	0.490	⊗0.625
7	-0.026	-1.679	⊗0.095	0.002	0.170	⊗0.865	0.001	0.127	⊗0.899	0.005	0.354	⊗0.723
8	0.004	0.289	⊗0.773	0.004	0.422	⊗0.673	-0.007	-0.688	⊗0.492	-0.003	-0.218	⊗0.828
9	-0.019	-1.212	⊗0.227	0.004	0.354	⊗0.724	-0.007	-0.719	⊗0.473	-0.016	-1.259	⊗0.210
10	0.022	1.452	⊗0.148	0.000	0.012	⊗0.990	-0.002	-0.238	⊗0.812	-0.009	-0.724	⊗0.470

Event days	COAL			NTPC			CIPLA			WIPRO		
	AR	t-test	p-value	AR	t-test	p-value	AR	t-test	p-value	AR	t-test	p-value
-10	0.019	1.277	⊗0.203	-0.003	-0.250	⊗0.803	-0.001	-0.036	⊗0.971	0.015	1.160	⊗0.247
-9	0.016	1.044	⊗0.298	-0.009	-0.883	⊗0.378	-0.005	-0.342	⊗0.733	0.000	0.038	⊗0.970
-8	-0.025	-1.689	⊗0.093	-0.015	-1.394	⊗0.165	-0.021	-1.384	⊗0.168	-0.002	-0.165	⊗0.869
-7	-0.011	-0.707	⊗0.480	0.007	0.682	⊗0.496	-0.011	-0.699	⊗0.485	-0.038	-2.988	⊙0.003
-6	-0.019	-1.272	⊗0.205	-0.010	-0.956	⊗0.340	0.005	0.354	⊗0.723	-0.002	-0.152	⊗0.879
-5	0.016	1.088	⊗0.278	-0.018	-1.752	⊗0.081	-0.003	-0.216	⊗0.829	0.035	2.759	⊙0.006
-4	0.014	0.941	⊗0.348	-0.004	-0.385	⊗0.701	-0.022	-1.459	⊗0.146	0.000	0.018	⊗0.986
-3	0.014	0.958	⊗0.339	-0.026	-2.519	⊙0.013	-0.006	-0.392	⊗0.696	0.025	1.999	⊙0.047
-2	-0.010	-0.642	⊗0.522	0.002	0.181	⊗0.857	-0.027	-1.773	⊗0.078	0.000	0.018	⊗0.985
-1	0.009	0.583	⊗0.561	0.002	0.192	⊗0.848	-0.021	-1.347	⊗0.180	0.006	0.446	⊗0.656
0	0.017	1.111	⊗0.268	-0.003	-0.288	⊗0.774	0.008	0.512	⊗0.609	-0.005	-0.366	⊗0.715
1	0.004	0.248	⊗0.804	-0.003	-0.319	⊗0.750	0.024	1.557	⊗0.121	-0.038	-2.974	⊙0.003
2	-0.002	-0.125	⊗0.900	0.017	1.641	⊗0.102	-0.009	-0.614	⊗0.540	0.015	1.220	⊗0.224
3	-0.002	-0.115	⊗0.909	0.006	0.556	⊗0.579	0.000	0.021	⊗0.983	0.003	0.241	⊗0.810
4	0.011	0.740	⊗0.460	-0.024	-2.284	⊙0.024	0.002	0.146	⊗0.884	-0.001	-0.060	⊗0.952
5	-0.008	-0.536	⊗0.593	-0.003	-0.244	⊗0.808	-0.012	-0.797	⊗0.426	-0.001	-0.078	⊗0.938
6	-0.006	-0.429	⊗0.668	-0.012	-1.164	⊗0.246	-0.009	-0.593	⊗0.554	-0.001	-0.070	⊗0.944
7	0.009	0.598	⊗0.551	-0.019	-1.808	⊗0.072	-0.012	-0.788	⊗0.432	0.004	0.351	⊗0.726
8	-0.002	-0.126	⊗0.900	-0.005	-0.479	⊗0.633	0.000	0.021	⊗0.984	-0.004	-0.328	⊗0.743
9	-0.005	-0.362	⊗0.718	-0.008	-0.746	⊗0.457	-0.001	-0.071	⊗0.943	-0.003	-0.253	⊗0.800
10	-0.003	-0.218	⊗0.828	-0.018	-1.729	⊗0.085	0.042	2.716	⊙0.007	0.005	0.369	⊗0.712

Event days	TCS			TMS			SBI			HUL		
	AR	t-test	p-value	AR	t-test	p-value	AR	t-test	p-value	AR	t-test	p-value
-10	-0.021	-1.441	⊗0.151	-0.032	-1.502	⊗0.135	-0.011	-0.629	⊗0.530	-0.001	-0.095	⊗0.925
-9	0.019	1.296	⊗0.196	0.014	0.649	⊗0.517	0.008	0.451	⊗0.653	0.012	1.161	⊗0.247
-8	-0.006	-0.381	⊗0.703	-0.001	-0.056	⊗0.956	-0.008	-0.471	⊗0.638	-0.005	-0.490	⊗0.625
-7	0.032	2.159	⊙0.032	0.026	1.233	⊗0.219	-0.006	-0.372	⊗0.710	0.003	0.253	⊗0.800
-6	-0.042	-2.832	⊙0.005	0.004	0.199	⊗0.842	0.009	0.560	⊗0.576	0.019	1.872	⊗0.063
-5	-0.046	-3.118	⊙0.002	-0.001	-0.054	⊗0.957	-0.003	-0.198	⊗0.843	-0.014	-1.439	⊗0.152
-4	0.015	1.049	⊗0.295	0.012	0.558	⊗0.578	0.012	0.687	⊗0.493	-0.003	-0.268	⊗0.789
-3	-0.013	-0.887	⊗0.376	0.006	0.275	⊗0.784	0.021	1.224	⊗0.222	0.004	0.359	⊗0.720
-2	0.000	0.007	⊗0.995	-0.002	-0.099	⊗0.921	-0.001	-0.071	⊗0.943	-0.007	-0.656	⊗0.513
-1	-0.022	-1.522	⊗0.130	0.005	0.257	⊗0.797	-0.017	-0.992	⊗0.323	-0.001	-0.125	⊗0.901
0	-0.038	-2.563	⊙0.011	-0.013	-0.631	⊗0.529	0.016	0.968	⊗0.334	-0.005	-0.545	⊗0.586
1	-0.035	-2.377	⊙0.018	-0.029	-1.345	⊗0.180	-0.049	-2.899	⊙0.004	0.003	0.338	⊗0.736
2	0.012	0.802	⊗0.423	-0.004	-0.210	⊗0.834	-0.020	-1.190	⊗0.235	0.003	0.254	⊗0.800
3	0.005	0.362	⊗0.718	-0.017	-0.785	⊗0.434	-0.019	-1.126	⊗0.261	0.008	0.761	⊗0.447
4	-0.018	-1.241	⊗0.216	0.027	1.287	⊗0.200	0.025	1.457	⊗0.147	0.003	0.311	⊗0.756
5	-0.008	-0.513	⊗0.609	-0.022	-1.016	⊗0.311	0.003	0.162	⊗0.871	-0.003	-0.334	⊗0.738
6	-0.009	-0.634	⊗0.527	0.019	0.880	⊗0.380	-0.015	-0.908	⊗0.365	0.000	-0.028	⊗0.978
7	-0.033	-2.217	⊙0.028	0.046	2.186	⊙0.030	0.014	0.813	⊗0.417	0.014	1.451	⊗0.148
8	0.003	0.187	⊗0.852	-0.017	-0.782	⊗0.435	-0.002	-0.147	⊗0.883	0.004	0.367	⊗0.714
9	-0.001	-0.041	⊗0.967	0.002	0.102	⊗0.919	-0.005	-0.277	⊗0.782	-0.004	-0.422	⊗0.673
10	-0.035	-2.398	⊙0.017	-0.012	-0.545	⊗0.587	-0.001	-0.065	⊗0.948	0.014	1.386	⊗0.167

Event days	BHEL			HERO MOTOT			MARUTI			TPS		
	AR	t-test	p-value	AR	t-test	p-value	AR	t-test	p-value	AR	t-test	p-value
-10	0.009	0.568	⊗0.570	-0.009	-0.865	⊗0.388	-0.010	-1.076	⊗0.283	-0.006	-0.408	⊗0.684
-9	0.022	1.358	⊗0.176	-0.006	-0.545	⊗0.586	0.006	0.673	⊗0.502	0.005	0.357	⊗0.721
-8	0.012	0.739	⊗0.461	-0.005	-0.503	⊗0.615	-0.011	-1.233	⊗0.219	-0.012	-0.836	⊗0.404
-7	-0.023	-1.454	⊗0.147	0.005	0.428	⊗0.669	-0.003	-0.305	⊗0.761	-0.012	-0.847	⊗0.398
-6	-0.007	-0.417	⊗0.678	-0.008	-0.734	⊗0.464	-0.009	-0.928	⊗0.355	-0.008	-0.583	⊗0.561
-5	0.013	0.830	⊗0.408	-0.003	-0.288	⊗0.774	-0.005	-0.515	⊗0.607	-0.007	-0.501	⊗0.617
-4	0.004	0.230	⊗0.819	0.002	0.217	⊗0.828	0.001	0.098	⊗0.922	0.011	0.819	⊗0.414
-3	-0.019	-1.179	⊗0.240	0.006	0.540	⊗0.590	-0.005	-0.511	⊗0.610	-0.005	-0.353	⊗0.725
-2	-0.007	-0.447	⊗0.655	-0.017	-1.565	⊗0.119	-0.012	-1.290	⊗0.199	0.012	0.842	⊗0.401
-1	0.046	2.881	⊙0.004	0.001	0.087	⊗0.931	-0.006	-0.622	⊗0.535	0.000	0.028	⊗0.977
0	0.064	4.014	⊙0.000	-0.019	-1.815	⊗0.071	-0.027	-2.946	⊙0.004	-0.014	-1.022	⊗0.308
1	-0.004	-0.279	⊗0.781	0.000	0.036	⊗0.971	-0.001	-0.112	⊗0.911	-0.010	-0.751	⊗0.454
2	-0.011	-0.657	⊗0.512	0.005	0.476	⊗0.635	-0.009	-0.992	⊗0.323	-0.004	-0.291	⊗0.771
3	-0.031	-1.946	⊗0.053	-0.008	-0.714	⊗0.476	0.002	0.183	⊗0.855	-0.008	-0.612	⊗0.542
4	-0.056	-3.483	⊙0.001	0.000	0.040	⊗0.968	-0.004	-0.463	⊗0.644	-0.010	-0.740	⊗0.460
5	-0.021	-1.305	⊗0.193	-0.002	-0.179	⊗0.858	-0.002	-0.189	⊗0.851	-0.014	-1.003	⊗0.317
6	0.007	0.453	⊗0.651	-0.002	-0.193	⊗0.847	0.003	0.300	⊗0.765	-0.016	-1.146	⊗0.253
7	0.015	0.952	⊗0.343	-0.014	-1.276	⊗0.204	-0.011	-1.157	⊗0.249	-0.013	-0.951	⊗0.343
8	0.015	0.957	⊗0.340	0.009	0.824	⊗0.411	0.001	0.067	⊗0.947	-0.001	-0.041	⊗0.967
9	0.002	0.118	⊗0.906	0.002	0.142	⊗0.887	-0.005	-0.577	⊗0.565	-0.003	-0.189	⊗0.850
10	0.003	0.215	⊗0.830	-0.018	-1.643	⊗0.102	-0.004	-0.431	⊗0.667	0.004	0.263	⊗0.793

Event days	M&M			AIRTEL			GAIL			JINDAL			HINDALCO		
	AR	t-test	p-value	AR	t-test	p-value	AR	t-test	p-value	AR	t-test	p-value	AR	t-test	p-value
-10	-0.003	-0.045	0.964	0.014	0.760	0.448	0.000	-0.010	0.992	-0.063	-2.796	0.006	-0.032	-1.770	0.078
-9	0.001	0.019	0.985	-0.008	-0.409	0.683	0.002	0.083	0.934	-0.002	-0.098	0.922	0.018	0.992	0.322
-8	-0.009	-0.123	0.902	-0.003	-0.152	0.879	0.000	-0.016	0.987	-0.014	-0.641	0.523	0.009	0.509	0.611
-7	-0.024	-0.341	0.733	0.002	0.124	0.902	0.005	0.251	0.802	-0.002	-0.107	0.915	0.014	0.746	0.457
-6	-0.014	-0.199	0.843	0.003	0.178	0.859	0.009	0.455	0.649	-0.036	-1.612	0.109	0.005	0.263	0.793
-5	0.004	0.059	0.953	-0.006	-0.330	0.742	0.016	0.825	0.411	0.009	0.399	0.691	-0.005	-0.298	0.766
-4	-0.005	-0.071	0.943	0.012	0.636	0.525	0.025	1.289	0.199	0.024	1.076	0.283	0.014	0.763	0.446
-3	0.019	0.260	0.795	0.005	0.284	0.777	0.028	1.454	0.148	0.000	0.014	0.989	-0.008	-0.461	0.646
-2	0.018	0.255	0.799	0.011	0.590	0.556	-0.018	-0.942	0.348	-0.022	-1.000	0.319	-0.003	-0.180	0.857
-1	-0.007	-0.091	0.928	0.100	5.375	0.000	-0.006	-0.315	0.753	-0.012	-0.540	0.590	0.007	0.357	0.722
0	0.018	0.246	0.806	-0.055	-2.965	0.003	0.008	0.390	0.697	0.006	0.284	0.777	-0.005	-0.292	0.771
1	0.028	0.396	0.693	0.021	1.141	0.255	0.007	0.350	0.727	0.006	0.283	0.778	-0.017	-0.929	0.354
2	0.036	0.502	0.617	-0.033	-1.795	0.074	-0.003	-0.149	0.882	-0.002	-0.070	0.944	0.010	0.538	0.591
3	-0.027	-0.375	0.708	0.002	0.108	0.914	-0.017	-0.875	0.383	-0.076	-3.391	0.001	-0.005	-0.277	0.782
4	0.010	0.135	0.893	-0.012	-0.625	0.533	-0.001	-0.073	0.942	0.009	0.385	0.701	0.027	1.455	0.147
5	-0.017	-0.238	0.812	0.006	0.300	0.765	-0.004	-0.209	0.835	-0.070	-3.113	0.002	-0.007	-0.392	0.695
6	0.017	0.239	0.811	0.019	1.030	0.304	-0.036	-1.856	0.065	0.017	0.770	0.442	0.004	0.237	0.813
7	0.008	0.113	0.910	0.013	0.711	0.478	-0.015	-0.750	0.454	0.006	0.264	0.792	0.036	1.954	0.052
8	-0.011	-0.150	0.881	0.010	0.554	0.580	-0.021	-1.094	0.275	-0.010	-0.428	0.669	-0.027	-1.459	0.146
9	0.006	0.077	0.938	-0.001	-0.044	0.965	-0.027	-1.411	0.160	-0.036	-1.613	0.108	0.014	0.750	0.454
10	0.002	0.025	0.980	-0.020	-1.048	0.296	0.034	1.771	0.078	0.001	0.024	0.981	-0.009	-0.484	0.629

In above tables it is analyzed that the AR (Abnormal Return) in the event window are not statistically significant. The P-value in the event window for most, of the days is greater than 0.05, which indicates the support for the Null hypothesis i.e. the AARs in the event window is statistically and significantly not different from zero. But few companies in market are inefficient of day after of dividend announcement, they are Tata Consultancy services, State Bank of India, Wipro private limited, ICICI bank and Reliance Industries. Inefficiency means market participants can easily earn abnormal returns. Therefore, after analyzing 29 companies on stock exchange it can be said that other than five companies market is efficient. The information was quickly reflected by the stock prices and there was no scope of earning abnormal returns.

**Daily AARs before and after the announcement Date in the Event Window:**

The AARs of the selected companies were calculated and listed during event window. As  $H_{0a}$  in the study was that AARs of the sample firms are not different from zero in the event window. Parametric T-test has been used to test the significance of AARs during the Event window. The p values in the following table 2 represent the values of test statistic for AARs and can be seen that around the event date there is no significant abnormal return except -10, -8, +3, +5 and +10 day of the event.

**Table-2: Representing AAR and t values.**

Event Window	AAR	T-Stat	P-Value
-10	-0.008	-2.0873835	0.03821
-9	0.003	0.9060745	0.36606
-8	-0.008	-2.1975004	0.02921
-7	0.000	0.0462145	0.96319
-6	-0.005	-1.2340873	0.21872
-5	-0.004	-1.1463984	0.25310
-4	-0.003	-0.8156795	0.41572
-3	0.004	1.2284756	0.22081
-2	-0.002	-0.5023416	0.61602
-1	0.004	1.20951	0.22799
0	0.001	0.180596	0.85688
1	-0.001	-0.2326176	0.81631
2	-0.001	-0.3082357	0.75825
3	-0.008	-2.1528382	0.03261
4	-0.005	-1.2481706	0.21353

5	-0.009	-2.5765538	0.01075
6	0.000	-0.0505008	0.95978
7	0.001	0.2671518	0.78965
8	0.000	-0.021097	0.98319
9	-0.003	-0.8851665	0.37720
10	-0.026	-6.9935631	0.00000

### INFERENCE

In table 2 it is analyzed that the AAR (Average Abnormal Return) in the event window are not statistically significant. The *P-value* in the event window for most, (say 16 observations out of 21 observations) of the days is greater than 0.05, which indicates the support for the Null hypothesis i.e. the AARs in the event window is statistically and significantly not different from zero. Therefore, it can be said that the information was quickly reflected by the stock prices and these was no scope of earning abnormal returns.

### Daily CAARs before and after the announcement Date in the Event Window

The CAARs of the selected companies were calculated and listed during event window. As  $H_{0b}$  in the study was that CAARs of the sample firms are not different from zero in the event window. Parametric T-test has been used to test the significance of CAARs during the Event window. The p values in the following table 3 represent the values of test statistic for CAARs and can be seen that around the event date these is no significant abnormal return except -10, -6, -5, -4, +4, +5, +6, +7, +8, +9 and +10 day of the event.

**Table-3: Representing CAAR and t values.**

Event Window	CAAR	T-Stat	P-Value
-10	-0.0076	-2.0874	0.0382
-9	-0.0043	-0.8353	0.4046
-8	-0.0124	-1.9508	0.0526
-7	-0.0122	-1.6663	0.0973
-6	-0.0167	-2.0423	0.0425
-5	-0.0209	-2.3324	0.0207
-4	-0.0239	-2.4676	0.0145
-3	-0.0194	-1.8739	0.0625
-2	-0.0212	-1.9342	0.0546
-1	-0.0168	-1.4525	0.1480
0	-0.0161	-1.3304	0.1850
1	-0.0170	-1.3409	0.1816
2	-0.0181	-1.3738	0.1711
3	-0.0260	-1.8992	0.0591
4	-0.0305	-2.1571	0.0323
5	-0.0400	-2.7327	0.0069
6	-0.0401	-2.6634	0.0084
7	-0.0392	-2.5254	0.0124
8	-0.0392	-2.4629	0.0147
9	-0.0425	-2.5984	0.0101
10	-0.0681	-4.0619	0.0001

### INFERENCE

In table 3 it is analyzed that the CAAR (Cumulative Average Abnormal Return) in the event window are statistically significant. The *P-value* in the event window for most, (say 11 observations out of 21 observations) of the days is lesser than 0.05, which indicates the rejection for the Null hypothesis i.e. the CAARs in the event window is statistically and significantly different from zero. Therefore, it can be said that the information was not quickly reflected by the stock prices and there were scope of earning abnormal returns, if the investor holds the stock.

### CONCLUSION

The objective was to find out the stock market (BSE Sensex) efficiency to the dividend announcements for the selected companies. From the above study it is concluded that market is efficient is case of the event of dividend announcement and participants of market can-not earn abnormal returns from the stock market due to market capacity of fast absorbing information.

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**MANAGERIAL LEADERSHIP STYLE & EMPLOYEE JOB SATISFACTION; AN EMPIRICAL STUDY OF TRAVEL ORGANIZATIONS**

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**ABSTRACT**

*Present paper intends to probe the relationship between employee job satisfaction and managerial leadership style with focus area being travel organizations from National Capital Region (NCR). This study delves deep into the relationship between employee's job satisfaction and leadership styles adopted by their reporting managers. A questionnaire consisting 51 items based on five-point Likert scale was used to get responses with regard to managerial leadership style as well as job satisfaction levels. Based on researcher's prior job experience in travel organizations of study area, convenient sampling was used to select five travel organizations from NCR. Further a mix of judgment and snowball sampling was used to collect primary data for the study. Total of 350 questionnaires were executed through personal interview, mail and e-mail interactions. Out of which 289 were responded back. Data so collected was analyzed using SPSS (Statistical Package for the Social Sciences) Version 18. Empirical evidence has been indicative of mainly two types of leadership styles i.e. democratic and laissez-faire, which were found to have direct positive relation with employee job satisfaction.*

*Keywords: Leadership Styles, Job Satisfaction, Travel Organizations*

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**INTRODUCTION**

Leadership styles have always been a subject that has attracted researchers for being an important construct of overall leadership abilities and competencies (Woods, 1990). Leadership style has been found to be having significant bearing on subordinate performance since they tend to work more effectively and productively when their managers employ a specific leadership style (Mullins, 1998). Managers develop their personal leadership style through their education, training, and experience (Hersey et al., 2001). It has been noted that when managers adopt their subordinates' preferred leadership style giving them due respect, care and fair treatment they deserve, then it leads to job satisfaction, which is further linked to overall functioning of the organisation (Spector, 1997). Satisfied employees shows lesser absenteeism, lesser job stress, longer work periods and more likely to make positive contributions towards performance of their organizations (Griffin, 2002). Further, it has been confirmed through various empirical studies that satisfied employees stay more vigilant, attentive and aware of changes taking place in their business environment that further helps the organization in aptly accommodating the changes and further optimizing its performance. On account of its sheer nature and unpredictable demands that tourism industry poses, managerial leadership style becomes significant in deriving subordinate performance. Continuously changing business environment along with evolving consumer preferences create difficulties in adopting the participative leadership style (Woods, 1990). However, managers in tourism organizations can also provide various motivations for their subordinates to enhance their job satisfaction (Mullins, 1998). Leadership styles have been emerged as vital tools to create satisfied employees which in turn help fine tuning organizational functioning (Kavanaugh, 2001). Therefore tourism organizations should give due importance to effective leadership for not just improving the client services but also for improvements in employee job satisfaction (Woods, 2002). Successful organisations need to have employees with high levels of job satisfaction (Purcell, 2003). Present study is an attempt to investigate the nature and influence of three leadership styles (namely, democratic, autocratic, and laissez-faire) have on job satisfaction of employees working in tourism organizations.

**LITERATURE REVIEW****A. Leadership Styles**

Since early 1900s there has been various studies on leadership, which have contributed to a large pool of theoretical knowledge related to various leadership concepts. Leadership style has been defined as an interaction process between managerial & subordinate groups in structured & unstructured situations including members' expectations and perceptions (Bass, 1990). It has also been defined as behavioral patterns exhibited by leaders while working with and through others (Hersey, 1993). There are three factors that are primary determinants of leadership style viz. leaders' characteristics, subordinates' characteristics and organization's environment (Kavanaugh, 2001). Leadership styles can be classified according to leaders' power and behavior as autocratic, democratic, or laissez-faire, where styles are distinguished by the influence of leader on subordinates (Rollinson, 2005). Different leadership styles may be adopted by leaders according to their perception of their subordinates' style preferences (Woods, 1990) and therefore the

influence of leadership style could differ according to the type of power used by a leader over subordinates (Mullins, 1998).

In tourism sector, the management is characterized by 'being there' style, which further results in stress, intervention, and control of operations and interactions at all levels of organization (Woods, 1990). Further, Mullins (1998) has also confirmed that managerial leadership style of 'being there' or 'hands-on' is considered as a prevalent leadership style in tourism industry, this style could be more effective than other styles to achieve employees' job satisfaction, since managers work all the time with their employees and can therefore give more concern to employees' problems at work. However, this has not been a preferred leadership style in Indian tourism industry (Chaudhary, 2001). On the other hand, participative leadership style seems to be more difficult to adopt for sheer nature of business. This does not make autocratic style as preferred option, While, Okumus and Hemmington (1998) indicated that the prevalent leadership style in tourism industry was autocratic leadership style. On the contrary, Gupta (2004) found that the most common leadership style among managers in Indian travel organizations based on power sharing was democratic style.

### ***B. Job satisfactio***

Job satisfaction as stated by Locke (1976) is "a pleasurable or positive emotional state resulting from one's job or job experiences". Later, Armstrong (2003) also stated job satisfaction as the attitudes and emotions of people for their job. He further stated that if people have favorable and positive attitudes towards their job, it will imply job satisfaction, but in case they have unfavorable and negative attitudes towards their job, this will result in job dissatisfaction. Spector (1999) in his study bifurcate the constructs of job satisfaction in two main groups. The first group encompasses of job environment itself along with some other factors related to job, whilst the second includes personal factors related to the individual performing the job. This primarily deals with previous experiences and personality traits. Content theories of motivation are also equally relevant for job satisfaction. For example, Herzberg's theory of motivation can be comfortably considered as a theory of job satisfaction in relation to motivation at work (Mullins, 1998). Content theories relate unsatisfied needs to a tensional state and eventually dissatisfaction. Herzberg's (1959) theory argued that hygiene factors that includes work conditions, interpersonal relationships, supervision quality, job security, organizational policies & management style along with salary. Levels of these factors falling below acceptable limits resulted in job dissatisfaction; nevertheless acceptable level did not necessarily lead to job satisfaction, thus preventing dissatisfaction and poor performance. Motivating factors like reward & recognition, advancement & achievement, autonomy & responsibility leads to job satisfaction. In case of Tourism industry, hygiene factors were found to be more commonplace as against other industries as some employees have lower level of expectations to satisfy higher needs and thus making hygiene factors appears as a greater place (Mullins, 1998). Furthermore Chitiris (1988) in his study on Greek hotel employees have found that they were more concerned with hygiene factors as against motivating factors. Moreover, Hancer and George (2003) related higher level of job satisfaction with intrinsic factors and vice versa.

### ***C. Leadership Style and Job Satisfaction***

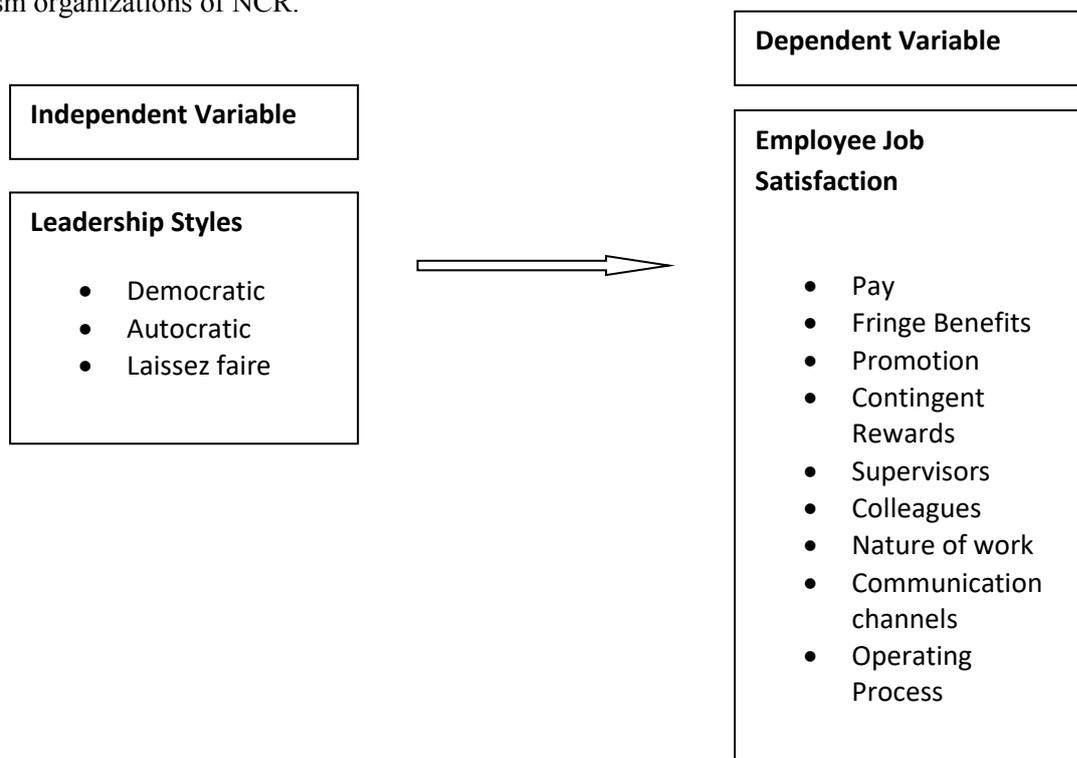
Leadership style and job satisfaction have been extensively researched however Tourism industry with its relatively new advent does not have much studies particularly delving into this intricate relationship between Leadership styles and Job Satisfaction. Significance of leadership in relation with job satisfaction was first researched in 1920s using various surveys, a positive co relation between employees' favorable attitudes toward supervision and job satisfaction was found (Bass, 1990). Many other studies were also conducted during 1950s and 1960s to look into the possibilities of enhancing employee satisfaction favorable leadership behavior of managers and supervisors (Northouse, 2004), these studies further confirmed the significant bearing of leadership styles on employees' job satisfaction levels (Bass, 1990). Employee job satisfaction is greatly influenced by the internal environment of organization such as leadership styles (Seashore, 1975), and therefore employees tend to be more satisfied with leaders who are considerate and supportive rather than with those who are either indifferent or critical towards their subordinates (Yukl, 1971). Consequently, leadership style has emerged as an important determinant of employee job satisfaction. Yousef (2000) has also confirmed that leadership behavior has a positive co relation with employee job satisfaction levels and therefore managers need to exhibit appropriate leadership styles in order to improve employees' job satisfaction levels. Managers and their leadership style prove to be an important determinant of job satisfaction levels among subordinates (Chen, 2005). Further Yousef (2000) has also confirmed the validity of theories developed and tested in Western organizations for non-western countries and organizations as well. Hence it will be safe to assume that leadership style has very significant impact on job satisfaction levels, and this relationship is irrespective of geographical and cultural differences between west and east. Hence leadership quality has emerged as an important determinant of success or failure of any business organization. (Lok, 2004).

Leaders thus can alter employees’ level of job satisfaction significantly through improving their effectiveness and enhancing their motivation levels. Different leadership styles are found to have different type of effect on job satisfaction levels, for example autocratic leadership style tends to have less satisfied employees, while democratic leadership style leads to higher levels of job satisfaction among subordinates. Moreover, the level of job satisfaction under laissez-faire leadership tends to be less than that of under democratic leadership style (Bass, 1990). Savery (1994) also confirmed a positive relation between employees’ job satisfaction levels and leadership styles in federal organizations of Western Australia. Lok and Crawford (2004) found that consideration leadership style bears a positive co relation with job satisfaction, however initiating structure leadership style was negatively co related to job satisfaction. In contrast, Rad and Yarmohammadian (2006) found no co relation between leadership styles and job satisfaction in their study conducted at Isfahan University Hospitals in Iran. Furthermore, Erkutlu and Chafra (2006) in their study on boutique hotels found that laissez-faire leadership style led to negative results in terms of organizational performance as well as low satisfaction, high stress, and low commitment levels. Tsai and Su (2011) in their study on airlines also confirmed that transactional leadership has a greater positive co relation with job satisfaction as against transformational leadership. Also Shurbagi and Zahari (2012) confirmed a positive relationship between transformational leadership and job satisfaction in national oil company. Voon et al. (2011) has also conducted studies confirming that two types of leadership styles, namely, transactional and transformational have a direct bearing on employees’ job satisfaction levels. Results further showed that transformational leadership style has a stronger relationship with employees’ job satisfaction levels in case of public sector organisations. Bhatti et al. (2012) in his studies on public and private teachers affirmed that Leadership styles has a positive impact on job satisfaction as well that public teachers were found to be more satisfied as against their private sector counterparts. Thus with this background it can be safely assumed that leadership styles have a bearing on employee’s job satisfaction levels in different sectors.

**THEORETICAL FRAMEWORK**

Theoretically present study is an attempt to gauge the impact of managers’ leadership styles on job satisfaction levels of employees working in travel organizations. Manager’s leadership style has been conceived as an independent variable whereas job satisfaction has been taken as a dependent variable as shown in below. Based on these theoretical underpinnings a hypothesis has been developed to co relate the effects of leadership style on employee’s job satisfaction levels.

**H1:** Is there any relationship between leadership style and job satisfaction levels of employees working in tourism organizations of NCR.



As shown above three different leadership styles i.e. democratic, autocratic, and laissez-faire leadership has been considered in this study. Further employee job satisfaction levels has been measured in terms of pay, promotion, supervision, fringe benefits, contingent rewards, operating procedure, co-workers, nature of the work and communication.

**METHODOLOGY**

Questionnaire method was used to conduct this study. A questionnaire consisting 59 items based on five-point likert scale (ranging from strongly disagree to strongly agree) was used to measure both leadership style as well as job satisfaction from employees’ perspective. The job satisfaction section consisted of 39 statements based on nine dimensions that were adapted from Job Satisfaction Survey (JSS) as developed by Spector (1985), to measure job satisfaction throughout nine job characteristics that are pay, promotion, supervision, fringe benefits, contingent rewards, operating conditions, co-workers, nature of work, and communication. The leadership style section consisted of 22 statements about three leadership styles considered for this study i.e. autocratic, democratic and laissez-faire style, adapted from a leadership style survey, developed by Clark (2002). A total of 1400 employees working in six travel organizations in National Capital Region were the population of this study, and 350 employees were selected using simple random sampling technique. Accordingly 320 questionnaires were distributed mainly using e mails out of which 209 were completed and analysis of data was done using SPSS.

**FINDINGS AND DATA ANALYSIS**

An internal consistency test was performed on the whole data collected. Results indicated a Cronbach’s Alpha coefficient value ( $\alpha$ ) = 0.85 for the leadership style, and  $\alpha$  = .97 for job satisfaction, thus confirming a high consistency and reliability among statements in each variable.

A total number of employees participated in this study was 209. Most participants (n=195) were males. The majority of participants (n=163) aged 35 years or less. However, most of participants (n=89) were degree holders. The highest number of participants (n=87) was with 2-4 years of service.

<b>Variable</b>	<b>Frequency</b>	<b>Percent (%)</b>
<b>Gender</b>		
Male	195	93.30
Female	14	7.7
<b>Age</b>		
25 Years or less	92	43.4
26-35 Years	71	32.9
36-45 Years	41	20.1
46-55 years	4	1.3
56 Years and more	-	-
<b>Education</b>		
Diploma	78	38.6
Graduate Degree	89	44.2
Post Graduate & Above	32	11.8
<b>Length of Service</b>		
1 Year or less	45	21.1
2-4 Years	87	40.8
5-7 Years	66	30.3
8 Years and more	11	7.8

Mean of scores for all dimensions of job satisfaction varied between 3.1366 to 3.5474, thus indicating a moderate level of satisfaction. It was also found that the highest levels of satisfaction among employees were for co-workers, fringe benefits, and operating conditions, whereas lowest levels of satisfaction were found for communication and work nature. Moreover, the findings reported the highest mean (3.8457) for democratic leadership style thus confirming the same being prevalent leadership behaviors exhibited by managers, followed by laissez-faire style with mean (3.5531), and autocratic style was found to have lowest mean (3.2743) as shown in Table below, thus emerged as least prevalent style. Mean scores for all three leadership styles were found to be more than (3) and varied with minute differences, implying that managers were oblivion towards their leadership style, or they are novice managers trying to find correct leadership behavior.

DESCRIPTIVE FOR MAJOR CONSTRUCTS

Dimension	Mean	Std Deviation
Pay	3.2156	.98657
Supervision	3.3789	.94563
Promotions	3.2477	.91072
Working conditions	3.4654	.97456
Nature of job	3.1645	.95110
Colleagues	3.6453	.98738
Fringe Benefits	3.2437	.81420
Contingent Rewards	3.3065	.97003
Communication channels	3.6163	.92651
Job Satisfaction	3.3456	.88336
Democratic leadership style	3.6745	.98756
Autocratic Leadership Style	3.7335	.87564
Laissez Faire Leadership Style	3.3265	.81435

(All items using a five point likert scale with 1 denoting strongly agree and 5 strongly disagree)

Carl Pearson’s correlation coefficient (P=.321) indicated a moderately significant correlation between democratic leadership style and job satisfaction, as the significant level was less than 0.01. Also a moderately significant correlation between laissez-faire style and job satisfaction was also indicated with Carl Pearson’s correlation coefficient (P=.206), since the significant level was less than (0.05) and more than (0.01), no correlation between autocratic style and job satisfaction was found, as shown in below table. Generally, democratic and laissez-faire leadership styles and job satisfaction are found to have moderate levels of correlation.

Correlation between Leadership Style and Job Satisfaction

		Auth. Style	Democratic Style	Laissez-faire Style
Job Satisfaction	Pearson	.102	.324**	.207*
	Correlation Sig (2-tailed)	.287	.001	.042
	N	209	209	209

\*\* Correlation is significant at the 0.01 level (2-tailed).

\* Correlation is significant at the 0.05 level (2-tailed).

Further, a linear regression model was also applied in order to indicate the impact of each leadership style i.e. democratic, laissez-faire and autocratic separately as independent variable on job satisfaction being a dependent variable as shown in Table below.

Linear Regression for the Impact of Leadership Style on Job Satisfaction

Variable	R	R <sup>2</sup>	F	B	T	Sig
Democratic Style	.324a	.106	13.738	.546	3.540	.001
Laissez Faire Style	.216b	.052	4.716	.265	2.194	.030

a) Predictors: (Constant), democratic style

b) Predictors: (Constant), laissez-faire style

**Dependent Variable:** Job satisfaction

Findings of regression model as shown in above table indicated a weak positive relation between democratic style and job satisfaction at a lesser significance level of .001. The results also indicated that democratic style explains only 10.4% of the variance in job satisfaction thus meaning that democratic style cannot be termed as sole determinant of job satisfaction. As shown in table above, an increase of one unit in democratic style increase in job satisfaction will be only .466 units. A slightly positive relation between laissez-faire style and job satisfaction is also noticed, as the significance level was less than 0.05. As per the findings laissez-faire

style explains 4.2% of the variance in job satisfaction, with this low percentage it can be concluded that laissez-faire style is also not a good determinant of job satisfaction. In other words an increase of one unit in laissez-faire style will increase the job satisfaction by .286 units only. Based on these results hypothesis (H1) is accepted. Since R for democratic style (0.320) was more than R for laissez-faire (.206) it can be safely assumed that democratic style has more impact on employee job satisfaction as against laissez-faire style. Based on these findings it can be concluded by the researcher that there exist a positive relationship between leadership style and employee job satisfaction.

### **MANAGERIAL IMPLICATIONS**

Findings of this study revealed a moderate level of job satisfaction. More satisfaction was reported with regard to co-workers, fringe benefits, operating conditions, supervision, pay, and contingent rewards. However lower levels of satisfaction were indicated for promotion schemes, communication within organization, and the nature of work. Findings of present study have a mixed relation with regard to studies conducted in western countries, while current findings are in agreement with some of the studies however there exist some contrary studies as well. Managerial implications of present study include a renewed thrust by managers on factors found to have a significant impact of employee job satisfaction. Present study recommends the managers to encourage hygiene factors for being vital to enhance job satisfaction among employees. Managers in the tourism industry could enhance employees satisfaction levels by providing various motivators as well there should be a focus on job facets that relates with job satisfaction (Hencer, 2003). Current study advocates concentrating on job aspects that support the highest levels of job satisfaction such as co-workers, fringe benefits, operating conditions, supervision, pay, and contingent rewards. Also other factors such as promotion, communication, and nature of work should also be taken into account. Moreover it is recommended for managers have to acquaint themselves with various leadership behaviors and their applicability, thus helping them adopt the style most appropriate in their organizational roles. Also job satisfaction of employees needs to be perceived as one of the key result areas for future managers.

### **LIMITATIONS AND FUTURE RESEARCH**

Research is a process with never ending scope and this study is no exception. Lack of studies in Indian context can be termed as one of the major limitations. Most of the works referred in this study were from western countries; however there exist a considerable difference in western and Indian contexts. There is also a lack of awareness among Indian organizations and any participation in research works is with suspicion, thus authenticity of information provide remain doubtful and hence affect the results. Owing to physical access and logistical constraints sample size chosen was small and less representative of population.

Further research could probe into the impacts of organizational and national culture on employees' job satisfaction levels and leadership styles. Further studies could also focus on analyzing the differences in leadership styles over time. Additionally, further research can be undertaken to conduct cross-cultural research, thus exploring the impact of national culture on the relationship between employees' job satisfaction levels and leadership behaviors in order to replicate this study at different cultures and generalize the findings.

### **CONCLUSION**

This study found a lack of relevant literature for tourism industry especially in Indian context. Almost all relevant studies were taken from Western countries. It was noticed that no studies have looked at the impact of managerial leadership style on employees' job satisfaction in Indian travel organizations. Review of literature indicated a difference in leadership styles based on managers' demographic profile. Moreover job satisfaction among employees was found to be varying based on their demographic profiles. A positive relation between managerial leadership styles and employee job satisfaction was confirmed. Results of analyzed data confirmed a moderate level of job satisfaction with democratic style of leadership was found to be the prevalent style among managers.

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**AN ANALYTICAL STUDY OF FINANCIAL PERFORMANCE OF PUBLIC SECTOR  
UNDERTAKING WITH SPECIAL REFERENCE TO ONGC LTD.****Dr. Firdous Ahmad Parray<sup>1</sup>, Bilal Ahmad War<sup>2</sup> and Owais Ahmed Shiekh<sup>3</sup>**Assistant Professor<sup>1</sup>, Govt. SPMR College of Commerce, JammuResearch Scholar<sup>2,3</sup>, Department of Commerce, Devi Ahilya Vishwavidyalaya, Indore

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**ABSTRACT**

*Since independence, among all sectors that have contributed to the growth of Indian economy, PSU sector has been the most consistent and prominent regarding its contribution towards the country. PSU sector has not only contributed in terms of GDP's growth and development, but also assured self-reliance to the people of the country. Public Sector Undertaking (PSUs) plays an important role in the development of Indian economy as these sectors have been perceived to accelerate the growth of core sectors of the economy like, agriculture development, regional development, increasing employment opportunities, mobilisation of resources, diversification to cover-up wide spectrum of industries etc. It is also very apparent from the available literature that with the growth and expansion of Public Sector Undertakings; the developing economy of India will also develop to a large extent. With this perspective this write up is an attempt by the researchers to study and find out the effect of financial performance on the overall performance of a public sector undertaking that is ONGC Ltd. The researchers have used various parameters to measure and quantify the financial performance of the concern. The primary objective behind this research study is to provide fruitful suggestions not only the PSU under study but also for other PSUs comprising of similar nature of business. Since these PSUs are contributing huge to the Indian economy, this study will be an attempt to provide necessary suggestions and remedies to increase their financial performance, with a view that they can provide invaluable contribution towards the economy.*

*Keywords: Indian Economy; PSUs; ONGC; Financial Performance*

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**INTRODUCTION**

Public sector undertakings are those which are owned by government, In these companies majority of the share (more than 50%) is owned by the government it may be state or central if it is owned by central government then we call it central PSU and if owned by state government then it is called state PSU, some of the well-known PSU are ONGC, IOCL, BHEL, SBI etc. these undertakings are having the government ownership and management, financed from government fund, and are also for public welfare, having public utility service and public accountability. In Indian Public sector undertakings plays very important role in economic development both in pre independence and post-independence period, before independence it was confined to certain sectors but after independence it got diversified and plays very important role in the Indian economy after independence there is progressive expansion of the public sector undertakings the government has made the strong efforts to develop the PSU. approximately 27% of the national income comes from the public sector and 21% of the total working population is engaged in this sector, these enterprises shapes the path of Indian economy, there are several public sector enterprises which plays very vital role in the development of Indian economy as these companies helps the Indian economy to generate the income, formation of capital, generation of employment, mobilisation of resources and also helped the Indian economy in development of infrastructure and strong industrial base etc. The development of the public sector enterprises also prevents concentration of the economic power in the hands of an individual or a group of individuals. In India economic inequalities are increasing as the poor are becoming poorer and rich are becoming richer the public sector can reduce the inequalities with the help of various policies like utilise the profit in public welfare activities. Most of the PSU hold the following areas mainly coal, oil and natural gas, Power generation, telecommunication etc.

**REVIEW OF LITERATURE**

**Sheela (2011)**, researcher has revealed the financial performance of Wheels India ltd. through various financial tools namely ratio analysis, comparative balance sheet and DuPont analysis and also statistical tools such as trend analysis and correlation. The main contribution of this study is the use of five power analysis methodology to retrieve ratios commonly used in financial analysis to tackle the problem of sample size and distribution uncertainty.

**Singh A. & Tandon P. (2012)**, in their paper they examined the financial performance of SBI and ICICI banks public sector and private sector respectively they compare the financial performance of SBI and ICICI banks on the basis of ratios such as credit deposit, net profit margin etc. The period of study taken is from the year

2007-08 to 2011-12. The study found that SBI is performing well and financially sound than ICICI Bank has better managing efficiency than SBI.

Roy M. & Sabah N. (2014), in their paper analyzed the performance of Oil and Natural Gas Corporation by using ratio analysis tool particularly those which are related to financial statement and find out the strength and weakness of the company and their position in the market for the balance of 2010-2013 are used.

**RESEARCH METHODOLOGY**

This study is micro analytical in nature and is entirely based on secondary data. The data has been retrieved from various secondary sources such as Annual Reports, research journals, articles, magazines, and newspapers.

**DATA ANALYSIS**

**Profitability analysis:** Profitability means the ability of an enterprise to use its resources to generate revenue in excess of its expenses. In other words we can say it is the ability of an enterprise to generate profit from its operation it is one of the most important block for analysing the financial performance and its effect on the country’s economy. Profitability can be determined through profitability analysis as it allows management and outsiders to forecast the profitability of a project or an enterprise.

**Analysis of Profitability of ONGC based on following ratios**

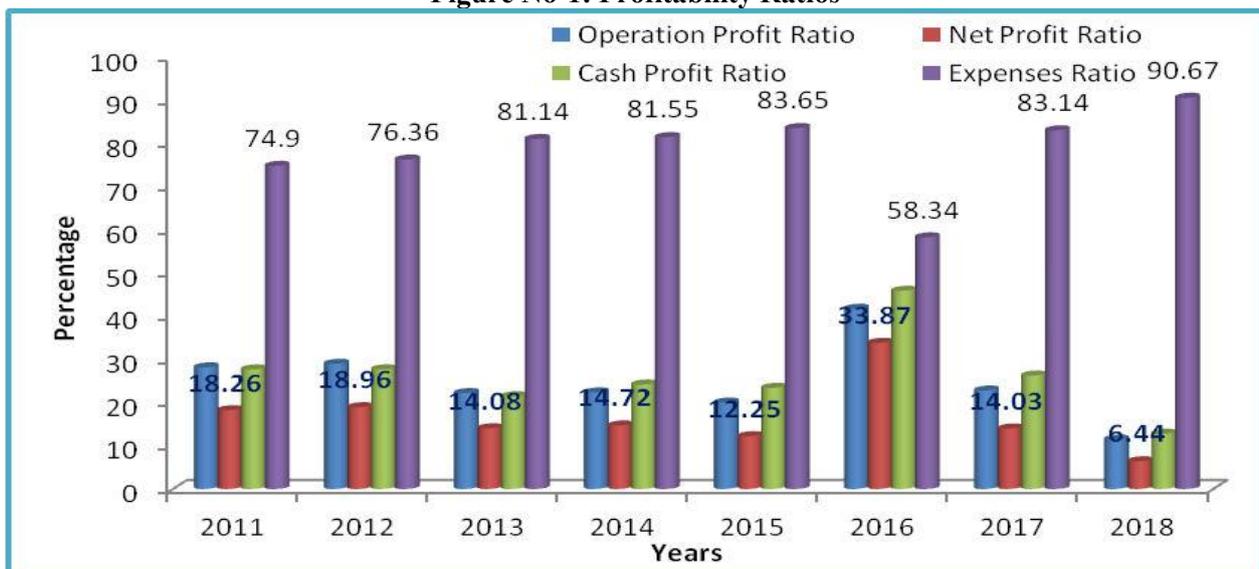
To find out the profitability analysis of ONGC various ratios related to the profitability with a view to find out the position or the trend of ONGC Ltd from 2013 to 2018.

**Table No-1: Calculation of Profitability Ratios**

Year	Operating Profit Ratio (%)	Net Profit (%)	Cash Profit (%)	Expenses Ratio (%)
2011	28.19	18.26	27.72	74.90
2012	29.02	18.96	27.74	76.36
2013	22.23	14.08	21.52	81.14
2014	22.39	14.72	24.22	81.55
2015	20.05	12.25	23.45	83.65
2016	41.77	33.87	45.95	58.34
2017	22.84	14.03	26.30	83.14
2018	11.45	06.44	12.81	90.67
<b>Average</b>	<b>24.74</b>	<b>16.57</b>	<b>26.21</b>	<b>78.71</b>

Source: Annual Reports of ONGC Ltd. (2011-2018)

**Figure No-1: Profitability Ratios**



**INTERPRETATION**

While analyzing the profitability of the concern under study, it is revealed that the profitability is showing a declining trend during the study period, excluding the year 2016. While talking about operating profit ratio, it is ascertained that this ratio is declining during the study period. The highest (41.77%) and lowest (11.45%) percentage of this ratio is found during the years 2016 and 2018, respectively. As the profitability of any

concern depends largely on the cost incurred by the company, it is found that the expenses incurred by the company during the year 2018 are 90.67%, which is highest during the study period. Hence if we correlate the net profit ratio with the expense ratio, it is clearly depicted that the highest expenses ratio, the lowest net profit ratio is found and vice versa.

### SUGGESTIONS

- Profitability provides clues to the company's pricing policies, cost structure and production efficiency. It is recommended from the results that ONGC Ltd is maintaining a satisfactory level of Profitability. Increasing profitability is a key objective for every business unit and the same must be maintained effectively and efficiently. Here are various cost-effective tactics that could, if implemented properly, help to save money and increase profits.
- ✓ **Control expenses.** The advantage of controlling expenses is that, for every rupee you save by eliminating an expense, you gain an extra rupee in profits. One way to be conscious of cash flow is to use the zero-based budgeting system. It requires beginning each year's annual budget process by setting each category to zero.
- ✓ **Increase margins.** A margin is the difference between the sales price of a good or service and the price the business owner paid to attain that product or service.
- ✓ **Reduce marketing costs.** Invest in methods proven to increase profits, and stop using methods that show minimal results.
- ✓ **Manage your inventory.** Stay vigilant of products which are selling and which are not by efficiently monitoring inventory. Based on that knowledge, determine if the company is purchasing too few of the top-selling items or too many of the worst-selling items. Adjust accordingly. This will end up meeting customers' needs and saving money.

### CONCLUSION

It is worth to conclude that the results shown during analysis are representing a negative approach adopted by the company. In order to make a mark regarding profitability, it will be highly recommended by the researchers that the company should endeavour a greater control over its expenses which in turn will result in increasing profitability.

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**EMPIRICAL EVIDENCES ON COMPLEXITIES AND CHALLENGES ON WORK-LIFE INTERFACE: A GLIMPSE ON DUAL CAREER COUPLES WORKING IN CORPORATE SECTOR**

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**ABSTRACT**

*Objective: The purpose of this empirical paper is to explore various work-life challenges faced by dual career couples working in the corporate sector.*

*Design/methodology/approach: This study is explorative and descriptive in nature. It involves exploring various challenges faced by working couples in their work and non-work domain.*

*Findings: Results reveal that there are various challenges faced by DCC on professional fronts such as emotional exhaustion, job stress, time conflict, work-demand factor, 24\*7 work-life confrontation. Therefore it is recommended that a number of company initiatives such as flexible work arrangements, on-site child care centres, and reduced work load arrangements can be made.*

*Originality/value: The literature on the work-family interface is complex and results also vary from one demographic profile to another. However, the result clearly draws the significance of balance between work and non-work domain. Therefore it is insufficient for DCC to work without supportive organisational work-life balance policies, which are in a great need.*

*Keywords: DCC- dual career couples, work-life challenges, work-non-work domain.*

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The literature on the work-family interface is very complex on several accounts, and not surprisingly, this interface has become crucial area in organizational and human resource research. Family and work life are the two most important domains for most of the working couples (Andrews and Withey, 1976). When conflict arises between these two domains, it has adverse consequences for both employees and organisation. These juggling dual roles may prevent dual career couples to contribute optimally to the organisation because of time pressure and increased levels of stress and emotional burnout. Inability of the dcc to deal with the demands of the two domains, results in the form of higher attrition rate, reduced organisation commitment and lower productivity. Greenhaus et al (1989) proposed that the number of hours worked per week by spouses was positively associated with conflict between work and family. Non-working spouses are usually the pillars of the family, and they take custody of most of the family responsibilities. This frees the employed partner to fully concentrate on his/her work. In contrast, families with both partners working full-time (or part-time), employees face dual demands from work and family activities, resulting in increased levels of FIW conflict.

**DEFINITION OF TERMS**

**Dual Career Couple (DCC):** DCC was originally discussed and the phrase coined by Rapport and Rapport (1969, 1971) they describe such a family as “one where both heads of household pursue a professional career by choice and at the same time maintain a family together”. Family was arbitrarily defined as “involving at least a marital pair and one child living as a domestic unit” (Cherpes, 1985). Consistent with the existence literature DCC will also be called as dual income couples regardless of organisation type (Brett et al, 1992; Hall and Hall, 1979; Hammer et al, 1997).

**Work Family Conflict (WFC):** WFC occurs when demand of family and work are incompatible so the participation in either the family or work roles is more difficult because of participation in the other (Peralin 1989; Voyodanoff, 1988). Greenhaus and Beutell (1985) have offered the following definition of this conflict “Work-Family Conflict is a form of inter-role conflict in which the role pressures from the work and family domains are mutually incompatible” (p.22).

Carter (1997) states “ To function effectively in the workplace must be able to negotiate a balance between the demands of work and family. So, family friendly policies make good business sense. Proactive Corporate Programs- including child and elder care, flexible benefits, job sharing, part-time work, telecommuting, parental leave, personal time and employer assistance programs- all have reflected the change perspective of corporate interest and involvement” (p.22). Work and family emerges as a major reason for negative outcomes for work, family and individual in order to integrate their work and family in a more satisfying way. This integration results into bidirectional interference of WFC i.e. work to home and home to work. This bidirectional influence is mainly because of two careers i.e. of husband and wife in one family which results into “more complex career development processes”. However this complexity has increased particularly more in family with young

children. Couples with young children are bounded with the responsibilities of raising the children, which leads to a greater need to coordinate work and family roles. Therefore, when DCC tries to raise their own career, multiple issues arise such as relocations, promotions and transfers, sharing of household tasks and many more. Therefore this makes DCC to go for unique work-life arrangements style (O'Neil et al, 1987; Pixley Moen, 2003). DCC also experiences higher level of work exhaustion leading to tension between work and family domains. Furthermore, this exhaustion leads to emotional drainage and depletion of physical energy level. We combat that this blurring boundary between work and family should become more tangible in the eyes of today's HR professional and corporate houses.

Consistent with the above researches, Greenhaus and Beutell (1985) gave three forms of WFC (a) time-based conflict (b) strain-based conflict, and (c) behaviour based conflict. Time based conflict occurs when time devoted to one role makes it difficult to participate in another role. "Strain-based conflict" suggests that strain experienced in one role intrudes into and interferes with participation in another role. In 1991, Gutek et al also mentioned two directions of WFC with each of these three forms. When two directions WIF and FIW are combined with three forms i.e. time based conflict, strain-based conflict and behaviour based conflict results into six dimensions (1) time-based WIF (2) time-based FIW (3) strain based WIF (4) strain based FIW (5) behaviour based WIF (6) behaviour based FIW. Multiple threads of evidence consistently indicate that work-family spillover appears to be in every DCC daily routine.

### **WORK LIFE CHALLENGES FACED BY DUAL CAREER COUPLE**

When conflict between work and non work domains occurs there are adverse consequences for both the individuals and organisations. Thus, DCC are playing more dynamic and pivotal role in meeting work life challenges faced by them in various corporate sectors. However these work life challenges requires the understanding of all the variables that trigger WFC. Conflicts originating in the work domain may impinge on the family such as long working hours prevents the performance of domestic tasks. Similarly, those stemming from the family domain may have negative organisational consequences, such as care of sick child or elders in the family prevent attendance at work. Also, Frone, M.R., Yardley, J.K. and Markel, K.S. (1997b) expanded the term working hours. According to him 'working more hours means employee is at work for more hours and may have more work duties and has less time for other activities'. As hours increase, so should one's level of perceived work demand (Greenhaus et al.,1987). Therefore with increasing work demands, WFC also increases which may affect employee work activities. In addition to this, role stressors also directly affect an employee's level of demand (Voydanoff, 1988).

According to Heraty Noreen, Morley J. Michael, Cleveland N. Jeanette, (2008) two separate forms of work-family conflict i.e. work interfering with family (WIF) and family interfering with work (FIW) have 'negative impact' on organisation, family and personal outcomes. At "individual level" the problematic issues arising out are tensions between work and family, reduced well-being, stress, and life satisfaction and dissatisfaction and disturbed psychological activities. At "organisational level", critical issues emerging are negative organisational commitment, negative job performance and job attitude, absenteeism and turnover. At "societal level", concerns relate to dumping of social and community activities, family disruption and reduced social citizenship. In addition, these challenges are even more 'catalyzed' when work demand and family demand coincides due to non-supportive society and organisation. In addition, receiving conflicting direction from working environment may affect employee work activities and be perceived as work demand. This leads to role overload which makes impossible for DCC to perform roles comfortably (Greenhaus and Beutell, 1985). Work overload tends to increasing experience of negative emotions, fatigue, tension, lower level of energy and reduced mental health (Cooper and Hensman, 1985). These symptoms further leads to increasing work-life challenges faced by DCC. Furthermore, these detrimental work outcomes such as lower performance, burnout, increased turnover and adverse health effects (Carson, R. L., Baumgartner, J. J., Mathews, R. A., & Tsouloupas, C. N., 2010; Cropanzano, R., Rupp, D. E., & Byrne, Z. S., 2003; Demerouti and Bakker, 2006; Maslach, C., Schaufeli, W. B., & Leiter, M. P., 2001; Moore 2000a; Shirom 2011; Swider and Zimmerman, 2010; Taris 2006) are the 'dramatic trends' in corporate sector.

Role ambiguity an important construct, given by House, R.J., Schuler, R.S. and Levanoni, E. (1983), defines "it occurs when individuals are unsure of what is expected of them for a given role". Thus as role conflict and role ambiguity increases, an employee suffers from lower levels of job satisfaction, high related tensions and lower self confidence. The role mixing of work and home domains results into workload and emotional exhaustion. Working couples often feel emotionally drained off after full day working. Work exhaustion is also a growing concern for many professional level employees, who are working long hours and excessively breaking their work energy threshold level. Hence they are unable to meet the required job demands ( Moore 2000a, b;

Hobfoll, 1989; Lee and Ashforth, 1996; Wright and Cropanzo, 1998). In addition, many researchers have previously linked work exhaustion to an array of negative outcomes such as increased absenteeism, turnover, physical illness, reduced satisfaction, and lower job performance (Carson et al 2010; Cropanzo et al 2003; Demerouti and Bakker, 2006; Maslach, C., Schaufeli, W. B., & Leiter, M. P., 2001; Moore 2000a; Parker and Kulik, 1995; Shirom 2011).

### OBJECTIVE

To determine the various challenges faced by the dual career couples in corporate sector.

### RESEARCH DESIGN

This study was exploratory and descriptive in nature. In the present study, various work-life challenges were explored with the help of *exploratory factor analysis*. The study was carried out in corporate sectors in North Zone of India. The corporate sectors includes manufacturing, services, consulting, IT, institutes and training, ITES (BPO, KPO), hospital and healthcare, telecommunication, and mobile. These sectors were also included in similar studies by Bailyn, Lotte; Drago, RobertKochan, Thomas (2001) including system engineers and software engineers in IT firm, Health senior account executive in healthcare and education sector's university professor's, product-development engineers in manufacturing and IT sector. Similarly, Golden, T. D., (2011), also mentioned the use of technology at corporate offices including higher percentages of IT sector firms. Parasuraman, S., Purohit, Y.S. and Godshalk, V.M. (1996) also included the respondents from healthcare units. From the list of 1047 companies, 40 companies were chosen covering these sectors. Approximately 10 Questionnaires was distributed in these 40 companies, Out of these 40 companies, 30 companies responded back. Hence 315, filled questionnaires were collected back. Out of 315 questionnaires, 271 filled questionnaires were found to be suitable for this study after editing and criterion meeting. Likert scale ranging from 'strongly agree =1 to strongly disagree =5' was used for quantifying our study.

### POPULATION

For questionnaire, online and field survey was done. Companies with more than 100 employees and participants from executive level to higher managerial level were taken. Minimum criterion of education was graduation and age of minimum 21 years. This study includes the age limit of 21 years, since as per law the marriage below 21 years is considered

as illegal. Carnicer, M.P.D.L., Sanchez, A. M., Perez, M. P., & Jimenez, M. J., (2004) and Duxbury & Higgins (2003) also reported similar types of demographic and job characteristics including employees in managerial and professional positions, employees with a graduation, master's or doctoral degree. Finally, 315 filled questionnaires were collected, out of this after editing and criterion meeting, only 271 respondents were found to be suitable. The response rate was approximately 67 %.

### SAMPLING TECHNIQUES

Scientific approach was adopted for sampling technique and completed in three steps.

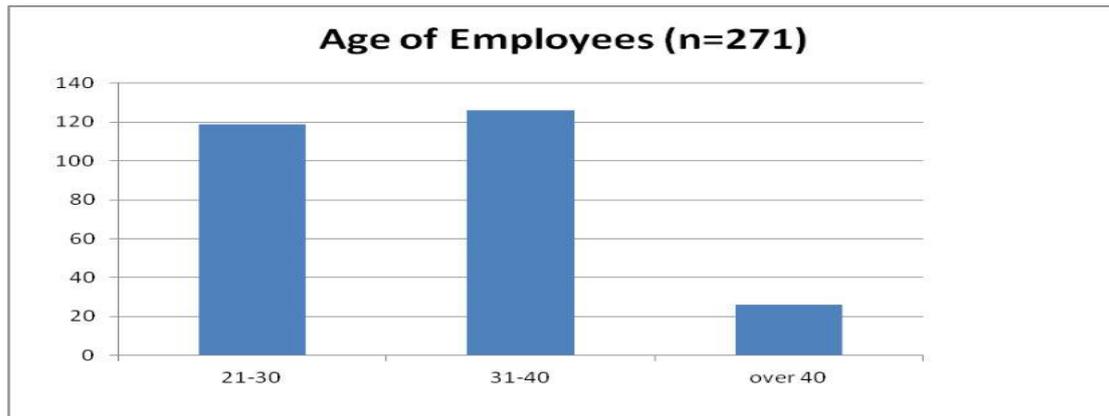
- i) **Convenience Sampling:** was done for the selection of corporates and respondents in 'Delhi/Ncr region'. Further sub-dividing to Delhi, Noida, Gurgaon, Faridabad.
- ii) **Quota Sampling:** Through 'quota sampling' 50% quota was fixed for IT sector and rest, 50% from non-IT sectors.
- iii) **Snowball sampling:** subsequent respondents were selected based on the 'referrals and through social networks'.

### ANALYSIS

#### Descriptive Statistics

The sample consisted of 271 dual career couples sample. The mean age of respondents was in the range of 31-40 years. The age of the employees range in three categories: 21-30, 31-40, over 40.

Age of Employees



Exploring various work-life challenges faced by DCC by Exploratory Factor Analysis

A list of 25 statements was taken, to explore the various factors responsible for work-life challenges. Exploratory factor analysis was performed to explore the various factors (an underlying dimension that explains the correlations among a set of variables) responsible for these challenges. The chronbach's alpha was calculated to know the reliability of data. The chronbach's alpha came out to be 0.79 for the selected variables of work-life challenges.

ASSUMPTIONS OF EXPLORATORY FACTOR ANALYSIS

**Kaiser-Meyer-Olkin Measures of sampling adequacy:** In present study, the KMO Measures of sampling adequacy comes to be 0.88. The value of KMO 0.88 is more than the p-value of 0.5. Thus exploratory factor analysis may be considered to be as an appropriate technique for analyzing the correlation matrix. Therefore, the first attempt of KMO was fulfilled for the present study. **Bartlett's test of sphericity** In the current study, the null hypothesis that the population correlation matrix is an identity matrix, is rejected by Bartlett's test of sphericity. The p-value comes to be 0.000 which is significant for the p-value 0.05 level of significance. A value less than 0.05 indicates that the data in hand do not produce an identity matrix. This tells that there is a significant relationship among the variables, taken for factor analysis.

**The Principal component Analysis:** In the present study, for the extracting the components PCA was used. The diagonal of correlation matrix consists of unities and full variance can be observed into the factor matrix. Overall, PCA is used when minimum numbers of factors have to be extracted that will account for maximum variance in the data. **Eigen:** Only factors with eigen values more than 1 are retained. Factors with variance less than one are equivalent to a single variable. **Varimax rotation:** In rotating the factors, each factor will be showing significant loadings with some of the variables only. For the present study, varimax procedure is followed for rotating the factors. This also leads to achieving simplicity and interpretability of the factors. Specific items were retained whose factor loadings comes to be greater than 0.40.

Factor Loadings for Work Life Challenges

Items	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Communalities
I feel emotionally drained when I get home from work.			0.423			.486
I wish I had more time to do things with my family.				0.811		.699
My commitment to job is inhibiting my leisure activities.				0.503		.558
After getting home from work I am unable to switch off and relax.			0.434			.659
I almost bring work home with me.	0.748					.670
I often put extra hours at work.	0.778					.624

Work pressure often interferes with my personal life.	0.647					.560
My spouse demands greater attention from me.					0.706	.537
My boss favors those employees who believe in 24x7 work concept (workaholics).		0.728				.741
Working long hours are expected and regarded as signs of high job commitment.		0.714				.635
An employee who uses flexi-time is less likely to advance his career than non-users.		0.729				.677
The expectations of my subordinates conflicts with those of my family demands.					0.446	.699
<b>Eigen values</b>	7.8	1.7	1.5	1.3	1.2	
<b>% of Variance</b>	31.4	38.5	44.8	50.4	55.3	

**CONCLUSIONS**

With the changing composition of today’s workforce, DCC consists of equal percentage of men and women. Participation of women has made it tough for them to balance work and life. Therefore, DCC faces various work-life challenges in various corporate houses, leading to increasing complexities on personal and professional front. All these imbalances have increased the turnover intentions of employees, increased absenteeism and reduced organisation commitment. Total five factors responsible for work-life challenges were discovered.

**work-demand factor**(Fu, Carmen K, Shaffer Margaret A., 2001; Golden, T. D., 2011; Geurts, S. A. E., & Demerouti, E. 2003; Meijman, T. F., & Mulder, G. 1998; Pleck, J., Staines, G. and Lang, L. 1980; Greenhaus and Beutell, 1985 and Small, S. A., & Riley, D. 1990); **24\*7 work-life confrontations**(Piotrkowski, C. 1979; Burke. J. Ronald, 2004; Burke. J. Ronald, 2004; Carlson, D.S. and Perrewe, P.L. 1999; Frone, M.R., Yardley, J.K. and Markel, K.S. 1997b; Gutek, B.A., Searle, S. and Klepa, L. 1991 and Parasuraman, S., Purohit, Y.S. and Godshalk, V.M. 1996); **emotional exhaustion**(Kossek & Ozeki 1998, 1999; Maslach and Jackson 1981; Carlson, D. S., Kacmar, K. M., & Williams, L. J. 2000; Kossek, E. E., & Ozeki, C. 1998; Allen, T. D. 2001) **job stress** (Lu, Y. Y. 2008; Judge, T.A., Boudreau, J.W. and Bretz Jr. R.D. 1994); as **time-conflict** it was found to be the social challenge faced by dual career couple; all the above mentioned factors were found to be responsible for work-life challenges.

In the work and organisational spheres, the existence of DCC is increasing in every type of organisation. This results into increased challenges and complexities in the work-family interface, this further creates imbalances on both personal and professional front. Undoubtedly, these problems are faced not at individual level but also at societal level. So proper initiatives are required both from organisation and employer side, to ease out these DCC’s work-life complexities and issues.

Thus it is recommended that a number of company initiatives such as flexible work arrangements, on-site child care centres, and reduced work load arrangements can be made. Also, Duxbury, L., & Higgins, C., (2003) reported similar type of sample selection including DCC from managerial and professional positions than those working in non-managerial and non-professional positions as they reported higher levels of work-to-family conflict. Similar type of respondents were also taken by Carnicer, M.P.D.L., Sanchez, A. M. , Perez, M. P., & Jimenez, M. J., (2004) and they found that employees with a master’s or doctoral degree experienced greater work-to-family conflict and family-to-work conflict than employees with high school education. Therefore, it encourages both society and corporate houses to support working couple in handling work and non-work domain. This will lead to increased quality of work-life. It was also discovered that support from society and

family also plays a vital role in balancing work-family domains. Social support from family, friends, co-workers and peer helps in maintaining a harmonious relationship between the work and family domains.

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**ANALYTICAL STUDY OF MICRO INSURANCE IN INDIA: POLICY, PROSPECTS, AND STRATEGY****Dr. Shikha Gupta**

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**ABSTRACT**

*Developing countries lack an effective social protection mechanism to reach the vast majority of the population systematically, which is engaged in the informal economy. As several low-income people cannot access necessary risk-management tools, they are vulnerable to fall into deep poverty in times of hardship. Micro insurance as combined with micro credit is widely recognized as an important tool for down streaming the economic and social security benefits towards the low-income strata. The study examined the present Indian scenario of micro insurance scheme especially in the state of Uttar Pradesh and Rajasthan. Although India is the first such country who has initiated the micro insurance scheme in a big way through enactment of special regulations, its grassroots level condition is in infant stage. To assist the policy makers in drafting future strategy, a conscientious analysis has taken through a scheduled questionnaire over the 400 low-income peoples residing in rural urban settings of sample states. The study emphasized over the questions whether low-income people are getting micro insurance policy, if yes then what type of products they are availing, their future requirements, and problems associated with products offered, followed with policy recommendations. The author found no statistically significant relationship between the micro insurance scheme and the sample states. The author further reported, lack of awareness, and faulty product designs are the major reasons for low penetration of the scheme and through efficient and effective utilization of the available means, the scheme may perhaps promoted to the masses.*

*Keywords: micro insurance, psychological security, social security, economic security, customized products, risk hedging technique.*

Developing countries lack an effective social protection mechanism to reach the vast majority of the population systematically, which is engaged in the informal economy. "The poor face more risks than the well off, but more importantly, they are more vulnerable to the same risk", (Rangrajan, 2008, p. 6). For instances a chronic illness, accidental death, destroy of crop due to unfavorable monsoon conditions, destruction of property due to natural disasters, etc shatter the household economy of poor peoples, that may take years and years to stand again. However, the risk mitigating techniques such as saving money, storage of grain, borrowing from friends, relatives or moneylenders, and at times involves selling of assets, or live stock which are the only source of earning, sometimes push the household in to the chronic debt trap. With the passage of time, these risk-mitigating techniques are no longer adequate. To trim down the vulnerability in face of such risks, insurance prove to be great help. However, the poor's are also deprived of insurance services just as they have been for credit by the formal financial institutions. The insurance providers approach the middle and upper income stratum to make easy profit. Consequence, the poor live off the banking grid, due to lack of awareness, high costs of issuing millions of small policies and typical products not designed for the needs of the poor.

The Rangrajan Committee, 2008 defined the term micro insurance as "the protection of low income households against specific perils in exchange for premium payments proportionate to the likelihood and cost of the risk involved." Thus, the focus of Micro insurance is on the low-income segment ignored by mainstream commercial and social insurance schemes. The aim of the micro insurance is to provide quality insurance services at affordable price to the weaker sections. It is characterize by low premium and low coverage limits. Each policy generates a "micro" financial transaction. However, the risks are not "micro" to the households, which experience them. Low-income people are exposing to numerous perils. They live in continuous uncertainty about whether and when a loss might occur. Poverty and vulnerability reinforce each other in a viciously escalating downward spiral. By linking multiple small units into larger structures, micro insurance pools the risk and creates networks that enable better governance. This gives easy access to reinsurance and helps to generate data, which can help in product design and development.

India is the first country to have special regulations for micro insurance scheme. In India the micro insurance schemes had earlier started by social organizations to provide security to communities they were working with. As the Micro Finance Institutions evolved in the country, they took up micro finance in a big way. The Insurance Regulatory Authority (IRDA) of India supported the momentum and made India, the first such country in the world, who has special regulation for growth of micro insurance scheme. IRDA made it mandatory for all formal insurance companies to extend their activities to rural & social sectors in the country. The Indian Institute of Bankers, (2010). As former IRDA Chairman, Mr. C.S. Rao put it succinctly, "IRDA

made serving the poor compulsory for insurers in India." India has become a hot spot for the development of micro insurance. To fulfill the obligations insurance companies found that Micro Finance Institutions as an ideal partner for this. Hence, insurance companies and Micro Finance Institutions are increasingly negotiation to provide group or standardized individual schemes for the low-income people. In consideration, many micro-schemes have emerged in recent years. The fast development of the micro insurance might be due to three reasons:

1. All companies that operate in India must dedicate a fraction of their business to the low-income market. Few companies regard the rural and social obligations as a business opportunity. Nevertheless, the number of policies with poor customers increases with increasing penetration of the higher-income market.
2. India has a successful history with self-help groups in the area of microfinance. Many microfinance institutions have set up schemes to serve their clients. Other community-based organizations have taken the same path, leading to the development of stand-alone community schemes in which a growing number of people are covered.
3. Mobile coverage today has been an extremely large user base and has literally broken all barriers to connect to the last mile. A citizen from all strata of society, especially weaker sections has affected by this technology. Such a platform helps to provide insurance and other valuable services to the low-income strata at affordable cost.

Government and the regulating authority acknowledge that insurance can be a risk management mechanism for the poor. Therefore, rural and social obligations for the formal insurance companies had introduced, which has led to the widespread use of the partner-agent approach.

In a country where about 78 per cent of the population has no access to insurance, micro insurance is proving to be a life-saving boon. However, as of now, over a million Indians covered by micro insurance. These people are mostly from the poorest section of society, ignored by the insurance sector. Their poverty enhances their risk to disease and other natural catastrophes but they simply could not afford insurance. Until, micro insurance came along.

Although micro insurance is in the early stages of development, efforts have taken to formalize and design the process. There are certain case studies like Yeshasvini Cooperative Farmers Health Care Trust of Karnataka, Karuna Trust of Karnataka, and Iffco Tokio's in India etc., that offers micro insurance policy to the below poverty line sections. Although overall success of the micro insurance program is limited due to faulty planning, poor administration, and lack of expertise in operating such scheme, their potential viewed to be considerable.

The crucial reason for the growth of the scheme has been the entrance of commercial players. The micro insurance sector is at booming stage where in 2005, only fourteen percent of the fifty largest insurance companies in the world offered micro insurance, now sixty six percent of it offering such services, according to the International Labour Organization. "In the previous five years, the number of people who have micro insurance has increased by a factor of 6.5, with a market size of as Rs. 280 billion, according to the International Labor Organization. Today, that is half a billion people". (ROSENBERG, 2012) The Lloyds, and SwissRe Sigma (2010), estimates the potential of micro insurance market is approximately 2.6 billion peoples with the potential of US dollar forty billion.

The Micro insurance is still in its infancy. Problems include be short of awareness, high transaction costs, complex procedures, frauds in claims, impede settlements of claims, inappropriate distribution systems, product design issues especially related to the irregular cash flows of the low-income market and lack of data to interpret the vulnerabilities of the poor.

The challenge is to promote an insurance culture in the low-income group and simultaneously develop an appropriate business model that creates a profitable & sustainable market at the "bottom of the pyramid." This will help to realize the immense potential of the vast, underserved market of low-income households. Besides, it also provides certain social benefits like protecting vulnerable people, expanding financial inclusion, and safeguarding hard-won income gains.

Reviews of research on micro insurance scheme have conducted that just as a large demand for formal savings and loans exist among the poor, there was also believed to exist a large demand for formal insurance. Nourse, 2001; Churchill, 2002. It has realized that, "just providing micro credit without micro insurance component is self-defeating" (Rangrajan). There is, therefore, a need to emphasize linking of micro credit with micro-insurance to keeping this segment away from the poverty trap. Further, it observed that well-designed

customized micro insurance products if offered would provide great economic and psychological security to the poor as it reduces exposure to multiple risks and cushions the impact of a disaster. Thus, seeing, huge success of the microcredit to meet credit needs of low-income strata. Now a similar revolution is beginning with micro insurance. The widespread use of mobile phones in our country and a vast network of microfinance service providers offer a platform for growth of micro insurance services for the people who would otherwise be outside the purview of the financial system. This will help to drive down the cost of reaching insurance services at the bottom. Nourse goes on to argue that Micro Finance Institutions need to provide tailored lending services for the poor instead of rigid loan products. Supporting this latter assertion of Nourse, and Eyiah (2001) developed a model of small construction management contractors and Micro Finance Institutions in developing countries that provides a tailored lending structure for microenterprise contractors. Similarly, Woller (2002a), Cohen (2002), and Dunn (2002) argue that Micro Finance Institutions need to be more client-focused, including offering a mix of financial products tailored to the varied needs and wants of poor consumers. Poor people require insurance more than better-off people do, because they have no other cushion. Weaker sections are generally in a state of poverty. Most are cyclically poor. They work and save, but then due to certain events they fall into poverty like a crop failure, a loss of a job, the death of a breadwinner. Often, the trigger for poverty is illness. As stated by the findings of the Indian Ministry of Health, a quarter of all people hospitalized pushed into poverty by their hospital costs rather than the cost of missed work. Insurance offers a safety net, but it is more than that. If you know you are covered, you will be more likely to invest in the future. "Your whole capacity to take risks changes," Andrew Kuper.

Nearly all the studies examined revealed that low-income people need customized micro insurance services. Nevertheless, no effort made to know what type of risk poor actually face in different geographical area. Moreover, none of the study attempted to know the defects in the existing micro insurance products offered to the low-income peoples who are residing in different states of India. The present study tries to gauge flaws of existing varied insurance products offered. It also revealed whether micro insurance services are actually reaching the masses and the type of risk faced by the low-income peoples particularly in the state of Uttar Pradesh and Rajasthan.

## **METHOD**

### **Participants**

We randomly selected 400 low-income peoples from the state of Uttar Pradesh and Rajasthan, India. From each state 200 subjects were selected, out of it fifty percent of subjects belong to the rural areas and rest from urban settings.

### **Materials and Procedures**

To collect the valuable primary data, we developed the structured questionnaire schedule. The questionnaire comprises of four items. The item do they have taken micro insurance is a dichotomy question with closed ended option yes and no. The second and third item is the type of insurance taken and type of insurance product required by the subjects respectively. The last but not the least fourth item i.e. the three most important risk faced by the subjects according to their preference helped to make future strategy while designing the products for the low-income strata particularly in the given sample states. In addition, the observation tool incorporated in the research study. In the study, the state is the dependent variable and insurance policy is independent variable. The objective of the study is to gauge whether the service of micro insurance is reaching to the poor's and what they understand by the scheme. The study also tried to find out the type of risk they are prone to particularly in the sample state, and what the low-income strata expect from the micro insurance scheme.

H1: Low-income peoples are obtaining micro insurance services.

H2: Low-income peoples are aware about the type of micro insurance products available.

H3: Low-income peoples require variety of micro insurance products.

## **RESULT**

The skewness lies between + 1 to -1, which indicates data is normally distributed. The majority of the sample does not have micro insurance ( $M = 0.18$ ,  $SD = 0.380$ ). Although 82.5% respondents reported that they have not taken any micro insurance product, 17.5% do have micro insurance. The average type of commercial insurance taken by the respondents was 2.28 ( $SD = 2.63$ ). However, where majority 45% respondents has never taken any insurance, 33% respondents reported that they have taken life insurance, 18% taken health insurance, 3% education insurance, and only half a fraction 0.5% taken accidental insurance, and 0.5% has taken building insurance, respectively. The average of type of insurance required in future was 0.20 ( $SD = 0.401$ ). The 80% of the respondents reported that they do not need any kind of insurance, while 20% felt the need to have health

insurance product. The illness reported as the fore most risk respondents faced in near future, while no risk and natural disaster were comes in the second and third preference of the respondents respectively. The other risk faced by the respondents following their preference order comprises of loss or damage of vehicle, poor business performance, loss of job, loss or damage of house, fall in harvest, and loss of cattle respectively.

A chi-square test of independence was performed to examine the relationship between the micro insurance scheme and the sample state. These results indicate that there is no statistically significant relationship between the micro insurance scheme and the sample states (chi-square with one degree of freedom = 1.690,  $p > .001$ ). Hence, we reject the hypothesis that, low-income peoples are obtaining micro insurance products. Similar trends were observed in case of micro insurance requirement in sample states (Chi-square with one degree of freedom = 144.0,  $p < .001$ ), and type of insurance taken and sample states (Chi-square with five degree of freedom = 427.40,  $p < .001$ ). we further rejected the hypothesis that, low-income people are aware of micro insurance products, and low-income people require variety of micro insurance products.

**Table-1: Mean, Standard Deviation and skewness of insurance services, type of insurance services availed and type of insurance services required by low-income peoples**

	Do insurance	Type of insurance taken	Type of insurance required
N	400	400	400
Mean	.18	2.28	.20
S D	.380	2.693	.401
Skewness	1.717	.584	1.506

**Table-2: Frequency, parentage and cumulative parentage of low-income peoples who have micro insurance**

Do Micro Insurance	Frequency	Percentage	Cumulative Percentage
No	330	82.5	82.5
Yes	70	17.5	100.00
Total	400	100.00	

**Table-3: Frequency, parentage and cumulative parentage of type of insurance taken by low-income people**

Type of Insurance Taken	Frequency	Percentage	C.P.
No	180	45.00	45
health	72	18.00	63
Building	2	0.5	63.5
Education	12	3.00	66.5
accident	2	0.5	67
life insurance	132	33.00	100
Total	400	100	

**Table-4: Frequency, parentage and cumulative parentage of type of insurance required by low-income people**

Type of insurance required	Frequency	Percentage	C.P.
No	320	80.00	80.00
health /medical	80	20.0	100.00
Total	400		

**Table-5: Ranking of type of risk faced by low-income people**

Risk Faced by Low-income Peoples	Rank
Illness	1.00
No	2.00
Natural Disaster	3.00
Loss or Damage of Vehicle	4.00
Poor Business Performance	5.00
Loss of Formal/Informal Employment	6.00
Loss or Damage of House	7.00
Fall in Harvest	8.00
Loss or Damage of Cattle	9.00
Other	10.00

Table-6: Chi-Square Testing Results

	Do insurance	Type of insurance taken	Type of insurance required
Chi-Square	1.690E2 <sup>a</sup>	427.400 <sup>b</sup>	144.000 <sup>a</sup>
df	1	5	1
Asymp. Sig.	.000	.000	.000

a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 200.0.

b. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 66.7.

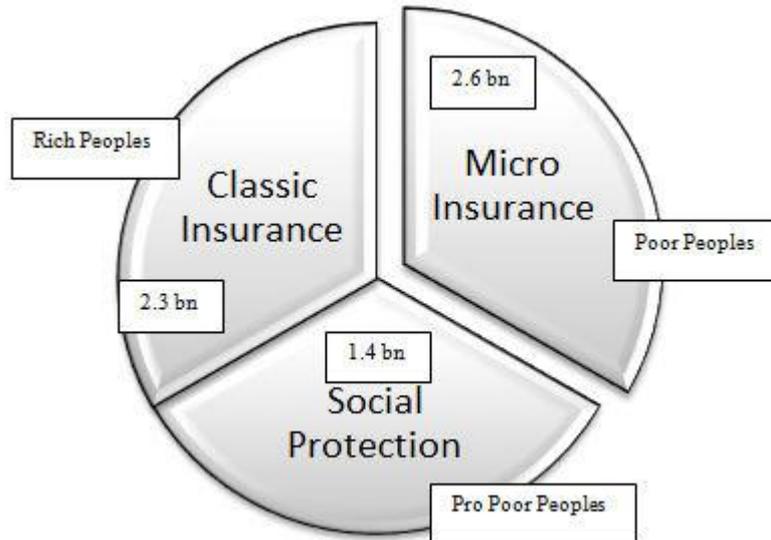


Figure-1: Pie graph showing the potential market of micro insurance. From “UN MDG Report”, 2011

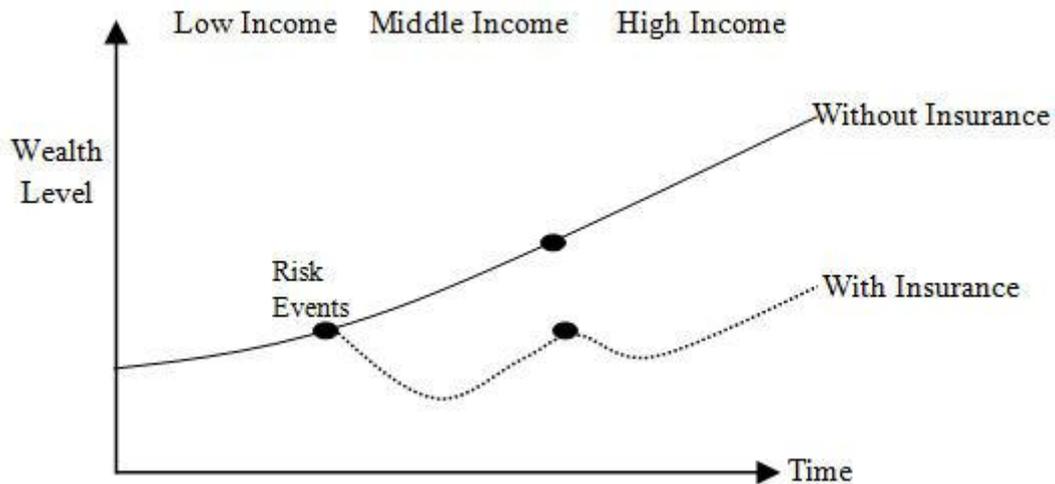


Figure-2: Line graph showing micro insurance as a risk hedging technique for low-income peoples

**DISCUSSION**

The major findings of the study reveals that majority (82.5%) of the respondents do not have micro insurance policy, and (80%) not even feel any need to have such policy. The result gives a clear implication that the sample population had very little knowledge about the micro insurance and its products offered. In the absence of information about such loans, they resort to rely on traditional techniques to mitigate such risks. lack of awareness among the low-income peoples about the micro insurance services. Further, the results revealed that the 17.5% respondents who had taken the micro insurance, actually provided by the micro finance institutions as a compulsory obligation prior to avail micro credit services. As mentioned above in literature, to meet their legal obligations the insurance companies are leveraging the infrastructure of micro finance institutions. The alliance between the two made the micro insurance product compulsory for the micro finance borrowers. Although the arrangement is compulsory for micro credit borrowers but the scheme has help to achieve triple effect. At the one side, such contracts facilitate insurance companies to meet their social obligations. It help the micro finance institutions to make easy income by the commission received from the insurance company, along with surety of credit in case of death of borrower, as the institution firstly settle down the outstanding loan amount from the insurance money. The policy takers also benefited as they get some cushion to save themselves

from the vulnerability associated with the state of their poverty. The policyholder family immediately gets some money to meet burial expenses. The family also gets relief from outstanding loan burden and sometimes gets part of insured money left after settling all prior loan obligations from the micro finance institutions. However, 45% refused to take any type of insurance policy, only 33% taken life insurance policy and just a fraction taken other insurance products namely health, education, accidental, and building insurance. The similar results had also reported by the CPD baseline study, 93% of people had no knowledge about health insurance. Even less was know about vehicle, property and fire/theft insurance. The respondents seemed to be more familiar with life insurance, with 29.5% expressing some knowledge about life insurance. Over half of those who knew about insurance before joining got their knowledge from insurance agents or health institutions.

The majority find illness as the most important risk due to which the borrower work suffers and their financial budget disturbs. They wish to have such micro loans, which protect them and their family against expenses they need to bear in case of major illness. The other important risk according to the borrower are natural disaster, loss or damage of vehicle, poor business performance, loss of employment, loss or damage of house, fall in harvest, and loss or damage of cattle respectively in chronological order of their preference.

Thus, health is an important risk factor for poor households. It had observed that not improper health infrastructure, but insufficient financial means, which hindered the poor people from curing their health problems. The costs of even minor health problems (e.g., appendix surgeries) make it very difficult for low-income groups to obtain the necessary care. To address the problem of low purchasing power, the idea of health insurance covering critical surgeries evolved, and the insurance model developed.

The above-mentioned results evidently indicate low-income people do not find insurance an ailment to save them from the certain life miss-happening events. It considered, as a financial burden than a home economy savvy product. Micro insurance even today associated with life insurance policy by the majority of respondents. Its visible there is immense shortage of awareness among the low-income peoples about the micro insurance services, range of products offered by the insurers, the key benefits, the service providers, and the government regulations with regard to micro insurance.

The micro-insurance sector is unique in the sense that there is an ongoing challenge to explain the concept and benefits to the insured. It was observed that lack of understanding of insurance and its benefits is a major obstacle to the expansion of micro insurance. Those who not know how micro insurance works, and benefit them, are unlikely to trust its worth valuable proposition. It was further observed that for effective implementation, there is an urgent need to promote financial literacy. It help low-income strata to understand how insurance works as a risk management tool.

Creating awareness thru' use of pictorial posters, local folk arts and street theatres might be useful to explain the mechanisms of insurance, and helps gives them at least a chance to consider adding micro insurance to their financial planning strategies.

It was also observe that the information flows fast among the local community when disseminated through SHG members. The reason behind it that the women tends to be more socialize, disadvantaged women feel empowered when they get informal power to have a better understanding than others. Hence sharing new information and knowledge not only makes flow of information better but also satisfy their self-esteem issues. It was confirmed by the findings of Karuna Trsut of Karanataka, India, in its household survey over 358 SHG members and non- members and found that 40% of the respondents had better knowledge about the micro insurance scheme as compare to respondents of control group. Thus, it is strongly recommended to disseminate quality knowledge among the micro finance clients so that its benefit reached to the masses through word of mouth publicity.

There is a need to design customized flexible micro insurance products to meet the needs of diverse regions of India. The micro insurance policy should be design keeping in view the pro poor clients with the options to be availed at individual as well as group policy. Such as personal insurance of life and property, fire & allied perils and burglary cover to the building(house) and its contents, personal accident, group health policy that covers hospitalization expenses, critical illness policy, comprehensive protection against loss or damage to the property insured by Fire and allied perils and burglary & house breaking. For casual labourers and workers in factories, personal accident policy for Self Help Groups clients, providing coverage against death, permanent total disablement, permanent partial disablement and temporary total disablement resulting out of an accident. The majority of women microfinance client found engaged in cattle rearing. The survey revealed that many who starting cattle rearing as a new occupation are ignorant of risk associated with the business i.e. loss of cattle due to disease, accident, lack of proper take care and vaccination etc, result in overburden the household to repay the

micro loan. Hence, there is a strong need to introduce cattle insurance policy compulsory for those who are in the cattle rearing business. The policy must be comprehensive to include all types of risk associated with the business and thus applicable to indigenous, cross breeds and exotic breeds of cattle, covering the death of the animal due to accident, disease, surgical operations, strike, riot and civil commotion, terrorism and earthquake. The prime occupation of the rural India is agriculture and its yield depends on the monsoon, which is uncertain. This uncertainty may sometimes make the poor rich and in contrast rich to poor. The survey also revealed certain stories where the micro credit women handover the loan money to their husbands or children to their existing agriculture occupation. Being investing the loan money in the same existing occupation, a high risk is involved. A bad monsoon may collapse the household economy and drive in to debt trap. Hence, there is a strong need to initiate weather insurance policy that may include the products for Kharif (monsoon) crops like Jowar, paddy, soyabean, cotton etc., and for Rabi crops like Wheat, Mustard, and Potato etc. against financial losses arising due to adverse weather perils- temperature, humidity, and unseasonal, deficient, or excess rainfall.

To penetrate the micro insurance market the micro insurance providers need to maintain quality of the insurance products. The financial sustainability should not be justified at the cost of defective insurance products introduction. The policy should be value for money, service oriented, with quick settlement of claims. It had observed that people hesitate to take insurance due to its lengthy procedures, complex terms and conditions, frauds by agents, who run away after taking few installments, and bad settlement procedures. Therefore, it is strongly recommended that the insurer should settle the policy claims with in a period of two weeks. The localite, well qualified, and specialist staff employed should be hired for responsible sales practices. The micro insurance provider should maintain the transparency, clear communication, sharing information and costs, accountability for results.

The low-income people residing in different geographical conditions are prone to different types of risk. Thus rather than creating standardized insurance products. There should be room for flexibility. So that insurance policy customized according to the specific location.

According to the Rangrajan Committee, Micro-insurance has not penetrated rural markets. Traditional insurers have not made much headway in bringing micro-insurance products to the rural poor. It has not even penetrated among the urban poor.

To make the micro insurance services a viable venture, there is a strong need of collaboration between the public-private partnerships. The service of micro insurance could be made economical and widely acceptable through using existing government network, which are commonly perceived as most secure channel by the weaker segment.

The micro insurance products have to be simple, customized, available, affordable and accessible to the poor. To promote micro insurance service certain models viz., the Partner-Agent Model, Full Service Model, Community Based Model and Provider Model, advised by the Rangrajan committee, 2008 may implemented.

The strategic alliance should takes place with such partners who have expertise in the field. Leveraging the existing banking infrastructure, network of micro finance sector and telecommunication services set-up, is a good option to accelerate the scheme. While a technology platform may take time for setting up, in the long-run, the same will be cost-effective and reliable. The government could do efforts to bring Corporate Social Responsibility (CSR) and micro insurance to leverage synergies and create better social impact.

Local community-based organizations could organize premium collections, as they have better access to the local people. To make it more acceptable to the people, micro-insurance products, apart from covering only risks, should also provide an opportunity for long term savings (endowment).

Seeing the diversity in the demand side of micro insurance market, the products need to be refined and develop time to time. For this appropriate feedback, systems must be created. The service providers could adopt strategies like sharing knowledge, timely follow up by customer satisfaction surveys, grievance mechanism, and judging through social and financial indicators, to enrich and make the products offered defect free.

Being learning the lessons from the bad past experiences of Karuna Trust Karnataka, Yashaswini Trust Karnataka, Sewa Ahmedabad, FINCA, Uganda etc., the right products with right pricing should be launched through pilot study of the risk profiles, claims, settlement ratios etc. in the potential market prior introducing the product.

A holistic inclusive effort is required. Micro insurance cannot work alone, and the micro credit providers have to make it integral part of their services render to weaker segments.

**CONCLUSION**

Micro insurance is still in its infancy. Problems include high transaction costs, inappropriate distribution systems, product design issues especially related to the irregular cash flows of the low-income market and lack of data to interpret the vulnerabilities of the poor. The challenge is to promote an insurance culture in the low-income group and simultaneously develop an appropriate business model that creates a profitable & sustainable market at the "bottom of the pyramid." This will help to realize the immense potential of the vast, underserved market of low-income households.

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**A STUDY ON THE IMPACT OF EMERGING TECHNOLOGIES ON EMPLOYEE ENGAGEMENT**

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**ABSTRACT**

*To increase the profitability in an inundated marketplace Employee Engagement has become the hotspot of HR Paradigm in recent times. Although the importance of Employee Engagement is invasive, however the move is from conversations, connecting with an approach that is reactive and now organizations are turning to Technology to create steps that are predictive and correcting behaviors that are proactive. Human Professionals role has been completely redefined by the use of Technology all over the world. Every aspect of Human Resource Management have transformed by the recent advancement in Technology.*

*Earlier was the time when the major challenge was the process of identifying and measuring the engagement levels. Various methods like surveys, feedback forms and conversations HR Professionals used to measure the engagement levels, critical areas were identified and later strategies were formed in rectifying behaviours. This whole process involved both operational and strategic processes. But now the tiresome task of measuring Employee Engagement has become more simpler and comprehensive by the use of Technology which have led to better decision making.*

*To solve the Employee Engagement challenge Undoubtedly HR and Technology have to move forward. There are challenges that Technology has been able to overcome but it has its own set of limitations. This paper attempts to study the Impact of Emerging Technologies on Employee Engagement.*

*Keywords: Human Resource, Employee Engagement*

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**INTRODUCTION**

Employee engagement—defined in Forbes as “the emotional commitment the employee has to the organization and its goals”—is a critical part of any human resources or internal communications’ strategy. Engagement enables businesses to reach their full potential by helping to create open communication channels, improve productivity, and retain talented staff. On the employee side, engagement helps workers fulfill a wide range of personal and professional needs that can ultimately lead to feelings of life-changing self-actualization and desire to make a social impact. EX—which is based on employees’ positive and negative associations and opinions about a company based on their interactions with it—is more than just the latest HR buzzword. The experience that an employee has with a company is now rated as the fourth most important global trend for business leaders to address, according to the Deloitte Human Capital Trends Report 2017. Yet despite management’s growing admission of the importance of EX, Deloitte found that only 22 percent of companies report excellence in building a differentiated employee experience.

Over the last few years, we have seen a vast amount of attention paid to the impact of technological development on work, sometimes referred to as the changing world of work, particularly by popular media and consultants. Newspaper headlines such as “Robots will take our jobs. We’d better plan now before it’s too late” (Elliott, 2018) have become commonplace. Some commentators also suggest that advances in technology will lead to changes in the workplace as dramatic as the collapse of the traditional employment relationship, the widespread use of artificial reality instead of travel and the replacement of humans with artificial intelligence (AI) and robotics. It is true to say that the most recent advancements in technology, such as AI, are having a dramatic effect on the workplace. Indeed, we are seeing rapid growth in the use of AI and robotics to automate simple and repetitive tasks such as factory work and many back-office duties; and to make complex decisions, such as medical diagnostics, quickly and more accurately via predictive algorithms.

In order to address the question above, an analysis of published evidence relating to the impact of technology on work and people management was undertaken. Evidence reviews typically focus on peer-reviewed, academic papers. However, due to the time it takes to research and publish such outputs and the speed of change in relation to technology, published information on technological advancement and its impact on work and people management tends to be slightly out of date. In order to address this limitation, we broadened our review to include the grey literature, and research undertaken by consultancies and similar bodies.

A comprehensive review of the existing evidence in relation to how technological advancement has/is changing the world of work; what technological trends are likely to directly affect work, the workplace or the workforce;

and the role of HR in relation to these changes was therefore undertaken. To identify published evidence related to the above areas, a list of appropriate keywords and search strings was identified. These were grouped into the following six thematic areas: technology, work, future, HRM, working practices, and other trends

### **METHODS**

Publications were analysed for relevance to our research question (i.e. did they focus on research pertaining to the research question?) and quality in relation to the research design. For example, studies were assessed in relation to whether they: were based in a comprehensive literature review; used rigorous and appropriate research methods; used a large enough and appropriate sample; employed appropriate analyses; drew conclusions based on the evidence. The research team reviewed the titles and abstracts of all the identified literature making an initial selection of 115 documents. Then, each document was critically examined for relevance to the literature review by a careful read of the document itself and evaluation of the contribution of each article to the three areas investigated. The final selection of this review comprised 51 documents.

In order to address the question above, an analysis of published evidence relating to the impact of technology on work and people management was undertaken. Evidence reviews typically focus on peer-reviewed, academic papers. However, due to the time it takes to research and publish such outputs, and the speed of change in relation to technology, published information on technological advancement and its impact on work and people management tends to be slightly out of date. In order to address this limitation, we broadened our review to include the grey literature, and research undertaken by consultancies and similar bodies. A comprehensive review of the existing evidence in relation to how technological advancement has/is changing the world of work; what technological trends are likely to directly affect work, the workplace or the workforce; and the role of HR in relation to these changes was therefore undertaken. To identify published evidence related to the above areas, a list of appropriate keywords and search strings was identified. These were grouped into the following six thematic areas: technology, work, future, HRM, working practices, and other trends

### **FINDINGS**

The results identified a number of emerging technologies that are likely to have an impact on the future of work and therefore have implications for the HR function. First, digital platforms were shown to be used commonly within work and are central to online marketplaces such as Amazon or e-Bay and to labour market platforms such as Uber or Freelancer.com (Morgan, 2014; Zysman & Kenney, 2018). Second, AI and machine learning were prominent within the published evidence and mostly applied for data analysis, finding patterns and making predictions (Government Office for Science, 2015). Third, robotics was seen as affecting employment as industrial robots have increasingly taken on routine tasks usually performed by manufacturing workers (Frey & Osborne (2017)). Fourth, augmented and virtual reality (AR and VR) are demonstrated to be playing an increasingly significant role in industries such as healthcare, construction, oil and gas and aerospace (Higgins, 2017). Fifth, wearable devices are increasingly being employed in the workplace to improve employees' awareness about their personal wellness, to track employees' progress and plan measures to sustain their engagement.

These emerging technologies will present a number of challenges for the HR function and for people management more broadly (Bondarouk & Brewster, 2016; Marler & Parry, 2016; Stone *et al.*, 2015). Organizations will need to build a strategy for how they can most benefit from these technologies, for example to build efficiencies and improve the accuracy of decision-making, while also addressing any potentially negative impacts on employees. The role of the HR function in facilitating, or mitigating, the potential effects of emerging technologies on the workforce are presented briefly below.

### **AUTOMATION AND CHANGING SKILLS REQUIREMENTS**

Evidence suggests that there are enormous financial incentives for employers to increasingly automate their (currently human) processes (Markoff, 2011) and that advances in automation could dramatically change the nature of jobs available (PWC, 2017). Realistically, whether a task can be automated depends on the ability of coders to write a set of procedures that will improve the problem specification and account for every possible contingency (Frey & Osborne (2017)). Despite this limitation, automation is increasingly being used in areas that require the storing or access of information (Frey & Osborne (2017)), such as in fraud detection, medical diagnosis (Cohn, 2013; Wolcott, 2018) and law (Markoff, 2011). In addition, the automation of manual tasks is increasingly widespread, including tasks such as driving (Autor *et al.*, 2003; Veres *et al.*, 2011), cargo handling (Bloss, 2011) and mining (Frey & Osborne (2017)).

The role of HR practitioners in the process of automation is not clear from the evidence, but it would seem that they could play a key role in identifying tasks (and thus eventually roles) that could be automated. Perhaps more

important however, is the HR function's role addressing the impact of job losses as a result of automation (Frey & Osborne (2017); PWC, 2017). Not only should HR practitioners be central to supporting employees through a period of uncertainty while such decisions are made, they should also be responsible for considering how employees can be re-skilled or up-skilled in order to replace obsolete skills so that they can be retained in the workforce.

f Automation will accelerate the shift in required personnel skills we have seen over the past 15 years. Our delve into finds that the strongest development in demand will be for technological skills, the smallest category today, which will rise by 55 percent. This surge will affect demand for basic digital skills as well as advanced technological skills such as indoctrination. insist for social and touching skills such as guidance and managing others will rise by 24 percent, to 22 percent of hours worked. Demand for advanced cognitive skills will grow rather overall, but will rise piercingly for some of these skill, specially ingenuity. f Some skill category will be less in demand. indispensable cognitive skills, which include basic data key and handing out, will beg off by 15 percent, lessening to 14 percent of hours worked from 18 percent. Demand for physical and manual skills, which include general equipment operation, will also drop, by 14 percent, but will remain the largest category of workforce skills in 2030 in many countries, accounting for 25 percent of the whole hours work. Skill shifts will play out differently across sector. Healthcare, for example, will see a rising need for physical skills, even as demand for them declines in manufacturing and other sectors. f Companies will need to make significant organizational changes at the same time as addressing these skill shifts to stay aggressive. A survey of more than 3,000 business best in seven countries tourist attractions a new importance on permanent learning for workers and a shift to more cross-functional and team-based work. As tasks change, jobs will need to be redefined and companies say they will need to turn into more agile. sovereign work will likely grow. control and human property will also need to adapt: almost 20 percent of company say their executive team lacks sufficient knowledge to lead adoption of automation and artificial intellect. Almost one in three firms are fretful that lacking the skills they need for automation espousal will hurt their future financial performance. f friendship for high-skill human resources will increase, while displacement will be resolute largely on low-skill staff, long-lasting a trend that has make worse income difference and summary middle-wage jobs. Companies say that high-skill workers are most likely to be hired and retrained, and to see rising wages. Firms in the forefront of mechanization adoption expect to draw the talent they need, but slower adopters fear their options will be more incomplete.

### **INCREASED FLEXIBILITY OF TIME AND PLACE**

There is considerable evidence that organisations are increasingly offering flexible working practices in order to meet employees' needs and to reduce costs associated with having a physical workplace (Berkery *et al.*, 2017; de Menezes & Kelliher, 2011; Stavrou *et al.*, 2015). It is clear that developments in internet, and more recently mobile, technologies have increased the ability of individuals to work remotely and therefore out of usual office hours. However, it is also important to realise that technology is not the sole driver for an increase in flexible working as this has also been influenced by higher numbers of women in the workplace and by flexible pension arrangements (Atkinson, 2017). The management of flexible working policies, and creation of career and performance management systems that ensure that employees are not disadvantaged by working flexibly are undoubtedly the remit of the HR function.

### **JOB DIAGNOSIS**

Not all jobs are favorable to occasion or rest flexibility. yet, most have convinced duty that are amenable to being done at exchange period and chairs other than the workplace. If you look at the jobs you supervise and break them into their constituent parts, it is possible you'll find that some tasks, maybe even up to a third of a whole job, loan themselves to instance and put flexibility.

### **PERSON DIAGNOSIS**

very soon like all jobs are not equally contributing to to elasticity, some staff are better candidates for give than others. If you have a high-performing worker who has demonstrated he can self-manage fit, you most likely can trust him with added flexibility. If you have a additional not established worker, or one whom you experience wants more arrangement and hands-on leadership, I'd chat to them about what they need to demonstrate to you before they earn a more flexible bargain.

### **JOB REDESIGN**

In her groundbreaking research, Harvard economist Claudia Goldin establish that career in which work is substitutable be inclined to have more flexibility and gender fairness. That is, when the conclusion of work is not fully needy on one individual worker, but quite when employees can coordinate actions to the point that many can competently satisfy client needs, workers are freer to work additional flexibly.

### EMPLOYMENT ARRANGEMENTS

The evidence suggested that the trend towards workers undertaking jobs using AI platforms via the gig economy and open talent economy is resulting in employment relations increasingly based on self-employment contracts, subcontracts, and various forms of ‘gig-work’ (Deloitte, 2013). Research suggests that almost 2.8 million workers in the UK are involved in the gig economy to some extent and that this is contributing to a decrease in demand for permanent employees, allowing organisations to reduce costs and increase their numerical flexibility (Berg, 2016). This in turn is said to be leading to precarious work conditions (Fleming, 2017; Moisander *et al.*, 2018), the inability of individuals to be able to influence their working environment (CIPD, 2017) and a lack of institutional connectedness (Fitzgerald *et al.*, 2012). In addition, the gig economy has been linked to growing economic insecurity, low productivity, diminished autonomy and increased levels of personal debt

### EFFECTS ON EMPLOYEE WELL BEING

The above discussion suggests that employers need to consider a possible downside of the increased use of technology in the workplace. Indeed, research has proposed that the move to a workforce that is increasingly connected and contactable, along with the increase of global working, means that work is becoming nearer to 24/7 (Deloitte, 2016) and that the potential for employees to overwork (and thus damage their wellbeing) is increasing (Chron, 2016; Schlacter *et al.*, 2018). Media coverage demonstrates that employees are concerned about this prospect. For example, employees from Google referred to connectivity as an “electronic leash” that damages their wellbeing (Independent, 2017), while other reports have linked increased connectivity with stress and burnout (The Guardian, 2016).

### THE IMPACT OF EMERGING TECHNOLOGIES ON HRM

The above examples suggest a role for the HR function in navigating the changes to work, the workplace and the workforce that are driven by technological advancement. However, it is important to also note that emerging technologies have been shown to also influence the way that organisations undertake their HR activities. The principal HR functions of attracting, selecting, developing, motivating and retaining talented employees in organisations (Stone *et al.*, 2015) remain important, but potentially require different approaches in the future world of work (Holland & Bardoel, 2016). For example, as reported by Davenport *et al.*, (2010) we see companies adopting sophisticated data collection technology and analytics to improve methods of attracting and retaining talent, thus confirming the idea that technology is transforming the way that HR processes are managed, especially in relation to collecting and using data. Using interactive technologies can support line managers and HR professionals to enhance interactions and communication with their employees

### CONCLUSIONS AND IMPLICATIONS

We would go beyond that statement and propose that actually the role of the HR function is also to develop and support employees in order to ensure their growth and wellbeing, as well as the sustainability of the organisation, against the backdrop of this technological advancement. The findings of the evidence review and above discussion suggest that emerging technologies such as AI, robotics, VR and AR, digital technologies, wearables and blockchain have the potential to affect work and employees significantly. The degree and speed of this impact depends to a large extent on developments in the technologies themselves and the willingness of organisations to adopt them. This review also indicates that the HR function has a key role to play in helping employees to navigate the changes to the world of work particularly in relation to skills development, work organisation and mental health. While the key activities involved in HRM – to support managers in employees in going about their daily work (CEB, 2018) – are unlikely to change, the role of the HR function may become even more important as both the potential benefits and risks of emerging technologies for employees develop. Whether the HR function can successfully undertake this role depends upon their own skills development and their own understanding of technologies and their implications. Jesuthasan (2017) suggests that sustaining digital engagement in the future workplace will become a key part of the HR role

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**GST E-WAY BILL: PAVING THE WAY TO THE DIGITAL TAX REFORM**

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**ABSTRACT**

*Purpose: The purpose of this paper is to discuss the concept and role of E-way Bill in bringing digitalized taxation practice in India. It also reports the present status of online billing and logistics in India.*

*Design/methodology/approach: The paper is descriptive in nature. Qualitative analysis of available literature in form of research papers, news articles, rules and notifications issued by the GST council has been done.*

*Findings: Present paper concludes that GST E-Way is undoubtedly an effective way to report both intrastate and interstate transactions, but still there is scope to improve the system and make it more hassle free. There is lack of awareness and knowledge of law among traders and transporters regarding the E-Way Bill. In addition, if implemented as planned, the system of E-Way Bill can revolutionize the tax compliance mechanism.*

*Practical implications: This paper attempts to clarify the concept of E-Way Bill with the context of Goods and Services Tax (GST) in India. As GST is a new concept for India, there is lack of literature and work available for reference.*

*Originality/value: The paper extends the literature on GST and E-Way Bill by incorporating the latest changes brought by the GST Council. An attempt has been made to highlight the need of digitalization in the taxation practice. Few suggestions for improvement in the reporting system have been given for better tax compliance.*

*Keywords: GST, E-Way Bill, Tax Reform, Indirect Tax, Indian Economy.*

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**INTRODUCTION**

Digital tax data gathering and analysis is getting popular in today's era. It not only facilitates greater efficiency in tax collection with improved compliance but generates more revenue as well. This move towards "digitalized tax reform" helps to collect tax in real time and maintain assessee's tax record properly. Some countries have come a long way in digitalizing their tax system while some are still struggling to embrace digitalization. India, with the implementation of GST E-way bill from 1<sup>st</sup> April 2018, has marked its step in the path of "tax digitalization". E way bill system is introduced to track the movement of goods. It is an attempt to pave the way for a nation-wide single bill system. Initially, E-way Bill system was only applicable for inter-state movement of goods but in later phases, states agreed to adopt and implement the system for intra-state transactions as well. Data collected for the study shows that generation of E-way Bills for intra state transactions is more as compare to inter-state transactions within the period of April, 2018 to February, 2019.

Before the implementation of GST, the Centre and State indirect tax administration used to work under different laws, rules, regulations, procedures and formats. Hence, resulting in- different independent IT sites for each law/act. With the implementation of GST, entire indirect tax system came to same level of IT knowledge and maturity with uniform format and interface for taxpayers and other external stakeholders (2017, May 10: economic times).

**1.1 Background of the study**

The GST System Project is one of its kind and complex IT initiative. It is unique as it establishes, for the first time ever to establish a uniform interface for the tax payers and a common and shared IT structure between Centre and the States.

Under the headship of Mr. Nandan Nilekani, a Technology Advisory Group for Unique Projects (TAGUP) was set up in 2010. The group submitted its report in January, 2011.

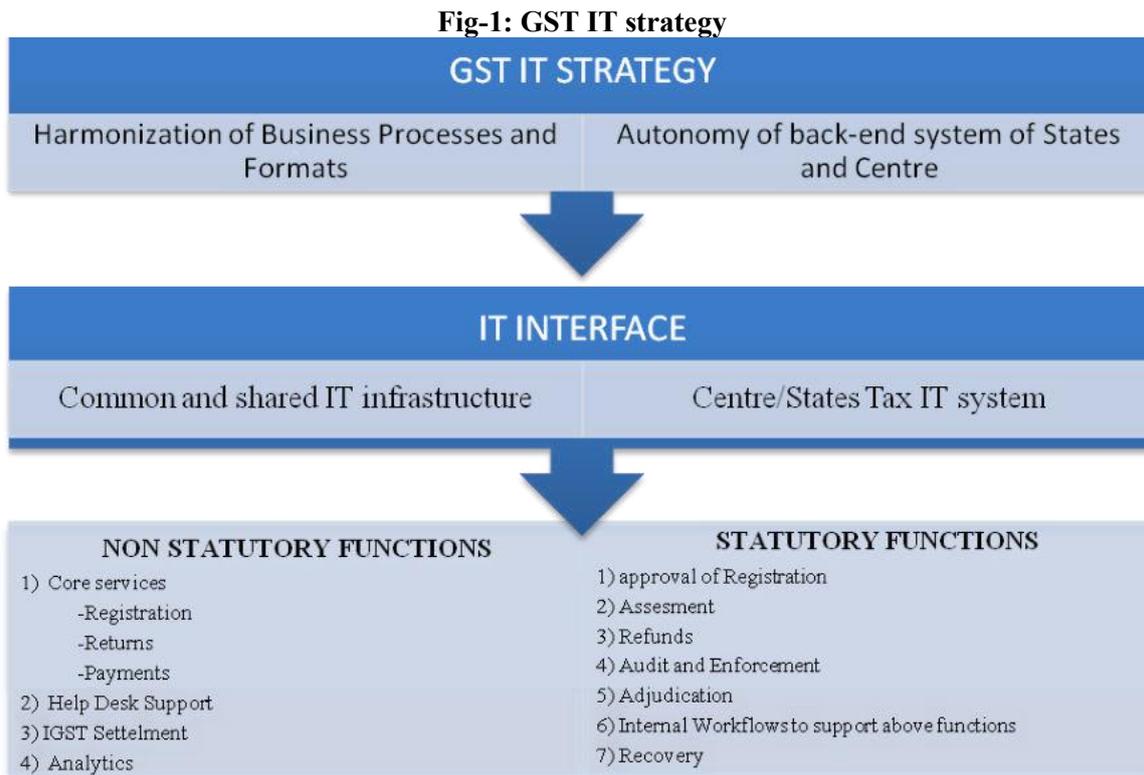
A Goods and Service Tax Network (GSTN) has been constituted as Special Purpose Vehicle (SPV) in August 2012. NSDL is providing service to this GSTN.

Goods and Services Tax Network (GSTN) was formed as a Section 8 (under new companies Act, not for profit companies are governed under section 8), non-Government, private limited company. It was incorporated on March 28, 2013. The Government of India initially had 24.5% equity in GSTN and all States of the Indian Union, including NCT of Delhi and Puducherry, and the Empowered Committee of State Finance Ministers (EC), together held another 24.5%. Balance 51% equity was with non-Government financial institutions. The

Company has been set up primarily to provide IT infrastructure and services to the Central and State Governments, taxpayers and other stakeholders for implementation of the Goods and Services Tax (GST). The Authorized Capital of the company is Rs. 10,00,00,000 (Rupees ten crore only).

**1.2 Role of GSTN**

Aptly remarked as “Technology backbone for GST in India”, GSTN is a linking pin between tax officials and ultimate tax payers. Creation of common and shared IT infrastructure for functions facing taxpayers has been assigned to GSTN and these are filing of registration application, filing of return, creation of challan for tax payment, settlement of IGST payment (like a clearing house), generation of business intelligence and analytics. All statutory functions to be performed by tax officials under GST like approval of registration, assessment, audit, appeal, enforcement etc. will remain with the respective tax departments (www.gstn.org). The diagram below shows the work distribution.



**2. LITERATURE REVIEW**

**Silpa P. et al., (2018)** in his study on the topic “An introduction to E-way bill; a game changer of the Indian economic system” emphasized on the positive outcome of E-way Bills. Researchers are of the view that if the system of E-Way bills is implemented as planned, will reduce the documentation and lead to faster movement of goods unlike VAT way bills. They also highlight the significance of RFID (Radio Frequency Identification Device). This device helps in mapping and verification of E-way bills when attached with the vehicle.

**Sivashankari K., (2018)** anticipates for Indian logistics industry to develop at CAGR of 15%-20% between 2016 to the budgetary year 2020. In his paper he concludes that there will be positive impact on companies dealing in logistics and negative for shipping owners.

**Dr Shakir shaik, Dr S.A. Sameera & Mr S.K.C. Firoz(2015)** in their study on the topic "Does Goods and Service tax (GST) leads to Indian economic Development” concludes that GST will have both positive and negative impact on the Indian economy. They are of the opinion that foreign trade and logistics will show gradual growth with the passage of time after implementation of GST in India.

“GST Impact Analysis: on various sectors” conducted by **Mercurius Advisory Services (2017)** compares the supply and distribution models before and after implementation of GST. It reports efficient supply chain restructuring in the business and predict lower distribution and transportation costs in future. However, it also warns of higher compliance charges to be incurred by e-commerce sector.

“**The E-way Bill System: How, what and what next?**”(2016). Retrieved from <https://www.pwc.in/research-insights/2018/the-e-way-bill-system.html> hails GST E-way Bills for increase in the collection of tax and rise in revenue. The researcher finds it too early to comment on the success or failure of the system.

The website of **National Informatics Centre (NIC)** highlights GST E-Way Bills as a tool to reshape the logistics industry by making the transport of goods and services easier and faster. Transparency in the taxation system will be brought with the digitalization of documentation.

**3. RESEARCH GAP**

Since GST is new for the Indian economy, there is huge inadequacy of literature on the concerned topic. Concept of Electronic way bill is not very much popular among the mass. A very few studies have been done that focuses on this emerging topic. Attempt has been made to fill the gap and clarify the mechanism of e way bill in simple language.

**4. RESEARCH OBJECTIVES:**

1. To discuss the concept and role of E-Way Bill in digitalized taxation practice
2. To investigate the IT strategy and role assigned to GSTN
3. To report the present status of online billing and logistics in India.

**5. RESEARCH METHOD**

The present research paper is descriptive in nature.

Secondary data available in form of research papers, reports, news papers articles, rules, notifications issued by the government is thoroughly examined. Electronic data from various websites have been taken with due credit to fulfill the objectives of this paper.

**6. DISCUSSION AND FINDINGS**

E-way bill is not an entirely new billing system. Under the VAT regime, road permit or way bill serve the same purpose as of E-way Bill. The main highlight of the e-way bills is its electronic generation and tracking system. This electronic billing system provides for Radio Frequency Identification Device (RFID) which tracks the movement of RFID embedded vehicles. As per the new notification issued by the department, there will be automatic calculation of the distance between the supplier and recipient on the basis of their pin code provided.

E-way bill has the status of documentary evidence of a transaction of value more than Rs. 50,000/-. A GST registered person (Consignor, consignee, transporter) cannot engage in movement of goods within the state or outside without electronically generated bill from the [ewaybillgst.gov.in](http://ewaybillgst.gov.in). Alternatively, GST Council has also provided the facility to generate E-Way bills through SMS, android app or site to site integration. Few exceptional cases have also been mentioned in the act in which there is no requirement of generation of electronic bills. In case of composition traders E-way bills shall not be generated as they are barred from inter-state movement of goods.

During the study it has been found that there is lack of knowledge and awareness about GST E-way bill among the traders and transporters. This is mainly because of low literacy rate and lack of self motivation towards tax compliance. Major updates and changes need to be communicated properly to the tax payers so that they could update their working system and knowledge.

➤ **CURRENT STATUS**

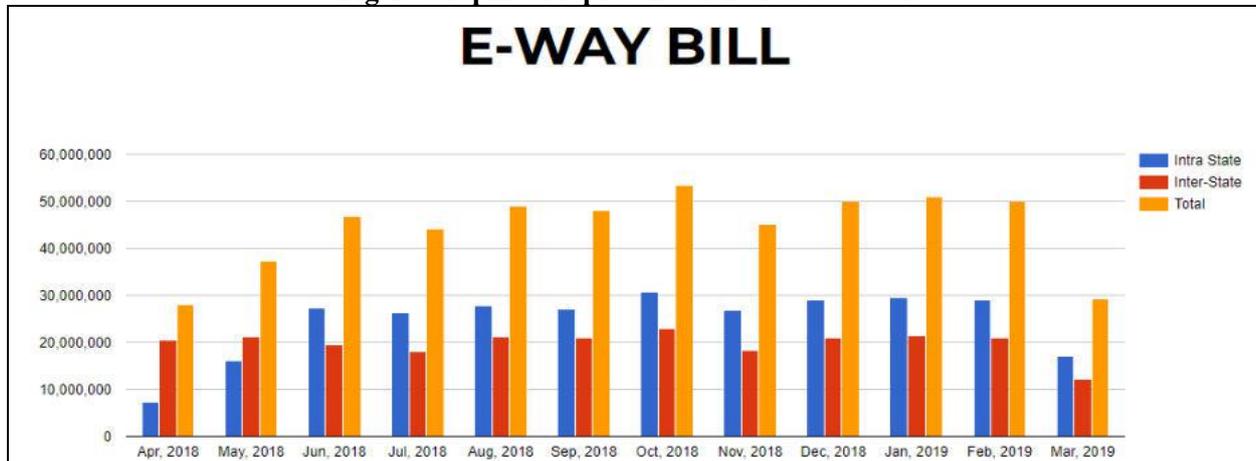
It has been found that there is a significant rise in the generation of E-way bills after the system has been implemented in the country. The figure mentioned below shows that intra state movement of goods have been accounted more with the passage of time while inter-state movement of goods show an irregular pattern of rise and fall. Maximum intra-state and inter -state movement of goods was accounted in the month of October, 2018 with number of bills generated rising to 30,651,459 for intra-state and 22,856,671 for inter-state transactions, respectively. Whereas, least number of transactions were recorded in March, 2019. Below mentioned table shows the total number of E-way bills generated within the stipulated time:

**Table-1: E-Way bills generated:**

<b>Month, Year</b>	<b>Intra-State</b>	<b>Inter-State</b>	<b>Total</b>
April, 2018	74,377,665	20,558,339	27,996,004
May, 2018	16,100,890	21,130,776	37,231,666
June, 2018	27,273,991	19,491,208	46,765,199
July, 2018	26,221,010	17,989,426	44,210,436
August, 2018	27,783,011	21,168,113	48,951,124
September, 2018	27,074,491	21,039,539	48,114,030
October, 2018	30,651,459	22,856,671	53,508,130

November, 2018	26,745,667	18,316,758	45,062,425
December, 2018	28,924,054	21,054,452	49,978,506
January, 2019	29,565,228	21,452,244	51,017,472
February, 2019	29,057,120	20,978,733	50,035,853
March, 2019	17,096,321	12,265,424	29,361,745

Fig-2: Graphical representation of above table:



(Source: <https://www.gstn.org/>)

## 7. CONCLUSION

### 7.1 Problems to be resolved

On the event of “One Year journey of GST” organized by Federation of Indian Chambers of Commerce and Industry (FICCI), Finance Secretary Hasmukh Adhia admitted that there were some teething problems while implementation of GST. Earlier, Telangana Principal Secretary (Commercial Taxes and Excise) Somesh Kumar, too, raised certain technological glitches in the GST network that need to be resolved. He said: "Though there are issues and concerns like invoice- matching which was one of the highlights of GST, the GST network has not been able to provide this facility. We also want to do lot of data analytics in Telangana but we do not get the full data as we would like from the GSTN." Somesh Kumar further said that "if there is any criticism of GST it is not on GST per se, it is on GSTN, and its inability to respond to various problems" as reported by Business Today.

### Challenges may include

- Lack of data available in the required formats
- Difficulty submitting data
- Inefficient processes for transforming data
- Lack of process support for new data requirements
- Outdated tax operating models
- More frequent need for more comprehensive analytics, in advance of submission to tax authorities
- Inability to respond to audit notices in a timely or effective manner
- Inability to respond quickly when there is disagreement with a tax assessment

### 7.2 Forthcoming changes in E-way Bill system:

As per the government’s latest notification (dated: 25.03.2019) following changes will be done to for the effective implementation and monitoring of GST E-Way Bill system:

1) **One invoice, one E-way bill:** There will be only one e-way generated for each invoice. This change is brought by the recommendation given by transporters. Now, neither consigner or consignee nor the transporter can generate multiple e-way bills on behalf of an invoice.

2) **Automatic calculation of route distance:** Now, e-way bill system will auto calculate the distance between the supplier and the recipient based on their pin code. This system will predict the time involved in each transaction and eliminate ambiguity. Various attributes like type of road, traffic condition, average speed, travelling direction etc will be considered before automatic generation of route distance.

3) **Extension of EWB in case consignment is in transit:** When the consignment is in transit i.e. either it could be on road or in warehouse, it will be considered to be 'consignment in-transit'. It is to be chosen by the dealer whether the Consignment is in Transit or in Movement. On selection of In Transit, the address details of the transit place need to be provided. On selection of In Movement the system will prompt the user to enter the Place and Vehicle details from where the extension is required.

4) **NO EWB for composition dealers:** GST Act prohibits dealers, who have opted for composition scheme, to enter in inter-state transactions. Thus, as per the new notification by the department, no e-way bill will be generated for composition dealers. This rule shall be implemented from the new version of the system.

Thus, it can be concluded that GST E-way bill is a commendable step towards digitalization of tax system and compliance. There are many positive sides of Electronic bill generation system as it promises to make logistics industry more advanced in its operation. A lot is expected by the public but it is matter of time that how well it gets executed. Till date no major issues or loopholes in the system has been detected. It can be expected that E-way bills will lead Indian logistics and transport industry to the path of digitalization.

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**REGIONAL SPREAD AND HEALTH OF MICROFINANCE INSTITUTIONS POST  
DEMONETIZATION IN INDIA****Himanshu<sup>1</sup> and Sumit Bansal<sup>2</sup>**Research Scholar<sup>1</sup>, Department of Management Studies, Indian Institute of Technology, Roorkee  
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**ABSTRACT**

*The microfinance sector in India is growing at an exponential rate. Demonetization announced by the government has been challenging for this sector. It has affected the regional spread and health of microfinance institutions (MFIs) in the country. This paper aims to examine the regional disparities in the client outreach and gross loan portfolio, and the health of MFIs post demonetization. The paper is based on the trend analysis of secondary data collected from various published sources. The paper finds that post demonetization, the growth rate in client outreach and gross loan portfolio (GLP) has declined. The domination of Southern region and subservient of Northern and Northeastern regions in client outreach and GLP reflect regional disparities which exist even after demonetization. The demonetization move has also adversely affected repayment rates and portfolio at risk of MFIs drastically. This reflects bad health and sub-standard performance of MFIs. This study recommends that MFIs should equally cover all regions of the country to achieve operational sustainability.*

*Keywords: Microfinance, gross loan portfolio, demonetization, portfolio at risk, repayment rates.*

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**1. INTRODUCTION**

The Government of India announced the demonetization drive in November 2016 which created turbulence in the economy. The government of India withdrew 500 and 1000 rupees notes from circulation. Demonetization affected various sectors in different degrees. One of the such sectors is microfinance which was shattered badly by demonetization. However, this impact has not gained significance in overall discussion on demonetization drive. The CEO of Microfinance Institutions Network reported that delinquencies due to demonetization may require MFIs to write-off 7 per cent of total loan portfolio i.e. over Rs 1 lakh crores (Mondal, 2017). Demonetization has created disruptions, not only in the services provided by microfinance institutions (MFIs hereinafter), but also in the businesses of clients of MFIs.

Microfinance acts as a mechanism for offering financial services to the poor and deprived. Poor people have no access to the formal financial system. As a result, they tend to rely extensively on informal credit markets for their financial needs, that typically operate unregulated and unmonitored by government agencies and beyond the purview of codes of law, which make them highly risky. Therefore, in order to meet the substantial demand created by low-income micro-entrepreneurs for formal and dependable financial institutions, the first seeds of microfinance was sowed during the period between 1950-1980 (Sundaresan, 2008), with the purpose of eliminating poverty in regions where there is an unreasonable gap in the demand and supply of financial services by providing loans in small amounts to the vulnerable class who did not possess sufficient collateral. Microfinance was pioneered by institutions such as the Grameen Bank in Bangladesh, ACCION International in Latin America, and Self-Employed Women's Association (SEWA) Bank in India (Sundaresan, 2008). The Grameen Bank, established by Dr. Mohammad Yunus in 1983, started offering financial services to the poor women in Bangladesh. This bank received Nobel Prize in the year 2006. Grameen bank remains to be one of the most prominent and successful MFIs in the world. The model has been replicated in numerous nations including India.

**The Concept of Microfinance in India**

The evolution of microfinance sector in India dates back to 1980s when Self Help Groups (SHGs hereinafter), kind of informal groups that used to pool small savings and to lend them to the needy. The tremendous growth of the sector makes it a multi-billion-dollar industry. NABARD (National Bank for Agriculture and Rural Development) and SIDBI (Small Industries Development Bank of India) provide majority of the financial resources to microfinance sector in India.

Microfinance is a form of banking service that is extended to low-income or unemployed people who do not have access to financial services due to inadequate collateral and complexity involved. The National Task Force constituted by NABARD (1999) has defined microfinance as "the provision of thrift, credit and other financial services and products of very small amounts to the poor in rural, semi-urban or urban areas for enabling them to raise their income levels and improve living standards". In the contemporary scenario, the scope of financial

services under microfinance is not limited to credit disbursement, but it also encompasses other services such as insurance services, micro pension, and micro remittance etc.

## **2. RATIONALE AND SCOPE OF THE STUDY**

The India Microfinance Industry is growing at an exponential rate in the recent time. It has a gross loan portfolio of Rs 55,061 crore for the year ended March 2018 compared to Rs 46,842 crore for the year ended March 2017. However, the compelling feature of this growth is that there are regional disparities in the concentration of MFIs in the country. The studies and the reports examining the growth of Indian microfinance highlight that the MFIs are mainly concentrated in southern part of India. Out of the total client base of 295 lakh, the respective contribution of Southern part alone is 38%, which is followed by Eastern part with 25%, Central part with 19%, and Western part with 9%. The least client base is observed in Northern and North-eastern with 6% and 3% respectively (The Bharat Microfinance Report, 2017). The post demonetization period has been challenging for the microfinance sector in India. The microfinance sector witnessed disruption in its business as the clients primarily use cash for transactions. MFIs faced a reduction in their repayment rates, with several prominent MFIs reporting Portfolio at Risk (PAR) over and above 10%. MFIs having significant exposure in states of Madhya Pradesh, Maharashtra, Uttar Pradesh, Karnataka, and Uttarakhand continue to experience problems in their loan portfolios (The Bharat Microfinance Report, 2017). Demonetization also emphasized digital transactions (Balaji and Balaji, 2017). In December 2017, only after 1 year from demonetization, the volume of digital transactions crossed 1 billion (Reserve Bank of India). The shift towards digital transactions may affect the regional disparities in the concentration of MFIs in the country. In the recent years, there has been a steady shift in client outreach and loan portfolios of MFIs towards other states. The MFI client outreach has registered an intensive growth in the states of Assam, Gujarat, Jharkhand, Bihar, and Madhya Pradesh. Hence, there is a need to examine the penetration and the health of MFIs in different regions post demonetization.

The study is based on MFIs in India. It covers three financial years: the financial year (FY) before demonetization (2015-16), the FY in which demonetization took place (2016-17) and the FY after demonetization (2017-18). The FY 2018-19 is not considered because the data for the financial year ending March 2019 is not available.

## **3. LITERATURE REVIEW**

Nerkar (2016) observed that it was unlikely to eliminate black money and to fight parallel economy. Dasgupta (2016) provided a theoretical analysis of demonetization and concluded that demonetization would not seem to provide benefits in short-term and medium-term scenario. It would be less likely that economic variables such as demand and goods and services move in a healthy direction. Balaji and Balaji (2017) studied the impact of demonetization on cashless transactions and concluded that it has a significant positive impact on cashless transactions. Ghosh (2017) reported that demonetization would lead to the contraction in unorganized and organized sectors. It destroyed the low skilled jobs. Samuel and Saxena (2017) highlighted that demonetization would be beneficial in the long run. It would lead to increase in tax revenue of the government which can be used for new projects of national importance. Goel (2018) stated that demonetization has several positive effects such as eliminating staked up money, improving governance, and purifying financial system. Sethi et al. (2018) contended that demonetization has adverse effects on cash in hand and money supply, thus pressurizing investments and development across different sectors.

Zerai and Rani (2012) found that operational sustainability of MFIs was positively related to breadth of client outreach. Rupa (2014) reported that Indian MFIs had higher financial performance, as they had lower operating expenses and higher financial revenue by assets.

Champatiray et al. (2010) revealed that the Southern region dominated in terms of access to microfinance services which accounts for 54% of all microfinance loan portfolios and 52% of all microfinance clients. In contrast, microfinance sectors were underdeveloped in the Central, Northeastern, and Northern regions, accounting for 2%, 2%, and 8% of loan portfolio and 3%, 3% and 9%, of client outreach respectively. Nasir (2013) observed that the progress of microfinance programme in India had been seen in those areas where formal financial institutions were growing exponentially. The spread of microfinance programme was larger in four southern states such as, Tamil Nadu, Andhra Pradesh, Kerala, and Karnataka, while it was negligible in northern states and north-eastern states. Goyal (2013) found that MFIs are heavily concentrated in small regions. This results in glaring regional imbalances in access to their products. Regions and states which have some of the highest indices of poverty and lack of banking infrastructure ironically have one of the lowest MFIs' penetration. Mittal (2014) overviewed the progress of microfinance programme in India by examining number of Self-Help Groups (SHGs) with outstanding loan. She highlighted that the numbers of SHGs with

outstanding loan were highest in Andhra Pradesh in 2013, followed by West Bengal, Tamil Nadu, Orissa, and Karnataka. There were only a few SHGs with outstanding loan in Bihar, Madhya Pradesh, and Kerala. It was concluded that there were regional disparities in the progress of the programme across the country.

Laha and Kuri (2015) analyzed variations in microfinance among different states of India. They found that the outreach of the SHG-Bank linkage program is much widespread in southern region, specifically Kerala and Tamil Nadu; more than 100 percent of the poor households have been covered under microfinance program. The outreach of microfinance program to poor households was higher in states like Tamil Nadu, Kerala, Andhra Pradesh, Karnataka, and Himachal Pradesh. Of these states, three southern states (Tamil Nadu, Kerala, and Andhra Pradesh) outstrip in outreaching microfinance program to the most vulnerable sections. Saraf (2015) used OLS regression to find out possible justification for concentration of MFIs in southern states and highlighted that presence of MFIs in southern states had a significant and positive correlation with wealth and past history of those states and female literacy rates had mixed effects in different states. Ray and Mahapatra (2016) collected data on the penetration of MFIs from 26 states and 4 union territories and suggested that MFIs were dominant in states which had good rural infrastructure, and were relatively richer but devoid of adequate banking facility. Kanjilal (2016) compared the district-level data on microfinance institutions of north-eastern and southern states and observed that an anomaly exists in the penetration of MFIs in north-eastern states, nevertheless the factors promoting the growth of MFIs were present in similar capacity in both southern states and north-eastern states. Socio-cultural and political background of the states might create a such difference. Dhar (2016) constructed a state-wise microfinance penetration index and reported that there was an uneven distribution in microfinance services, which were mainly concentrated to southern part of India, while north and north-eastern part had not access to these services.

Many studies show the concentration of MFIs in southern region and to some extent in western region. There are very few studies which examine the regional disparities in the client outreach and spread of loan portfolio of MFIs post demonetization, and also the health of MFIs post demonetization.

#### **4. OBJECTIVES AND RESEARCH METHODOLOGY**

- To examine the regional disparities in the client outreach of MFIs post demonetization.
- To examine the regional disparities in the spread of loan portfolio of MFIs post demonetization.
- To assess the health of MFIs by analyzing loan portfolio at risk post demonetization.

This study is based on the trend analysis of secondary data which is obtained from various sources such as The Bharat Microfinance Report, MFIN Micrometer Report, Government publications, NABARD reports, articles in newspapers, and various published sources on microfinance.

#### **5. FINDINGS AND DISCUSSION**

The study analyzed data for the financial year end of three financial years: the FY before demonetization (2015-16), the FY in which demonetization took place (2016-17) and the FY after demonetization (2017-18). FY 2015-16 and FY 2016-17 were considered to know about the changes that took place post demonetization.

##### **Regional client outreach of MFIs**

Total client base of MFIs as on 31 March 2016, 31 March 2017, and 31 March 2018 stood at 399 lakhs, 295 lakhs, and 281 lakhs respectively. The growth rate in client outreach decreased by 26.06% in March 2016-March 2017 period and by 4.74% from March 2017 to March 2018. The reason for decrease in growth rate is that 6 MFIs have been converted into small finance banks. It is also likely that consecutive fall in growth rate is attributable to demonetization effect.

In figure 1, there is a clear indication of regional disparities in client outreach of MFIs. MFIs are mainly concentrated in Southern region. MFIs have moderate outreach in Eastern, Western and Central regions. The least client outreach can be observed in Northern and Northeastern regions.

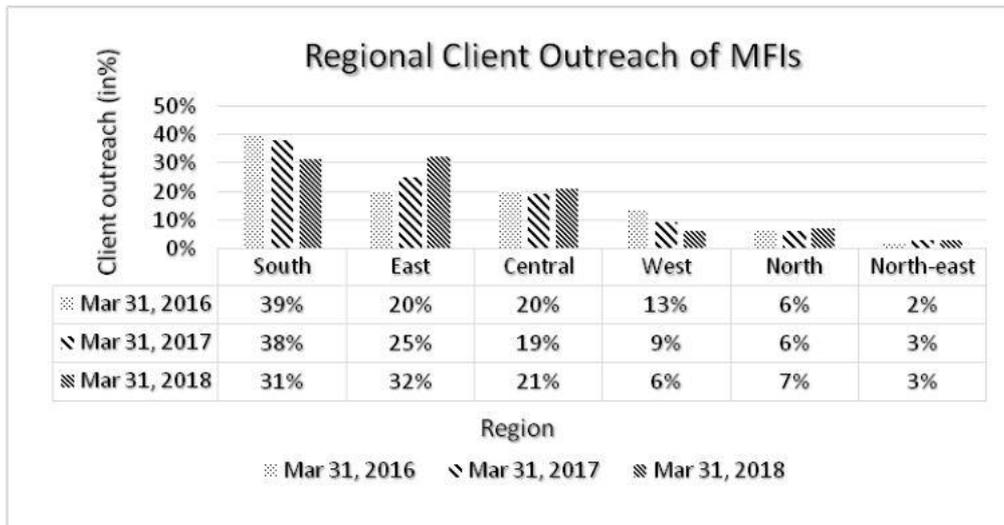


Figure-1: Regional Client Outreach of MFIs

Source: Numerical data was taken from The Bharat Microfinance Report

Post demonetization, the client base in Southern and Western regions declined from 39% to 38%, then to 31% and from 13% to 9%, then to 6% respectively. However, Eastern region witnessed upward growth in client base from 20% to 25%, then to 32%. There was a meagre change in clients served in Central, Northern, and Northeastern regions. It seems that MFIs are shifting their focus on clients served from Southern and Western regions to Eastern region.

**Regional spread of MFIs’ gross loan portfolio**

The Gross loan portfolio (GLP hereinafter) of MFIs as on 31 March 2016, 31 March 2017, and 31 March 2018 stood at Rs. 63853 crores, Rs. 46842 crores, and Rs. 55061 crores respectively. The growth rate in GLP decreased by 26.64% from March 2016 to March 2017. The main contributing factor for decrease in growth rate is conversion of 6 MFIs into small finance banks. Although GLP rose from March 2017 to March 2018, it was still lower as compared to GLP in March 2016. One of the reasons for fall in GLP may be demonetization effect.

In figure 2, post demonetization, the GLP of MFIs witnessed an upward trend in Eastern region. In Southern region, GLP increased in March 2017 but declined in March 2018. GLP of MFIs in Western region faced a downward trend. There was a very little change in GLP in Central, Northern, and Northeastern regions.

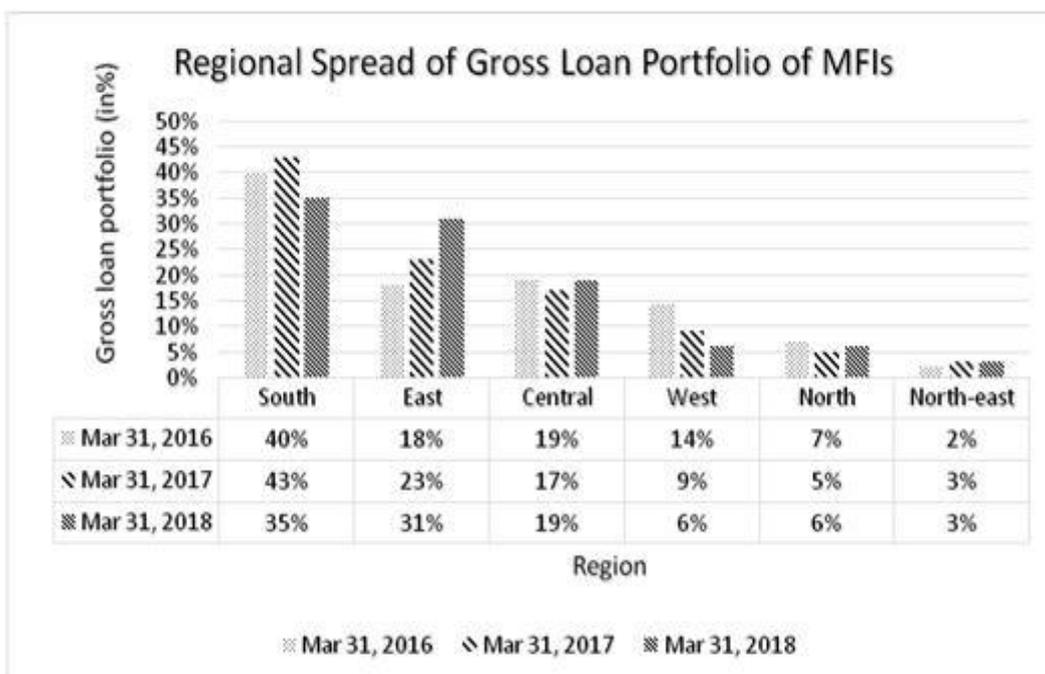


Figure-2: Regional Spread of Gross Loan Portfolio of MFIs

Source: Numerical data was taken from The Bharat Microfinance Report

It seems that MFIs are also shifting their position of GLP from Southern and Western regions to Eastern region. However, the domination of Southern region and subservient of Northern and Northeastern regions in all years reflect regional disparities which still exist post demonetization.

#### Health of MFIs by analyzing loan portfolio at risk

The loan portfolio is the main revenue yielding asset for MFIs. As mentioned in The Bharat Microfinance Reports 2016 and 2017, it also provides information about the health of MFIs. The trends of loan portfolio at risk are analyzed to gauge the health and performance of MFIs. The data on portfolio at risk (more than 30 days and more than 90 days) of MFIs for top 15 states in terms of Gross Loan Portfolio (GLP) was analyzed for the March 2016, March 2017, and March 2018, shown in table 1 and table 2.

**Table-1: Portfolio At Risk more than 30 days of MFIs (in %) for top 15 states in terms of Gross Loan Portfolio**

States	March 31, 2016	March 31, 2017	March 31, 2018
Tamil Nadu	0.21	14	1.5
Karnataka	0.49	18	3.7
Maharashtra	0.29	28	10.4
Uttar Pradesh	0.39	37	10.8
Madhya Pradesh	0.46	17	6.3
West Bengal	0.18	14	1.1
Bihar	0.22	3	0.8
Gujarat	0.53	16	*
Kerala	0.10	1	2.7
Odisha	0.09	1	0.6
Haryana	0.38	22	10.5
Rajasthan	0.64	11	3.7
Punjab	0.19	16	5.9
Assam	0.07	1	0.9
Jharkhand	*	10	3.4

Source: MFIN Micrometer Reports

\*Data was not available

Table 1 shows that portfolio at risk (PAR hereinafter) more than 30 days has increased significantly in most of the 15 states after demonetization. Because of cash crunch, the riskiness of loan portfolio might be increased. The expectation of riskiness of loan portfolio in some states came down in a financial year after demonetization. However, in March 2018, PAR more than 30 days was still higher in states such as Maharashtra, Uttar Pradesh, Madhya Pradesh, Haryana, and Punjab. These findings show the bad health and performance of MFIs in these states.

**Table-2: Portfolio At Risk more than 90 days of MFIs (in %) for top 15 states in terms of Gross Loan Portfolio**

States	March 31, 2016	March 31, 2017	March 31, 2018
Tamil Nadu	0.11	2	1
Karnataka	0.33	12	3.2
Maharashtra	0.19	20	9.7
Uttar Pradesh	0.23	14	8.4
Madhya Pradesh	0.30	9	5.1
West Bengal	0.13	4	0.9
Bihar	0.14	1	0.5
Gujarat	0.33	9	*
Kerala	0.06	1	1.8
Odisha	0.06	0.3	0.4
Haryana	0.20	11	8.4
Rajasthan	0.47	5	2.8
Punjab	0.13	5	4.4
Assam	0.04	0.3	0.7
Jharkhand	*	5	2.9

Source: MFIN Micrometer Reports

\*Data was not available

Table 2 shows that PAR more than 90 days has also increased in majority of 15 states after demonetization. But the increase was less than increase in PAR more than 30 days. It reveals that majority of loans overdue by 30 days as compared to overdue by 90 days. PAR more than 90 days decreased in March 2018 except few states which were same as in case of PAR more than 30 days. The results reveal that MFIs continue to experience worse repayment rates which adversely affect their health.

## 6. CONCLUSION AND RECOMMENDATIONS

Demonetization was an unanticipated event for the microfinance sector. It has given severe blow to the MFIs. It has damaged the repayment behavior and credit discipline culture of MFIs which is necessary for their survival. It is concluded that the demonetization move has negative effects. Post demonetization, the growth rate in client outreach and gross loan portfolio (GLP) has declined. It seems that MFIs have been shifting their focus on client outreach and their GLP from Southern and Western regions to Eastern region. The domination of Southern region and subservient of Northern and Northeastern regions reflect regional disparities which still exist post demonetization. The demonetization move has also adversely affected repayment rates drastically. PAR more than 30 days and 90 days has increased in majority of the states. It reflects bad health and sub-standard performance of MFIs.

As the study is limited to three years, future research could examine the regional disparities and health of MFIs by taking data for a large number of years. It is recommended that MFIs should equally cover all regions of the country to achieve operational sustainability. The basic motive of microfinance is to provide financial services to under-served. It cannot be achieved until MFIs understand their roles in extending their ambit to under-served regions so as to eliminate regional disparities.

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**AN IMPACT OF GST ON COMMON MEN (WITH SPECIAL REFERENCE TO DELHI REGION)**

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**ABSTRACT**

*There are different sorts of duties winning in our nation under an umbrella of direct assessment and backhanded expense, for example, pay charge, blessing charge, capital addition ta(CGT), security exchange charge, perquisites charge, corporate assessments, deals charge, administration charges, esteem included charges, extract duty, octroi and custom obligation, proficient assessment, civil charges, riches charges, amusement charges and so forth. The introduction of new arrangement of tax assessment framework in india i.e. GST has supplanted all the roundabout assessments, for example, administration tax(ST), extract obligation aside from custom obligation." The present research paper is an endeavor to examine idea of merchandise and administration duty and its effect on Indian economy.*

*Keywords: ST, GST, VAT, impact of GST, CGT, GST rates.*

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**INTRODUCTION**

Tank was brought and came into power into the Indian tax collection framework from 1 April 2005. Esteem included expense is a noteworthy improvement over the nearby deals charge.

At the state level, the merit of tank is that it is a multi-arrange charge with change for duty paid on buys and it anticipates repeating tax collection of a similar item. In spite of the accomplishment of tank framework, there are as yet certain restrictions in the structure of tank both at focal and state level too. To explain the issues immaculate by VAT the then Finance Minister Pranab Mukherjee while introducing the spending limit on July 6, 2009, said that GST would become effective from April 2010, however at this point it is the period of GST which is appearing from April 2017.

The merchandise and enterprises Tax (GST) can so be an extra significant improvement towards a thorough income upgrade changes inside the nation.

Reconciliation of items and administrations tax assessment would give India a world class legitimate framework and improve charge accumulations.

It would complete mutilations of differential medications of creating and fix part.

It will cause the finish of expenses like obligation, focal deals charge, state level deals charge, passage charge, stamp obligation, telecom permit charges, turnover charge and so on. GST is anticipated to shape a business amicable environment, as value levels and thus swelling rates would descend additional time as a uniform duty rate is connected.

It will moreover improve government's business undertaking wellbeing in light of the fact that the gathering framework would turn into extra clear, making delinquency extreme.

**MEANING OF GST**

The item and administrations charge (GST) might be an extract charge required on most merchandise and enterprises sold-out for residential utilization.

The duty is required to supply income for the focal.

The GST is paid by customers, however it is required and dispatched to the legislature by organizations selling the products and enterprises.

GST is one tax assessment for the whole country, which will make India one bound together basic market.

GST might be a tax collection on the arrangement of items and administrations, directly from the maker to the buyer.

Credits of info charges paid at each stage will be accessible in the consequent phase of significant worth expansion, which makes GST basically an expense just on esteem expansion at each stage.

The last customer can along these lines bear exclusively the GST charged by the last seller inside the offer chain, with set-off advantages at all the past stages.

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**ADVANTAGES OF GST**

1. GST is a straightforward Tax and furthermore lessen quantities of circuitous assessments.

With GST authorized a business premises will demonstrate the assessment connected inside the business receipt.

Client will know precisely how much assessment they are paying on the item they purchased or benefits they expended.

2. GST won't be an expense to enlisted retailers in this way there will be no shrouded duties and the expense of working together will be lower. This progressively can encourage Export being a ton of aggressive.

3. GST can likewise help to enhancement of salary hotspots for Government other than pay duty and oil charge.

4. Under Goods and Services Tax, the taxation rate will be separated similarly among Manufacturing and administrations.

This should be possible through lower charge per unit by increment resources and lessening exceptions.

5. Under the arrangement of GST, both state GST and focal GST will be charged on the expense of assembling and gathered on purpose of offer. This will in the end give the advantages to the general population as costs will descend that thusly will help the corporates as utilization will increment.

6. Incredible advantage will be that various expenses like octroi, focal deals charge, state deals charge, passage charge, permit expenses, turnover charge and so forth will be dispensed with and all such duties will go under a one umbrella called GST. With GST, doing any business will currently be simple and agreeable in light of the fact that the same number of concealed assessments will be absent.

**DISADVANTAGES OF GST**

1. It is being discovered that Critics additionally rotating round over the GST framework and it is being imagined that it would affect adversely on the land advertise. It would mean 8 percent to the expense of new homes and lessen request by around 12 percent.

2. Some Economist says that SGST, CGST are only new names for Central Excise/Service Tax, VAT and CST and henceforth GST gets just the same old thing new this.

**OBJECTIVES OF THE STUDY**

1. To investigation the effect of GST on the basic men in Delhi and NCR area.

2. To discover the impact of GST on the pay of center and lower white collar class regular people.

3. To Study the impression of everyday citizens over the GST arrangement of the Govt in numerous issues, for example, Food, Clothes, Houses, Aviation and so on.

**RESEARCH METHODOLOGY**

The study is based on the primary data where the most of the areas of Delhi were covered and Survey was conducted and questionnaire was being taken from the people over their perception regarding GST policy of the government.

Sample Size:- More than 500 persons from different places of Delhi is considered in the form of the sample size.

**FOOD PROCESSING INDUSTRY**

The sustenance preparing industry can inhale simple as bundled nourishment things might be exempted from the proposed Goods and Services Tax (GST). At Current, handled sustenance products(PFP) are exempted from focal extract, however most states demand Value Added Tax (VAT) on these.

Certain bundled nourishment things may be placed in the exempted class, said an account service official. He said the administration may need to excluded these products from obligation in GST, on fears that exacting it even at the lower rate of 12 percent (6 percent each for the Center and the states) could fuel swelling.

Prepared leafy foods, prepared to-eat nourishment, solidified sustenance, bread shop items, infant nourishment, curd, spread milk, tea, ketchup, refreshment and noodles, among others, go under the bundled nourishment class. On a portion of these things, numerous states are as of now collecting assessment at a rate lower than the one endorsed by the Empowered Committee (EC) of state fund clergymen. For example, Tamil Nadu charges pastry shop items at 4 percent, rather than the 12.5 percent affirmed by EC. Maharashtra likewise requires 4

percent expense each on semi-handled natural product/meat and dry organic products, though the EC-endorsed rate is 12.5 percent. Most states demand 4 percent VAT on tea, rather than the affirmed 12.5 percent rate.

Examiners, in any case, think saddling prepared nourishment in GST at a lower rate would not have much effect on costs. The Center is taking a gander at a solitary rate of 16 percent in three years from the date of presentation of GST. The products like virus drinks, which are saddled at 12.5 percent, by the states may not be affected much, however natural product juices, tea, consumable oil, which are burdened at 4 percent, will be hit whenever exhausted in GST.

"I think from future point of view we ought to have two rates — a legitimacy rate and a concessional rate, which is lower than 12 percent. Items which are not expose to focal extract but rather pull in VAT may go under the lower rate in GST".

Made nourishment items establish around 12 percent of the Wholesale Price Index (WPI) crate. The Rs5,45,000-crore sustenance handling industry includes around eight percent of the nation's GDP. It is assessed to achieve a dimension of Rs8,73,000 crore by 2014-15.

At present, 350 things are exempted by the Center, while states have avoided 99 things. A joint gathering of the Center and states will work out a rundown of things to be exempted. The Center may want to keep some different products exempted from extract obligation under the zero-charge classification in GST. Power: GST is said to have negative effect on power, GST is relied upon to blow up power costs by up to eight percent as the administration has chosen to keep power out of the circle of this new assessment administration.

**Power manufacturing corporations:-** - each sustainable and customary - would need to be constrained to pay GST for his or her data sources like fuel and apparatus anyway won't almost certainly get these charges discounted, given that their yield - power - is absolved.

This greater expense of delivering power will at that point be passed on to customers under the "difference in law" proviso in power buy understandings (PPA).

Designers mercantilism power inside the wares advertise or on a non-PPA premise would need to be constrained to consider the upper cost.

### **WORK CONTRACTS**

GST has Positive effect GST tries to give truly necessary clearness on works contracts, and accordingly, on the designing, procurement and development (EPC) business line. Works contracts are proposed to be burdened as "administrations".

This implies the GST rate and arrangements, similar to place of supply rules, as material on administrations will apply to works contracts.

The significant addition from this treatment is that the expense would be right now charged on the specific composed agreement base.

Additionally, nearby versus between state works gets, that at present prompts endless question, ought to get disposed of.

Thus, EPC contract costs should return fairly by virtue of this new assessment proficient structure, that progressively should benefit venture property holders.

### **CEMENT INDUSTRY**

GST has positive effect on bond industry, Cement is a vital contribution to the infra area, and GST is relied upon to affect it decidedly. The overall indirect charge rate is at present evaluated to associate with 25 for every cent. The bond exchange is also expected to gain from lower costs of supply. Overall, a diminishing in concrete costs is normal.

### **LOGISTICS**

GST has positive effect on coordinations industry The GST is relied upon to empower a decrease in coordinations cost by as much as 20 percent to 30 percent, as firms reconfigure their supply chains on four tallies. To start with, as Asian Nation ends up one gigantic market, there'll be bigger anyway less distribution centers.

Also, it will prompt a bigger number of greater trucks on streets as there is more prominent appropriation of the center point and-talked model.

Third, these progressions can result in bigger economies of scale for transport administrators and result in extra firms re-appropriating their supply tasks. Four, decrease in pausing and sitting time at between state hindrances and registration is required to give an enormous alleviation.

Warning, counselling, designing and venture the board services: GST is said to have negative effect on counselling and undertaking the executives administrations, As with all different administrations, firms giving these administrations to the foundation division will have a negative effect because of the higher frequency of GST at 17 to 18 percent opposite the present 15 percent Abolition of assessment occasions and exclusions: GST has negative effect There are distinctive expense occasions and exceptions for framework advancement and activities at both the focal and state levels.

While there's the expectation that inside the end, these duty occasions and exclusions will be permitted to run their course, the prowling dread is that they will be evacuated.

**Civil aviation:** GST has negative impact on Five petroleum products - crude, natural gas, aviation turbine fuel (ATF), diesel and petrol - are excluded from the coverage of GST for the initial years whereas the remaining fossil fuel product - coal oil, naphtha and liquefied petroleum gas (LPG) - are covered.

Flight tickets area unit possible to urge costlier as airlines won't be able to claim credit on tax paid on jet fuel. The current service tax ranges from 5.6 per cent to nine per cent of the base fare, which is considerably less than the GST rate that is being spoken about, of 15 to 18 per cent.

Currently, airlines will claim what's known as a cenvat credit on the central excise duty for fuel. They stand to lose this within the GST regime as ATF is outside the view of GST. While there's this bundle of negatives and positives, this columnist is of the opinion that on the whole, GST has a positive impact on the sector.

Increase in costs of airline tickets and electricity area unit shortly absorbed and forgotten. But the positives that emanate from rationalisation of taxes on works contracts, reduction in cement costs, the massive profit to supply and also the elimination of a raft of complicated exemptions and tax holidays has clear long-term advantages.

#### **ADVANTAGES TO BUSINESS AND INDUSTRY**

Simple consistence: a solid and thorough IT framework would be the motivation of the GST routine in Republic of India.

In this manner, all citizen administrations such as registrations, returns, installments, etc. would be out there to the citizens on the web, which may fabricate consistence direct and clear.

Consistency of assessment rates and structures: GST will guarantee that roundabout expense rates and structures are basic the nation over, in this manner expanding certainty and simplicity of working together.

In various words, GST would fabricate working together inside the nation charge impartial, independent of the decision of spot of working together.

**Removal of cascading:-** An arrangement of consistent duty credits all through the esteem chain, and crosswise over limits of States, would guarantee that there is minimal cascading of charges. This would diminish shrouded expenses of doing business. Improved intensity: Reduction in exchange expenses of working together would inevitably prompt an improved aggressiveness for the exchange and the business. Addition to producers and exporters: The subsuming of real Central and State imposes in GST, complete and exhaustive set-off of information products and services and eliminating of Central Sales Tax (CST) would downsize the estimation of locally industrial facility made product and services. This will expand the forcefulness of Indian product and administrations inside the worldwide market and gives lift to Indian exports. The consistency in expense rates and techniques the nation over will go an extended methodology in diminishing the consistence esteem.

#### **FOR CENTRAL AND STATE GOVERNMENTS**

Basic and clear to Administer: Multiple backhanded assessments at the Central and State levels territory unit being supplanted by GST.

Sponsored with a solid start to finish IT system, GST would be less complex and simpler to regulate than all other circuitous assessments of the Center and State imposed up until now.

Better Controls on Leakage: GST can finish in higher assessment consistence because of a solid IT foundation.

Because of the consistent exchange of information charge credit from one stage to another in the chain of significant worth expansion, there is an in-constructed system in the structure of GST that would boost charge consistence by dealers.

Higher Revenue Efficiency: GST is relied upon to diminish the expense of accumulation of assessment incomes of the Government will in this manner lead to the higher income productivity. .

### **FOR THE CONSUMER**

Single and Transparent Tax Proportionate to the Value of Goods and Services: Due to different aberrant assessments being collected by the Center and State, within complete or no info charge credits .

accessible at dynamic stages helpful expansion, the expense of most products and ventures in the nation today are loaded down with many shrouded charges.

Under GST, there would be only one expense from the maker to the purchaser, prompting straightforwardness of duties paid to the last shopper.

Help in Overall Tax Burden: Because of proficiency additions and avoidance of spillages, the general taxation rate on most wares will descend, which will benefit buyers.

At the Central dimension, the accompanying assessments are being subsumed:

- a. Focal Excise Duty,
- b. Extra Excise Duty,
- c. Administration Tax,
- d. additional custom typically alluded to as levy, and
- e. Exceptional Additional Duty of Customs.

At the State level, the accompanying duties are being subsumed:

- a. Subsuming of State Value Added Tax/Sales Tax,
- b. amusement Tax (other than the duty demanded by the local bodies), Central Sales Tax (exacted by the Center and gathered by the States),
- c. Octroi and Entry charge,
- d. Buy Tax,
- e. Extravagance charge, and
- f. Charges on lottery, wagering and betting.

If there should arise an occurrence of between State exchanges, the Center would require and gather the Integrated Goods and Services Tax (IGST) on all between State supplies of merchandise and enterprises under Article 269A (1) of the Constitution.

The IGST would generally be up to CGST and SGST.

The IGST component has been intended to ensure consistent progression of information decrease from one State to an alternate.

The between State vendor would pay IGST on the closeout of his product to the Central Government when adjusting credit of IGST, CGST and SGST on his buys (in that order). The corporate greed State can exchange to the Center the credit of SGST used in installment of IGST.

The business seller can guarantee credit of IGST while releasing his yield liabilities (both CGST and SGST) in his own State. The Center can exchange to the trade State the credit of IGST used in installment of SGST. Since GST might be a goal based assessment, all SGST on a definitive item can normally collect to the mind-boggling State. For the usage of GST inside the nation, the Central and State Governments have conjointly enlisted product and Services Tax Network (GSTN) as a not-for-benefit, non-Government Company to provide shared IT foundation and administrations to Central and State Governments, citizens and option stakeholders. The key targets of GSTN square measure to deliver an ordinary and uniform interface to the citizens, and shared framework and administrations to Central and State/UT governments.

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GST is dealing with building up a cutting edge thorough IT framework including the basic GST entryway giving frontend administrations of enlistment, returns and installments to all citizens, just as

the backend IT modules most likely States that grasp procedure of profits, enlistments, reviews, evaluations, offers, and so on.

All States, bookkeeping specialists, count and banks, are additionally setting up their IT foundation for the organization of GST.

There would be no manual recording of profits. All expenses can likewise be paid on the web.

All mis-coordinated returns would be auto-produced, and there would be no need for manual intercession.

### **CONCLUSION**

GST has made another situation in the Indian economy, which diminishes twofold tax assessment on the products, buyers will have more noteworthy preferred standpoint as the duty rate is 0% on sustenance gains, the nation will have uniform expense rates there will no twofold tax assessment on merchandise. It is utilization based assessment, all the extravagance merchandise become costlier, though fundamental needs winds up less expensive, and wipes out the impact of expansion on purchaser products.

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**A STUDY ON POST HOC TESTS ON OCCUPATIONAL PERCEPTION ON UDAN SERVICES**

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**ABSTRACT**

*Present study is to administer the Post Hoc Tests on Occupational perception on UDAN services. The analysis is in conformity with the objectives of the study and the hypotheses formulated. The collected data has been analyzed using post hoc analysis and multi comparison through SPSS. Findings include that service people have a significant difference than students which is supported by opposite signs of Lower bound and Upper bound. Student has a significant difference than service persons for location of airline office sand authorized agents were in reach. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations at 5 percent level of significance.*

*Keywords: Occupation, Post hoc, UDAN, customers, satisfaction.*

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**INTRODUCTION**

The Indian Aviation Sector has witnessed marvelous development in the recent past which is driven by sound demographic, macroeconomic, government supported reforms & changing market forces at work. The three-fold increase in consumerism, rising disposable income; developing aviation sector; burgeoning middle class; increasing business travel; government reforms; entry of low cost carriers; increasing competition etc have positioned the Indian Aviation Sector in a high development path. Almost 35 % of exports from India & 97% foreign tourists to India arrive by Air each year. Aviation sector has undergone a major development and growth in past 5-6 years.

Customer service has a direct impact on the customer's level of satisfaction, which in turn, ultimately reflects on the service provider's bottom line. Although, it is difficult to analyze and predict the true influence of customer service, quality customer service has been found to be a major means for improving a variety of aspects of a business.. The key to getting closer to one's customers is making it easier for them to do business with the service provider, better known as convenience (Anton, 1996). • The number and quality of services offered, founds the brand image of the service provider.

Multiple services reinforce customer's sense of security. Protective services such as security staff, emergency medical facilities, clearly marked exits impart trust and confidence in customers. • Quality customer service has the potential to produce increased traffic for the service provider. Further, the delivery of quality service and customer satisfaction has been clearly associated with profits, cost savings and market share (Sager, 1994). • Service providers who encompass their services beyond slight expectations have a far better chance of satisfying their customers.

An airline company provides services to its travellers at the airport (check-in, during boarding and on arrivals), F/C class lounge services, ground staff service, cabin staff service, services at the airline website and onboard products offered to the passengers. India is expected to be the fastest growing civil aviation market in the world by 2020 with about 420 million passengers being handled by the Indian airport system, according to the Economic survey 2010-11. The number of passengers carried by the domestic airlines during Jan-Feb 2011 was 9.51 million as against 7.95 million in the previous year in 2010, as a result, registering a growth of 19.6%, according to the data released by DGCA. The domestic airlines registered a growth of almost 16 % year-on-year (y-o-y), carrying record 5.2 million passengers in Dec. 2009. The domestic air passenger traffic grew by 19% in 2010, registering 51.53 million passengers as compared to 43.3 million in 2009, according to economic survey 2010- 11. (Aviation, March 2011)

**REASONS FOR BOOM IN INDIAN AVIATION INDUSTRY**

- Foreign equity allowed- The RBI declared that foreign institutional investors might have shareholdings more than the limited 49% in the domestic sector.
- Low entry barriers- Now a days, venture capital of \$10 million or less is enough to launch an airline.
- Attraction of foreign shores- Kingfisher airline and Jet Airways have gone international by starting operations, first to SAARC countries, and then to South-East Asia, the UK and the US.

- Increased income levels - Though India's GDP (per capita) at \$3,100 is still very low as compared to the developed country standards, India is admirable at least in metro cities and urban centers, where IT and BPO industries have made the younger generation prosperous.
- Intact potential of India's tourism- Currently, India attracts more than 5.11 million passengers every year, while China gets 10 times the number. Tourist arrivals in India are predicted to grow exponentially, especially due to open sky policy between India and SAARC countries and the increase in two-sided entitlements with European countries and the US.
- Charm of the airlines- No industry other than film-making is as glamorous as the airlines. Airline tycoons from the last century, like J.R.D. Tata, Howard Hughes, Sir Richard Branson and Dr. Vijaya Mallaya today have been idolized. Airlines have a culture of glamour around them and high net worth individuals can always enlighten with the idea of owning an airline.

## REVIEW OF LITERATURE

**K Vasantha (1997)** investigated the association between the financial and operating characteristics of an airline and its service quality by using correlation analysis. The service quality variables were denoted by the complaint rates, delays, and involuntary denials of boarding; and operating and financial variables by market share, revenue per passenger per mile, revenue growth-rate, debt to capital ratio, current ratio, load factor, employees per departure and operating revenue per employee. The analysis specified that airlines delays are directly related to load factors, and complaint rates to debt to capital ratios. Thus, airline complaint rates, delays and involuntary denials of boarding factors are pointedly taken as major consideration while analyzing service quality of domestic airlines.

**John and Robin (2001)** examined the power of consumers' perception of service assessment according to their personality traits. The application of personal traits, including the Jungian personality types as a probable predictor of perceived satisfaction levels. The review of literature did not confirm any relationship between airline flights service satisfaction levels but always there was a strong relationship between perceptions of quality and satisfaction. The distinction of the Jungian personality types used in the evaluation of leisure airlines' service attributes appeared to be useful of further examination.

**David and Robin (2002)** attempted to recognize the service dimensions on airline passengers in Hong Kong. The study compared the differences in passengers' expectations of the desired airline service quality in terms of the dimensions of reliability, assurance, facilities, and employees' flight patterns, customization and responsiveness. The primary data were collected from passengers departing in Hong Kong airport. The study evidently showed that assurance was the imperative service dimension and also concluded that passengers were concerned with the safety and security aspect. This pointed out that why there has been such a downturn in demand means. This study was conducted just prior to the world trade centre incident on the 11th September 2001.

**Bhagyalakshmi and Nargundkar (2006)** investigated the service quality delivered by four major airlines in India on the background of rigid competition in the airline service sector. Pricing and service quality are the major variables that decided the brand equity of each organization in the airline industry. The process of traveling on a domestic airline was divided into pre-flight, in-flight and post-flight experiences. A survey was conducted to find out the perceived service quality of frequent fliers on each of the four airlines across a series of service performance variables. The airline brands were placed in a perceptual space, where the perceived service attributes were also plotted. Clear differences existed among the airlines, with two of them perceived as being similar to each other, and the other two divergent in many respects.

**Philemon et al. (2007)** examined the problem of customer satisfaction in the airline industry with reference to Malaysia. The data were collected through questionnaire survey at Kuala-Lumpur international airport in Malaysia. The findings of the study retrieved that human interactions, check-in procedures, source of recommendations on choice of Airline, as well as monetary incentives do not influence the level of customer satisfaction. On the other hand, factors such as use of Information Communication Technology, reservation procedures, in-flight services, company image, and mode of registering complaints/suggestions seem to influence customer satisfaction in Malaysian setting.

**Agarwal and Dey (2010)** provided a comparison on the customer satisfaction based on service quality as perceived by air travelers on six domestic airlines namely Go Air, Kingfisher, Jet Airways, Indigo, SpiceJet and Air India (Domestic) by using different variables such as ease of bookings through the website/call center, hassle free check in, efficient ticketing staff, regular announcements during flight delays at airport, on time

performance of flights, in flight experience, baggage handling and value for money. Approximately, 150 questionnaires were collected by using convenient sampling method. The Perceptions travelers were captured who had actually undergone the experience of travelling by an airline. The result of the study revealed that travelers perceive a significant difference between six airlines for each of the above six identified variables. The study concluded the study useful to help marketers of domestic airlines and designers of flight service offerings to enhance the satisfaction level of air travelers.

**Krishna Kumar and Baby (2012)** studied the domestic airlines preferences and purchase decision in TamilNadu. Eight factors had been acknowledged and employed to study the preference and purchase decision of domestic airlines services. Primary data was collected through well-structured questionnaire through convenient sampling method. It was recognized through the research that among the eight factors convenient arrival and departure were the most influencing factor and facilities in ticket booking was least influencing factor of preference and purchase decision. The researchers recommended that importance must be given by the airline service providers in those aspects to retain the passengers.

**Grove and Fisk (1997)** conducted a study "The Impact of Other Customers on Service Experiences: A Critical Incident Examination of 'Getting Along'" using the critical incident method, data were gathered from 486 customers regarding satisfying or dissatisfying incidents with service organizations that were the result of other customer's presence. The findings of this study are (a) Prolonged waits that often go with many service encounters can put people in a bad mood, displeasures can burst and disruptive behavior can result, (b) apparently satisfying all customers with the same service delivery is almost impossible, (c) tendency of people to be less self-conscious when they are "out-of-town" or among strangers has long been observed, (d) methods for improving customer-to-customer relationships are apparently required. The study suggested that before means of enhancing customer-to-customer relationships or governing against negative incidents can occur, organizations need to progress for an appreciation for the importance of managing other customers.

**Aksoy, Atilgan and Akinci (2003)** quoted in their paper "Airline services marketing by domestic and foreign firms: difference from the customers' view point" that significant differences exist between the foreign and domestic airline passenger groups on the same flight terminuses with respect to their demographic profiles, behavioral traits and understanding of airline service parameters. They also suggested that a firm's competitive advantage is established by its ability to satisfy customers' present and future needs.

### **THE UDAAN SERVICE**

The UDAAN service is portion of the regional connectivity scheme also known as 'UdeDesh ka AamNagrik' (UDAN) which seeks to connect unserved and under-served airports as well as make flying more affordable, with fares capped at Rs 2,500 for one-hour flights.

### **Research Methodology**

#### **Scope of the Study**

The present study is confined to A study on Post Hoc Tests on Occupational perception for UDAN services in India

#### **Objectives of the Study**

The main objective of the A study on Post Hoc Tests on Occupational perception towards UDAN scheme. In the broader framework, the specific objectives of the study are as under:

- (i) To study the post hoc analysis of student with service, self-employed and others for perception in UDAN service.
- (ii) To understand the post hoc analysis of service with student, self-employed and others for perception in UDAN service.
- (iii) To comprehend the post hoc analysis of self-employed with service, student and others for perception in UDAN service.
- (iv) To twig the post hoc analysis of others, self-employed service and student for perception in UDAN service..

### **RESEARCH HYPOTHESES**

To validate the results of the study, the following hypotheses have been formulated:

**H<sub>01</sub>:** There is no relationship between occupations student, service, self-employed and others towards the satisfaction in UDAN services

**Sample Profile**

In the present study, the population considered is all the customers of aviation industry. But the target population is defined by considering all the customers using UDAN service during the target period of study *i.e.* 2017. Judgment sampling was used to collect the data. As the population was not defined, therefore standard proportion formula was adopted for sample selection.

**Data Collection**

The present study was based on both primary and secondary data. Primary data were collected through well-structured questionnaire on 5-point Likert scale *i.e.* Strongly Disagree (SD), Disagree (D), Indifferent (I), Agree (A) and Strongly Agree (SA). After examination, 103 questionnaires were found complete in all respect and considered for further analysis. Secondary data include the research studies and articles published in various journals, magazines, newspapers and websites.

**Reliability Test for Scale**

A reliability coefficient of 0.60 or higher is considered "acceptable" in most social science research situations. The alpha coefficient is 0.802 for 12 items of customer satisfaction suggesting that these items have relatively high internal consistency.

**Data Analysis**

The collected data were analyzed through descriptive statistical techniques like frequency distribution, percentage, mean, standard deviation, *etc.* For coding and analyzing the data, weights were assigned in order of importance *i.e.* 1 to Strongly Disagree (SD), 2 to Disagree (A), 3 to Indifferent, 4 to Agree (A), and 5 to Strongly Agree (SA). ANOVA were used to test the hypotheses and validate the results. The analysis is in conformity with the objectives of the study and the hypotheses formulated. The collected data were analyzed through SPSS.

**Limitations of the Study**

The study was confined to the study of perception of customers only but did not consider the industry's viewpoint. As UDAN is a new concept and there is a lack of awareness among the people about the scheme, therefore the sample size was limited to 103 respondents only. The results derived based on sample may not be generalized on population.

**Significance of the Study**

The present study would be beneficial to the policy makers, aviation employees, and researchers to know the levels of passengers' satisfaction to formulate the suitable strategies to improve customer satisfaction.

**Table-1: Quality of in-flight Was Satisfactory**

(I) Occupation	(J) Occupation	Mean Difference (I-J)	Std. Error	p-value	95% Confidence Interval	
					Lower Bound	Upper Bound
Student	Service	.0500	.2337	.997	-.561	.661
	Self-Employed	.0250	.2630	1.000	-.662	.712
	Others	-.5417	.4383	.606	-1.687	.604
Service	Student	-.0500	.2337	.997	-.661	.561
	Self-Employed	-.0250	.2512	1.000	-.681	.631
	Others	-.5917	.4314	.520	-1.719	.536
Self-employed	Student	-.0250	.2630	1.000	-.712	.662
	Service	.0250	.2512	1.000	-.631	.681
	Others	-.5667	.4479	.587	-1.737	.604
Others	Student	.5417	.4383	.606	-.604	1.687
	Service	.5917	.4314	.520	-.536	1.719
	Self-Employed	.5667	.4479	.587	-.604	1.737

Degree of freedom=3, 99 Source: Survey

Post hoc analysis for occupation level-wise perception of the customers about satisfaction about quality of in-flight was satisfactory in UDAN is given in Table 1, which shows that Students have no significant difference than service persons (Mean Difference=.0500, SE=.2337) which is supported by opposite signs of Lower bound=-.561 and Upper bound .661. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=0.997$ ,  $df=3, 99$ ) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

Similarly, Student have no significant difference than self-employed (Mean Difference=.0250, SE=0.2630) which is supported by opposite signs of Lower bound=-.662 and Upper bound .712. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=1.000$ ,  $df=3$ , 99) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

Similarly, Student have no significant difference than others (Mean Difference=.5417, SE=0.4383) which is supported by opposite signs of Lower bound=-1.687 and Upper bound .604. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=.606$ ,  $df=3$ , 99) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

**Table-2: Meals Were Timely Delivered**

(I) Occupation	(J) Occupation	Mean Difference (I-J)	Std. Error	p-value	95% Confidence Interval	
					Lower Bound	Upper Bound
Student	Service	.1063	.2277	.966	-.489	.701
	Self-Employed	-.3488	.2562	.527	-1.018	.321
	Others	.3646	.4270	.828	-.751	1.481
Service	Student	-.1063	.2277	.966	-.701	.489
	Self-Employed	-.4550	.2447	.252	-1.095	.185
	Others	.2583	.4202	.927	-.840	1.356
Self-employed	Student	.3488	.2562	.527	-.321	1.018
	Service	.4550	.2447	.252	-.185	1.095
	Others	.7133	.4364	.364	-.427	1.854
Others	Student	-.3646	.4270	.828	-1.481	.751
	Service	-.2583	.4202	.927	-1.356	.840
	Self-Employed	-.7133	.4364	.364	-1.854	.427

Degree of Freedom=3, 99 Source: Survey

Post hoc analysis for occupation level-wise perception of the customers about satisfaction about meals were timely delivered in UDAN is given in Table 2, which shows that Student have no significant difference regarding Meals were timely delivered than service persons (Mean Difference=.1063, SE=0.2277) which is supported by opposite signs of Lower bound=-.489 and Upper bound .701. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=0.966$ ,  $df=3$ , 99) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

Similarly, self-employed have no significant difference than service (Mean Difference=.4550, SE=0.2447) which is supported by opposite signs of Lower bound=-.185 and Upper bound 1.095. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=.252$   $df=3$ , 99) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

Similarly, others have no significant difference than students (Mean Difference=.3646, SE=0.4270) which is supported by opposite signs of Lower bound=-1.481 and Upper bound .751. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=.828$ ,  $df=3$ , 99) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

**Table-3: Quality of Food and Beverage was Satisfactory**

(I) Occupation	(J) Occupation	Mean Difference (I-J)	Std. Error	p-value	95% Confidence Interval	
					Lower Bound	Upper Bound
Student	Service	.0813	.2342	.986	-.531	.693
	Self-Employed	.1363	.2636	.955	-.553	.825
	Others	.3229	.4394	.883	-.825	1.471
Service	Student	-.0813	.2342	.986	-.693	.531
	Self-Employed	.0550	.2518	.996	-.603	.713
	Others	.2417	.4324	.944	-.888	1.372
Self-employed	Student	-.1363	.2636	.955	-.825	.553

	Service	-.0550	.2518	.996	-.713	.603
	Others	.1867	.4490	.976	-.987	1.360
Others	Student	-.3229	.4394	.883	-1.471	.825
	Service	-.2417	.4324	.944	-1.372	.888
	Self-employed	-.1867	.4490	.976	-1.360	.987

Degree of freedom=3, 99 Source: Survey

Post hoc analysis for occupation level-wise perception of the customers about satisfaction about the punctuality of flights and ground deserved to be appreciated in UDAN is given in Table 4, which shows that Student have no significant difference than self-employed (Mean Difference=.1363, SE=0.2636) which is supported by opposite signs of Lower bound=-.553 and Upper bound .825. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=0.955$ ,  $df=3, 99$ ) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

Similarly, service people have no significant difference than others (Mean Difference=.2417, SE=0.4324) which is supported by opposite signs of Lower bound=-.888 and Upper bound 1.372. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=.944$ ,  $df=3, 99$ ) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

Similarly, others have no significant difference than self-employed (Mean Difference=-.1867, SE=0.4490) which is supported by opposite signs of Lower bound=-1.360 and Upper bound .987. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=.976$ ,  $df=3, 99$ ) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

**Table-4: The Punctuality of Flights and Ground Deserved to be Appreciated**

(I) Occupation	(J) Occupation	Mean Difference (I-J)	Std. Error	p-value	95% Confidence Interval	
					Lower Bound	Upper Bound
Student	Service	.5625	.2387	.092	-.061	1.186
	Self-Employed	.2175	.2687	.850	-.485	.920
	Others	-.0625	.4478	.999	-1.233	1.108
Service	Student	-.5625	.2387	.092	-1.186	.061
	Self-Employed	-.3450	.2566	.537	-1.016	.326
	Others	-.6250	.4406	.491	-1.776	.526
Self-employed	Student	-.2175	.2687	.850	-.920	.485
	Service	.3450	.2566	.537	-.326	1.016
	Others	-.2800	.4576	.928	-1.476	.916
Others	Student	.0625	.4478	.999	-1.108	1.233
	Service	.6250	.4406	.491	-.526	1.776
	Self-employed	.2800	.4576	.928	-.916	1.476

Degree of freedom=3, 99 Source: Survey

Post hoc analysis for occupation level-wise perception of the customers satisfaction about ticket was available properly online as well as offline in UDAN is given in Table 5, which shows that Student have no significant difference than self-employed (Mean Difference=.2175, SE=0.2687) which is supported by opposite signs of Lower bound=-.485 and Upper bound .920. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=0.850$ ,  $df=3, 99$ ) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

Similarly, service people have no significant difference than others (Mean Difference=-.6250, SE=0.4406) which is supported by opposite signs of Lower bound=-1.776 and Upper bound .526. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=.491$ ,  $df=3, 99$ ) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

Similarly, others have no significant difference than self-employed (Mean Difference=.2800, SE=0.4576) which is supported by opposite signs of Lower bound=-.916 and Upper bound 1.476. Multi comparison results show

that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=.928$ ,  $df=3$ , 99) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

**Table-5: Ticket was Available Properly Online as well as Offline**

(I) Occupation	(J) Occupation	Mean Difference (I-J)	Std. Error	p-value	95% Confidence Interval	
					Lower Bound	Upper Bound
Student	Service	.6125	.2337	.049	.002	1.223
	Self-Employed	-.0625	.2631	.995	-.750	.625
	Others	-.5625	.4384	.576	-1.708	.583
Service	Student	-.6125	.2337	.049	-1.223	-.002
	Self-Employed	-.6750	.2513	.041	-1.332	-.018
	Others	-1.1750	.4314	.038	-2.302	-.048
Self-employed	Student	.0625	.2631	.995	-.625	.750
	Service	.6750	.2513	.041	.018	1.332
	Others	-.5000	.4480	.681	-1.671	.671
Others	Student	.5625	.4384	.576	-.583	1.708
	Service	1.1750	.4314	.038	.048	2.302
	Self-employed	.5000	.4480	.681	-.671	1.671

Degree of freedom=3, 99 Source: Survey

Post hoc analysis for occupation level-wise perception of the customers satisfaction about Location of fairline offices and authorized agents was in reach in UDAN is given in Table 6, which shows that Student have a significant difference than service persons (Mean Difference=.7750, SE=0.2365) which is supported by opposite signs of Lower bound=-.157 and Upper bound 1.393. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=0.008$ ,  $df=3$ , 99) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is rejected.

Similarly, service people have a significant difference than students (Mean Difference=-.7750, SE=0.2365) which is supported by opposite signs of Lower bound=-1.393 and Upper bound .157. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=.008$ ,  $df=3$ , 99) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is rejected.

Similarly, others have no significant difference than self-employed (Mean Difference=.3000, SE=0.4534) which is supported by opposite signs of Lower bound=-1.485 and Upper bound .885. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=.911$ ,  $df=3$ , 99) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

**Table-6: Location of Airline Offices and Authorized Agents was In reach**

(I) Occupation	(J) Occupation	Mean Difference (I-J)	Std. Error	p-value	95% Confidence Interval	
					Lower Bound	Upper Bound
Student	Service	.7750	.2365	.008	.157	1.393
	Self-Employed	-.0500	.2662	.998	-.746	.646
	Others	.2500	.4437	.943	-.909	1.409
Service	Student	-.7750	.2365	.008	-1.393	-.157
	Self-Employed	-.8250	.2543	.009	-1.489	-.161
	Others	-.5250	.4366	.627	-1.666	.616
Self-employed	Student	.0500	.2662	.998	-.646	.746
	Service	.8250	.2543	.009	.161	1.489
	Others	.3000	.4534	.911	-.885	1.485
Others	Student	-.2500	.4437	.943	-1.409	.909
	Service	.5250	.4366	.627	-.616	1.666
	Self-employed	-.3000	.4534	.911	-1.485	.885

Degree of freedom=3, 99 Source: Survey

Post hoc analysis for occupation level-wise perception of the customers satisfaction about Airfarespricewasreasonable in UDAN is given in Table 7, which shows that Student have no significant difference than service persons (Mean Difference=.3875, SE=0.2319) which is supported by opposite signs of Lower bound=-.218 and Upper bound .993. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=0.344$ ,  $df=3, 99$ ) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

Similarly, service people have no significant difference than self-employed (Mean Difference=-.3000, SE=0.2492) which is supported by opposite signs of Lower bound=-.951 and Upper bound .351. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=.626$ ,  $df=3, 99$ ) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

Similarly, others have no significant difference than service persons (Mean Difference=-.6333, SE=0.4280) which is supported by opposite signs of Lower bound=-1.752 and Upper bound .485. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=.453$ ,  $df=3, 99$ ) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

**Table-7: Airfares Price: Was The Price Reasonable**

(I) Occupation	(J) Occupation	Mean Difference (I-J)	Std. Error	p-value	95% Confidence Interval	
					Lower Bound	Upper Bound
Student	Service	.3875	.2319	.344	-.218	.993
	Self-Employed	.0875	.2609	.987	-.594	.769
	Others	1.0208	.4349	.094	-.116	2.157
Service	Student	-.3875	.2319	.344	-.993	.218
	Self-Employed	-.3000	.2492	.626	-.951	.351
	Others	.6333	.4280	.453	-.485	1.752
Self-employed	Student	-.0875	.2609	.987	-.769	.594
	Service	.3000	.2492	.626	-.351	.951
	Others	.9333	.4444	.160	-.228	2.095
Others	Student	-1.0208	.4349	.094	-2.157	.116
	Service	-.6333	.4280	.453	-1.752	.485
	Self-employed	-.9333	.4444	.160	-2.095	.228

Degree of freedom=3, 99 Source: Survey

Post hoc analysis for occupation level-wise perception of the customers satisfaction about Decoration: Interiordesignofaircraftandcabinrewin UDAN is given in Table 8, which shows that Student have no significant difference than service persons (Mean Difference=.2250, SE=0.2321) which is supported by opposite signs of Lower bound=-.382 and Upper bound .832. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=0.767$ ,  $df=3, 99$ ) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

Similarly, service people have no significant difference than self-employed (Mean Difference=-.0800, SE=0.2495) which is supported by opposite signs of Lower bound=-.732 and Upper bound .572. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=.989$ ,  $df=3, 99$ ) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

Similarly, self-employed have no significant difference than others (Mean Difference=-.0200, SE=0.4450) which is supported by opposite signs of Lower bound=-1.183 and Upper bound 1.143. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=1.0$ ,  $df=3, 99$ ) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

**Table-8: Decoration: Interior Design of Aircraft and Cabin Crew**

(I) Occupation	(J) Occupation	Mean Difference (I-J)	Std. Error	p-value	95% Confidence Interval	
					Lower Bound	Upper Bound
Student	Service	.2250	.2321	.767	-.382	.832
	Self-Employed	.1450	.2613	.945	-.538	.828
	Others	.1250	.4354	.992	-1.013	1.263
Service	Student	-.2250	.2321	.767	-.832	.382
	Self-Employed	-.0800	.2495	.989	-.732	.572
	Others	-.1000	.4285	.995	-1.220	1.020
Self-employed	Student	-.1450	.2613	.945	-.828	.538
	Service	.0800	.2495	.989	-.572	.732
	Others	-.0200	.4450	1.000	-1.183	1.143
Others	Student	-.1250	.4354	.992	-1.263	1.013
	Service	.1000	.4285	.995	-1.020	1.220
	Self-employed	.0200	.4450	1.000	-1.143	1.183

Degree of freedom=3, 99 Source: Survey

Post hoc analysis for occupation level-wise perception of the customers satisfaction about onboardentertainmentin UDAN is given in Table 9, which shows that Student have no significant difference than service persons (Mean Difference=.3750, SE=0.2202) which is supported by opposite signs of Lower bound=-.200 and Upper bound .950. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=0.328$ ,  $df=3$ , 99) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

Similarly, service people have no significant difference than students (Mean Difference=-.3750, SE=0.2202) which is supported by opposite signs of Lower bound=-.950 and Upper bound .200. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=.328$ ,  $df=3$ , 99) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

Similarly, self-employed have no significant difference than service (Mean Difference=-.5050, SE=0.2367) which is supported by opposite signs of Lower bound=-.114 and Upper bound 1.124. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=.150$ ,  $df=3$ , 99) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

**Table-9: On Board Entertainment**

(I) Occupation	(J) Occupation	Mean Difference (I-J)	Std. Error	p-value	95% Confidence Interval	
					Lower Bound	Upper Bound
Student	Service	.3750	.2202	.328	-.200	.950
	Self-Employed	-.1300	.2478	.953	-.778	.518
	Others	.4167	.4131	.745	-.663	1.496
Service	Student	-.3750	.2202	.328	-.950	.200
	Self-Employed	-.5050	.2367	.150	-1.124	.114
	Others	.0417	.4065	1.000	-1.021	1.104
Self-employed	Student	.1300	.2478	.953	-.518	.778
	Service	.5050	.2367	.150	-.114	1.124
	Others	.5467	.4221	.568	-.556	1.650
Others	Student	-.4167	.4131	.745	-1.496	.663
	Service	-.0417	.4065	1.000	-1.104	1.021
	Self-employed	-.5467	.4221	.568	-1.650	.556

Degree of freedom=3, 99 Source: Survey

Post hoc analysis for occupation level-wise perception of the customers satisfaction about loyaltyprogrammeVIPcardfrequentflyerprogrammein UDAN is given in Table 10, which shows that Student have no significant difference than others (Mean Difference=.0208, SE=0.4222) which is supported by opposite signs of Lower bound=-1.082 and Upper bound 1.124. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of

different occupations ( $p=1.000$ ,  $df=3$ , 99) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

Similarly, service people have no significant difference than students (Mean Difference=-.3625, SE=0.2251) which is supported by opposite signs of Lower bound=-.951 and Upper bound .226. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=-.951$ ,  $df=3$ , 99) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

Similarly, self-employed have no significant difference than service (Mean Difference=-.1150, SE=0.2419) which is supported by opposite signs of Lower bound=-.517 and Upper bound .747. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=.964$ ,  $df=3$ , 99) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

Similarly, others have no significant difference than service (Mean Difference=-.3417, SE=0.4154) which is supported by opposite signs of Lower bound=-.744 and Upper bound 1.427. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=.844$ ,  $df=3$ , 99) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

**Table-10: Loyalty Programme VIP Card Frequent Flyer Programme**

(I) Occupation	(J) Occupation	Mean Difference (I-J)	Std. Error	p-value	95% Confidence Interval	
					Lower Bound	Upper Bound
Student	Service	.3625	.2251	.377	-.226	.951
	Self-Employed	.2475	.2533	.763	-.414	.909
	Others	.0208	.4222	1.000	-1.082	1.124
Service	Student	-.3625	.2251	.377	-.951	.226
	Self-Employed	-.1150	.2419	.964	-.747	.517
	Others	-.3417	.4154	.844	-1.427	.744
Self-employed	Student	-.2475	.2533	.763	-.909	.414
	Service	.1150	.2419	.964	-.517	.747
	Others	-.2267	.4314	.953	-1.354	.901
Others	Student	-.0208	.4222	1.000	-1.124	1.082
	Service	.3417	.4154	.844	-.744	1.427
	Self-employed	.2267	.4314	.953	-.901	1.354

Degree of freedom=3, 99 Source: Survey

Post hoc analysis for occupation level-wise perception of the customers satisfaction about flightsafety in UDAN is given in Table 11, which shows that Student have no significant difference than others (Mean Difference=-.1250, SE=0.4516) which is supported by opposite signs of Lower bound=-1.305 and Upper bound 1.055. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=.993$ ,  $df=3$ , 99) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

Similarly, service people have no significant difference than students (Mean Difference=-.2000, SE=0.2408) which is supported by opposite signs of Lower bound=-.829 and Upper bound .429. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=-.840$ ,  $df=3$ , 99) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

Similarly, self-employed have no significant difference than service (Mean Difference=-.0350, SE=0.2588) which is supported by opposite signs of Lower bound=-.711 and Upper bound .641. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations ( $p=.999$ ,  $df=3$ , 99) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

Similarly, others have no significant difference than service (Mean Difference=-.3250, SE=0.4445) which is supported by opposite signs of Lower bound=-.884 and Upper bound .836. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the

customers of different occupations ( $p=1.486$ ,  $df=3$ , 99) at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

**Table 11: Flight Safety**

(I) Occupation	(J) Occupation	Mean Difference (I-J)	Std. Error	p-value	95% Confidence Interval	
					Lower Bound	Upper Bound
Student	Service	.2000	.2408	.840	-.429	.829
	Self-Employed	.2350	.2710	.822	-.473	.943
	Others	-.1250	.4516	.993	-1.305	1.055
Service	Student	-.2000	.2408	.840	-.829	.429
	Self-Employed	.0350	.2588	.999	-.641	.711
	Others	-.3250	.4445	.884	-1.486	.836
Self-employed	Student	-.2350	.2710	.822	-.943	.473
	Service	-.0350	.2588	.999	-.711	.641
	Others	-.3600	.4615	.863	-1.566	.846
Others	Student	.1250	.4516	.993	-1.055	1.305
	Service	.3250	.4445	.884	-.836	1.486
	Self-employed	.3600	.4615	.863	-.846	1.566

Degree of freedom=3, 99 **Source:** Survey

**FINDINGS**

Students have no significant difference than service persons about quality of in-flight were satisfactory. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

Students have no significant difference than self-employed which is supported by signs of Lower bound and Upper bound. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

Similarly, Student has no significant difference than others which is supported by opposite signs of Lower bound and Upper bound. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

Flight safety in UDAN is shown that Student have no significant difference than others which is supported by opposite signs of Lower bound and Upper bound. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations for flight safety.

Similarly, service people have no significant difference than students which is supported by opposite signs. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

Similarly, self-employed have no significant difference than service which is supported by opposite signs of Lower bound and Upper bound. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

Similarly, others have no significant difference than service which is supported by opposite signs of Lower bound and Upper bound. Multi comparison results show that there is no significant difference in average agreement on customer satisfaction in UDAN services among the customers of different occupations at 5 percent level of significance. Therefore, the null hypothesis ( $H_{01}$ ) is accepted.

**SUGGESTIONS**

Quality of in-flight was satisfactory. UDAN schemes should be affordable for more booking. It should be done with collaboration with private partnership. Traffic congestion and safety issues are other points for consideration. Reduced check in time will be more beneficial. MRP of items and other services should be checked. Better food options should be provided to passengers. Better customer services are expected. More service quality. Sanitation must be taken care of. Delay in flights should be reduced, as far as feasible. Online

and Offline Ticketing Should be reliable for first time users. Interior should be more comfortable. Baggage security is also suggested to be taken care of. Work life balance of employees must be improved

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## JOB SATISFACTION TOWARDS THE AGE OF EMPLOYEES'

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**ABSTRACT**

*This is a research to study effect of age on job satisfaction. The factor of job satisfaction was identified by review of literature and pilot study. Twelve factors of job satisfaction were identified which affect employees' satisfaction. It is a descriptive type of research and based on primary and secondary data. Primary data was collected from books, journals, magazines and websites. Secondary data was collected from self-administered questionnaires. Questionnaires asked questions about demographic details and twelve questions about employees' satisfaction. After data collection, data analysis was done using SPSS version 21. Statistical tools used in this study are percentages, correlation, regression analysis, reliability analysis and hypothesis testing. Hypothesis was tested by regression analysis. The result of regression analysis proved that the impact of age of respondents on job satisfaction is not significant.*

*Keywords: Job Satisfaction, Age*

**1. INTRODUCTION**

Studies in the area of job satisfaction as an important and popular research topic started decades ago. In 1935, the concept of job satisfaction gained importance through the publication of a monograph by Hoppock on "Job Satisfaction". Hoppock in his monograph defined job satisfaction as "any combination of psychological, physiological and environmental circumstances that cause a person truthfully to say I am satisfied with my job". (Frukh. et al 2009)

Many researchers and investigators identified that job satisfaction has direct relations to human psyche, emotion, behavior and attitude. These all parameters help the individual to understand what the level of job satisfaction showed by others (Nazir et al., 2013). In current era, most organizations set out their goals regarding employees and customers' satisfaction. One of the important goals of any organization is job satisfaction of employees (Mohammed & Eleswed, 2013).

**1.1. Factor Affecting Job satisfaction**

The organizational determinants play an important role in job satisfaction. Employees spend lots of time in organization so there are number of organizational factors that affect satisfaction of the employees. The employee satisfaction in the organization can be increased by organizing and managing the organizational factors (Sageer, 2012). Following these 10 variables come in this category:-

**i. Working Environment**

Work environment plays an important role in influencing job satisfaction, as a comfortable physical work environment that will ultimately render a more positive level of job satisfaction in employees (Robbins 2001). Lack of favorable working conditions, amongst other things, can affect badly on the employees' mental and physical health (Baron and Greenberg, 2003).

**ii. Workload and Stress Level**

Dealing with a workload that was too heavy and deadlines that were impossible to touch it can cause job dissatisfaction in the most dedicated employee. The office operates in a crisis mode because supervisors did not have enough time to perform the assigned tasks effectively or because staff levels are inadequate (Swarnalatha & Vasantham, 2011).

**iii. Respect from Co-Workers**

Employees seek to be treated with respect by those they work with. A hostile work environment with rude or unpleasant coworkers is one that usually has lower job satisfaction.

**iv. Organization Development**

Organizational development is a continuous and organized process to implement effective change in an organization. Its objective is to enable the organization in adopting better to the fast-changing external environment of new markets, regulations, and technologies. It starts with a careful organization-wide analysis of the current situation and of the future requirements (Sageer, 2012).

**v. Policies of Compensation and Benefit**

Pay is one of the fundamental components of job satisfaction since it has a powerful effect in determining job satisfaction. Employees should be satisfied with competitive salary packages and they should be satisfied with it when comparing their pay packets with those of the outsiders who are working in the same industry. Individual has infinite needs and money provides the means to satisfy these needs, (Arnold and Feldman 1996).

**vi. Promotion and Career Development**

Promotion can be reciprocated as a significant achievement in the life. It promises and delivers more pay, responsibility, authority, independence and status. So, the opportunity for promotion determines the degree of satisfaction to the employee. There is a consensus among the researchers that job satisfaction is strongly associated with the opportunities for promotion (Pergamit & Veum, 1999; Sclafane, 1999).

**vii. Job Security**

Job security is an employee's assurance or confidence that they will keep their current job. Employees with a high level of job security have a low probability of losing their job in the near future. Certain professions or employment opportunities inherently have better job security than others; job security is also affected by a worker's performance, success of the business and the current economic environment (Simon, 2011).

**viii. Relationship with Supervisor**

Research demonstrates that a positive relationship exists between job satisfaction and supervision (Smucker, Whisenant, & Pederson, 2003). According to Ramsey (1997), supervisors contribute to high or low morale in the workplace. The supervisor's attitude and behavior toward employees may also be a contributing factor to job-related complaints (Sherman & Bohlander, 1992). Supervisors with high relationship behavior strongly impact on job satisfaction (Graham & Messner, 1998; Luddy, 2005).

**ix. Leadership Styles**

The satisfaction of employees was also affected by the leadership style. Employee satisfaction is high with democratic style of leadership. It is because democratic leaders encourage friendship, respect and warmth relationship among the employees. On the other hand employees working in authoritarian and dictatorial leaders show lower employee satisfaction (Sageer, 2012).

**1.2. OBJECTIVE OF THE STUDY**

- A. To identified the components of employee satisfaction.
- B. To analyse the effect of age on employee's satisfaction.

**1.3. Hypothesis**

**Alternative Hypothesis (H1):** Age has a direct significant effect on employee's satisfaction.

**Null Hypothesis (H0):** Age has no direct significant effect on employee's satisfaction.

**1.4. LIMITATIONS OF THE STUDY**

The limitation in the theoretical framework is that only one demographic variables were studied in the current research which affect employee's satisfaction. Impact of other variables and interaction effects of those variables with employee's satisfaction are not taken into account. It would be ideal to take up a larger sample in future research to avoid practical restrictions. The other limitation is the swearing of an oath of secrecy and indifference on the part of interviewees and respondents were limitations to the study as some of the employees felt uncomfortable and other were simply not bothered.

**2. REVIEW OF LITERATURE**

Soni, Chawla and Sengar (2017) their study find a significant correlation between the variables from job satisfaction and employee experience. Their study also shows that relationship between job satisfaction and employee experience and job satisfaction to some extent is dependent on employee experience. So it is important for companies in today's world to make sure that the experience of employees in their organization is a positive one as it would affect the job satisfaction of employees and would also create a word of mouth amongst the work force.

Riza, Ganzach, Liu (2015) studies contributes to job satisfaction research by providing a rigorous, empirical answer to the question of whether and how the two primary time metrics, age and tenure, relate to job satisfaction and whether job rewards mediate this relationship. They leveraged two multiyear, large-scale representative longitudinal datasets to study age and tenure in relation to job satisfaction simultaneously. They found that people became less satisfied as their tenure increased within each organization, yet as people aged

and transitioned from organization to organization their satisfaction increased. Their study also found that an exemplar of job rewards, pay, mediated these relationships.

**Samaiya (2015)** founded that there is no significant difference in employee satisfaction in employees of public and private sectors. No significant difference found in employee satisfaction in employees along age, and gender in public and private sectors.

**Yapa, Rathnayake, Senanayake, and Premakumara (2014)** The younger staff members (age group 20-40) were more satisfied than older staff members (Age group 41-60). Interacted effect of age and job category showed relatively high satisfaction of young technical staff members while older group of technical staff had the least satisfaction. Although young and old clerical staff had nearly equal level of job satisfaction; in labourer grades young males were more satisfied than older labourers. Human resource managers need to concern more about carrier needs of older labourers. They have devoted their energy for long years for the sake of the institution.

**Oktug (2013)** The results of the study showed that age and organizational tenure do not affect job satisfaction. However, job tenure has a moderating effect on job satisfaction.

**Parvin and Kabir (2011)** had performed research on "Factors Affecting Employee Job Satisfaction of Pharmaceutical Sector". The study attempted to evaluate job satisfaction of employees in different pharmaceutical companies. The result shows that salary, efficiency in work, fringe supervision, and co-worker relation are the most important factors contributing to job satisfaction.

**Sowmya and Panchanatham (2011)** studied on "Factors influencing job satisfaction of banking sector employees in Chennai, India". The result describes that in the case of job satisfaction aspects the commercial banks perceived pay and promotion is an indispensable factor to decide their satisfaction level. The employees have significant inclination towards optimistic supervisory behaviour and pleasant organizational setup. The factor analysis meticulously identified that the job, suitability as well as the working condition and other, interpersonal relationship among the workers are able to, ascertain their level of satisfaction within the working, domain.

**Nousheen, et.al. (2009)** had conducted the research in order to critically evaluate and examine the level of employees' satisfaction as well as the factors of dissatisfaction among the employees **and** especially among the hardworking managers, and to find out the reasons which make them realize that they do not have a clear of Karachi Electric Supply Corporation (KESC). The results had shown that working environment, total compensation, growth opportunities and training & development are significant factor and these four are affecting job satisfaction and correlated with each.

**Avery, McKay & Wilson (2007)** the suggest that organizations can capitalize on the prospective value added by older workers by surrounding aging employees is efficient, reliable, knowledgeable, and enthusiastic peers. Doing so should create psychological conditions in the workplace to increase their engagement, which should aid in decreasing turnover, absenteeism, and employee theft and enhancing customer service, safety, and performance.

**Bernal, Snyder & McDaniel (1998)** there findings conclude that there is a positive linear relationship between age and job satisfaction, albeit a weak association. Aging is a multifaceted process that should not be represented in simple terms of chronology alone, because changes are brought on by various physiological, social, and psychological factors (Warr, 1994). Thus, the psychological mechanisms that accompany aging need to be properly identified in order to enhance the prediction of job satisfaction based on age. Such research should allow investigators to find more definitive (and thus stronger) relations between variables associated with the "aging process" and job satisfaction.

**Judge and Hulin (1993)** had performed research on "Job satisfaction as a reflection of a disposition: a multiple source causal analysis". Their findings suggested that employee satisfaction is positively correlated with motivation, job involvement, organizational citizenship behaviour, organizational commitment, life satisfaction, mental health, and job performance and negatively related to absenteeism, turnover, and perceived stress and identify it as the degree to which a person feels satisfied by his/her job.

### 3. RESEARCH METHODOLOGY

The present research focused on the effect of employees age on their job satisfaction level. The variables of job satisfaction were identified by literature review, secondary data and pilot study. The factors identified were work environment, relationship with superior, relationship with peer group, job security, decision making, leadership, performance appraisal, career growth, physical condition of job, opportunity to learn, working hour & job location. Employees are divided in three age group *first* is 25-35-year-old employees, *second* 35-45-year-

old employees and *third* is 45 years above. Sample size 50 respondent. The survey instrument was composed of questions relating to demographic details and employee satisfaction. Questionnaire used was self-administered based on Likert scale (1= highly dissatisfied, 2= dis satisfied, 3= neutral, 4= satisfied, 5= highly satisfied) format with a five-point response scale. In questionnaire the respondents were given five response choices. Perception regarding the employee’s satisfaction was obtained through 12 item questions. Percentage analysis, correlation and regression analyse are used as a Statistical tool in a study.

**4. ANALYSIS AND DISCUSSION**

**4.1. Description of the Respondents**

AGE OF RESPONDENT					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	25-35 YEAR OLD	23	46.0	46.0	46.0
	35-45 YEAR OLD	12	24.0	24.0	70.0
	OVER 45 YEAR OLD	15	30.0	30.0	100.0
	Total	50	100.0	100.0	

The description of respondent according to age groups is 46% of respondent is 25-35 year-old, 24% respondent is 35-45 year- old, and the 45 year old and above respondent were 30%.

**4.2. Percentage Analysis**

**Percentage Analysis** was done to summarize quantitative data in a manageable and user-friendly way to obtain a holistic overview of the research data. Percentage Analysis had been completed in three age group. From the study of review of literature twelve variables were identified which affect employees’ satisfaction. To calculate the level of employees’ satisfaction with these variables, the percentage of employees satisfied with each of the twelve variables was calculated.

**Percentage Satisfaction Level of Employees According to Age**

Sl. No.	Job Satisfaction Variable	Satisfaction Level 25-35 year old	Satisfaction Level 35-45 Year old	Satisfaction Level 45 Year Above
1.	Work Environment	65%	66%	86%
2.	Work load	65%	91%	73%
3.	Work relationship with co-workers	86%	91%	86%
4.	Job Security	60%	75%	93%
5.	Decision making	73%	58%	60%
6.	Leadership	60%	66%	46%
7.	Performance Appraisal	47%	58%	80%
8.	Career Growth	65%	66%	93%
9.	Physical Condition of Job	65%	66%	80%
10.	Opportunity to Learn	86%	91%	86%
11.	Working Hour	73%	83%	100%
12.	Job Location	78%	83%	100%

The result of percentage analysis shows that satisfaction level of work environment, job security, performance appraisal, career growth, physical condition of job, working hour and job location found highest in 45 year-olds and above respondent. The satisfaction level of work load, relationship with co-worker, leadership, opportunity to learn found highest in 35-45 year- old and the satisfaction level of decision-making is found highest in 25-35 year old employees.

The employee satisfaction was increase with increasing age. The senior employees of 55 years and above had satisfaction level maximum then other age groups in all the variables except Appropriate & Fair Compensation. The youngest employees of 25-35 year-old had minimum satisfaction level then other age group except monetary compensation and appropriate and fair compensation. Employees’ satisfaction and satisfaction with retirement benefits and recognition and reward increases with increasing age, but there was no such linear relation was seen with monetary compensation and appropriate and fair compensation.

**4.3. Correlation**

Correlation was between the compensation variables and the demography of respondent was calculated. In interpreting the correlation the guidelines suggested by Cohen (1988) were followed. In terms of these writings, correlation coefficients of r=0.10 show a small effect size. Correlations of r=0.30 show a medium effect size whilst those of r=0.50 indicate a large effect size. These guidelines assist in quantifying and reporting on the

effect sizes of the findings. Pearson correlation coefficient was used to measure the strength of association between these variables at \*p<0.01 and \*\*p<0.05 level.

		AGE OF RESPONDENT
Age Of Respondent	Pearson Correlation	1
	Sig. (2-tailed)	
Work Environment	Pearson Correlation	.296*
	Sig. (2-tailed)	.037
Work Load	Pearson Correlation	-.036
	Sig. (2-tailed)	.805
Work Relationships	Pearson Correlation	-.084
	Sig. (2-tailed)	.561
Job Security.	Pearson Correlation	.245
	Sig. (2-tailed)	.086
Put Forward My Opinions.	Pearson Correlation	-.207
	Sig. (2-tailed)	.148
Leaders	Pearson Correlation	.014
	Sig. (2-tailed)	.924
Performance Appraisal	Pearson Correlation	.200
	Sig. (2-tailed)	.163
Career Growth	Pearson Correlation	.170
	Sig. (2-tailed)	.237
Physical Job	Pearson Correlation	-.101
	Sig. (2-tailed)	.484
Opportunity To Learn.	Pearson Correlation	-.180
	Sig. (2-tailed)	.210
Working Hour.	Pearson Correlation	.039
	Sig. (2-tailed)	.790
Job Location	Pearson Correlation	.125
	Sig. (2-tailed)	.388

From the above table it is evident that strong positive correlation was seen between age and work environment, performance appraisal, career growth and job security.

The workload, relationship with co-worker, decision making, opportunity to learn and physical condition of job has strong negative correlation with age. The leader, career growth, job location and working hour does not have strong correlation with age.

4.4. Regression

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.081 <sup>a</sup>	.006	-.014	.59191

a. Predictors: (Constant), Age Of Respondent

ANOVA <sup>a</sup>						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.110	1	.110	.314	.578 <sup>b</sup>
	Residual	16.817	48	.350		
	Total	16.927	49			

a. Dependent Variable: Job Satisfaction  
b. Predictors: (Constant), Age Of Respondent

Coefficients <sup>a</sup>						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.731	.290		12.877	.000
	Age Of Respondent	.055	.098	.081	.560	.578

a. Dependent Variable: Job Satisfaction

The model summary showed that Adjusted R Square is a -.014. The regression test implies that model is fit having F value .314. The overall p-value of model is <0.001. This shows that Monetary Compensation has significant effect on employee satisfaction. The regression coefficient of monetary compensation is .055 with p-value of  $p < 0.001$ . It shows that a unit changes in monetary compensation causes almost 5.5 % change in employee satisfaction. The t value for monetary compensation is .560. In the above variables t value is less than 2.5. According to the rules if t value is lesser than 2.5 ( $2.5 > t$ ) than null hypothesis will be accepted and alternate hypothesis will be rejected. Results had showed that age does not has a strong a significant impact on job satisfaction and hypothesis was rejected.

## 5. CONCLUSION AND RECOMMENDATION

This study was design to investigate Job Satisfaction level towards the age of respondent. The result of regression analysis, correlation analysis and regression analysis shows that impact of age on employees' satisfaction is negligible. The impact of age on employees' satisfaction is evidently visible only in job security, performance appraisal, working hour and job location variable of employees' satisfaction.

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**GAMIFICATION: A NEW TOOL FOR RECRUITMENT**

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**ABSTRACT**

*Now a day’s HR Professional face biggest challenges in finding suitable candidate for required vacancies. Due to the advancement of the internet nowadays the traditional recruitment process has been reshaped. The fast growing technological innovation creates several changes in recruitment practices, in recent days companies are using gamification for recruitment which make the process simpler and faster than earlier. Gamification of the process creates time for the recruiter, organizes their tasks and deeply engages them in the creative steps of sourcing the best talent. This paper will explore the concept of gamification in recruitment process.*

*Keyword: Gamification, Recruitment, Game*

**INTRODUCTION**

Employees are asset of an organization. Acquiring the right talent can be a challenging task for the HR Professionals. Gamification is an emergent technique, to contact the candidates on individual bases. Gamification is latest concept which helps to recruit, select and retain the employee in the current position. By using games as a strategy for recruitment the HR professionals to judge the candidate’s aptitude, innovation in thinking, problem solving competencies. In addition to that the can assess the candidates specific skills like creative thinking, time management etc. It save time of process candidate elimination, less stress in recruitment, helps to keep competitor, which not possible with the traditional recruitment process.

To contact the candidates on individual bases. Gamification is latest concept which helps to recruit, select and retain the employee in the current position.

**Fig-1: Reasons for using Gamification**



Source: TalentLYFT

HR Professionals need to design the recruitment game to inspire potential candidates to engage with careers portal and social media. A game is not only for psychometric test, it attracts more candidates so the recruiter can easily hire the best candidate for the required position by shortlisting those who achieve the highest score in the game.

**Gamification in Recruitment**

In Modern days recruiter know that gamification is the best way to tap millennial candidates who have grown up playing reality games. Among talent management organizations, a generally agreed upon definition is that gamification is the concept of applying game mechanics and game design techniques to engage and motivate people to achieve goals. A recent report on gamification by Markets and predicts that the gamification industry will grow by 67 percent by 2018 and worth estimated to \$5.5 billion. Gamified recruitment enable recruiters to significantly enhance talent pool, make better selection of candidates using the platforms cognitive to test candidates behavior, strengthen brand value and to able to attract and retain the right candidate.

**APPLICATION OF GAMIFICATION**

**Employee Referral Tool**

Gamification has leverage to boost the employee to share job vacancies on prominent social networks. For example, providing a cash rewards like, share job vacancies with five friends and get a chance to win cash awards. It will work just like an in house referral program except that with social sharing which reach wider.

**Virtual job fair**

The internet allow the recruiters to create fun and engaging virtual job fairs for attract the candidates. Theses virtual job fairs can employ different logic games to test the skill and abilities of job seekers, assist the recruiter to screen the right ones with ease and accuracy. There are plenty of tools online which enable recruiter to create a virtual job fair with ease. Recruiter can also design fair in a way that will also test candidate’s skills and qualifications, narrowing down our choice of the right people.

**Puzzles:**

Puzzles are effective and low cost recruitment strategy for gaining valuable insights throughout the sourcing cycle. It assists the recruiter to assess the problem solving skills among jobseeker. Puzzles help recruiters check the ability of candidates without putting them bore and time consuming screening test.

**Rewards:**

If the organizations have a careers site as a part of recruitment process, it offers plenty of scope for gamification and makes the process more engage. It can include reward point and badges for jobseekers every time they leave a comment or rate company videos.

**Video Interview:**

Video interviews are favorable for both employers and job seekers. Employees can cut down the costs because they no need to go for interview location and they can back to work quickly. On the hand, there was less stress for the candidates because they can present themselves from the comfort zone which in their home or in their workplace.

**Real time Progress Bar**

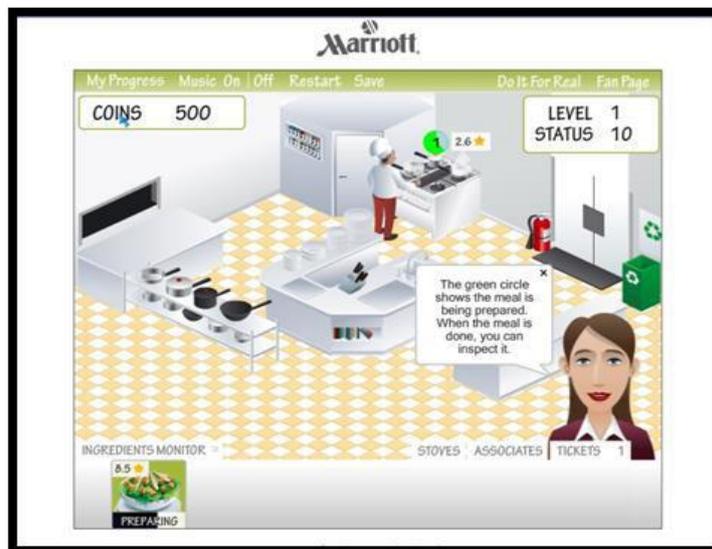
Great way to use a candidate-centric careers portal is to provide an easy-to-follow progress bar where candidates can check their progress in the recruitment funnel in real-time. This will not only keep them updated and engaged but also help them stay focused on reaching the next stage and collecting the prize.

**ORGANIZATIONS USING GAMIFICATION:**

Tech master Google has been organising a Google Code Jam software-writing competition for 12 years as a way to find fresh, new talent to work for the company.

**Marriott**

Marriott International developed a game called My Marriott Hotel to recruit millennials. It permits candidates to run their own virtual hotel and other functions. Players design their own restaurant, procure stock on a budget, train employees and serve guests. They are award score for happy customers, and they lose score for poor customer service.

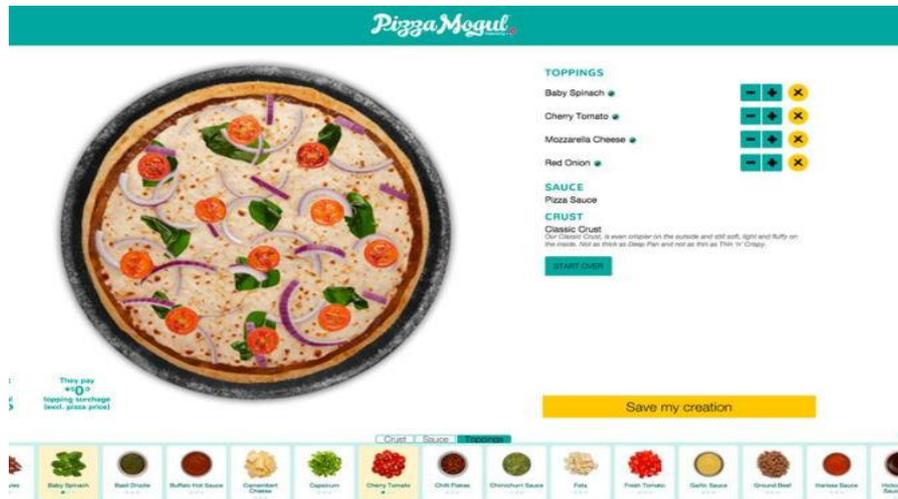


Source: Recruiter Box

**Domino's**

Domino's launched a game named "Create Your Own Pizza Legend." It's available for everyone. The customers have a chance to create their digital pizza and they get all the fame for it. The customers have an opportunity to make their own digital pizza. Instead of inviting all candidates for test, by using this type of game in recruitment process to simplifies test to examine their activity by allowing them to play with digital ingredients

Gamification is relevant to the all industries. Hiring manager can test the multiple candidates, can help them to hire the qualified candidate than actual interview



Source: Recruiter Box

**CONCLUSION**

Gamification helps the both hiring manager and application can interact more fun and meaningful. Not only has the recruiter had ability to better assess the applicant through real game, but applicant too would be enthralled to be part of such innovative organization. Gamification has the potential to work as a talent magnet.

Gamification is the chance to make employer-candidate interactions more fun and meaningful. Not only will the recruiter be able to better assess talent through real games, but candidates too would be enthralled to be a part of such an innovative company. Gamification has the potential to work as a talent magnet.

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**TRANSFORMING TO SMART DIGITAL SUPPLY CHAIN – TECHNOLOGY –SUSTAINABILITY-  
INNOVATION**

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**INTRODUCTION**

A world where automation comes together, with technology, to deliver products without human intervention is digital supply chain.

Digital supply chain is an authentic media come into existence, which encompasses the process of delivery of a digital media, from the point of origin (content provider) to the destination (consumer) in a supply chain.

In supply chain it is the processing of the order which end up into a consumable product.

Digital supply chain was configured to distribute goods or services, that had been in the early times had been previously been done on a physical form of goods and services.

The content provider provides the necessary format into digital files, hard disks, in a digital supply chain.

The content which is in the digital form is to set to capture the digital forma by the content provider, and convert them into digital supply chain format, which undergo various process, including quality process in supply chain.

The digital file in supply chain, which may usually be large as the matter confined to supply chain does not matters, which requires appropriate digital storage, and does become impossible to delivery in broad band form, are compressed into a process of encoding or trans-coding.

Digital supply chain data is a fundamental problem, due to continuous growth, and since the increasing number of complex problems, that comes up due to competitive advantage in supply chain.

**Cost:** Low cost including using of cloud, storage, encourages organization, to capture all supply chain data, but due to aggregate system, in a supply chain the cost may be higher, and it is necessary to retain how much data is necessary, and to gauge which is essential or non-essential.

**Value:** The growing consensus in supply chain drives to the value of data to be developed into a single data, managing the strategy that overlooks the business goals in digital supply chan.

The data of strategy should be complied with simplification, and the approach for data acquisition should classify in supply chain.

Data for guiding on artificial intelligence technology in digital supply chain is important, and also machine learning can help to automate, and integrate the data in digital supply chain.

Internet of things, block chain is technology in supply chain that transforms the magnitude of cloud technology in digital supply chain.

**Risk:** Much is needed in digital supply chain, with complex data that go into the interpretation of supply chain. Advance analytics with data strategy results in complication, and rather mistaken identities in supply chain. Inadvertent data leads to risk in digital supply chain.

**LITRATURE REVIEW**

If an order is placed by a consumer in a digital supply chain, the 3D printer's pick-up, the details, and print the requirement of finished product. It is then picked by robots, from the shelves packed and placed, into a self driven truck. The trucks leave the facility, and drones are automatically dispatched from the truck to deliver products while moving. The truck never stops until arriving for re-loading this is the future of digital supply chain.

Generate a huge data that leverage the supply chain. The same data have a drastic impact on supply chain planners, and agencies around the globe, it is important that you understand how the top emerging trends in the digital supply will shape the supply chain, and transportation process in coming years.

The objective to understand supply chain is on the right path, towards using of digital 3D printers, internet of things, and artificial intelligence in supply chain:

Methodology surveys conducted by the supply chain, and the methods adapted to digital insights has been different in many ways.

Digital transportation and logistics in supply chain: **Telematic** (enabling fleet, manages drivers to mitigate the customer issues with significant supply chain disruption), and any disruption can happen in a small scale, in such cases when unpredictable traffic occurs, on a large scale will bound to have unscheduled delays in delivering the products, and to supplement the inventory it is best to have sufficient inventory to take care of any disruption, and the use of Global Positioning devices have changed the life of the driver in a transport vehicle. The driver can see real time traffic, jams, sense, and then shift due to congestion of roads, heavier traffic and also the maintenance status. The dispatcher can also sense the position of the vehicle also able to give the expected time of arrival; this concept is adoptable in supply chain. Digital systems in supply chain are changing rapidly for the logistic convenience.

The digital supply chain is very discrete, and largely penetrating into marketing products, development, manufacturing, and distribution of products, and finally into the hands of the consumer. Digital supply brings down the walls of supply chain into a completely integrated system, thus coinciding with fully transparent to all involved in supply chain, from suppliers, raw-materials, components, and spare parts to transporting of those supplies, and finished goods, and finally to customer demand fulfillment.

### **METHODOLOGY RESULTS**

The network of digital supply chain will depend upon number of key technology, associated with integrated planning, and execution systems logistics, visibility, autonomous logistic, smart procured, and warehousing spare parts management, and advanced analytics, this will result in supply chain, to react, to disruption in the supply chain, and even anticipate by fully implementing the network, creating and adjusting supply chain, real-time, conditions of change.

Digital supply chain have been used to improve service, and reduce cost with the wide availability, and adoption of powerful digital technology, include advanced analytics, cloud based solution organization are getting better returns on investment.

Digital supply chain and data has allowed emergence of supply chain to allow the organization: 1. Understand the customer needs more better, and thus match supply chain, and inventory. 2. Optimize the network to build an expensive supply chain, which optimizes manufacturing, distribution, and logistic transportation. 3. End-to-end visibility in digital supply chain thus enabling performance management, and operation success and digital supply chain.

Digital procurement in supply chain: The automation of digital procurement depends upon having real-time data base that combine to join the point of sale, loyalty of information in supply chain process. Procurement has changed considerably in digital supply chain management, with robotic process, automation, cloud based applications, sophisticated analytics, and they have gained importance. Classified procurement has been identified ways to make substantial gains and cost savings.

Digital supply chain will play a significant role in robotics and automation digital transformation to come by. There will be massive productivity gains to be made across manufacturing and logistics and also in the service sectors, as artificial intelligence that takes on some of the workload of certain white collar roles in supply chain. Going into digital in supply chain network, is a means of capitalizing on the inter-connecting of all the functions in supply chain. The key is seeing activities to come together and drive operational excellence across the network in supply chain. Will there be a change in demand if you automate exception management, and make it more predictive by leveraging analysis in supply chain.

If in making new designs to suppliers and switching over production will there be a surge in demand in supply chain. Is there a chance of suppliers calling apart, if predicted in digital supply chain and the aftermarket service is responding to change.

Digital supply chain can deliver: 1. Increase revenue. 2. Reduce cost 3. Reduce working capital. 4. Improve customer service. Digital supply chain becomes completely integrated, that is fully transparent to all players involved from suppliers of raw materials-components, parts, transporters, and of those suppliers and also finished goods, and finally customers demand fulfillment.

Digital supply chain network will depend upon a number of key technologies, integrated planning, and execution systems, logistic visibility, automation in logistics, smart procurement, and warehousing, spare parts management, and advanced analytics. This will result, and will enable companies to react to disruption in supply chain, and even anticipate them by fully modeling network, and creating, and adjusting supply chain real time in conditions of change.

The digital supply chain in planning and distribution, consists of key elements, which consists of integrated planning, and execution, and logistic visibility and volatility, procurement in modern digital system, smart warehousing, efficient spare parts management, autonomous supply chain management, and B2C logistics, prescriptive supplier analytics, and digital supply chain enablers.

### **DISCUSSION**

The goal of digital supply chain is ambitious to build, an altogether new kind of supply chain network, that is both resilient, and responsive, and if companies are to make digital supply chain- aggressive, and digital supply chain ecosystem a reality, and gather technologies, and build capabilities it must also find right people with right skills, and manage the supply chain, and transform the entire organization.

The digital supply is a new media, which encompasses the process of delivery from the point of origin (provider) to destination (consumer). In this process the physical media must go through a process in ordering to mature into a consumable product digital media, and must pass through various stages in processing to get to a point in which a consumer can comply the concept of supply chain activities.

Digital Supply chain trends that digitalization that will experience: 1. Picking optimization: when with the use of wireless network, mobile computer, RFID technology, and voice picking, application, it can extend the facilities to the mobile worker in supply chain activities. Mobile and wireless systems make workers more productive, and reduce the labor required to manage materials, Bar code or RFID data to capture improves and preserve inventory accuracy. While providing real time, visibility in supply chain.

Facility planning In digital supply chain the implementation of easy work flow through facility planning, as this saves money, capital investment, freight or container loading, automatic loading facilities which could replace physical loading and unloading, with driverless SUV vehicles, lifts, with heads on display and step-by-step instructions on how efficient load a container given the size, dimensions, weight, and packages, going into it in digital supply chain.

Traffic support in supply chain going digital which is being equipped with Global Position devices systems and navigation controls that allow carriers to efficiently route shipments, without the distraction to the driver. The display will show the importance when transporting special materials of medical supplies thus maintaining cargo temperature which importance should be given to digital supply chain.

All these aspects clearly should change the digitalization of supply chain, but one understanding is that how it plays in a work-in-progress. Breaking down some of the enabling technology should help logistic manner, and figure out how to embrace the new era. Technology like predictive analysis better visibility over the movement of goods, and robotics application that help warehouses and distribution centre's keep pace with all, and play pivotal role in digital supply chain management, so will the realization that new technologies many often lay over the existing system, as a means of trading partner, and better communication system in digital supply chain system.

### **LIMITATION**

Digital supply chain is about systems that can be more aware of what is developing and which are quick or smart enough to change the supply chain physical process for optional process.

Digitalization in supply chain will change the world supply chain activities, expecting leaps and bounds in adoption of digital information technology: 1. more process with suppliers will be automated. 2. Organization with real-time status updates of information will be available from across the entire supply chain. 3. Organisation will use more data analytics to bench mark and evaluate the supplier's performances. 4. Holding suppliers to higher standards will become more and more important, as the pressure moves from transparency, ethical and sustainable supply chain, and the importance of collaborating with suppliers goes beyond of assuring supply and optimizing cost.

Technology investment in modern digital supply chain is on Internet of Things, Bar code scanning, Tablet computers, data analytics, warehouse truck loading automation, advanced images, mobile thermal printers, stationary label printers, wearable, RFID. Technology deployment in the warehouse is expected to increase productivity, efficiency, and visibility in supply chain. Wireless network that is to be built for environment that deals in manufacturing and warehouses are limited in a digital supply chain.

Drone delivery E-commerce has announced its plan to use drone to deliver products to customers, as a part of innovation, sustainability in supply chain, and this has led to a new heat wave in the industry, and now most companies are considering the idea of drone delivery in supply chain but drone delivery has battles to fight as it

is subjected to a lot of skepticism, but drone delivery will foster delivery in shipping and highly specialized areas as delivering drugs to remote location in a digital supply chain.

Cloud computing intelligence, transportation systems, and automation will help companies to provide customer centric solutions based on their needs. Bar codes and RFID's are very useful for tracing the location of shipments and tracking them on real time basis and use of warehouse automation, cold storage technologies also are becoming widespread in e-commerce logistic.

### **FUTURE WORK**

Automatic identification technologies like RFID/RFT (a request for tender an opportunity for suppliers to submit an offer to supply goods or services) are increasing being used now for vehicle and fleet tracking management. Bar coding also widely incorporated for material storage retrieval/dispatch with minimum error. Communication technologies is a core business enabler now as the system EDI/GPS/IDS are fostering innovating, and bringing in sustainability in helping logistic companies become efficient. Tools like ERP/WMS and the software related to inventory management, scheduling planning optimizers, and customer management are favored by logistic industries. Companies are well equipped with proper information technology systems and able to create higher performance visibility with minimum manual intervention, and having a competitive edge over others.

Total visibility in digital supply chain is to bring in everything from movement of goods in production or transit to demand signals, and relevant data from the point of sale system, and critical source in digital supply chain. Total visibility is the ability is to see perfect deliveries, so as to take care of any supply chain disruption.

In order to have a total free visibility is to have flexibility in organization collaboration across the network, manufacturing facilities, and warehouse.

In order to improve digital supply chain: 1.improve the sustainability across the global supply chain. 2. Ensure ethical product sourcing. 3. Minimize the exposure to ensure that performance of recalling of products.

The demand in supply chain drive, integrated planning process in business is the primary part of digital supply chain, and is responsive to flexible changes in supply demand across supply chain.

Predictive analysis in maintaining design of the product has a note to be assessed in digital supply chain: 1. Addressing major issues as they become a major concern in supply chain management. 2. Predicting the breakdown of machine, and fixing them so as to avoid break down. 3. Aligning of shipping of goods to forecast weather problems or calamity. 4. Realigning the manufacturing problems so as to adjust the analysis of meeting any undue circumstances. Digital supply chain can better manufacturing, and the lot sizes of the products that are in demand in conjunction with agile manufacturing process in supply chain, and thus improve the distribution process by giving an impetus to the delivery schedules in digital supply chain.

As technology progress in the organization, it has become necessary to realize the advantage of digital supply chain to maximize the carrying cost of large amount of inventory, with the help of better advancement, and generate product demand.

### **CONCLUSION**

Digital supply chain data sources are multiplying, and technology is becoming widely used in cloud based technology, sharing the organizations changing technology, and becoming more volatile. Many organizations are going in a digital way in supply chain to take control of the most important the data growth, complexity, standardization, data analysis, through data exploring management, and going into the possibility of different digital supply chain offered by machine learning, Internet of Things, Block chain taking advantage of the growth of the digital supply chain.

As the digital supply chain becomes more volatile, and complex, the future of digital supply chain bring I market changes, conditions, trends, and the digital supply chain will innovate and adapt more quickly.

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**IMPACT OF E-HRM SYSTEM ON ORGANISATIONAL PERFORMANCE: A CASE STUDY IN AUTO-COMPONENT MANUFACTURING SECTOR**

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**ABSTRACT**

*PURPOSE: Human resource management is replacing its activities involving face to face interaction with web-based HR tools. The purpose of this paper is to study a Research project on impact of E-HRM system on overall organisational performance on the basis of Employees responses in an Auto component manufacturing organisation i.e IMPERIAL AUTO INDUSTRIES LTD on departmental basis.*

*Methodology: The study used a questionnaire in which Top and Middle level executives of 3 Departments (Management department, Human resource Department & Accounts Department) in Imperial Auto Industries ltd headquarters participated. They responded to the questions on the basis of their experience and access to different components of e-HRM which reflected their attitude towards this system and their views regarding the overall performance of the organisation. The whole study is based on the responses attained from the employees of the organisation and some literature review is done to study the meaning of E-HRM, E-HRM Activities, its benefits to the organisation and a little study on the organisation in which this study is conducted.*

*Findings: 1. About 69% of the HR activities have an access to information technology system, electronic modes, internet etc.*

*2. There is a visible difference in the levels of accessibility to E-HRM activities amongst different Departments.*

*3. Approximately 80% of the employees (in all the 3 Departments) agree (including 45% strongly agreeing) with the statement that E-HRM system has a positive impact on the overall Performance of the organisation taking basis of certain selected statements related to Electronic Human Resource Management.*

*Originality/ Value: 1. This Research Paper will help the organisations in the Auto-component manufacturing industry in understanding the level difficulties which employees are facing in using offline modes of performing HRM activities and which are the major Activities which should be inculcated electronically to solve their problems.*

*2. It also helps to analyse and improve the thought process of the employees regarding E-HRM system on overall performance of the organisation.*

*3. This paper will help to understand the importance of E-HRM activities in Auto component manufacturing firm.*

*Keywords: E-HRM, Information Technology, Auto component Industry, Overall Performance.*

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**INTRODUCTION**

Organisations are made and run by Humans. The most important Pillar for proper functioning of any organisation is Human Resources irrespective of the type of industry it belongs to. Further information technology systems, electronic modes, internet etc are increasingly influencing every aspect of an organisation including human resource management practices. Due to this rapid development of information technology it has enhanced the adoption of Electronic Human Resource management.

E-HRM can be narrowly defined as the administrative support of the HR function in organisation by using internet Technology. Due to the introduction of this concept of e-HRM (A web tool used to support the HR processes), it is very important to study its impact on the overall performance of the organisation. The impact of E-HRM on the overall organisation performance depends on the way the employees in the organisation approach towards the adoption and acceptance of IT based HR system. E-HRM is divided into these following activities:

- 1. Transactional Activities** (For instance those activities which involve day to day transactions and record keeping)
- 2. Traditional HR Activities** (Recruitment, Selection, Training, Compensation, Performance Management etc)
- 3. Transformational Activities** that adds values to the organisation and may be used to manage HR across the whole employee life cycle.

E-HRM offers a large number of **advantages** like Data security and Personal Privacy, Automated employee information records, Fast response to employee grievances, Considerable reduction in administrative work, Quick Decision making, Standardisation etc.

Evidently, every economy requires a well-versed transportation system for its smooth functioning and further development. The automobile industry along with the auto component manufacturing industry is one of the core industries in India. This sector has a major contribution in the economic growth of the country. Automobile industry is incomplete without the base of auto components industry. **Auto-components industry** has benefitted India in the following aspects:

- Growing Demand
- Export opportunities
- Policy support
- Competitive Advantages.

This sector has provided India with a global standing in the international market. As this sector has a strong economic standing at national and international level, it is very important to cope up with the new technologies used all over the world. Therefore, there is a **need** to check the impact of e-HRM system in this industry.

This paper helps to study the introduction of e-HRM practices in a leading Auto-component manufacturing company i.e **Imperial Autos Industries Ltd** and to find out its impact on the overall organisational performance. Imperial Autos industries ltd is one of the largest integrated manufacturer of Fluid transmission Products (FTP's) and an approved global supplier of International Truck cummins, Caterpillars, JCB, Joh Deere and other OEM manufacturers overseas.

To check the impact of E-HRM activities on the overall organisation it is important to differentiate between the responses of various departments. This Paper represents employees responses on departmental basis and integrates the results to analyse the overall impact. This research offers recommendations and suggestions for improving the effectiveness of e-HRM systems.

#### **METHODOLOGY**

The Present Research is conducted by using Questionnaires amongst the top and middle level employees at imperial Auto industries headquarters in three departments i.e General Management Department, Human Resource Department, Accounts Department. The questionnaire had Three sections A, B & C

Section A included Statements regarding whether the organisation has introduced IT based practices in various activities related to HR like

- E-Recruitment (Process of Personnel Recruitment)
- E-Training (Anywhere, Anytime instruction delivered over the internet)
- Performance Management (Appraisal Process)
- Payroll (Electronic Salary transfer and processing)
- Leave Management (Apply for leave online)
- Attendance management (Managing Attendance or presence at work)
- Employee Grievance Management

Section B introduces a scale rating from 1(NOT AT ALL) to 5(VERY HIGH EXTENT) to check that up to what extent E-HRM practices are being implemented i.e upto what level Different departments have access to these activities. Statements included:

- Presence of online recruitment and selection policy
- Presence of formal induction and orientation to help new Recruits
- Use of online training facilities for Promotion
- Effective salary Administration system
- Use of online system for tracking and applying for leaves
- Use of online system for time and Attendance Management
- Provision of online medical Aid request and claim

- Availability of online suggestion Box
- Arrangement of online stress management Programs

Section C helps to analyse employees views regarding the impact of these E-HRM practices on the overall Performance of the organisation. The employees have provided ratings from 1 to 5 on the basis of their Personal experience where 1 represents Strong Dis-agreement with the particular statement and 5 represents Strong Agreement with the corresponding statements. Statements include:

- Aims at increasing efficiency
- Cost Reduction due to E- HRM system
- Aims at visibility
- Increases Productivity
- Promotes ability to attract/retain employees
- Improves quality of HRM services
- Reduces dependence on HR professionals
- Increases competency Development
- Increases Transparency
- Improves Monitoring
- ROI has increased with E-HRM implementation
- Improved organisation Image.

These three sections included different aspects of E-HRM on the basis of which further Grphical Representations will be made and percentages will be calculated to find the final conclusions.

FINDINGS / SECTION A / TABLE A1

Sno.	E-HR Activities	Available (online/web)	Only offline	Both online and offline
1	E-Recruitment	32	0	0
2	E-Training	0	32	0
3	Performance Management	12	16	4
4	Payroll Facility	32	0	0
5	Leave Management	32	0	0
6	Retirement	19	5	8
7	Attendance Management	32	0	0
8	Compensation Planning	0	32	0
9	Career Planning	0	32	0
10	Employee Self-service	32	0	0
11	Employee grievance Management	11	10	11
12	Travel management	0	32	0
13	Promotion and Career Advancement	0	19	13

GRAPH A1

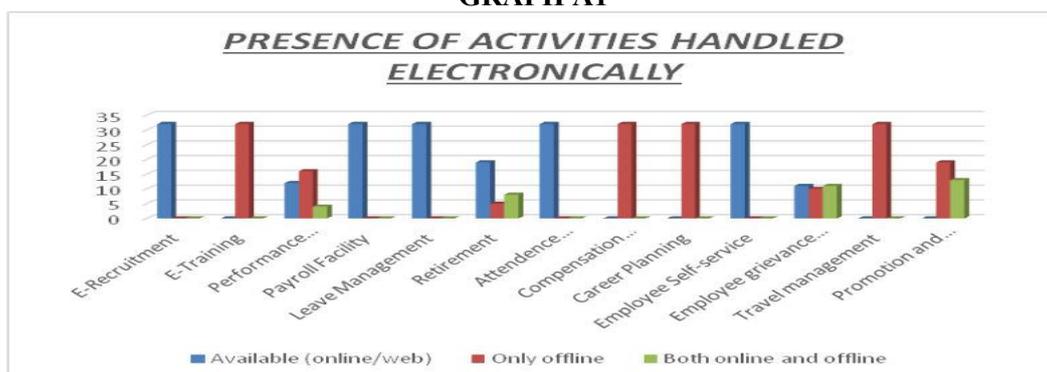
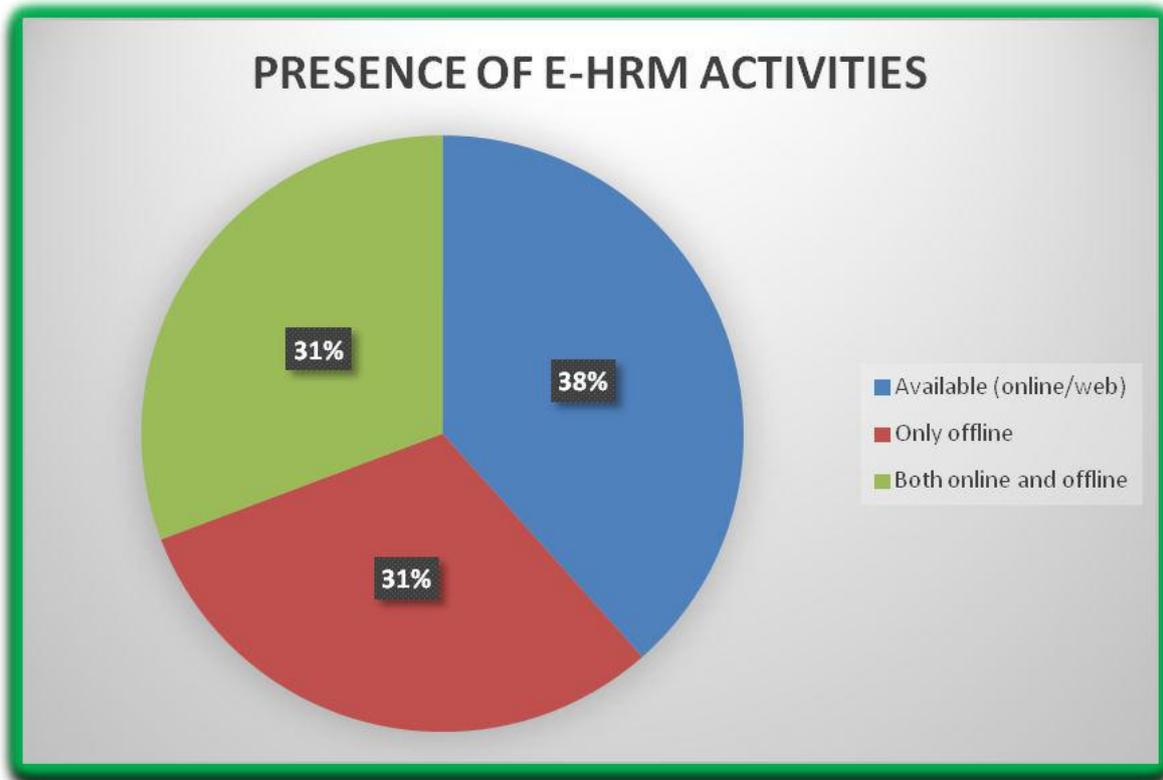


TABLE A2

Total E-HR Activities	Available (online/web)	Only offline	Both online and offline
13	5	4	4

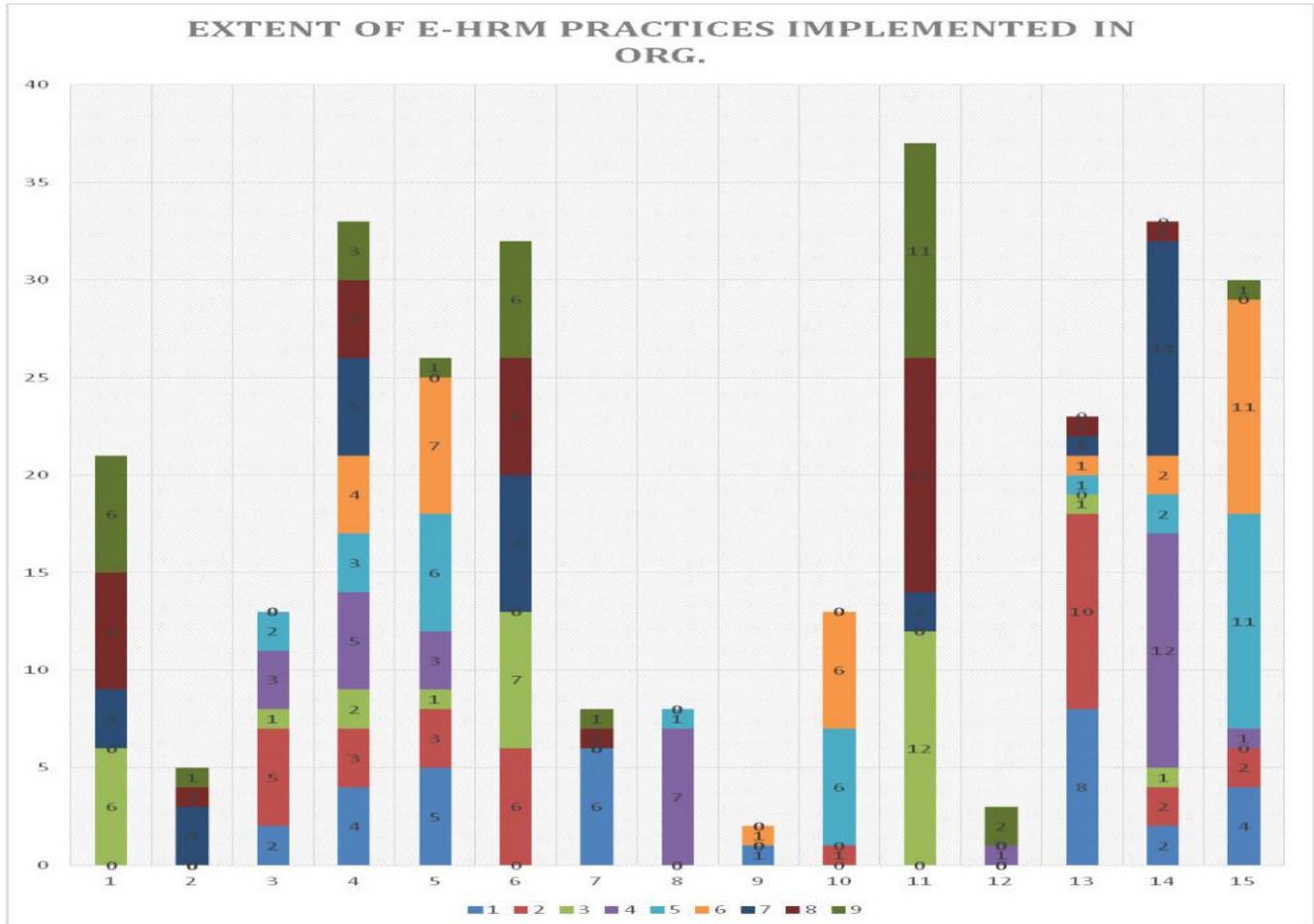
CHART A1



SECTION B / TABLE B1

SNO.	STATEMENTS	GEN. DEPT.					MGT. DEPT.					HR DEPT					ACCOUNTS DEPT				
		Rating scale					Rating Scale					Rating Scale									
		1	2	3	4	5	1	2	3	4	5	1	2	3	4	5					
1	Presence of online recruitment and selection policy	0	0	2	4	5	0	6	0	1	0	0	0	8	2	4					
2	Presence of formal induction and orientation to help new Recruits	0	0	5	3	3	6	0	0	0	1	0	0	10	2	2					
3	Use of online training facilities for Promotion	6	0	1	2	1	7	0	0	0	0	12	0	1	1	0					
4	Effective salary Administration system	0	0	3	5	3	0	0	7	0	0	0	1	0	12	1					
5	Use of online system for tracking and applying for leaves	0	0	2	3	6	0	0	1	0	6	0	0	1	2	11					
6	Use of online system for time and Attendance Management	0	0	0	4	7	0	0	0	1	6	0	0	1	2	11					
7	Provision of online medical Aid request and claim	3	3	0	5	0	7	0	0	0	0	2	0	1	11	0					
8	Availability of online suggestion Box	6	1	0	4	0	6	1	0	0	0	12	0	1	1	0					
9	Arrangement of online stress management Programs	6	1	0	3	1	6	1	0	0	0	11	2	0	0	1					

GRAPH B1



SECTION C / TABLE C1

SNO.	STATEMENT	GEN. MGT. DEPT.					HR DEPT					ACCOUNTS DEPT					TOTAL
		Rating scale					Rating Scale					Rating Scale					
		G 1	G 2	G 3	G 4	G 5	HR 1	HR 2	HR 3	HR 4	HR 5	A/C 1	A/C 2	A/C 3	A/C 4	A/C 5	
1	Aims at increasing efficiency	0	1	2	3	5	1	0	0	0	6	0	0	3	8	3	
2	Cost Reduction due to E- HRM system	0	0	3	4	4	1	0	0	0	6	0	0	7	5	2	
3	Aims at visibility	0	0	2	4	5	0	0	1	6	0	0	0	0	11	3	
4	Increases Productivity	0	0	2	4	5	0	0	0	1	6	0	0	1	10	3	
5	Promotes ability to attract /retain employees	0	0	2	4	5	0	0	0	0	7	0	0	13	0	0	
6	Improves quality of HRM services	0	0	4	3	5	0	0	0	0	7	0	0	8	2	4	
7	Reduces dependence on HR professionals	0	0	2	6	3	0	0	0	0	7	0	0	2	9	3	
8	Increases competency development	0	0	0	8	3	0	0	0	0	7	0	0	1	12	1	
9	Increases Transparency	0	0	4	4	3	0	0	0	0	7	0	1	2	8	3	
10	Improves Monitoring	0	0	1	5	5	0	0	0	0	7	0	0	8	4	2	
11	ROI has increased with E-HRM implimentation	0	0	4	2	5	0	0	1	6	0	0	0	2	9	3	
12	Improved Organisation Image	0	0	5	0	6	0	0	0	6	1	0	0	2	5	7	
		0	1	3	4	54	2	0	2	19	61	0	1	49	83	34	384

GRAPH C1

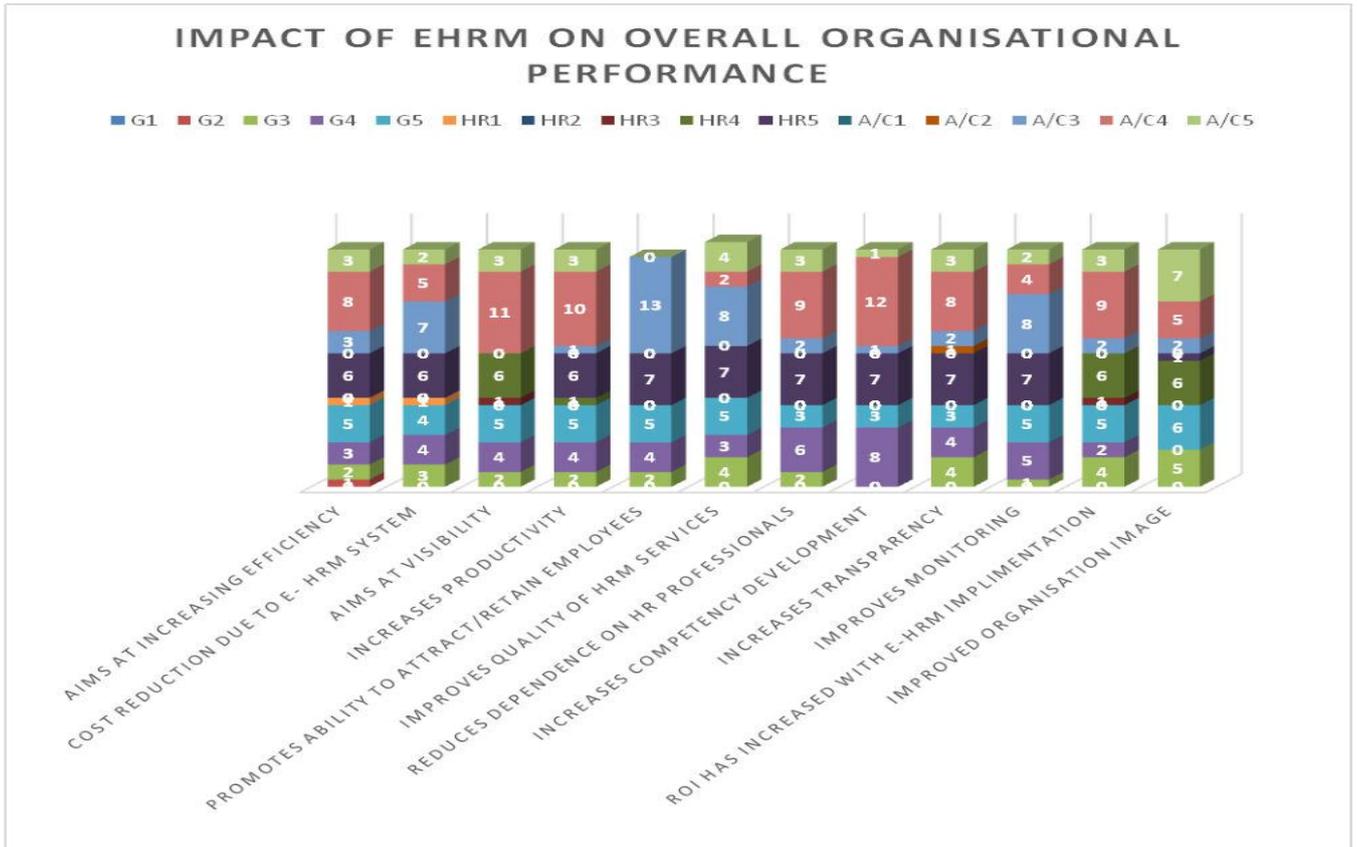
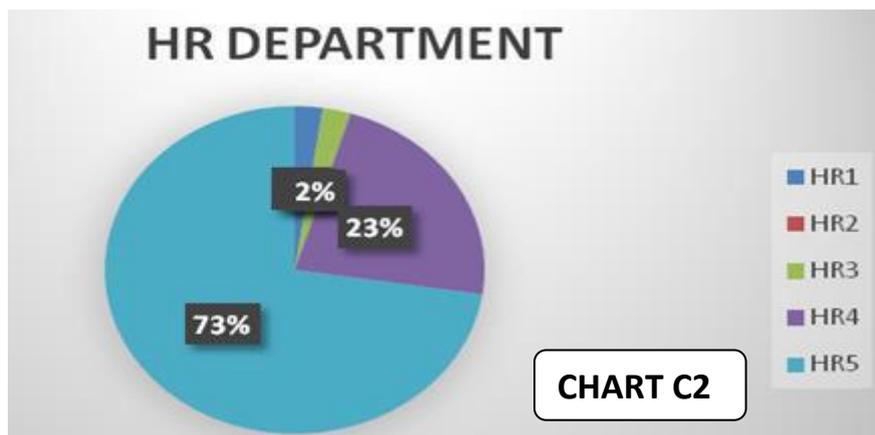
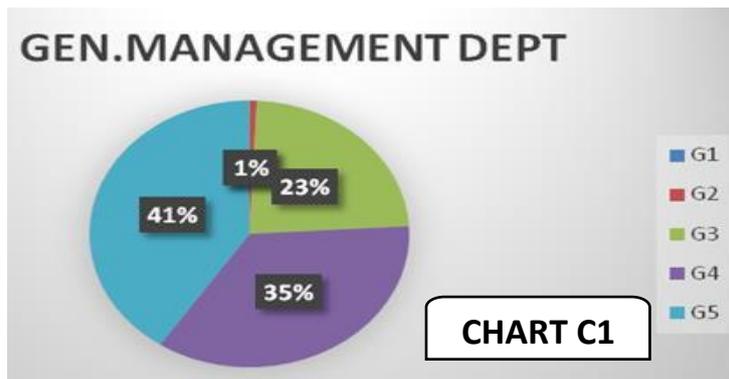
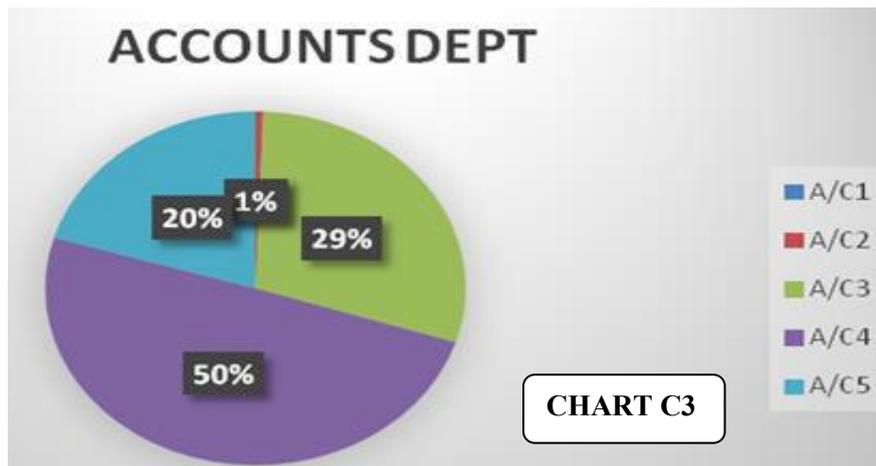


TABLE C2

EHRM statements	GEN. MGT. DEPT.					HR DEPT					ACCOUNTS DEPT				
	G1	G2	G3	G4	G5	HR1	HR2	HR3	HR4	HR5	A/C1	A/C2	A/C3	A/C4	A/C5
TOTALS	0	1	31	47	54	2	0	2	19	61	0	1	49	83	34





### DISCUSSION SECTION A

The responses of the questions(mentioned in methodology above) asked in this section gave the following outcomes.

1. **38% of HR** activities are Performed completely on online/web basis ( E-RECRUITMENT, PAYROLL, LEAVE MANAGEMENT, ATTENDANCE MANAGEMENT, EMPLOYEE SELF SERVICE)
2. **31% of HR** activities are performed on online as well as offline basis. (PERFORMANCE MANAGEMENT, RETIREMENT, EMPLOYEE GRIEVANCE MANAGEMENT, PROMOTION AND CAREER ADVANCEMENT)
3. **Only 31% of HR** activities are performed on offline basis. (TRAINING, COMPENSATION PLANNING, CAREER PLANNING, TRAVEL MANAGEMENT)

These outcomes provide clear picture that even though IMPERIAL AUTO INDUSTRIES LTD is a manufacturing organisation , is still handling approximately 70% of its activities in web basis. (**REFER CHART A1**)

### SECTION B

The responses gathered from this section helped to analyse the extent upto which various departments had access to different E-HRM activities. Following outcomes were recorded:

1. Activities related to ONLINE SYSTEM FOR TRACKING AND APPLYING LEAVES AND USE OF ONLINE SYSTEM FOR TIME AND ATTENDANCE MANAGEMENT (**S.NO. 5,6 REFER TABLE B1**) have the highest rating of 5 from all the employees in all the departments. This means that all the departments have complete access to these E-HRM services.
2. Activities related to USE OF ONLINE TRAINING FACILITIES FOR PROMOTION, PROVISION FOR ONLINE MEDICAL AID REQUEST AND CLAIM, AVAILABILITY OF ONLINE SUGGETION BOX, ARRANGEMENT OF ONLINE STRESS MANAGEMENT PROGRAMS (**S.NO- 3, 7, 8, 9 REFER TABLE B1**) have the lowest ratings from maximum employees.

Management department=54.5%

HR Department= 89.2%

Accounts Department= 83.9%

This means that the above-mentioned percentage of people in the 3 departments have least access to these HRM activities.

3. Activities related to PRESENCE OF FORMAL INDUCTION AND ORIENTATION TO NEW RECRUITES AND EFFECTIVE SALARY ADMINISTRATION SYSTEM have mixed responses inter-departmentally.
  - i. In management and Accounts department, the ratings of activity mentioned in **S.NO. 2 (REFER TABLE B1)** from maximum employees is 3. In HR Department this activity is given the ranking of 1 which means they donot have access to online induction and orientation.

- ii. In Management and Accounts Department the ratings for activity mentioned in **SNO. 4 (REFER TABLE B1)** from maximum employees is 4(High accessibility) whereas in HR Department ratings for this activity ,from maximum employees is 3 (low accessibility).

### SECTION C

The outcomes of this section represent the following:

- 1) In General Management Department ,76% of employees agree that the e-HRM systems has a positive impact on the overall performance of organisation out of which 41%(Rating 5) strongly agree to the statement.(**CHART C1**)
- 2) In HR department 96% of employees agree that e-HRM systems has a positive impact on the overall performance of organisation out of which 73%(Rating 5) strongly agree to the statement(**CHART C2**)
- 3) In Accounts department 70% of employees agree that e-HRM systems has a positive impact on the overall performance of organisation out of which 20% strongly agree with the statement. (**CHART C3**)

### CONCLUTIONS

- I. Electronic HRM is progressively being implemented in the organisation. (**GRAPH A1**)
- II. There is a disproportionate access to E-HRM activities in different departments i.e the employees of different departments do not have equal access to E-HRM activities.
- III. Approximately 80% of the employees in the organisation have a clear view that E-HRM activities have a strong positive impact on the overall performance of the organisation

**To sum up** on the basis of this case study research it can be concluded that the integration of Information technology with HR activities is a blessing for the organisation satisfying the employees in almost all the departments. The benefits which are provided by E-HRM activities force the employees to form a positive opinion on the impact of the practices on the organisational performance.

Taking this case study research as a base we can conclude that E-HRM is a blessing for all the organisations irrespective of the sector it belongs to. **It can also be said that the Auto-component manufacturing sector is significantly rising at national and international levels and E-HRM has its significant role in this growth.**

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**LIFE SKILL EDUCATION: A VEHICLE FOR SOCIAL TRANSFORMATION OF YOUNG ADOLESCENTS**

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**ABSTRACT**

*Adolescence is a transitional period in the human life span. It links childhood and adulthood and happens to major physical changes and health related issues and other social problems in any country. It is also the most demanding period of one's life and can be better described as a stormy and stressful time in life. At this period they portray of their self to others and try to establish a personality of their own and seeking a new identity. On the other hand, they also confronted with the problems of tension, anxiety, fear, drug abuse, juvenile delinquency, violence, sexual-problems, School and College related problems etc., etc. This is the problem of our society as Adolescents are the part of it. Life Skill Education is the study of abilities for adaptive and positive behaviour that enable individuals to deal effectively with the demands and the challenges of everyday life. It has an impact over the life and sound life skills usually increase potentiality, reduce stress and conflict, improve human social relationship building ability, increase human understanding, promote joy and thus make a healthy and peaceful life. In this Paper an attempt has made to highlight on some basic concepts of Life Skill education, its aims and objectives, scope , area and how they can be helpful as a tool for social transformation of the young adolescents and to make them a good citizen of our country.*

*Keywords: Life Skills, Adolescents, Interpersonal Skills, Effective Communication, Stress Management, Diversity Management, Time Management, Conflict Management, Peace and Shared Humanity, Prosperous Nation.*

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**INTRODUCTION**

Adolescents is a period of ranging from 10 to 21 years, during which a growing person makes a transition from childhood to adulthood. WHO refers age range to adolescents between 10 to 24 and it is a transitional period in the human life span that prepares a young individual to meet the challenges of social and economic world. Most of the youth at this period becomes a perfect dreamer. He dreams of a perfect friend, perfect teacher, a perfect philosophy of life, a perfect job and a perfect conduct in life. On the other hand young adolescents also face different social problems. It occurs due to various factors like unresolved conflicts, misunderstanding with parents, impulsiveness, anger outburst, aggressive behaviour, increased interest in sexuality etc. The challenges faced by the youth may be categorized as i) Psychological e.g. preparing examinations, peer pressures, etc. ;ii) Social e.g. peer pressure, inter-relationships, etc. iii) Economic e.g. lack of resources such as finance, basic necessities, excessive resources ; iv) Spiritual e.g. exposure to conflicting religious beliefs etc. As the youth are the part of the society, so this is a social problem and have to be tackled at a more fundamental level. Adolescence is also the most demanding period in one's life—a period of anxiety and stress. Accurate portrayal of self to others is in the process of establishment during this period and this is also the identifying criterion of healthy personality. Thus, it is important to understand the need of social and emotional support to the young adolescents. It requires to reinforcement of norms, acquisition of skills which are essential to cope with the difficult situations, that they encounter in their day-to-day lives, manage peer pressure and deal with gender stereotypes etc. The absence of such support can lead to confusion and misinterpretation about these changes and adversely affect not only their academic performance but also their social behaviour. To develop a sound and healthy personality of our young people as well as to develop a knowledge based society life skills are one of the crucial element for their sustainable and professional growth. It is better to say make them a better citizen and a whole round man of the society.

**What is Life Skill Education?**

The term Life Skill Education is being widely used now-a-days but it is often used interchangeably with Livelihood Skills. But the two are different. Livelihood Skills as the name suggests, are skills related to generate income to fulfill one's household or individual economic goals. These skills are basically connected with vocational Skills, business management skills etc. , where as Life Skills encompasses all the dimensions of human life, be it economical, social or psychological.

World Health Organization(WHO) in 1993 defined Life Skills as “ the abilities for adaptive and positive behaviour that enable individuals to deal effectively with demands and challenges of everyday life”.

UNICEF defined Life Skills as, “ a behaviour change or behaviour development approach designed to address a balance of three areas : knowledge , attitude and skills”.

Hendricks (1966) defined Life Skills as “ Skills that help an individual to be successful in living a productive and satisfying life”.

Yarham(1919) defined Life Skills as “ the personal competence that enables a person to deal effectively with the demands and challenges confronted in everyday”.

Powell (1995) defines Life Skills as” the life coping skills consonant with the developmental tasks of basic human development processes, viz. those skills necessary to perform tasks for a given age and gender in the following areas of human development- psychological, physical, sexual, vocational, cognitive, moral, ego and emotional”.

Therefore, Life Skills are a large group of psycho-social and inter personal skills, which can help people, to make informed decisions, communicate effectively and develop coping and self management skills that may help an individual to lead a healthy and productive life.

### **LIFE-SKILLS EDUCATION - A BRIEF HISTORY OF DEVELOPMENT**

Life Skills-based education(LSBE) has a history of gradual development in its present form. In 1986 the Ottawa Charter for Health Promotion first recognized life skills in terms of making better health choices. It was followed by an another event in 1989 i.e. Convention on the Rights of the Child(CRC). It linked life skills to education by showing that education should be directed towards the development of the child’s fullest potential. In 1990 Jomtien Declaration on Education for All took this vision further and included life skills among essential learning tools for survival, capacity building and improvement of quality of life. Thereafter in 2000 Daker World Education Conference took a position that all young people and adults have the human right to benefit from “ an education that includes learning to know, to do, to live together and to be”, and included Life Skills in two out of six EFA(Education for All) Goals.

Life Skills- based education is now recognized as a methodology to address a variety of issues of child and youth development and thematic responses including as expressed in UNGASS on HIV/AIDS(2001), UNGASS on Children(2002), World Youth Report(2003),World Programme for Human Rights Education(2004), UN Decade on Education for Sustainable Development(2005), UN Secretary General’s study on Violence Against Children(2006), 51<sup>st</sup> Commission on the status of Women(2007), and the World Development Report(2007).

### **IMPORTANCE OF LIFE SKILL EDUCATION**

Prosperous and healthy nation is the valuable resource for the development of any country. Indian youth represent a significant proportion of World wide population. It was estimated that young Adolescents below 20 years of age represent 40% of the World’s population, while 80% are living in the developing countries(SEARO,2000). Life Skills help adolescents to transit successfully from childhood to adulthood by healthy development of social and emotional skills. It helps the student to recognize their talents and abilities; to develop their social competence and problem solving skills, which in turn help adolescents to form their own identity. The awareness about themselves help them to set goal in their life. Finally enhancement of these skills are useful to address the needs and concerns of their daily life. Life skills will develop a wide range of Psycho-social and interpersonal skills which will help students to make informed decisions, communicate effectively, develop coping with stress and self management skills. These will help them to develop into healthy and well balanced individuals leading to a productive life and contribute in the development of a peaceful, healthy and sustainable environment. Life Skills will equip the students with the knowledge, skills and attitude to face the challenges in their adult life and the world of work. It will develop an awareness of our history and inform the students of their rights and responsibilities as an active citizen. They will learn movement and motor skills for an active participation in physical and leisure activities. They will be empowered to recognize the benefits of healthy lifestyles, analyze the risks and consequences of unhealthy life styles and to take responsible decisions to manage their own lifestyle and behavior. In short, this field of education help students and young adolescents to develop into whole individuals with a good sense of significance, responsibility, competence and well being.

### **Aims and Objectives of Life Skills to the Students and Young Adolescents**

In respect to the above stated discussion it may be said that the basic aims and objectives of Life Skills to the students and young adolescents are as follows :

- i) The young Adolescents should understand the importance of a healthy and active lifestyle.

- ii) To develop a range of movement and motor skills for a healthy and active life.
- iii) To develop a range of interpersonal and social skills through games and activities.
- iv) To develop an awareness of the past so as to understand the evolution of society to its present state.
- v) To aware students and young Adolescents of their rights and responsibilities as an active citizens for sustainable development.
- vi) To develop knowledge, skills and attitudes needed to preserve, appreciate, share our multiple cultural heritages.
- vii) To develop skills to deter behaviours and lifestyles associated with crime, drugs and violence.
- viii) To develop an atmosphere of peace and a sense of shared humanity; demonstrate basic assertiveness, strategies to manage interaction with others.
- ix) To develop an understanding of the functioning of the human body.
- x) To develop action competence to reduce vulnerability to health problems.

### **SCOPE OF LIFE SKILL EDUCATION**

Life Skill Education increase the practical knowledge and skills of the young adolescents backed by their emotional and social intelligence. It help them to behave in a socially acceptable manner and adapt themselves to a social environment so that the others may feel comfortable with them and vice versa. So Life Skills increase their ability to function harmoniously with others in a larger society. It make them to be openness to learning new ideas. It promote their tolerance to an unfavourable situations and differences in opinions. It help them to be broad minded to accept people from different cultures. Learning ground of Life Skill education raise their eagerness to make things work in their personal and professional life. Life Skill education also help the young Adolescents to manage their own emotions. At the same time it promote their ability to manage others by mapping their mood. Thus they becomes dim fit to manage a situation by predicting its depth and nature and do needful accordingly.

The three broad areas of Life Skills are :i) Rational Abilities-it means to understand a problem and then to find a way to solve it effectively. ii) Personal Qualities- it means whether having or not the qualities to take initiative, responsibility, accountability, self esteem, sociable and socially sensitive, well adaptive capacity, ability for self management in personal and professional life with integrity and honesty etc. iii) People Skills-means ability to participate as a member of a team, leadership qualities when situation demands, negotiating and working capacity with ease even with people from different socio-economic and cultural background.

Thus the scope of the Life Skills education are varied in nature ;from the individual self development in the day-to-day life of the young adolescents to the social, cultural, economic development of the larger society , community, organization and the whole nation.

### **SOME AREAS OF LIFE SKILLS EDUCATION**

World Health Organization(WHO, Geneva,1997)"Life Skill Education for Children and Adolescents in Schools"-determined ten core areas of Life Skills education. These are-i) Self Awareness, ii) Decision

Making, iii) Coping with Stress, iv) Managing Emotions, v) Empathy, vi) Interpersonal Skills, vii) Effective Communication, viii) Creative Thinking, ix) Critical Thinking and x) Problem Solving for School Students and young Adolescents.

The other areas which the Experts suggested as a part of Life Skills Education are-Leadership Skills, Team Playing Skills, Adaptability, Mood management, Conflict management, Diversity management, Time management, Image management, Stress management, Change management etc.

### **CONCLUSION**

Every nation, society and community should take responsibility to work for promoting Adolescent's physical, social and mental health. This should be done by helping young people acquiring knowledge, attitudes, and value added skills etc. It eventually benefit them in a variety of ways such as taking informed decisions, solving problems, thinking critically and creatively, communicating effectively, empathizing with others, coping with stress and managing their lives in a healthy and productive manner. These knowledge, attitude and skills etc., thus lead to behaviours that prevent disease and injury, foster healthy relationships and enable young people to take ownership of their action and play leadership roles constructively. These are all helpful to develop a healthy and prosperous nation as well as a responsible citizen of our country.

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**DIGITALISATION AND ITS IMPACT ON CUSTOMER RELATIONSHIP MANAGEMENT- A STUDY FROM CUSTOMERS' PERSPECTIVE**

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**ABSTRACT**

*A customer is an individual or a group of individuals or business that purchases the goods or services produced by a business organization. Attracting, retaining and satisfying customers is the primary and most important goal of most of the public facing businesses, because it is the customer only who creates demand for goods and services. It has become very important for business units to emphasize on creating long-term relationships with customers to nurture their stability in today's blooming market. These days customer's expectations are now not only limited to get best products and services but they also need a face-to-face business in which they want to receive exactly what they demand and also in a quick times so that a relationship of trust can be built. Also, we are living in a dynamic world where digitalization is taking on everything including marketing. All the objectives of Customer Relationship Management can be easily achieved through digitalization. So, it is becoming important for the businesses to have an efficient Customer Relationship Management system in place in this world of digitalization. So, the research has been conducted to find out the satisfaction level of customers of ICICI Bank with its services online services also. The research study is Empirical in nature and is based on Primary sources. It provides deep insight into the problems that customers are experiencing in the current scenario and suggestions have been provided that may act as a solution to the emerging issues in the bank.*

*Keywords: customer information, digitalization, customer satisfaction, loyalty, customer relationship,*

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**1. INTRODUCTION**

Customer Relationship Management (CRM) refers to strategies, ways and technologies that are used by the companies to analyze and manage client interactions and their data throughout the client lifecycle, with the objective of improving relationships with the customers, which ultimately helps in customer retention and enhancing the sales growth. CRM systems help in giving customer-facing staff detailed information including customer's personal information, purchase history, buying preferences and concerns. CRM is a practice that solidifies a company's relations with its customers. An ideal CRM system is a centralized collection of all data sources of customers under an organization and provides detailed customer information.

The new age of transformation in India and in the whole world is called '**Digital Era**'. Though digitization and digitalization are interchangeably used but the two words are conceptually different. While the term digitization means the technical method of changing streams of analog info into digital bits of 1s and 0s with separate and discontinuous values, the term digitalization means using digital technologies to change the model of the business and to provide new revenue and value-producing opportunities. Some of the best examples of digital technologies are applications on mobile phones, data analytics, customer profiling, cloud computing, and IOT (Internet of Things) Technology which has led to the growth of Information age business and knowledge driven virtual markets. Use of digital technologies in Customer relationship management is becoming very important to improve customer life time value and to survive in today's Digital Era. Understanding the needs of customers and meeting their needs efficiently by offering value-added services are the recognized factors that determine the success and failure of companies nowadays. So, more and more companies have begun to attach greater importance to digitalization to revive relationships with customers, so that customer's needs are considered in all aspects of a business in an easy and efficient manner ensuring customer satisfaction to a great extent. Customer relationship management focuses on customers rather than products and services. Companies that enter to compete in a market may weaken the existing and solid ones, due to new ways of doing and conceiving business by using new digital technologies. So, it is very important for existing companies to maintain and retain customers which can be done effectively with the help of digitalization in customer relationship management.

Usually, an organization has various departments which predominantly have access to customers' information whether directly or indirectly. To make the work easy for human resource managers, the CRM system piles up with this information centrally, examines it and then makes it addressable within all the departments. Digitalized CRM system provides a well-defined platform for all the business units to interact with their current and potential customers and fulfill all their demands and needs effectively and to build a long-term relationship with them. It is an application or initiative designed to help an organization to optimize its interaction with

customers, suppliers or prospects via one or more touch points such as call center, salesperson, distributor, store, branch office, web or e-mail – for the purpose of acquiring, retaining or cross-selling customers.

A digitalized CRM system is not only used to deal with existing customers but is also useful in attracting and acquiring new customers. Firstly customers are identified by using online sources and all the corresponding details are maintained into the digitalized CRM system which is also called ‘Opportunity of Business’. After that, the sales and field representatives try to get business out of these customers by following up with them and converting them into a winning deal. Digitalized CRM strategies have helped in giving a new outlook to all the organizations to keep the business going under a strong relationship by fulfilling the mutual needs of buyers and sellers.

The growth of CRM in recent years is led by some important perspectives. Some of these are:

- The belief that customers are the real assets of the organization and not just the people in audience.
- The change of business view from transactional approach to relationship approach.
- The change in the approach of concentrating on how the product is delivered to the customer to concentrating more on customer values.
- The approach of focusing on customer satisfaction and loyalty rather than focusing on self-satisfaction and profit.
- The increasing tendency among the organizations to retain existing customers and trying to get more and more business out of them by using digitalized means.
- The realization by the businesses that the traditional strategies and trends of marketing and selling are increasingly fading out in the current economic scenario.

## **2. LITERATURE REVIEW**

CRM is a strategy which is customized by an organization according to its own objectives and structures to maintain and administrate its customers and vendors in an efficient manner for achieving excellence in business. In this era of Digitalization, most of the organizations are adopting new technological ways of planning their Customer Relationship Management. So, various scholars and researchers are doing research on the current scenario of Digitalized CRM system. A focused review of the literature was conducted to evaluate recent publications on Digitalization and CRM.

The research paper by Geeti Mehra (2017), titled- ‘Era of Digitalization and Indian Economy’ describes the idea of Digitalization and steps taken by the government so far to influence organizations to adopt new ways of doing business. It highlights the positive impact of such an era on India’s GDP and increasing job opportunities in India, the likely financial impact with increase in foreign direct investment (FDI) in the country and the path towards overall development with innovations and better administration.

Santhanamuthu. D. & Manickam S. (2012) in their research paper, with title- ‘Impact of Digitalization on Rural India stresses the importance of telecommunication in the development process, importance of mobile phones in reducing information asymmetry in most of the sectors, growth of telecommunication network in India and the studies relating to its growth with that of economic growth . It concludes with the transformation of villages into knowledge centers with the introduction of internet connections in rural areas to bridge the digital gaps. Rural population comprises of the 70% of the Indian population. So, it can be said that most of the Indian population is digitally educated. Hence, it becomes extremely important for the organizations nowadays, to go with the modernized ways of handling businesses.

Vollmer & Precourt, (2008) suggested that nowadays, the internet has become a mass media vehicle for communications with customers. Now it represents the number one source of media for customers at work. Customers are parting away from the traditional sources of advertising like, radio, television, magazines, and newspapers. Customers are consistently demanding more control over their media consumption. They need on demand and immediate access to information at their own convenience. Customers are using more frequently various types of social media to conduct various information searches and to make their purchasing decisions.

Chaffey, 2007 said that it is becoming important to understand the relationship between digital communication and traditional communication. In the old media; for example, TV, radio, newspapers, magazines and billboard ads, the communication model was and is one-to-many compared to one-to-one or many-to-many communication model in digital media like blogs, social networks, wikis and other social media.

Consumers are known to be the best judge in terms of service quality. Their conclusion is based on several factors and some of these factors like Responsiveness, Assurance, Tangibles, Empathy and Reliability are identified by Parsuraman, Berry and Zeithmal. Their model is called Servqual model. They believe that good amount of information related to service quality of organizations can be gathered on the basis of these factors (Nargundkar, 2009).

Servqual surveys are conducted by the organizations to understand the quality of their relationship with their consumers. These surveys are known as relationship surveys that assist banks in analyzing the strengths and weaknesses of their relationship. These surveys are also worthwhile in making comparison with competitors of an organization (Zeithaml, Bitner, Gremler & Pandit, 2011).

CRM in banking sector is essential for the survival of the banks. Banks must take ideas from consumers to enrich their services. (Putney & Puney, 2013).

CRM is known to be a process which increases customer satisfaction. In today's competitive business environment if any competitor wants to enter the market, then it has to focus on how to satisfy the customers. And this represents successful implementation of CRM (Shaon & S. M., 2015).

Banking sector is a fully customer-oriented sector and so, research is needed in this sector to analyze customers' needs and attitude in order to build long term relationship with them and hence building a successful CRM system. (Renuga & Durga, 2016).

The review of Literature has helped in developing a conceptual framework of the study.

### **3. OBJECTIVES OF THE STUDY**

The following objectives are set up for this study:

1. To find out whether the customers are satisfied with the current CRM practices adopted by ICICI Bank in South Delhi.
2. To find out whether the customers of ICICI bank are using Digitized services provided by the bank.
3. To find out whether the customers are satisfied with the current digitized CRM practices adopted by ICICI Bank in New Delhi.
4. To understand the impact of digitalization and online services on CRM of ICICI bank.

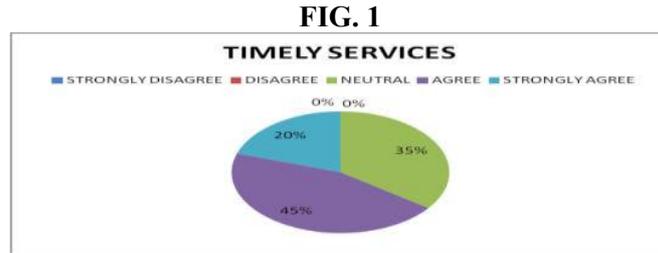
### **4. RESEARCH METHODOLOGY**

- The nature of research for this study is empirical because data has been collected to understand the customers' point of view about the CRM practices of ICICI bank.
- Questionnaires were used to collect the data from the customers of ICICI Bank. All the respondents belong to the region of New Delhi.
- The primary sources have been used to collect the data.
- Observations were made to come to conclusion.
- The Sample size for research work is 50 customers of ICICI Bank.

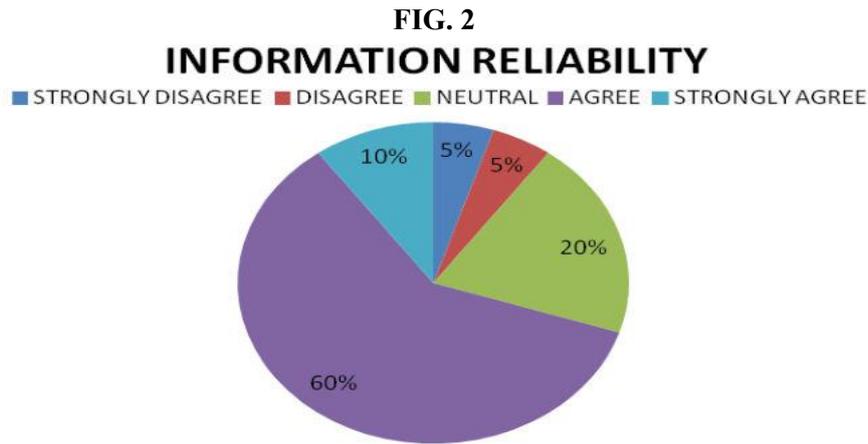
### **5. DATA ANALYSIS AND RESULTS**

The data has been profoundly analyzed to understand the perception of the customers about the current CRM practices followed by the ICICI Bank. The data collected through questionnaires has been diagrammatically represented below:

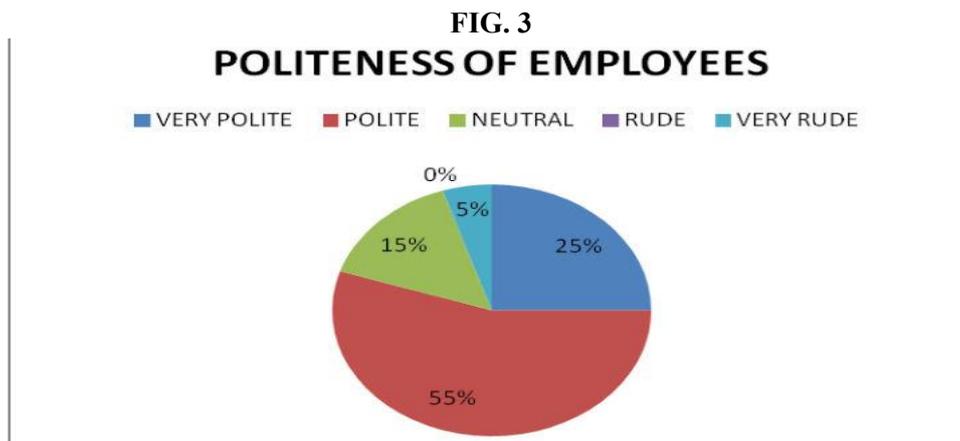
- 1.) The following figure (Fig 1) shows that 20% of the customers of ICICI bank are very much satisfied with getting the timely services from the employees of the bank with regards to introduction of any new policy or scheme or rule in the bank. 45% of the customers are also satisfied to an extent in getting timely services from the bank. Remaining 35% of the customers are neutral to say whether they are satisfied with timely services or not.



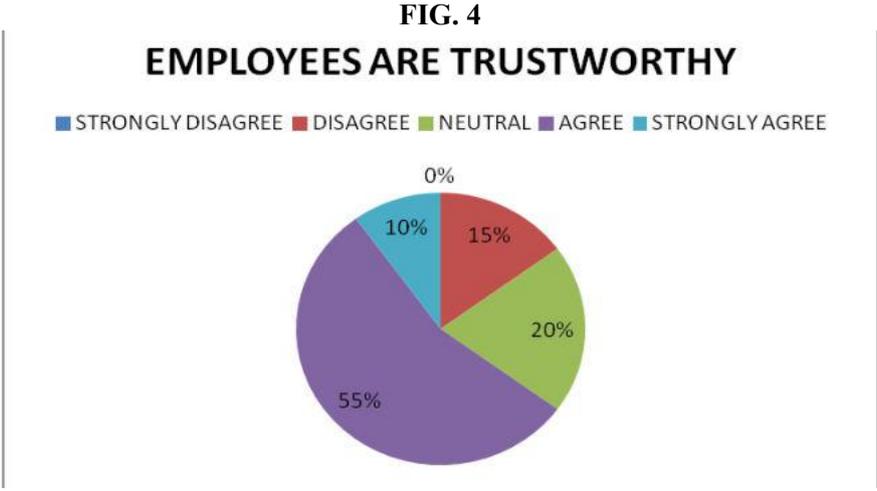
2.) Fig. 2 shows that 10% of the customers fully trust the information provided by the employees of ICICI Bank and 60% of the customers also trust the employees of the bank. But, 20% of the customers are neutral regarding trust issues in the employees. On the other hand, remaining 10% of the customers don't trust the services and information provided by the bank.



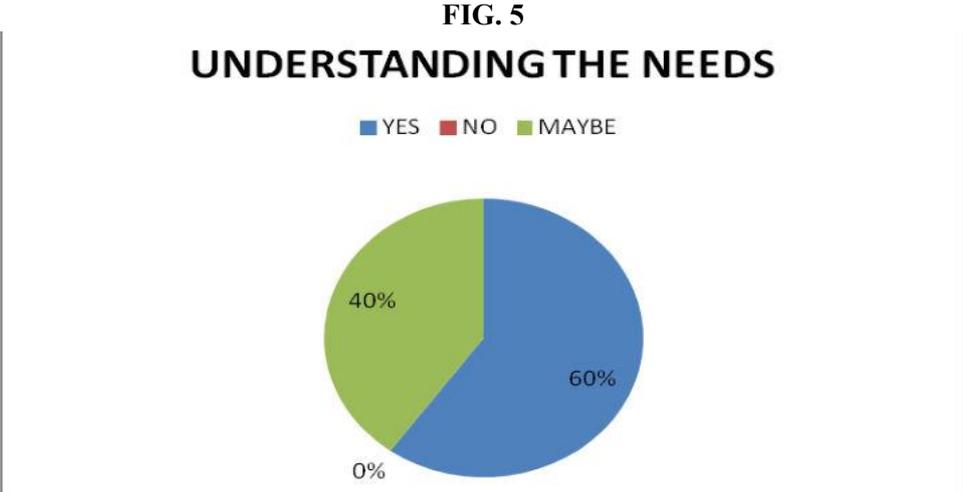
3.) The following fig. 3 depicts that majority of the customers (80%) are satisfied with the behavior of the employees and they agree to the fact that employees are polite in nature towards the customers. 15% of the customers are neutral in terms of behavior of employees and 5% of the customers are not at all satisfied with the behavior of employees towards customers.



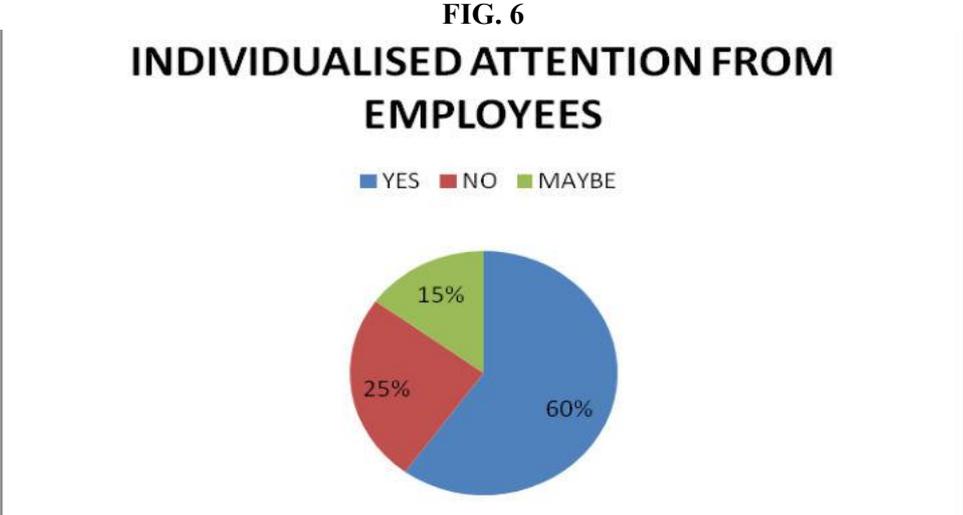
4.) The following figure shows the result that whether the customers are satisfied and whether they trust the employees in case of any discrepancy or any issues in their bank account or their transactions. Positive response is depicted in the figure which means that 65% of the customers feel that employees are trustworthy in terms of resolving issues. But 15% of the customers are not satisfied with the ways of solving issues.



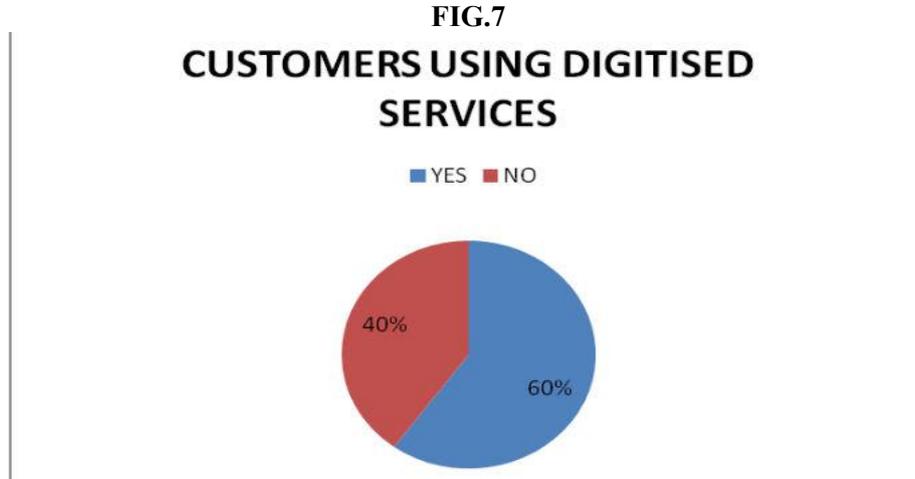
5.) The following figure shows that customers are somewhat satisfied that employees of the bank understand the needs of customers appropriately as 60% of the customers have thoroughly agreed for that point. On the other hand according to 40% of the customers, sometimes their needs are understood appropriately and sometimes not.



6.) FIG. 6 shows that 60% of the customers strongly agree that they have received individualized attention from the employees of the bank in case if any issue or problem arose. But, 25% of the customers strongly disagree in getting personal attention from the employees of the bank.



7.) The following figure shows that whether the customers of ICICI Bank are using the bank application on their mobile phones named as 'i mobile app' or not. Majority of the customers (60%) are using the application while 40% are not using the application in this digitized era.



8.) The following figure shows that whether the customers are satisfied with the digitized services provided by the bank on the application 'i mobile' app or not. More than half of the customers are satisfied with the online services. On the other hand, 42% of the customers are not fully satisfied with the services provided on the application.

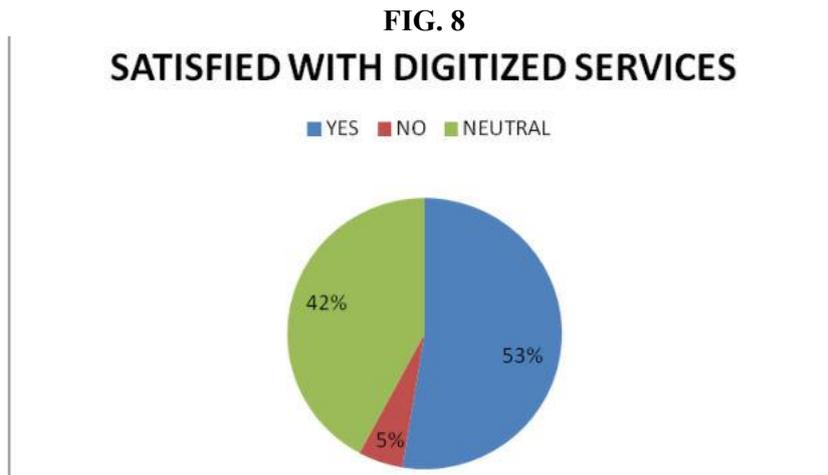
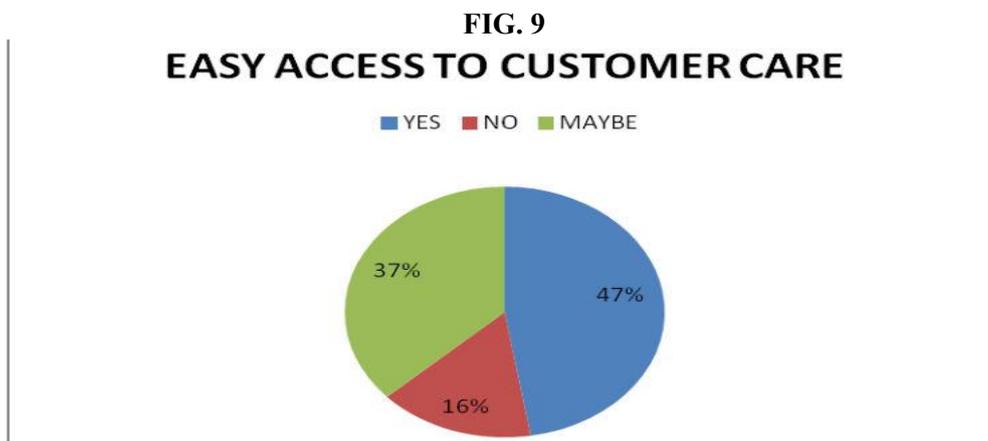
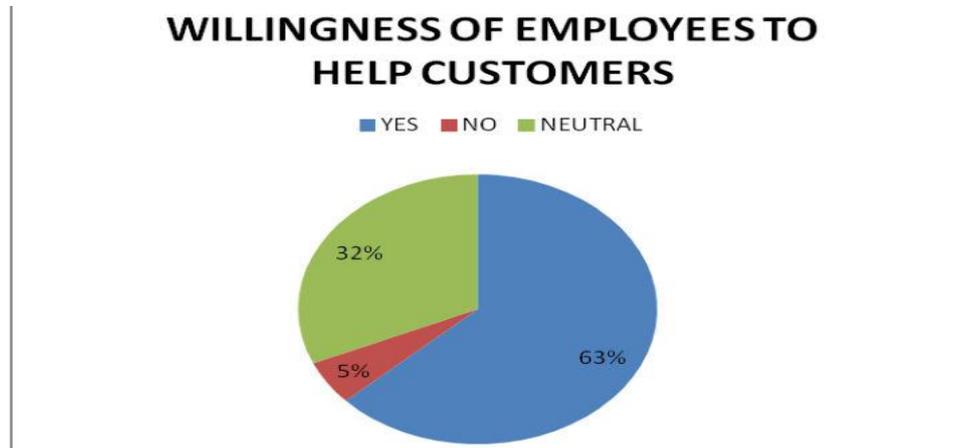


FIG. 9 shows that in case of any problem in operating the application on their mobile phones, whether the customers are able to contact the customer care easily or not. According to 47% of the customers, customer care is easily accessible and their problems are resolved easily. 37% of the customers say that sometimes they are able to contact customer care easily and sometimes not. But, 16% of the customers are not satisfied with bank in terms of customer care services for 'i mobile' app.



9.) This figure reflects that in case of any issue relating to online services, whether the employees of the bank are willing to help the customers and resolve their problems. More than half of the customers are satisfied that employees are eager help their customers anytime. But 5% of the customers are not satisfied with the employees' behavior towards resolving problems and issues.

FIG. 10



## 6. FINDINGS AND SUGGESTIONS

- From this study, it is found that most of the customers are satisfied with the employees of the bank in terms of getting timely information, authentic information and politeness of the employees. So, the bank must be having a strongly managed CRM system in place.
- 40% of the customers think that their needs are not appropriately understood by the employees. So, the management of the bank should train its employees in understanding needs and wants of customers because no organization can survive until and unless it understands its customers.
- Individualized attention to customers is very important to understand them and their needs. 40% of the customers don't agree that they receive personal attention. So, employees of the ICICI Bank should try to give time each and every customer.
- In this era of digitalization, 40% of the customers of ICICI Bank are not at all using the online and digitized services provided by the bank on its application. So, customers should be convinced and influenced to use digitized services.
- More than half of the customers are satisfied with online services. So, it can be said that digitalization has a great impact on Customer Relationship Management. By getting digitized services, customers are more satisfied and relationship with them is maintained for a lifetime. It can be suggested that the bank must work on with continuously providing better and updated services.
- For digitized services, customer care number and email id should be provided to customers so that in case of any discrepancy, they can easily able to contact the employees of the bank.

## 7. LIMITATIONS OF THE STUDY

1. The sample size of this study may not be sufficient to represent the whole population.
2. The research is done in New Delhi only and other states of India may also be considered to conduct research to have better results.

## 8. CONCLUSION

After the analysis done for this research study, it is clear that CRM is the backbone of any organization. In today's business markets, the key to sustainable competitive advantage is the customer. It can become much difficult for the business units without proper CRM systems to survive in today's market scenario. Companies should have knowledge about who their customers are, which customer populations directly drive their profits and what efforts will keep these customers loyal and happy over time. Customers drive business success to a great extent. CRM systems move a business unit beyond the obvious. CRM also helps in the main functions of planning and decision making. With a balanced CRM system, not only the customers will get to know about a particular business unit, but they will also value their relationship with such unit and will also become loyal customers. Each and every bank and organization is following the CRM practices to face challenges of the

rivalry. During the data analysis, it has been identified that customers are highly satisfied with ICICI Bank in the area of NEW DELHI. However, they are still expecting and looking for some important factors to be improved in the bank which would further enhance their satisfaction level. Customers need some more personalized treatment and they expect that the employees help in making their problematic situations easier for them. So, it can be concluded that Digitalization has its impact on CRM because in this world of digitalization, customers are more satisfied with online services. Also, having a Digitized CRM system has a great impact on satisfaction level of employees. CRM which was earlier a very difficult task, has been simplified in today's era of Digitalization.

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**A STUDY ON CONSUMER PERCEPTION TOWARDS DIGITAL WALLET WITH REFERENCE TO SURAT CITY**

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**ABSTRACT**

*This paper addresses the issues of consumers' perception towards digital wallets. We were conducted a research on the consumers perception and the findings are presented and analyzed in the content of this paper. The objectives of the research were to study the factor that influences the consumer in adoption of mobile wallet, to study the problem faced by the consumer in use of digital - wallet, to study the purpose of using digital wallet. This paper argues the positive and negative impact of digital wallet. This research has made it possible to identify the various factors which influence people to adopt digital wallet and most relevant reason behind usage of digital wallet. The last part of the paper includes some recommendations for the digital wallet players and consumers too.*

*Keywords: Perception, Digitalization, Digital wallet*

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**INTRODUCTION****DIGITAL WALLET**

In today-world, smart phone has become important part of everyday life. As it has become more affordable, the number of Smartphone users has increased dramatically. The quantity of smart phone consumers surpassed 1.75 million in 2014 and predictably it will reach 60 billion in 2018.

Along with smart phone production, plenty of services have been created to utilize the possible functions of Smartphone's. Not only smart phones are used as communication devices, but also to be used as socialized tool, entertainment tool, internet access tool, and even payment tool.

Thanks to technology, mobile users can nowadays use their smart phones to make money transaction or payment by using applications installed in the phone. Besides payment, people can also store receipts, coupons, business cards, bills...in their smart phones. When smart phones can function as leather wallets, it is called "Digital Wallet" or widely known as "Mobile Wallet".

**CONSUMER PERCEPTION**

Perception is defined as the process by which an individual select, organize and interprets stimuli into a meaningful and clear picture of the world.

Two individuals may be exposed to the same stimuli under the same time apparent condition but how each person recognizes, selects and organizes and interprets these stimuli is highly individual process based on each person's own needs, values and expectations and past experience.

Consumer perception theory is any attempt to understand how a consumer's perception of a product or service influences their behavior. Those who study consumer perception try to understand why consumers make the decisions they do, and how to influence these decisions.

A customer's perception can be defined as an accumulation of past experiences and personal believes. This is because the customer would be bias favorably or unfavorably towards a particular product based on the number of information received.

**Changed perception = Changed buying behave**

**LITERATURE REVIEW**

**Dr. Ramesh Sardar (2016)** in this study targeted among the "population of Jalgoan the preference towards mobile wallets" and carefully examines the effects of demographic variables on the use of m-wallets along with the factors influencing and refraining for the use of m-wallets. The study concludes that India needs to move towards a cashless. This will be useful in reducing currency management cost, check tax avoidance / fraud, track transactions, reduce terrorism funding etc... This paper concludes that in pushing cashless and electronic payments, the most significant contributor emerged is the M-wallet.

**Ms. Seema Rathi, (Dec 2016)** in her paper "Demonetisation and Digital Payment System in India: Issues and Challenges" discussed about demonetisation in India, digital payment platforms, and thus identify issues and challenges and strategies to overcome these issues and concluded that there are some problems for public to use

cashless digital methods at present. But government can create awareness, build trust, provide cyber security framework and provide necessary infrastructure to make it possible for public to adopt digital payment systems.

**DR.S. Manikandan, J. Mary Jayakod, (May2017)** in their paper “The empirical study on consumers adoption of mobile wallet with special reference to Chennai city” they studied the application and usage of wallet money endorsed by different companies and various factors that affect the consumer’s decision to adopt mobile wallet and various issues and challenges faced by the users of mobile wallet. And from the study it was analysed that Factors like brand loyalty, convenience of shopping plays an important role in adoption of mobile wallet while Security and safety of funds plays a challenging factor for the users and also concluded that Mobile wallet awareness is spreading among the people in India due to government policy so might have tremendous growth in adoption of mobile wallet in the forthcoming years.

**S. NazimSha, Dr. M. Rajeswari, (2018)** in their paper “A Study on Paytm Services in Promoting Cashless Economy After Demonetization In India And An Outline On Its Support Towards Making India Digital” discussed the opinion among people in adopting Paytm as a solution to the Indian Demonetization. And examine the importance of Paytm in day to day life, and way its flexible service contributes to digital India.

**OBJECTIVES OF THE STUDY**

- To study consumer perception toward digital wallet
- To study the factor that influences the consumer in adoption of mobile wallet
- To study the problem faced by the consumer in use of m- wallet.
- To study the purpose of using digital wallet.

**RESEARCH METHODOLOGY**

- **Type of Research:-** In this study Descriptive research was used in order to Study Consumer Perception towards Digital wallet in Surat city
- **Data collection method:-** In this research study the survey method was used to collect the data.
- **Population:-** Population for the study was people in Surat city
- **Sampling method:-** Non Probability convenience sampling method was used .
- **Sampling frame:-** Sampling frame 243 people from different areas in Surat
- **Sample size:-** 243 respondents were selected for the purpose of the study.
- **Research instrument:-** Questionnaire was used for the purpose of the data collection as the research instrument.
- **Source of the data:-** Primary data was collected by survey method while Secondary Data was collected through book, research paper and various authenticated websites.

**DATA ANALYSIS AND PRESENTATION**

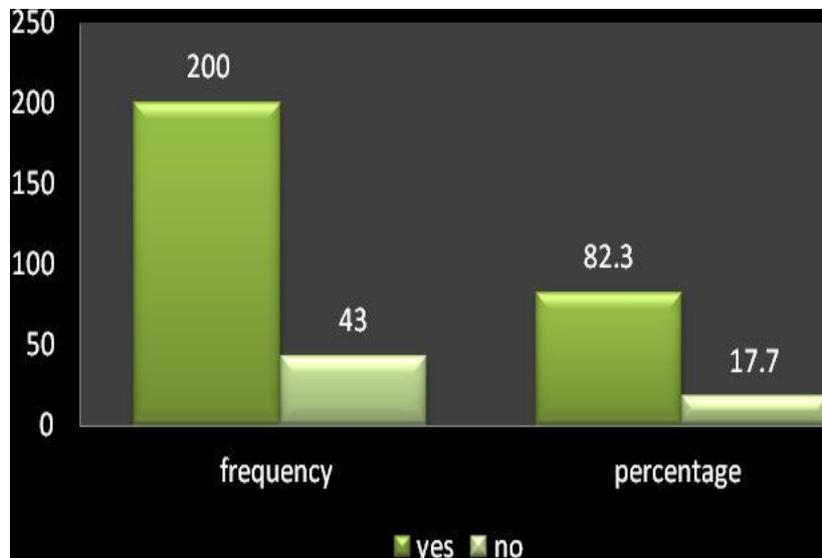


Figure-1: Users of Digital Wallet

**INTERPRETATION**

From the above representation it can be inferred that 82.3% of respondents are users of Digital Wallet and 17.7% were not use it.

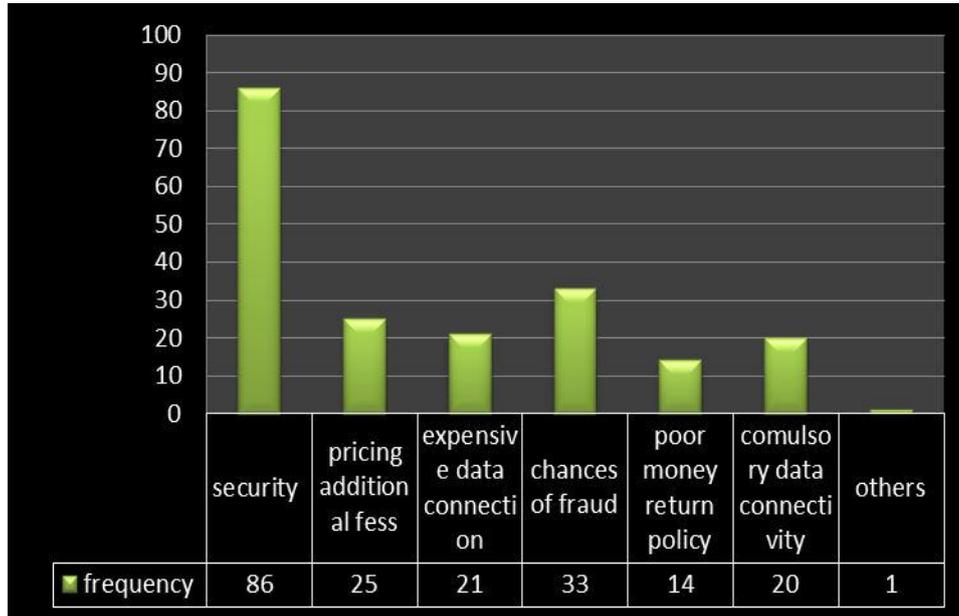


Figure-2: Issues/problems faced by users

**INTERPRETATION**

1. 86 respondents consider security /safety problems as biggest risk factor while using Digital Wallet
2. 25 respondents consider pricing as risk factor while using Digital Wallet
3. 21 respondents consider expensive data connection as a risk factor while using Digital Wallet
4. 33 respondents consider more chances of fraud as risk factor while using Digital Wallet
5. 14 respondent consider poor money return policy of companies as risk factor while using Digital Wallet
6. 20 respondents consider compulsory data connectivity as risk factor while using Digital Wallet and
7. 01 respondent consider other factor risky while using Digital Wallet.



Figure-3: Purpose of using digital wallet

**INTERPRETATION**

1. 23% of respondent use Digital Wallet for payment purposes at hotel, restaurant bill etc...
2. 16% of respondent use Digital Wallet for paying utility bills like electricity, gas bills etc...
3. 20.5% of respondent use Digital Wallet for shopping purposes
4. 18.5% of respondent use Digital Wallet for recharge purpose
5. 11.5% of respondent use Digital Wallet for transferring money and
6. 10.5% of respondent use Digital Wallet for ticket booking at movie, train, and flight etc...

**Table-1: Factors that influence customers to adopt Digital wallet**

Factors	Frequency value				
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Convenience in buying	50	106	41	03	00
Easy to use	61	100	36	03	00
Brand loyalty	37	64	88	07	04
Security	34	84	56	21	05
Privacy	42	71	66	19	02
Discounts/Offers	80	73	42	05	00
Advertisement	43	71	57	28	01
Speedy Transaction	97	60	33	06	04

### INTERPRETATION

From above table it reveals that 50 respondents strongly agreed and 106 respondents agreed that Convenience in buying is the factor which influenced them towards digital wallet. Out of 200 hundred users 100 agreed that Easy to use is the influencing factor for them. 64 respondents agreed and 88 respondents stay neutral for Brand loyalty factor. 84 respondents agreed that Security is influencing factor while 05 respondents were disagree with the same. 42 respondents strongly agreed and 71 respondents agreed that Privacy is the essential influencing factor for them. 80 respondents strongly agreed and 73 agreed with Discounts factor. 71 respondents agreed that Advertisement influenced them towards digital wallet while 01 respondent disagreed with the same. Out of 200 users 97 strongly agreed and 60 agreed with Speedy transaction factor

### FINDINGS

#### To study the factor that influences the consumer in adoption of mobile wallet

- It is found that 25% of respondent strongly agree that convenience in buying factor encourage them to use Digital Wallet, 53% agree, 20.5% are neutral, 1.5% disagree on that point.
- It is found that 30.5% of respondent strongly agree that easy to use factor encourage them to use Digital Wallet, 50% agree, 18% are neutral, 1.5% disagree on that point.
- It is found that 18.5% of respondent strongly agree that brand loyalty factor encourage them to use Digital Wallet, 32% agree, 44% are neutral, 3.5% disagree and 2% strongly disagree on that point.
- It is found that 17% of respondent strongly agree that security factor encourage them to use Digital Wallet, 42% agree, 28% are neutral, 10.5% disagree and 2.5% strongly disagree on that point.
- It is found that 21% of respondent strongly agree that privacy factor encourage them to use Digital Wallet, 35.5% agree, 33% are neutral, 9.5% disagree and 1% strongly disagree on that point.
- It is found that 40% of respondent strongly agree that discount/offers factor encourage them to use Digital Wallet, 36.5% agree, 21% are neutral, and 2.5% disagree on that point.
- It is found that 21.5% of respondent strongly agree that advertisement factor encourage them to use Digital Wallet, 35.5% agree, 28.5% are neutral, 14% disagree and 5% strongly disagree on that point.
- It is found that 48.5% of respondent strongly agree that speedy transaction factor encourage them to use Digital Wallet, 30% agree, 16.5% are neutral, 3% disagree and 2% strongly disagree on that point.

#### To study the problem faced by the consumer in use of m- wallet.

- It is found that 43% of respondents consider safety and security as biggest risk factor they faced mostly while using Digital Wallet, 16.5% respondent consider more chances of fraud as risky factor, 12.5% of respondent consider pricing, and the rest 10.5%, 10%, 7%, 5% consider expensive data connection, compulsory data connectivity, poor money return policy, other factor as a risky factor respectively.

#### To study the purpose of using digital wallet

- It is found that 23% of respondents were using digital wallet for payment purposes, 16% were using Digital Wallet for paying utility bills, 20.5% use for shopping purpose, 18.5% use for recharge purpose, and the rest 11.5% and 10.5% of respondent use for transferring money and ticket booking respectively.

### CONCLUSION

Digital wallet usage awareness as spread among the people in India due to government policy of demonetization and this as forcefully induced the usage of digital wallet. The security issues are tightening and risk factors are

reduced will automatically increase the adoption of digital wallet. Apart from these issues the convenience and ease of use as gained a credit to digital wallet and it can be concluded that they will be a tremendous growth in adoption of digital wallet in the forthcoming years.

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**TRANSFORMING EDUCATION IN INDIA: TEACHING AND LEARNING IN THE DIGITAL ERA****Soni Jain****Assistant Professor, Lingaya's Lalita** Devi Institute of Management and Sciences, Delhi**ABSTRACT**

Technology plays a vital role in the digital era for imparting education both at school and higher education level. Today's generation have high level of technological literacy. Use of digital innovation has led to the expansion of technology in education. These generations are receptive to outside impressions and have an active participation in the social environment. Hence, technology has to be embraced in today's education and teachers have to apply technology as part of the students learning. The aim of this paper is to review the role of technology in improvising the teaching and learning aspect in the digital era. This paper also presents some of the emerging issues related to inclusion of "Quality Education" as one of the key sustainable development goals of UN.

*Keywords: Technological literacy, quality education, education in digital era, social environment, sustainable development goals, technology for teaching and learning*

**OBJECTIVE OF STUDY**

The paper focuses on following key areas:

Imbibing technology in teaching and learning framework

Ways through which digital education is transmitted to a learner in a better way

Government initiatives and future endeavors to enable technology based learning

Overcome Challenges of Digital education

**INTRODUCTION**

It has become a worldwide concern for our educational system to shift its gear from formal lecture method to learning-by-doing approach. The previous generation was inclined towards the sense of duty. Present generations have different motivational profiles: Interest, peer pressure, engagement and competition. In past, higher education has been seen through the lens of its institutions. Students in various job profiles were considered according to their marks and the institution they attended.

With rapidly changing technology and constantly evolving job types companies require skilled and competent employees therefore, student's education need an ecosystem that integrates theoretical and practical learning approach. In order to have a transformative impact on student learning and success, it must be aligned with quality content and flexible learning opportunities to facilitate the needs of a broader range of students. Institutions should encourage instructors and department leaders to review courses and employ technology-based applications, tools, and resources to redesign these courses to support student success. Technology, with wider reach can be used to complement the instructor interaction with the students and the available academic and non-academic support.

**TECHNOLOGY ENABLED TEACHING**

Technology enable instructors to create active learning environments that connect students with content in different ways. For example, rather than formal lectures, instructors can use demonstrations and short films along with lecture-discussion method. Online tools can create active learning environments that encourage students to collaborate, participate and engage in activities that promote the attitudes and non-cognitive skills needed for real-world application of their knowledge. In addition, learning can be organized around real-world challenges and scenarios through various case studies, role plays and training methods. So that students can master skills and work together to find collaborative solutions.

**THE EMERGING VIRTUAL TECHNOLOGY**

Computer and mobile technology has become an important tool in the teaching and learning process. It involves connectivity for downloading, uploading and working online via wireless networks. Virtual reality uses additional tools such as VR goggles which help to present an artificial environment using sounds, 3D images and other stimuli to accommodate the new generation of learners, Artificial Intelligence is being used for developing virtual teaching assistants and personalized learning for a student, as the technology evolves and becomes more commercially viable.

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**DIGITAL TRANSFORMATION PATHS IN HIGHER EDUCATION**

Historically, Higher education has never focused as a means of social mobility and an engine of economic growth. With the transforming India technology has paved the way for the future aspects of higher education to fulfill its promise as a great equalizer; continued innovation can move us toward increased access, affordability and equity. The upcoming years will see an ecosystem that will provide wide range of opportunities for high-quality education and learning suited for the differing needs of students.

**Remote classrooms and Exam Proctoring:** Remote classrooms will enable students in far corners of the world to attend a class in school or university in countries. It let students to appear for exams from any location. The system can track and monitor remote using advanced image, video, audio streaming with the intelligence to analyze if the student is cheating.

Technology, has evolved at an interesting stride in the last decade, college enrollment has increased due to economic recession, competition, deindustrialization, and increasing demand for skilled workers. For a particular job, where, it was previously possible to get high-paying middle-class job with no post secondary education, workers new to the workforce are finding they need comparatively more education for applying new job types in industries. In the recent years, external environment have also dramatically changed where students seeking higher education are already working or have family obligations to support them financially. At the same time, increasing costs and decreased state funding for higher education have created challenges for all students. By placing students at the center, policies should be framed to provide flexible learning schedules, include courses they can complete at their own pace, faster or slower, depending on their obligations.

**Tailor made education Aid-** Every student is different in terms of educational aptitude, retention ratio and learning behavior. This brings us to rejuvenate the longest persisting flaw in our education system. With the ongoing AI systems and its applications, students get individual attention and reasonable care which was not possible in a batch of more than fifty students. AI allows teachers to monitor and guide students individually.

**Government initiatives** such as E-Basta, skill India, SWAYAM, Rashtriya Madhyamik Shiksha Abhiyan (RMSA) and Digital India will provide the infrastructure needed by students to study online. *Union Budget 2018 brought many announcements in the area of Artificial Intelligence as a welcome initiative.* Government also doubled allocation to \$480 million in 2018-19 to create a robust ecosystem to promote education, health and other sectors. According to Forbes in 2017, international funding reached USD 9.52 Billion and EdTech investments mark a gain of 30% from 2016. One of the India's leading EdTech startups Byju's raised USD 40 million as its total funding.

**Online learning platforms at school level-** Virtual school teaches students primarily through the internet. Online education delivers instruction to students who are separated from the instructor to support their regular interaction. It exists at all levels of education. At earlier times conventional learning which put emphasis on course curriculum served well in the past, now the scenario has changed, to be innovative and outperform others right skill sets and practical knowledge is the need of the hour. Online k-12 courses are designed to help children learn to diversify their learning and vary with the pace of learning. Online learning apps like BYJU'S, Khan Academy; Coursera and Teachoo are some common examples which have become part and parcel of student's life.

**Online learning platforms at undergraduate level -** undergraduate education in India is also known as higher education. According to All India Survey on Higher Education (AISHE) report the Survey covers all institutions at undergraduate level in the country categorized in 3 broad Categories, University, Colleges and Institutions. There are 903 Universities, 39050 Colleges and 10011 Stand Alone Institutions listed on AISHE. Students studying at this level generally begin their education from 18 onwards. As per one estimate 88% of higher education is provided by colleges in India. In the domain of higher education online learning is provided through E-content listed on MHRD website includes NPTEL, virtual labs, Talk to teacher, E-Yantra, Digital library InFLiNet and E-kalpa. According to Haugen, LaBarre, & Melrose, 2001, Universities and Colleges have increased their web-based course offerings appealing to such working adults who otherwise have limited access to higher education.

According to **Forbes** following are the ways to impact student's learning:

**Virtual Reality** Technology is making learning collaborative and interactive which enhance teacher's instruction along with creative learning environment. It has the capability of bringing the outside world into the classroom reality.

**Artificial Intelligence-** AI an area of computer science proficient to perform tasks which require human intelligence such as voice recognition, decision making and translation between languages. AI has already been applied to education industry that develops skills and provides solution to bridge teaching- learning gaps. India, being the fastest growing economy and amplified with the youth population consisting half of the population below age 25 are well equipped with digital innovation, by channelizing their potential in right direction towards learning though digital aids will help to create well developed education sector. According to EdTechXGlobal, Edtech is becoming a global phenomena, the market is projected to grow at 17.0% per annum. India's digital learning market was valued at USD2 billion in 2016 and projected to grow at CAGR of 30% and according to technopak will reach USD 5.7 billion in 2020.

**Gamification** when learning and playing collide and classrooms utilize gaming as an instructional tool it makes learning more exciting and interactive. New technology enables a team-based approach. It promotes educational games which provide immediate feedback and keep students motivated.

**USE of Smart Boards** Educators have realized that they no longer require limiting their teaching and learning space. With collaborative-friendly spaces it facilitates students visiting field trips instead just reading text books. In 21<sup>st</sup> century classrooms are equipped with smart boards instead of chalkboards.

### **WHICH MODE IS BETTER- TRADITIONAL LEARNING OR ONLINE LEARNING?**

Over few decades, it has been observed that most institutions have started offering online courses over traditional face to face. Respondents believed that offering online courses are advantages due to its easy understanding of course content compared to formal lecture method (Ella Carter, Bowie State University, USA). Earlier contributions made by proponents differ as (Farmakis and Kaulbach (2013)) is of the view that there is little change in the perception of online offering when compared to face-to-face, According to proponents of online education (Bernard et al, 2004; Means et al, 2009 and Farmakis and Kaulbach (2013)) little difference found between the learning outcomes of the two formats. Harasim (1989) and Talebain et al (2014) believed that online mode represents augmented environment which allows users to greater control over time, place and interaction with participants and instructors compared to face to face education. However critics (Allen and Seaman (2013) stated that online courses perceived to be inferior compared with face to face. According to Gallup poll, October 2013 (Saad, Busted, and Ogisi, 2013) online education in US revealed that online education was positively perceived as it offers wide range of courses along with flexibility at reasonable costs. On the other hand, it was negatively perceived because it involves less qualified instructors.

### **Overcome Measures of Challenges to Digital Innovation**

#### **Internet connectivity issues**

The internet connection in rural areas and some parts of urban areas is poor. Due to digital illiteracy it becomes a challenging issue for a large part of the population to get online education and access to appropriate resources. To solve such issues there is a need to increase IT department and spread awareness in rural areas.

#### **LACK OF FUNDS**

In developing country like India, it becomes difficult to implement digital technology into education system as it requires huge amount to build infrastructure and get updated with latest technology. This issue can be resolved through government initiatives, venture capitalists and other private financiers to promote Digital innovation programme.

#### **SHORTAGE OF TRAINED STAFF**

In the realm of digital innovation lack of knowledge and skills in rural area is the hindrance to economic growth. There is shortage of teachers and trained staff who could share their abilities and learning. At some places in rural areas, school teachers and college professors are not interested in using digital tools for conducting classes. They generally use traditional chalk board method and believe in providing a lot of information at one go. In rural areas, teachers are reluctant to be trained and adopt digital technologies for digital education in school because they are in view that these disruptive technologies are out to replace them permanently. The solution is to have blended learning process which involves learning by doing approach.

#### **FUTURE PROSPECTS**

Technology is changing at a fast pace, from 2016 introduction of MOOC with focus on blended learning models developed. To promote technology startups, app developers and entrepreneurs are being financed by venture capitalists. By 2020, cloud-based learning will be the rule which will help in better data sharing and more visual assessment results. According to a report over 5.8 million students enrolled for online courses in 2016, which is a 263% increase over the last 12 years. As per report of KPMG and Google points, online education in India

will witness a robust growth with an eighth fold increase by the year 2021, the focus has been shifted from rote learning to building skills.

### **LITERATURE REVIEW**

To develop student's interest and gain positive learning outcomes an instructor has to position the content with practical applications along with theoretical framework to create an interactive session through "learning by doing" approach (Picciano, 2002; Watkins, 2005). A teacher should be enthusiastic and appreciate students for their contributions in overall participation (Adler, Milne & Stablein, 2001; Burke & Moore, 2003; Meyers & Jones, 1993)

Barron (2001) observed that Online learning is cost effective method to provide standardized and an efficient content delivery but according to Ludwig-Hardman and Dunlap (2003) e-learning is not sufficient alone, due to feelings of isolation, decrease in motivation and lack of direction, therefore focus should be on blended learning which includes classroom sessions, technology based sessions and web based sessions (Rubenstein, 2003; Ward & LaBranche, 2003). Marcus, Taylor and Ellis (2004) dealt with blended learning process involving conversion of 2-4 hours of lectures to 2 hours of practical class to 2 hours of online case session in small groups and finally 2 hour of case resolution session.

With the fast pace life and to increase standard of living, both parents become the breadwinner to support their family. In such a situation parental contribution (Kerr & Stattin, 2000; Stattin & Kerr, 2000) becomes utmost important to accomplish their children in using technology helping them in the overall development and encourage social interaction (Rhee & Bharnagri, 1991; Bergin, Ford, & Hess, 1993; and Clements, 1994).and get report by teachers via online which includes attendance report, emails, instant messaging and video calling.

To indulge students in e-learning estimates suggests that a good sum of money being spent by U.S. companies to provide I.T based training (Koprowski, 2000) universities and colleges continued to increase offering web-based courses to target those who have limited access to materials and face time constraints due to fulfilling family obligations.

Colleges and universities will increase their web based offerings to cater the needs of those who have limited access to higher education. Various projections made by (Forbes) suggest, e-learning market will grow by \$325 Billion by 2025.

E-learning overcomes the limitations of physical presence (Biocca et al. 2001) and subjectivity involved. Performance of students improves through applied learning in real life situations of theoretical framework (Bereiter & Scardamalia, 1989; Bransford, Brown, & Cocking, 2000). With the help of technology and online instruction learning can be facilitated by providing real-life contexts to solve complex problems (Duffy & Cunningham, 1996; Honebein, 1996).

(Benek-Rivera & Matthews, 2004; Sarason & Banbury, 2004) stated that student's involvement increases through "instructional activities involving students in doing things and thinking about what they are doing" called active learning.

With the help of E-learning "new" information can be delivered which were not included in traditional sources, by citing examples information are reinforced through examples, , assessments, explanations and exercises. (McEwen, 1997), in this way, online instruction can potentially enhance learning compared to what can be accomplished using a classroom approach only.

According to Jinal Jani and Girish Tere (2015), Digital India drive introduced by Government of India to create digital empowered society will help in creating jobs. According to (Meyen, Aust, Gauch, Hinton, & Isaacson, 2002).Projections suggested that online offerings will continue to increase rampantly in educational as well as corporate settings in years to come.

### **RESEARCH METHODOLOGY**

The data for this study are gathered from NITI Aayog discussion paper (niti.gov.in). The online learning programs having future growth prospects for quality education has been into limelight by UN environment, www.unenvironment.org according to which by 2030 all learners will be equipped with knowledge and skills to promote sustainable development through education. The paper puts emphasis on the government's role to fuel the Indian economy through Artificial Intelligence in the current budget 2018. In India, it is estimated that schools are investing around 20% of their budget on teacher and administrator training. Proving continuing education is a great strategy for Teacher retention and career advancement. The infusion of AI and technology will require the teachers to be equipped with latest knowledge, tools and guidelines on 'how to deal with the

changes' and educate effectively. According to research conducted by KPMG and insights from Google study online education industry will be \$1.96 billion industry by 2021. Primary and secondary education category has the largest segment of audience comprise a student base of around 260 million and expected to reach \$773 million by 2021 compared to competitive exams and other tests which likely to become \$515 million.

### **CONCLUSION REMARKS**

India holds a key place in the global education industry. Education sector has seen a rapid expansion in the last couple of years with the help of digital education landscape for learners is increasing. The study reveals that development of infrastructural facilities for online education is required for making population digital literate across the country. Government has taken initiatives for transforming India by doubling the allocation of resources in education, health and other sectors. While there are number of obstacles to scale up online programs such as lack of funds, shortage of trained staff and internet connectivity issues. The future prospects of digital education is prospering and challenging. It is therefore required to overcome such challenges for the development of digital education in India.

Based on previous literature, investigators expected no difference in learning outcomes between online learning and face to face learning outcomes.

Overall, this paper provides an analysis of the key characteristics of the set of institutions that have gained significant scale in their online education offering platforms, various startups emerged as a giant in education industry including BYJU'S, unacademy, vedantu, Meritnation and anymore and has provided some direction for what other institutions should do to expand their own online offerings.

On comparing the points made by proponents and critics on online education, it can be concluded that it is better to have a hybrid method which involves a blended learning.

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**POST LIBERALISATION SCENARIO OF INDIAN BANKING AND REGULATIONS FROM CUSTOMER SERVICES PRESPECTIVE: A CRITICAL REVIEW**

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**ABSTRACT**

*In 1991-1992 Liberalisation has been initiated in Indian economy, and liberalisation is incomplete without Globalisation and Privatisation (LPG). All these initiatives have opened the doors for the private and foreign parties, who were interested in banking business. LPG has fastened the pace of growth in Indian Economy, mobilizing the funds, immense infrastructure development, investment churning etc. From the customer perspective, services have been improved drastically, transaction time has been reduced, customers are empowered by technology driven banking. Earlier customers had to choose Public sector banks as an only option, to avail the banking services but after LPG there are many options to get banking services. Although private sector banks has given a intense competition to the PSU banks but they joined the banking industry with a motive of profitability and wealth maximisation, a large number of complex products are introduced to meet the different requirements of the customer, but these products are not easily understood by the customers and leads to misselllling. In the name of the superior services, multiple and exorbitant charges are levied on the customers and erode the customer money. By arranging the modern looking facilities and maintaining physical appearance of the branch premises, higher Average balance is demanded from the customers. The services are provided on the basis of the financial health of the customer. In this paper we briefly elaborate the post liberalization scenario and the bank practices with the provisions of the Banking code and standard board of India (Autonomous body established by Reserve Bank of India to take care of the customer interest by monitoring the customer services practices in banks). In this research we found that banks are lacking in providing services as per the commitments made by BCSBI code and certain issues are raised by the customers regarding insufficiency in the services.*

*Keywords: Liberalization, BCSBI code, Bank Practice, Customer Services*

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**1. INTRODUCTION**

Banking industry is a symbol of trust in any economy and regulator works as a watchdog, to safeguard that trust from erosion by regular monitoring and by setting up rules, regulations and standards. After independence in 1947 Indian banking industry was in miserable state but gradually various steps were taken by the government for the overall development of the country including banks. But the turning point was the introduction of Liberalisation, due to which norms were relaxed for the private banks to enter in the market. Private Banks were very aggressive in grabbing the market share and hence provided good physical facilities, ambiance and excellent customer service, where the PSU banks were lacking. Private Banks also introduced the computers in banking, which created a great difference in transaction timing in private and PSU banks. PSU banks have also undertaken all these changes to retain the customer from losing to private banks. Private Banks also make use of liberalized interest rates and provide higher interest to the customers on their deposits with the banks but same time charges a higher rate of interest from the loan customers. When private banks started to establish their selves they used penetration strategy to grab the market share by opening zero balance accounts and the basic accounts for the general masses, but gradually the strategy has been changed from penetration to skim the cream. In this skimming strategy private banks has started concentrating on wealthy individuals, corporate, wholesale customers etc, which is called as a creamy layer of the society. In short, the actual image of the private banks appears after some time that these banks are meant for the customers who are not poor and above an average class, if a customer is having adequate amount to fulfill the average balance criterion of the private banks only then they are welcomed. In this case poor is still excluded from getting good financial services and they have to stand in the long waiting queues for hours, where no customer is entertained by the staff during the long lunch and tea hours. Can we assume this practice as Financial Exclusion of the disadvantage group?

Not only poor public but rich and wealthy customers are also exploited on the name of service. Such a wide range of products are documented by banks that neither the bankers nor the customers are able to remember or gain knowledge about all the products/services. Only those product/services are sold to the customers which are target based or earn revenue for the bank and incentive for the employees, customer need identification is just an eye wash or as a formality for the sake of adherence of regulations. Not only in Indian Banking but all over the world banking history has seen scandals for the wealth maximisation like LIBOR scandal, Financial crisis in 2008, Deutsche Bank's \$10 billion scam, Lehman brothers collapse etc. in the core of all these scam activities

making easy money was the motive. Generally in international frauds poorer countries become more poor and rich become richer.

In this paper we have elaborated those services which are mentioned in the BCSBI code's commitments and all the member banks are bind to follow the same. We have recorded customer's perception regarding the fulfillment of these services and done a bank wise comparison of the adherence of the regulations.

## 2. LITERATURE REVIEW

To check the service quality of the bank (*Valarie A. Zeithaml, A. Parsuraman, Leonard L. Berry 1985,1988*) has developed a scale named SERVQUAL having five dimension of service quality named as Reliability, assurance, tangibility, empathy and responsiveness and that create the acronym RATER. Although private banks are providing good services but still there is a huge gap in resolving customer issues emphatically by the bankers, they have modern looking facilities, good ambiance and mannered staff but still lacks in understanding the customer (*A. Anant, R. Ramesh, B. Prabakaran 2010*). Various researches has found that banks concentrate on other facilities but do not work on their human resource, it's the personal touch of the banker that makes a difference, because services are available in all the banks (*Dr. S. Saraswathi 2012*). Researchers have also found that bank branches are skewed distributed, the average density in urban branches are 6000 population and in rural area this average density is 24000 population per branch. It also states that as per census of 2011, 9% of the deposit and 8% of the advances are contributed by the rural population and India's rural population is 68% of the total population. Urban population contribute 32% of the total population and approximately 91-92% of the deposit and advances come from urban population and moreover in this urban contribution 92% of the total contribution comes from some affluent business families. This shows the changing mind set of the banking industry, that discrimination exists on the basis of the location and in the core its financial difference (*R.K. Dubey 2014*). Since the inception of the banking industry the focus has been shifted a lot in terms of services to marketing activities. Nowadays banking marketing strategies are only concentrating on those persons who are getting rich income through agriculture, industry, business sector and neglecting the rural masses and the retail customer segment that is actually creating the wealth for the nation by working in these industries and business. Banks are unwilling to market those products that are pushed by the government and basically meant for poor and rural masses (*Boruggadda Subbaiah 2012*). Not only this but sometimes the basic products like Lockers are given to the customers only after getting a big amount in their accounts or a handsome amount of investment policies purchased by the customers. Nowadays bank uses locker as a product for completing their third party product targets (*Why it is difficult to get a locker 2011*). [24]

Regulators also keeps an eye on the banking activities and levies fine if the regulations are not obeyed by, in 2013 The Reserve bank of India has imposed penalty on 22 banks amounting Rs. 50 lacs to 3 crores. All the big banks were included in it like State bank of India, ICICI, HDFC and others for violating the KYC norms, procedures and compliance system in April 2013. Money laundering charges have been levied on various banks including ICICI, HDFC, INDUSIND, AXIS etc. (*RBI fines 22 banks for violating KYC norms 2013*). [22]

It is not only the banks but customer's orientation has also changed in terms of getting services, they have high expectation but their perceived quality is quite low particularly across the public sector banks. Continuous feedback from the customer is required to improve the service quality and reliability of the bank (*Dr. T. Meharajan, Dr. P.S. Venkateswaran, S. Arvind, 2015*). There are seven reasons which are identified by the researches which are responsible for customer bank switching nature these are price, reputation, service quality, advertising, involuntary action, distance, cost and other factors. Among all these factors reputation and pricing are main factors to influence the customer decision of switching the bank (*Dr. Ramaiyer Subramaniam, Dr. Jayalakshmy Ramachandran 2012*). Last 5 years report of banking ombudsman shows that they used to receive approximately 70-80 thousand complaints every year from the customers and approximately 25-30% of the complaints are related to non fulfillment of BCSBI code/ unfair banking practices. One more thing which was highlighted that approximately two third of the complaints are received by urban area, it shows the level of awareness among the customers (*Reserve Bank of India-Banking Ombudsman reports from 2010-2011 to 2015-2016*).

We have tried to check the level of services provided to the customer while keeping the BCSBI code as a standard for comparison and developed a questionnaire on the basis of code and evaluated the bank wise services provided to the customers.

## 3. SCOPE OF THE STUDY

In our study BCSBI (Banking Code And Standard Board of India) has been taken as the regulatory standard for comparing the actual banking practices. BCSBI code is having two parts one is for retail customer and another

is for MSME (Micro, Small and Medium Enterprises), in this study we have taken Retail customers for our study.

**4. CONCEPTUAL FRAMEWORK**

In 2006 Banking Code and Standard Board of India was established by Reserve Bank of India to safeguard the interest of common bank customer, BCSBI code is established to maintain and monitor the bank services as per the provisions of the code. Code made provisions for the fair and equal treatment of the bank customers and time to time monitor the bank practices who become member of this code. This code is revised time to time in this study we are working on latest i.e. Code of Bank’s Commitment to Customers – January 2014

**Key Commitments of the code**

- To act fairly and reasonably in all our dealings with Customers
- To help customer to understand how our financial products and services work
- To help you use your account or service
- To deal quickly and sympathetically with things that go wrong
- To treat all your personal information as private and confidential
- To publicise the Code
- To adopt and practice a non - discrimination policy

**Initiative taken by Regulators to improve the customer services**

- *Committee on Capacity Building 2014, Purpose- Human Resource development in Financial sector*
- *Goiporia Committee 1990, Purpose- Improvement in Customer service*
- *Damodaran Committee 2011, Purpose-Improvement in Customer service*
- *R. Jilani Committee 2016, Purpose-for Audit/inspection soundness and accountability*

**5. Objective and Hypothesis of the Study**

**OBJECTIVES**

1. To check the overall score of bank practices with the commitments of BCSBI code.
2. To do a bank wise comparative analysis of the dimensions of the bank practices.

**HYPOTHESIS**

**1<sup>st</sup> Objective- H0-** Customers are satisfied by the bank practices.  $\mu \geq 4$

**H1-** Customers are not satisfied by the bank practices.  $\mu < 4$

**2<sup>nd</sup> Objective- H0-** There is no significant difference in the bank practice of different banks.

**H1-** There is a significant difference in the bank practice of different banks.

**6. RESEARCH METHODOLOGY**

**Research type-** Exploratory, Descriptive and Explanatory

**Sampling Technique-** Banks are chosen randomly and customer are chosen by Stratified sampling technique.

**Sample Size-** 570 customers have been chosen for the study from 8 banks, among which 4 are private banks and 4 are Public sector banks. The banks are selected Randomly on the basis of the highest number of branches in Faridabad region (Data about the number of branches has been collected from the lead bank i.e. Syndicate Bank).

**Table-1: Bank wise Number of respondents**

Private Banks	No. of Actual Respondents
Axis Bank	71
HDFC Bank	74
ICICI Bank	72
Kotak Mahindra Bank	69
Public Banks	
Syndicate Bank	71

Canara Bank	71
Punjab National Bank	72
State Bank of India	70
Total	570

**Questionnaire Design and Data Collection**

Questionnaire is designed by using the commitment of BCSBI code and data is collected by the researcher only. Questionnaire is having 35 statements related to below mention 7 dimensions.

**Table-2: Instrument design and variable identification**

Sr. No.	Commitments	Variable
1.	<ul style="list-style-type: none"> <li>To provide fair, reasonable and adequate services to the customers</li> <li>Maintain a efficient payment system</li> </ul>	<ul style="list-style-type: none"> <li>Duty Deliverance</li> <li>Transactional Efficiency</li> </ul>
2.	<ul style="list-style-type: none"> <li>To help the customer to get knowledge about the banking products and services.</li> <li>Marketing material should be in local language and clear</li> <li>Pricing and terms related to product/service should be clear to the customer</li> </ul>	<ul style="list-style-type: none"> <li>Sales Conduct</li> </ul>
3.	<ul style="list-style-type: none"> <li>To advice the customer in using their financial product/ services</li> <li>Inform the customer about the change in fee/ charges structure and change in interest rates.</li> </ul>	<ul style="list-style-type: none"> <li>Communication</li> </ul>
4.	<ul style="list-style-type: none"> <li>Resolve the customer complaints emphatically and satisfy the customer</li> </ul>	<ul style="list-style-type: none"> <li>Empathy</li> </ul>
5.	<ul style="list-style-type: none"> <li>Treat the personal and financial information as important and secret.</li> </ul>	<ul style="list-style-type: none"> <li>Merged with Transactional Efficiency</li> </ul>
6.	<ul style="list-style-type: none"> <li>To spread awareness about the code and its provisions among the customers and bank staff.</li> </ul>	<ul style="list-style-type: none"> <li>Awareness</li> </ul>
7.	<ul style="list-style-type: none"> <li>Do not discriminate with the customer on the basis of their race, religion, financial status etc.</li> </ul>	<ul style="list-style-type: none"> <li>Discrimination</li> </ul>

**Duty Deliverance-** includes statements related to day to day dealing with the customers

**Transactional efficiency-** includes statements related to transactional efficiency of the bank staff

**Sales Conduct-** includes statements related to sales practice, need identification and disclosure norms

**Communication-** includes statements related to updating the customer about the change in bank rates and fee structure

**Empathy-** includes statements related to resolving the customer complaints empathetically

**Awareness-** includes statements related to awareness about the various provisions of the code

**Discrimination-** includes statements related to check the discrimination on the basis of location or financial position of the customer.

**7. ANALYSIS AND INTERPRETATION RELIABILITY**

Table-3: Reliability Statistics	
Cronbach's Alpha	N of Items
.867	35

Cronbach’s Alpha should be more than .7 for considering the responses as reliable. []

**1<sup>ST</sup> OBJECTIVE ANALYSIS**

1. To check the overall score of bank practices with the commitments of BCSBI code.

**Technique-** Frequency Distribution, one sample T test

**Confidence Interval-** Alpha ( $\alpha$ )- 95%

**Table-4: Statement wise analysis (Mean Values)**

Sr No.	Statement	Mean Value	Comment
1.	Bank Provides minimum banking facilities of receipt and payment of cash/ cheques, etc. at the bank's counter.	3.65	Moderate to agree
2.	Bank employees are friendly in their attitude towards customers.	2.96	Disagree to moderate
3.	All the transactions are fulfilled in the minimum required time.	2.83	Disagree to moderate
4.	It happens that work got delayed due to staff shortage/ server problem.	2.31	Agree to moderate
5.	Employees are willing to help the customers.	3.02	Moderate
6.	Special services are provided for senior citizens and disabled.	3.02	Moderate
7.	Bank employees always treat the customer with respect.	2.87	Disagree to moderate
8.	Misbehaviour by employees is a major reason of customer complaints.	3.29	Agree
9.	Bank services are provided at a reasonable cost.	2.96	Disagree to moderate
10.	Transacting with bank provides a feeling of safety and security.	3.59	Agree
11.	Bank treats your personal/ financial/transactional information as important and maintains secrecy.	3.98	Agree
12.	Bank insists on doing error free transaction.	2.97	Disagree to moderate
13.	Advertising and promotional literature is clear and not misleading	2.38	Disagree to moderate
14.	Term & conditions of the products are fully explained to the consumers By banker /agents/sub agents.	2.20	Disagree
15.	Banking products/documents are easily understandable by common people.	2.08	Agree
16.	Agents or bank officials do not disclose the negative features of the schemes/ policies to the consumer while selling the same.	2.25	Agree
17.	Bank staff/ agents sometime fails to understand/identify the customer's need and recommend the product.	2.02	Agree
18.	Sometimes bank staff/agent sell the products to the customer to complete their targets.	2.09	Agree
19.	Bank employees work undue pressure to bring maximum business for the company.	2.07	Agree
20.	Sometimes customers have to bear loss due to wrong/ inadequate information provided by bank officials/agents.	2.00	Agree
21.	Employees/agents have sufficient knowledge to resolve the customer questions.	3.56	Moderate to agree
22.	Malpractices in sales is a major reason of customer complaints	2.47	Agree to moderate
23.	Bank provides information for all the newly introduced services.	2.02	Disagree
24.	Timely information about changes in charges and interest rates are provided by banks.	2.10	Disagree
25.	All the marketing/informational material is available in the local language	2.32	Disagree
26.	Marketing material (pamphlets, brochures) are visually appealing in the bank premises.	2.69	Disagree to moderate
27.	Employees are capable to resolve the complaints satisfactorily.	2.58	Moderate
28.	Bank staff shows sincere interest to resolve the customer complaints.	2.69	Disagree to moderate
29.	Provide your agreement regarding the awareness of the	1.55	Disagree

	BCSBI code.		
30.	Complaints escalation is very well known by the customers.	1.58	Disagree
31.	Provide your agreement regarding the awareness of the Informational portal/ Booklet.	1.63	Disagree
32.	Provide your agreement regarding the awareness of the Citizen Charter.	1.57	Disagree
33.	Location of bank branches are convenient to all the sections of the society (e.g. villages, backward areas etc.)	1.61	Disagree
34.	Difference on the basis of financial status is common in banking.	1.59	Agree
35.	Economically weaker and socially oppressed people can get the loan easily and on easy credit term.	1.72	Disagree

Table No. 4 shows that non of the statement is having score close to 5, hence there is a need of drastic improvement.

**One Sample T Test is done of overall dimension**

	N	Mean	Std. Deviation	Std. Error Mean
Duty Deliverance	570	2.9968	.85064	.03563
Transactional Efficiency	570	3.3759	1.03022	.04315
Sales conduct	570	2.3111	.82471	.03454
Communication	570	2.2829	.80986	.03392
Empathy	570	2.6377	1.25622	.05262
Awareness	570	1.5838	.70594	.02957
Discrimination	570	1.6116	.60799	.02547

Source: SPSS output

	Test Value = 4					
	T	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Duty Deliverance	-28.157	569	.000	-1.00323	-1.0732	-.9332
Transactional Efficiency	-14.464	569	.000	-.62412	-.7089	-.5394
Sales conduct	-48.894	569	.000	-1.68895	-1.7568	-1.6211
Communication	-50.620	569	.000	-1.71711	-1.7837	-1.6505
Empathy	-25.890	569	.000	-1.36228	-1.4656	-1.2589
Awareness	-81.716	569	.000	-2.41623	-2.4743	-2.3582
Discrimination	-93.786	569	.000	-2.38835	-2.4384	-2.3383

Source: SPSS output

Table no. 6 shows that all the dimensions of the BCSBI code is significantly different from score 4, but table no.5 shows that the overall mean value of the dimension is exceeding the customer expectation or lower from customer expectation. All the values of the dimensions are low from 4, actual values are ranging between 1.5 to 3.3, hence customers are not at all satisfied with the quality of service provided by banks.

**Hypothesis Testing**

**1<sup>st</sup> Objective- H0-** Customers are satisfied by the bank practices.  $\mu \geq 4$

**H1-** Customers are not satisfied by the bank practices.  $\mu < 4$

To check the above mentioned hypothesis we have to use 7 sub hypothesis, as we have seven dimensions.

**Table: 7.1<sup>st</sup>objective , Hypothesis results**

Null Hypothesis	Sig. Value	Result
1.1 Customers are satisfied by the Duty Deliverance practices of the banks. $\mu \geq 4$	.000***	Alternate Hypothesis Accepted
1.2Customers are satisfied by the Transactional efficiency of	.000***	Alternate Hypothesis

the banks. $\mu \geq 4$		Accepted
1.3 Customers are satisfied by the Sales Conduct practices of the banks. $\mu \geq 4$	.000***	Alternate Hypothesis Accepted
1.4 Customers are satisfied by the Communication practices of the banks. $\mu \geq 4$	.000***	Alternate Hypothesis Accepted
1.5 Customers are satisfied by the Empathy practices of the bank. $\mu \geq 4$	.000***	Alternate Hypothesis Accepted
1.6 Customers are satisfied by the Spreading Awareness practices of the bank. $\mu \geq 4$	.000***	Alternate Hypothesis Accepted
1.7 Customers are satisfied by the Discrimination practices of the bank. $\mu \geq 4$	.000***	Alternate Hypothesis Accepted

Sig. Value-\*\*\* significant at 1% level, \*\* significant at 5%, \* significant at 10%

**2<sup>nd</sup> Objective**

1. To do a bank wise comparative analysis of the dimensions of the bank practices.

**Technique-** MANOVA (Multivariate Analysis of Variance)

**Confidence Interval-** Alpha ( $\alpha$ )- 95%

		Value Label	N
bankname	1.00	Axis Bank	71
	2.00	HDFC Bank	73
	3.00	ICICI Bank	72
	4.00	Kotak Mahindra Bank	70
	5.00	Syndicate Bank	71
	6.00	Canara Bank	72
	7.00	Punjab National Bank	71
	8.00	State Bank of India	70

Source: SPSS output

Table-8 shows the number of respondents from each bank which are used for the analysis.

Bank name	Duty Deliverance	Transactional Efficiency	Sales conduct	Communication	Empathy	Awareness	Discrimination
1.00 Axis Bank	3.3032	3.7641	2.4028	2.4437	3.1268	1.6796	1.5632
2.00 HDFC Bank	3.1286	3.5890	2.1164	2.3356	3.0616	1.6027	1.5936
3.00 ICICI Bank	3.4157	3.3889	2.0611	2.5278	3.1667	1.4618	1.6806
4.00 Kotak Mahindra Bank	3.0776	3.5750	2.2443	2.2786	3.3071	1.7214	1.6477
5.00 Syndicate Bank	2.9635	3.4472	2.7606	2.1655	2.5141	1.4648	1.8121
6.00 Canara Bank	2.6878	3.1563	2.5667	2.3646	1.9028	1.6181	1.5232
7.00 Punjab National Bank	2.6717	2.9437	2.0775	2.0528	1.7606	1.5070	1.5539
8.00 State Bank of India	2.7180	3.1393	2.2629	2.0857	2.2571	1.6179	1.5189
Total	2.9968	3.3759	2.3111	2.2829	2.6377	1.5838	1.6116

**Table-10: Tests of Between-Subjects Effects**

Source		Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power <sup>h</sup>
bank name	Duty Deliverance	40.926	7	5.847	8.862	.000	.099	62.031	1.000
	Transactional Efficiency	37.821	7	5.403	5.364	.000	.063	37.548	.998
	Sales conduct	31.260	7	4.466	7.055	.000	.081	49.384	1.000
	Communication	14.296	7	2.042	3.198	.002	.038	22.386	.953
	Empathy	186.354	7	26.622	21.026	.000	.208	147.180	1.000
	Awareness	4.665	7	.666	1.343	.228	.016	9.399	.576
	Discrimination	4.879	7	.697	1.907	.066	.023	13.346	.758

Table no. 10 shows that all the banks are significantly different in providing services to the customers in all the dimensions except spreading awareness among the customers, but the table no. 9 of mean value shows that which banks are last in the comparison and which banks are doing comparatively good.

**HYPOTHESIS TESTING**

**2<sup>nd</sup> Objective-H0-** There is no significant difference in the bank practice of different banks.

**H1-** There is a significant difference in the bank practice of different banks.

To check the above mentioned hypothesis we have to use 7 sub hypothesis, as we have seven dimensions.

**Table: 11 2<sup>nd</sup> objective, Hypothesis results**

Null Hypothesis	Sig. Value	Result
There is no significant difference in the Duty Deliverance practices of different banks.	.000***	Alternate Hypothesis Accepted
There is no significant difference in the Transactional efficiency of different banks.	.000***	Alternate Hypothesis Accepted
There is no significant difference in the Sales conduct practices of different banks.	.000***	Alternate Hypothesis Accepted
There is no significant difference in the Communication practices of different banks.	.002***	Alternate Hypothesis Accepted
There is no significant difference in the Empathy practices of different banks.	.000***	Alternate Hypothesis Accepted
There is no significant difference in the awareness practices of different banks.	.228	Null Hypothesis Accepted
There is no significant difference in the discrimination practices of different banks.	.066*	Alternate Hypothesis Accepted

Sig. Value-\*\*\* significant at 1% level, \*\* significant at 5%, \* significant at 10%

**8. FINDINGS**

**1<sup>st</sup> Objective**

By analyzing the 1<sup>st</sup> objective we have found that in non of the service dimension the bank is providing the satisfactory services to the customers, in fact the level of services are quite poor, the highest mean value was 3.3 in transactional efficiency and rest of the dimensions are less than 3.3, which says that customers are not at all satisfied in duty deliverance, transactional efficiency, communication, sales conduct, empathy, awareness and discrimination practices of the banks. Public and private sector banks both needs to gear up in providing services to the customers up to the level of satisfaction and at an acceptable level.

The result of this objective shows the another side of the coin:

Low score of duty deliverance means- misbehavior is prevailing in the industry

Low score of transaction efficiency means- transactional inefficiency

Low score of Sales Conduct means- Sales misconduct or Misselling is prevailing in the industry

Low score of Communication means- Customer is not updated about the changes

Low score of Empathy means- customer complaints are not resolved properly

Low score of Awareness means- Customers are not aware about their rights

Low score of Discrimination means- Discrimination of financial basis is prevailing in the industry

**2<sup>nd</sup> Objective**

The study depicts that the banks are significantly different in providing services in all the dimensions except awareness, score of awareness is low throughout the banks .

**Table-12: Dimension wise Scoring of banks**

Sr. No.	Dimensions	Highest Score	Lowest score
1.	Duty Deliverance	ICICI Bank	Punjab National Bank
2.	Transactional Efficiency	Axis Bank	Punjab National Bank
3.	Sales Conduct	Syndicate Bank	ICICI Bank
4.	Communication	ICICI Bank	Punjab National Bank
5.	Empathy	Kotak Mahindra Bank	Punjab National Bank
6.	Discrimination	Syndicate Bank	State Bank of India

Table No. 12 shows that Punjab national bank has reflected in 4 dimension in which it scored poorly and Syndicate bank scored highest in two dimensions, ICICI bank has scored highest in 2 dimensions, Kotak Mahindra and Axis score highest in one dimensions. ICICI and SBI bank scored poorly in one dimension.

**9. CONCLUSION**

Private Banks are blindly following the money, hence they are not able to see the mutual benefit of all the stakeholders. Public banks have relaxation in terms of monitoring and supervision, hence they did not bother the customer and their services and behavior is not up to the required standard. In both the cases some sort of action is required on the part of the regulators. In Private Banks auditors or monitoring staff should take necessary care that equal services should be provided to all the section of the society and in public banks they should have strict standards for customer services.

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**AN INVESTIGATION OF SCIENCE TEACHING-LEARNING PROCESS AND LEARNING ENVIRONMENT IN SCHOOLS AT SECONDARY LEVEL**

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**ABSTRACT**

*In order to develop students' scientific competencies systematically, educational experiences in school, especially high-quality classroom level processes, are crucial (Muller et al., 2016). Science teaching is a complex activity that lies at the heart of the vision of science education presented in teaching standards which describe what teachers of science at all grade levels should understand and be able to do. To teach science as portrayed by the Standards, teachers must have theoretical and practical knowledge and abilities about science, learning, and science teaching. In this context, it is very essential to study the teaching-learning process and learning environment of present classrooms in the light of guiding principles laid in National curriculum framework, 2005 (NCF, 2005) for bringing out best practices in teacher education. Teacher education is equipping the perspective teachers with qualities in order to perform their task effectively and also works on how to implement the guiding principles laid down by Right to Education Act (RTE), National Council of Educational Research and Training (NCERT) etc. in actual classroom practice by educating perspective teachers. It is very challenging as on one side these principles have to be understood in their actual sense and on the other side the situation/conditions, real difficulties, opportunities, powers and weaknesses of the teachers in the classroom must be studied. This study has investigated the pivotal strengths and weaknesses in science teaching learning process being practiced and learning environment being provided to the learners in science classrooms which was conducted at the selected schools in district Sonapat of Haryana State.*

*Keywords: Science Education, Teaching and Learning, Teacher Education*

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**INTRODUCTION**

Equity in education means that regardless of ethnicity, gender, religion and tribe, every citizen has the right to education. To date, on-going efforts of the Indian government aim to enhance educational equity and educational quality for all Indian citizens. To some degree, this effort has been successfully achieved. For example, the number of illiterate people has decreased and the number of student enrolments has increased. Yet, the Indian government is still struggling and trying to provide all students with the best quality teaching practices. In context of Science teaching which is a complex activity that lies at the heart of the vision of science education presented in teaching standards. These standards describe what teachers of science at all grade levels should understand and be able to do. In the vision of science education portrayed by standards effective teachers of science create an environment in which they and students work together as active learners. While students are engaged in learning about the natural world and the scientific principles needed to understand it, teachers are working with their colleagues to expand their knowledge about science teaching. To teach science as portrayed by the Standards, teachers must have theoretical and practical knowledge and abilities about science, learning, and science teaching. The standards for science teaching are grounded in five assumptions.

- ✓ The vision of science education described by the Standards requires changes throughout the entire system.
- ✓ What students learn is greatly influenced by how they are taught.
- ✓ The actions of teachers are deeply influenced by their perceptions of science as an enterprise and as a subject to be taught and learned.
- ✓ Student understanding is actively constructed through individual and social processes.
- ✓ Actions of teachers are deeply influenced by their understanding of and relationships with students.

For best practices of teacher education to meet teaching standards it is essential to study the teaching-learning process and learning environment of present classrooms in the light of guiding principles laid in National curriculum framework, 2005 (NCF, 2005) and the quality parameters of RTE Act, 2009. The RTE Act in force since April 2010, has not only generated a series of huge challenges for the country, but also, enormous opportunities. As states think about how to admit students currently out of school into the age – appropriate class, it is important to think about how to help those students who are already enrolled in school, achieve the levels of learning appropriate to their age. As the rapidly mushrooming private schools and tuition classes show, parents all over the country are pointing their expectations on education for the better life of their wards. The time is right to think about what our schools can do to ensure that these aspirations are fulfilled, so that not just

schooling, but learning is guaranteed to every child. This is the Right to Education 2009 (RTE) Act, in its true spirit.

As Teacher education is the production base of teachers who work as farmers for the product (learner) and also equipping the the perspective teachers with qualities in order to perform their task effectively. It also works on how to implement the guiding principles laid down by National Council of Educational Research and Training (NCERT) etc. in actual classroom practice by educating perspective teachers and by providing in service training to teachers. It is very challenging as on one side these principles have to be understood in their real sense and on the other side the situation/conditions, actual difficulties, opportunities, strengths and weaknesses of the teachers in the classroom have to be studied.

So, the present study was undertaken with the aim of studying of the teaching-learning process being adopted and learning environment being provided at the secondary level in the schools of district Sonipat of Haryana State.

### **OBJECTIVES**

- To find out the teaching learning processes being adopted by teachers while teaching science at the secondary level.
- To study the learning environment being provided by teachers in the science classroom at the secondary level.
- To compare the areas of improvement in teaching-learning process and learning environment in science classroom to those mentioned in teacher education programme at secondary level.

### **RESEARCH METHOD**

Descriptive Survey method was used for studying the teaching learning processes adopted by teachers and learning environment being provided to students in science classroom in schools of district Sonipat of Haryana State. . The study involves collection and analysis of data both qualitatively and quantitatively.

**Population:** Students studying in classes IX and X in schools of district Sonipat of Haryana State comprised the population of the study.

### **SAMPLE SELECTION PROCEDURE**

- Ten Schools Were Selected Randomly From The Schools Of District Sonipat Of Haryana State.
- A list of teachers teaching science to students of classes IX and X in each sample school was prepared. Two teachers were selected randomly from each sample school. In all twenty teachers were selected for the study.
- In most of the schools there were two sections of classes IX and X. Five students were selected randomly from each class. In this way fifteen (10) students were selected from each school. In all one hundred and fifty (100) students were selected for the study.
- Five schools (05) were selected randomly from the ten sample (10) schools already selected for the study. Two classrooms were selected from each of these five schools in which the teachers selected for the study were teaching. In all ten sections (10) were selected for the classroom observation. As it is not justified to generalise anything by observing any classroom once only. Therefore it was decided to visit a classroom three times at least for observing the actual teaching learning process taking place and learning environment being provided in these classrooms.

### **TOOLS USED IN THE STUDY**

Keeping in view the objectives of the study, three tools were developed:

1. **Interview Schedule for Teachers (IST):** to interview the teachers, selected for the study about the teaching-learning processes adopted and learning environment being provided by them in the science classroom.
  2. **Learning Environment Scale (LES):** to take views of the learners about the learning environment being provided to them in Science classroom.
  3. **Classroom Observation Schedule (COS):** to observe the teaching-learning process adopted and learning environment being provided in science classroom in actual situations.
- All the above points have been concluded in the following table:

S. No.	Selection of	No.	Specification	Purpose: For
1	Schools	10	5 schools from randomly from the schools of district Sonipat of Haryana State.	carrying out the Study
2	Teachers	20	2 Teachers from each school	carrying out Teachers Interview Schedule
3	Students	100	10 students from each school	carrying out Learning Environment Scale
4	Classrooms	10	2 classrooms in five schools	carrying out classroom Observation Schedule

### DEVELOPMENT AND DESCRIPTION OF TOOLS

The items for these tools were framed on the basis of what NCF-2005 has said on teaching learning process and learning environment in the classroom. For example: Was teaching learning material available in the classroom?

One way to develop learning atmosphere in the classroom is to display teaching learning material in the class which students can use and manipulate even in the absence of the teacher. Students can discuss about that material with other students of the class and explore scientific concepts themselves.

- Were students' experiences used while teaching?
- Were students' performing experiments in laboratories?
- To show students that they are valued, it is essential to ask them about their experiences and use them while teaching.
- Did the teacher use any teaching learning material other than textbook?
- Did the teacher ask students to work in small groups or pairs?

The NCF states: "The pluralistic and diverse nature of Indian society definitely make a strong case for preparing a variety of not only textbooks but also other materials, so as to promote students' creativity, participation and interest, thereby enhancing their learning. No single textbook can cater to the diverse needs of different groups of students".

Keeping the above points in mind, the first draft of all the three tools was developed.. Each tool was sent to experts and was discussed item wise. Valuable suggestions given by the expert were incorporated and tools were finalized.

A try out of the tools was done during School Experience Programme in govt. schools of district Sonipat other than the sample schools. All the three tools were conducted to see whether students and teachers were comprehending language of items. The sequencing of the items was also checked. Minor variations were made wherever the need was felt.

IST was a semi structured interview in which items were prepared on the following parameters:

- Introduction of the teacher
- Teaching plan and its execution
- Teaching-learning process
- Identification and remediation of learning difficulties
- Evaluation
- Problems related to teaching-learning process and learning environment
- Reflection by teachers

For LES the learning environment was classified into three categories: Traditional teacher- centred classroom environment, Transforming learning environment and Child friendly learning environment. Quantitative analysis of learning environment of the classrooms was done on the following scores of LES:

36 – 52 Traditional teacher- centred classroom environment

52 – 68 Transforming learning environment

68 – 84 Child friendly learning environment

The researcher conducted COS in Science classes and wrote a descriptive note on teaching-learning process and learning environment keeping in mind the following thrust areas:

S.No.	Parameter	Thrust areas
1	Learner friendly environment in class	Introduction of the concept being taught
		Seating arrangement
		Teaching-Learning material used
		Activities undertaken
		Group size
		Feedback mechanism
		Evaluation procedure
2	Activities in class were teacher driven/student engagement	Maintenance of discipline
		Strategies adopted to engage students
		Management of students responses
		Type of assignments given

### ANALYSIS OF DATA

Quantitative data of LES revealed that out of ten sample schools observed, six had Traditional teacher- centered learning environment, four had Transforming learning environment and none of the school had Child friendly learning environment.

Qualitative data of IST, LES and COS revealed that there were many strengths of teaching-learning process and learning environment in classrooms in post NCF scenario, but at the same time some areas were identified which need improvement.

### STRENGTHS OF TEACHING-LEARNING PROCESS AND LEARNING ENVIRONMENT

**Physical environment:** All the classrooms were built for all weather. Teacher could physically approach all students sitting in the classroom. The ventilation and light were adequate in all the classrooms. Students were sitting on the wooden desks. Blackboard was available in each classroom. Sufficient number of fans in working condition was also there in each classroom. On the whole the physical environment of the classroom was reasonably good for students as well as teachers.

**Well qualified and trained teachers:** The teachers were well qualified. Most of the teachers in the sample had Postgraduate degrees. All the teachers had the professional qualifications in teaching. This way the teachers were well acquainted with content and pedagogy of sciences.

**Following plan provided by the Department:** All the teachers were following the Weekly Plan provided by the board of Education. Sometimes due to other duties they could not follow that plan rigidly. Otherwise they tried to teach according to that plan only. It helped teachers not only in teaching but also devoting sufficient time on each and every concept given in the text book.

**Corporal punishment:** During the administration of tools, teachers giving corporal punishment to students in science class were not observed at all. It was good that students were not harassed in any way. The guiding principle of NCF-2005 that "Learning takes place in fearless environment" was followed.

**Discrimination:** During the Classroom Observation of science teaching any discrimination on the basis of sex, colour, cast, religion or disability was not observed. All the students were treated equally in the class. Teachers were not found biased for any sex or religion. It leads to healthy environment in the class.

**Scientific inquiry based learning:** All the teachers at the secondary level gave due weight age to teaching-learning of complex scientific concepts in science classroom which is helpful in developing scientific attitude. Teachers organized science Quizzes/science exhibition and various competitions for students at school level and district/zone level. Prizes and certificates were also distributed in those competitions.

**Laboratory work:** Teachers assigned students the project work and other lab activities in physics/chemistry/biology in sciences. It helped students in learning by doing and exploring scientific concepts on their own. Students take interest in doing practical assignments provided they are meaningfully planned by the teachers.

**Responses of teachers to students' queries:** It was observed that teachers responded to questions raised by students in science class. Students were not insulted for raising questions or asking their doubts during teaching-learning process. Though such incidences were rare but still it encourages them to ask more doubts.

**Teachers showed willingness to field work:** Teachers told that they wanted to teach by organizing science activities apart from classroom in outer field, but due to large classroom, vast syllabus and other duties they could not plan more activities in the science class.

### IMPROVEMENT AREAS

**Planning:** It was observed that all the teachers in the sample schools developed the plan of the lesson in the teacher diary. It was a weekly plan based on the plan provided to the teachers by the board of Education. It was observed that the weekly plan was very sketchy as many important points were missing, like teaching aids or concrete materials to be used in the class for teaching the planned content, strategies to be used for transacting the content, tools of continuous evaluation and remediation etc. It was basically mentioning of syllabus to be covered and not a teaching plan. As these points were missing in the weekly plan, the same were missing in the teaching-learning process being adopted by them in the science classroom.

**Traditional method:** In most of the sample schools traditional method of teaching was still prevalent. Teacher was dominating and students were passive listeners in the class. Students were not asking questions/doubts to the teacher. Students' experiences were not shared. Students' participation was negligible in the teaching-learning process. Interaction with peers was also missing. Use of activity method/demonstration method for transacting content was not found in any of the classroom observed under study. Use of models/real learning materials/models and students working in groups and sharing their experiences were missing in science classroom. Use of innovative techniques, multiple approaches or alternative approaches had no place in the teaching-learning process of science class. Important scientific skills like analysing, observation/visualization, experimentation were not visible at all in science class.

**Lack of proper introduction of the lesson:** Improper previous knowledge testing hamper in developing interest of the students in the lesson. It is like hammering the cold iron which is a fruitless exercise. It is against the psychological principles of learning i.e. learning from the known to the unknown especially at this stage of learning. Students who need individual attention or are not very regular in school or are first generation learner may not understand the topic/concept being introduced without explaining the need and importance of studying that concept. Slowly and gradually they develop the notion that learning sciences is not their cup of tea. This very thought blocks their way of learning science.

**Rigid class arrangement:** The infrastructure of the class made the sitting arrangement of students very rigid. It was not possible for students to work in groups (small or large) in science class. Students' desks were too heavy to move and rearranged.

**Lack of identification and remediation of learning difficulties:** Identifying learning difficulties of the students and providing remediation for the same was not observed in any science classroom. It was found that teachers were rushing for the completion of the science syllabus and had no time for discussing and removing bottlenecks of learning in the classroom. Students were also not bothered to ask their difficulties about understanding concepts in science class.

**No planned homework/practical assignments:** It was found that students were not assigned well planned assignments. They were just given the problems from the textbook. Assignments involving elements of variety, interest and extension of classroom learning were not observed in any of the classroom.

**Students did not ask questions:** Students were not asking questions or their doubts in science classroom. It led to lack of interactions between the teacher and students. The environment of the class needs improvement so that students could raise and discuss their doubts in science class. It would help teacher in planning the lesson better.

**Pupil teacher ratio:** The pupil teacher ratio in the classrooms of five schools observed in the present study was 45:1, which is much more than the recommended norms. It was observed that in two classrooms out of ten, the students of two sections (between 70 to 80 in numbers) were sitting in the same room in science class. Three to four students were sitting on one desk meant for two students. Teacher told that it was due to shortage of classrooms in their schools. This ratio needs to be improved for effective teaching-learning process.

**Intrinsic Motivation:** The data of the study revealed that more than half the number of teachers in the sample joined the teaching profession not as their choice. They lack intrinsic motivation, which is an important factor for teaching profession. Self motivation is essential for improving oneself in the profession. Such teachers take teaching as a job and not as a profession.

After knowing these areas of improvement in teaching-learning process and learning environment in actual classrooms the researcher was keen to know whether such areas were being addressed in teacher education programme at the secondary level. A group discussion was arranged with students of B.Ed i.e. teacher education programme at the secondary level. Students gave following areas which need to be addressed for preparing effective and quality teachers at the secondary level. They also pointed out certain practical tasks to be involved in teacher education programme.

**Planning:** Pupil teachers told the researcher that they were doing a lot of work during school experience programme like observing and developing a lot of records, conducting action research and delivering forty lessons during SEP in schools but still there are problems which need to be addressed in teacher education programme.” The problems mentioned were as follows:

- “We are studying constructive approach of teaching-learning, but we are not told how to make lesson plans using constructive approach. How to develop teaching plans using seven E’s namely engagement, eliciting responses, exploration, explanation, elaboration, evaluation and extension. How to share experiences of learners and use them for construction of knowledge? We are studying strategies of constructive approach theoretically, how to develop concept maps for teaching-learning in different subjects which are not known to us.”
- Other student said, “We have all theoretical knowledge, practically we are not using such concepts in teaching-learning.”
- Some pupil teachers mentioned, “We do not know how to develop interesting plans and include elements of challenge in teaching-learning process? How to develop activities through which each and every student may be engaged in learning? How to plan lesson which provide success experience to each and every child of the class? How to plan experimental activities in large classroom? What may be the criterion of forming groups of students while conducting group activities in the class? Pupil teachers also mentioned that they lack understanding of how to integrate various strategies and tools of continuous and comprehensive evaluation in the lesson plan?”
- They mentioned that theoretically they knew the use of ICT in teaching, but practically they could not plan lessons based on it.
- They knew the meaning, needs and characteristics of inclusive classroom but they were not able to develop teaching plan for mathematics in such classrooms. There is no separate paper on Inclusive Education but workshops are conducted for their awareness. Some teaching aids are developed for inclusive classrooms in such workshops but neither demonstration of teaching-learning process nor how to adapt curricular strategies in such classroom is explained.
- Some pupil teachers mentioned, “When they conduct activities during SEP, they find few students complete their activity before the estimated time while some do not even understand it. We are not able to deal with such variation in the classrooms.”
- During SEP the only source used for developing teaching plan by the pupil teachers was text book. They suggested that they were hardly made aware of using other resources for planning teaching-learning process.

**Traditional Method:** Pupil teachers told that they studied about various teaching methods like inductive-deductive, problem solving, project, analytic- synthetic, inquiry, discovery and experiential methods but these were hardly used for the purpose of teaching-learning in their classrooms. They said, “As the demonstration of such methods was also not done in our class, so we might not feel confident in using such methods for teaching. We are taught through traditional methods only”.

They suggested that if they were taught using such methods then it would help them in employing the same when they became teachers. Some pupil teachers mentioned that they were not motivated to ask doubts or queries during their lectures.

Some pupil teachers viewed, “in teaching subjects like teaching of hindi, social science etc. more emphasis is given on content and pedagogy, which we lack in, is not given its due importance.”

**Assignment:** Some pupil teachers told, “We are not taught about assigning meaningful and interesting home assignments in different school subjects. How to develop such assignments for students? How to deal with defaulters? How to motivate students who do not want to study? Basically we feel we have all theoretical knowledge but practical aspects of all these strategies are weak and need to be strengthened.”

**Evaluation Strategies:** Pupil teachers mentioned, “They study about importance and construction of Achievement Tests, use of Diagnostic Tests, and difference between the two. Different tools of Continuous and Comprehensive Evaluation and their formation need to be included in our curriculum.” They wanted to learn how to develop different tools of evaluation and actually wanted to develop them.

**Identification and remediation of learning difficulties:** Pupil teachers wished to add the topic: different strategies of remediation to be adopted at the elementary level, in their curriculum in detail. They added it further, “We want to learn it practically. It may be added in our assignments also.”

**Conclusion:** The three tools of the research study namely ITS, LES, COS and the group discussion with pupil teachers revealed that the areas of improvement in teaching-learning process and learning environment in actual classrooms are similar to those areas which need to be addressed in teacher education programme i.e. B.Ed Programme. For effective teaching in schools there is a need to add practical aspects of concepts to be used in classroom either as group field activities/lab activities/visualizing experiments through the use of ICT or as practical home work. Pupil teachers are well aware of the aspects they need to strengthen for performing their task of teaching effectively.

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**DIGITAL INNOVATION AND MEDIA: OPPORTUNITIES AND FUTURE AHEAD**

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**INTRODUCTION**

The power of the Internet has penetrated every parts of life so it is there in the arena of Mass Communication and Journalism. It has also been revolutionized with the inclusion of the World Wide Web for newsgathering and news dissemination. Aspiring journalists today need to be familiar with cyber journalism and the basics of web designing.

Also, it is important to understand the hugest impact of online media and news dissemination though it, how media is not only making but also changing opinion in today's times via various Social Media platforms. Besides, It has also become a major source of advertising. Gone are the days, when people used to wait for newspaper for getting information in a certain way. In the era of smart phones, everything is in our hands and just a click away. Almost every big and small media houses are online through channels, apps, or even on YouTube, instead they have a fully fledged websites of their own. Which has completed changed the scenario, of the way media is consumed today.

This Research Paper “ **Digital Innovation and Media**” aims at covering various aspects of New Age media with presenting a review of various studies and research done on Digital Revolution, Media Advertising, Artificial Intelligence, Internet of Things, Consumption of Social media via Mobile and Penetration of Internet in the lives of Users. Although the presenter has tried its level best to give you a glimpse of the study but due to the vast capacity and capabilities of Digital platforms and paucity of words could not get into the depth of the area of study. All the details are elaborated with the help of Text, Graphs and Pictures.

**EXPANSION OF INTERNET IN NEWS MEDIA**

Computers had entered the nation the early 90's with the policies of Liberalization and globalization. Since then, Computer technologies are growing upward, taking over all the areas of life. From education to banking, from shopping to trading, from entertainment to serious discussions and what not.

In such a transformation when nothing left untouched of computer and internet, it is impossible for journalism to remains aloof. Last one decade has witnessed changes upside down. With the fact that smart phones entering in the hand of everyone, all of it has changed.

Every Media house is running its digital version independently or dependently. Teams of people dedicated to digital media are formed that is the reason why digital journalism terms have coined and new crop of journalist are taught to be digitally sound. In nutshell, we have reached a phase where it is impossible to imagine news without internet and digital.

**Digital journalism**, also known as **online journalism**, is a contemporary form of journalism where editorial content is distributed via the Internet, as opposed to publishing via print or broadcast.

What constitutes digital journalism is debated by scholars; however, the primary product of journalism, which is news and features on current affairs, is presented solely or in combination as text, audio, video, or some interactive forms like news games, and disseminated through digital media technology.

Fewer barriers to entry, lowered distribution costs, and diverse computer networking technologies have led to the widespread practice of digital journalism. It has democratized the flow of information that was previously controlled by traditional media including newspapers, magazines, radio, and television.

**MARKET DYNAMICS**

Indian Media & Entertainment sector is expected to grow at a Compound Annual Growth Rate (CAGR) of 14.3 per cent to touch Rs 2.26 trillion (US\$ 33.9 billion) by 2020, while revenues from advertising is expected to grow at 15.9 per cent to Rs 99,400 crore (US\$ 14.91 billion).

While Digital Advertising will grow at 33.5 per cent. The largest segment, India's television industry, is expected to grow at a CAGR of 15 per cent, while print media is expected to grow at a CAGR of 8.6 per cent.

**ONLINE GLOBAL TREND**

In the present Digital Marketing landscape, New Media marketing has emerged as one of the most indispensable tools for marketing products and services. There are various tools and forms used for the same.

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In 2018, social media sphere enjoyed more than 2.3 billion active users and more than 1.9 billion active mobile social users which is increasing at an amazing pace.

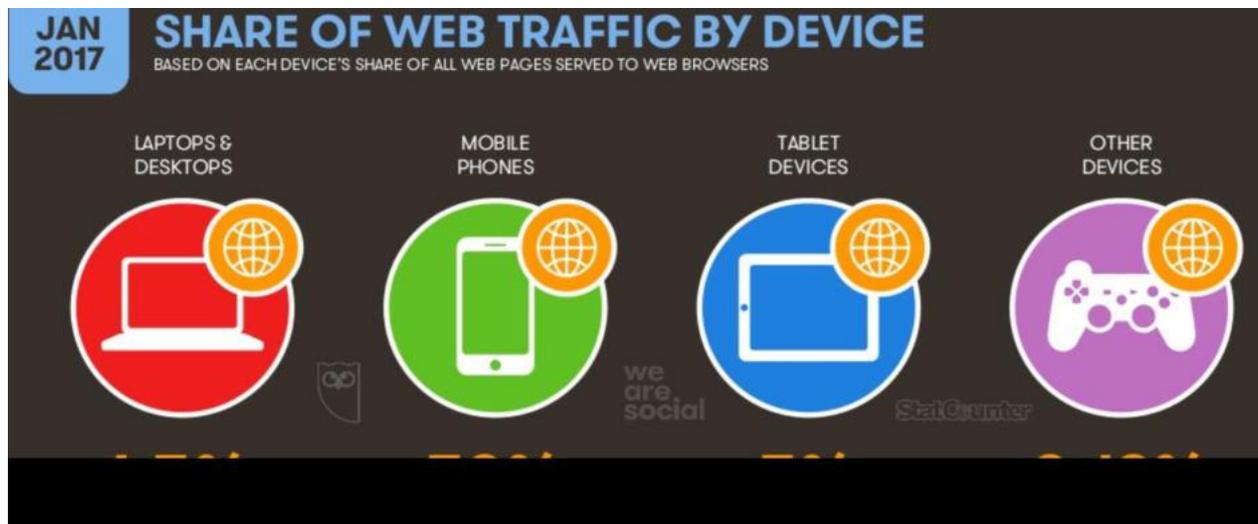
More than 83% of marketers have already utilized social media marketing to boost their sales and gain better brand identity which itself is a huge number of people.

**ONLINE CONSUMPTION PATTERN**

As shown in the below image, 45% of the consumer using laptops and desktops whereas 50% consumers are using mobile phones for getting the information. Only 5% consumers are using tablets and very minimum 0.12% is using other devices to get the information.

The usage of Mobiles phones, especially smart phones is maximum that is maybe because the low cost and easy availability of the mobiles. Even a rickshaw driver or a fruit seller is using mobiles these days. Those who are even little educated and can understand the functionality of the phones are using them for various information. The telecom industry has made this possible by providing mobile phones at reasonable prices.

Desktops and laptops are most convenient and easy way to work and access digital platforms. And then come the later.

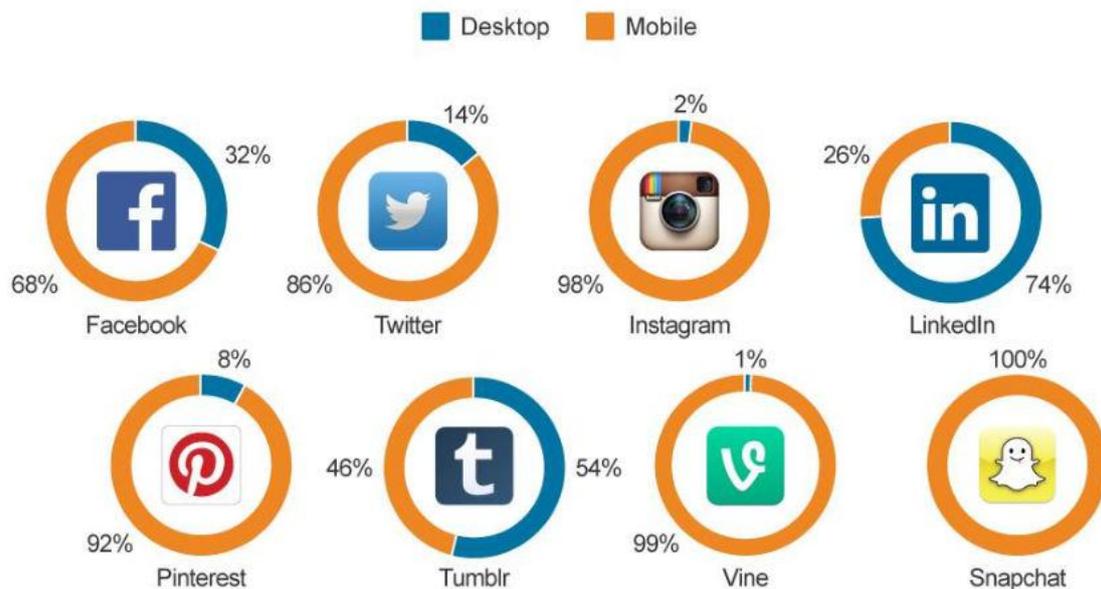


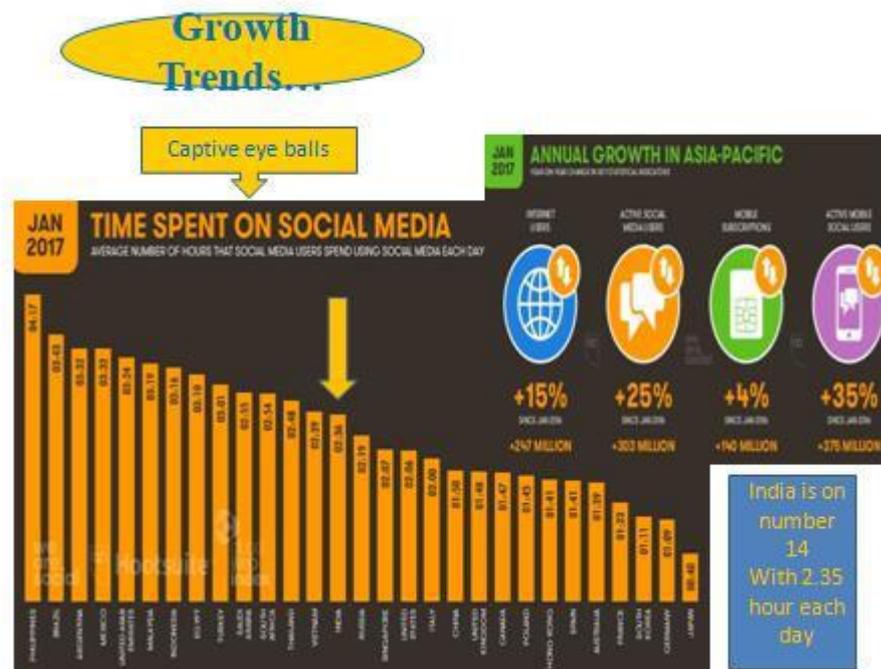
**MOBILE FIRST**

Following image provide the mobile usage data in detail defining the range of various social media approaches. Take a look at it:

**Most Social Networks Are Now Mobile-First**

% of time spent on social networks in the United States, by platform\*





**Live Videos**

The trend of live video is not going anywhere rather will continue to rise in the year 2019. In fact, 14% of marketers experimented with it in 2018 itself and 43% plan to use live video this year.

Every social platform has introduced the feature of live streaming, and it has become the hottest thing in the social media. Face book’s Live Video and sharing Stories, Twitter’s periscope and Instagram stories has created quite a buzz in social media.

Thanks to live video feature, Facebook has enjoyed lot of growth last year and particularly on the New Year’s Eve, live streaming on Facebook reached a record-breaking number. Even Instagram did not lag behind and enjoyed 100 million active users on Instagram Stories.

In digital marketing trends, now video is shifting and shaping the world of marketing more than ever in 2018.

Video is no longer an option for marketers it’s a vital part of any content strategy that wants to taste success.

The shifts in the video marketing industry will help understand audience’s preferences, habits, and how video can help move the needle and drive ROI for the business.

82 % of internet traffic will be video in 2020

**EVERYTHING IS SMART**

The **Internet of things (IoT)** is the inter-networking of physical devices, vehicles (also referred as "connected devices" and "smart devices"), buildings, and other items embedded with electronics, software, sensors, actuators, and network connectivity which enable these objects to collect, exchange data and talk to each other.

**IoT** is a key component of home automation and **Smart Homes**.

A **Smart City** is an urban development vision to integrate information and communication technology (ICT) and Internet of Things (IoT) technology in a secure fashion to manage a **city's** assets.

**Future:**

VR - Virtual Reality is actually computer-generated simulation of a three-dimensional image or environment that can be interacted with in a seemingly real or physical way by a person using special electronic equipment, such as a helmet with a screen inside or gloves fitted with sensors. 'Virtual reality' basically means 'near-reality'.

**OPPORTUNITIES**

- Digital Marketing
- TV Industry
- Film Industry

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- Marketing
  - Event Industry
  - Public Relation
  - Corporate Communication
  - Corporate Affairs
  - Education

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## ALTERNATIVE ENERGY FOR SUSTAINABLE DEVELOPMENT

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**ABSTRACT**

*Energy drives development of mankind, economic growth, and increases social equity. Development is not possible without energy and sustainable energy is pre-requisite for sustainable development. In the context of sustainable energy, alternative energy sources play an important role. So far, the energy needs of the world have been catered to by majorly conventional sources of energy such as coal, gas, petroleum etc. These resources pose two concerns, first, these are available in limited quantity and are depleting at a high rate. Second, these are not environment friendly. Coal/liquid fuel based electricity generation, and petrol/diesel run vehicles are one of the major sources of pollution.*

*In this context, the role of alternative sources of energy or renewable energy sources as sustainable energy source that comes from natural environment becomes important. Various countries in the world have realized the importance of keeping the balance between the development and environment and are taking steps to in this regard. The United Nations Climate Change Conference (COP 21 or CMP 11) held in Paris, France in Dec, 2015 witnessed consensus among 196 participating entities to pursue efforts to limit the temperature increase to 1.5 °C. India, in its Intended Nationally Determined Contribution (INDC) has pledged to improve the emissions intensity of its GDP by 33-35% by 2030 below 2005 levels. It has also pledged to increase the share of non-fossil fuels-based electricity to 40% by 2030. It has agreed to enhance its forest cover which will absorb 2.5 to 3 billion tonnes CO<sub>2</sub> by 2030.*

*For implementation to achieve this aim, India has taken various initiatives including making a target to install 175 Giga Watts of renewable energy by 2022 (100 GW-Solar, 60 GW-Wind, 5 GW-Small Hydro, 10 GW Biomass). Till Feb, 2019, we have over 75 Giga Watts of Renewable Energy installed in India. Promotion of Electric vehicles is also expected to reduce pollution. Energy Efficiency measures also help in reducing energy usage.*

*The education system should encourage students to generate new ideas for efficient and innovative use of resources and create interest in working including research and development in areas related to deployment of alternative energy sources for sustainable development.*

*Keywords: Alternative Energy, Sustainable Development, Environment, Renewable Energy, Education*

**1. INTRODUCTION**

In recent years, the focus has shifted from growth to sustainable development. As per NITI Aayog, sustainable development is defined as development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Sustainable development requires collective efforts for building an inclusive, sustainable and resilient future for people and planet. Harmony in three core elements namely economic growth, social inclusion and environmental protection is pre-requisite for sustainable development.

One of the biggest obstacles to achieve sustainable development is climate change. Climate change resulting from fast pace development has posed a threat to biodiversity, ecosystem and wellbeing of people. As per World Bank, countries and communities around the world are already experiencing increased climate change impacts including droughts, floods, more intense and frequent natural disasters, and sea-level rise. Climate change is an acute threat to global development and efforts to eradicate poverty and could push an additional 100 million people into poverty by 2030 if timely appropriate measures are not taken. Climate change is already having real and measurable impacts on human health wherein air pollution is causing more than 7 million premature deaths each year.

In Indian context, energy is central to achieving India's development targets, to support its fast growing economy, to provide electricity to all, to fuel the demand for greater mobility and to develop the infrastructure to meet the needs of the people. Fossil fuels (Coal, gas, petroleum products) have been traditionally used as main source of energy in India. Besides their limited availability, fast depletion and import burden on the economy, they also have adverse impact on the environment. There have been efforts to find alternative energy sources which is clean, green and as far as possible, indigenous.

Alternative energy is any energy source that is an alternative to fossil fuel. These alternatives are intended to address concerns about fossil fuels, such as their limited availability, pollution issues and high carbon dioxide

emissions causing global warming. There are differences of opinion related to what constitutes alternative energy. However, in general, it is termed as fuel sources that are other than those derived from fossil fuels. Alternative energy is generally used interchangeably for renewable energy.

Some of the benefits of alternative energy are: reduced overall usage of fossil fuels, reduced pollution, distributed generation, diversified energy supply and lesser dependence on imported fuels. They also create economic development and employment in manufacturing, installation, and operation and maintenance.

## **2. ALTERNATIVE ENERGY SOURCES:**

### **❖ Solar Energy**

Solar power is the conversion of energy from sunlight into electricity, either using photovoltaics (conversion of light energy to electrical energy), or using concentrated solar power (conversion of heat energy to electrical energy). In India total installed capacity of solar energy is 26.03 GW (Giga Watts) as on Dec, 2018. Government has made a target of installation of 100 GW of solar power by 2022. Its modular structure provides flexibility in terms of innovative installations both in rooftop and ground mounted and from small to large sizes. Solar power has proved beneficial in electrifying remote areas through distributed generation. Solar lanterns are rapidly replacing kerosene lamps. Solar photovoltaic water-pumping systems are being used for irrigation and drinking water. Government is also providing subsidy for solar power installations.

### **❖ Wind Energy**

In wind energy, wind turbines convert the kinetic energy in the wind into mechanical power and a generator is used to convert mechanical power into electricity. Mechanical power can also be utilized directly for specific tasks such as pumping water. In India total installed capacity of wind energy is 35.29 GW as on Dec, 2018. Government has made a target of installation of 60 GW of wind power by 2022.

### **❖ Biomass**

Biomass is a fuel developed from organic materials such as scrap lumber, forest debris, crop residuals, manure and waste residues. They provide an efficient way to convert waste and crop residues into electricity and reduce pollution. In India total installed capacity of biomass energy is 9.78 GW as on Dec, 2018. Government has made a target of installation of 10 GW of biomass power by 2022.

### **❖ Hydro Electric Power**

In hydropower or hydroelectricity the conversion of energy takes place from flowing water into electricity. It is considered a renewable energy source because the water cycle is constantly renewed. Hydro power plants can be small or large. Hydro power plants are run of the river or storage with dam. Dammed reservoirs can also help with flood control, be a reliable source of water for irrigation and drinking. However, there are many concerns with hydropower, particularly large dam facilities which include significant impact on the regional ecosystem, flooding upstream landscapes, disrupting habitats for wildlife, blocking fish passages, and displacing local communities. In India total installed capacity of hydro power is 50 GW as on Dec, 2018 out of which 45.4 GW is large hydro (above 25 MW) and 4.6 GW is small hydro (less than 25 MW).

### **❖ Geothermal Energy**

Geothermal energy is the heat from the Earth. Resources of geothermal energy range from the shallow ground to hot water and hot rock found a few miles beneath the Earth's surface, and down even deeper to the extremely high temperatures of molten rock (magma). Many technologies have been developed to take advantage of geothermal energy such as generating geothermal electricity, producing heat directly from hot water within the earth and using the shallow ground to heat and cool buildings through geothermal heat pumps.

### **❖ Tidal Energy**

Tidal energy converts the natural rise and fall of the tides into electricity. The high cost and lesser availability of appropriate sites have been limitations of deployment of tidal energy in large scale. Tidal power can also have adverse effects on marine life.

### **❖ Wave Energy**

Wave Energy is another type of ocean based renewable energy source and uses power of the waves to generate electricity. Unlike tidal energy which uses the flow of the tides, wave energy uses the vertical movement of the surface water that produces tidal waves. Wave power converts the up and down movement of the ocean waves into electricity. Equipments are placed on the surface of the oceans to convert mechanical energy into electrical energy. This technology requires constant strong waves. The limitations of this technology are high costs, intermittent power and threat to navigation that cannot see or detect the equipments by radar.

**3. RESEARCH AND DEVELOPMENT (R&D)**

R&D for renewable technology development should involve industry and scientific establishments. Time bound specific tasks for identified R&D activities should be assigned to recognized / identified industry and institutions with clear understanding on the achievement of results. There is a need to develop platforms for sharing of knowledge so as to avoid 'reinventing the wheel'. Local innovations for new and emerging technologies should be done for improvement of available technologies to cater to the specific needs of the people of a particular area. In India, Ministry of New and Renewable Energy has been supporting R&D for technology and manpower development in Renewable Energy. Clean Energy Research Initiative (CERI) by Department of Science and Technology is one of the schemes to support R&D and capacity building in the area of solar technologies.

**4. COMMUNITY INVOLVEMENT**

Getting community engagement and sharing the benefits equitably is a key part of a renewable energy project. Various steps involved in community involvement include providing balanced and objective information, assisting the community in understanding all aspects of a project, including possible problems/issues, obtaining feedback from the community on plans, options and decisions and skill development of the community members to work and manage the project. Some of the benefits of community involvement are minimized objections, good stakeholder relations and a level of community awareness and trust in the project.

**5. CONCLUSION**

Energy is of utmost importance for modern economies and societies. The management and development of energy resources are priority from a sustainable development perspective. Improving energy access is critical to progress in the areas of poverty reduction, industrialization, economic growth, health, and education. Efforts to increase energy access must also factor in climate change as encompassed in the United Nations Climate Change Conference (COP 21 or CMP 11) Paris 2015 agreement. With this objective, carbon-intensive economic development is no longer an option and focus needs to be shifted towards clean and renewable sources.

In Indian context, with right investments in green technologies, India is well positioned to achieve renewable energy targets. The pursuit towards renewable energy will have an important role in enabling the country's transition to a fully sustainable energy system supporting sustainable development. With 300 clear sunny days, over a dozen perennial rivers and a coastline of more than 7,500 KMs, India has huge potential of development of renewable energy for the benefit of its inhabitants. India with its population of 1.3 billion people is the world's fourth-largest carbon emitter and power sector contributing majorly to the same. But in the recent years, due to climate change concerns have led to a significant shift from fossil fuel based energy sources to renewable energy sources. One more benefit of renewable energy is providing employment to local population. India has made significant developments in the renewable energy space with present installed renewable energy capacity of over 75 GW. In order to make the most of renewable energy sources, there is also a need to focus on energy efficiency practices as India's energy demand will witness an exponential growth owing to the lighting and cooling requirements due to the varied climatic conditions, increasing electric mobility, growth of the industries and rural electrification.

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**DIGITAL INNOVATION AND SUSTAINABLE DEVELOPMENT: IMPLICATIONS FOR AN ENGLISH CLASSROOM**

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**ABSTRACT**

*The onset of Global Digital Revolution has revolutionised the way in which all fields of knowledge function. It is not only supremely interesting as far as the question of technological innovations go but also the implication that these technologies offer a host of possibilities in varied industries and contexts. Since digitalisation has taken over the entire world, it seems like being digitally literate is the only way to go. Key research studies have also attempted to create a positive correlation between digital innovation and sustainable development. The important area for discourse is to create solutions in the classroom wherein learners can use digital innovation to further sustainable development. Just like any other domain of knowledge, use of digital resources, traditionally under the purview of Information and Communication Technology, has become the talk of the day much more than the need of the hour in classrooms, globally. Indian classrooms, too, irrespective of the context, type of school, regional placing of the school are opening their arms to use of digital resources (or ICT resources as they are popularly referred to) infusing them into the teaching-learning process.*

*In this paper, the author attempts to establish the extent to which digital innovation has been infused in classrooms, especially the typical English classroom and its impact on sustainable development.*

*Keywords: Digital Innovation, Sustainable Development, Information and Communication technology and resources (ICT resources), Typical English classroom*

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**INTRODUCTION**

The onset of Global Digital Revolution has revolutionised the way in which all fields of knowledge function. It is not only supremely interesting as far as the question of technological innovations go but also the implication that these technologies offer a host of possibilities in varied industries and contexts. Since digitalisation has taken over the entire world, it seems like being digitally literate is the only way to go. Key research studies have also attempted to create a positive correlation between digital innovation and sustainable development. The important area for discourse is to create solutions in the classroom wherein learners can use digital innovation to further sustainable development. Just like any other domain of knowledge, use of digital resources, traditionally under the purview of Information and Communication Technology, has become the talk of the day much more than the need of the hour in classrooms, globally. Indian classrooms, too, irrespective of the context, type of school, regional placing of the school are opening their arms to use of digital resources (or ICT resources as they are popularly referred to) infusing them into the teaching-learning process.

For the purpose of establishing a context, it is imperative to operationally define some key terms. These terms have been defined as follows:

- Digital Innovation- Digital innovation is in consonance with Digital Technology. A digital innovation refers to key transformations in the field of technology, be it computers, tablets, mobile phones which lead to a relatively enhanced productivity and democratization of a particular discipline or field.
- Sustainable Development- Sustainable development has often been conceptualised as economic development without the depletion of natural resources, implying that it is a development which does not hamper the natural and ecological environment of the world.
- English Classroom- A classroom where English is the target language being actively taught as a Second language, especially in the Indian context.

The relationship between Digital Innovation and Sustainable Development is a much discussed one. The term, "Sustainable Development" was first used by the Brundtland Commission which defined it as, "the development with sustainability that meets the needs of the present without compromising the ability of the future generations to meet their own needs." This phrase is now being used in most official documents and policies across the globe. It is also important to underline that sustainable development can have various dimensions- social, political, economic, ecological, environmental, educational, socio-political, so on and so forth.

“Technology has great potential to help deliver the SDG’s but it can also be at the root of exclusion and inequality. We need to harness the benefits of advanced technology for all”

-UN Secretary General, Antonio Guterres, at the closing of the 2018 High-Level Political Forum on Sustainable Development”

Guterres seems to be banking on the merits of digital technology for sustainable development. As academicians, researchers and teacher educators, it is imperative that we understand, address and bank upon this relationship between digital innovation and sustainable development to use it inside our classrooms. In this section, we will try and delve deeper into the nuance of this relationship.

Firstly, technology has transformed our world into being a more compact one. People are connected now more than ever. If any form of development happens in any part of the world, it reaches the other parts of the world at a lightning speed.

Secondly, the access of development and news of development (emphasising the difference between the two) is not only quick to reach its audience but is faster in elicitation of responses. The eventual and expected outcome of Sustainable Development Goals is to bring communities (irrespective of any barriers) and individuals to come closer. We are also close to this outcome through digital innovation, literally at the tap of a button.

Thirdly we must hold ourselves (the community of teachers) accountable for the introducing Sustainable Development and its goals to our students. UNESCO in its key document on Sustainable Development asserts that quality education must be imparted to students of all grades, learning levels, irrespective of context, to educate them about the skills, values, morals and attitudes to create a sustainable future. It has also been suggested that issues pertaining to sustainable development should be introduced in the curriculum such as climate change, environmental concerns and degradation among others to create a more aware, responsible, alert and proactive population. The opening lines of Kothari Commission say, “The future of the country is being shaped in our classroom today.” It will not be an exaggeration to say that this historical statement holds true for classrooms across the world.

### **Infusing Technology in Classrooms for a Sustainable Future**

It is a truth, universally acknowledged (alluding to Austen) that technology has become the prime, driving force of our classrooms today. Lesson plans with ICT infused in them are not considered ‘modern’, ‘innovative’ or ‘unconventional’ are now counted as being the norm. Classrooms with traditional teaching methodology interspersed with ICT have revolutionised the way students are taught turning the process of learning from drab and dreary to more learner-centred, entertaining and engaging. While students were earlier used to rote memorizing facts and figures, now are moving towards a sense of self motivation and self regulation. This whole concept of ‘Blended Classrooms’ which meaningfully and pragmatically integrates technology with conventional pedagogical techniques is being touted as the solution to what UNESCO posed in front of educators: teaching our young learners about sustainable development.

In this section, we will try to take a sample of a middle school English classroom to closely examine and critically analyse how the concept of Blended Classrooms can be used to effectively teach learners to engage with the concept of Sustainable Development.

### **Blended Classrooms and Sustainable Development**

The concept of Blended Classrooms has gradually but consistently found its way inside our classrooms. Not just any one particular subject, but all subjects are using the advantages and merits of ICT in classes of various subjects. English classrooms have greatly benefitted from Blended classrooms. The world of English language learning has opened up after the use of ICT in classrooms. Areas of Prose, Poetry, Drama and Grammar teaching have become mesmerizing with the use of ICT. Multiplicity of interpretations, considered an important attitude has become easier to impart and engage with through the use of ICT resources such as PowerPoint presentations, Audio-Visual aids and Simulations.

Bloom’s Taxonomy considered to be a tool for creating successful educational objectives is the driving force behind most of the lesson planning that pre-service and in-service teachers engage in. It is divided into three hierarchical levels of educational objectives which function as domains, namely, cognitive, affective and psychomotor.

Blended classrooms are misconstrued as being extremely different from regular classrooms, which is inaccurate. Blended classrooms are an extension of conventional classrooms using digital content to increase some of its advantages. Its advantages include, but are not limited to the following:

- Individualised or personalised instruction
- Less reliance on rote learning
- More entertaining, fun learning
- Activity-based learning
- Child centred learning
- Accelerated learning
- Scope to adapt lessons in accordance and consonance with desirable learning outcomes

Regular classrooms can have some, most or all of these features. The only difference between regular classrooms and blended classrooms is that blended classrooms make use of digital content.

There are various models and approaches to successfully create a Blended Classroom and effectively integrate and use digital innovation in the classrooms:

One way is to use the 'Lab Rotation Method' which means that a limited number of computers or electronic devices are accessible to the students on a rotation basis when they visit the lab for full or partial access to digital content.

The second method is 'Classroom Rotation'. In this method, the number of electronic devices is not limited and is available for access in classrooms. However this access to digital content is centred on the activity and the teacher's reliance and willingness to use digital content in the classroom.

The third and last method is the 'Flex Method' which is basically a large room where each learner works on an individual computer through online courses with the help of a teacher. This large also consists of some smaller rooms where learners (individually or in a small group) work their way to advanced learning stages.

These three methods can be used individually or in a group

Let us take an example to understand this better. An English teacher teaches a poem by Alexander Pope to young English learners. Elements and characteristics of Neoclassicism reflected in the poem are discussed by the teacher along with the central theme of the poem. Now the teacher has the option of closing this discussion right here and now or also has the scope of using videos to discuss how different readers across the world have interpreted this poem in different ways. A popular activity done with the use of ICT is "The Author/Poet's Hat". In this activity, the learners are asked to metaphorically don the hat of the author/poet. Then they are asked various questions and they answer these questions based on their own understanding of the poem. The underlying idea of this activity is that every reader is a poet/writer herself as every piece of literary writing is open to interpretation.

While English learning is mostly equated with development of communicative competence, it can be used for a variety of other purposes as well. English language teaching is divided into teaching of Prose and Poetry, traditionally while modern advocates of ELT also add the teaching of Drama and Grammar to this. A primary aspect of English teaching and learning is the learning, relearning and unlearning of stories. These could be in any form- prose, poetry or drama but essentially we teach students the narratives of these stories. It is important that we also understand the way these stories are to be told: there are two central themes of any story. These themes are the implicit theme and the explicit theme. The explicit theme is what is generally taught in a classroom which refers to the core storyline of the piece. It includes the basic plot structure and the central characters. The teacher tries to explain the bell-shaped curve in the story focussing on the introduction, the main conflict and the resolution of the conflict. We also come to understand that there is one more theme in any literary piece, the implicit theme. This theme is of a greater concern to teachers as it talks about the moral systems, values and cultural norms which learners are socialised into. And this is where the teachers must help students imbibe the concept of sustainable development. We live in a world where it is becoming increasingly important to develop a lifestyle which uses our natural resources in a sustainable way. While the use of ICT and Blended Learning in itself is a step towards furthering the cause of sustainable development, English pedagogy can also be used to narrate stories about sustainable development to students. It has been proven time and again that literary pieces, be it stories, poetry or drama can be used as didactic tools to help students understand about various issues around them, especially as a tool to inculcate moral values and aspects of humanism

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It can be asserted that these can also be used to teach students about our current practices of over exploitation of our natural resources and overdependence on artificial or man-made resources. We can also use the English content matter to teach students about the importance of Sustainable Development and what can be done on the grassroots level to further establish an attitude of the progression of Sustainable Development.

**CONCLUSION**

English classrooms are considered to be extremely didactic in nature. We must acknowledge the fact that we can use English content to help students learn, unlearn and relearn theories, ideas and contexts. Literary pieces can be used to help students understand and engage with the idea of Sustainable Development. Stories and poems can be used to educate children about possible ways to establish Sustainable Development and use digital innovation to use our natural resources wisely. In itself, digital innovation is something which helps the cause of Sustainable Development. Infusion of digital resources helps institutions to save paper, time and other resources and has also been found to lead to more effective teaching- learning process. These digital resources can be used to help students generate discourses about Sustainable Development.

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**DIGITAL INNOVATIONS: A TOOL FOR SUSTAINABLE DEVELOPMENT IN EDUCATION**

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**ABSTRACT**

*The point of this paper entitled Digital Innovations: A Tool for Sustainable Development in Education is to contribute in the discourse on advanced advances as the way to cultivate practical instructive advancements for improving the instructing, taking in and appraisal from K-12 to Higher Education. It gathers the information and substance from different researchers and sources which have as its objective to address these difficulties and advance the viable utilization of new devices and advances to help educating, learning and appraisal. The paper comprises of 6 Digital Transformation Trends In Education and exhibit how they can be utilized to address center instructive difficulties; crossing from reexamining and changing learning conditions crosswise over instructive settings to viably developing understudies capabilities for the computerized brilliant society of things to come.*

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**INTRODUCTION**

Instructors from all evaluation levels are coming to understand the advantages of innovation in the homeroom. Normally, instruction is one of the last businesses to roll out broad improvement, clutching techniques and practices that were not coordinating pace with the consistently changing specialized world. In any case, through the advanced change and the ascent of instructive innovation, educators have started rolling out radical improvements to their guidance, evaluations, even the physical make-up of their homerooms, and at an a lot quicker rate than anticipated. These present patterns are standing out as truly newsworthy in training on account of the manners by which they are affecting understudy realizing, which will be talked about further:

**Virtual Reality**

Many allude this as increased reality but another term could be Mixed Reality. Gone are where understudies are relied upon to sit discreetly at their work areas. Instructive innovation is prevailing with regards to making learning community and intuitive. Computer generated reality is a case of transformative innovation that improve instructor guidance while all the while making vivid exercises that are fun and drawing in for the understudy. Augmented reality has the capacity of carrying the outside world into the homeroom and the other way around. Combining AR/VR/MR is exceptionally foreseen. Take, for instance, Experiential learning procedures, the utilization of computerized reasoning in training, and customized learning strategies are a portion of the real patterns which keep on reforming the Indian instruction framework in 2019. Experiential learning is being actualized in India as virtual labs, internet based life stages, virtual and enlarged reality instruments, and Virtual labs are intuitive conditions for making and leading reenacted tests dependent on certifiable wonders so understudies can collaborate with an exploratory contraption or other action by means of a PC interface. VR permits understudies utilizing e-learning stages on cell phones to straightforwardly connect with concentrate material. This keeps their commitment levels high and spurs them to find out more and better. Then again, AR encourages instructors and coaches in performing undertakings, they beforehand haven't or can't, in a protected situation.

**Classroom Set of Devices**

Schools are moving far from conventional ways and understudies never again need to go to the innovation lab for access to a PC or PC. Late years have demonstrated an expansion in study hall sets of PCs. Gadgets, for example, SMART Board permit both the educator and understudy to investigate the subject more than what's composed on the course books. It opens up the part of this present reality to the student and at the am etime makes the communication all the more vivacious and pleasant. As that number keeps on developing, so does the requirement for expanded spotlight on projects that show advanced citizenship abilities. We have to set up sessions for educators were they can gain proficiency with a wide range of new things that can be attempted with this colossal progression in innovation.

**Redesigned Learning Spaces**

Teachers have understood their homerooms must copy such a situation, which isn't just community oriented yet in addition well disposed spaces to encourage understudy learning. The onboarding of innovation has upheld their undertaking. Understudies are going on virtual field trips through these upgraded learning spaces rather than simply perusing from a content; they are making media rather than simply taking a gander at it. These spaces are loaded down with incorporated innovation, which implies understudies aren't simply utilizing these things, yet they are understanding howto use them so as to accomplish a particular objective. In addition, a

portion of these learning spaces aren't even in the study hall. Schools and colleges are making increasingly casual grounds learning spaces since they comprehend the significance of making and teaming up day in and day out, not exactly when class is in session.

### **Artificial Intelligence**

The utilization of AI in advanced education has effectively demonstrated helpful. Australia's Deaken University utilized IBM Watson to make a virtual understudy warning administration that was accessible 24-hours every day, seven days seven days. Watson's virtual counselors handled in excess of 30,000 inquiries in the main trimester. Another utilization for AI incorporates chatbots. Since chatbots are furnished with Natural Language Progression, as found in Siri, they have the human ability of answer inquiries concerning homework, helping understudies through an administrative work process like money related guide or paying bills, and facilitating the outstanding task at hand of the general population who might typically serve these jobs. Different utilizations of AI in instruction incorporate customizing realizing (which is talked about in more detail beneath), assessing the nature of educational programs and content, and encouraging one-on-one coaching with the utilization of Intelligent Tutoring Systems. We should keep one thing very clear in our psyches that innovation doesn't plan to supplant instructors, just to supplement them.

### **Personalized Learning**

We can customize adapting more now than any other time in recent memory. From school decision — open, private, sanction, virtual — to the alternatives accessible for how an understudy learns, training can be customized to suit every person. Mixed learning gives greater duty to the understudy, as it includes less immediate guidance from the instructor and more disclosure based techniques for learning. Mixed learning is a case of how understudies can control certain components of their learning by settling on choices about things like where and at what pace they travel through material. Versatile learning is like mixed in that it, as well, enables understudies to settle on choices about things like the time period and way of their learning. Versatile learning innovation gathers data about understudy conduct as they're responding to questions, and after that along these lines utilizes that data to give moment criticism so as to change the learning knowledge as needs be. Instructive devices with versatile SEQUENCE ceaselessly examine understudy information continuously and settle on split second choices dependent on that information. It consequently changes what comes next in a grouping, be it modified substance or an alternate request of aptitudes, in light of how understudy an understudy is performing.

### **Gamification**

Playing and learning impact when homerooms use gaming as an instructional device. Gaming innovation makes learning troublesome topic all the more energizing and intelligent. As the innovation advances, it is rapidly being utilized to upgrade instructive recreations in each order. Recreations are intended to give prompt input, understudies are inherently inspired to continue playing them, sharpening aptitudes all through. New innovation and new learning models are energizing and offer already incomprehensible potential outcomes to understudies, however they require consistent IT support. As instructive establishments keep on getting on board with the temporary fad and embrace these advanced change patterns, we should think about the present worldview for innovation guidance and push toward a group based methodology. As understudy desires increment, responsiveness to those requirements must increment too.

Case Study: How did Byju's transform education on the online platform

Raveendran, a mechanical specialist from Calicut University, established Byju's in October 2012. It tries to adjust the manner in which understudies learn, offers programs for youngsters from Classes IV to XII, other than getting ready alumni for aggressive tests - CAT, IAS, GRE and GMAT. The emphasis is on making learning visual and relevant, instead of simply hypothetical. The startup use innovation and information to offer customized exercises. "This methodology encourages understudies acknowledge what to realize, when to realize, how to learn and the amount to learn," says Raveendran, Founder and CEO. The thought is to modify understudies' learning knowledge to make the way toward learning pleasant. "On the off chance that the understudies learn in the correct manner and, on the off chance that they like learning, they will verify great stamps in any case," says Raveendran. Established with an underlying venture of Rs 2 lakh, put in by Raveendran, Byju's begun with study hall instructing and, throughout the years, it developed as an instructive innovation organization, with an attention on online activities. Byju's learning application, propelled in August 2015 has been a gamechanger, and is presently contributing 90% to its income. The application offers unique substance, watch-and-learn recordings, movements and intelligent recreations that assistance understudies handle things effectively and in a fun manner. "No repetition learning," says Raveendran. The startup pursues a freemium display a portion of the substance is offered for nothing, while understudies need to pay a charge for

cutting edge levels. The application is presently being utilized by 40 lakh understudies and, of these, 1.6 lakh are paid supporters. Somewhere in the range of 25,000 paid clients are jumping aboard consistently. "When youngsters perceive how fun and drawing in learning can be, they begin learning alone. This self-roused learning has helped manufacture the confidence of the two understudies and guardians in the item," says Raveendran. The startup, whose normal yearly membership ticket measure is Rs 10,000, created an income of Rs 4 crore in its first year of activity (2011-12). In pretty much five years, it has seen sensational development with income ascending to Rs 120 crore in 2015-16. Its staff quality has additionally developed from 10 to 900. Raveendran says that improved learning background that Byju's offers is the key explanation behind its tremendous development. Its 500-in number R&D group enables produce and bundle to content that makes learning alluring for students. "Our USP is that we make each understudy experience passionate feelings for learning and not concentrate on simply the propelled ones and the toppers," says Raveendran. The startup has won a few honors including Big Research NDTV Profit Business and Service Excellence Award, CNBC-TV 18 Crisil Emerging India Award in Education, Deloitte Technology Fast 50 India and Fast 500 Asia Award (for four successive years) and, most as of late, VC Circle Award for Education Company of the Year. As anyone might expect, Byju's guarantee has attracted financial specialists. The startup, which saw 15% of its income a year ago from abroad clients, for the most part from West Asia, has gotten a gigantic subsidizing of more than Rs 700 crore in three rounds from funding firms Aarin Capital and Sequoia Capital, and Belgian speculation firm Sofina. "We've made understudies who are dependent on learning, and in that lies the key to our prosperity," says Raveendran.

### **Future Scope**

"No Technology Can Replace Teachers". Notwithstanding, it is likewise the duty of the instructors, as it were, to consolidate present day training innovations like online task and video address in the homerooms to help make the examination material connecting with, intelligent and reviving. Aside from getting engaged with considering through such imaginative measures, understudies will comprehend the significance and significance of the whole substance, consequently demonstrating more enthusiasm for studies and learning. The benefit of computerized learning is likewise that it helps both withdrawn and outgoing understudies voice their perspectives in the homeroom. With the assistance of web apparatuses like message sheets, gatherings and online addresses, understudies who are bashful and reluctant can be enabled by the educators in study halls. These days, delicate aptitudes are more significant than hard abilities for one reason: everything changes so quick, that your capacity to adjust to evolving conditions, persistently adapt new patterns, think efficiently and be proactive – these are the abilities that are regularly esteemed the most at this point. 75% of teachers and understudies feel there is a hole in their capacity to meet the abilities needs of the IT workforce. To set up the ability required for the advanced economy, instruction must adjust as quick as the interest for IT aptitudes is developing and advancing. Innovation has significantly extended access to instruction and gave tremendous open doors for adolescents beginning their very own new businesses before even they turn 18. Just by realizing how to code, they can program their site and begin doing their business. In addition, presently all data that you need is accessible on the web and you have online gatherings, where you can really solicit exhortation from the experts, gain admittance to the contextual analyses and begin self-training.

In the customary homeroom, the instructor is the essential wellspring of data, and the students inactively get it. This model of the educator has been in instruction for quite a while, and today is still especially in proof. Be that as it may, on account of the entrance to data and instructive open door that innovation has empowered, in numerous study halls today we see the educator's job moving to the "manage as an afterthought" as understudies assume greater liability for their very own getting the hang of utilizing innovation to assemble pertinent data. Schools and colleges the nation over are starting to update learning spaces to empower this new model of instruction, cultivate more connection and little gathering work, and use innovation as an empowering agent. The fate of innovation in training is helping instructors to grow past direct, content based learning and to draw in understudies who adapt best in different ways. Its job in schools has developed from a contained PC class into a flexible learning apparatus that could change how we exhibit ideas, allocate extends and survey advance.

Likewise, the fate of innovation in training is to improve correspondence. In districts that were hard to achieve, for example, puts in sub-Saharan Africa are currently beginning to be open through eLearning. Mentors can address students over long separations and researchers can accomplish their scholarly papers through eLearning. Additionally, understudies that vibrate like examining from home would now be able to do it. Headway of data innovation in instruction has improved research. There are a lot of online libraries that help instructors and understudies with exhaustive perusing materials. Educators and teachers are additionally ready to post their work online for their understudies to peruse.

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**FUTURE OF TECHNOLOGY IN EDUCATION: EXAMPLES & POSSIBILITIES**

- **Social media in education** – allow learners and educators to post thoughts, ideas, and comments in an interactive learning environment. Also, students can follow influencers and learn from their posts.
- **Ipads& computers** – technology helps students be more responsible. Owning their own device or borrowing the school’s devices gives students the opportunity to improve their decision-making skills as well as taking ownership of a valuable and often times expensive device.
- **Better Simulations and Models** – digital simulations and models can help teachers explain concepts that are too big or too small or processes that happen too quickly or too slowly to demonstrate in a physical classroom. Other simulations the organization is developing include a software that allows students to experiment with virtual greenhouses in order to understand evolution, a software that helps students understand the physics of energy efficiency by designing a model house, and simulations of how electrons interact with matter.
- **Global Learning** – at sites like Glovico.org, students can set up language lessons with a native speaker who lives in another country and attend the lessons via Skype, hangouts, etc. Learning from a native speaker, learning through social interaction, and being exposed to another culture’s perspective are all incredible educational advantages. Also, podcasts are another popular learning method, with hundreds of free educational programs now available online.
- **More efficient assessment** – teachers can collect real-time assessment data from their students. When the teacher gives out an assignment, she or he can watch how far along students are, how much time each one spends on each question, and whether their answers are correct. With this information, a teacher can decide what concepts students are struggling with and can pull up examples of students’ work on a projector for discussion.
- **E-books** – a digital textbook is a PDF on a tablet that students can carry around and now there is no need to carry five textbooks anymore. It’s all digital. What used to take hours in the library to find, now students find instantaneously.
- **Students database and results tracking** – teachers are able to track individual progress, and are encouraged to identify learning objectives and differentiate instruction based on the needs of their students. Also, “My dog ate my homework” just won’t work anymore, everything is saved on cloud. Other than that, students are able to check their grades immediately in the digital diary. Basically, students will each have a digital portfolio where they store all of their projects, assessments, notes.
- **Interactive textbooks & case studies** – the way that we think of textbooks is completely changing. It is no longer limited to merely text and pictures. Today’s textbooks often have web-based sites that include assessments, animations, additional materials, videos, and other materials to support the learning of new content. Normally students have questions after reading a material and they can answer them in an interactive way.
- **Digitalization of everything** – students don’t need pass notes in class anymore. And have their room full of notebooks, books and papers. Now everything is available online.
- **Extended classroom communities** – technology facilitates to extend classroom community by using web-based platforms like Edmodo or others. Teachers and students can use this platform to discuss homework, post assignments, and interact with peers as they work on projects.
- **Flexibility and online learning** – it is now easy for anyone to learn at their own pace, rather than being forced to adhere to strict timelines. I think, that the future of technology in education is about making it possible for people to learn from any place in the world. Online learning means that people can learn at varying pace, depending on their ability and the amount of time that they are willing to devote to their learning effort. Given learning materials are delivered to learners online, learners can schedule their learning timetables as they wish and submit homework and exams online.
- **Making learning fun again** – Teachers can now use videos, animations and other forms of content to enhance the process of learning. Nowadays, with the help of technology, it is now common for learners and teachers to use games as a way of enhancing the process of learning and teaching. As a result of the use of various forms of content, learning and teaching are now fun and more meaningful than the way it was in the past.

- **Cost Reduction** – technology has contributed to significant reductions in the costs of accessing education. Everything is available online now.
- **Improved student-teacher Interaction** – more and more teachers are now using technology to keep in touch with their students, for example e-mails and services like dropbox that allows you to upload and share content with a large number of people.
- **Video Games** – simulating real life problems, video games can bring about behavioral changes in the students by making them more goal-oriented. Gaming models not only provide a wide range of information but also initiate students to be problem-solvers.
- **Lifelong Learning** – the future of technology in education is also about revolutionizing education by normalizing lifelong learning. Online learning is a great way to facilitate today’s knowledge-driven society and the ongoing demands for continuous professional development. The nature of employment has changed, and keeping one job for life is no longer expected. As a result of globalization, educational institutions around the world are now integrating technologies into all elements of their courses. Online education has become part of mainstream teaching and learning, since students now have access to a wide range of increasingly impressive online resources.
- **Virtual reality is a hot topic in education.** With brands such as Oculus, Samsung and Google innovative learning resources are now available, capable of immersing students in their chosen subject.
- **Classes available online + live streaming** – schools can create private channels and upload classes video on youtube, so that students who are sick, can watch it from home and ask questions in real time.
- **Differentiate assignments to fit student’s personal learning style** – they is no need to assign a project like “write a book report using MS Word” or “create a slideshow in PowerPoint”. Now, students receive the “book report” assignment and make their own determination how best to communicate their thoughts, be it audio, visual, written, musical, video, artistically. As long as they fulfill the requirements of the project, the delivery format will be up to them. Like this students can find their passion, develop their strengths and polish their skills that they will need for their future.

## CONCLUSION

The paper briefly covers all the trends which can digitally transform education and the way students learn. Not only students but also teachers/instructors need to adapt to the current changing times so that learning no longer remains a dull activity and ensures entire growth of the learner. We must also ensure that these facilities to all irrespective of caste, colour and creed.

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**RELATION OF ACADEMIC ACHIEVEMENT WITH CRITICAL THINKING AND LEARNING SATISFACTION OF VIII STANDARD STUDENTS OF SCIENCE**

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**ABSTRACT**

*This research paper focuses on the relation of Academic achievement with Critical Thinking and Learning Satisfaction of VIII standard students of Science. Science is fundamentally concerned with exploring the physical world through the three fundamental areas of Physics, Chemistry and biology. Science is a very essential subject for a student. It familiarizes him with the empirical mode of investigation. It gives an answer to all the questions that keep disturbing him from time to time like how different processes takes place, how things are carried out etc. Understanding its conceptual structures and methodologies are an important part of an educated person.*

*Thus, Academic Achievement is one's intellectual ability to gain knowledge in a learning environment which is provided in school, college and universities. The student performance is measured through examinations or continuous assessments carried out during the course of study. The main concern is the how much the students have acquired and achieved. Therefore, it represents performance outcomes that indicate the extent to which an individual has accomplished specific goals.*

*Critical Thinking is the ability to think clearly and rationally about what to do and what to believe. It includes the ability to engage in reflective and independent thinking, making clear decisions. Learning Satisfaction plays a major role in shaping a student to become successful in pursuing their education. Students are viewed as customers of education market and as such their satisfaction is invaluable. Understanding the students learning satisfaction is to be able to provide improvements that may contribute to quality.*

*Keywords: Reflective, Conceptual Structures, Methodologies, Outcomes*

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**INTRODUCTION**

In the present Indian Education system, we still follow the traditional method of teaching without considering the need of the child and the society. Besides the fact that our educators are aware of the different approaches and strategies to be adapted inside a classroom but it is really unfortunate that our teachers follow the traditional lecture method and all other methods do not have their applicability. Having just the theoretical knowledge of the concepts and then memorizing it is not the aim of education. Science is a subject of experiments. No concept is accepted without a proof and a proper explanation supported by experimentation, whether it is physics, chemistry or biology. They are all very close to the world we live in. There is nothing which the student has to study virtually; all things have evident proof behind its acceptance. Science is fundamentally concerned with exploring and interpreting the physical world through the three fundamental areas of Physics, Chemistry and Biology. We live in a scientific and technological age and none of us can function properly without the basic scientific literacy and scientific skills. We also depend on scientific techniques for our economic and materialist requirements.

Science helps us to comprehend and establish connection with the physical and biological world around us. It has provided a pathway for advanced life from bicycle to jet aircraft, medicine to high-tech surgeries, televisions to gazettes like mobiles, tablet etc and many more. It has really affected the life style of people living from villages to towns and cities. Science cannot be used in a society without of men and women who have specially trained for science based vocations in industry, research and teaching. Science is all around us. Talk about household or everyday living, we are all the time surrounded by science .Right from how we breathe, what we eat, the machineries we use at home and outside how we travel to work place, what activities we do and so on. There is an endless list to the importance of science. We are all the time applying scientific steps to explore, study and to find out the reason and the cause of what all is happening around us.

Science is a very essential subject for a student. It familiarizes him with the empirical mode of investigation. It gives an answer to all the questions that keep disturbing him from time to time like how different processes takes place, how things are carried out etc. Understanding its conceptual structures and methodologies are an important part of an educated person. It helps in the development of intellectual skills and motor abilities. It develops a power of thinking, reasoning, curiosity, open-mindedness which leads to the development of scientific attitude and scientific temper. Thus science is such a subject which will always help in the progress of

the people and the nation by bringing out social changes for the betterment of the society. A student of science has knowledge based on facts, concepts, processes which enable him to continue to learn throughout his life.

Academic achievement is very important in the life of the student. It helps the students to know their level of performance and the weak areas in different subjects. It also helps the teachers to analyze their teaching and thus can bring in improvement accordingly. In today's competitive world academic achievement of a student holds lot of importance. The present society is achievement oriented. For taking admissions in higher classes or professional courses, academic achievement plays a role. Students who do not score well do not get admissions in reputed colleges. It is concerned with both the quantity and quality of learning. It is assessed continuously throughout the year in the form of formative and summative assessments. Thus, academic achievement is the marks obtained by the students through examination or achievement test which may be standardized or non-standardized. Academic Achievement is one's intellectual ability to gain knowledge in a learning environment which is provided in school, college and universities. The student performance is measured through examinations or continuous assessments carried out during the course of study. The main concern is the how much the students have acquired and achieved. Therefore, it represents performance outcomes that indicate the extent to which an individual has accomplished specific goals. In other words, it is the end product of all educational programmers.

Critical Thinking is the ability to think clearly and rationally about what to do and what to believe. It includes the ability to engage in reflective and independent thinking, making clear, reasoned decisions. During the process of critical thinking ideas should be reasoned, well thought out and judged (Beyer, 1995). Critical thinking is a skill where the student not only solves the problem but also in a position to take his own decisions, develops rational thinking and is able to reason out effectively. It is a skill in which he acquires the ability to interpret, analyze and evaluate the problem. In its exemplary form, it is based on universal intellectual value that studies subject matter divisions: clarity, accuracy, precision, consistency, relevance, sound evidence, good reasons and fairness. The term is used to describe forms of learning, thought and analysis that go beyond memorization and recall of information and facts. A person with good memory and who knows a lot of facts is not necessarily good at critical thinking. A critical thinker is able to analyze things and come to a conclusion and he knows how to make use of information to solve problems and to seek relevant sources of information. Critical thinking helps us acquire knowledge, promotes creativity, enhances language and presentation skills and is also a foundation for progress in science and technology.

Education is all about learning in a conducive environment where the students are satisfied and contented with what they learn and acquire in their classes. Learning Satisfaction is the major criteria used to evaluate the personal satisfaction towards his academic environment (Lee, 2008). Learning Satisfaction plays a major role in shaping a student to become successful in pursuing their education. Students are viewed as customers of education market and as such their satisfaction is invaluable. Understanding the students learning satisfaction is to be able to provide improvements that may contribute to quality (Ansari, 2011). Learning satisfaction is the pleasure or contentment that a student feels when he has achieved something. Teachers who show care or appreciation for their students influenced the student's satisfaction of learning (Teven & Croskey, 1997). The factors that affect students learning satisfaction are the instructor, technology, course management, Instruction and interactivity. Satisfaction can be manifested in student feelings and attitude towards learning activities; a cheerful mood or positive outlook shows satisfaction, while an unhappy mood or negative outlook shows dissatisfaction.

#### **LITERATURE REVIEW**

Wu and Hsieh (2006) conducted a study on sixth graders science students. A series of Critical Thinking Skill activity were selected. 58 sixth graders science students were exposed to these learning activities and they showed improvement. The statistical results showed that there was significant difference in their academic achievement. Joan (2007) conducted a study on the longitudinal impact of an eight-grade inquiry curriculum on student's beliefs and achievement in science. A longitudinal study followed 42 students through high school, contrasting attitudes and achievement towards science. Results showed significant gains in student's belief and achievement during the eighth grade curriculum followed by the general pattern in continuing education. Taylor and Bilbrey (2012) conducted a research on the effectiveness of Critical thinking techniques on 5<sup>th</sup> grade science and mathematics school students in Alabama, USA. The school changed the science and mathematics curriculum for a period of 3years. A statistical analysis showed significant improvement in the academic achievement of students. Kalaian and Kasim (2014) A meta analytical study was conducted to compare the academic achievement of students who have been instructed using one of the learning methods to those who have been instructed using lecture based instruction. The results showed that Inquiry based Instruction,

cooperative and collaborative learning methods supported the effectiveness of the small-group learning methods in improving students' academic achievement with an overall average effect size of 0.60.

Nuangchalerm and Thammasena (2009) studied the effect of cognitive development, analytical thinking and learning satisfaction on second grade students through Inquiry based Instruction. The participants of this study were 10 second grade students, sampled by purposive sampling technique. The scores revealed that the cognitive development, analytical thinking and learning satisfaction on students were high. Hwang and Chiu and Chen (2015) conducted an experiment on social studies students of elementary school to study the effect of Inquiry based Instruction on students' performance and their learning satisfaction. The results showed significant difference in the scores showing increase in students' performance and learning satisfaction. Gomez and Martinez (2015) studied the impact of Inquiry based Instruction on students' academic performance and to assess their satisfaction. Linear and logistic regression analysis proved that there is significant difference in the scores showing increase in students' performance and learning satisfaction.

### **OBJECTIVES OF THE STUDY**

The present study undertakes the following objectives:

- To find the relation between Critical Thinking and Academic Achievement of VIII Standard Science students.
- To find the relation between Learning Satisfaction and Academic Achievement of VIII Standard Science students.
- To find out the difference between Critical Thinking of boys and girls student of VIII Standard Science students.
- To find out the difference between Learning Satisfaction of boys and girls student of VIII Standard Science students.

### **HYPOTHESES OF THE STUDY**

The hypotheses of the study were as follows:

- There is no significant relation between Critical Thinking and Academic Achievement of VIII Standard Science students.
- There is no significant relation between Learning Satisfaction and Academic Achievement of VIII Standard Science students.
- There is no significant difference between Critical Thinking of boys and girls of VIII Standard Science students.
- There is no significant relation between Learning Satisfaction of boys and girls of VIII Standard Science students.

### **SAMPLE**

In every research project, it is not only difficult but impossible to include the whole population. Thus the researcher tries her best to select such a sample which is representative of the whole population to be studied. For the present study, six high schools of Dwarka, New Delhi were randomly selected. Totally 300 students were selected by randomly selecting 50 students from each school including boys and girls.

### **TOOLS USED**

For the present study, following tools were used:

- Critical Thinking Scale (Mincemoyer and Perkins)
- Learning Satisfaction Questionnaire prepared by the Investigator
- School Records for academic achievement.

Learning Satisfaction Questionnaire was given to experts to study and to check the suitability, language and the relevance of the test items. The suggestions were incorporated and the test items were modified accordingly. This test was then subjected to pilot administration.

### **COLLECTION OF THE DATA**

The researcher collected the data by visiting the six schools personally. The Critical thinking Scale and learning Satisfaction Questionnaire was given to the students. They took around an hour to complete both the scale and

the questionnaire. The scoring procedure was then done and the collected data was classified according to the hypotheses.

**STATISTICAL TECHNIQUES USED**

- ‘t’-test will be used to see the significant difference between the Means.
- Correlation (Pearson Product Moment) is used to find the relation between Critical Thinking, Learning Satisfaction and Academic Achievement.

**ANALYSIS AND DISCUSSION**

**Table-1: Analysis of Critical Thinking of VIII Standard Science Students.**

<i>Critical Thinking</i>	<i>No. of Students</i>	<i>Percentage</i>
Very High	169	56.4
High	38	12.7
Medium	64	21.3
Low	29	9.6
Very low	00	00

From table1 it is clear that most students have high Critical thinking and there are no students fall in the category of very low Critical thinking.

**Table-2: Analysis of Learning Satisfaction of VIII Standard Science Students**

<i>Learning Satisfaction</i>	<i>No. of Students</i>	<i>Percentage</i>
Above Average	66	22.0
Average	176	58.7
Below Average	58	19.3

From Table 2 it is clear that more students fall in the average category showing average learning Satisfaction.

**Table 3: Significance of Relation between Critical Thinking and Academic Achievement**

<b>Variable 1</b>	<b>Variable 2</b>	<b>Co-relation co-efficient</b>	<b>Significance</b>
Critical Thinking	Academic Achievement	0.385	0.000

From Table 3 it is seen that the co-relation co-efficient 0.232 is significant, there is considerable evidence to reject the null hypotheses. Positive co-relation indicates that as Critical thinking increases Academic Achievement also increases.

**Table-4: Significance of Relation between Learning Satisfaction and Academic Achievement**

<b>Variable 1</b>	<b>Variable 2</b>	<b>Co-relation co-efficient</b>	<b>Significance</b>
Learning Satisfaction	Academic Achievement	0.311	0.000

From Table 4 it is clear that the Co-relation co-efficient 0.311 is significant, there is considerable evidence to reject the null hypothesis. Positive co-relation indicates that as Learning Satisfaction increases Academic Achievement also increases.

**Table-5: Significance of Difference between Critical Thinking of Boys and Girls.**

<b>Variable</b>	<b>Sex</b>	<b>N</b>	<b>Mean</b>	<b>S.D.</b>	<b>t</b>
Critical Thinking	Boys	150	57.26	14.67	-4.927
	Girls	150	65.43	15.52	

From Table 5 it is clear that the t- value is 4.927 which is greater than the value meant for 0.05 level of significance, the null hypotheses is rejected. Thus Girls have greater critical thinking skills as compared to boys as is evident from the data.

**Table-6: Significance of Difference between Learning Satisfaction of Boys and Girls.**

<b>Variable</b>	<b>Sex</b>	<b>N</b>	<b>Mean</b>	<b>S.D.</b>	<b>t</b>
Learning Satisfaction	Boys	150	36.61	8.54	-0.521
	Girls	150	38.45	9.32	

From Table it is clear that the t- value is -0.521 which is less than the value meant for 0.05 level of significance, the null hypotheses is accepted. Thus Girls and boys have equal learning Satisfaction in Science.

**FINDINGS**

According to the above study the findings are as follows:

- There is a significant co-relation between Critical Thinking and Academic Achievement. As the critical thinking increases academic achievement also increases.
- There is a significant co-relation between Learning Satisfaction and Academic Achievement. As the learning Satisfaction increases academic achievement also increases.
- There is a significant difference between Critical thinking of Boys and Girls. The data reveals that girls have more critical thinking than boys.
- There is no significant difference between Learning Satisfaction of Boys and Girls.

**EDUCATIONAL IMPLICATIONS**

In accordance with the findings of the study, a few suggestions are given which can help students to achieve better in academics

- ✓ Critical Thinking helps student to achieve better. So teachers should make a point to enhance the critical thinking skills of students from time to time. Special lessons and workshops should be organized to help the students with this skill.
- ✓ Learning Satisfaction is must for each child's growth. As educators we should take care that the child is able to understand and grasp each topic. This will be possible only and only if we make our lesson simpler and easy by using certain techniques and teaching aids. Then only students will have learning Satisfaction and will achieve academically.

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**THE IMPORTANCE OF LANGUAGE IN THE SCHOOL CURRICULUM**

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**ABSTRACT**

*This article shed light on the importance of language in one's life and how it is an integral part of the school curriculum. This will be discussed how teachers play a major role in classroom scenario and how they deal with communication. Language is a dynamic concept as there is a first language and also acquired language through education. Teacher can use negotiation, semantic mapping to enhance language. We need language to learn, to retain and to recall our knowledge. Linguistic preservation and protection is necessary so that the languages don't die out.*

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**INTRODUCTION**

The role of language in the life of a human being holds supreme importance. For the all round development of the child, shaping the child's world, giving him/ her a means of expressing himself/herself; and fostering emotional growth besides improving academics, language is important.

**THE PRESENT INDIAN SCENARIO**

India has often been touted as a 'sociolinguistic area', 'a linguistic giant' and a 'language laboratory' by researchers who have engaged themselves in the study of language. For a country as multilingual and pluralistic like India, the requirement of more than one language becomes imperative in order to attain 'national cohesion', 'cultural integration' and 'social area mobility'.

Therefore, in the context of a classroom, the objective of teaching languages to students is not only equip them with the necessary language skills but also enable them to be effective communicators. . For this the teachers need guidance on how to use the textbook(s) in the classroom so as to fulfill the purpose for which it was intended; besides it will also help the students become competent users of the language.

**TEACHING AND LEARNING IN LANGUAGE**

A rising debate is between the cognitivists and the behaviorists. Skinner explains language behavior and language acquisition in terms of

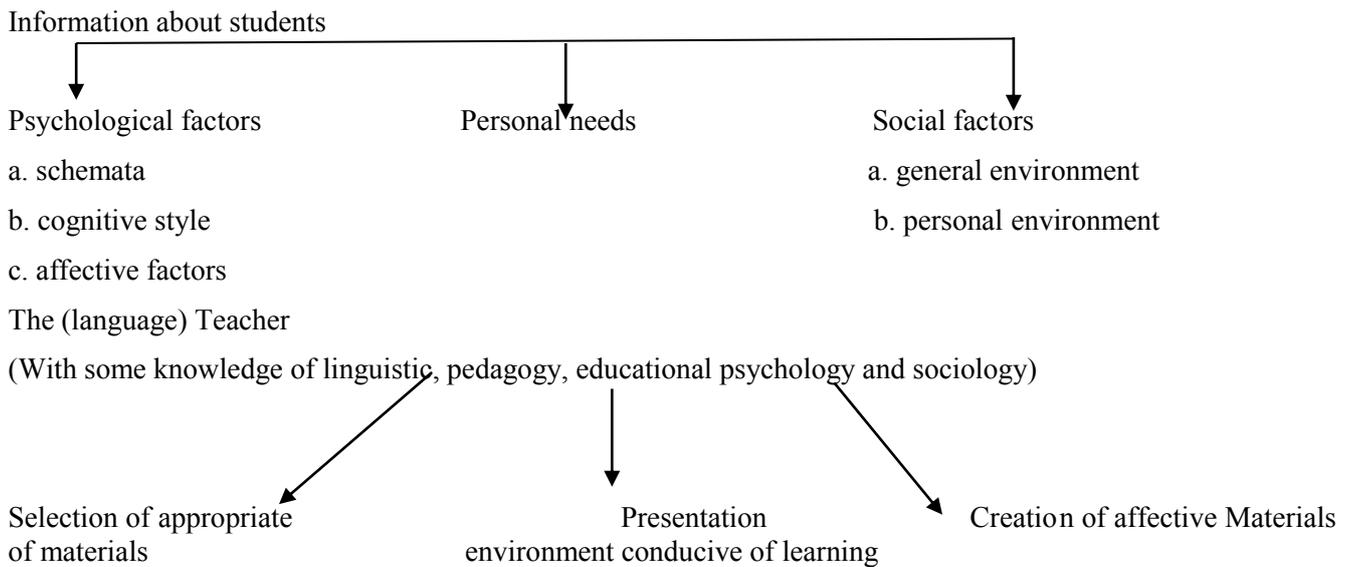
1. Stimulus,
2. response and
3. reinforcement.

Chomsky's cognitive model postulates a Language Acquisition Device (LAD) which is an inner mechanism in the brain that contains innate knowledge of grammatical universals and a hypothesis-forming capacity. Thus the child who is provided exposure to a language is able to deduce the system of rules of that language. While cognitivism today is given more importance than behaviorism, many teachers still believe that a response positively reinforced is more likely to be learned.

Language is much more than lists of vocabulary and sets of grammar rules. Language learning is not simply a matter of acquiring a system of linguistic formulas but is the mastery of language skills and all teachers at the school and college level direct their energies to achieve this. Language is a way of thinking and processing information apart from being a symbol of culture and personal identity.

Research involving the teaching of language is progressing at an ever- accelerating rate. The most significant discoveries in this area of research has not been about the methods to be used but recognizing the importance of psychology and sociology in the classroom, as well as more extensive training in pedagogy.

It is a fact undeniable that every learner is unique and constructs his/her own knowledge. Considering this, only one teaching methodology may not suffice. The trend now is shifting towards 'eclecticism', which is, selecting materials and techniques from various sources. This shoulders the teacher with additional responsibilities of drawing up activities which each student can select from. A wider training in pedagogy is thus called for. The following diagram will clarify the concept.



However, “Psychology and linguistics”, as Chomsky says “have caused a good deal of harm by pretending to have answers to those questions and telling teachers and people who deal with children how they should behave. Often, the ideas presented by the scientists are totally ambiguous and may cause trouble.

**THE CONTEMPORARY SCENARIO**

The focus today is on the functional approach to language teaching. Pit Corder and Alexander have grouped together related speech acts which could be termed functions, under different sets of categories. Their categories are:

1. Imparting and seeking factual information (identifying, reporting, correcting).
2. Expressing and finding out intellectual attitudes (agreeing, disagreeing, denying).
3. Expressing and finding out emotional reactions (expressing pleasure or displeasure, likes or dislikes).
4. Expressing and finding out moral attitudes (apologizing, forgiving, and disapproving).
5. Persuasion (getting things done (suggesting, requesting, inviting)).
6. Socializing (introducing, leave-taking).

Functions must be taught from the very outset, without waiting till a certain measure of fluency has been achieved. They are grouped as macro-functions subsuming micro-functions, skills as macro- skill and micro-skills. For instance,

1. Articulating sounds in connected speech
2. Strong and weak forms
3. Neutralization of weak forms
4. Reduction of unstressed vowels
5. Modification of sounds especially at word boundaries through
  - a. Assimilation
  - b. Elision and
  - c. Liaison
6. Phonemic change of word boundaries
7. Allophonic variation of word boundaries
8. Expressing conceptual meaning, specially
  - a. Quantity and amount

- b. Definiteness and indefiniteness
- c. Comparison, degree
- d. Time, especially tense and aspect
- e. Location, direction
- f. Means, instrument
- g. Cause, result, purpose, reason, condition, contrast

### **TEACHER'S RESPONSIBILITY**

A teacher has to be well -versed and alert to the realities of:

1. The importance of language in scholastic and co- scholastic activities
2. Importance and implementation of the three language policy
3. Roles of different languages in our country.

Language learning and teaching today has become task-based, activity oriented and follows the participatory mode of learning. In this context the role of the teacher in the classroom is to motivate the students to learn the subject through their joyful involvement and a sense of achievement through and with the language.

In the wider context language has to be viewed:

- a. As a mean of communicating ideas
- b. As a means of social coordination
- c. As a means of expressing events, beliefs, desires

The teacher is thus expected to be able to manipulate information in several distinct areas of knowledge, besides the subject he/she is teaching. This will require a change both in the attitudes of the teacher and the students.

### **FIRST LANGUAGE ACQUISITION AND SECOND LANGUAGE LEARNING**

Here it may be clarified that children acquiring their native language are not merely learning a specific language; but they are learning control over their speech organs and learning to organize their experiences, with the use of that language .On the other hand, second language learners already have language as well as concepts and ways of naming and describing them through their first language.

Another difference between the first and second language learner is the immensely greater exposure to the language in the case of the former. Children hear their native language spoken around them over a period of years. The second language learner hears the language classroom for about an hour a day. Compare for yourself the exposure here! The native language is a means of relating to the world of children, of people, of expressing their needs, emotions and beliefs. The second language learner is denied this favorable position. The classroom remains an artificial setting, no matter how much we may seek to simulate a natural one, through varied contexts.

In our school under the three language policy, English is generally taught as a second language, where many children are the first generation learners who receive no help at home, and many teachers when speaking spontaneously commit the very same errors which they are supposed to correct, and hence teacher training and material production become extremely important.

It may be more efficient for teachers to focus on form for meaningful interaction, i.e. to act as a conscious "monitor". It may also focus on language, language support, and reduce ambiguity by providing relevant and helpful information about language. Rather than correcting forms through recasts and explicit correction, feedback techniques are preferred that provide active engagement for assisting them to draw on what they already know.

### **LANGUAGE AND CULTURE**

According to Fishman, language is an integral part of culture. Ceremonies, rituals, songs, stories etc. constitutes our textbooks. Language is therefore a crucial part of the culture. It reveals the basis for thinking and organizing experiences that have commonality with associated cultures. A particular language becomes symbolic of a particular ethnic culture in which they are embedded, for instance; food, clothing, means of earning livelihood etc.

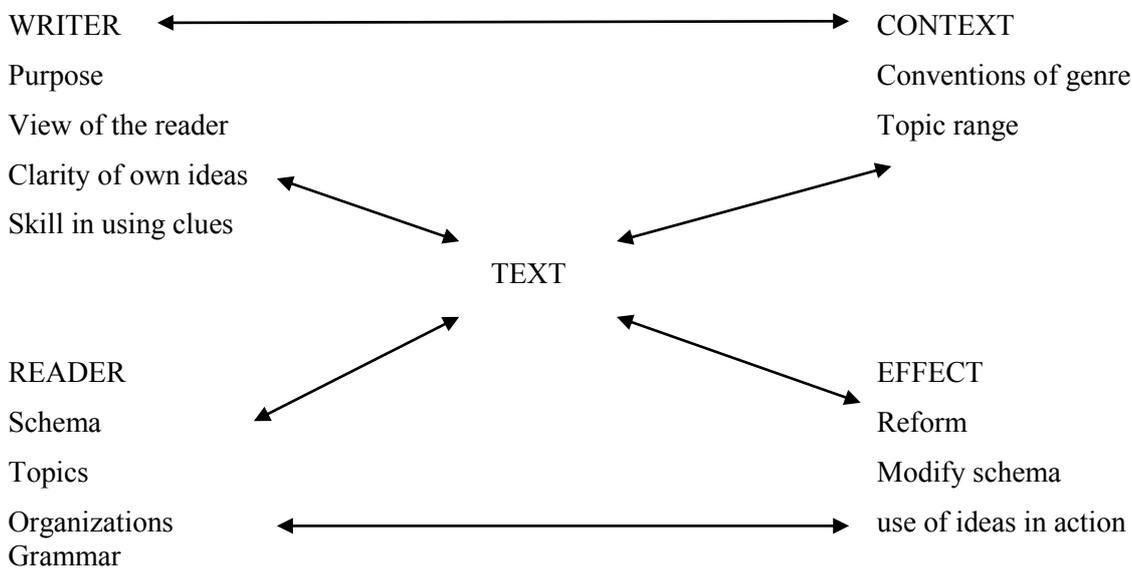
**EFFECTIVE COMMUNICATION**

In schools, we generally have recitation and speech contests to prepare students for declamation. In reality, a great majority of us are shy when speaking. In addition, when we have spoken before a crowd, or express our views at a seminar we become tongue-tied and inarticulate in thought. This is all because we have not mastered our skill of public speaking primarily because we took the recitation contests and language classes less seriously than the other school subjects. We therefore feel hesitant in our language today. To be effective in communication, one has to be near – perfect which comes through practice. Cicero, one of our greatest orators, had at one time a speech defect. He overcame this problem by keeping a small pebble in his mouth and practiced talking aloud to the vales and mountains.

**ESSENTIAL LANGUAGE SKILLS**

Language teaching and learning requires the four skills of listening, Speaking, Reading and Writing in that order. There is an interrelation between them. Some of them are regarded as receptive while others are taken to be productive skills. Such a distinction may not be wholly true.

Perhaps the reading skill seems to be the most important for our teachers and students. Reading is an important aspect in our life. There are a number of definitions for reading. Researches have shown that there is much similarity in acquisition of the reading skill in the first language and in the second.



**NEGOTIATING SKILLS**

Teachers can also engage their students by eliciting synonyms, precise terms, spelling, and pronunciation in form negotiation. By providing feedback in this way during meaningful interaction in subject lessons or in thematically contextualized language lessons, teachers do not undermine the expression of meaning, yet provide opportunities for students to notice unambiguously.

A high degree of reciprocity and shared involvement characterize interpersonal communication on a daily basis. It is a cooperative enterprise that involves the participants in a negotiation process as to who will speak, what will be discussed and how the discussion will proceed.

Speakers and listeners are constantly negotiating meaning through conversational adjustments to ensure that messages are communicated effectively if necessary. This is particularly important in a classroom situation for a teacher.

In the classroom, our students may be encouraged to use negotiation to manage their own learning. Students can take advantage of the learning opportunities presented by questioning, checking, asking for clarification or additional explanation. They thus signal where the language input needs to be modified or adapted to better fit their learning level.

Long and Porter suggest that there may be little opportunity to develop negotiating skills in large group situations. However, negotiation can take place when students work in pairs or in small groups, and it usually does. In addition, interaction patterns are closer to those found in real life as students are more relaxed and willing to take on different roles. Since not all are of the same linguistic ability, the teacher will have to guide the students to gain negotiating skills in order to take advantage of such opportunities for interaction in the classroom. Some suggestions are:

1. Examine the degree of negotiation that occurs in the classroom.
2. Maintain a classroom climate in which negotiation is encouraged.
3. Use teaching materials that focus on negotiation.
4. Employ activities that give students practice in negotiations.

### **SEMANTIC MAPPING**

Semantic mapping in language classroom can become an effective technique. When we teach meaning in language, we usually resort to the dictionary. The dictionary is of little help many times because word meanings do not always carry the word's power. Semantic mapping has been successfully tested to clarify concepts in other subjects, especially science. Even students in language learning have shown significant improvement in reading understanding, writing, expression, and development of vocabulary. Brown and Perry found weekly processing to be an effective strategy for vocabulary learning. Studies by Carrel (1989) have examined how schema theory and semantic mapping can improve the reading skills of the students.

Semantic mapping can be used as a pre-assignment strategy to activate the students' prior knowledge or to assist the teacher in evaluating the readiness of the students to do the job. It therefore enables students to record what they are learning during their assignment. As a post-assignment strategy, semantic mapping will help them integrate what they've studied and help students view learning from an organized perspective rather than from a fragmented perspective.

Briefly, semantic mapping involves the following phases:

1. Introducing the topic
2. Brainstorming
3. Categorization
4. Personalizing the map
5. Post- assignment synthesis

The map- either in its final form or in the personalized version made by each student can serve as a springboard for other language activities. Semantic mapping will thus be profitably used in communicative classes because it is:

- a. interactive
- b. allows for negotiation
- c. an information gap activity
- d. a productive activity
- e. student- centered
- f. teacher- friendly, and
- g. an integrative activity

### **HOME ATMOSPHERE LANGUAGE AND SCHOOL / STANDARD LANGUAGE**

It is generally understood that dialect and language differ somewhat. Similarly, the language spoken at home is very different from the language spoken at school, which is usually the standard language, although between the two there is a lot of giving and taking. Standard Hindi was derived from Khari Boli, for example. Awadhi, Brij, Maithili, Bhojpuri were once fully developed languages, now relegated to dialect status.

It is assumed that his / her first language or mother tongue is the one spoken in the school whenever the child enters the school in his / her locality. Which may not be true at all? The child is therefore educated in the standard language form. The child is placed in a dilemma in such a situation as to which language to use, or which one is correct. The student may use Brij at home, for example, but he / she learns Hindi standard at school, which is different. The standard form is also used by other subjects taught through the Hindi medium.

Teachers should be aware of the first language or mother tongue of their student so that they can explain the concepts in a simple and comprehensible language to the students in times of difficulty. Teachers of other subjects like history, economics, physics, botany, etc. should also have dialect knowledge spoken around their

area. Students can be unobtrusively and authoritatively corrected. Even teaching the mother tongue or the first language should create a proper atmosphere in the classroom.

### **EXTINCTION OF LANGUAGE**

It is a matter of concern to linguists that almost every fortnight a language somewhere in the world is dying. Out of the world's nearly 12000 languages only 6500 are being today. Bernard Comrie lists only 5000. If this trend continues the day is not far when we will have only SMS or any other man-made language for our life or work. We know the fate of many artificial languages, Esperanto being the most common example. In a way, the language world might be lost in the not too remote future. When astrology, magic, alternate medicine are being included in university courses, the moot point is why are languages being cold shouldered in various courses, including at the school level. Perhaps because of the economic and political clout wielded by some Western languages, English in particular, many of the languages of the third world are on the brink of extinction. Then it will be difficult to reconstruct the civilization which is evident from the fact that we have still not been able to decipher the script of Harappa and Mohenjodaro in spite of the many artifacts, including the Rosetta stone.

In the present scenario, the mother tongue is being neglected. In many schools, even speaking in Hindi invites a fine or punishment. And because of increasing mobility in our country languages tend to suffer as speakers of dialects have to speak the language of the state they are posted in. To save languages from extinction China can be cited as an example which has set up a number of surveys in different linguistic areas, which thus keep the language from dying out. India should also focus its concern towards doing research in linguistic areas.

### **ZERO CREDIT BUT COMPULSORY PASS**

In this regard, we can suggest that since languages are not part of many professional courses, they are never given any attention. Although language forms a component in some courses, students hardly pay any attention to it as it does not add its marks to the aggregate. The teachers take it lightly, as do the students, though each realizes how important a role the language will play in their later lives. In any professional course, languages should be made compulsory with zero credit.

### **RESTORING SANSKRIT, OL - CHIKI, URDU**

Sanskrit's revival can be called reverse sanskritisation— an attempt to hold back people in cultural ghettos as Indians aspire to globalize themselves. This is hardly economically reasonable. Indian teachers are recruited abroad for jobs. Learning Japanese, German, and Chinese in this context would be as fruitful as earlier learning English.

Recently, there has been a growing demand for tribal language introduction in the state of Orissa. Since the inclusion of Santhali language in the 8th schedule, Ol-chiki is now the language many tribals want to include in the curriculum along with its script, especially in the Mayurbhanj, Keonijhar, Balasore and Sundargarh districts. The establishment of a Santhali Academy on the lines of the Urdu Academy is also demanded.

In the schools, Urdu must be kept alive. However, Urdu medium school and Urdu textbook conditions are abysmally low; textbooks are only available late in the school session. Indian Urdu schools' ever-declining results show the parents of the teacher and the confusion of the student. Low results are indicative of incoherence and lack of coordination between managing bodies and stakeholders in Urdu schools.

### **THE TEACHER FOR THE NEW GENERATION**

Therefore, every teacher would do well to introspect and reflect on his / her teaching in the context of languages and the vast changes taking place in society and education, with particular attention to the language he / she uses.

Who am I as a teacher?

Who are my students? How do they experience my teaching?

Do they easily understand my language?

Do I use too many technical words?

Do I follow known conventions of language?

What are the consequences of my language abilities on the students?

Do I fortify my language with slang?

How is my tone in the language?

Do I maintain the rhythm of the language?

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What sort of change do I see as fit for my own teaching?

The teacher has to reason with himself/herself about his/her teaching which he /she lives to improve upon continuously. The answer lies in the ultimate question.

**CONCLUSION**

Language is not merely the medium of instruction at all levels of education, it is the medium of growth. It provides capacity for preservation and communication of intellectual life. At higher level, language provides the medium of fresh and free thinking and research. In education it is supposed to communicate knowledge, and in general life it is the instrument to pick up information. We need language to learn, to retain and to recall our knowledge. It is the primary need of the child. Thus language teaching should be a concern for both the teachers and teacher educators so that our originality and diversity of languages don't die out.

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**AN OVERVIEW OF AWARENESS ABOUT E-BANKING FACILITIES**

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**ABSTRACT**

*The resultant of technological innovation has been the transformation in operational dimension of banks over some decades. Internet technology has brought a paradigm shift in banking operations to the extent that banks embrace internet technology to enhance effective and extensive delivery of wide variety of value added products and services.*

*Globalization and technological advancements like internet, brought about many products and services like ATMs, Smart Cards, etc. This paper discusses an overview of e-banking facilities with respect to various products and services.*

*Keywords; E-banking, Electronic banking products and services, Mobile Banking.*

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**E-BANKING**

**Electronic Banking**, also known as **Internet Banking and Online Banking**, is an electronic payment system that enables customers of a bank or other financial institution to conduct a range of financial transactions through the financial institution's website. The online banking system will typically connect to or be part of the core banking system operated by a bank and is in contrast to branch banking which was the traditional way customers accessed banking services.

Some banks operate as a "direct bank" (or "virtual bank"), where they rely completely on internet banking.

Internet banking software provides personal and corporate banking services offering features such as viewing account balances, obtaining statements, checking recent transaction and making payments. Access is usually through a secure web site using a username and password, but security is a key consideration in internet banking and many banks also offer two factor authentication using a (security token).

**ELECTRONIC BANKING**

For many people, electronic banking means 24-hour access to cash through an automated teller machine (ATM) or Direct Deposit of paychecks into checking or savings accounts. But electronic banking involves many different types of transactions, rights, responsibilities — and sometimes, fees. Do your research. You may find some electronic banking services more practical for your lifestyle than others.

- Electronic Fund Transfers
- Disclosures
- Errors
- Lost or Stolen ATM or Debit Cards
- Overdrafts for One-Time Debit Card Transactions and ATM Cards
- Limited Stop-Payment Privileges
- Additional Rights
- For More Information and Complaints

**ELECTRONIC FUND TRANSFERS**

Electronic banking, also known as electronic fund transfer (EFT), uses computer and electronic technology in place of checks and other paper transactions. EFT's are initiated through devices like cards or codes that let you, or those you authorize, access your account. Many financial institutions use ATM or debit cards and Personal Identification Numbers (PINs) for this purpose. Some use other types of debit cards that require your signature or a scan. For example, some use radio frequency identification (RFID) or other forms of "contactless" technology that scan your information without direct contact with you. The federal Electronic Fund Transfer Act (EFT Act) covers some electronic consumer transactions.

**Here are some common EFT services:**

*ATMs* are electronic terminals that let you bank almost virtually any time. To withdraw cash, make deposits, or transfer funds between accounts, you generally insert an ATM card and enter your PIN. Some financial

institutions and ATM owners charge a fee, particularly if you don't have accounts with them or if your transactions take place at remote locations. Generally, ATMs must tell you they charge a fee and the amount on or at the terminal screen before you complete the transaction. Check with your institution and at ATMs you use for more information about these fees.

**Direct Deposit** lets you authorize specific deposits — like paychecks, Social Security checks, and other benefits — to your account on a regular basis. You also may pre-authorize direct withdrawals so that recurring bills — like insurance premiums, mortgages, utility bills, and gym memberships — are paid automatically. Be cautious before you pre-authorize recurring withdrawals to pay companies you aren't familiar with; funds from your bank account could be withdrawn improperly. Monitor your bank account to make sure direct recurring payments take place and are for the right amount.

**Pay-by-Phone Systems** let you call your financial institution with instructions to pay certain bills or to transfer funds between accounts. You must have an agreement with your institution to make these transfers.

**Personal Computer Banking** lets you handle many banking transactions using your personal computer. For example, you may use your computer to request transfers between accounts and pay bills electronically.

**Debit Card Purchase or Payment Transactions** let you make purchases or payments with a debit card, which also may be your ATM card. Transactions can take place in-person, online, or by phone. The process is similar to using a credit card, with some important exceptions: a debit card purchase or payment transfers money quickly from your bank account to the company's account, so you have to have sufficient funds in your account to cover your purchase. This means you need to keep accurate records of the dates and amounts of your debit card purchases, payments, and ATM withdrawals. Be sure you know the store or business before you provide your debit card information to avoid the possible loss of funds through fraud. Your liability for unauthorized use, and your rights for dealing with errors, may be different for a debit card than a credit card.

**Electronic Check Conversion** converts a paper check into an electronic payment in a store or when a company gets your check in the mail.

When you give your check to a cashier in a store, the check is run through an electronic system that captures your banking information and the amount of the check. You sign a receipt and you get a copy for your records. When your check is given back to you, it should be voided or marked by the merchant so that it can't be used again. The merchant electronically sends information from the check (but not the check itself) to your bank or other financial institution, and the funds are transferred into the merchant's account.

When you mail a check for payment to a merchant or other company, they may electronically send information from your check (but not the check itself) through the system; the funds are transferred from your account into their account. For a mailed check, you still should get notice from a company that expects to send your check information through the system electronically. For example, the company might include the notice on your monthly statement. The notice also should state if the company will electronically collect a fee from your account — like a "bounced check" fee — if you don't have enough money to cover the transaction.

Be careful with online and telephone transactions that may involve the use of your bank account information, rather than a check. A legitimate merchant that lets you use your bank account information to make a purchase or pay on an account should post information about the process on its website or explain the process on the phone. The merchant also should ask for your permission to electronically debit your bank account for the item you're buying or paying on. However, because online and telephone electronic debits don't occur face-to-face, be cautious about sharing your bank account information. Don't give out this information when you have no experience with the business, when you didn't initiate the call, or when the business seems reluctant to discuss the process with you. Check your bank account regularly to be sure that the right amounts were transferred.

Not all electronic fund transfers are covered by the EFT Act. For example, some financial institutions and merchants issue cards with cash value stored electronically on the card itself. Examples include prepaid phone cards, mass transit passes, general purpose reloadable cards, and some gift cards. These "stored-value" cards, as well as transactions using them, may not be covered by the EFT Act, or they may be subject to different rules under the EFT Act. This means you may not be covered for the loss or misuse of the card. Ask your financial institution or merchant about any protections offered for these cards.

## DISCLOSURES

To understand your rights and responsibilities for your EFTs, read the documents you get from the financial institution that issued your "access device" — the card, code or other way you access your account to transfer

money electronically. Although the method varies by institution, it often involves a card and/or a PIN. No one should know your PIN but you and select employees at your financial institution. You also should read the documents you receive for your bank account, which may contain more information about EFTs.

Before you contract for EFT services or make your first electronic transfer, the institution must give you the following information in a format you can keep.

- a summary of your liability for unauthorized transfers
- the phone number and address for a contact if you think an unauthorized transfer has been or may be made, the institution's "business days" (when the institution is open to the public for normal business), and the number of days you have to report suspected unauthorized transfers
- the type of transfers you can make, fees for transfers, and any limits on the frequency and dollar amount of transfers
- a summary of your right to get documentation of transfers and to stop payment on a pre-authorized transfer, and how you stop payment
- a notice describing how to report an error on a receipt for an EFT or your statement, to request more information about a transfer listed on your statement, and how long you have to make your report
- a summary of the institution's liability to you if it fails to make or stop certain transactions
- circumstances when the institution will share information about your account with third parties
- a notice that you may have to pay a fee charged by operators of ATMs where you don't have an account, for an EFT or a balance inquiry at the ATM, and charged by networks to complete the transfer.

You also will get two more types of information for most transactions: terminal receipts and periodic statements. Separate rules apply to deposit accounts from which pre-authorized transfers are drawn. For example, pre-authorized transfers from your account need your written or similar authorization, and a copy of that authorization must be given to you. Additional information about pre-authorized transfers is in your contract with the financial institution for that account. You're entitled to a terminal receipt each time you initiate an electronic transfer, whether you use an ATM or make a point-of-sale electronic transfer, for transfers over \$15. The receipt must show the amount and date of the transfer, and its type, like "from savings to checking." It also must show a number or code that identifies the account, and list the terminal location and other information. When you make a point-of-sale transfer, you'll probably get your terminal receipt from the salesperson.

You won't get a terminal receipt for regularly occurring electronic payments that you've pre-authorized, like insurance premiums, mortgages, or utility bills. Instead, these transfers will appear on your statement. If the pre-authorized payments vary, however, you should get a notice of the amount that will be debited at least 10 days before the debit takes place.

You're also entitled to a periodic statement for each statement cycle in which an electronic transfer is made. The statement must show the amount of any transfer, the date it was credited or debited to your account, the type of transfer and type of account(s) to or from which funds were transferred, the account number, the amount of any fees charged, the account balances at the beginning and end of the statement cycle, and the address and phone number for inquiries. You're entitled to a quarterly statement whether or not electronic transfers were made.

Keep and compare your EFT receipts with your periodic statements the same way you compare your credit card receipts with your monthly credit card statement. This will help you make the best use of your rights under federal law to dispute errors and avoid liability for unauthorized transfers.

### **ERRORS**

You have 60 days from the date a periodic statement containing a problem or error was sent to you to notify your financial institution. The best way to protect yourself if an error occurs is to notify the financial institution by certified letter. Ask for a return receipt so you can prove that the institution got your letter. Keep a copy of the letter for your records.

**Under federal law, the institution has no obligation to conduct an investigation if you miss the 60-day deadline.**

Once you've notified the financial institution about an error on your statement, it has 10 business days to investigate. The institution must tell you the results of its investigation within three business days after

completing it, and must correct an error within one business day after determining that the error has occurred. An institution usually is permitted to take more time — up to 45 days — to complete the investigation, but only if the money in dispute is returned to your account and you're notified promptly of the credit. At the end of the investigation, if no error has been found, the institution may take the money back if it sends you a written explanation.

An error also may occur in connection with a point-of-sale purchase with a debit card. For example, an oil company might give you a debit card that lets you pay for gas directly from your bank account. Or you may have a debit card that can be used for a various types of retail purchases. These purchases will appear on your bank statement. In case of an error on your account, however, you should contact the card issuer (for example, the oil company or bank) at the address or phone number provided by the company for errors. Once you've notified the company about the error, it has 10 business days to investigate and tell you the results. In this situation, it may take up to 90 days to complete an investigation, if the money in dispute is returned to your account and you're notified promptly of the credit. If no error is found at the end of the investigation, the institution may take back the money if it sends you a written explanation.

### **LOST OR STOLEN ATM OR DEBIT CARDS**

If your credit card is lost or stolen, you can't lose more than \$50. If someone uses your ATM or debit card without your permission, you can lose much more.

If you report an ATM or debit card missing to the institution that issues the card before someone uses the card without your permission, you can't be responsible for any unauthorized withdrawals. But if unauthorized use occurs before you report it, the amount you can be responsible for depends on how quickly you report the loss to the card issuer.

- If you report the loss within two business days after you realize your card is missing, you won't be responsible for more than \$50 of unauthorized use.
- If you report the loss within 60 days after your statement is mailed to you, you could lose as much as \$500 because of an unauthorized transfer.
- If you don't report an unauthorized use of your card within 60 days after the card issuer mails your statement to you, you risk unlimited loss; you could lose all the money in that account, the unused portion of your maximum line of credit established for overdrafts, and maybe more.

If an extenuating circumstance, like lengthy travel or illness, keeps you from notifying the card issuer within the time allowed, the notification period must be extended. In addition, if state law or your contract imposes lower liability limits than the federal EFT Act, the lower limits apply.

Once you report the loss or theft of your ATM or debit card to the card issuer, you're not responsible for additional unauthorized use. Because unauthorized transfers may appear on your statements, though, read each statement you receive after you've reported the loss or theft. If the statement shows transfers that you didn't make or that you need more information about, contact the card issuer immediately, using the special procedures it provided for reporting errors.

### **OVERDRAFTS FOR ONE-TIME DEBIT CARD TRANSACTIONS AND ATM CARDS**

If you make a one-time purchase or payment with your debit card or use your ATM card and don't have sufficient funds, an overdraft can occur. Your bank must get your permission to charge you a fee to pay for your overdraft on a one-time debit card transaction or ATM transaction. They also must send you a notice and get your opt-in agreement before charging you.

For accounts that you already have, unless you opt-in, the transaction will be declined if you don't have the funds to pay it, and you can't be charged an overdraft fee. If you open a new account, the bank can't charge you an overdraft fee for your one-time debit card or ATM transactions, either, unless you opt-in to the fees. The bank will give you a notice about opting-in when you open the account, and you can decide whether to opt-in. If you opt-in, you can cancel any time; if you don't opt-in, you can do it later.

These rules do not apply to recurring payments from your account. For those transactions, your bank can enroll you in their usual overdraft coverage. If you don't want the coverage (and the fees), contact your bank to see if they will let you discontinue it for those payments.

### **LIMITED STOP-PAYMENT PRIVILEGES**

When you use an electronic fund transfer, the EFT Act does not give you the right to stop payment. If your purchase is defective or your order isn't delivered, it's as if you paid cash: It's up to you to resolve the problem with the seller and get your money back.

One exception: If you arranged for recurring payments out of your account to third parties, like insurance companies or utilities, you can stop payment if you notify your institution at least three business days before the scheduled transfer. The notice may be written or oral, but the institution may require a written follow-up within 14 days of your oral notice. If you don't follow-up in writing, the institution's responsibility to stop payment ends.

Although federal law provides limited rights to stop payment, financial institutions may offer more rights or state laws may require them. If this feature is important to you, shop around to be sure you're getting the best "stop-payment" terms available.

### **ADDITIONAL RIGHTS**

The EFT Act protects your right of choice in two specific situations: First, financial institutions can't require you to repay a loan by preauthorized electronic transfers. Second, if you're required to get your salary or government benefit check by EFT, you can choose the institution where those payments will be deposited.

### **FOR MORE INFORMATION AND COMPLAINTS**

If you decide to use EFT, keep these tips in mind:

- Take care of your ATM or debit card. Know where it is at all times; if you lose it, report it as soon as possible.
- Choose a PIN for your ATM or debit card that's different from your address, telephone number, Social Security number, or birthdate. This will make it more difficult for a thief to use your card.
- Keep and compare your receipts for all types of EFT transactions with your statements so you can find errors or unauthorized transfers and report them.
- Make sure you know and trust a merchant or other company before you share any bank account information or pre-authorize debits to your account. Be aware that some merchants or companies may process your check information electronically when you pay by check.
- Read your monthly statements promptly and carefully. Contact your bank or other financial institution immediately if you find unauthorized transactions and errors.

If you think a financial institution or company hasn't met its responsibilities to you under the EFT Act, you can complain to the appropriate federal agency. Visit the Consumer Financial Protection Bureau or HelpWithMyBank.gov, a site maintained by the Office of the Comptroller of the Currency, for answers to frequently-asked questions on topics like bank accounts, deposit insurance, credit cards, consumer loans, insurance, mortgages, identity theft, and safe deposit boxes, and for other information about federal agencies that have responsibility for financial institutions.



### **DIFFERENT TYPES OF ONLINE FINANCIAL TRANSACTIONS ARE:**

#### **National Electronic Fund Transfer (NEFT)**

National Electronic Funds Transfer (NEFT) is a nation-wide payment system facilitating one-to-one funds transfer. Under this Scheme, individuals, firms and corporates can electronically transfer funds from any bank branch to any individual, firm or corporate having an account with any other bank branch in the country

participating in the Scheme. Individuals, firms or corporates maintaining accounts with a bank branch can transfer funds using NEFT. Even such individuals who do not have a bank account (walk-in customers) can also deposit cash at the NEFT-enabled branches with instructions to transfer funds using NEFT. However, such cash remittances will be restricted to a maximum of Rs.50,000/- per transaction. NEFT, thus, facilitates originators or remitters to initiate funds transfer transactions even without having a bank account. Presently, NEFT operates in hourly batches - there are twelve settlements from 8 am to 7 pm on week days (Monday through Friday) and six settlements from 8 am to 1 pm on Saturdays.

**Real Time Gross Settlement (RTGS)**

RTGS is defined as the continuous (real-time) settlement of funds transfers individually on an order by order basis (without netting). 'Real Time' means the processing of instructions at the time they are received rather than at some later time; 'Gross Settlement' means the settlement of funds transfer instructions occurs individually (on an instruction by instruction basis). Considering that the funds settlement takes place in the books of the Reserve Bank of India, the payments are final and irrevocable. The RTGS system is primarily meant for large value transactions. The minimum amount to be remitted through RTGS is 2 lakh. There is no upper ceiling for RTGS transactions. The RTGS service for customer's transactions is available to banks from 9.00 hours to 16.30 hours on week days and from 9.00 hours to 14:00 hours on Saturdays for settlement at the RBI end. However, the timings that the banks follow may vary depending on the customer timings of the bank branches.

**Electronic Clearing System (ECS)**

ECS is an alternative method for effecting payment transactions in respect of the utility-bill-payments such as telephone bills, electricity bills, insurance premium, card payments and loan repayments, etc., which would obviate the need for issuing and handling paper instruments and thereby facilitate improved customer service by banks / companies / corporations / government departments, etc., collecting / receiving the payments.

**Immediate Payment Service (IMPS)**

IMPS offers an instant, 24X7, interbank electronic fund transfer service through mobile phones. IMPS is an emphatic tool to transfer money instantly within banks across India through mobile, internet and ATM which is not only safe but also economical both in financial and non-financial perspectives.

**OBJECTIVES OF IMPS**

- To enable bank customers to use mobile instruments as a channel for accessing their banks accounts and remit funds
- Making payment simpler just with the mobile number of the beneficiary
- To sub-serve the goal of Reserve Bank of India (RBI) in electro notification of retail payments
- To facilitate mobile payment systems already introduced in India with the Reserve Bank of India Mobile Payment Guidelines 2008 to be inter-operable across banks and mobile operators in a safe and secured manner
- To build the foundation for a full range of mobile based Banking services.

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**A STUDY OF PARENTAL ENCOURAGEMENT ON EMOTIONAL INTELLIGENCE OF 11<sup>TH</sup> GRADE STUDENT**

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**ABSTRACT**

*Parental Encouragement plays a significant role in developing emotional well-being of the students. Now a days we can see that in this fast paced world, no one has time to spend with each other and to share their feelings as we are living in 21<sup>st</sup> century where the life has become really busy. Due to complexities of life, the students, especially the adolescents, always want someone to stand on their side as this stage is regarded as very crucial in their lives. They are on that path where they can't take correct decision for their lives. Therefore, this stage requires constant support being provided by the parents as they act as the biggest guiding force in the students' life. This support, emotions if channelize properly, can help the students to achieve their goals in their lives. The present study was undertaken to study the effect of parental encouragement on emotional intelligence of 11<sup>th</sup> grade students. The sample of the study composed of 160 senior secondary school students in which 80 were Males and 80 were females of 11<sup>th</sup> grade. The sample was collected through simple random sampling technique based on gender from 8 senior secondary schools. Descriptive Survey Method was employed for the present study. Parental encouragement scale (APES) developed by Dr. Kusum Agarwal and Mangal Emotional Intelligence Inventory developed by Dr. S.K. Mangal and Mrs. Shubhra Mangal was used for data collection from the selected sample. The objective that has been formulated for the present study were i) To find out the effect of parental encouragement on emotional intelligence of male students studying in 11<sup>th</sup> class. ii) To find out the effect of parental encouragement on emotional intelligence of female students studying in 11<sup>th</sup> class. Mean, Standard Deviation One – Way Anova and 't' test were used for the analysis and interpretation of data. After the analysis of the results it was found that there was significant effect of parental encouragement on emotional intelligence of both male and female students.*

*Keywords: Parental Encouragement, Emotional Intelligence*

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**INTRODUCTION**

Yes, now a days life has become very complex and full of challenges. The life which was lived by our ancestors was totally different from the one that we are living today. The competition in every field has increased a lot and everyone, especially the students who are at their adolescent stage, want to be first at every step. At this stage they want someone who can show them a right path, provide them guidance and support them for their good deeds. Earlier, neither the parents nor the students were, in most cases worried about their future, as the options for career were limited and competition was also not at its peak like it is these days. Now the things have changed a lot. There is a change in our education system and despite a plethora of opportunities, competition has created multiple obstacles. For overcoming these obstacles, students must need encouragement from their parents and that too at an appropriate time and in an appropriate manner, i.e. without hurting their emotions. Emotions play a vital role in one's life, especially in the students who are at the critical stage of their lives when they can't decide what is good and what is bad for them. Under such circumstances parent need to step in and try and take control of their child's emotions in a most effective manner. It is absolutely true that emotionally intelligent people get more success in life than those who are not as they are able to understand their emotions and others too. They know how people would react if their emotions get hurt. This helps them to handle their relationships in a better manner, both in personal as well as in professional life. This is because the above mentioned quality makes them to feel and understand the emotions and problems of others. So, both the qualities i.e. parental encouragement and emotional intelligence are necessary for one's life, especially for those who are at their adolescent stage for achieving desired objectives.

**STATEMENT OF THE PROBLEM**

“A Study of Effect of Parental Encouragement on Emotional Intelligence of 11<sup>th</sup> Grade Students”.

**DEFINITIONS OF KEY TERMS**

**1. Parental Encouragement:** Parental encouragement is the motivation provided by parents to their children at every stage of their lives. With the help of this support, the children are encouraged to achieve success in every field and do not get disheartened in spite of failures.

**2. Emotional Intelligence:** Emotional Intelligence is the good aspect of one's personality in which an individual develops the quality of understanding the emotions of others as well his too. This quality helps the person to maintain relationships with others in a better manner.

### **OBJECTIVES OF THE STUDY**

The objectives for the present study have been formulated below:

1. To find out the effect of parental encouragement on emotional intelligence of male students studying in 11<sup>th</sup> class.
2. To find out the effect of parental encouragement on emotional intelligence of female students studying in 11<sup>th</sup> class.

### **HYPOTHESIS**

Following hypothesis have been formulated for the present study

H<sub>01</sub> - There is no significant effect of parental encouragement on emotional intelligence of male students studying in 11<sup>th</sup> class.

H<sub>02</sub> - There is no significant effect of parental encouragement on emotional intelligence of female students studying in 11<sup>th</sup> class.

### **REVIEW OF LITERATURE**

#### **1. Studies on Parental Encouragement**

Rafiq, Waqas, Fatima, Tehsin, Sohail, Muhammad, Saleem, Muhammad, Khan, Ali (2013) conducted a study on "Parental Encouragement and Academic Achievement; A Study on Secondary School Students of Lahore, Pakistan". The sample was selected from 9<sup>th</sup> class of secondary schools (public and private) from Allama Iqbal Town, Lahore City. A total of 150 students (boys and girls) were included in the sample. Simple random technique was adopted for the purpose of the study. Survey questionnaire was used as a tool for data collection. Through the results it was found that parental encouragement has significant effect in better academic performance of their children. Kishore, Vimal (2014) conducted a study on "influence of parental encouragement on students' academic achievement of high school students". The sample comprised of 200 (both male and female) from government and private high school. For the research study, the parental encouragement scale developed and standardized by Dr. R.R. Sharma was used. For testing the hypotheses descriptive statistics, 't' test and product moment coefficient of correlation has been used. The findings of the study showed that government and private high school students differ significantly on their parental encouragement and academic achievement. The study also revealed that there is a significant and positive relationship between parental encouragement and academic achievement of government and private high school students. Afroza, Akhter & Pandey, Shalini (2018) conducted a study on "A study of parental encouragement on the academic achievement of secondary level students in J & K". The sample was selected from 10<sup>th</sup> and 12<sup>th</sup> grade by using purposive sampling technique. It consists of hundred secondary school students in which 50 were Rural (25 Male and 25 Female) and 50 were Urban (25 Male and 25 Female). Parental Encouragement Scale (PES) by R.R. Sharma and for deducing the academic achievement of the students, result of High School Board Examination (2014) was used. The findings revealed that there is significant difference between rural secondary students and urban secondary students on their parental encouragement. Further it was found that secondary students have better academic achievement as compared to male secondary students. It was also found that parental encouragement with respect to domicile is positively correlated with academic achievement. The study also indicates that parental encouragement with respect to gender is positively correlated with academic achievement.

#### **2. Studies on Emotional Intelligence**

Lawrence, Arul & Deepa. T (2013) conducted a study on "Emotional Intelligence and Academic Achievement of High School Students in Kanya Kumari District". The sample comprised of 400 students (male and female) studying in IX and X standard. The tools employed in the study were self – made Trait Emotional Intelligence Questionnaire Form (TEIQue SF) and Achievement Test Questions. The findings of the study revealed that there is no significant difference between male and female high school students in their emotional intelligence. The study also indicated that there is no significant correlation between emotional intelligence and academic achievement of high school students. Chamundeswari, S. (2013) conducted a study on "Emotional Intelligence and Academic Achievement among Students at the Higher Secondary Level". The sample comprised of 321 students, selected from the higher secondary level through random sampling technique. The tools that were employed for the study were Emotional Intelligence Scale (Hydes and others, 2002) and the marks scored in

Science Subject in half yearly examination was taken to measure the academic achievement of the students. The findings of the study revealed that there was a positive significant correlation between emotional intelligence and academic achievement among the students. The students belonging to the central board schools have a higher level of emotional intelligence compared to students in state board but did not differ with students in matriculation board schools at the higher secondary level. Further the study indicates that the students belonging to central board schools are found to perform better in academics in comparison to the students who are in state and matriculation board schools at the higher secondary level. Sarita & Kataria, Sumit (2014) investigated “A Study of Emotional Intelligence and Academic Achievement among Secondary School Students”. The sample consists of 100 secondary school students selected through stratified sampling technique. The tools that were used for the study were, Emotional intelligence scale developed by Anukool Hyde and Sanjyot Deth. Descriptive Survey Method was employed in the study. The results showed that there was no significant difference in the mean score of emotional intelligence in relation to gender. There was significant difference in the mean score of Academic Achievement in relation to gender. Further it was also highlighted that there was slight relationship between Emotional Intelligence and Academic Achievement among secondary school students.

**METHODOLOGY**

Descriptive Survey Method was employed in the present research study. Quantitative approaches were adopted for the analysis and interpretation of data.

**SAMPLE USED FOR THE PRESENT STUDY**

The sample for the current research study comprised of 160 senior secondary school students, i.e. of 11<sup>th</sup> grade in which 80 were males and 80 were females which were selected by simple random sampling technique.

**TOOLS USED IN THE PRESENT RESEARCH STUDY**

1. Parental Encouragement Scale (APES) developed by Dr. Kusum Agarwal and
2. Mangal Emotional Intelligence Inventory (MEII) developed by Dr. S.K. Mangal and Mrs. Shubhra Mangal was used for the collection of data.

**STATISTICAL TECHNIQUES USED IN THE RESEARCH STUDY**

With a view to understand the parental encouragement on emotional intelligence of students at (10+1) stage, different statistical techniques were adopted for testing the hypothesis. Mean value and standard deviation were calculated from the obtained scores. Then F – ratio was worked out to judge the difference among several samples means was significant or it just a matter of sampling fluctuations. Further T – Test was used to see the significant difference among each two groups i.e. i) High – Average, ii) High – Low and iii) Average – Low.

**ANALYSIS AND INTERPRETATION OF DATA**

**Table – 1.1: Table showing Numbers, Means, Standard Deviation of High, Average and Low groups of Male Students Emotional Intelligence with respect to parental encouragement**

Different Groups/Levels	High			Average			Low		
	N	M	SD	N	M	SD	N	M	SD
Male Students	15	61.73	7.41	37	60.72	8.45	28	53.53	6.47

The groups were made on the basis of parental encouragement and scores of emotional intelligence have been taken according to these groups. From the table it was found that there is not much difference between High and Average groups’ mean scores which was 61.73 and 60.72 respectively. But High and Average groups’ mean scores were quite high than Low groups’ mean scores which was found to be as 53.53. To see whether the difference was significant or not, One Way ANOVA was calculated whose summary were as follow.

**Table - 1.2: Table showing One Way ANOVA (Male Students)**

Source of Variation	Sum of squares	df	Mean square variance	F – Ratio	Result
Between - groups	1029.99	2	514.995	8.53	Significant P < 0.05
Within - groups	4645.21	77	60.32		
Total	5675.2	79			

From the above table, it was found that calculated value of ‘F’ was 8.53 which was significant at 0.05 level. Since table value of ‘F’ was less i.e. at df = (2,77) it was 3.11. So, Hypothesis H<sub>0</sub>1 was rejected at point 0.05 level of significance with respect to groups of Male students.

**Table – 1.3: Table showing ‘t’ value of Male students**

Groups/Levels	Percentage	‘t’ value	Level of Significance
High/Average	73%/54%	5.98	P < 0.05
High/Low	70%/25%	4.87	P < 0.05
Average/Low	50%/17%	5.66	P < 0.05

To find whether there was significant difference between each two groups or not ‘t’ value was calculated. ‘t’ value between High and Average group was 5.98 and table value was 1.98 which was significant at 0.05 level. Percentage value concludes that High groups were more affected by parental encouragement on emotional intelligence as compared to Average groups of Male students.

When ‘t’ was worked out in between High and Low groups, it was found to be 4.87 which was significant at 0.05 level of significance. Table value was 2.63 and Percentage value concludes that High groups were more affected by parental encouragement on emotional intelligence as compared to Low groups of Male students.

Again, when ‘t’ was worked out in between Average and Low groups, it was found to be 5.66 which was significant at 0.05 level of significance. Table value was 2.62 and Percentage value concludes that Average groups were more affected by parental encouragement on emotional intelligence as compared to Low groups of Male students.

**Table – 2.1: Table showing Numbers, Means, Standard Deviation of High, Average and Low groups of Female Students Emotional Intelligence with respect to parental encouragement**

Different Groups/Levels	High			Average			Low		
	N	M	SD	N	M	SD	N	M	SD
Female Students	24	59.87	7.07	22	61.63	8.41	34	52.11	5.71

The groups were made on the basis of parental encouragement and scores of emotional intelligence have been taken according to these groups. From the table it was found that there is not much difference between High and Average groups’ mean scores which was 59.87 and 61.63 respectively. But High and Average groups’ mean scores were quite high than Low groups’ mean scores which was found to be as 52.11. To see whether the difference was significant or not, One Way ANOVA was calculated whose summary were as follow.

**Table - 2.2: Table showing One Way ANOVA (Female Students)**

Source of Variation	Sum of squares	df	Mean square variance	F – Ratio	Result
Between - groups	1481.425	2	740.72	14.73	Significant P < 0.05
Within - groups	3871.255	77	50.27		
Total	5352.68	79			

From the above table, it was found that calculated value of ‘F’ was 14.73 which was significant at 0.05 level. Since table value of ‘F’ was less i.e. at df = (2,77) it was 3.11. So, Hypothesis H<sub>02</sub> was rejected at point 0.05 level of significance with respect to groups of Female students.

**Table – 2.3: Table showing ‘t’ value of Female students**

Groups/Levels	Percentage	‘t’ value	Level of Significance
High/Average	76%/57%	7.89	P < 0.05
High/Low	72%/23%	7.11	P < 0.05
Average/Low	52%/13%	6.20	P < 0.05

To find whether there was significant difference between each two groups or not ‘t’ value was calculated. ‘t’ value between High and Average group was 7.89 and table value was 1.98 which was significant at 0.05 level. Percentage value concludes that High groups were more affected by parental encouragement on emotional intelligence as compared to Average groups of Female students.

When ‘t’ was worked out in between High and Low groups, it was found to be 7.11 which was significant at 0.05 level of significance. Table value was 2.63 and Percentage value concludes that High groups were more affected by parental encouragement on emotional intelligence as compared to Low groups of Female students.

Again, when ‘t’ was worked out in between Average and Low groups, it was found to be 6.20 which was significant at 0.05 level of significance. Table value was 2.62 and Percentage value concludes that Average groups were more affected by parental encouragement on emotional intelligence as compared to Low groups of Female students.

**EDUCATIONAL IMPLICATIONS**

1. The study should be simulated on a vast sample.
2. The study may be investigated to study the parental encouragement of exceptional students.
3. A comparative study may be investigated to study the parental encouragement, emotional intelligence of Government and Private senior secondary school students.
4. The study may be investigated to study the parental encouragement, emotional intelligence in different area i.e. Rural, Urban, Semi – Rural and Semi – Urban.
5. The students in various streams (i.e. Arts, Science, Commerce, Humanities) may be compared on parental encouragement and emotional intelligence.

**SUGGESTIONS FOR PARENTS**

1. Parents are the first teachers of a child, so parents should provide proper and conducive environment for the development of its emotional intelligence.
2. The small accomplishments of the child ought to very warmly appreciated by the parents.
3. Parents should not focus on what the child could not do, but instead encourage him and be positive about whatever he does.
4. Parents should not be harsh while giving any kind of instructions to their child.
5. Parents should motivate their child by giving rewards for achieving good grades.

**SUGGESTIONS FOR TEACHERS**

1. Teachers should recognise the importance of emotions of students and proper encouragement should be given to them based on those teachings.
2. Teachers should help the students to become emotionally strong by making them practice yoga and meditation.
3. Teachers should develop democratic attitude towards the students and should encourage them to express their own ideas and views.
4. Teachers should provide extra attention to the students who are emotionally weak.

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**CONTINUOUS AND COMPREHENSIVE EVALUATION AND LEARNING TECHNOLOGY****Ghazala Khatoon**

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**ABSTRACT**

*Continuous and Comprehensive Evaluation (CCE) refers to a system of school-based evaluation of students that covers all aspects of students' development. The main aim of CCE was to evaluate every aspect of the child during their presence at the school through integrating assessment with the teaching-learning process on learning and development of children holistically. Comprehensive means the scheme attempts to cover both the scholastic and the co-scholastic aspect of student's growth and development. This study covers implementation and recommendations by Kothari Commission (1964-66), acceptance and modification through different educational supportive bodies. Evaluation process developing ICT enabled CCE framework to help teachers manage the complex learning and assessment activities in CBSE schools with tools and techniques. It covers assessment pattern with advantages and disadvantages of CCE.*

*Keywords: Evaluation, Curricular, ICT, CCE, RTE Act 2009, Assessment*

Implementation of Continuous and Comprehensive Evaluation was one of the recommendations of Kothari Commission (1964-66). The recommendation was accepted by the Govt. of India under National Policy of Education (NPE), 1968 which was formulated on the basis of the recommendations of the Kothari Commission. Since then lot of changes was made by introducing unit tests in place of Term end exam or yearend exam. All the documents such as National Curriculum Framework for School Education (2000) and the National Curriculum Framework (2005) also stressed on the implementation of the CCE. One of the important features of right to education act (RTE) was the introduction of continuous and comprehensive evaluation (CCE). Thus CCE is implemented now during the tenure of Shri Kapil Sibbal, Minister of Human Resource Development. This is the new evaluation method introduced recently to decrease the accumulated stress of board exams. To achieve the objectives of evaluation or to work on the functions of evaluation "The Central Board of Secondary Education introduced Continuous and Comprehensive Evaluation (CCE) in Primary Classes in 2004 (Circular No. 5/18/25/04). The achievement records and its formats was also circulated for Classes I to V with the objective of facilitating holistic learning in the school. The Board recommended a five-point rating scale, it also recommended the elimination of the pass/fail system at the primary classes (Circular No. 31/04/21/05). The Board has also followed it up by extending this scheme up to classes VI to VIII and developed a CCE card on School Based Assessment for the same Circular No./2/06). The scheme of Continuous and Comprehensive Evaluation (CCE) will be now further strengthened in all affiliated schools from October 2009. The Class IX students will be assessed through the CCE by the school itself.

In 2009, the Right to Education (RTE) Act had mandated 'continuous and comprehensive evaluation (CCE) of a child's understanding and ability to apply the same' (Section 29.2.h) to complement policies such as no detention and age appropriate admission at the elementary stage among its slew of reform measures having the potential to transform the institutional structure and climate of elementary education in India (Kumar, 2017). Simultaneously, for the secondary stage, the CBSE announced a paradigm shift from examination to effective pedagogy in the replacement of its 10th class board exams with school-based evaluation—CCE with effect from 2011 (CBSE, Circular No. 39).

As per its provisions, section 29(2) ensures the right of each child to full time elementary education of satisfactory and equitable quality in a formal school that satisfies certain essential norms and standards. The RTE Act demands that each child should get an opportunity to learn and progress and be supported during this process. CCE can be a potent tool in respecting the intent of the RTE Act by ensuring learning for all children, as assessment during teaching-learning process would help teachers observe child's learning progress, provide timely feedback support to help the child to overcome the learning difficulties. In that case the state of 'failing' and thus detaining any child at the end of a term can be minimized. Therefore, it is crucial to understand and use both teaching learning and assessment in tandem, one complementing the other to arrive at a realistic picture of students' learning and development to help them accomplish the desired goals of education.

Thus, in order to impart quality education and help children develop holistically it is important to know their learning progress in such a manner through CCE so that it helps to;

- Find out the change in a child's learning and development over a period of time.
- map these changes through assessment of different curricular areas

- Identify the support each child needs to progress individually.
- Plan teaching-learning situations to suit their needs to enable them improve their learning.
- To allow children to assess themselves through reflection, seeking ways to regulate and improve learning by him/her.
- Find out to what extent curricular expectations and learning outcomes have been achieved. improve teaching-learning processes in the classroom.
- Provide evidence based feedback and communicate children's progress to different stakeholders including parents and guardians and involve them constructively in child's growth, learning and development.
- Encourage each child to be confident of learning by doing away with the fear of assessment and providing continuous support to ensure every child's learning and development.
- Keeping in view the primary purpose of learning which is to promote an overall development of children i.e. development of the cognitive, physical and socio-emotional dimensions holistically, the major aspects under CCE that need to be explored are;

– What is the understanding about CCE?

– Why Continuous and Comprehensive Evaluation (CCE) is to be undertaken?

– What is to be assessed under CCE? – How should it be assessed?

– When should it be assessed? – How can assessment information under CCE be used? Against this backdrop, this document endeavours to answer these questions and provide guidelines that give a research-based perspective of CCE and the process of its implementation at the ground level, in tune with the RTE Act. The content placed under four subsequent sections includes Section 2 dealing with 'Why' and 'What CCE is' and section 3 comprising of 'What needs to be assessed'. Section 4 details out the 'How' aspect of CCE i.e. the process of CCE and its implementation in schools whereas the last Section 5 includes some examples of checklists, rubrics and progress report.

### **Recommendations of National Curriculum for Elementary and Secondary Education in Reforming Evaluation Practices**

The continuous and comprehensive evaluation was initiated based on the recommendations to reform evaluation practices in school education by National curriculum for elementary and secondary education – a framework (1988). Therefore, it is desirable to examine the viewpoints presented in the framework with respect to evaluation. The framework emphasizes the following.

- Defining minimum levels of learning at all stages of education while evaluating the attainment of children
- Attaining mastery level in all competencies.
- Broadening the scope of learners' assessment by way of including the assessment of psychomotor skills and socio-emotional attributes.
- Aiming at qualitative improvement in education through valuation.
- Using grades instead of marks
- As feedback mechanism for the benefit of teachers, learners and parents providing timely corrective measures for improving attainment level of students.
- Using various tools, techniques and modes of evaluation such as paper, pencil test, oral testing, observation schedules, rating scales, interviews and anecdotal records, individual and group evaluation methods at different stages. Maintain comprehensive student portfolios based on observational and situational tests.
- Reducing undue emphasis on paper pencil tests in evaluation process.
- Using more and more informal means of testing to reduce the anxiety and fear of the examinees.
- Laying more stress on informal and child friendly methods of testing.
- Recording of evidences regarding psychomotor skills related to co-scholastic areas such as work experience, art education and physical education.
- Preparing a profile of the growth and development of every learner.

- Every school may do planning of a detailed scheme of evaluation in view of the minimum learning outcomes coupled with content.
- Evaluation of the key qualities like regularity and punctuality, cleanliness, self-control, sense of duty, desire to serve, responsibility, fraternity, democratic attitude and sense of obligation to environmental protection.
- Participatory and humane evaluation.
- Continuity of evaluation through periodical assessment of learning to be utilized for diagnosing the areas of difficulty and arranging remedial instruction.
- Demystification of evaluation process for making it transparent by taking parents and community into confidence.
- Communication of the evaluation outcomes in a positive manner.
- Developing competence for self-evaluation keeping in view the maturity level of children.

### **EVALUATION**

Education is a process of changing behaviour pattern of human beings in terms of thinking. The aim of education is the comprehensive & the all-round development of the child. It may be physical, intellectual, social, emotional, spiritual and moral. It is a continuous process. Evaluation is the systematic process of collecting and analysing data in order to determine whether, and to what degree objectives have been, or are being achieved. Evaluation is a systematic process of collecting and analysing data in order to make decisions. Evaluation is not an objective process. There is another dimension of evaluation process that is, the individual judgment. Evaluation in teaching learning is very much essential for

- (1) Making teaching learning process more effective,
- (2) Organizing the teaching activities in a proper way and
- (3) Keeping track of the teaching-learning process in a right direction.

### **FEATURES OF EVALUATION**

- The teacher evaluation system must have the two purposes of improving as well as measuring teaching effectiveness. The system should focus on improving teaching as well as accountability—improved student learning.
- The system should be based on teacher standards that define teaching and teacher quality.
- The system must be linked with professional development. Providing feedback to teachers on their performance is meaningless if there are no opportunities provided to learn and practice new skills.
- Because teaching is complex, it cannot be measured by just one or two tools. The system must include multiple sources of information on teachers' effectiveness such as observations, student evaluations of teachers, parent surveys, teacher self-report measures, teacher portfolios, and evidence of student learning.
- A career ladder as well as merit pay for teachers should be in place to recognize and reward teaching excellence.
- All evaluators should be well trained and knowledgeable so that the evaluations are credible and conducted with expertise.
- Serious evaluations require time and money. We must spend to get teacher evaluation right, and effective evaluation systems require a budget to support and sustain them.
- A top-down evaluation system can create resistance among teachers. Effective evaluation systems must be designed in partnership with teachers participating from the beginning.
- A teacher evaluation system must take into account the external factors that impact teachers' performance and effectiveness. One factor is the conditions of teaching in an institution, such as class size. These conditions may vary from one workplace to another and thus, an educator who is an effective teacher in one context may be less effective in a teaching context with different, or more difficult conditions. Other factors that affect teacher practices are culture, teaching traditions. and examinations systems.

### **CONTINUOUS AND COMPREHENSIVE EVALUATION**

Continuous and Comprehensive Evaluation refers to a system of school based assessment that covers all aspects of student's development. The comprehensive component of CCE takes care of assessment of all round

development of the child’s personality. As a part of this new system, student’s grades are given instead of marks which will be evaluated through a series of curricular and extra-curricular evaluations along with academics. The aim is to reduce the workload on students and to improve other skills; more emphasis is given on expression or presentation ability of the student with the help of so many activities inside and outside the school. Grades are awarded to students based on work experience skills, innovation, steadiness, teamwork, public speaking, behaviour, etc. to evaluate and present an overall measure of the student's ability. This type of evaluation help the student who are not good at studies they get the chance to perform in other fields like art, games, robotics, athletics etc. Unlike CBSE's old pattern of only one test at the end of the academic year, the CCE conducts several. There are two different types of tests the formative and the summative.

**TOOLS AND TECHNIQUES OF EVALUATION**

**Formative Assessment (FA)**

Through Formative tests student’s work at class and home, the student's performance in oral tests and quizzes and the quality of the projects or assignments submitted by the child are judged. Formative tests will be conducted four times in an academic session, and they will carry a 40% weightage for the aggregate. Some of the main features of Formative assessment are that it is diagnostic and remedial, provides effective feedback to students, students can understand their own problems and can work on them accordingly. It enables teachers to adjust teaching to take account of the results of assessment and recognizes the profound influence that assessment has on the motivation and self-esteem of students, both of which are crucial influences in learning. FA should not be confined to only paper, pencil tests but should include use of other tools and techniques such as project work, assignments, practical work etc.

**Summative Assessment (SA)**

Summative Assessments carried out at the end of a course of learning. It measures or ‘sums up’ how much a student has learned from the course. It is like traditional exams generally taken by school at the end of a unit or semester to demonstrate the “sum” of what they have or have not learned. It is usually a graded test, i.e., it is marked according to a scale or set of grades. Grades are given according to the performance of the student in these summative exams. It, at best, certifies the level of achievement only at a given point of time. In summative assessment, the students will be tested internally. The Summative assessment will be in the form of a pen-paper test conducted by the schools themselves. It will be conducted at the end of each term twice in a year.

**Evaluation of Scholastic Areas**

Area	Technique	Tool	Periodicity	Reporting
All the school Subjects	Oral test	Oral questions	Every day after completing a competency or group of competencies	Using direct or Indirect Grades
	Written test Project work Practical activities Maintenance of Portfolios	Class work Question paper Unit test Assignments Diagnostic test	Monthly class test Unit test Terminal test	

**Evaluation of co-scholastic areas and Personal and Social qualities**

Area	Technique	Tool	Periodicity	Reporting
Health	Medical checkup for physical growth	Norms of fitness used by Doctor	Once in a year	Health status
Physical Education	Observation of activities	Rating scale	As per time table	Direct Grading
Work Experience & Art Education	Observation at work and activities Maintenance of Portfolios	Rating Scale	As per timetable	Direct Grading
Social and Personal qualities -Cleanliness -Obedience -Discipline -Co-operation -Regularity -Punctuality -Protecting environment -Truthfulness -Patriotism -Responsibility	Observation, Interview and Self reporting techniques (students' diary)	Rating scale, Checklist and Anecdotal Records	Day to day observations by the teachers by determining criteria for each trait	Direct Grading (once in every month)

**CCE using learning Technology**

Evaluation process of developing ICT enabled CCE framework to help teachers manage the complex assessment activities in CBSE schools. We are developing a framework for incorporating formative and summative assessments, calculating and storing student data like marks, grades and percentage for scholastic and co-scholastic areas. CCE framework analyzes the students' performance data and provides easy to understand visualizations giving students and teachers a complete picture of performance of one student or a class of students, need for improvement in performance of a particular student, alerts for continuous degradation in performance, etc. These are helpful for the students since they get timely feedback and can work accordingly to improve the performance, as well as teachers and school management in monitoring the overall teaching-learning process and to identify the need for improvement.

**Salient Features**

- Teachers can define activities under assessments, do mark entry for scholastics and co-scholastics and can generate the score cards.
- Functionality to show Performance analysis of student and teacher.
- Functionality to show Performance analysis of students grouped at school level and CBSE Board level.
- Alerts for students and teachers.
- Animation, Video or Rich media for hard spots.
- Multimedia enabled Question Bank with metadata attribute for class 9 and 10, (Physics, Chemistry, Biology, and Mathematics).
- Web based Teacher training materials.
- Hosting on cloud with deployment support.

**Expected Outcomes**

- Development of ICT enabled CCE framework as contained in the CBSE Teacher's Manual and other appropriate material available on the CCE portal of CBSE Board's website for Class 9, 10.
- Innovation in learning environment during formative evaluation of a topic to allow a student to be adaptively assessed and then learn at their own pace in areas of needs improvement.
- Advanced students may work on advanced areas, while weaker students can practice more to get to the Minimum Levels of learning (MLL) for that topic.
- Develop an ICT based interactive CCE delivery system in a user friendly interface to administer assessments online and on demand, securely and dependably.

**CCE Help a Classroom Teacher**

In sum, the continuous and comprehensive evaluation helps a classroom teacher in the following ways.

- To identify learning difficulties in mastering certain competencies and the intensity of such learning difficulties.
- To improve students' learning through diagnosis of their performance.
- To plan appropriate remedial measures to enable the students who have learning difficulties in mastering the competency.
- To improve or alter instructional strategies to enhance the quality of teaching.
- To decide upon the selecting of various media and materials as a supportive system in mastering the competencies.
- To strengthen evaluation procedure itself.

**Current Assessment Pattern**

Under the current assessment pattern, students have to focus on one final annual exam. Each paper carries a total of 100 marks with 80 marks component for board examination or final examination and 20 marks component of Internal Assessment (IA). Here, we are discussing about the advantages and disadvantages of the current assessment pattern.

**ADVANTAGES**

- The board exams give students a fair idea about the exams far away from the home atmosphere of their schools and teachers, hence prepare them for the pan India exams.
- An exam conducted by one board throughout the country, provides transparency and standardisation in the whole system.
- In school exams, there may be chances of discrimination as some school exam papers might be really easy while some might be very difficult.
- As a student has to write a test for the whole syllabus so he/she get to revise it many times before the final exam. Thus, it helps to make a strong academic base.
- The Class 10 board exams give the students a trial run for the class 12 board exams.

**DISADVANTAGE**

- Due to the extra hype and extra emphasis on good scores in board exams, it automatically promotes rote learning and exam-centric education.
- Though the internal assessment includes weightage of subject enrichment activities, it does not give room to non-academic activities like listening and speaking skills, promoting logical and conceptual thinking, etc.
- Parents' and teachers' high expectations from the student's board result, imposes a great mental pressure on him/her.
- Students have to study the complete syllabus at the end which makes it more difficult for them to prepare for the annual exams.

**SUGGESTIONS**

Although CCE is a good system of evaluation but there are few problems regarding its implementation.

- Formative Assessment needs to be taken up with discrimination and in consultation with all subjects' teachers so that projects of all subjects are not given at the same time.
- Student should be encouraged for Self-learning and study skills through in-class activities. 3. Project work may be given in groups and the group members need to work in school under the direct supervision of the teacher.
- The classrooms should be interactive so that the teacher can help students in exploring, experimenting and experiencing learning.
- School may lay emphasis on Co-Scholastic Areas i.e., Life Skills, Attitudes and Values for personality development.
- It's very important to give feedback to the students and to their parents about their performance time to time.
- Due to lot of activities some time syllabus either not finished or not done properly so there should be proper time management.
- To reduce the work pressure from students Integrated Projects may be given where subjects are interlinked, through this they will be able to understand some new concepts. Subject teachers should plan and develop the project and assess it together.
- All the rules and regulation about CCE should be known to parents and student through hand outs. Details of CCE can be mentioned in the schools Almanac/ Diary/Syllabus booklets.
- Student teacher ratio is almost 42:1 which is destroying the purpose of CCE. It should be taken care.
- There is a need to train the teachers about CCE, because according to a survey lot of teachers doesn't understand this System (67%) and lot of teachers oppose this (58%).

**CONCLUSION**

CCE system is not a simple task by teachers in class rooms. A trained teacher required knowledge of ICT and CCE with enthusiasm to handle this system. This technology helps to frequent interaction between among students, teachers and the Principal. Teachers will have to put in greater effort to improve their teaching on the basis of regular feedback and diagnosis followed by remedial instruction through the use of learning technology.

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**INCLUSIVE EDUCATION: ACCESS TO QUALITY EDUCATION**

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**ABSTRACT**

*The purpose of the study was to identify the pedagogical practice adopted by the teachers and to identify the challenges encountered by them in managing in an inclusive set up. The literature review shed light in the various related aspects of inclusive education. The study employed qualitative method in which (FGD) Focus Group Discussions were used. Eighteen elementary school teachers from three government schools of Delhi were purposively sampled. The findings of the study revealed that majority of the teachers were not trained on how to teach in an inclusive classroom and hence faced many challenges which are discussed below. Most of the teachers were also not have exposure to the appropriate inclusive pedagogy. However, it is suggested that with proper training and resources, the teacher could be able to create an inclusive and effective learning environment. It can be concluded that mainstream teachers generally lacked confidence as they attempted to include students with disabilities in classrooms.*

*Keywords: Inclusive Classroom, Inclusive Pedagogy, Mainstream Education*

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**INTRODUCTION****Inclusion and Inclusive Education**

“Inclusion means that anyone, regardless her/his deficiency or learning difficulties, must be treated as a member of the society, and s/he is entitled to any available special services which he/she needs in the frame of the social, educational, medical and other services available to all the members of the society.” (Doru-Vlad POPOVICI - Elements of integrative psycho-pedagogy, Pro Humanitate, 1999 – p. 4). The word inclusion refers to a model where children with special needs spends more and more time with the students of general education or mainstream students. The purpose of inclusion is that the students with special needs can get a mixed experience and to enable them for successful social interaction so that they can lead a successful life. Inclusion is an approach going beyond the idea that all children should be educated in the same place, stressing equity and including everyone, if possible, in the curriculum. Major ideas are participation, development of full potential and involvement in the wider community. (Sage, 2004) Inclusion is the provision of services to students with disabilities, including those with severe impairments, in the neighbourhood school in age-appropriate general education classes, with the necessary support services and supplementary aids (for the child and the teacher) both to ensure the child's success academic, behavioural and social and to prepare the child to participate as a full and contributing member of society. (US National Centre on Educational Restructuring and Inclusion 1995, cited in Frederickson and Cline, 2002) Inclusive education is when all students (with special needs and children without any disability learn together) under same roof. It means improving schools so that all children learn more successfully. **Inclusive education** might be seen as a luxury, or as the responsibility of specialists,<sup>3</sup> but inclusive education is crucial to ensure all children have access to quality education. (Teachers, Inclusive, Child-Centered and Pedagogy, Webinar 12- technical booklet, UNICEF 2014)

Inclusive education is not about **containment, assimilation or accommodation**. It is not about placing particular pupils in changed, under-resourced and unplanned circumstances. (Barton, 2003: 427) It is a good example of new social condition where all students are treated equally. There is a slight change in the curriculum and adapted for hassle free learning for example TLM are developed for blind students where the child uses his/her tactile ability and learn. An inclusive classroom is a general education classroom in which students with and without any disability learns together where in special classroom only students with any disability and learning disability learns. Inclusive education describes **the process by which a school attempts to respond to all pupils as individuals** by reconsidering and restructuring its curricular organisation and provision and allocating resources to enhance equality of opportunity. Through this process the school builds its capacity to accept all pupils from the local community who wish to attend and, in doing so, reduces the need to exclude pupils. (Sebba and Sachdev, 1997, cited in Frederickson and Cline, 2002: 66)

**Who is and Inclusive Teacher?**

The European Agency for Development in Special Needs Education developed a profile of inclusive teachers based on four core values for inclusive teachers and a set of competences related to each core value. It has been recognized that inclusive values and attitudes in teacher training are essential for inclusive teachers. (Teachers, Inclusive, Child-Centered and Pedagogy, Webinar 12- technical booklet, UNICEF 2014 p-8). Actions in inclusive schools (such as adaptations in *teaching style, content and materials*) that are not related to

inclusive values such as equality, rights, respect for diversity and participation, etc., are less sustainable and more related to instructions from higher authorities. The skills and knowledge teachers learn in order to teach in inclusive settings should therefore be embedded in inclusive values to be meaningful. Teachers who believe it is their responsibility to teach all children are more effective teachers in general. (Rieser et al., "Teacher Education for Children with Disabilities: Literature Review").

### **Policies and Legislative Frameworks for Education and Inclusion**

- National Policy of Education (1968)
- National Policy of Education (1986)
- Bahrul Islam Committee (1985)
- Program of Action MHRD (1990 & 1992)
- Centrally sponsored scheme of Integrated Scheme Education for the Disabled (1974)
- Rehabilitation Council of India Act (1992)
- District Primary Education Programme (1994)
- Janshala (1998)
- National Trust Act (1999)
- Action Plan for Inclusive Education of Children and Youth with Disabilities (2005)
- Sarva Shiksha Abhyan (2001)
- National Policy for persons with Disabilities (2006)

### **Related Term**

There are few terms in which are used mostly and have an unclear meaning to layman for ex:

The two terms are very frequently used interchangeably i.e. impairment and disability. While impairment refers to a *lesser degree* of complexity in the way our bodies work whereas disability refers to *inability* or not being able to perform a task.

**Impairment:** In Hindi language it is translated as **Dosh, Vikaar**. Impairment can be defined as reduced quality of strength due to some injury or illness, it is a complexity in the functioning of our body or any part of the body which arises from any difficulty.

**Disability:** Disability is a permanent injury, illness or physical or mental condition that tends to restrict the way that someone can live their life. Disability may be intellectual, developmental, mental, physical, sensory or some combination of these. It substantially affects a person's life activities and may be present from birth or occur during a person's lifetime.

### **Special Education, Inclusive Education and Integrated Education**

**Special Education:** The term special education includes all aspects of education which are applied to all exceptional children, physically and mentally disadvantaged and gifted children and is provided in special schools which literary means a school that is specially organized to meet the needs of specific groups of children (such as children with disabilities). (*Teachers, Inclusive, Child-Centered and Pedagogy, Webinar 12-technical booklet, UNICEF 2014 p-46*).

Modern definition of special education is the education for special need children where as in primitive era it means the education for Brahmins, Kshatriyas, Vaishya, Shudras etc. It is an especially designed instruction that meets the unusual needs of special children

**Inclusion (Samavesh)/ Inclusive Education (Samaveshi Shiksha)** to an education system which takes into account the learning needs of ALL children and young people, street children, girl children, children of ethnic minority group, children from economically weaker sections (EWS). It includes all the students who are away from the education for any reasons like physically or mentally challenged, economically, socially deprived or belonging to any caste, creed, gender etc.

Inclusive education is a part of a broader goal of creating an inclusive society. Not developing yet more methods and systems, but nurturing values and beliefs. Its focus is not the disabled children and children with learning disability, it means inclusion of all children where each child has equal opportunity to learn. Inclusive

Education ensures that these children are afforded equal rights and opportunities to education. Inclusive education aims to combat the marginalization of individuals and to promote difference in a positive way.

**Integration (Ekikaran)/Integrated Education (Ekikrit Shiksha)** means providing education to students with special needs in regular classrooms either on full time or part time basis. Focus of integrated education is on having the child adapt and adjust to the regular classroom. The concept of integrated education ascends as outcome of recommendation National Policy of Education, 1986 i.e. to provide equal opportunities to all not only for access but also for success. The main aim of integrated education is to remove the feeling of inferiority among the children with any disability, and to ensure social integration. It is less expensive as there is no need to appoint specially trained teacher and special infrastructure is not required.

Exclusion means one to one instruction and educational support services for students with special needs that are provided outside of the typical school environment.

### OBJECTIVES OF THE STUDY

- To study the pedagogical practices followed by the teachers in inclusive schools
- To study the challenges faced by teachers in inclusive schools

### Sample

Eighteen teachers of Elementary classes from three government schools were taken as sample i.e. 6 teachers from each school. Purposive sampling technique was used for the sample selection.

### Tool

Semi structured focus group interview was taken as the tool of the study.

### Analysis

Analysis of the study was done qualitatively and the findings are as follows:

### FINDINGS

#### Pedagogical Practices

The teachers suggested the following pedagogical practices which they prefer to use

#### (a) Demonstration through Oral Presentations

There is a wide variety of learning styles and educational needs of students in an inclusive classroom for which the teacher has to adopt appropriate teaching learning strategies which makes learning accessible to all students e.g. if the student does not have the writing skills, the teacher may demonstrate learning through an oral presentation.

#### (b) Collaborative Style

If the student is able to learn visually, a piece of art may be presented in front of him/her. These ways can also help in their assessment. Similarly, the activities can also be done in groups in a collaborative way. The principle of "one method or strategy fits for all" does not apply in an inclusive classroom. Inequality and diversity found here demands the maintenance of too much flexibility and diversity in the use of teaching learning methods and strategies.

#### (c) Use of IEPs (*Individual Education Plans*)

Pedagogy of inclusive classrooms is derived from special education practices, this can be justified by the example of IEP's (*Individual Education Plans*) which were developed initially for special classroom specifically but gradually shifted by the time and used today in mainstream classrooms with an idea to promote learning of children with learning disabilities, language learning and other learning problems.

IEP and other practices are helpful in development of inclusive pedagogy, but in classroom where there are learners of diverse educational needs, such pedagogy is needed where no form of diversity exists and caters the needs of all and reduce or eliminates the singling out the individual for special teaching. The most familiar of these approaches includes *Universal Design of Learning (UDL)* and *Differentiated Instruction (DI)*, however new approaches continue to be developed that are also worthy of attention, such as Florian's and Spratt's (2013) "*Inclusive Pedagogical Approaches in Action (IPAA) framework*".

#### (d) Use of Assistive Technologies

Teachers suggested that assistive technologies can also be used for individual with disabilities and includes adaptive, rehabilitative devices such as

- *Screen readers* that enable person to hear electronic text as synthesized speech,

- *Speech to text software* that enable people to use their voices to enter text, *text telephone*, *accessible keyboards*, *standing frames*, *large print*, *braille* and, *speech recognition software*.

#### (e) Other Pedagogical Strategies

The other pedagogical strategies that can be practiced in an inclusive classroom may be

- **Peer tutoring:** Pairing of two students together where one is high performer and another one is low performer with any disability. Through this method student can learn better and interact without hesitation with his/her better knowing peer. This method also helps in building confidence and gives social learning experiences to students.
- **Cooperative Learning:** Through cooperative learning students learn to articulate their thoughts more freely, receive constructive feedback and gets more opportunities to respond.
- **Multisensory Teaching:** It used all/ maximum senses of students in the learning process. It is ideal for students with disabilities learning in an inclusive environment. To be effective teachers must be adequately trained to teach students with disabilities along with their non-disabled peers. ([www.questia.com](http://www.questia.com))
- **Buddy System:** In buddy system a learner is paired with another one usually an older one or with higher abilities. This promotes friendship and a sense of belongingness between them. Through this social interaction skill and a sense of independence is also developed among students with special needs.

#### CHALLENGES FACED BY TEACHERS IN INCLUSIVE SCHOOLS

On the basis of interview, it was found that most of the teachers faced following challenges:

- **Professional Training**

Teachers said that they are not trained for inclusive classrooms as they are mainstream teachers and mostly are not trained special educator or have thorough knowledge of special education. They also said that opportunities are given to them to attend the workshops on inclusive education but most of the time the schedule of workshop doesn't match the busy schedule of teachers. Only few stated that they are comfortable in teaching in an inclusive classroom. They emphasized that such programmes should be organized at regular basis, so that teacher can become familiar with the strategies that can be used in inclusive classrooms, as they did not learn about inclusion and were not exposed to teaching learner with disabilities.

- **Lack of teaching learning Resources**

It was found that there is lack of teaching learning resources in schools which hamper the teaching to deal with learners with disabilities. Teachers stressed that there should be concrete material which visually impaired learners can touch and feel. For example, Braille, magnifying glasses, hearing aids etc. But when asked whether they are trained enough to use these devices, they answered that they need training to use some devices such as Braille. They also suggested that all stakeholders including parents need training to use these devices.

- **Large Classroom Sizes**

Another challenge faced by teachers is the large size of classrooms which hinders them to give equal attention to each student in an inclusive classroom. If the teacher pays more attention to special children or CWSN, then the other gifted children becomes restless and sometimes it becomes difficult to handle the class discipline.

- **Time Management**

It was stated by the teachers that it becomes difficult sometimes to complete the syllabus on time because there is diversity in class and we have to use different teaching strategies for CWSN, so it is a big issue to manage time.

- **Assessment**

The teachers responded that the centralized system of assessment caters only the mainstream students and does not include methods of assessment for CWSN or with disability. Educators need to assess where learners have difficulty and determine if the learner needs extra help.

#### CONCLUSION

From this study it is concluded that teachers are somewhat familiar with the pedagogies and suggested some effective methods such as cooperative learning, reflective teaching, buddy system etc and they are also open to adopt new pedagogies. They also felt the issue of time which is short due to which they are not able to implement the new teaching methods. The teachers also faced a number of challenges while teaching in an inclusive classroom such as large classroom size, using new assessment techniques, limited or non-availability of teaching learning resources etc. They felt that they need training to work in an inclusive environment as they

were trained to work in mainstream. The continuous training may help them to build a positive opinion towards inclusive education.

### RECOMMENDATIONS

The vision of inclusive education is that all children reach their full learning potential, to reach this vision certain recommendations are made on the basis of the study conducted.

- Practical portion should be included in the pre-service curriculum where pre service teachers must use teaching methods and teaching aids meant for inclusive setup.
- Short term/ Long Term training courses must be organized for in-service teachers.
- Parents must be given orientation which enable them to inculcate values in their child to cooperate with their special need peers.
- A sufficient amount must be assigned to teachers from which appropriate teaching aid or device can be purchased.
- Experts must be invited from the area of special education for extension lectures so that there could be a healthy interaction between teachers and special educators

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**INTEGRATION OF INFORMATION AND COMMUNICATION TECHNOLOGY IN INCLUSIVE SCHOOLS**

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**ABSTRACT**

*This paper presents and evaluates the development of Information and communication technology in inclusive curriculum the focus is on the incorporation of ICT competences for inclusive education. Students were able to monitor the development and implementation of technology tools for special needs pupils. Within an educational technology curriculum, a competence framework was developed for fostering the use of ICT in the teaching of, and learning by, special needs pupils. This was achieved various learning objectives of autonomy, inquiry, creativity and innovation. It focus more specifically on the use of ICT for special needs pupils, the aim is to carry into effect the principles of equality, diversity and inclusive education. The research was designed to evaluate the candidate students' learning and to consider the alignment of learning objectives and activities with learning outcomes in the new curriculum. The research questions considered within the paper are: (1) How the new curriculum assists mutual development of ICT in inclusive schools? (2) How were various tools of technology are used in the assessment of students?*

*Keywords: educational technology curriculum, pre-service teacher education, inclusive education, special educational needs, e-learning environment for special educational needs, competences*

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**INTRODUCTION**

Information and Communications Technology commonly termed as ICT comes from the acronym IT and CT and refers to methods of storing, manipulating and communicating information. Information Technology (IT), as defined by the Smart Computing Dictionary, is

“A general term used to describe any technology that helps to produce, manipulate, store, communicate, or disseminate information. IT refers to the most expensive, complex computers, with devices usually dealing with electronic data in binary format. However, these IT machines are not able to communicate with one another.”

And, Communication Technology (CT) is “the term used to describe telecommunications equipment through which information can be sought and accessed”. (New Zealand MOE, 1998). Examples include: video conferencing, teleconference phones, and modems.

Globally, educational systems are adopting new technologies to integrate ICT in the teaching and learning process, to prepare students with the knowledge and skills they need in their subject matter. In this way the teaching profession is evolving from teacher-centered to student-centered learning environments. “ICT integration is understood as the usage of technology seamlessly for educational processes like transacting curricular content and students working on technology to do authentic tasks” (Kainth and Kaur). Nowadays ICT facilitate not only the delivery of lessons but also the learning process itself. This includes computer based technologies, digital imaging, the internet, file servers, data storage devices, network infrastructure, desktops, laptops and broadcasting technologies namely radio and television, and telephone which are used as instructional tools at schools.

**INTEGRATING ICT IN THE TEACHING AND LEARNING PROCESS**

Allen (1997) believed that the basic skills of the future are the use of powerful technologies. The traditional textbook can no longer fulfill the need in the rapid changing and the information-explosion world. He asserted that the traditional teacher-centered approach makes classroom no longer an effective system to prepare students for the realities which they face in the near future.

Parmley et al. (1997) stated that technology works best as a supporting tool-making complex processes or creative experience either possible or easier to accomplish. He thought that technology can offer new ways to provide meaningful, real-life context for learning, it also allow students to collaborate with peers and experts across the country and around the World.

Rosener (1997) described IT as good as, or even better than, traditional method of teaching and learning as it being limitless of time and space. Poole (1998) pointed out that suitably integrated computer use can contribute to successful results in the classroom as to: support teaching and learning, support children's socialisation, enable children with disabilities to integrate and enables a teacher to duplicate excellence.

According to Kennewell et al. (2000), integration of ICT in teaching requires understanding at a deeper level to facilitate the development of strategies and process to identify opportunities, solve problems and evaluate solution. They believe that these higher-level objectives require not only technical knowledge and skills, but the ability to choose an effective strategy for a problem. Poole (1998) shared his view that the technology is only a tool to both teacher and student. The effectiveness of the tool depends entirely on the skills they bring to the learning process. He believed that the teachers' task is thus to nurture the students' willingness to learn.

The present paper tries to evaluate the development of Information and communication technology in inclusive curriculum the focus is on the incorporation of ICT competences for inclusive education. Students were able to monitor the development and implementation of technology tools for special needs pupils. Within an educational technology curriculum, a competence framework was developed for fostering the use of ICT in the teaching of, and learning by, special needs pupils. This was achieved various learning objectives of autonomy, inquiry, creativity and innovation. It focus more specifically on the use of ICT for special needs pupils, the aim is to carry into effect the principles of equality, diversity and inclusive education. The research was designed to evaluate the candidate students' learning and to consider the alignment of learning objectives and activities with learning outcomes in the new curriculum. The research questions considered within the paper are: (1) How the new curriculum assists mutual development of ICT in inclusive schools? (2) How were various tools of technology are used in the assessment of students with special needs?

### **ICT FOR INCLUSIVE CLASSROOM PROJECT WORK STRUCTURE**

The project work is incorporated within the new Educational technology curriculum. The basic scope of the curriculum is to develop an autonomous teacher, who shall autonomously choose between options and tools, and adopt decisions on introducing creative and innovative solutions during lessons, taking into account the needs of Individuals as well as groups. During tutorials, the students work on projects. At the beginning of the Project work, authentic cases from pedagogical practice are presented. Tutorial structure consists of the familiarization with learning objectives, introductory motivation, discussing a topic or issue, working in groups, and completing the reflection journal at the end of every tutorial.

The tutorial work is followed with practical work which is conducted by full time students during their teaching practice in schools. The part-time student teachers have a good opportunity to apply the project work during their normal professional work. For final assessment of the course, students write an essay on ICT use for special needs pupils and ICT in teacher's professional development and learning.

A qualitative study by Williams explored the working environment of teachers to identify what needs are to be addressed when developing an ICT learning environment for special educational needs. It considered the main issues in everyday work, the information needs of teachers, new experiences with ICT and knowledge of ICT impact upon the special educational needs learning environment, facilities and tools within environment (Williams, 2005, p. 540). During their daily work, teachers need most: familiarization with the administrative procedures and policies, lesson plans and ideas, how to evidence work undertaken, and current level of areas in the curriculum that every individual student still needs to cover. In this inclusive approach Project work is focusing on lesson plans and ideas, which form an integral part of teacher's daily work. Project topics need to be selected exclusively by students, which is a prerequisite for quality learning that is based on the motivation and interest of every individual student. Students will prepare projects which included the deliberation on and proposals of creative ICT use in resolving different problems and dealing with different topics in inclusive classroom.

**DIGITAL RESOURCES OF EDUCATION****Jugnu Khatter Bhatia<sup>1</sup> and Dr. Sushma Rani<sup>2</sup>**Assistant Professor<sup>1</sup>, Satyug Darshan Institute of Education & Research, Faridabad  
HOD<sup>2</sup>, School of Education, Lingaya's Vidyapeeth, Faridabad**ABSTRACT**

*In a technology driven world where change is constant, there is a perpetual need to acquire new skills, knowledge and gain insight. In today's competitive and globalized world, digital learning provides learners not only with the different tools to add value to their current skill set but also to refine old set of skills and knowledge and provide opportunities to broaden their horizons without the constraints of time and pace. Digital learning helps to eliminate all types of borders and barriers whether social and physical. Emerging Online courses are a great solution to the challenges that learners face as they are provided with high-quality education according to their learning pace and on their own place and time. Everyone can access to the information and knowledge through various tools of digital learning. Through digital learning, the society can pave its way to accessing a conducive and effective e-learning environment with the ease of availability to necessary resources, teacher and learner-controlled activities, and collaborative opportunities & activities with peers. The digital platforms are able to enhance the learning and knowledge with respect to any field and across all age groups There are several online tools of learning that offer high-end innovative and budget-friendly digital learning opportunities.*

*Keywords: Digital Learning, Online Courses*

Technology is becoming an essential part of people's lives, and it has led to many drastic changes – both in how we think and in how we learn. The globalization of our society is a direct result of the recent technological development, which means that the barriers between different parts of world are starting to break down and world is becoming more and more closer. In today's competitive and globalized world, digital learning provides learners not only with the different tools to add value to their current skill set but also to refine old set of skills and knowledge and provide opportunities to broaden their horizons without the constraints of time and pace. Digital learning helps to eliminate all types of borders and barriers whether social and physical. Education system is moving into a new phase when it comes to the power of innovations and technology in a classroom. More effective, stimulating and sophisticated learning tools are being developed and they changed the whole scenario of how teacher will teach and students will learn. Such innovations and technological developments are being met with a blend of resistance and acceptance. Some educators worry that these new innovations may reduce their importance and role in the education process and eventually will replace them, or these learning tools are too costly, complex to understand or not required. Some are concerned that their teaching work will increase with these learning tools. Despite of these contradictory views, a growing number of teachers are accepting these tools and utilizing them in innovating ways to enhance students learning.

**DIFFERENT DIGITAL LEARNING TOOLS AND RESOURCES**

The medium of digital learning makes the overall education system highly comprehensive and effective. Development of Technology allows for various interactive activities for consolidating learning in an effective manner.

**• Webinars (Web-based Seminar)**

These are web-based seminars which are organized through the medium of the Internet. The webinars are a productive and interactive way of preaching the recent trends as well as updates with respect to global education. The webinars are held live which is attended exclusively by an online audience. These offer the opportunity to ask a question, poll, chat, survey, test, and so more over a specified topic. From a teaching and educational perspective, webinars are interesting and stimulating tool because of the very high degree of interaction, helping participants to learn and understand more rapidly.

**• E-Learning Portals**

Through e-Learning portals, effective educational and training programmes can be brought to the desktops and mobile devices of learners. They can benefit from them, by receiving up to date information. These learning portals can be customized, made accessible 24/7, are flexible, convenient and user-friendly as a centralized knowledge management entity. Learners can enhance their skills and knowledge over a certain subject or topic, learn about the latest trends and acquire some new skill through these online learning portals.

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- **Massive Open Online Course (MOOC)**

A Massive Open Online Courses is a completely free online portal that offers high-end educational materials for the students of all intellectual levels. Anyone can access these courses depending upon his time and pace. Through this portal, the learners are able to participate, engage, connect, or collaborate in various interactive learning processes and programs.

- **Edublogs (Educational Blog)**

Educational Blogging is another significant aspect of digital learning in the current education system. Through education-based blogging, teachers as well as students can utilize to their advantage. Edublogs is a specialized WordPress-based blogging platform that has been designed by keeping the teachers on focus specifically. This platform serves to be a great platform for the creation of online documents like handouts and assignments that can be easily shared with students. There is even an option of adding images with the given assignments.

- **Learning Management System (Moodle)**

A Learning Management System (LMS) is a secure and private online space to post content and to facilitate online learning activities and communications for a course. Instructors can use an LMS to enhance a face-to-face class or as an integral part of blended or online classes.

- **Learning Apps/Google Apps**

Through the means of advanced smartphone technology, there are various e-learning apps available for the students. Google consists of a set of apps that have been specifically designed for educators and teachers of the current education system. There are several teachers and educators that utilize Google Hangouts as it allows the students to initiate video-based conversations even from the most remote locations. Through these apps, the students can learn content. They can also enhance their skills and talents through these apps. For eg: E-Pathshala an initiative by NCERT and MHRD.

- **Clickers**

Clickers, are a tool used to make lectures more active, effective and engaging. Clickers use PowerPoint Presentations as a vehicle for delivering questions throughout the lecture that students can answer using a personal device. Clickers can make lectures more engaging by requiring students to actively apply their learning in class, and they provide very helpful feedback about student learning to instructors.

- **Lecture Capture**

Lecture capture is a tool used to record what the instructor is displaying on the computer along with the accompanying audio of a lecture. Instructors can use lecture capture to record in-class lectures for students to use as a review resource and to improve accessibility for all learners. An instructor can also record lectures to use in place of in-class meetings in other or future sections of the course. Concordia currently supports *Panopto* and *Camtasia* as lecture capture solutions.

- **Dropbox**

Cloud computing has changed the way people store files on their computers and Laptops. Many organizations have used it to make it easier for people to access files from multiple systems, as well as to share information with different users on their network. The same technology can also be used in a classroom setting, as it can make it easier for teachers and students to share files and electronic documents. Dropbox has a number of features that can allow teachers to share specific folders with their students, and they can access them from their computers.

- **ClassDojo**

A large part of teaching is managing the classroom, and ClassDojo makes the process easier. It puts more emphasis on providing “positive feedback” to students. One can also add more detailed information about the student’s performance or behavior, and can send messages to parents about their progress. It will even allow parents to look at their children feedback in real time, so they can stay up to date about how they are doing in class.

- **Edmodo**

Classroom Communication can be a challenge, especially if one has a large group of students to manage. Edmodo can offer a more streamlined approach to this part of classroom management. It can serve as a means for submitting assignments, getting grades, and sending any relevant information to students. It makes it easier to post assignments, messages, polls, quizzes, calendars, and other classroom resources, and they can access them online.

- **Slack**

This is a great tool for assigning group projects, as students can easily collaborate with others in their group. Slack also streamlines the communication among students so they can work together from remote locations. It incorporates Google Docs and Google Hangouts so students can share files with each other.

- **Educreations**

It gives the ability to create electronic whiteboards with lessons and tutorials that teachers can share with students. It's easy to create diagrams, commentaries, animations, and other instructions, and one can even record audio for narrative purposes and share it with students – both in the classroom or via e-mail or social media.

- **Cloud-Based Word Processors (e.g., Google Drive)**

Cloud-based word processors were a boon to teachers. With cloud-based word processors, students can collaborate on writing pieces from anywhere, save comments, and curate all steps of the writing process in digital portfolios.

- **TED Talk (Technology, Entertainment and Design)**

TED Talk has a library of video lectures that cover a wide range of topics and content, and they can be used in the classroom to supplement what one is teaching. This covers almost all topics — from science to business to global issues — in more than 100 languages.

- **Kahoot**

It is a game-based learning platform where students can learn through games or, 'Kahoots,' which are multiple-choice quizzes. With this digital learning tool, which can be accessed through a web browser, teachers can draft questionnaires, discussions online with academic lessons. The material can be then projected in the classrooms and questions are answered by students while playing and learning at the same time. This not only enhances student engagement but also creates a dynamic, social, effective and fun educational environment.

The digital world has blurred the walls of the schools and places of learning. Individual learners can learn anywhere, anytime and at their own pace. Digital learning resources can add considerable value to the quality teaching and to the learner's experience. Use of Technology extends our communications ability beyond face-to-face talking. It expands it beyond the printed page and reading to a new dimension. It is building a new and more efficient means of sharing ideas and information among all people.

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**SCAFFOLDING THE DEVELOPMENT OF TECHNO-PEDAGOGIC COMPETENCIES AMONG PRE-SERVICE TEACHERS THROUGH GOOGLE CLASSROOM AND MOODLE: A COMPARATIVE STUDY**

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**ABSTRACT**

*The 21<sup>st</sup> century has brought along a plethora of web and digital technologies. The advent of these information communication technologies (ICT) has altered the principals and process of teaching and learning. The learners of this century are no longer depended on the teachers for knowledge as all the knowledge that they seek is just a click away from them. Hence to meet the demands of these digital learners, the teachers must change their roles from sage on the stage to the guide on the side in knowledge exploration and creation. Therefore it is imperative to develop techno-pedagogic competencies among the teachers. UNESCO (2002) asserted that the best way to inculcate the ICT competencies among the teachers is by integrating the ICT into their learning environment. Learning management systems (LMS) is a software-based online platform that facilitates the management, delivery and measurement of the e-learning programmes. Through this study an attempt has been made to integrate ICT into the pre-service teacher's learning environment via learning management systems; Moodle Cloud and Google classroom. The LMS provided the instructional support to the 50 pre-service teachers enrolled in Central Institute of Education for developing the desired techno-pedagogic competencies. The present paper focuses on the comparative analysis of the two LMS used to scaffold the development of the competencies. The findings of the study highlighted that interface of the Google classroom is easy to access and learn than Moodle cloud.*

*Keywords: LMS, pre-service teacher education, techno-pedagogic competencies, Moodle, Google Classroom*

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**INTRODUCTION**

The fast paced life of the 21<sup>st</sup> century has welcomed the virtual ways of doing things. Digital technologies have become the integral part of all aspects of life; education, social, professional and health as they save time and allow huge scope for personalization. The drift in the orientation of the education from the teacher centered to the learner centered has further established the need for an education system that individualized the instructions as per the ability, interest and the need of the learner. Information communication technologies (ICT) allow the ease of accessibility to the learning content from anywhere, anytime. Also ICT helps in catering to the diversity in learning needs and styles of all the learners. With the help of ICT it is possible to personalize the instructions as per the interest of the individual. One such information communication technology is learning management systems (LMS).

Learning management systems (LMS) is a software-based online platform that facilitates the management, delivery and measurement of the e-learning programmes. The LMS software helps in administration, documentation, tracking and recording of the e-learning programmes. It also helps to maintain the collaboration over the internet and hence can be used to deliver online training and offering online courses to those learners who are not able to attend regular college because of certain reasons. Along with the distance education it also helps in providing the continual support to the regular face to face course in terms of maintaining the records, documenting the instructions, tracking and assessing the learning.

Most of the learning management systems are cloud based. Some of the Learning management system like moodle.org provides for the desktop or mobile application extensions that could be accessed without internet. On a LMS a course can be created and organized into topics. Each topic is supported by resources and followed with an assignment. There is also a provision for making an announcement. The LMS is also responsible for keeping a record of the submission status by the students and help students tracking their own progress. Grades and feedback on the submitted assignment can be shared with the learner instantly. In some cases LMS may have certain built tools like survey, quiz etc. that enable the development of the online learning material without any other software. Looking at the affordances of the LMS, it would not be wrong to say that LMS provides excellent support and opportunity to provide online or blended learning.

The learning management systems have lots of benefit. LMS increases the teaching efficiency as they facilitate flexible delivery of the course, provide multiple learning resources, and support online collaboration and helps in tracking progress assessments (Ryan, Scott, Freeman & Patel 2000). LMS also decreases the capital investment required for a course as it reduced the demand for space and infrastructure (Coates, James &

Baldwin, 2005). LMS also enhances student learning by supporting constructive pedagogies as the course contents provides diverse range of resources and knowledge networks to the learners to engage with. It also supports the provision of formative assessments and instant feedback (Coates, James & Baldwin, 2005). It also supports student's expectations to work with advance technologies as the present generation learners are highly influenced by upcoming technologies (Coates, James & Baldwin, 2005).

There are many learning management systems such as moodle, schoology, blackboard and many more. However there are certain common characteristics to all the learning management systems. According to Jill (2016) these are

- Managing users, courses and roles; all the LMS have a process through which courses are uploaded, users are added to the course and their role is assigned.
- Course calendar: it helps in managing the course activities like completion/submission of tasks
- Messaging and notifications: there is provision for sending individual messages to the users and the notification of any new addition on the course is also sent to the users
- Assessments: LMS supports the automated evaluation of the learners. Assignments, quizzes, activities, etc. can be assigned to the learners for tracking their progress.
- Maintain records: LMS helps in maintain the records/grades of the learners
- Course/content management: LMS helps in organizing the contents of the course into an effective learning pathway like the topic, subtopic, class etc.
- Administration: LMS allows the instructor to manage the course display, course settings, etc.

Learning management systems plays a very important role in supporting the teaching and learning so one must choose a LMS that plays this role well. Pappas (2018) mentioned certain points that could be looked at while choosing an LMS for teaching. The LMS must have a very effective course management system. It must be able to create learner centred, user friendly and easy to use learning path. The LMS must appropriately track the progress for each learner for evaluation of the learning. The data access must be unrestricted i.e. the user must have the access to the database anytime, anywhere and from any operating system. The LMS must not be too complex for the user to use. The interface must be user friendly. LMS must be well integrated with other social media and application so that data can be easily import/export across the various systems. LMS must be budget friendly, if possible it should be free and open sources so as users can use it freely without any financial constraints. The LMS selected must have a very strong technical support.

### **THE STUDY**

The learning management system has the potential to provide the academic support to the learners and helps the teachers in designing their courses better. The present study is aimed at comparing the two learning management systems; Google classroom and the Moodle with regard to user friendliness, ease of use and accessibility. The Moodle is the free and open sourced learning management system licensed under GNU (general public license) and the Google classroom is an application of the G-suite and is owned by the Google. The reason for choosing these two learning management systems is that they are free to use. The learning management systems are used to provide the instructional support to the pre-service teachers for the course 'Critical Understandings of the ICTs'. The course content provided on both the learning management systems is same however the interface of the two learning management systems is different. The objective of the study is to explore whether this difference in the interface of the two learning management systems brings any difference in the use and accessibility of the two systems.

### **METHODOLOGY**

The study is descriptive in nature and adopted the survey method.

### **RESEARCH OBJECTIVES**

- To compare the Google classroom and Moodle with respect to ease of use
- To compare the Google Classroom and Moodle with respect to accessibility.
- To explore the learning opportunities provided by Moodle and Google Classroom.
- To explore the difficulties arises while using Moodle and Google Classroom

**Participants and Setting**

The sample for the study is consisted of 50 students enrolled in B.Ed programme for the academic year 2018-2019 at Department of Education, University of Delhi having Critical understanding of ICTs in education as their course. The course is been implemented using learning management systems on two portals; www.learningict2018.moodlecloud.com and https://classroom.google.com along with the face to face classes. The course content for these two learning management system which consisted of manuals of various software and assessment tasks is also prepared. The sample is divided randomly in two equal groups, having 25 participants each.

**Tool and data collection**

A questionnaire having open and closed ended questions is constructed. The close ended questions aimed to explore the ease of use and accessibility of the learning management systems. The open ended questions are aimed to explore the opportunities and difficulties arise while using the learning management systems. The questionnaire is circulated to all the 50 participants through Google form.

**DATA ANALYSIS AND DISCUSSIONS**

**Ease of use**

The ease of use in the context of this study refers to the simplicity and user friendliness of the interface of the learning management systems. The participants were asked about the difficulty that they faced while working with various aspects of the learning management system (Moodle and Google classroom) and the responses were compiled in the Figure 1 and 2:

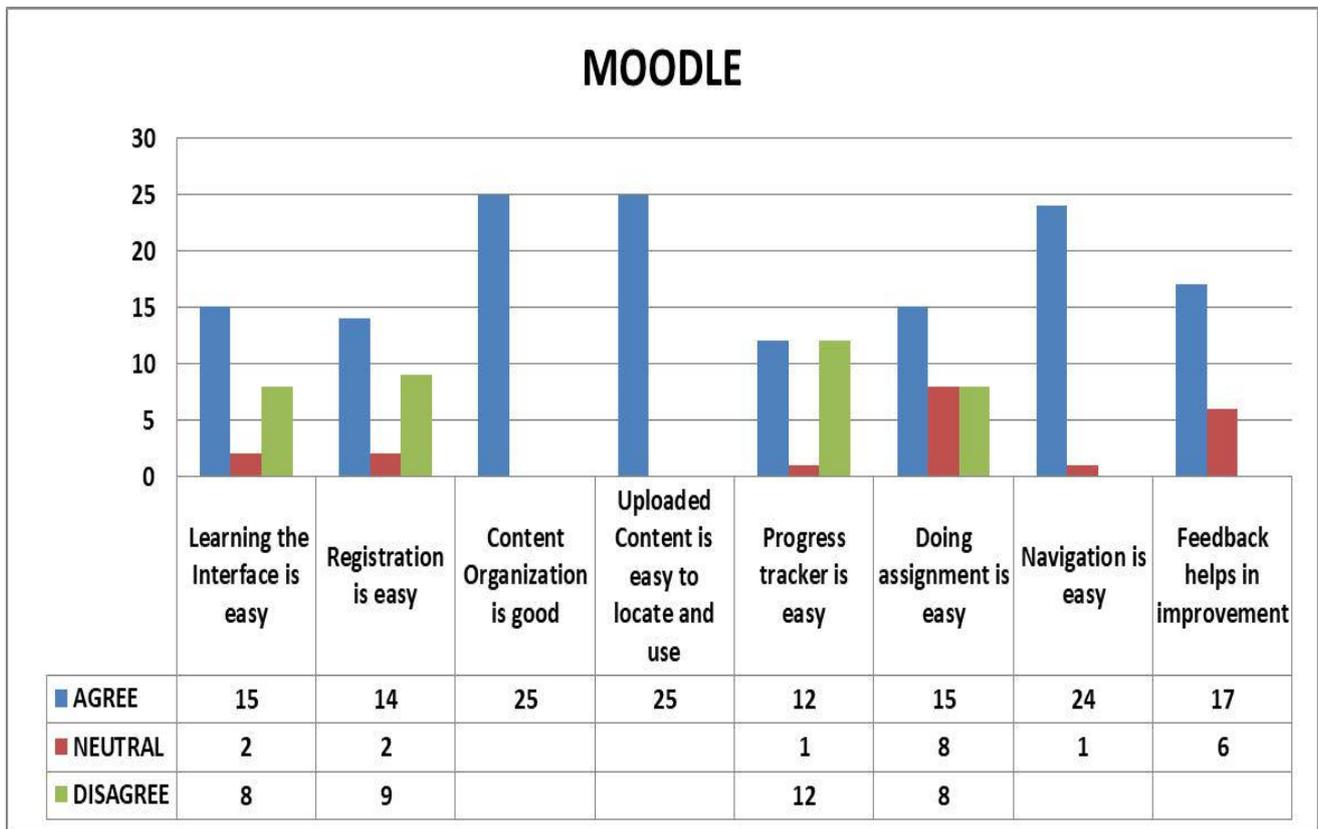


Figure-1: Ease of use with respect to Moodle

The Figure 1 clearly illustrates that 60% of the pre-service teachers finds that the interface of the Moodle was easy to learn and 32% finds it difficult to learn. Majority (56%) of the pre-service teachers said that registration to the Moodle cloud is easy whereas 38% said that the registration was not easy. All the pre-service teachers agreed that content organization on the Moodle cloud in topics and sub-topics is well organized and easy to locate. The progress tracker aspect of the Moodle cloud that helped the pre-service to map their learning received mixed response, almost half of the pre-service teachers (48%) find it easy to use and equal number of teachers (48%) found it not useful. Most of the teachers (60%) find it easy to do assignments on the Moodle cloud and 32% finds it difficult. Majority (96%) of the pre-service teachers said that the navigation in Moodle cloud from one topic to another is easy. Most of the pre-service teachers (68%) agree that the automated feedback provided by the Moodle cloud helps them in improving their assignments whereas rest of the teachers were unsure.

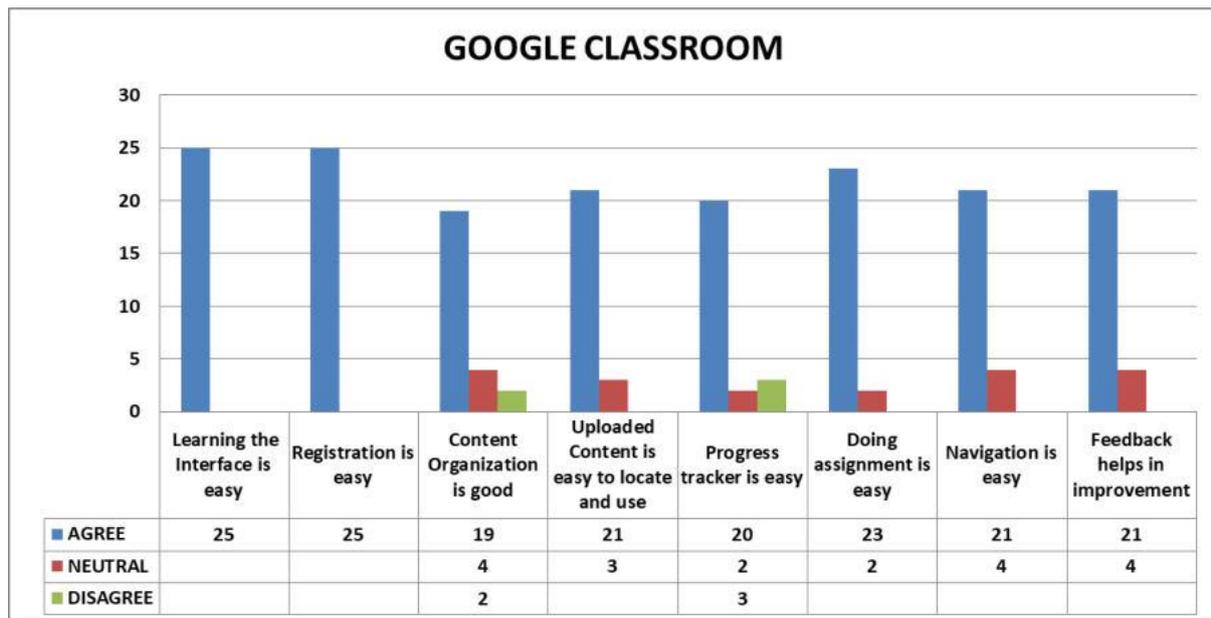


Figure-2: Ease of use with respect to Google classroom

All the teachers said learning the interface of the Google Classroom and the registration is easy. Majority of the pre-service teachers (76%) agreed that the content on the Google classroom is organized well into topics and sections. Only 1% of the pre-service teachers disagrees the content on the Google class room is not organized well rest of the pre-service teachers were not sure. Most of the pre-service teachers (84%) said that the content uploaded on the Google classroom is easy to locate and use whereas rest of the teachers are not sure. Most of the pre-service teachers (80%) agreed that the progress tracker of the Google classroom is easy to use, very few (1%) said that the tracker is not easy to use and rest of them are not sure. Majority (92%) of the pre-service teachers agreed that doing the assignment assigned on the Google classroom is easy to do and 84% of the pre-service teachers agreed that the automated feedback helped them in improvements. Most of the pre-service (84%) teachers said that the navigation on the Google classroom is easy and rest of them is unsure.

The comparison of the responses of the pre-service teachers with respect to the ease of use of both the learning management systems is compared and illustrated in the figure 3 below.

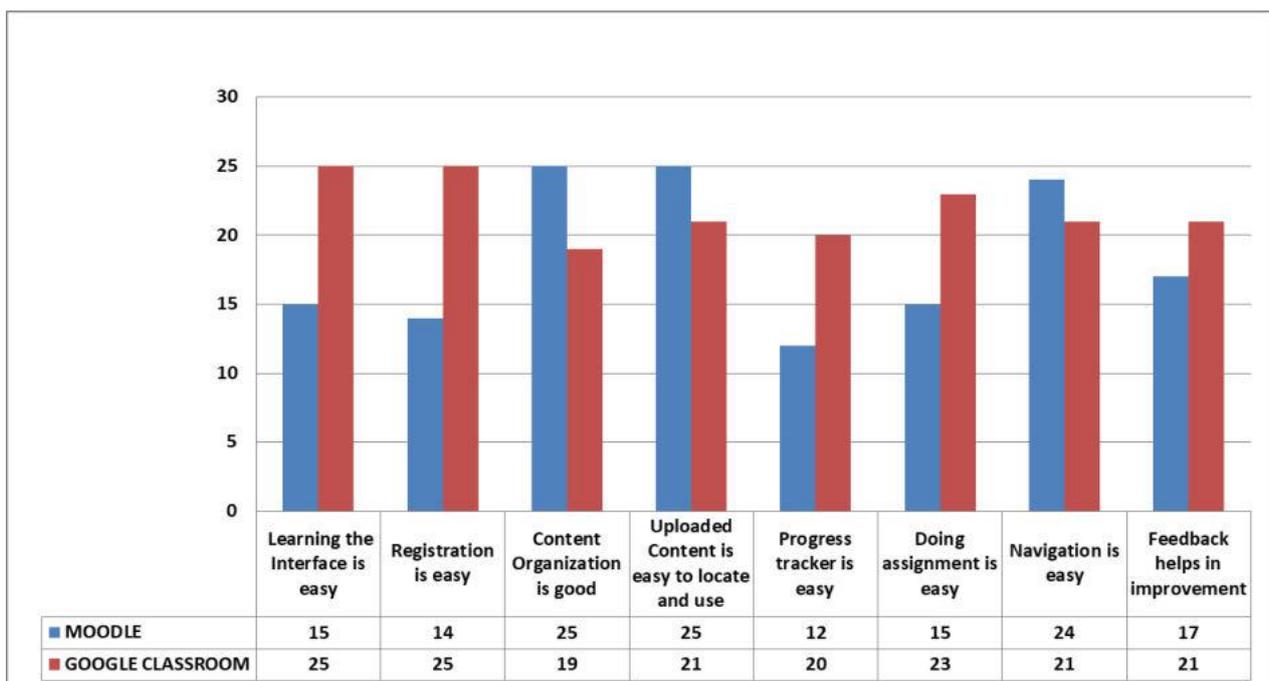


Figure-3: Comparison of Moodle and Google classroom with respect to the ease of use

The Figure 3 depicts that the learning of the interface and the registration is easy on Google classroom as compared to the Moodle cloud. On the other hand content organization and searching the desired topic from the uploaded content is slightly easy on the Moodle cloud as compared to the Google classroom. The progress

tracker function of the Google classroom is easier to work with than that of the Moodle Cloud. Assignments are easier to submit on Google classroom than on the Moodle. Also the automated feedback given on the assignment is slightly easier to access than that of Moodle. However the navigation of the Moodle cloud is slightly better than that of the Google Classroom.

**Accessibility**

Accessibility is one of the crucial aspects for easy use of any learning management systems. One of the main features of the learning management systems that it is web based which provides the freedom to the learner to access the course content from anywhere and at any time. Also the course contents can be downloaded and used offline in case on no internet connectivity. The Figure 4 and 5 below illustrated the pre-service teacher’s opinion about the accessibility of the Moodle and Google classroom respectively.

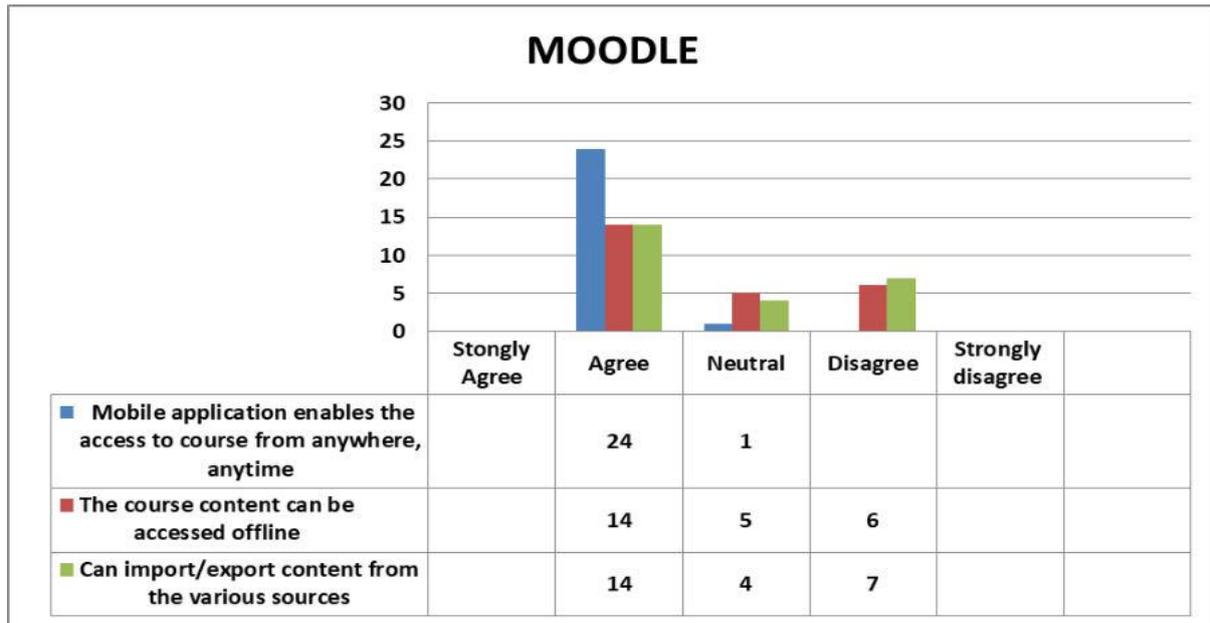


Figure-4: Accessibility with respect to Moodle

Almost all the pre-service teachers (96%) agree that the mobile application of the Moodle cloud enables them to access the course form anywhere as per their requirements. Many pre-service teachers (56%) said that the course content can be downloaded for offline use, some of the (24%) disagree to this and rest is not sure. Pre-service teachers (56%) agree that content from the various cloud storage, networks and websites can be imported to Moodle cloud and vice versa, however 28% felt that content cannot be imported and few are not aware of this.

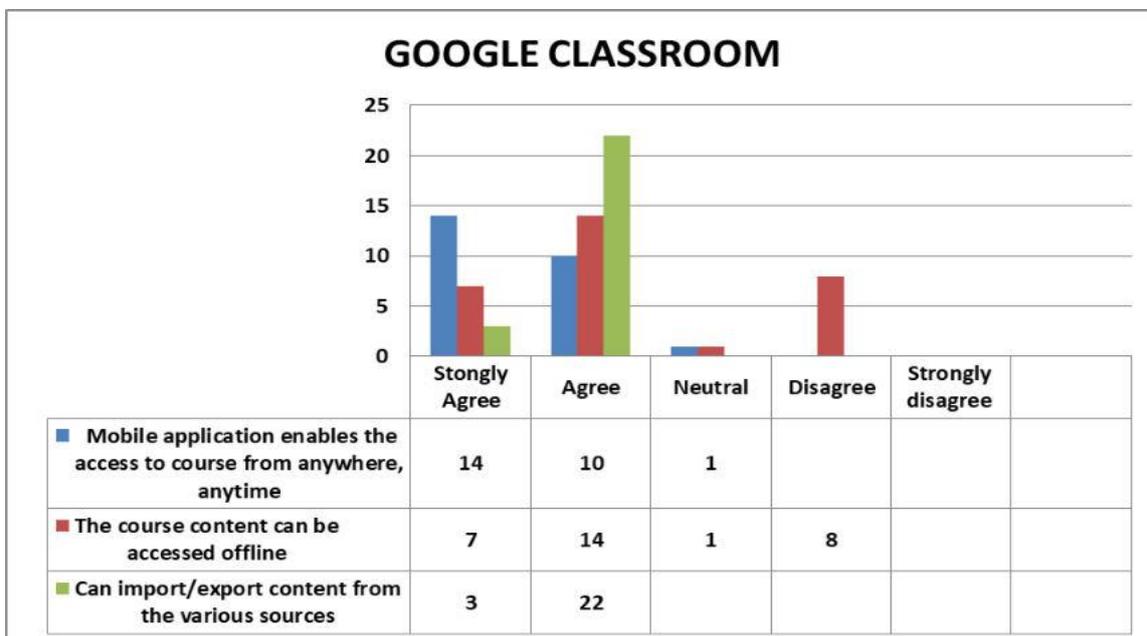


Figure-5: Accessibility of the Google Classroom

The figure 5 illustrates that majority of the pre-service teachers (96%) said that the mobile application of the Google classroom enables them to access the course from anytime, anywhere. All the pre-service teachers agree that the Google classroom enable them to import the content from various other online sources. Majority of the pre-service teachers (84%) states that the online contents of the course can be downloaded for offline use; however some of them (32%) disagree to it.

The comparison of the responses on the accessibility of the two learning management system is shown in figure 6.

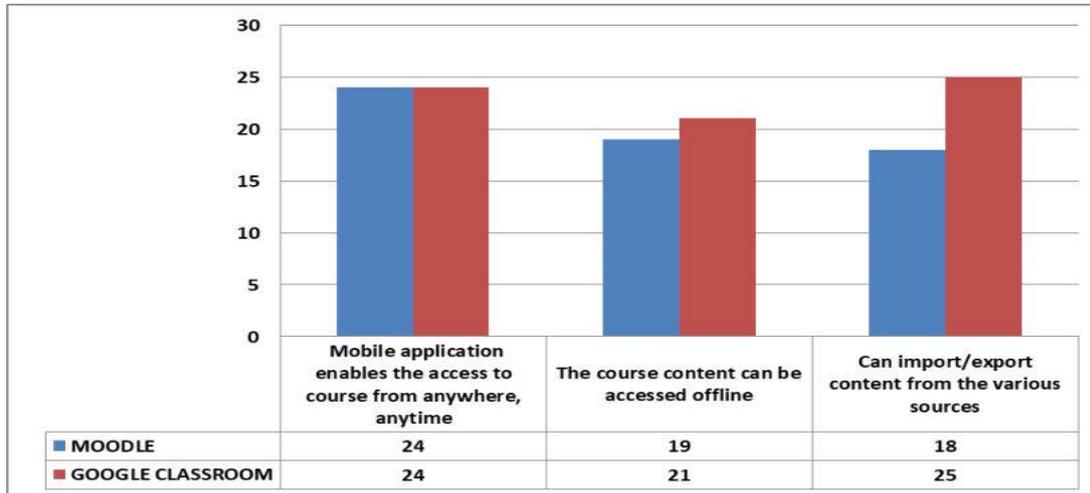


Figure-6: Comparison of Moodle and Google Classroom with respect to accessibility

The comparative analysis of the two learning management systems revealed that both the LMS provides the mobile access to the learners. The online course contents on both the learning management systems can be downloaded for the offline access, the difference is not much in this case. The ability to import content from various web sources is higher in Google Classroom than that of Moodle cloud.

**Learning opportunities provides by Learning Management Systems**

The pre-service teachers are inquired about the usefulness of the instructional support provided through the Moodle cloud and Google Classroom.

In the context of Moodle cloud the pre-service teacher’s respondent that it helped them by providing a backup for the face to face classes which help them in revision, deliver them learning materials, helps in recovering the missed classroom instructions as evident from the responses of the participants;

*“When I missed classes, I was able to go back and read the topics discussed in class. Lessons along with tasks assigned (with detailed instructions on how to do them) helped me in learning about ICT through using ICT.”*

*“It has helped me a lot. Everything was given in details so even if I forgot anything I faced no problem in completing my tasks”*

*“It helps me revising the steps of the software learnt. Also readings on the theory topics”*

*“Agar koe concept samajnahiaaya to use moodle cloud me phir se dekhkarsamajhsaktehai.Moodle cloud ICT sikhne main bahutmadadgarhai.Iskokahebhpadhajasaktahai.”*

*“It make the task easier and help in recapping the various step for the respective task. It gives a backup for class notes”*

*“It was structured, short and crisp.It provides knowledge about different software and ICT topics”*

In the context of Google classroom, similar findings are discovered. The pre-service teachers’ mentions that Google classroom helps in solving the classroom queries by reflecting by to the learning material uploaded. The learning material also addresses their technical queries. The Google class room helps them in keeping the record of their assignments. Some of the responses for the pre-service teachers’ are;

*“It helped me in solving my queries, keeping a track on what all has been covered and what all I have done and organized content in a very systematic and planned manner”*

*“Clear and accurate instructions through attached files, PDFs, video links and articles has helped a lot in directing to sort out all problems and technical issues related to projects of ICT.”*

*"I can keep track of the assignments given and read manual whenever I have problem"*

*"Google Classroom helped in keeping my assignments organized and I didn't face problem in finding them. It is very useful for learning and teaching in the world of technology."*

*"It provides backup of the class notes. So I can go to that in case I miss the class"*

*"In the process of doing my assignments, if I face any problem I can go back to Google classroom and read through the respective instructions. This helps me to resolve problems I face"*

### **Difficulties faced in using Moodle and Google classroom**

Most of the pre-service teachers mentioned that main difficulty that they had witnessed in the context of the Moodle cloud was uploading the assignment and registration. The difficulty in uploading the assignment is that the Moodle cloud accepts the file of size not exceeding more than 1MB. The registration process requires an automated generated password that would be sent to the user as soon as admin added him/her to the course. Some of the pre-service teachers had problem in logging in using the system generated password. The responses of the pre-service teachers which substantiate the above problem are as follows;

*"I had difficulty in registration as the password generated was not working"*

*"Aisekoedikkatnahithakintu Submission karne main kabhekabhedikkathotatha."*

*"Earlier I found interface a bit complicated but later I got used to it. Apart from this, one thing I would want in Moodle is ample space to upload our files. I have to share links if my file exceeds the file limit."*

*"I had to look for online software to merge two files and upload as it provided only one file to be uploaded."*

*"I have difficulty in uploading assignment as it does not file size above 1 MB"*

The difficulty faced by the pre-service teachers in the using the Google class is not much. The only problem articulated by them is that they had issues in finding the class code to join the class. The content in the Google classroom is organized in the form of classes, to join a class, one requires a class code, so the participants had problem in searching for the code as evident from a response *"I have difficulty in locating the class code"*.

### **EDUCATIONAL IMPLICATIONS**

- The study could help the teacher educator in choosing the appropriate learning management system for their pupil teachers
- The study revealed the opportunities and difficulties that arises while using Moodle and Google classroom that one can keep in mind before designing the course

### **CONCLUSION**

Moodle and Google classroom have provided an instructional support to the pre-service teachers. The learning management systems have helped them in keeping the track of their assignment and help them in coping up with missed instructions. Though there are certain technical difficulties like problem in registration, access to class code and uploading assignment, still the learning management systems have provided the desired instructional support. The comparative analysis of the two learning management systems depicts that Google classroom is more user friendly than the Moodle. However the content organization of the Moodle is better than of the Google classroom. The findings highlighted that both the learning management system have mobile application that provide offline access as per the requirement.

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**A STUDY OF EDUCATIONAL ASPIRATION OF SECONDARY SCHOOL GIRLS IN RELATION TO THEIR SOCIO-ECONOMIC STATUS**

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**ABSTRACT**

*Educational aspiration plays a very important role in one's academic and career achievement. If a person has high level of educational aspiration he will move towards the path of success in his career. But the level of educational aspiration is dependent on many factors. One of them is socio-economic status of individual. Hence present study explored the relation between these two variables. Researcher used descriptive research methodology. The population of research consists of secondary school girls from Jalaun district of UP. For data collection researcher used an Educational Aspiration Scale and a self-developed SES scale with semi structured interview schedule.*

*After qualitative and quantitative analysis researcher found that the girls from secondary school hold high educational aspiration. The study concluded by proposing that parents should improve their socio-economic status and government should also modify their policies accordingly as it has an impact on educational aspiration and attainment.*

*Keywords: Educational Aspiration, Socio-Economic Status, Secondary School Girls*

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**INTRODUCTION**

The immense potential of education in the development of an individual and in the promotion of a society has been widely accepted. Education has been recognized as a major instrument which societies can use to direct the process of change and development towards desired goals. Education plays a vital role in the programme of nation building.

"Education is one of the most important means of empowering women with the knowledge, skills and self-confidence necessary to participate fully in the development process. Education played an important role in emancipation of women as said that it is a liberating force. The importance of education of women gets highlighted when one looks into the role to be played by women in nation building.

If one takes the literacy figures as any indication of how various factors, be they personal, governmental, or societal, have helped the females in getting education, it is noted that over the years the progress is slow. As data reveals that female literacy has increased from 53.70 % to 64.60% in India and 42.20% to 52.20% in Uttar Pradesh in recent decade. Besides this improvement there is another major improvement in GER of girls at secondary level.

Educational enhancement raise aspirations among girls related to their career, vocation and education. Aspirations, whether they are related to career or higher education, play a significant role in someone's life. Aspirations represent not only the present level of achievement of an individual but also the level he would like to achieve in future.

Girls studying in secondary schools are in adolescent stage of development. This stage is an important stage to determine the direction of life. The decisions had been taken at this stage; the choices had been made at this stage affect significantly one's potentialities and abilities to be actualized. The choices and decisions are partly affected by the opportunities available to a person and his aspirations. Aspirations play a key role in the actualization of potentialities of any person. The person with high level of aspiration, not only achieves great achievements by developing his talent, but also became an active citizen by participating in social-cultural activities of the country, whereas the low aspires to leave undeveloped and also create problems in the development of society and country.

Aspirations, however, usually connote the achievement of something high or great. They also address both present and future perspectives. In this sense, aspirations can be defined as an individual's "ability to identify and set goals for the future, while being inspired in the present to work toward those goals".

Traditionally, aspirations in research spheres have focused on the career and educational ambitions of young people. In research, for example, educational aspirations typically have been measured with questions regarding how far one hope to go in school or how much education one hopes to achieve. Career aspirations may be classified according to the type of job that young people aspire to do in the future. The classification can be

based on the socio-economic classification of occupations. Beyond educational and occupational goals, however, aspirations are multidimensional, encompassing a range of future desires from personal needs to collective duties.

Educational aspirations help in choosing a vocation and appropriate educational stream. The main purpose of educational system is to enhance individual employability so that the mismatch between demand and supply of skilled manpower could be reduce and to provide an alternative for those pursuing higher education without any particular purpose or interest. (NPE-1986)

Socio-Economic Status plays an important role in the development of an individual. Educational status is contingent on socio-economic status of the family/household in principal, area and region of residence. Socio-economic characteristics exert a profound influence on the literacy and schooling of girls. Socio economic status includes variable of category, religion, education of parents, parents' occupation, family income etc.

A number of factors such as Parental Aspiration, family background, social and psychological factor, play a key role in the determination of aspiration. Parents have aspirations for their children which has major impact on the formation of educational aspiration. Socio-economic conditions are often proposed to explain the educational aspirations. Education does not hold equal appeal to all the social strata (Warren1996). In other words, the educational status of a group or a sub-group of population largely depends on the size of the strata aspiring for education. The strong influence of socioeconomic background (parent's education, occupation, family income) on educational expectations was reported by Trusty (1998). Family background variables including parental education, parental income, social class and minority status have been shown to influence on students (Kao and Tienda, 1998).

Aspirations are also shaped by the characteristics of young people and their families, peers, schools and neighbourhoods as well as wider social forces such as the labour market social background, parents education, peers, school environment, teachers, classroom environment etc. There are few psychological factors responsible to the determination of level of aspiration. Maslow in his theory of "hierarchy of needs" pointed out the need of Self-actualization". What a man can be, he must be." This famous quotation explains all four dimensions of aspirations or the need of self-actualization.

#### **REVIEW OF RELATED LITERATURE**

From the literature available on aspiration one can understand the importance of Aspirations in one's life. They play an important role in shaping future. They are decisive at the adolescent stage. Therefore in the present study the primary purpose of the researcher is to measure the level of educational aspiration among adolescent girls. The contradictory results in various researches about the relationship between educational aspirations and socio-economic status, lead researcher to the present study. Findings of Some researches in this area reflect that there is no relation between these two variables and on contrary other depicts that a positive correlation is there.

The study of educational aspirations in relation to socio-economic status is worth studying for a variety of reasons. First, because educational aspirations play a very important role in one's academic and career achievement. If a person has high level of educational aspiration he will move towards the path of success in his career. It has proved by researches that students having high level of educational aspirations are much focused, task oriented; set challenging goals and feel a sense of purpose (Quagila& Cobb, 1996). Evidently there is no confusion that the one of the major task of educational system should be to raise in the educational aspirations of students.

Second, the girls getting secondary education may have some educational aspirations. Study of their educational aspirations will help in policy formation towards achieving higher education and developing the plan at the district level. It will also help educational system including school and teachers to understand their aspirations and the hurdles towards achieving them. Educational aspirations show students inclination towards science, humanities, commerce, engineering, and medical courses. This study will be useful to understand the marketability and employability of individuals. It will also help government to reviewing their schemes of women empowerment.

Educational aspiration among girls comes from the attitude of society in general and parents in particular. Our society has traditionally specified different roles, personality characters and accepted behavior of male and female. This results in restricted range of educational choices. Therefore it is require understanding the impact of socio-economic background on educational aspirations of second sex. "Apart from the schooling factors, the family and social factors direct, promote and inspire the educational aspirations and vocational preferences of the girls"(Kushwaha and Vandana-2012). Aspirations are also affected by urban and rural background. In

literature it has been stated that urban students have higher educational aspirations than their rural counterpart (MacBrayne-1987). Literature throws a light on the importance of educational aspirations and factors of their formation. So being an educator it is important to understand these variables and use them in directing the youths.

Jalaun is my native place which is situated in one of the most backward pocket i.e. Bundelkhand of the country. It has improved its female literacy rate than other district of this region like Banda, Mahoba, Lalitpur and Hamirpur which have female literacy rate of 53.67, 53.22, 50.84, and 55.95 respectively. Jalaun has improved its female literacy rate and it is near national average. So it is useful to study the girls' educational aspirations in this district. Since no work was done in this direction in Jalaun district. So there is a need of study to fill this research gap, and therefore the researcher wants to do the present study.

### **RESEARCH QUESTIONS**

The present study is aimed at finding answer of the following research question.

1. What is the level of educational aspiration of secondary school girls?
2. What is the difference in level of educational aspirations of secondary school girls studying in private management and government management schools?
3. What is the socio-economic status of secondary school girls?
4. What is the difference between the socio-economic status of secondary school girls studying in private management and government management schools?
5. What is the relationship between the educational aspiration and socio-economic status of secondary school girls?

### **OBJECTIVES OF THE STUDY**

In order to concretize the study and address the aforesaid research questions it is important to formulate the research objectives. The objectives of the study are as follows.

- 1) To study the educational aspirations of secondary school girls.
- 2) To study the socio-economic status of secondary school girls.
- 3) To study the relationship between the educational aspirations and socio-economic status of secondary school girls.

### **METHODOLOGY**

A descriptive research methodology was used for this study. A descriptive research is concerned with a condition or relationship that exists (Best-1970). A survey was administered to a selected sample from a specific population. The term 'survey' is commonly applied to a research methodology designed to collect data from a specific population, or a sample from that population, which typically use a questionnaire or an interview as the survey instrument.

Surveys are used to obtain data from individuals about themselves, their households, or about larger social institutions like schools. Sample surveys are an important tool for collecting and analysing information from selected individuals. They are widely accepted as a key tool for conducting and applying basic social science research methodology.

### **POPULATION AND SAMPLE**

The population of this study consists of girls studying in secondary schools of Orai Sub-Division of Jalaun district.

The sample of the study is consisting 92 girls studying in secondary school from 4 secondary schools Orai Sub-Division of Jalaun district. Stratified random sampling method was used by the researcher for data collection. Stratified random sampling method was used for homogeneous groups of population. The Researcher has divided the population into the strata of girl students studying in government schools and girls studying in private management schools. Two government and two private management schools were randomly selected for the sampling by the researcher. And then all the girl students, who were present on the day of data collection, were selected. On the day of data collection 25 girls of class 10<sup>th</sup> were present in the AryaKanya inter college, 24 girls of class 10<sup>th</sup> were present in the Government Girl Inter College, 20 girls of class 10<sup>th</sup> were present in the M.V.M. Inter college, and study 24 girls of class 10<sup>th</sup> were present in the R.N.T. Inter college. All these 92 girls were selected for the study.

**TOOLS AND TECHNIQUES USED FOR DATA COLLECTION**

After a thorough survey of literature available on educational aspiration and socio-economic status researcher used the following tools for data collection.

1. Educational Aspiration Scale (Form-P) developed by Prof. V.P. Sharma and Anuradha Gupta (1996) for measuring the educational aspiration of Secondary School girls.
2. Semi structured interview schedule to measure the level of educational aspiration.
3. Socio-Economic status scale (Self-Developed).

**OPERATIONAL DEFINITION OF KEY TERMS**

**Educational Aspiration:** Educational aspirations are the function of goal discrepancy i.e. level of past performance and setting new goals, and attainment discrepancy i.e. setting of goal level and new performance.

**Socio-Economic Status:** Socio-economic status (SES) is an economic and sociological combined total measure of a person's work experience and of an individual's or family's economic and social position in relation to others, based on income, education and occupation. When analysing a family's SES, the category, religion, type of family and number of family members, education of parents and siblings, the household income, and occupation will be examined.

**Secondary School Girls:** Secondary school girls mean the girls studying in 10<sup>th</sup> class.

**Data analysis:** Data analysis is done qualitatively and quantitatively to fulfil the purpose of the present study.

**Delimitation of the study:** The study is confined to the secondary girl students of Orai sub-division of Jalaun district of Uttar Pradesh only.

**MAJOR FINDINGS**

1. The secondary school girls possess high educational aspiration
2. There is a big difference between the educational aspiration of secondary school girls from the government schools and the private schools. Girls from private school possess higher educational aspiration than their counterparts.
3. There is also a big difference between the socio-economic status of secondary school girls from the government schools and the private schools. Girls from private school have better socio-economic status than that of government school girls.
4. There is relationship between the educational aspiration and socio-economic status of secondary school girls.
5. Girls belongs to general category possess very high educational aspirations.
6. Family size and number of siblings have impact on educational aspirations of girls. The girls belong to smaller family possess higher educational aspirations.
7. Parent's income and education are positively co-related with girls' educational aspiration. Parental educational background and income has emerged as an important factor for higher educational aspirations.
8. The girls have higher educational aspiration whose parents are in service sector.
9. Possession of laptop and Mobile phones also emerged as important indicator for high educational aspirations among girls. The girls using computer and mobile possess very high educational aspiration.

**DISCUSSION AND ANALYSIS****1. Educational Aspiration of secondary school girls**

The secondary school girls hold high educational aspirations. The girls from private management schools possess much higher aspiration than that of government management schools. There is also a difference between the aspirations of Hindi medium girl students and English medium girl students. The reason for this difference is that the English medium girls are from private schools, where they are getting quality education.

Hindi medium girls are from government schools, where poor infrastructure, and lack of other educational facilities results into low aspiration of girls. This result contrast with the previous results of R.K. Sharma (1992) and Veenakumari (2001), their finding was that girls possess average educational aspiration. This result is due to advancement in technology, awareness about the benefits of education, Media, and Government initiatives for higher education.

**2. Socio-Economic Status**

The SES of Secondary school girls was determined by its constituents variables, which are category, religion, family type and size, number of siblings, parents, occupation, and family income.

Most of the girls are staying in single family system although joint family system also exists there. Joint family system represents the traditional mindset of the people, whereas single family system is of modern and progressive outlook similarly family size and numbers of siblings in the family also determine SES of a family.

Majority of the population has larger family size and more than three children. In the present age having large family represents the stereotype mindset of the people. This means they are not aware of family planning, Health, schooling and other economic benefits of the small family system. As the population policy also says to maintain the TFR below 2.1. These data depicts the low socio economic status of the majority of the sample.

**CONCLUSION**

As the socio-economic status of the students plays a major role in academic excellence. It is the duty of the parents to improve their socio-economic status by way of higher earnings, participation in community programs, saving their earnings for future needs etc.

From the research findings it is clear that the students who studies in the private schools have better socio-economic status than their counterparts. The parents who have adequate economic resources and recognizable social status admit their children in private schools as they provide quality education and develop an all-round personality. Identifying the role of socio-economic status in getting better educational opportunities, it is necessary to develop each ones socio-economic status through various personal and social welfare programs.

The government and other social agencies are also supposed to help the low socio-economic status people to improve their status by way of implementing social welfare schemes. Once socio-economic status of the parents is improved, they will provide better educational facilities to their children. Even the confidence that gives the socio-economic status to a child will help him to achieve well in all spheres of life. So, everyone in the society must try to direct the ladder of socio-economic status.

Usually schools which offer English as a medium are managed by private trust societies and individuals. These schools demand high fees and the parents who can afford them only join their children in these English medium schools. These parents with good socio-economic status can afford English medium education and quality education in private schools. Everybody in the society aspires for better education but the socio-economic status restricts it. Hence S.E.S. is to be improved and also the government schools which provide education in Hindi-medium also try to provide quality education and sound of English.

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**EMOTIONAL INTELLIGENCE AND SELF-CONCEPT: A CORRELATIONAL STUDY OF B.ED. STUDENTS**

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**ABSTRACT**

*The study examines the relationship between Emotional Intelligence and Self-concept of B.Ed. students of Haryana state. Emotional Intelligence and Self-concept inventory is administered on 150 B.Ed. students. Normative survey method is utilized to gather the data and is subjected to descriptive, correlation and differential analysis. The results revealed that there is positive significant relationship between Emotional Intelligence and Self-concept. Students from unaided colleges have possessed high level of Self-concept compared to students from aided colleges. This study further reveals that female B.Ed. Students are significantly different from male B.Ed. students as far as Emotional Intelligence is considered. Students from unaided colleges have possessed high level of Emotional Intelligence in comparison to students from aided colleges.*

*Keywords: Emotional Intelligence, Self-concept, B.Ed. students*

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**INTRODUCTION**

“The destiny of India is being shaped in its classroom”, as rightly pointed by Kothari, the teachers are the future destiny makers of our nation. If the teacher is well matured emotionally, he can easily understand others feelings or emotions which help him to predict future behavior according to situation. If the teacher has a self – ideal means he will become role model to students. The aim of education is to discover and develop each individual’s abilities and full moral excellence in order to serve society better. The education imparting institute should emphasize intellectual activities, moral judgments, aesthetic judgments, self – realization, individual freedom, individual responsibility and self-control development. In the educational process, a good and effective teacher occupies a place of tremendous importance (NPE, 1986). A teacher is not just a mere passenger of information, he is more than that. Apart from performing the role of teacher he should be in such a position to guide and understand his/her students emotions, feelings and able to have supportive relationship. For this he should be Emotionally Intelligent and have better knowledge of his/her self-i.e., Self-concept.

Happiness is the nearest and dearest emotion desired by people and a state of wellbeing as well as of contentment. According to Mayers and colleagues (2000), happiness is the key to many things enabling the perception of the world a safer place to live, healthier and more satisfying lives, and perception also that one has the ability to make decisions more easily. The modern concept of emotions focuses on emotional competency and emotional intelligence. Emotionally intelligent people are well aware of these things hence they use their rational skills to handle their emotions and moods rather allowing them to dominate. Latest researches have shown that the emotional intelligence is significant to make life successful than the educational intelligence.

Emotional intelligence on the whole refers to the ability to deal with people and make better decisions, which is more helpful for a person than theoretical or abstract intelligence when he joins any profession. Person who recognizes and identify various types of emotions in others, able to sense his own feelings and emotions and capable of integrating these emotions in his thought can be called an emotionally intelligence person. Person with emotional intelligence understands nature and strength of his own emotions; therefore he easily can control and normalize his expressions while dealing with himself and others too, just to promote coordination, attainment and peace (Hussein, 2015). It is very important for an emotionally intelligence person to develop ability to face setbacks, having empathetic attitude, co-operation, managing emotions and making right decisions at right moment of time. The concept of emotional intelligence with its need at every sphere of life emerged out and highlights that only high intelligence is not enough to be successful person in the society. Person who co-operates, motivates, and empathize with others and build healthy relations are more appreciated and valued always. We can understand person’s emotional intelligence by observing, how he taps situations during crisis and gets responses to meet the demands of the immediate situations, very successfully.

During the process of growth and development, every individual acquires the awareness of ‘self’. This includes ‘ones identity’ in the sense that the impressions one has about one’s physical appearance and other tangible properties. It further includes the conception of oneself about one’s traits, abilities, roles, attitudes, beliefs, values and the possibilities of future. Referring to School subject choice Marsh and Young (1997) says that self-concept in specific school subject are significantly related to subsequent coursework selection between the

choice of the subject students want to study and the choices of what they actually pursue. Thus, in the modern era, 'self-concept' is recognized as a potent means for making a deep study of personality as it helps in understanding human behaviour. It is believed that 'self' is a principal controlling agent, which shapes human destiny. In reality, 'self' is viewed by the majority of psychologists as the nucleus of human being. The development of self-concept involves a slow process of differentiation, in which the child gradually emerges into focus out of his total world of awareness.

Fundamentally human beings are creatures of feelings and emotions. Our emotions control our behavior; emotion in the organism is a dynamic internal adjustment that operates for the satisfaction and welfare of the individual and society. Mere acquisition of degree and position are not a great thing but the conduct and character are very important. To behave in this manner the teacher should have the self-perception himself which leads him to understand professional and personal life. Then he will be capable to express his emotions in a right time, in a right manner and right amount. If the teacher is well matured emotionally, he can easily understand others feelings or emotions which help him to predict future behavior according to situation. As the B.Ed. student teachers are future teachers who deal with the student at the transition stage who face lot of emotional problems. Hence it is better to train them itself at the preparation to have knowledge of their self and an understanding of the emotions i.e., make them emotionally intelligent and possess all the capacities to make use of the opportunities and available resources for students' welfare and also social welfare. With this background the researcher made an attempt to know about the Emotional Intelligence and Self-concept of B.Ed. students.

### **METHODOLOGY**

The present study is purposed to measure the level of Self-Concept and Emotional Intelligence of B.Ed. student teachers of Haryana State. The study is descriptive in nature and survey method is used. Sample consists of 150 B.Ed. Students studying in both aided and unaided B.Ed. colleges in Haryana State are drawn through random sampling technique.

### **OBJECTIVES OF THE STUDY**

The following objectives are formulated to carry out the study:

- To study the level of Self-concept and Emotional Intelligence of B.Ed. students.
- To find out whether there is a significant difference in the means of Self-concept of B.Ed. student's with reference to-
  - a) Male and female students
  - b) Aided and unaided college students
  - c) Science and Arts subject background students
  - d) Kannada English medium of instruction students
  - e) 21-25 years age and above 25 years age students
- To find out whether there is a significant difference in the means of Emotional Intelligence of B.Ed. student's with reference to the following categories of variables.
  - a) Male and female students.
  - b) Aided and unaided college students.
  - c) Science and Arts subject background students.
  - d) Kannada and English medium of instruction students.
  - e) 21-25 years age and above 25 years age students.
- To find out whether there is a significant correlation between Self-concept and Emotional Intelligence of B.Ed. students of Haryana.

### **Tools Utilized**

- '**Emotional Intelligence Scale**' (EIS) standardized by Anukool Hyde SanjyotPethe, UpindarDhar is used to measure Emotional Intelligence of B.Ed. students
- '**Self-Concept Scale**' (SCS) standardized by S. P. Ahluwalia is used to measure the self-concept of the B.Ed. students.

**DATA ANALYSIS AND INTERPRETATION**

Data analysis is divided into three parts.

- Percentage analysis
  - ‘t’ test
  - Correlation test
- **Percentage Analysis** In this part, level of Self-concept and Emotional Intelligence of the B.Ed. students is analyzed by using percentage analysis technique.

**Level of Self-concept of B.Ed. Students:**

Category	Score limits	Students	Percentage
<b>Above average</b>	113 and above	20	13.33%
<b>Average</b>	86-112	102	68%
<b>Belowaverage</b>	0-83	28	18.66%

Table-1: Level of Self-concept of B.Ed. Students

The above table-1 shows that 68% of the B.Ed. students have average level of Self-concept (102 students out of 150 students). 18.66% (28 students) B.Ed. Students have below average and 13.33% of (20 students) B.Ed. students have above average Self-concept level. This means most of the B.Ed. students are at average level of self-concept.

**Level of Emotional Intelligence of B.Ed. students**

Category	Score limits	Students	Percentage
<b>Above average</b>	148-177	22	14.67%
<b>Average</b>	124-147	104	69.33%
<b>Belowaverage</b>	0-123	24	16%

Table-2: Level of Emotional Intelligence of B.Ed. students

The above table-2 shows that 104 students out of total 150 B.Ed. students have average level of Emotional Intelligence which is 69.33% of total sample. 22 B.Ed. students have above average Emotional Intelligence which is 14.67% of total B.Ed. students. 24 B.Ed. students have below average level of Emotional Intelligence which is 16.3% of total sample. It can be interpreted that most of the B.Ed. students are at average Emotional Intelligence level.

- **T-Test:** In this part, level of Self-concept and Emotional Intelligence of the B.Ed. students is analyzed by using t-test.

**Self-concept with reference to gender, types of college, stream, medium of instruction & age**

Gender	N	Mean	SD	‘t’value	df	Level of significance
<b>Male</b>	34	97.714	15.56	0.12	148	Not Significant
<b>Female</b>	116	99.46	12.01			
<b>Types of college</b>						
<b>Aided</b>	71	101.39	11.06	2.14	148	0.05 Significant
<b>Unaided</b>	79	96.75	14.44			
<b>Stream</b>						
<b>Arts</b>	91	97.21	12.46	0.412	148	Not Significant
<b>Science</b>	59	98.76	13.33			
<b>Medium of Instruction</b>						
<b>Hindi</b>	68	98.65	11.55	0.77	148	Not significant
<b>English</b>	82	99.89	14.37			
<b>Age</b>						
<b>21-25 years</b>	32	99.52	14.25	0.32	148	Not significant
<b>Above 25 Years</b>	118	98.70	12.80			

Table-3: Self-concept with reference to gender, types of college, stream, medium of instruction and age

**RESULTS AND DISCUSSION**

**1. Comparison of Self-concept of B.Ed. Students with regard to gender**

Mean Self Concept scores of male and female group of B.Ed. Students were compared in the table-3. The t-value calculated is found to be 0.12 which is not significant. Therefore the first hypothesis that Self-concept among male and female B.Ed. students does not differ significantly is accepted. It means that both male and female B.Ed. students have same level of Self-concept. The probable reason for this result may be that nowadays both male and females have equal opportunities with respect to all domains of the society which makes them to develop high level of Self-concept.

**2. Comparison of Self-concept among B.Ed. students with regard to types of colleges**

The t-value calculated (2.14) between these two groups of B.Ed. students was found to be significant. Therefore the hypothesis that Self-concept among B.Ed. students does not differ significantly with regard to types of colleges is rejected. So the conclusion may be drawn that B.Ed. students from aided and unaided are significantly different as far as Self-concept is considered.

**3. Comparison of Self-concept among B.Ed. students with regard to their stream of study**

The t-value calculated between these two groups was found to be 0.412 which is not significant. Therefore the hypothesis that Self Concept among B.Ed. students does not differ significantly with reference to their stream of study was accepted. It means that B.Ed. students from Arts stream and Science stream possess same level of Self-concept.

**4. Comparison of Self-concept of B.Ed. students with regard to their medium of instruction**

Mean Self Concept scores of B.Ed. Students from Hindi and English medium of instruction were compared in the table-3. T-value calculated was found to be 0.77 which is not significant. Therefore the hypothesis that Self Concept among B.Ed. Students from Hindi and English medium of instruction does not differ significantly is accepted. It means that both the groups of B.Ed. students have the same level of Self-concept. The probable reason for this result may be that the system of education has considered both the languages are essential for the development of the students where the regional language or mother tongue is vehicle for understanding of the other languages. Hence the language builds up confidence among the students which in turn develops the self-image of the students.

**5. Comparison of Self-concept of B.Ed. students with regard to their age**

Mean Self-concept scores of B.Ed. students from age group of 21-25 years and above 25 years were compared in the table-3. T-value calculated is found to be 0.32 which is not significant. Therefore the hypothesis that Self Concept among B.Ed. Students from age group of 21- 25 years and above 25 years does not differ significantly is accepted. It means that both the groups of B.Ed. students have the same level of Self-concept. The probable reason for this result may be that nowadays individuals have open and wider opportunities to widen their knowledge irrespective of their age group which helps in building up their Self-concept.

**Emotional Intelligence with reference to gender, types of college, stream, medium of instruction and age**

Gender	N	Mean	SD	't' value	df	Level of significance
Male	34	130.14	10.63	2.38	148	Significant
Female	116	135.32	12.18			
<b>Types of college</b>						
Aided	71	133.17	11.06	2.38	148	Significant
Unaided	79	135.32	11.05			
<b>Stream</b>						
Arts	91	134.01	11.03	0.40	148	Not Significant
Science	59	134.32	13.58			
<b>Medium of Instruction</b>						
Hindi	68	133.43	11.08	0.80	148	Not significant
English	82	135.03	12.60			
<b>Age</b>						
21-25 years	32	136.93	14.20	1.34	148	Not significant
Above 25 Years	118	133.66	11.30			

Table-4: Emotional Intelligence with reference to gender, types of college, stream, medium of instruction and age

**RESULT AND DISCUSSION**

**1. Comparison of Emotional Intelligence of B.Ed. students with regard to their gender**

Mean Emotional Intelligence scores of male and female group of B.Ed. Students were compared in the table-4. The t-value calculated was found to be 2.30 which is significant. Therefore the first hypothesis that Emotional Intelligence among male and female B.Ed. Students does not differ significantly is rejected. It means that female B.Ed. Students are significantly different from male B.Ed. students as far as Emotional Intelligence is considered. Female B.Ed. Students have high level of Emotional Intelligence than the male B.Ed. students. The probable reason for this result may be females have more patience when compared to male who can think about their emotions and take decisions. The finding is in agreement with the report of Gowdhaman and BalaMurugan, Umadevi, Indu.H (2009). They reported that gender has significant effect on Emotional Intelligence of B.Ed. students.

**2. Comparison of Emotional Intelligence among B.Ed. students with regard to types of colleges**

The t-value calculated (2.38) between these two groups of B.Ed. students was found to be significant. Therefore the hypothesis that Emotional Intelligence among B.Ed. Students does not differ significantly with regard to types of colleges is rejected. So the conclusion may be drawn that B.Ed. students from aided and unaided are significantly different as far as Emotional Intelligence is considered. The finding is in agreement with the report of Singaravelu, S. (2009). He reported that locality of residence has significant influence on Emotional Intelligence of primary student teachers.

**3. Comparison of Emotional Intelligence among B.Ed. students with regard to their stream of study**

The t-value calculated between these two groups was found to be 0.50 which is not significant at 0.01 level. Therefore the hypothesis that Emotional Intelligence among B.Ed. Students does not differ significantly with regard to their stream of study was accepted. It means that B.Ed. students from Arts and Science stream have same level of Emotional Intelligence. The result is in agreement with the findings of Patil. A.B. (2004), Umadevi. M.R. (2009).

**4. Comparison of Emotional Intelligence among B.Ed. students with regard to their medium of instruction**

The t-value calculated between these two groups is found to be 0.80 which is not significant at 0.01 level. Therefore the hypothesis that Emotional Intelligence among B.Ed. students does not differ significantly with regard to their medium of instruction was accepted. It means that B.Ed. students from Hindi and English have same level of Emotional Intelligence.

**5. Comparison of Emotional Intelligence among B.Ed. students with regard to their age**

The t-value calculated between these two groups was found to be 1.34 which is not significant at 0.01 level. Therefore the hypothesis that Emotional Intelligence among B.Ed. students does not differ significantly with regard to their age is accepted. It means that B.Ed. students from different age have same level of Emotional Intelligence.

➤ **Correlation test:**In this part, level of Self-concept and Emotional Intelligence of the B.Ed. students is analyzed by using correlation technique.

**Relationship between Self- concept and Emotional Intelligence**

Variable	N	df	r-value	Result
Self-concept and Emotional Intelligence	150	148	3.16	S*

Table-5: Relationship between Self- concept and Emotional Intelligence

Table-5 shows that the correlation between variables Emotional Intelligence and Self-concept is positive and significant at 0.01 levels of significance. This shows that there is a significant relationship between Emotional Intelligence and Self-concept of elementary teacher B.Ed. students. The finding is in agreement with the findings of the Deshmukh&Sawalakhe, 2010 which suggests that there is a significant positive and low correlation ship between Self Concept and Emotional Intelligence. This implies that the Self-concept supports the development of Emotional Intelligence. If an individual has higher level of Self-concept he/she is able to have knowledge of his capabilities, limitations, make judgments, take decisions which in turn are the essential characteristics of an emotionally intelligent individual. A person with high self-concept may naturally have more self-confidence and deals with other persons and situations in life in a positive way. Thus high self-concept has a positive correlation with emotional intelligence.

**MAJOR FINDINGS**

- B.Ed. students have possessed the same level of Self-concept with reference to the variables viz., gender, subject, medium of instruction and different age groups. But as far as B.Ed. students from aided and unaided are considered they significantly different, where students from unaided colleges have possessed high level of Self-concept compared to students from aided colleges.
- Female B.Ed. students are significantly different from male B.Ed. students as far as Emotional Intelligence is considered. B.Ed. students from aided and unaided colleges are significantly different with reference to Emotional Intelligence. Students from unaided colleges have possessed high level of Emotional Intelligence when compared to students from aided colleges.
- But the B.Ed. students from Arts Science stream, medium of instruction and different age groups have possessed same level of Emotional Intelligence.
- A significant relationship was found between Emotional Intelligence and Self-concept of B.Ed. students.

**EDUCATIONAL IMPLICATIONS**

As the students from the aided college have possessed high level of Self-concept and Emotional Intelligence, the government institutions should also emphasize development of the competencies of Emotional Intelligence and should take necessary actions to develop the self-concept of the students. The training programmes related to life skills should be organized for the students. It is essential to include the components of emotional intelligence and self-concept in the curriculum and ample opportunities should be provided for practical as the theoretical knowledge will not help students to develop their self-concept and emotional intelligence. Moreover it is the duty of the teachers who should be the role models and first they should have high level of self-concept and emotional intelligence should take active role in the enhancing these factors among the students who in turn can contribute to the national development.

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**A STUDY OF TECHNOLOGY READINESS AMONG SCHOOL TEACHERS OF KURUKSHETRA DISTRICT**

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**ABSTRACT**

*In the present paper it has attempted to study the technology readiness of school teachers of kurukshetra district. The investigation was carried out on 100 school teachers of kurukshetra district of Haryana. The data was collected from 50 government school teachers (25 male teachers and 25 female teachers) and 50 private school teachers (25 male teachers and 25 female teachers). The self-constructed questionnaire was used to conduct the investigation. Descriptive Statistics was used to analyses the data. The findings of the study shows that the technical readiness is don't differ significantly among male and female teachers. But technical readiness is differ significantly among government and private schools teachers of kurukshetra district.*

*Keywords: Technology Readiness, School Teachers, Class-room learning, Technology integration, digitalization.*

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**INTRODUCTION**

Education is a process of human development and achievement of better quality of life. Education is urged to integrate technology with curriculum. But its effectiveness can be judged by the readiness of teachers to use it in a proper way. Technology is considered the wave of future. So teachers must use various technological resources in their classroom while teaching. But are all the teachers ready and capable to use technology in their teaching? Integrating technology into classes is depends on teachers' readiness to use it. If teachers don't feel comfortable with the technology then they are hardly ready to use technology in their teaching plans.

**TECHNOLOGY READINESS**

Today's era is the era of science and technology. Technology spreads in everywhere and in every field. Use of Technology in teaching is the demand of our society. It is a practical art of using scientific knowledge in teaching- learning process. The adaptation of technology in the field of education requires readiness of teachers to use it in their teaching.

**“Technology** is the branch of knowledge that deals with the creation and use of technical means. **Readiness** is the state of preparedness of persons to meet a situation and carry out a planned sequence of action. **Technology readiness** is the overall state of mind determines a person's intention to use new technologies.”

The use of digital technology brings about a powerful change in learning environment and it transforms the whole learning and teaching process. Now-a-days digital technology is used as an important instrument to support new ways of teaching-learning process. Technology is being integrated into the teaching-learning process in our education system. Successful integration of Technology in teaching-learning process is dependent on the readiness of teachers to use new technology in classrooms. The use of technology in the classroom is very important to provide opportunities for students to learn and operate in the information age.

Only teachers can determine the development and innovation in the field of education. Because they are the people who use various technological resources for the development of education. There are various technological resources which teachers can use in teaching-learning process.

- Electronic interactive boards
- Hardware and software tools
- Digital cameras
- Computers
- LCD Projectors
- Audio tools
- Video tools
- Internet .....etc.....

When teachers effectively integrate technology into classroom teaching, teachers grow into roles of adviser, content expert, and supervisor. Technology helps make teaching and **learning** more meaningful and interesting. Students are also able to collaborate with their own peer groups through technological applications.

### **Integration of technology in education**

Teacher plays a very important role in the development of society. They play a crucial role in education system. Teachers make the curriculum of a school and execute them for the development of students. But a challenge faced by our education system is lack of competent teachers who are literate or proficient in the use of technology. Technology proficiency is the ability to use various technology tools and resources. It is the ability to access, evaluate, organise and use digital technology. "Teacher work as an agent of change so it is important that teachers must technology literate as this could bring a lot of positive attitude towards the use of technologies. Hence it is important that teachers are competent and have the right attitude towards technology" (Kadel, 2005). A school could have technological resources, but whether used efficiently will depend on the teachers. It will depend on the teachers' beliefs about the educational applications of technology.

Technology enhances the learning outcomes of students. It is a tool to transform the traditional -classrooms into innovative and digitalised classrooms. Teachers are the key elements in this transformation process which is based on the technological readiness of teachers in their teaching-learning process.

"The literature suggests that lack of adequate training and experience is one of the main factors why teachers do not use technology in their teaching. This also results in teachers' negative attitude towards computer and technology." (Kumar and Kumar, 2003).

"Teachers in Nigerian secondary schools are not competent in basic computer operations and in the use of the generic software. If teachers are expected to integrate ICT into the school curriculum, preparations must be made at the pre-service teacher education level. Teacher preparation programmed should focus on the need for student-teachers to have ICT skills for their own use, in the preparation of materials for teaching and learning activities: the need to facilitate the direct use of ICT in students' learning activities within the classroom situation, and the need for teachers to develop in their students a critical awareness of ICT applications and the social implications" Yusuf (2005)

"Teachers' attitudes toward computer technologies are also related to teachers' competence in using the technology. In addition, they have a significant impact on the openness to new experiences, and also reflect and implement the changes. Positive attitude towards ICT, though too limited support their use in classes. ICT should be effectively used in classrooms as this would serve justice to the investments made for the ICT to be available in the classrooms." (Albirini, 2006)

### **NEED OF THE STUDY**

The ongoing technological innovations in the society change the system of education. Technological tools and digital resources have become a part of the learning environment and a part of the school curriculum. There is lack of research on teacher readiness about use of various technical tools in teaching-learning process. Technical readiness of teachers is very important and challenging task. So there is need to study the level of technical readiness of teachers and to use various tools of technology in their teaching-learning process.

### **OBJECTIVES**

1. To study the level of technology readiness among secondary school teachers.
2. To compare the level of technology readiness between male and female teachers.
3. To compare the level of technology readiness between government and private school teachers.

### **HYPOTHESES**

- i. There is no significant difference between technology readiness scores of male and female teachers.
- ii. There is no significant difference between technology readiness scores of government and private school teachers.

### **DELIMITATION OF THE STUDY**

- The study is delimited to 100 school teachers.
- The study is delimited to one variable i.e. Technology readiness.
- The study is delimited to Kurukshetra District of Haryana only.

**SAMPLE**

The study was conducted on 100 school teachers working in government and private schools in Kurukshetra district of Haryana. Sample was collected through random sampling method. Out of 100 school teachers the researcher selected 50 government schools teacher (25 Male Teachers and 25 Female Teachers) and 50 private schools teacher (25 Male Teachers and 25 Female Teachers).

**RESEARCH METHODOLOGY**

Descriptive survey method of Research was employed for the present study and data was collected from kurukshetra district of Haryana.

**TOOLS USED**

For the present study, the investigator used a self-made questionnaire (English-Version). The questionnaire contains 50 test items. The judgment is done on 5-point Likert-rating scale from “strongly disagree” to “strongly agree”. It is related to know about the reasons why teachers are ready and not ready to integrate technological resources in their classrooms.

**DATA COLLECTION**

The data were collected by administering above mentioned tool on individual schools teacher. On completion of the data scoring was done with the help of likert scale

**STATISTICAL TECHNIQUES**

The investigator used the following statistical techniques in the interpretation of the data.

1. Mean
2. Standard Deviation
3. t-ratio

**RESULT & FINDINGS**

On the basis of the interpretation of the data, certain results had drawn which have been summarized in the following tables:

**Table-1: Table showing t-ratio of mean scores of Technical readiness of male and female Teachers**

GROUP	N	M	S.D.	t-ratio	Level of significance
Male teachers	50	93.24	21.52	0.63	Not significance
Female teachers	50	95.26	21.24		

**For the both group;-**

Degree of freedom =  $N_1 + N_2 - 2(50 + 50 - 2) = 98$

Tabular value of t at 0.05 level = 1.96

**INTERPRETATION**

It can be observed from table 1 that Technical readiness scores of male and female Teachers are found to have mean scores of 93.24 and 95.26 and S.D. of 21.52 and 21.24 respectively. The value of t-ratio between the mean scores of two groups comes out to be 0.63 which is smaller than 1.96 at 0.05 level. It means there is no significant difference between male and female teachers regarding technical readiness. Thus the hypothesis that there is no significant difference regarding Technical readiness between male and female Teachers is accepted.

**Table-2: Table showing t-ratio of mean scores of Technical readiness of government and private school Teachers**

GROUP	N	M	S.D.	t-ratio	Level of significance
Government school teachers	50	81.40	16.55	2.32	significance
Private school teachers	50	107.10	17.48		

**For the both group**

Degree of freedom =  $N_1 + N_2 - 2(50 + 50 - 2) = 98$

Tabular value of; t' at 0.05 level = 1.96

**INTERPRETATION**

It can be observed from above table 2 that the technical readiness scores of government and private schools teacher are found to have mean scores is 81.40 and 107.10 and S.D. is 16.55 and 17.48 respectively. The value

of t-ratio between the mean scores of two groups comes out to be 2.32 which is more than 1.96 at 0.05 level so it is significance at 0.05 level. It means that there is significant difference between government and private school teachers regarding technical readiness. Thus the hypothesis that there is no significant difference regarding technical readiness among government and private schools teacher is rejected.

### CONCLUSION

Technical readiness of teachers is must for the successful integration of technology in education system. The above study shows that there is no significant difference exists between male and female teachers regarding level of technology readiness. But there is significant difference is found between government and private school teachers due to lack of facilities available in government schools. The technology readiness level of the teachers is moderate. This can cause a problem in integration of technology in education system. We recommend that the curriculum should be updated according to the present scenario. Ministries, various educational committees and boards, school level administration should design various activities which enhance the technology readiness of school teachers. This may increase the quality of education and successful integration of technology in education system.

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## HISTORY OF INDIAN EDUCATION

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### ABSTRACT

*Education is the process of learning, or getting of knowledge, skills, values and habits of essential needs of life. It occurs through any experience that has an effect on the way one thinks, feels or acts. Indian education has many facets. These are formed by different institutions that existed from historic times to the present day. Like the culture and traditions of India, the Indian education system also has a rich history of its own.*

*In the ancient times, the education was imparted orally by the scholars and the information was passed on from one generation to the other. When the letters were developed, it took the form of writing on the palm leaves and the barks of trees. This also led to the spread of the written literature. Then the Gurukul system of education came into existence. These were the traditional residential schools of learning which were typically in the teacher's house or a monastery. At that time education was free, the students from well-do families paid the Gurudakshina as a voluntary contribution after the completion of their studies.*

*In the different eras, knowledge was imparted on various aspects of the religion, the scriptures, the philosophy, the literature, the warfare, the statecraft, the medicine, the astrology and the history. The education was widespread in the 18<sup>th</sup> century, with a school for every temple, mosque or village in most regions of India. The school had the student representatives from all sections of the society.*

*The present system of education was founded by the British in the 20<sup>th</sup> century, by the recommendations of Macaulay. It had western style of content. After independence, the education became the responsibility of the States and the Central Government. They coordinated the technical and higher education by specifying the standards. In 1964, the Education Commission started functioning with 11 Indian members and 5 foreign members.*

*The Central and the State Government formulated various education policies, of which, NPE 1986 and revised POA 1992 envisaged the free and compulsory education should be provided up to the age of 14 years before the commencement of 21<sup>st</sup> century. So, both western and our traditional models mixed together to form a different entity. Thus Indian Education was shaped by influences and institutions in various periods throughout the history.*

*Keywords: Education, Indian education system, Ancient times, Macaulay Minutes, Education policies.*

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### INTRODUCTION OF EDUCATION

Education is the process of acquiring developed by learning process in training a child or a person. Education is a comprehensive term. Its implications are rich and varied. It is, therefore, very difficult to give a single meaning to education. However, to enter into the domain of education, it is essential to understand what 'Education' is.

### NATURE OF EDUCATION

1. Education is **life-long process**- Education is life long process because every stage of life of an individual is important from educational point.
  2. Education is a **systematic process**- It refers to transact its activities through a systematic institution and regulation.
  3. Education is the **development of individual and the society**- It is called a force for social development, which brings improvement in every aspect of the society.
  4. Education is **modification of behavior**- Human behavior is modified and improved through educational process.
  5. Education is a **training**- Human senses, mind, behavior, activities; skills are trained in a constructive and socially desirable way.
  6. Education is **instruction and direction**- It directs and instructs an individual to fulfill his desires and needs for exaltation of his whole personality.
  7. Education is **life**- Life without education is meaningless and like the life of a beast. Every aspect and incident needs education for its sound development.
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8. Education is a **continuous reconstruction of our experiences**- As per the definition of John Dewey, education reconstructs and remodels our experiences towards socially desirable way.
9. Education is a **power and treasure** in the human being through which he is entitled as the supreme master on the earth.

### **EDUCATION SYSTEM IN INDIA**

The Indian education system has evolved to a great extent from the Vedic days to today's computer age and e-learning. However, there is one thing that remains common between the two scenarios, and that is the **importance of education**. As Indians, our parents have always been emphasizing on the importance of education. However, the education scenario wasn't this way ever since the existence of man. The Education system has evolved considerably from the Vedic Times to now and only for the better. So let's have a look on it.

#### **TIMELINE**

##### **VEDIC ERA (3000 B.C. to 500 B.C.)**

The system of education which was developed during Vedic period is known as the Vedic system of education. During this period, the Brahmins had gained their command over education. The education was completely under the individual control of the Gurus. The gurus themselves arranged for lodging and boarding of the students. The students used to pay Gurudakshina to their teachers according to their financial position.

The aims of education were inculcating religion, achievement of absolute which he himself is, and it was recognized that the entire visible world is fully pervaded with the absolute, development of knowledge, acquaintance and observance of social and national duties, preservation and development of culture, moral and character development, education of livelihood, arts and skills.

The students were taught language, grammar, numerology, agriculture, cattle rearing, arts, skills, economics, politics, medical science, exercise, Gurukul organization, Vedic literature, ethics and training in activities like control of sense organs, religion based conduct, mode of worship etc. The methods of teaching were oral method, thinking method and manas (reflection) method. The teachers and students enjoyed a father and son relationship.

##### **BUDDHIST ERA (500 B.C. to 1200 A.D.)**

The Buddhist period occurred after the Vedic period. When in Vedic period, harsh class system and rituals became excessive, these were opposed. In 563 BC, Mahatma Buddha took birth. And Buddhism was started by Gautam Buddha. He taught the principle of a religion which was based on the analysis of actual problem of life. The aims of education was physical development for good health, development of knowledge, education about compassion and kindness, preservation and development of human culture, character formation, vocational development. Students were trained in the eight fold path namely right view, right resolve, right occupation, right speech, right behavior, right effort, right contemplation and right meditation to achieve salvation.

In Buddhist education primary, higher and bhikshu education were organized in Monasteries and Viharas. After completing the education of twelve years, the monk at the age of 20 years had to undergo the Upasampada ritual and then he becomes the permanent members of the Sangha.

Teaching methods were lecture method, question answer method, logic and conference method. Activity oriented subjects were taught by demonstration, imitation and practice method. Students had to reside in Monasteries and Viharas. Teachers were like father figure to students. They looked after the administration of Monasteries and Viharas and organized teaching work while students carry out the different tasks as advised by their teachers.

##### **ISLAMIC ERA (1200 A. D. to 1700 A.D.)**

After the Islamic invasion of India from Persia and Asia Minor, and the establishment of Islamic theocratic monarchies under Mahmud of Ghazni in A. D. 1001, Muhammad Ghorī in A. D. 1175, the educational institutions of the Hindu and the Buddhist religion were destroyed paving their ways for the development of the Muslim education in India.

During medieval period, Muslim rulers started a new system of education. At that time, by education was meant what was taught at Maktabas and Madrasas. The main aim of Muslim education was development of knowledge, spread of Islamic culture and Islamic religion, development of character and morality, loyalty to the Government, education of arts, skills and vocations.

Knowledge of alphabets, 30 section of Quran, reading, writing, mathematics were given to children. Special practice in Arabic and Persian languages and their literature, Islamic law, Unani Medicine, Islamic literature,

various arts, skills and vocations were included in the syllabus. In the Muslim education different teaching methods were adopted to teach different subjects at different levels.

In the Medieval period, discipline referred to obeying the teachers and compliance to the rules. Corporal punishment was given and at the same time there was a provision of reward for disciplined students. Teachers loved their students and taught them with great concern. Students also respected their teachers and obeyed them out of fear.

### **BRITISH SYSTEM OF EDUCATION ( The Pre- Independence Era 1800 A.D. to 1947)**

After the downfall of the Muslim rule, Britishers came to India and established the East India Company but soon the reign of the government reached the hands of the British Parliament. During this period western science and literature made good progress through English medium. By the time the British came to India as traders of the East India Company and to spread their religion with the attempt of Christian Missionaries. The Modern System of Education in India was started to take place with the efforts of Britishers.

### **EDUCATIONAL ACTS AND LAWS DURING BRITISH ERA**

#### **CHARTER ACT OF 1813**

In 1813, the charter came for renewal in the British Parliament and as a result three articles were added – **(1)** Missionaries of any European country will have full freedom to visit India to propagate Christianity and to expand education there. **(2)** It will now be the responsibility of East India Company to organize education in the areas under its rule. **(3)** A sum of not less than one lakh of rupees each year shall be set apart and applied to the revival and improvement of literature and the encouragement of the learned natives of India and for the introduction and promotion of a knowledge of the science among the inhabitants of the British territories in India.

#### **ANGLICISTS – ORIENTALISTS CONTROVERSY**

The Anglicists – Orientalists controversy had its origin in the Charter Act 1813. The terms literature and the learned natives were not clearly defined in the section 43 of this Act. **Orientalist Group** – Mostly the senior and the experienced officials of the company belonged to this group. According to them, the term literature meant Indian literature and the term learned natives meant the scholars of Indian literature. **Anglicist Group** – This group contained mostly the young officials of the company. For them, the term literature and learned natives in the Charter Act 1813 meant Western literature and the learned natives of the western literature respectively.

#### **MACAULAY MINUTES 1835**

The Anglicists and Orientalists controversy could not be solved even after 20 years in the new Charter Act of 1833. On June 10, 1834 Lord Macaulay came to India as a law member of the Governor General's Council Lord William Bentinck. The Governor General appointed him the president of the public instructions and asked him to render his opinion on three points: **(1)** how to spend rupees ten lakh per annum on education **(2)** to define the terms literature and learned natives **(3)** to solve the anglicists - orientalist controversy. **He submitted his report and mentioned that** the word literature meant only English literature and not Sanskrit or Arabic or Persian literature. The word learned natives meant a scholar who is learned in the Locke's philosophy, Milton's poetry that is English literature.

#### **WILLIAM BENTINCK RESOLUTION**

Lord Bentinck seriously went through the Macaulay's report and declared the new education policy of the British Government on March 7, 1835. The major declarations were: **(1)** All Government fund appropriated for the purpose of education would be best employed on English education alone. **(2)** The educational institutions of Sanskrit, Arabic, Persian shall not be closed down. The economic grants for their teacher's salary and student's scholarship will continue as before. **(3)** In future no expenditure will be made on the printing and publication of Oriental literature. **(4)** The money so saved will be spent on the education of the English language, literature and Western knowledge and Science.

#### **DOWNWARD FILTRATION THEORY**

**This theory meant**, "Education is to be filtered to the common people. Drop by drop the education should go to the common public so that at due time it may take the form of a vast stream which remained watering desert of the society for long times and high class of people should be educated and common people gain influence from them". **Its basic causes** are: **(1)** The company needed various types of workers to run the business and government. They wanted to have cheap servants who work in different capacities. **(2)** The government did not have enough money to take the responsibility of educating the masses. **(3)** If the standard of living and ideas of the people of higher classes in society could be changed through the English education then the people of the

lower classes also be influenced and they shall grow loyal to the British government. (4) If educated high class people are given higher posts in government services then naturally they will use their influence for controlling the masses from going against British Government.

#### **WOOD'S DESPATCH 1854**

The company has to take orders after every 20 years from the British Parliament and in each order something was written about the education in India. Therefore when time for the Charter of 1853 came, the directors of the company thought for laying down a definite policy in regard to educational matters of India. So a Parliamentary Committee was appointed to survey the educational progress in India. As Mr. Wood was chairman of the Board of Control, so the declaration was Christianized as Wood's Educational Despatch.

The recommendations of the Despatch are as follows:

1. It proposed the setting up of primary schools (Vernacular languages) at lowest level, High schools (Anglo Vernacular) and Colleges (English medium) at district level.
2. Establishment of Institutions for training teachers on English model.
3. Universities on the Model of London University were proposed for Madras, Bombay and Calcutta. Each University should have a Senate, Chancellor, Vice-chancellor and fellows nominated by the government.
4. Female education was to be encouraged by the Government.
5. The system of grants-in-aid was recommended to help Private enterprises. However, the grants were conditional based on the principle of Religious neutrality.
6. Comprehensive system of scholarship was recommended.
7. More attention was to be given to Elementary education.
8. Director of public instruction was to be appointed in every province.

#### **HUNTER'S COMMISSION 1882**

Hunter Education Commission was a landmark commission appointed by Viceroy Lord Ripon with objectives to look into the complaints of the non-implementation of the Wood's Despatch of 1854; the contemporary status of elementary education in the British territories; and suggest means by which this can be extended and improved. This commission, headed by Sir William Wilson Hunter, had submitted its report in 1882. The Hunter Commission report is considered to be an important stage in history of education in India. Most of its recommendations were accepted by the British Government which resulted in the devolution of elementary education. This significantly reduced the British element in elementary education. In 1882, the Punjab University was established which lessened the burden over Calcutta University. Between 1882 to 1901, the number of students enrolled in primary and secondary schools increases substantially.

#### **WARDHA SCHEME OF EDUCATION 1937**

On July 31, 1937, Gandhi had published an article in the Harijan. Based upon this article, an all India National Education Conference was held on October 22 and 23, 1937. The conference is called Wardha Educational Conference and the president of this conference was Gandhi himself. Resolution at Wardha Conference:

1. Free and compulsory education to be provided for 7 years at a nationwide scale.
2. Mother tongue should be the medium of instruction.
3. Through out this period of 7 years, the education should be around some forms of manual and productive work and for this purpose a handicraft must be chosen, based upon the environment of the child.
4. This system would generate the remuneration of the teachers.

#### **BASIC EDUCATION COMMITTEE UNDER Dr. ZAKIR HUSSAIN**

Following Wardha conference, a committee under Dr. Zakir Hussain was appointed to formulate the scheme of the basic education. The aim of the basic education was to develop the qualities of the ideal citizenship and more aspect should be given to the Indian culture than the literacy. There should be NO PLACE for English in the curriculum. There was no place for religious education in this scheme. The most important point was the economic goals of the basic education, which would develop by the manual handicraft of the children for a period of 7 years. This was not accepted by Muslim League, for religious education was of utmost importance.

**THE EDUCATION SYSTEM AFTER INDEPENDENCE ( 1947 TILL DATE)**

On August 15, 1947 India attained independence from the British domination. This gave the people of the country the first fullest opportunity to mould their educational policy according to the needs of the nation in the fast changing times. Since 1947, Education Department in the centre has developed in a full - fledged Ministry under the Central Government. The education at the state level is the responsibility of the State Government; the Union Government is concerned only with the coordination and determination of academic standards in respect of higher education, research and scientific and technical education.

**THE UNIVERSITY EDUCATION COMMISSION (1948-49)**

After independence, the first significant step taken by the Government of India in the field of education was the appointment of the University Education Commission in 1948 under the Chairmanship of Dr. Sarvapalli Radhakrishnan. The Commission was appointed by the Government of India to go into the problems and prospects of Indian University Education and to suggest improvements and extensions that might be considered desirable to suit the present and future requirements of the country. The Commission was appointed in November, 1948 and it submitted its report in August, 1949.

The Report of the Commission is a document of great importance as it has guided the development of university education in India since independence. The Inter-University Board of Education and Central Advisory Board of Education recommended to the Government of India that an All India Commission on Education should be appointed to inquire into the requirements of the higher education in India and to put forward the recommendations for the re-organization of the University Education system in the light of the requirements of the country and its traditions.

In subsequent years, **several commissions and committees were also appointed by the government for educational restructure and changes in the system of education in India.** Some of them are:

1. Report of the Education Commission 1964-66
2. National Policy on Education, 1968
3. Draft Policy on Education, 1978
4. National Commission on Teachers-II, 1983
5. Challenge of Education: A Policy Perspective, 1985
6. National Policy on Education, 1986
7. National Policy on Education : A Programme of Action, 1986
8. Towards an Enlightened and Human Society – A Perspective Paper on Education, 1960
9. National Policy on Education : A Programme of Action, 1992

**SECONDARY EDUCATION COMMISSION (1952-53)**

After achieving the independence in 1947, both the public and the Government began to take keen interest in the development of secondary education. The university Education Commission also remarked that our secondary education remained the weakest link in our educational machinery and it needed urgent reforms. The Central Advisory Board of Education at its 14th meeting held in January 1948 recommended the appointment of a commission to examine the prevailing system of Secondary Education in the country and to suggest measures for its reorganization and improvement. In view of these considerations, the Government of India set up, the Secondary Education Commission in 1952, under the Chairmanship of Dr. A. Lakshmanaswami Mudaliar.

**KOTHARI EDUCATION COMMISSION (1964-66)**

Kothari Education Commission, 1964-66, was the sixth commission in the history of commission in India. The Five Years Plan, started after independence helped the growth of the country in many areas. However, the execution of these plans expresses the inherent weakness due to which the expected success was not being achieved. Education appeared to be one of areas which indicated many problems that needed our efforts for immediate solutions. To improve the educational set up the government constituted two commissions after independence which we have discussed earlier. The recommendations of these two commissions could not be succeeded in its full implementations. Consequently, the defects in the area of education persisted. In order to remove these defects, the government had to appoint a new education commission to advise the government on national pattern of education along with general principles and policies for the development of education at all stages.

**NATIONAL POLICY ON EDUCATION**

The National Policy on Education (NPE) is a policy formulated by the Government of India to promote education amongst India's people. The policy covers elementary education to colleges in both rural and urban India. The first NPE was promulgated in 1968 by the government of Prime Minister Indira Gandhi, and the second by Prime Minister Rajiv Gandhi in 1986. The government of India has appointed a new committee under K. Kasturirangan to prepare a Draft for the new National Education Policy in 2017. The main objectives behind this policy are free and compulsory education, development and protection of all the Indian languages, equality of educational opportunities, identification of gifted children, provision of work experience and national service scheme, science education and research, education in agriculture and industries, reform in examination system, part time education and correspondence curriculum, expansion of literacy and adult education and sports and games.

**MODERN EDUCATION AT PRESENT**

Modern day education is aided with a variety of technology, computers, projectors, internet, and many more. Diverse knowledge is being spread among the people. Everything that can be simplified has been made simpler. Science has explored every aspect of life. There is much to learn and more to assimilate. Internet provides abysmal knowledge. There is no end to it. One can learn everything he wishes to. Every topic has developed into a subject. New inventions and discoveries have revealed the unknown world to us more variedly.

**CONCLUSION**

The Indian education system has to pass many ups and downs since the early ages. The vast changes and development have mainly occurred during the pre – independence or British era. Some of which contributions are till now continuing in the present education system.

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**“LIFE SKILLS EDUCATION”: AN EFFECTIVE TOOL FOR EMPOWERING TEACHERS AND STUDENTS**

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**ABSTRACT**

*Today's world witness global challenges like communal hatred, terrorism, economic disparities, materialism, health hazards and human value crises. Un-employment, fear of job security, job sustenance, cut-throat competition in academics are some of the major concern for youth and students. Inability to tackle emotions, conflicts, frustration, anxiety act as catalyst for undesirable behaviour. To overcome this, we need a socially responsible education system which not only support but also inculcate such skills that enable students to live a better life.*

*Life skills are those competencies that assist people in functioning well in the environment in which they live. Life Skills have been defined by WHO as “Ability for adaptive and positive behaviour that enable individuals to deal effectively with the demands and challenges of everyday life.”*

*Life-skills education refers to a behaviour change, or behaviour development approach designed to address balance of three areas: knowledge, attitude and skills. – UNICEF*

*It has been globally proved that Life skill education have a positive effect in empowering the individuals to manage issues and challenges effectively in their life. This paper will throw light on need and importance of life skills education also methods and approaches to teach life skills.*

*Keywords: Life skills, Life skills education, Global Challenges, Empowering Teacher and students*

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**INTRODUCTION**

Teachers role in education used to be confined to a defined curriculum, specific instructions on how to teach and standard teaching methods for all students. With time this role evolved from beyond just executing lesson plan to a multifaceted role. Their job is to counsel students, help them learn how to use their knowledge and integrate it into their lives so they will become valuable members of society. Teachers are encouraged to adapt learning methods to each individual student's learning needs, to challenge and inspire them to learn. The role of a teacher is clearly more than just planning and executing lesson plans. The role of teacher has grown beyond than just being an instructor to be a facilitator of knowledge.

Today's world witness global challenges like communal hatred, terrorism, economic disparities, materialism, health hazards and human value crises. Un-employment, fear of job security, job sustenance, cut-throat competition in academics are some of the major concern for youth and students. Inability to tackle emotions, conflicts, frustration, anxiety act as catalyst for undesirable behaviour. To overcome this, there is need of a socially responsible education system which not only support but also inculcate such life skills that enable students to live a better life.

**LIFE SKILLS AS PRESCRIBED BY WHO**

Life skills are those competencies that assist people in functioning well in the environment in which they live. Life Skills have been defined by **WHO** as “*Ability for adaptive and positive behaviour that enable individuals to deal effectively with the demands and challenges of everyday life.*”

Life skills are those abilities which help individual to grow in physical, mental and emotional aspects and to be competent to face challenges and difficulties in life. Following are the **Ten Core life skills as prescribed by World Health Organisation:**

1. **Self-awareness-** It is an ability to identify one's own strengths, weaknesses, desires and dislikes. Developing self-awareness can help us to recognize when we are stressed or feel under pressure.
2. **Empathy-** To have a successful relationship with our loved ones and society at large, we need to understand and care about other peoples' needs, desires and feelings. Empathy is the ability to imagine what life is like for another person.
3. **Critical thinking** - It is an ability to analyze information and experiences in an objective manner. Critical thinking can contribute to health by helping us to recognize and assess the factors that influence attitudes and behaviour, such as values, peer pressure and the media.

4. **Creative thinking**–It is a novel way of seeing or doing things that is characteristic of four components – fluency (generating new ideas), flexibility (shifting perspective easily), originality (conceiving of something new), and elaboration (building on other ideas).
5. **Decision making** –It helps us to deal constructively with decisions about our lives. This can have consequences for health. It can teach people how to actively make decisions about their actions in relation to healthy assessment of different options and, what effects these different decisions are likely to have.
6. **Problem solving**– It helps us to deal constructively with problems in our lives. Significant problems that are left unresolved can cause mental stress and give rise to accompanying physical strain.
7. **Interpersonal relationship skills** help us to relate in positive ways with the people we interact with. This may mean being able to make and keep friendly relationships, which can be of great importance to our mental and social well-being. It may mean keeping, good relations with family members, which are an important source of social support. It may also mean being able to end relationships constructively
8. **Effective communication** means that we are able to express ourselves, both verbally and non-verbally, in ways that are appropriate to our cultures and situations. This means being able to express opinions and desires, and also needs and fears. And it may mean being able to ask for advice and help in a time of need.
9. **Coping with stress** means recognizing the sources of stress in our lives, recognizing how this affects us, and acting in ways that help us control our levels of stress, by changing our environment or lifestyle and learning how to relax.
10. **Coping with emotions** means involving recognizing emotions within us and others, being aware of how emotions influence behaviour and being able to respond to emotions appropriately. Intense emotions like anger or sadness can have negative effects on our health if we do not respond appropriately.

#### NEED FOR LIFE SKILLS EDUCATION

*Life-skills education refers to a behaviour change, or behaviour development approach designed to address balance of three areas: knowledge, attitude and skills.*– UNICEF

Life skills are essential for a well-balanced life. They are necessary in order to maintain equilibrium between personal and professional life of teachers and for personal and academic life of students. Knowledge of life skills empower individuals to translate knowledge, attitude and values into abilities.

To survive the ever-increasing pace and change of modern tech-savvy life that has a predominant impact on our education, professional and personal lives, teachers and students need life skills to cope up with stress and emotions such as frustration, fear, anxiety and similar.

Life skill education strengthens teacher pupil relationship as well as pupil -pupil relationship. It helps in achieving desirable behavioural changes in students. Socialisation process among learners improves due to life skill education. It leads to meaningful interaction among teachers, learners and school community which in turn bring about a healthy school environment.

Development of life skills enhances critical and creative thinking abilities which in turn helps in effective decision making and problem solving. Life skills are essential for the promotion of healthy child and adolescent development; primary prevention of some key causes of child and adolescent death, disease and disability; socialization; preparing young people for changing social circumstances

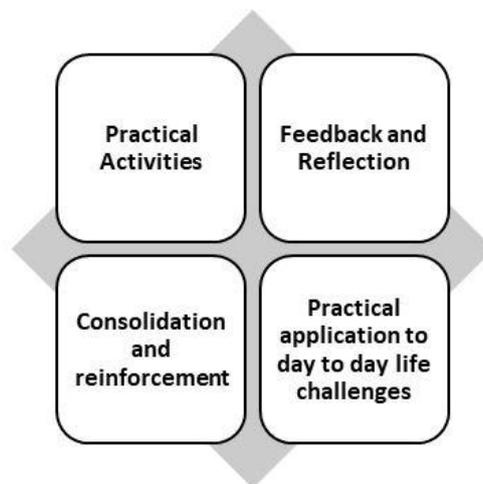
Life skills education contributes to basic education; gender equality; democracy; good citizenship; child care and protection; quality and efficiency of the education system; the promotion of lifelong learning; quality of life; the promotion of peace.

**The National Curriculum Framework (NCF) 2005** has emphasised on constructive learning experiences, and on the development of an inquiry-based approach, work-related knowledge and broader life skills.

**Central Board of Secondary Education (CBSE), in 2005, introduced life skills education as an integral part of the curricula through Continuous and Comprehensive Evaluation (CCE)** for classes 6 to 10 and has developed life skills manuals for teachers teaching classes 6, 7 and 8.

#### METHODS AND TECHNIQUES FOR INCULCATING LIFE SKILLS

The methods used in teaching of Life Skills builds upon the social learning theory and on what we know of how young people learn from their environment; from observing how others behave and what consequences arise from behaviour. It involves the process of Participatory learning using 4 basic components:



Following methods are proved to be beneficial in inculcating Life skills in learners directly or indirectly :

- **Class discussions:**The class examines a problem or topic of interest with the goal of better understanding an issue or skill, reaching the best solution, or developing new ideas and directions for the group.Provides opportunities for students to learn from one another and practice turning to one another in solving problems.
- **Brainstorming:**Students actively generate a broad variety of ideas about a particular topic or question in a given, often brief period of time.Allows students to generate ideas quickly and spontaneously. Helps students use their imagination and break loose from fixed patterns of response
- **Role plays:**Role play is an informal dramatization in which people act out a suggested situation. Provides an excellent strategy for practicing skills; experiencing how one might handle a potential situation in real life; increasing empathy for others and their point of view; and increasing insight into one's own feelings.
- **Educational games and simulations:**Students play games as activities that can be used for teaching content, critical thinking, problem solving and decision making and for review and reinforcement. Simulations are activities structured to feel like the real experience.
- **Case studies:**Teachers present a case or dilemma andthe students come out with suggestions to solve the caseor conflict posed. Teacher should ensure that enough timeis provided to the students in groups to discuss and studythe case and present the views.
- **Story telling:**The instructor or students tell or read a story to a group. Pictures, comics and photo novels, filmstrips and slides can supplement. Students are encouraged to think about and discuss important (health related) points or methods raised by the story after it is told.
- **Debates:**In a debate, a problem or issue is presented to the class, and students must take a position on resolving the problem or issue. The class can debate as a whole or in small groups.Provides opportunity to address anissue in depth and creatively

## CONCLUSION

It has been globally proved that Life skill education have a positive effect in empowering the individuals to manage issues and challenges effectively in their life. To be successful in their personal and professional lives teachers as well as students need life skills education. It helps them to be independent,multitasking,resourceful and self-confident.it helps them to think critically and creatively, to take effective decision and solve problems, build healthy relationships, communicate effectively and cope up with stress and emotions. Life skills education is an effective tool for empowering teachers and students to act responsibly, think critically and creatively, take initiative and helps them to sustain in this highly competitive era. Life skill education is beneficial for an individual as well as society, benefits such educational, social, cultural, economic and health related benefits enhance the prosperity of society.

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**A COMPARATIVE STUDY OF CONTINUOUS COMPREHENSIVE SYSTEM OF EVALUATION AND UNIFORM SYSTEM OF ASSESSMENT**

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**ABSTRACT**

*Evaluation is a very significant aspect of modern system of education. It influences the students' achievement motivation and future prospects. Continuous Comprehensive Evaluation (CCE) system was implemented by CBSE in 2009. Continuous and comprehensive evaluation refers to a system of school-based assessment of the students throughout the year on a continuous basis. It is comprehensive as it covers all aspects of students' development. It comprises formative and summative assessment of the students. Formative assessment of 40 marks includes assessment of Class work, homework, assignments, project work and unit tests. Summative assessment (60 Marks) is based on two term end examinations. These marks are later converted to grades in accordance with 9 point grading system.*

*Recently, certain changes have been made in the evaluation system. CCE pattern has been discontinued and Uniform System of Assessment has been introduced from classes VI to X in all CBSE affiliated schools from 2017-18. This system aims to bring uniformity in evaluation system in all CBSE affiliated schools. Under this system 20 marks are allocated for Periodic Assessment and 80 marks for End Term Exam. This paper aims to make a comparative analysis of the erstwhile Continuous Comprehensive Evaluation (CCE) system and the present Uniform System of Assessment with a view towards bringing further improvements in the system.*

*Keywords: Continuous Comprehensive Evaluation, Uniform System of Assessment*

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**INTRODUCTION**

Evaluation is a very significant aspect of education system and plays a major role in deciding the future career progression. It also has a great impact on students' confidence and achievement motivation. Continuous Comprehensive Evaluation (CCE) system was implemented by CBSE in 2009 till class X. The system also made Class X board optional for students. Continuous and comprehensive evaluation refers to a system of school-based assessment of the students throughout the year on a continuous basis. It is comprehensive in the sense that it covers all aspects of students' development. It comprises formative and summative assessment of the students. Formative assessment includes assessment of Class work, homework, assignments, project work and unit tests. Summative assessment is based on two term end examinations. Maximum Marks a student can score- 40(formative assessment) + 60(summative assessment) = 100 Marks. These marks are later converted to grades.

Recently, certain changes have been made in the evaluation system. CCE pattern has been discontinued and Uniform System of Assessment has been introduced from classes VI to X in all CBSE affiliated schools from 2017-18. This system aims to bring uniformity in evaluation system in all CBSE affiliated schools. Under this system 20 marks are allocated for Periodic Assessment and 80 marks for End Term Exam. The periodic assessment has 10 mark test based on syllabus covered till announcement of test date, five marks for notebook submission and five marks for subject enrichment activities, which include activity-based learning.

**NEED OF THE STUDY**

The decision to do away with the CCE pattern has evoked a mixed response and fuelled the speculation that boards will bring back a lot of pressure and stress on students. Following are some important questions which must be answered:

1. What were the reasons to change the Continuous Comprehensive Evaluation (CCE) system?
2. Why were the Board Exams for Class X reintroduced?
3. Was the system not evaluating the students properly?
4. Were there some strengths in CCE system, which should still be continued?
5. What features of the new system of evaluation i.e. Uniform System of Evaluation are different compared to C.C.E system?
6. Which system- C.C.E or Uniform System of Assessment is more beneficial for students?

Only after critically analyzing the various aspects of CCE and Uniform System of Assessment, steps should be taken to incorporate the strengths of both these systems of evaluation to make the present system more effective. The present study is a step in this direction.

**OBJECTIVES**

- (1) To analyze in detail the various aspects of Continuous Comprehensive Evaluation (CCE) system.
- (2) To study in detail the various aspects of Uniform System of Assessment.
- (3) To identify the strengths and limitations of CCE system of evaluation.
- (4) To identify the strengths and limitations of Uniform System of Assessment.
- (5) To make a comparative analysis of the Continuous Comprehensive Evaluation (CCE) system and Uniform System of Assessment
- (6) To enlist suggestions to further bring improvements in the present Evaluation System being followed in CBSE affiliated schools.

**CONTINUOUS COMPREHENSIVE SYSTEM OF EVALUATION**

CBSE had introduced the system of continuous and comprehensive evaluation (CCE) in 2009 and implemented it from academic session 2010-2011. Board exams that were earlier compulsory for all class X students have been made optional. Continuous and comprehensive evaluation refers to a system of school-based assessment of the students *throughout the year* on a continuous basis. It is comprehensive in the sense that it *covers all aspects* of students' development. The new system of evaluation comprises formative and summative assessment of the students. This assessment is conducted over two terms namely first and second term of an academic session.

*Formative assessment* - Class work, homework, assignments and project work are assessed twice in each of the terms. Each evaluation carries 10 marks. So a maximum of 20 marks are awarded in each term. Thus 40 marks are awarded under formative assessment. Distribution of marks is given below in a concise manner:

I term- Maximum Marks-10+10 = 20 Marks

II term- Maximum Marks-10+10 = 20 Marks

Total Marks (under Formative Assessment) = 40 Marks

*Summative assessment*- It is based on term end examinations. At the end of the first term, a term end exam of 30 marks is conducted. At the end of the second term, a term end exam of 30 marks is conducted. Thus a maximum of sixty marks are awarded under summative assessment. Distribution of marks:

I term- Maximum Marks- 30 Marks; II term- Maximum Marks- 30 Marks

Total Marks (under Summative Assessment) = 30+30= 60 Marks

Thus, students can score a maximum of 100 marks in the following manner:

Maximum Marks = 40(formative assessment) + 60(summative assessment) = 100 Marks

In this system, students are awarded marks for their performance and these marks are later converted to grades. Nine point grading system is followed to evaluate the students of classes IX and X. In this grading system there are nine grades corresponding to a range of marks.

The practice of declaring compartment or fail has been discontinued. The results of candidates are declared in two categories:

- (i) Eligible for qualifying certificate (QUAL)
- (ii) Eligible for improvement of performance

All candidates even if they have failed in all subjects have five chances to improve their performance without having to repeat a year.

It also includes assessment of co-scholastic and co-curricular areas which include a wide range of aspects ranging for life skills and values to physical education. These are assessed on a 3 point grading scale.

**Strengths of C.C.E are as follows**

- The content covered in one semester was not asked again in the next semester so it was easier to study.
- It was good for those students who were unable to perform well in academics as they could realize their potential and got good grades through other activities.
- Formative assessment conducted on a continuous basis provided regular revision.

- The system catered to overall personality development of students as it gave weightage to both scholastic and co-scholastic aspects.
- There was more flexibility in terms of wide range of activities from which certain activities could be selected for evaluation
- It gave more opportunities to pass the exams as compared to marking system
- There is lesser stress and anxiety due to no detention policy and board exams made optional. Dropout rate is reduced. Students need not dropout due to fear of failure in exams. Even if a student fails in all the subjects, he is given five chances to improve his performance.

**Weaknesses of C.C.E are as follows**

- Constant scrutiny of activities, home-work, projects and academics throughout the year put them under lot of pressure.
- Too much burden was there for teachers as not only lot activities had to be organized and evaluated but also lot of records had to be maintained.
- This system did not provide thorough revision as once the first semester exams were over, students didn't review that portion again.
- Students were more relaxed as under this system as they knew that they couldn't be detained. Also, they got marks for other activities and didn't take exams very seriously.
- Many of the activities, projects and models were copied from internet or even bought from the market. Such malpractices on part of students not only helped them gain good marks without any effort but also caused deterioration of values
- More time was spent on evaluation rather than teaching leading to lowering of standards.
- Competition was lesser, as many students got the same grade. The toppers who put in more efforts were not able to get due recognition and felt demotivated.
- There was scope for biasness and subjectivity in giving grades, especially on the criteria of values.
- Lot of time was spent in co-curricular activities, so lesser time was available for teaching.
- This system is being adopted in schools under CBSE. Many other boards in India have different evaluation system. The performance of students being assessed in different ways can't be compared. This creates problems at the time of admission for higher studies on the basis of class X results.

**UNIFORM SYSTEM OF ASSESSMENT**

Uniform System of Assessment has been introduced from classes VI to X in all CBSE affiliated schools from 2017-18. This system aims to bring uniformity in evaluation system in all CBSE affiliated schools. Under this system, there are two semesters. 20 marks are allocated for Periodic Assessment and 80 marks for End Term Exam in each semester. The periodic assessment has 10 marks for periodic tests, five marks for notebook submission and five marks for subject enrichment activities, which include activity-based learning. These marks are further converted into grades.

Board Exams have been reintroduced for Class X. The format of assessment is same for classes IX and X. Students getting marks 32 and below are considered failed. Co-Scholastic activities include Work Education, Art Education and Health and Physical Education which are graded on a 3 point grading scale

**COMPARATIVE ANALYSIS: CONTINUOUS COMPREHENSIVE SYSTEM vs. UNIFORM SYSTEM OF ASSESSMENT**

The philosophy behind CCE was good but the way it was being implemented led to a lot of flaws. After a critical analysis, the major weaknesses identified under C.C.E, which have been removed under Uniform System of Assessment are as follows:

- 1) The CCE system had increased the pressure and workload on teachers. The paper work and record keeping had increased at the cost of quality of teaching. This loophole has been removed under Uniform System of Assessment where documentation is reduced and teachers can focus on improving the quality of teaching
- 2) Students were also pressurized under C.C.E due to continuous scrutiny of their assignments, activities, unit tests, projects, presentations and end term exams. Under Uniform System of Assessment there are lesser number of activities.

3) Also, no detention policy under C.C.E made average students relaxed as they were able to scrape through without a thorough study of the scholastic areas. Fear of failure in Class IX and Board Exams in class X under Uniform System of Assessment has made students take studies more seriously in these higher classes.

4) There was some variation in the criteria of evaluation being followed by schools under C.C.E system. But the Uniform System of Assessment has brought uniformity in the system.

However, the C.C.E system also had some merits, which were not continued under Uniform System of Assessment. These are as follows:

1. In C.C.E, weightage given to a wide range of co-curricular and co scholastic activities led to overall personality development of students. Also adequate emphasis was laid on life skills and values. However, these important aspects are not given much emphasis under Uniform System of Assessment
2. Stress of board exams and fear of failure was removed which made learning more joyful under C.C.E. But with reintroduction of Board Exams and Pass/Fail system, students are again under undue pressure to perform well.
3. Weightage to Formative assessment was 40% under C.C.E while it is only 20% under Uniform System of Assessment. This may lead to lack of consistency and regularity amongst students on a continuous basis and more burden during end term exam in the present system.

### CONCLUSION

To conclude, both the C.C.E system and Uniform System of Assessment have their own strengths and limitations. Hence it is suggested to make the following modifications in the present system to overcome its loopholes:

- Some modifications should be made in the board exam system to give 50% weightage to internal assessment and 50% weightage to board exams to reduce its phobia and stress.
- Life skills and values should be given more emphasis.
- Weightage to Formative Assessment should be at least 30% to make students consistent throughout the year.
- To make learning joyful , enhance the practical skills , problem solving skills and equip them better to face life situations , present system should incorporate more practical activities related to daily life situations

It is recommended that these features should be incorporated in the new system of evaluation being implemented from 2017-18 session so as to make the present system more effective and beneficial for the students.

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**TEACHER EDUCATION: A STEP TOWARDS SUSTAINABLE DEVELOPMENT****Rohini Jain**

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**ABSTRACT**

*The world has been undergoing a major shift with respect to environment and the global climate. Countries are now focusing on environmental and climatic issues in order to move towards sustainable development. The concept of sustainable development was defined in 1987 by the Brundtland Commission earlier called as United Nations World Commission on Environment and Development. Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Out of the 17 Sustainable Development Goals (SDGs) adopted by the global community, quality education is ranked fourth - and is considered instrumental for achieving the success of all other 17 SDGs. The role of education is primary in creating awareness about the need for sustainable development. It is only when the young generation will show concern for a better global environment, that actual measures can be taken in that direction. This paper attempts to understand the concept of sustainable development across the world and how teacher education can play a major role in educating student teachers in this direction.*

*Keywords: Sustainable development, environment and global climate, teacher education.*

**INTRODUCTION**

In 1987 the United Nations World Commission on Environment and Development released the report 'Our Common Future', commonly called the Brundtland Report. It explored the ways in which both political and public participation can come together and manage environmental resources efficiently and effectively for achieving sustainable human growth, progress and survival. The report included what is now one of the most widely recognized definitions of sustainable development. According to the report,

Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts:

1. The concept of 'needs', in particular, the essential needs of the world's poor, to which overriding priority should be given; and
2. The idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs.

- World Commission on Environment and Development, Our Common Future (1987)

After the Brundtland Report was released and published, the Brundtland commission held an international conference to track the progress made by respective nations towards Sustainable Development. This is what led to the United Nations Conference on Environment and Development, which became historically famous as the 'Earth Summit', in Rio de Janeiro, in 1992.

The **Decade of Education for Sustainable Development (DESD) 2005-2014** was an Education for Sustainable Development (ESD) initiative of the United Nations. Teaching and learning for Sustainable Future is a UNESCO program for ESD, ensuring professional development of pupil teachers, teachers and curriculum developers. All Teacher Education Institutions, therefore are in more than one way related to this.

Education for sustainability is the practice of learning how to achieve global and local sustainable communities.

The objectives of the DESD are to:

- Facilitate networking linkages, exchange and interaction among stakeholders in ESD;
- Foster increased quality of teaching and learning in ESD;
- Help countries make progress towards and attain the Millennium Development Goals through ESD efforts;
- Provide countries with new opportunities to incorporate ESD into education reform efforts.

The UN Decade of Education for Sustainable Development took place from 2005 to 2014, with the goal of emphasizing education in all its forms (formal, non-formal and informal) as an indispensable element for achieving sustainable development. In November 2014, as the official follow-up to the DESD, UNESCO launched the Global Action Programme (GAP) for ESD with the overall objective to scale up action on ESD worldwide.

Two basic and very important objectives of GAP on ESD are:

- Reorienting education and learning so that everyone has the opportunity to acquire the values, skills and knowledge that empower them to contribute to sustainable development; and
- Enhancing the role of education and learning in all relevant agendas, programmes and activities that promote sustainable development.

#### **HOW TEACHER EDUCATION CAN HELP IN SUSTAINABLE DEVELOPMENT :**

Education, both formal and informal, is one of the main agencies to help towards achieving the goals of the concept of sustainable development. It is through carefully designed educational programs that the required teaching-learning opportunities can be created in **teacher educational institutions (TEIs)** for our young student teachers of today. They can be sensitized to think about not only saving the present environment from deterioration but also about conserving it for the future.

Some of the important components of the curriculum for teacher educational institutions, that must be integrated with the overall educational program in TEIs are :

1. Recycling of wastes : Information can be provided about the possible waste recycling techniques to students by TEIs and colleges and creating ways to implement these ways in the institutions itself.
2. Improved sanitation in slums : Sensitising student teachers about the actual situation of slum areas can be done by arranging for visits to slum areas. Inculcating of the need for better sanitation facilities in slums can be done effectively by such educational activities.
3. Reducing carbon footprints : Student teachers can be made aware of depleting ozone levels in the atmosphere and its harmful effects. They can be adequately informed about ways to reduce the carbon emissions so as to reduce the detrimental effects on the environment at present and also in future.
4. Climate protection awareness: Holding special lectures and workshops by environmentalists for explaining to student Teachers, how and why the climate is undergoing drastic changes. Talks on Global Warming and other such related issues can be held. Students can be told how they can help in climate protection.
5. Save water campaigns: Student teachers can be sensitized about the judicious use of water to prevent its wastage.
6. Biodiversity preservation : students can be sensitized why it is important to preserve all species in the ecosystem. Visits to biodiversity parks such as the Yamuna Biodiversity Park can be arranged.
7. Swachhata Abhiyan : Under the Swachh Bharat Abhiyan campaign, measures can be taken by students for a clean environment.
8. The Energy and Resources Institute, TERI, took the following initiatives in schools of Goa:
  - i. The GREEN Olympiad: is a programme open to all schools across the state of Goa that tests the environment quotient of school students.
  - ii. Awareness campaign on waste segregation: A source segregation campaign in association with Margao Municipal Council and Goa Pollution Control Board was undertaken in 2008.
  - iii. Project STARS : Sustainability Tracking, Action and reporting in Schools, In association with the Dempo Group of Companies, STARS seeks to inspire and encourage schools to practice the principles of sustainability by focusing on its environmental and socio-cultural performance.
  - iv. Project SEARCH (Sensitization, Education and Awareness on Recycling for a Cleaner Habitat): A programme that encourages students to recycle dry (inorganic waste) in schools and homes was carried out in around 20 schools across the state of Goa from 2013-2016.

Similar programs and projects can be initiated in TEIs also to prepare better informed teachers for the future

#### **CONCLUSION**

India is the only country to have passed one of the landmark judgments passed by the Supreme Court of the country directing all education boards to include environmental education (EE) as part of the formal education system at all levels, including our **Teacher Education Institutions (TEIs)**.

Besides the different ministries of the GOI, a large number of government and non-government Organizations are diligently working to promote ESD. Most notable amongst them are Centre for Environment Education

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(CEE) which is the nodal agency for implementing UNDESD in India; The Energy and Resources Institute (TERI); Bharati Vidya Peeth (BVP); Centre for Science and Environment (CSE); World Wide fund (WWF); National Council for Science Museums (NSCM) and National Council of Education, Research and Training (NCERT).

Teacher Education certainly plays a key role in making the world on a larger scale, towards Sustainable Development , as well prepared and well informed teachers will then be able to meet the needs of the 21<sup>st</sup> century, extremely effectively.

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4. UN Decade of Education for Sustainable Development.

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**ASSESSMENT OF LEARNING THROUGH AUDIO-VISUAL MEDIA - A STEP TOWARDS INCLUSIVE EDUCATION**

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**ABSTRACT**

*This paper looks at the issue of school inclusion by referring to the concept of Universal Access to Education. It focuses on the strong potential Audio-visual media to avoid any kind of discrimination among students. The paper also discusses that teachers play a fundamental role in capitalizing the opportunities offered by new technologies to support the full inclusion of all students in mainstream education systems. In this perspective, to view the Universal Access to Education as a concrete and reachable goal, teachers need to be aware of the technology potential and they must be able to acquire the suitable knowledge and operational skills to choose and use appropriately this type of resources.*

*Another matter discuss in this paper is about the role and impact of Audio-visual media which helps in making inclusive education effective. Educational research provides strong evidence that Audio-visual media provides both a medium and a powerful tool in supporting inclusive practice. It provides wide-ranging support for communication, assisting many learners to engage with learning, including those who are hard to reach, and helps to break down some of the barriers that lead to under-achievement and educational exclusion.*

*The basic idea is, in fact, that the process of inclusion can be fostered by means of new technological tools, but in turn it requires changes and modifications in educational contents, approaches, structures and strategies.*

*Keywords: accessibility, inclusion, best practices, educational multimedia, universal access, resources, audio-visual media, teachers, schools*

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***“Democratization of knowledge indicates knowledge for anyone, anytime, anyplace.”***

***-APJ Abdul Kalam***

**INTRODUCTION**

**Inclusion** in education is an approach to educating students with special educational needs. Under the inclusion model, students with special needs spend most or all of their time with non-disabled students. Implementation of these practices varies. Schools most frequently use them for selected students with mild to severe special needs.

All students, irrespective of their sex, race, color, ethnic or social origin, genetic features, language, religion or belief, political or any other opinion, membership of a national minority, property, birth, disability have the right to have equal opportunity in education and to be considered as being an integral part of the learning community. Recognition of this right has recently given rise to the concept of “inclusion”, which has gradually substituted that of “integration”.

Inclusion is actually a much stronger concept which refers to “the right to belong to the mainstream” leaving behind the idea that only few learners have “special needs”, the social model of inclusion rather suggests that all students as individual learners present their own peculiar characteristics and have their own specific educational needs. Such a perspective implies a Copernican revolution which brings all students at the very heart of the educational process whilst the school is required to adjust and change in order to enable each of them to participate in the life of the school to the best of their abilities.

“Inclusive education - according to UNESCO - means that the school can provide a good education to all pupils irrespective of their varying abilities. All children will be treated with respect and ensured equal opportunities to learn together. Inclusive education is an on-going process. Teachers must work actively and deliberately to reach its goals”.

Inclusion should, then, be regarded as a long-lasting process which requires time, effort, competence and strong conviction by all those involved in students' education, first and foremost, by teachers.

- Inclusion is less about children with disabilities and more about the education system is designed and implemented so that all children belong and receive a quality education.
- Teacher's attitude towards learners with a disability is paramount for integrating them into inclusive environments.
- The key role of teachers in giving birth to and maintaining a truly inclusive classroom is unquestionable, but such an important mission also requires that suitable, effective and barrier-free educational means should be employed.

From this perspective, technology resources are promising; there are grounds for maintaining that they help most students overcome barriers to learning, thus increasing their school achievement, together with their autonomy, willingness and self-esteem.

Indeed, educational research provides strong evidence that: "Technology is both a medium and a powerful tool in supporting inclusive practice. It provides wide-ranging support for communication, assisting many learners to engage with learning, including those who are hard to reach, and helps to break down some of the barriers that lead to under-achievement and educational exclusion".

In the following, it is argued that documenting the accessibility of educational multimedia products and offering access to best practice can (may) help teachers to make effective use of technology tools in order to support all students' full inclusion. We begin with an analysis of main teachers' wants/needs to this respect, and then explore the benefits of audio-visual aids.

First of all we will discuss about the qualities/essentials/features of the good audio-visual aids and then need to understand the principles of using the audio-visual media.

#### **Features of Good Audio-Visual Aids**

- \* They should be meaningful & purposeful.
- \* They should be accurate in all respects.
- \* They should be simple.
- \* They should be cheap.
- \* As far as they should be update.
- \* They should motivate the learner as well as to the teacher also.

Audio Visual aids or Devices or technical devices or technological Medias or learning devices that helps the teacher to clarify, establish, co-relate & co-ordinate accurate concepts, interpretations, appreciation and enable him to make learning more concentrate, effective, interesting, inspirational, meaningful, vivid etc. The Audio – Visual Aids always helps in competing the triangular process i.e. Motivation, Clarification and Stimulation.

#### **Principles of Audio Visual Aids**

For effective teaching to take place a good method must be adopted by the teacher. The teacher is always free to choose effective audio visual aids in the class room. Of course there are also certain principles of Audio – Visual Aids in teaching methodology. They are as follows:

##### **i. Principle of Selection:**

- a. The age level
- b. Other personality angles
- c. They should have specific educational values
- d. They should help in the realization of learning desired objectives.

##### **ii. Principle of Preparation:**

- a. As far as possible, the local material should be used in the preparation of aids.
- b. The teacher also must receive training in the preparation of aids.
- c. The teacher him/herself can prepare some aids or can take help of students also.

- iii. **Principle of Physical Control:** This is concerned with the arrangement of keeping aids safely and also to facilitate to their lending to the teachers for security.
- iv. **Principle of Proper Presentation:**
  - a. Teacher should carefully visualize the use of teaching aids before their actual presentation.
  - b. They should be well acquainted themselves with the use & manipulation of the aids to be shown in the class room.
  - c. The aids should be displayed properly. So that, all the students can see it, observe it, and can derive maximum benefits from it.
- v. **Principle of Response:** This is the important principle. This tells the teacher guide the students to respond actively to the audio visual stimulus so that they derive the maximum benefits in learning.
- vi. **Principle of Evaluation:** This Principle stipulates that there should be continuous evaluation of Audio Visual Aids materials & accompanying techniques in the light of desired objectives.

The aims of teaching with technological medias is clearing the channel between the learner and the things that worth learner. The teacher must "show" as well as "tell". The Audio –Visual Aids provides significant gains in informal learning, retention and recall, rethinking and reasoning, activity, interest, imagination, personal growth & development.

Here are the most important values of the proper use of Audio Visual Aids which defines its clear impact on inclusive education:

- i. **Best Motivator:** They are the best motivator. The students' works with more zeal & interest.
- ii. **Clear Image:** Clear image takes place when we, touch, handle, experience it.
- iii. **Variety:** "mere Chalk & Talk" do not help. Audio –Visual Aids give variety & provide different tools in the hands of teacher.
- iv. **Freedom:** When Audio –Visual Aids are employed, there is a great scope for children to move about talk, laugh & comment upon. Under such atmosphere the students work because they want to work, & not because the teacher wants them to work.
- v. **Opportunities to Handle:** Many students always get a chance to handle the aids.
- vi. **Helpful in Attracting the Attention:** Attention is the true factor in any process of learning & teaching Audio – Video Aids helps the teacher in providing proper environment for capturing as well as sustaining the attention and interest of the students in class room.
- vii. **Savings in Energy & Time:** Due to effective implementation of "principle of Presentation", a good deal of energy & time of both the teacher & students can be saved.
- viii. **Realism:** The Audio –Visual Aids gives the real touch to the learning situation.
- ix. **Encouragement to healthy class room interaction:** Audio-visual aids through variety of stimuli, motivational, provisional of active participation of students, a good experience always encourage healthy class interaction between teacher and the learners.
- x. **Scope of education as a mass scale:** The audio-Visual aids like radio, tape, television etc. always plays role in spreading mass education.
- xi. **Positive environment for creative discipline:** A balanced, rational, scientific use of Audio – Visual Aids develops, motivates, experience, attract the attention of the students and provides a variety of creative outlets for the utilization of their tremendous energy & keeps them busy in class room work.

This overall classroom environment becomes conducive to creative discipline. Grossly, we can say that there are various types of Audio – Visual Aids i.e. traditional as well as modern aids of audio-visual aids. But at the same time it is important to take into account that the Audio-Visual Aids do not play role up to disseminate the information, data, facts, clues but also they influences the mentality, psychology, grasping level of the students in the class room. On the other hand they greatly motivate, inspire the teachers to adopt the latest, creative, innovative aids. The scope of audio-visual aids is not only up to procuring & make presentation. Of, course it is technically part of teaching. But other side also it conveys us that it is a tool to know through effective communication in triangular process i.e. Motivation, Stimulation, and Clarification. Apart from this it is also

important that to think about difficulties & problems in the use of aids. There are certain problems like lack of enthusing for the use of teaching aids teacher, non-availability of aids in school, lack of facilities for the use of aids-electricity, room, furniture etc., lack of training on the part of teacher in the use of aids, costly nature of aids, lack of storage facility & non availability of suitable teaching aids in the regional languages.

### CONCLUSIONS

Many children are still excluded from, and within, education for a variety of reasons. In this paper we have addressed the issue of promoting e-inclusion through e-learning by discussing the role and impact of audio-visual media aimed at helping teachers to make effective use of technological educational products.

Since inclusion requires new approaches to teaching and learning (Lacey, 2006) as well as the use of valuable, new, suitable and barrier-free tools it's fundamental to give teachers appropriate advice and support to face this challenge.

The basic idea underpinning the discussion is, in fact, that the process of inclusion can be fostered by means of new technological tools: it requires, in turn, changes and modifications if required in educational contents, approaches, structures and strategies.

Teachers play a key role at these ends: innovation cannot cross the school's threshold without their deep and active involvement and the educational effectiveness of any technological means mainly depends on the choices they make, in order to take a significant step forward, e-tools need to be carefully selected and their use needs to be appropriately planned and conceptually well integrated in mainstream activities.

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**SKILL DEVELOPMENT IN INDIA****Dr. Sushma Rani<sup>1</sup> and Swati Chaudhary<sup>2</sup>****HOD<sup>1</sup> and Research Scholar<sup>2</sup>, Department of Education, Lingaya's Vidhyapeeth University****ABSTRACT**

*We have started Digitalization of education and try to educate each citizen of India digitally so skill development is important to propagate digitalization of each field. If we have well skilled population, sufficiently equipped with knowledge is not only necessary to sustain economic growth, but is also an important for integrated growth in every field because literate and skilled citizens able to stand for benefit most from the employment opportunities which provide growth to our India. Skills and knowledge are the driving forces of economic growth and social development for any country. Nowadays India has approximately over 460 million internet users, India is the second largest online market after China. By 2021 there will be about 635.8 million internet users in India. Therefore it is important to give them right direction to use internet and develop their skills. In this paper author focused on Professional ethics of teachers in schools, Non-profit organizations in societies and communities. Fundamentally, the Author has find that teachers are not enough digitally literate and Non-profit organizations are not ready to work on ground level even government wants to create a manufacturing-hub only. This paper based on descriptive research with qualitative and quantitative research method and higher secondary school teachers and ngo's are targeted population.*

**INTRODUCTION**

Education system makes expectation and it should by no means aim at creating simple advertises. Over a period of time lots of alters have take placed in dissimilar zones of economy including the education system. Education zone different any other zone has seen numerous phases in its development. From Guru-Shishya method of accomplishing the class in open garden under the trees to locked class room lectures, presentation type of teaching with the help of laptops touch-screen projector to online notes for teachers and students, at the present instantaneous Whatsapp communications is the exhortation among the learners. Whatsapp has increased the position of individual genuine prescribed signifies of communication among the students and the teachers. Indian subcontinent is included of different population belonging to diverse national and cultural clusters. Away from each other from these differentiations, the mainly noticeable divergence that creates a through impact on the Indian education system is the variety in purchasing power and affordability of the Indians. This paper is aimed at investigating the nature and capability of the teachers in modern education process in India. Digitalization means alteration of the entire information kinds (texts, sounds, visuals, video and other data from various sources) into the digital language. Discussing the observable fact of digitalization it should be note down those different analysts and predict specialists consider change of education procedure into digital phase as the twisting point in the history of education. The United Kingdom is supposed to be the first in the world to introduce required software engineering and IT education in the program for schoolchildren aged 5 - 16 years in 2015. The stated approach was accepted by the European Union. EU 2020 education improvement approach, accepted in 2014, centers on digital technologies. This research paper appeared to reflect remarkable accomplishments in IT region with its center purpose being combination of state-of-the-art IT-solutions in education institutions' activities across EU.

**OBJECTIVES**

1. To the study of availability of mobiles, laptops and other smart gadgets.
2. To the study of importance of Digitization in Education
3. To find out the challenges in skill development
4. To the study of digital literacy rate in teachers at higher secondary level.

**LITERATURE REVIEW**

• **Digital Strategy for Schools 2015-2020 ENHANCING TEACHING, LEARNING AND ASSESSMENT:** The Digital Strategy for Schools provides a rationale and a Government action plan for integrating ICT into teaching, learning and assessment practices in schools over the next five years. This Strategy builds on previous strategies in the area of ICT integration and it takes cognizance of current education reforms that are already underway within the education system at primary and post primary level. This Strategy focuses on the schools' sector and the proposed actions are designed to embed ICT more deeply across the system to enhance the overall quality of Irish education. Care has been taken, in developing the Strategy, to ensure that the actions align with and complement strategies and initiatives to

support digital learning in the further education and higher education sectors. In developing this Strategy, the Department adopted an evidence-based approach. A Census Report was initially conducted to provide base-line data on the levels and usage of ICT by teachers and schools. A raising from this research a consultative paper, Building towards SLearning with the launch of a public consultation phase. One hundred and twenty-four (124) submissions were received from various organizations and individuals on the content of the consultative paper and these views were further augmented by face-to-face meetings with a number of stakeholders groups.

- **The role of e-learning, the advantages and disadvantages of its adoption in Higher Education by Nelly Abaidoo and Valentina Arkorful:** earning involves the use of digital tools for teaching and learning. It makes use of technological tools to enable learners study anytime and anywhere. It involves the training, delivery of knowledge and motivates students to interact with each other, as well as exchange and respect different point of views. It eases communication and improves the relationships that sustain learning. Despite some challenges discussed, the literature has sought to explain the role of e-learning in particular and how eLearning has made a strong impact in teaching and learning. Its adoption in some institutions has increased faculty and learner's access to information and has provided a rich environment for collaboration among students which have improved academic standards. The overall literature which explains the advantages and disadvantages of e-learning suggests the need for its implementation in higher education for faculty, administrators and students to enjoy the full benefits that come with its adoption and implementation.

- **E-Learning in Rural India by Ms. Swati Yadav and Dr. Anshuja Tiwari:** has been said that development of any society depends on its access to information and the same is applicable to rural India too. E learning can work wonders in this direction and help the socially marginalized community to attain their entitlements. Launch of Digital India Program is a welcome step in this direction. It is anticipated that with dedicated leadership, willpower and control and an integrated framework comprising of the government, technology industry and society, E-learning interventions in the rural areas will undoubtedly pave way towards sustainable growth.

- **E-LEARNING TECHNOLOGY FOR RURAL CHILD DEVELOPMENT by Lect. S.K.Nayak and Dr.Kalyankar N.V.** they said Education is essential for everyone. The increased rate of literacy will push the nation towards development. E-learning is a useful way to provide education. Considering India's rural areas, problems create difficulties to implement the e-learning system but strategies can be developed and implemented. Before the actual implementation of e-learning system, the understanding of different components and their functions is necessary. A policy should be developed to implement the functions and to maintain the quality of system. With introduction of Web Based Education at school level rural children and youngsters will grow as "Computer kids". Their exposure will get increased due to which the Knowledge level will get definitely improved. Web-Based Learning adds human support through on-line tutor, thereby extending the scope of what can be effectively taught into many new subject areas. It will enhance the quality of education in our country at all levels i.e. Primary, Secondary and Higher Education. Computers are reshaping children's lives, at home and at school, in profound and unexpected ways. Common sense suggests that we consider the potential harm, as well as the promised benefits, of this change. E-learning technologies have great potential to spread learning however, the benefits of these technologies have to reach the rural masses of India, and otherwise they will be one of the causes of the Digital Divide. Development in the 21st century will be determined, to a large extent, by the thought, action and imagination of young people. This in turn, is shaped by the education system.

- **Role of e-Learning in a Developing Country like India by Deepshikha Aggarwal,** has been said that "In a market such as India where the concept is still new, one crucial element that will make a difference in generating a good response is marketing. This not only holds true for segments such as government and education, but for the corporate sector as well. Experts are of the view that there needs to be a mindset for the adoption of e-learning. The other point is content. If content providers are giving off-the-shelf content, there should be scope for customization since each organization has its own needs. Regions without university education can access universities in other regions via the Web, a solution much cheaper than building university infrastructure. In underdeveloped countries, e-learning can raise the level of education, literacy and economic development. This is especially true for countries where technical education is expensive, opportunities are limited, and economic disparities exist. However, one of the problems with e-learning in India is the lack of course content, especially outside the mainstream focus areas of IT education, English-language content, and tutorial-like courses. There will be high demand for people who can develop multi-lingual courseware that addresses various topics. The social implications of online learning center around one primary requirement that students need to feel a part of the class, regardless of where they are located physically or geographically. The

—missing of connection to the other students in the class and with the institution can impact the success of an online student. Bottom line: the Indian market is still young, but it will continue to adopt the concept of e-learning in order to meet its communication needs and seize business opportunities".

• In “**Empowering Indian Citizens Through Technology, September 2015**” ASSOCHAM suggested “To realize the vision of promoting inclusive growth through empowerment of citizens, it is important to reach out to citizens in the remotest of locations and make them part of India’s growth story. Globally, technology has been the greatest enabler in causing disruptive change. India’s story is no different, and the use of digital technologies to educate and empower citizens is being seen as a game-changer. Given India’s vast expanse and differences in demographics across the nation, there is also a vast difference in the level of adoption among the citizenry.”

### **METHODOLOGY**

According to researchers and educationists, very shortly digital layout will eradicate the require for handwriting lectures and speech, when every student will get all the materials and will be capable to progression them on a real-time basis and work interactively. The entire texts will be accessible online and stored in a digital ‘cloud’ (Apple iCloud alternative), which will sensibly remove some negative results related to absence from school. In accordance with the nature of the present study, quantitative and qualitative Method was used for the collection of information. The tools were administrated upon the sample and the descriptive data was collected by the investigator. Qualitative and quantitative method is concern with present situation, event, and practices with relationship among variables. These methodologies have been classified differently by various authors.

### **FINDINGS/ RESULTS**

In this research paper we find that teachers are not enough literate to digital literacy at higher secondary level. Teachers are feeling over saturated and overloaded with digitalized education. Demanding digital technologies access in education increases a number of sensible issues. Same like with the other innovations, the world of online technologies is associated with certain contradictions and unforeseen circumstances. For instance parents, who want their child to spend less time at the computer, should change their mind, since education process modernization presupposes the opposite. According to Lego analysts “Each education situation and each child is unique; therefore parents and teachers should determine how much time their child can spend in front of a computer. Therefore it’s vital to interactively find solution regarding correct “digital” behavior of a student and teachers work out “digital activity rules”. Although this statement is directly related to video games, teachers presentations for classrooms it can be applied to any “digital” activity, so much the more, as it was stated above, we face the tendency of ‘binding’ the games and education, especially in higher secondary schools.

According to the findings teachers should know about current technologies related to Education and also capable to use educational applications those are easy to access on smart phones and laptops. Another issue in this circumstance is wide-ranging digitalization of student’s life, forecasted by various scientists and educationists. Today digital technologies are not available in rural areas therefore mostly teachers and students are not enough literate by the technologies. At the same time the society demands turn to rise, forcing us to adapt to the 21st century progress. Nowadays the ability to adapt to new technologies is a success prerequisite, as stated in the 8-th issue of newsletter of global recruiting company Heys. (Digital Dawn, 2015).

Currently Khan Academy is a multi-field global education institution with numerous administrative and more than 80 teachers, actively engaged in their activities with wide range of classes: from online lectures and seminars for students of the academy to extensive archive of special digital records, used as a huge digital library. The key feature of the Academy is a simplified form of participation and presence at classes (personal presence, distant online or extra-mural offline). This academy concept was established when Sal Khan worked as hedge fund analyst in California, and in between was engaged in online teaching of people from all over the country. At a certain stage he collected enough records and his colleagues from Google advised him to upload these records on YouTube channel. Soon after Khan received feedback from people from all over the country and from abroad, particularly from Singapore, who asked for more uploads. The channel turned to be the starting point for today’s Khan Academy.

Today Khan Academy is a large organization with its base comprising more than 400 million lessons for students in 28 languages. In 2015 the number of languages reached its peak point according to statistical data, with more than 2.5 billion users connected to the Academy’s server. And finally more than 50000 teachers worldwide have cooperated with the Academy since its establishment. But the point is to be noted that it only limited to urban areas not for rural areas because there is no availability of smart gadgets and digital literacy educators as well.

Technologies have today redefined the conservative role of the teacher. No longer does a teacher enjoy a positive knowledge remaining over the taught. In fact, the knowledge gap is speedily narrowing between the teacher and the taught. Present teachers will require reinventing themselves by embracing technology and continuously developing to remain ahead of the knowledge curvature.

They will have to contact to their students and play catalysts for transferring information into knowledge. Application of academic perceptions in genuine life circumstances, make sure worldwide absorption and creating a vigorous and favorable learning environment will be challenges that innovative technologies can never overcome.

## **DISCUSSION**

However it should be noted that the stated education digitalization trend in India may soon raise numerous challenges for Teachers and schools. First it's digital separate between provision of information gadgets to teachers, who make lively use of them, and conventional approaches to studies. Therefore, digitalization has both realistic followers and unconvinced challengers. Thus, Y. Shikova considers that new explanations will personalize the education procedure, adjusting the program to a student's person requires. If a technology contributes to better understanding, memorizing, knowing or using any content, it's worth considering and implementing, even if it presupposes fundamental changes in academic activity. Alexander Sidorkin is however more skeptical about it, stating that Indian education digitalization process embodies major challenges; thus educational resources digitalization (for instance, tutorials) doesn't keep up with informatization of education process. The education lacks initiatives related to intensification of education communicative component using information technologies, as well as basic ideas. This area requires sustained flow of breakthrough ideas and venture projects (Internet and education, 2015). The aforementioned innovative tendencies will govern education development in terms of globalization and, as it was stated above, will influence all sides of education and will be followed by major changes in academic activity, i.e. class work and in classrooms. Classroom activities of the future will not represent a typical picture of a teacher in front of its students, sitting at desks arranged in perfect rows. Introduction of innovation digital technologies will change not only teaching form and tools, but its environment as such.

## **RECOMMENDATIONS**

### **1. Teachers should be permanent at their positions**

For the most part of the teachers in schools in rural areas are run by the government. They assign ad hoc teachers, instead of permanent ones, who are poorly paid as compared to the huge remuneration of a full-time Trained Graduate Teacher (TGT).

Furthermore, promising career views, which is pretty a motivation booster, is just about nothing for the non-permanent teachers. This leads to dissatisfaction, eventually resulting in a lack of teachers because they move away to more permanent jobs.

### **2. Lack of Responsibilities**

Lack of responsibilities of teachers and school authorities has raised the rate of absenteeism. School Development and Management Committees (SDMCs), comprising parents and members of the local community, have been entrusted with the responsibility of overseeing teachers and their duties. However, research suggests that the committee has hardly seen success.

### **3. Teachers should not take burden of non-teaching duties**

Additionally, non-teaching duties like appointment in invigilation often keep teachers away from schools and classrooms. Moreover, teachers often have to report for duty far away from their home. With an insufficient transportation system in rural India, the distance only adds to their despairs and often consequences in absenteeism.

### **4. Freedom from Teachers' Eligibility Test**

Some states have freed from candidates from Teachers' Eligibility Test (TET) as only 20 per cent of the candidates obvious it. This wrong move, in an effort to rapidly fix the matter of lack of teachers, has depreciated the feature of education in the states even further. However, quality of teachers is a most important concern not only in these states, but across the whole country.

### **5. Teacher training should emphasized on digital skills**

There are many private teacher-training institutes in India, but the quality and lack of emphasis on digital skills in the training they provide is unsatisfactory. Continuous professional development is a motivator for teachers, and adequate awareness is required in this regard.

**CONCLUSION**

We might state that modern educational system faces creative crisis. Class work and lessons do not contribute to students' personal initiatives to learn something new, establish objective connection between their knowledge and the real world, use their imagination to look for nonstandard answers to standard questions instead of using stereotypic models. Therefore the classroom of the future should not be a place of knowledge transfer, but a place of investing in the mind of students, focusing on creativity and innovation and not on repeating ready-made opinions or mechanical response to test questions. The stated approach to education will force us to reconsider curricula and integration of conceptual and actual innovations. New curricula should stipulate not only obligatory transfer of facts, but focus on students' reaching certain objectives, namely creativity, imagination and teamwork irrespective of team members' location. Finally, it should be noted that today's global education has faced major transformations, caused by further integration of new digital technologies in academic activity and is actively searching for efficient implementation models, which will compromise with traditions and innovations.

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**EFFECT OF INNOVATIVE DIGITAL INSTRUCTIONAL STRATEGIES ON CLASS PERFORMANCE OF PUPIL TEACHERS**

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**ABSTRACT**

*The most important tool of effective teaching learning process is teaching techniques. The use of innovation and digital equipment in the teaching processes has made learning process very simple, easy and student friendly. Digital innovation has revolutionized the instructional strategies for a sustainable development. Student teachers of today will become qualified teachers tomorrow and the demand for present time is that they should be trained with not only traditional learning methods but also trained them with new digital instructional techniques. Explain the differences between traditional learning methods and innovative techniques and bring awareness of new technique is the aim of our study.*

*The purpose of this exercise is to invigilate the outcomes of Digital instructional strategies on the performance of the teacher's students. This experiment was conducted on a teaching subject Life Skill Education of fourth semester of teacher education program. A sample of 50 students was selected randomly out of 100 students of Semester IV in a teacher training college. Two groups of 25 students each were made. Pre -test was given to both the groups and the results were recorded. One group was taken as a control group which was taught the subject by the teacher who used conventional method of teaching while the other i.e. the experimental group was taught by the teacher who used innovative digital teaching techniques. After two week time of teaching, a post- test was conducted.*

*Keywords: instructional strategies, teaching leaning process, experimental group, pre-test, post test.*

***“The art of teaching is the art of assisting discovery”—Mark Van Doren***

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**INTRODUCTION**

Today's Society is Information Centered Society and the Information and Communication Revolution combined all the people of the world together. This change on the world stage has meant the educationists need to reorganize the entire education process and place the innovation in education. Before the advent of the digital age the teachers were dependent on books and libraries only for reading and teaching. But in current time Technical development has begun a new age of information revolution and education dissemination. Through pressing a button you can gain knowledge about anything, in such a way to calm the curiosity of the children and to make them aware of the new dimension of knowledge is the biggest challenge for today's teachers

**NEED OF STUDY**

Today in most of the school's, the classroom teaching is not limited to Chalk –n- Talk methods. Here the emphasis is given to the interaction between the teacher and students. With the use of digital technology, hard-to-hard subject matter can be explained to students in a simple and interesting form. The innovative techniques included educational videos, power point presentations, movie screening, online lecture, e-learning and online training are being included in classroom teaching. Twentieth century is recognizing by revolution in communication technologies. The advancement of information technology change entire teaching learning process and its affected students as well as teacher too. In today's time, professional competitiveness of teachers is increasing continuously, all the school wants skilled teachers and because of the increasing responsibilities of the teachers in the changing environment getting a good job opportunity is become difficult that's why knowledge of the innovative digital instructional strategy of student teachers is essential for their personal and professional growth.

**SOME INNOVATIVE DIGITAL INSTRUCTIONAL STRATEGIES AND THEIR EFFECT OF STUDENTS LEARNING PROCESS**

- **Educational Videos** Use of educational videos during classroom has improved engagement level of students. Visual content inhence memory and students ability to retain new information. Relevant videos keep student more alert, motivated and focused on particular topic.
- **Mobile Learning:** Mobile learning and BYOD are becoming popular in digital classroom. It enable students to engage with their Multiple device like Tablet, Laptops, smart phones expand the boundaries of learning own comfort.

- **E-Books and Digital Content:** E-Books and Digital Content are enormous for teachers. They are cheaper than the text books and can be updated regularly to provide updated content.
- **Interactive Learning:** student engagement in an interactive environment open new horizons of learning and understanding. Availability of data makes it rich, easy to understand and relate.
- **Process outside of the classroom:** Stimulators bring virtual reality into the classrooms use of periscope or live streaming which offers opportunities to observe various culture and lives around the world.

#### **OBJECTIVE**

- To study the performance of pupil teacher.
- To compare the performance of experimental group and controlled group.

#### **HYPOTHESES**

- There is no significance difference between the performance of the student taught by digital technique and the student taught by conventional method.
- There is no significant difference between mean score of experimental group and controlled group.
- There is no significance difference between clarity of conceptual knowledge of student between experimental group and controlled group.

#### **DELIMITIZATION**

For this study we consider only 100 teacher students of forth semester of teacher training collage. This study organized for a particular subject Life Skill education

#### **SAMPLE**

Sampling 50 student were selected by random sampling out of the total population of 100 students of semester IV of teachers training program .Out of these 50 students again systematic random sampling was done to divide them into two groups of 25 students each. Pre-test was taken. Now one group is the experimental group and other one is called controlled group.

- **Controlled group;** the controlled group was take as a constant and taught by traditional (lecture and discussion) method.
- **Experimental group** Experimental group was taught by the teacher using following digital instructional strategies.
- Power point presentation
- Educational video
- E-Books and digital content
- Personalize Instruction

#### **METHODOLOGY**

According to the nature of objective of study experimental method is more suitable. For further process we divide our sample into two groups excremental group and controlled group

- **Controlled group:** The controlled group was take as a constant and taught by traditional (lecture and discussion) method.
- **Experimental group:** Experimental group was taught by the teacher using Digital instructional strategies.

#### **TOOL USED**

The researcher has used the teacher-made achievement test to collection of data and fulfillment of the objective of the study.

#### **STASTICAL TOOLS**

- MEAN
- STANDERD DEVATION
- T-TEST

**EXPREMENT**

The duration of the experiment was two week in the month of February 2019. According to the planner made by researcher three topics were taken from Life skill Education. Namely Core Life Skill, Key Issue and Concerns of Adolescent students in emerging Indian context. Learning to live together with other living beings. These three topics were divided into two week .initially both the class room were set on the same standard pattern later the researcher rearranged the excremental classroom with modern equipment. After two week time, post test was conducted from those three topics. A remarkable difference was observed between the scores of the two groups.

**RESULTS**

**a) PRE-TEST RESULTS**

S.NO	Control Group Score	S.NO	Experimental Group Score
1	7	1	10
2	11	2	9
3	15	3	14
4	27	4	24
5	10	5	15
6	17	6	11
7	19	7	21
8	16	8	13
9	6	9	16
10	14	10	17
11	24	11	20
12	15	12	19
13	18	13	15
14	15	14	16
15	20	15	19
16	17	16	18
17	14	17	3
18	19	18	16
19	22	19	23
20	21	20	27
21	12	21	10
22	24	22	26
23	14	23	16
24	9	24	13
25	23	25	11

**b) STATICS**

	SCORE	CONTROLLED GROUP N=25	EXPERIMENTAL GROUP N=25
1	MEAN	16.36	16.08
2	SD	5.36	5.52
3	VARIANCE	26	31
4	T-TEST	.33	

**INTERPRETATION**

Pre –test result display a clear similarity between the control group and the experiment group. the mean score are matching;i.e16.36 and 16.08.The value of standard deviation quite similar and variance shows that the scores are equally distributed in the two groups. And the value of t- test is .33 at 0.05 level of significance and this value is less then 1.96 .it means the null hypothesis that there is no significance different between performance of controlled group and experimental group is accepted.

**POST TEST RESULT**

S. No	CONTROL GROUP	S.N.o	EXPERIMENTAL GROUP
1	16	1	24
2	11	2	17
3	22	3	26
4	6	4	29
5	14	5	28
6	17	6	27
7	9	7	25
8	13	8	29
9	23	9	24
10	18	10	20
11	14	11	28
12	15	12	14
13	5	13	25
14	21	14	22
15	12	15	18
16	15	16	16
17	8	17	27
18	11	18	20
19	20	19	26
20	13	20	28
21	19	21	29
22	11	22	23
23	27	23	24
24	10	24	21
25	2	25	28

**STATISTICS**

S. No	SCORE	CONTROLLED GROUP N=25	EXPERIMENTAL GROUP N=25
1	MEAN	14.08	24.41
2	S.D	5.96	4.38
3	VARIANCE	35.57	19.24
4	T-TEST	6.74	

**INTERPRETATION**

- According to the results of post-test there is a large difference between controlled groups mean score and experimental group mean score .The value of mean in controlled group is 14.08 and the value of mean in controlled group is 24.41 and value of standard deviation is 5.96 for controlled group and value of standard deviation for experimental group is 4.38 value of T-TEST is 6.74 at 0.05 level of significance and its value is greater than 1.96,its means the null hypothesis “There is no significant difference between mean score of experimental group and controlled group” is rejected.

By the score of posttest the null hypothesis “There is no significance difference between the performance of the student taught by digital technique and the student taught by conventional method” is also rejected and also we concluded the level of students performance of teaching with the help of digital instructional strategies is much better then teaching by traditional methods and clarity of conceptual knowledge is far batter by using digital instructional strategies.

**CONCLUSION**

With the observation of result of pre- test and post -test conclusion is very clear that digital teaching methods is better than traditional methods and it increases students interest in classroom teaching .clearly of concept and they will be retained longer as compared to those taught with traditional method

With the help of this study researcher recommended that the teaching would be highly effective if the researcher use innovative digital instructional strategies. Hence innovation in digital instruction strategies is very vital tool

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for teacher's students not only their personal development but also their professional competency and career growth.

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**EDUCATIONAL POLICY FOR SUSTAINABLE DEVELOPMENT IN INDIAN SCHOOLS**

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*“Addressing the widespread acceptance or tolerance of corporal punishment of children and eliminating it, in the family, schools and other settings, is not only an obligation of State parties under the Convention. It is also a key strategy for reducing and preventing all forms of violence in societies.”*

*Committee on the Rights of the Child, General Comment No. 8*

**ABSTRACT**

*The use of different forms of punishment in the name of disciplining children is the universal and perhaps a global phenomenon where the incidences of children being punished are globally visible. Perpetuation of violence on children has become a routine culture in the school where powerlessness of the children is consistently misused. The act of punishment has been seen as a common and spontaneous culture of a school. It has been routinized in such way which needs our attention. The use of punishment does not provide children a welcoming environment but even become a significant pushing factor to drop out from the school. The act of Punishment caused by discrimination indicates low status of children in educational context. Largely impacts of different forms punishment has been understood psychologically but this paper to some extent attempted to understand the culture of punishment as a social phenomenon where culture of silence, culture of fear and culture of discrimination and control as socially embedded reality of our education system has been explored. This Paper is based on Secondary Data where theme based analysis from existing literature has been done. An attempt has been made to highlight the negative impact of punishment and discrimination on children. Punishment is seen as an illegal practice which represents unequal power relation between oppressor and the oppressed which further causes discrimination and raise inequalities among them.*

*Keywords: Corporal Punishment, School, Discrimination, Educational Participation, Learned helplessness*

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Each and every child has an equal opportunity to learn and live with dignity but the reality with which child encounters in the school atmosphere denies to avail equal opportunity to live with dignity. Empirical evidences of many of the studies showed the prevalence of various forms of discrimination and punishment not only create hurdle in children's opportunity to access schooling but also hampers their social, emotional, physical, mental and educational development. Punishment is seen as an illegal as well as dangerous tool in the hands of the teachers and other members of the school through which they manifest discrimination and unequal treatment on children of different race, caste, class, gender and religion.

The establishment of National Commission for the Protection of Child Rights and enactment of Right to Education of Free and Compulsory Act (2009) are some of the essential stepping stone to prohibit 'verbal, physical, mental harassments and different forms of discrimination' from our school system under Section 17(1),17(2), 8 and 9 of Right to Education Act (2009). But the crude reality as revealed from the secondary data sources is that even after the enactment of the RTE Act (2009), children are continuously subjected to different forms of punishment and discrimination in various educational institutes in general and schools in particular. Studies reported that children faced discrimination based on socio-economic disparities. Children are humiliated on account of their religious and linguistic differences. A study on 'Inclusion and Exclusion of Students in the Schools and Classroom in Primary and Upper Primary Schools' conducted particularly in six states by Ministry of Human Resource Development in 2011 highlighted the fact that children coming from socially disadvantaged group reported the prevalence of social exclusion in the school premises. Gender and caste based discrimination were higher in their everyday realities. It indicated that schools are seen as social institutes which not only propagate stereotypes but also strengthen the social taboos prevalent in the society. The whole attempt of punishment is largely seen as the inherent politics to keep children of poor and disadvantaged group to remain outside the school environment which negates children's equal rights of participation and other educational opportunities. The practice of punishment completely negates the constitutional principles of human rights. It not only violates the child's right to freedom but also curb child's right to life with dignity.

**BAN ON CORPORAL PUNISHMENT**

Corporal punishment under Right to Free and Compulsory Act (2009) indicates that physical punishment, mental harassment and discrimination not only create hurdles to the right of the child to education but also violate the right to life with dignity. Article 21 of the Constitution, which protects the right to life, has been

modified to include the right to education for children under 14 in Article 21 A, and the right to life with dignity can come only when education shall be the part of life. Corporal punishment, not only violates the child's right to freedom but also curbs child's right to life with dignity. Fear of being subjected to corporal punishment influences the child's right to education as well as the culture of fear not only discourages the children's desire to learn, but may also result into the drop out of the child from the school.

Right to Education Act, (2009) under section 17 (1) and 17 (2) read the provisions to prohibit 'physical punishment' and 'mental harassment' as follows

Clause 17: Prohibition of physical punishment and mental harassment to the child– (1) No child shall be subjected to physical punishment or mental harassment.

(2) Whoever contravenes the provisions of sub-section (1) shall be liable to disciplinary action under the service rules applicable to such person.

Whereas Section 8 and 9 of the RTE Act, (2009) specifically ensures that "child belonging to weaker section and the child belonging to the disadvantaged group are not discriminated against and prevented from pursuing and completing elementary education on any grounds".

The UN Committee on the Convention on the Rights of the Child defines corporal punishment in General Comment No 8 which India has been signatory to as "any punishment in which physical force is used and intended to cause some degree of pain or discomfort, however light. Most involve hitting ('smacking', 'slapping', 'spanking') children, with the hand or with an implement – a whip, stick, belt, shoe, wooden spoon, etc. But it can also involve, for example, kicking, shaking or throwing children, scratching, pinching, biting, pulling hair or boxing ears, forcing children to stay in uncomfortable positions, burning, scalding or forced ingestion (for example, washing children's mouths out with soap or forcing them to swallow hot spices). In the view of the Committee, corporal punishment is invariably degrading. In addition, there are other non-physical forms of punishment that are also cruel and degrading and thus incompatible with the Convention. These include, for example, punishment which belittles, humiliates, denigrates, scapegoats, threatens, scares or ridicules the child."

#### **ESTABLISHMENT OF LEGISLATION AGAINST CORPORAL PUNISHMENT CANNOT BE CONSIDERED AS A SUFFICIENT CONDITION**

The section 17 (1) and 17 (2) prohibits physical punishment and mental harassment but failed to define the comprehensible definition of the physical punishment and mental harassment. Does it include sexual offenses in the Act as per the Protection of Children from Sexual Offenses Act, 2012? This is difficult to figure out what are different forms of mental and physical punishment does RTE Act (2009) incorporate? Who will ensure the complete ban of the corporal punishment? What will be the mechanism through which complete ban of the corporal punishment can be achieved? If anyone was found practicing corporal punishment what will be the procedures through which individual can make a complaint? The Act specifies that the disciplinary action will be taken against the person for practicing corporal punishment, but it has not defined that what will be these disciplinary actions? Since the disciplinary actions are not defined explicitly in the Act it leaves the scope to the individual based on their understanding to interpret the provisions according to their convenience. Provisions in itself ambiguous, it leaves the scope to the audience to interpret accordingly. The provisions do not clearly propose that what educational, administrative, social, legislative measures the state and central government will take to eliminate the practices of corporal punishment particularly from the school setting? How will the state and central government will examine the implementation of the provisions in the educational settings?

A country like India, where corporal punishment is socially approved and socially sanctioned practice how would the concerned local authorities or even state and central government will bring attitudinal change among the parents, teacher and administrative staff of the school? The ban on the punishment under RTE Act is an essential and significant stepping stone, but the provisions are made in such a way that it does not enforce a complete ban on corporal punishment. It neither criminalizes corporal punishment nor impose standardized penalty on teachers or on school authorities for practicing corporal punishment in the school. The lack of intention to penalize school teachers and managements reflects that corporal punishment has been considered as the naturalized everyday reality of the school children. Corporal punishment has been largely seen as the acceptable tool to discipline.

Establishment of legislation can never be a sufficient condition. As Peter Newell also mentioned that "prohibiting all corporal punishment requires the removal of all justification and defense of 'reasonable' punishment or 'lawful' correction, so that children have the same protection as adults." There are many cases

of corporal punishments in school, which go unreported. Does the school provide a friendly environment where a child can make a complaint against the perpetrator? Is there anyone with whom the child can talk confidentially? The answers to most of these significant issues which regularly emerge in the schools are NO. The strong Redressal mechanism is a much needed measure to be taken in schools so that children do not suffer the pain alone in silence.

### **SOCIAL REALITIES IN SCHOOLS IN INDIA- MAJOR HEADLINES**

Studies reported the children faced discrimination based on socioeconomic disparities. Children were humiliated on account of their religious and linguistic differences. A study on 'Inclusion and Exclusion of Students in the Schools and Classroom in Primary and Upper Primary Schools' conducted, particularly in six states by Ministry of Human Resource Development in 2011 highlighted the fact that children coming from socially disadvantaged groups reported the prevalence of social exclusion in the school premises. Gender and caste based discrimination were higher in their everyday realities. SC girls were asked to sweep the floors. The teacher used derogatory remark based on their caste, gender and socioeconomic conditions. Children were made to follow caste and gender based tasks in the school. Children from well off family were reported that they prefer to go back home during lunch hours instead of eating in the school with their other classmates. Even some community denied having school meal if the cook was not of their own community. Discrimination based on gender, Caste, religion, regions were highly prevalent in the schools.

Schools were seen as social institutes which not only propagate stereotypes, but also strengthen the social taboos prevalent in the society. Schools are more interested to preserve and maintain the social orders of the society. The school acts as social institutions that legitimizes the social inequalities and maintain the status quo. A study, 'Child Abuse in India-2007' conducted by Ministry of Women and Child Development, Government of India reported that every two out of three school children faced corporal punishment.

Another study 'Eliminating Corporal Punishment in Schools' conducted by the National Commission for Protection of Child Rights in the year 2009-2010 in seven different states i.e. Andhra Pradesh, Delhi, Orissa, Rajasthan, Tamil Nadu, West Bengal and Madhya Pradesh over 6,632 children of age group 3-17 years. These children were from different types of schools and belonging to different socioeconomic background. Children across different states reported that experiencing one or the other form of punishments are their everyday reality independent of the place and the type of school they study. Findings revealed that only nine children denied of experiences of any kind of punishment in the school setting while 99.86% of children acknowledged that they have received one or the other form of punishment in schools. This study revealed the very important fact that the type of schools (Central school, State run Schools or Private schools) does not create much difference). This indicates that children are subjected to experience punishment independent of the kind of school they study. Children reported the experiences of all three types of punishment, i.e. 'Direct Punishment' - where the body act as the site to inflict pain, 'Verbal punishment' and 'Posture punishment'. Fostering posture punishment is one of the most humiliating punishments where a child has been subjected to experience public humiliation by remaining outside the classroom or asking to stand up on the desk. It generates a sense of shame among children. Children come under the notice of other. It has been reported that children were largely beaten up by a cane. Cane as traditionally can be seen as an instrument to control and threaten the children. This report indicates that 57.5% of children were severely injured as the result of the continued practices of brutal punishment. Boxing of ears (57.4%), made to stand with hands up (42.7%), squatting (41.4%), hair pulled (21.6%), made to stand on one leg (15.2%), wringing the nose (6.8%) and hands wrung (19.2%), mental characteristics/ derisive adjective (81.2%) and caste and community based (10.1%), Slapped on the cheek (69.9%), fingers pressed with pencil in-between (12. %) and getting tied to a chair / table (1.2%) and getting electric shocks (0.4%) etc. were some of the popular forms of practices experienced by children in school settings. Usage of cane, scale and hand were the regular instrument to inflict pain among children. This report discarded the gender based notion that girls are less beaten up in school settings than boys. In fact girls equally reported the experiences of punishment in schools similarly as their male counterpart. 16.2% girls and 15% boys of the state run schools reported that they were not allowed to use toilets on the school premises. Hair pulling was certain practice which was highly practiced in case of girls than boys. Children reported that they were punished for various reasons like for 'academic reasons' like for being unable to do homework, for not bringing class notes, textbooks, for being unable to answer the questions asked, for being unable to put a finger on the text while reading etc. Secondly, children were also punished for performing 'child like behaviour'. They were punished for talking with classmates, for making fun, for secretly eating in the classroom, for being late in coming from the toilet. Children also reported that they were denied to use the toilet. They punished for breaking the norms and rules of the school like not wearing the proper uniform, for missing classes, for running

away from the school etc. They were also punished arbitrarily when the teacher was angry she hit children for no reason.

It is apparently visible for the findings of the above study that the children were not only beaten for their poor academic performances, but also for not being able to fulfil the teacher's demand such as being unable to bring a notebook, being unable to complete homework etc. This indicated that the school acted as a space which legitimizes the culture of abuse in the social sphere. It was found that the school concerned authorities as well as teachers were frequently using abusive language while dealing with undesirable behaviour of the students. These verbal abuses also included derogatory remarks related to the caste and gender of the child. Under Scheduled Castes and Tribes (Prevention of Atrocities) Act, 1989, the Caste and tribe based abuses have been completely banned, but the practices of verbal abuses and discrimination on account of their caste and gender are still prevalent in the school setting. In the above mentioned study children of age group between 3-5 years suffered severely under verbal abuse category. 82.2% of children of age group 3-5 years reported that they were given derisive adjectives based on their mental characteristics even though they were unable to comprehend them fully. 10.1% of children between the age group 3-17 years experienced caste and community based abuses. Children were considered as incapable to learn since they do not possess the similar environment at home with those classmates who come from well off families. Children reported their helplessness and somehow showed their vulnerability to oppose the unequal, unpleasant and painful treatment experienced by them.

In order to increase the intensity of the pain children were asked to remain in a same posture for a longer period of time. The report analyzed verbal abuses into five categories i.e. Based on mental characteristics, caste and community based, relationship abuse, animal based and threatening phrases. With the repeated practice of verbal abuse teachers or the other personnel of the schools not only labels the child into a certain category but also fosters further discrimination based on caste, class, gender, race of the child. The language of the child again became the marker of discrimination. Teachers need to act as the enabling role or facilitator in order to integrate the child's language in the classroom, but in reality teacher is performing the role of prejudices promoter where the teacher is promoting stereotypes inside the classrooms as well as in the mind of the children. Teachers are asked to bridge the gap between the child's home and school language by using the child's mother tongue as the medium of instruction in primary classes as per the recommendation of N.C.F (2005) under the principle of three language formula. Child's use of his or her own language need to be encouraged and integrated in the classroom.

There is legal, constitutional provision to dissent and completely negate use of caste based derogatory remarks but our schools on large were found practicing and abolishing the constitutional principles. Existing literature indicates that these humiliating practices could severely hamper the child's own self image and child's own understanding of his own self concept.

It is visible from the findings of the above study that teachers were largely insensitive towards the socioeconomic background the students. The teacher acted as an oppressor in the classroom who not only suppress the child's biological need to use the toilet, but also victimize the child for being unable to perform according to the established norms and regulations of the school. Child's inability to perform well in the class resulted in a harsh punishment. Unable to bring books and stationeries in the school considered as disrespect towards teacher's authority and further penalized the child. The act of punishment begins at a very tender age of the child. Children were hit by dusters, chalks, sticks, bottles, books, pens. Objects or resources which can be used as the teaching-learning aid or supportive aid in the process of a child's learning, was used as the tool to hit the child.

It can be drawn from the existing literature that children were found most vulnerable participant in the school where least attempt has been made to understand the consequences of the punishment on the children. Different schools may have different infrastructure, fee structure, classrooms and other amenities, but the kind of experiences children were subjected to within the school premises were found more or less similar in nature.

#### **A PUNISHMENT USED AS AN INSTRUMENT TO CREATE FEAR AMONG CHILDREN**

Various studies and reports of newspaper articles indicated that Indian classrooms completely deny children to act like a child. Inappropriate behaviour considered as disobedience and uncivilized. Children are demanded to perform all the tasks of school without questions. Children were asked to submit themselves fully to the school authorities where children are expected to behave like an adult. Children are not treated as children instead they are seen as a body and it is the task of the school authority, particularly the teacher to exercise full control over the child's body and mind. Incidences of electric shocks and beating children with chalks and duster indicate

that any object available in the school premises meant to facilitate child's learning, are used as an instrument to inflict pain on the child's body.

The school consistently negate the space where children's problem can be heard. If the child is unable to perform the required rules or order of the school, the child is under constant threat. Schools are functioning under rule based regulating institution where any mistake or negligence on the behalf of children will be under the subject of harsh punishment. The teacher acts as a governing agency of the institution or performs the role of surveillance where the entire effort of the teacher and principal is to inspect the child's behaviour completely. The entire act of exercising control over children by beating them brutally must not be justified by any argument. It is completely negating children's right to study in a fearless and welcoming environment.

### **SCHOOL ACT A SPACE WHICH IMPARTS THE SKILLS TO BECOME A CONFORMIST**

Existing studies on corporal punishment indicates that school trains the children in such a manner that right words are coming from teachers and students need only to internalize those right words as the words of God. The culture to object the teacher's authority are rarely practiced or even encouraged in the school environment. The school consistently found as an institute which is interested to produce conformist rather than encourage becoming a critical thinker.

Indian classrooms are not considering child as the equal partner for their own learning instead they are in power relations with the teacher where the teacher is the authority figure who constantly monitors the children and children passively accept the continued interventions of the teacher over their minds and bodies. The powerlessness of the children is highly misused. Fear of being punished prevents the child to live life with dignity. It not only impacts on the child's mental health, but also impacts their social behavioural patterns. Kumar (2016) in his book 'Education, conflict and Peace' also says that teacher's demand on children to rote memorize answers and reproduce the same, this practice undermines the whole idea of the constructivist pedagogic approach to learning where children need to provide adequate space in the classroom where the child can explore, create and construct the knowledge of her own. Teacher at the same moment unknowingly kill the curiosity of the child if teacher creates the fearful environment where questions asked by students receive discouragement in the form of punishment.

The whole attempt can be seen as the inherent politics to keep children of poor and disadvantaged group to remain outside the school environment. Largely the culture of silence is the appreciated culture in the classroom, the most silent class considered as the best class of the school. Any attempt to ask a question is considered as the disrespect to the teacher. The school does not enforce the opportunity to question and learn collaboratively with other peers since this whole idea of collaborative learning disrupts the popular culture of silence in the class. The most important aspect here comes that the teacher whose class has been maintained with complete silence is considered as the best teacher. The basic responsibility of the teacher is to maintain pin drop silence in the classroom where there should not be any disruptions or loudness. Even the parents were also found being complaining if the teacher does not beat their child. The whole objective of the teacher is to maintain strict behaviour with children where leniency or friendliness in the nature of treatment with children is never encouraged. The entire role expectations from the teachers also lead them to behave arrogantly to some extent. Sinha (2009-2010) argues this accepted culture of silence in the classroom and highlights that this norm of silence classroom not only prevent 'Quality Education' which National Curriculum Framework (2005) talks about but also discourage the culture of questioning and learning from others.

### **SNATCHES AWAY THE CHILDHOOD OF THE CHILDREN IN THE NAME OF DISCIPLINING THEM**

Often the classroom interaction between teacher and students are not guided by democratic ideas, but it is the imposition of the teacher's power onto the children which snatches away the childhood of the children. The above findings explicitly highlighted that corporal punishment was the continued reality irrespective of their type of school, age and gender. Corporal punishment is the regular common practice to correct the child's undesirable behavior. Teacher instead of acting as a support system for children to learn, were found in most of the cases as impatient in dealing with children. Fear of being punished impact on the children's dignity at a very early age. Various studies reveal that school authorities do not trust on the child's potentialities to learn. The school has been seen as a violent space which inculcates culture of fear among children.

### **CHILDREN ARE SOCIALIZED TO ACCEPT THE PUNISHMENTS ARE MEANT FOR THEIR BETTERMENT**

The NCPDR Study (2009-2010) revealed that that children themselves justified the act of punishment by the teacher. It has been mentioned largely that punishments are means for their betterment and well being. Children

approved their submissions to the teacher's authority. It has been internalized among children that punishment will lead them to perform better in their lives. They are socialized in such manner that the teacher is there to correct them for their betterment. Anyone who disrupts this pre established culture of the classroom are either thrown out of the classroom or penalized for upsetting ritual of a classroom. This whole scenario reflects how children are treated in a classroom and kind of perceptions and attitude we hold towards them. Even fixed timetable, fixed curriculum, seating arrangements, morning assemblies, examinations and observations could be seen as the mechanism to maintain complete control over them. Children's movements within the class are even restricted through tables and desks. These desks create hurdle in their free movements. This is a systematic attempt to maintain control over their bodies and minds. But we cannot forget that there are marked differences between crime and discipline, between terror and penalization and cannot allow schools the perpetuation of violence in the name of disciplining children.

The fear of being evaluated inculcated in the minds of children, which in a way creates barrier towards their inner urge to unfold their natural capacities and potentialities. The teacher performs the role of a judge; she not only judges them, but also further labels them as good, average, poor etc. Children are expected to legitimize the perpetuation of violence and support when the teacher penalizes them. We need to reflect towards the politicization of legitimized culture of violence and introspect our own traditional understanding about who the child is? The orthodox, traditional, and biased understanding of children needs our serious reflections. Various constructive theory highlights on the very fact that children are actively involved in the process of knowledge construction and findings saddens us that this principle of active knowledge construction is highly negated in our Indian classrooms. The culture of silence has social sanction where an agency of the child in her own learning is culturally negated.

#### **SOCIAL ACCEPTANCE**

Punishment as a mean to control children manifests culture of insensitivity and violence. The significant question comes here when it comes to violation of the child's rights. It is problematic that punishments clearly violate the rights of the children, but how did it go unnoticed? In most of the studies and reports it has been highlighted that the larger section of the society did not find corporal punishment as the severe problem which children face during their schooling. Even it has been identified that parents as well as teachers and the respective school authorities are least interested in taking essential efforts to abolish corporal punishment completely from the school. Punishment has been considered as the normal behaviour and if the teacher does not punish the child on her inappropriate behaviour, the teacher is considered as the weakest teacher who seriously lacks the skills to manage a class. It is the sole duty or the responsibility of the teacher to punish the child for their misconduct and keep full surveillance on her. The culture of punishment has socially been reinforced. Punishment enjoys social approval. It is believed that children need constant intervention from the adults.

Punishment has been culturally embedded in our Indian schooling system. The child has been doubly victimized since parent themselves disrespect the child's voice and deny to hear her. Sinha (2010) says that this indicates irresponsibility on the part of the parent since children out of fear fail to dialogue with parents about the kind of humiliation and disrespect, child faces in the school which further lead them to submit to violence. Children not only support the act of punishment by being submissive, but also internalize the very fact that the growing up is all about punishments and justify the act of punishment. They consider punishment as the part of their growing up where submission without question is the only way to become a good student or a good citizen. Foucault in his book 'Discipline and Punish: The Birth of the Prison' (1975) specifically talk about the inherent politics behind punishment and discipline-the politics here is to convert the individual's body as a 'docile submissive body' that remain disciplined and submissive towards societal orders and established norms. Teachers to the larger extend justify the act of punishment. For them the meaningful transaction could only be achieved when the class is under control and silent.

Kumar (2010) Teachers somehow find it difficult to cope with adverse working conditions of the school. They feel overburdened with the overcrowded classes. But in a way victimizing children for structural difficulties can never be justified. Children are no longer responsible for overcrowded classrooms and increased workload. There is no study which reveals that punishment brings positive outcome. Children are more vulnerable and the use of punishment symbolically represents their law status in the society, it signifies that adult world does not consider them as the equal member of the society. They are somehow left behind when it comes to policy making and considering it in their voices. There are laws for protection of the child's right in almost every state, but the social attitude towards children legitimizes use of punishment. According to Newell "Some adults believe that their religion gives them a right or even a duty to use corporal punishment. The international human

rights instruments uphold the right to freedom of religious belief. But belief cannot lead to practices which breach others' rights, including their right to respect for their human dignity and physical integrity. Violence of any kind cannot be dignified or justified by reference to religion." Children to the great extent acquired the learned helplessness. When children are punished in front of the other onlookers (parents, peers, teachers, principals, relatives, friends, etc.) It becomes the part of their growing up experience. They internalize that receiving punishment in front of anyone is the normal ritual and in a way teachers or parents prepare the children that punishment is the necessary and normal ritual where there is nothing problematic. The loss of the dignity with freedom become ritualized act. Punishment has so embedded in the school culture that it has never seen as sudden or something shocking. Kumar(2016) mentions that the culture of punishment has become a normal activity of our Indian classroom. It is not only socially sanctioned but also culturally practiced. The existence of corporal punishment is socially approved practice. And it has been expected from the teacher to fulfil her moral duty to perform violence on children in order to correct their deviant behaviours. The teacher enjoys this moral responsibility and never thinks back to lose her chance to exercise it. It is the moral obligation on teachers to control children. It is usually believed that children do not know and it is the task of the teacher to impose information in the mind of the child. Freire in his book 'Pedagogy of the oppressed' (1972, 47) rightly said that "The teacher confuses the authority of knowledge with his own professional authority, which he sets in opposition to the freedom of the student. The teacher is the subject of the learning process, while the pupils are mere objects."

Children are domesticated in such a manner that they adapt to the other authoritarian agencies of the school and loose her inner consciousness of being an equal change creator of the society. This is well intended act of the teacher where she suppresses the students and compels students to allow oppressions. Broadly the idea is to create passive and ignorant citizens of the country who speaks and thinks less. The culture of fear basically legitimizes the culture of ignorance and passivity. The child learns that it is the teacher who is always right, therefore the child usually depends on the teacher in his or her own learning. The child has been trained in such a way that the adult world is full of knowledge and the adult's constant intervention is always right, even if the kind of interventions which adults provide harms the child. Adult supervisions become very necessary and the child does not resist it.

### **TRAINING OF UPCOMING TEACHERS**

The increasing number of private B.Ed. And DIETs institutes in today's scenario largely producing teachers with faulty concepts and false knowledge base. These private higher education institutes are largely functioning on the principle of commercialization and money making ideologies where they are found less interested in producing teachers who can further ensure better quality education in schools. The aim of education is not meant only to maintain the academic culture with moralistic overtone through harsh punishments, but to challenge the existing structures based on the principles of inequality and uniformity. The over the imposition of the culture of correction need a pause and our consistence reflection. Are our education system meant for correcting deviant behaviours and reproduction of more or less uniform individuals? Why is there so much stress on correcting the behaviours and making the child to follow the established rules and norms? Cannot we appreciate the plurality in our thinking pattern instead of fostering the principle of singularity and similarities? These are certain question which can be used as a mechanism to stimulate the thought process.

The curriculum should be designed in such a way which ensures that the teachers need to be reflective and apt enough to deal with the issues of inequality, social diversities and learning abilities. Children should be treated sensitively where teachers function is to acknowledge different needs of the children instead of applying one uniform principle over all of the students. The issues like corporal punishment which acknowledge social sanction need to address carefully. The consistent pressure on the teacher to make children perform well, sometimes lead teachers to take harsh measures to fulfil the parental and societal expectations need to be greatly challenged and the entire idea of performing well in exams needs our greatest attention. The dangers of punishment and its consequences need to be discussed. Alternative measures could be strategized to deal with disciplinary issues. There is no one size fit for all formula to deal with disciplinary issues instead different approaches should be used differently with different issues.

### **CONCLUSION**

School has become a site where there is a perpetuation of violence, which legitimizes the culture of fear and generates ignorant minds. There are all good with papers and legal provisions, but when it comes to Indian classrooms the reality is difficult to even imagine. Children are at the lowest strata; they are consistently ignored and neglected. School again becomes the site which negates the voices of children and violates their rights in each successive day. It is ironical that one who is helpless (teacher) is oppressing the other helpless (children)

and creating the crowd of helpless individuals and thus in a way school legitimizes the learned helplessness and learned powerlessness among so called dependent individuals.

Public interventions need to be encouraged where children should be encouraged to raise their voice against any form of punishment. They should be encouraged to make complaints against violation of their rights instead of accepting punishment as the naturalized everyday phenomenon. National Commission for Protection of Child Rights (NCPCR) and State Commission for Protection of Child Rights (SCPCR) need to address this issue with great care where immediate suspension and actions against teachers or school management should be taken. School Management Committee (SMC) needs to be involved in the matter of addressing issues related to corporal punishment and sexual harassment in the schools. Teacher students' relationships should be based on the principle of humanity and equality, where the teacher needs to be sensitive towards children and address their needs and respect their childhood. The teacher need to inculcate the values of non-violence among children instead of violence which further lead to the perpetuation of violence. The teacher should acknowledge the just principles while dealing with children where children from any socioeconomic background should be treated with respect, and efforts need to be made to ensure that the rights of every child should not be curbed. The sole purpose of the law is not only to prohibit practices of corporal punishment, but also to transform the attitudes of the teachers, parents and other involved members. The strong message need to be given to the respective members that punishment would not be tolerable. We will be unable to prohibit corporal punishment until or unless we do not bring attitudinal change. What we need is a comprehensive awareness to discourage corporal punishment. There is an urgent need to improve the quality of teacher training transactions and curriculum. The working conditions of the schools and the teachers need to be improved further. The elimination of corporal punishment is the social struggle which needs collectiveness in our efforts against the social evil which further can collectively challenges the socially approved biased mindsets of many of us. Corporal punishment does not only rob child's opportunity to learn with dignity but also influence their ability to learn to a great extent.

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**DIGITAL INNOVATION IN HIGHER EDUCATION**

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**ABSTRACT**

*Higher education is an optional final stage of formal learning that occurs after completion of secondary education. Often delivered at universities, academics, colleges, seminaries, conservatories and institutes of technology. Higher education is also available through certain college level institutions, including vocational schools, trade schools and other career colleges that award academic degrees or professional certifications. The right of access to higher education is mentioned in a number of international human rights instruments. Higher education includes teaching, research, exacting applied work and social services activities of universities. Higher education is important to national economies, both as an industry, in its own right and as a source of trained and educated personnel for the rest of the economy. for getting good results in the field of higher education requires digital innovation. Digital innovation is changing the education landscape at breakneck speed. Digital innovation is the application of new technologies to existing education problems or practices. Today, digital innovation is at the heart of every organization, we need to digitize internal operations to do things better, faster and cheaper, find new products and services to higher education. Innovative use of digital technologies increases the competitiveness of our higher education. It is the foundation of our future welfare as a nation. Thus we as a government must create favourable conditions for digital innovation to thrive. We need to adapt our regulations, remove obstacles to digitalisation and secure a first class digital infrastructure offering communication services of high quality. Universities have among the most demanding customers in the world, students. As digital natives, their expectations are set by the digital experiences they get every day. To meet those expectations universities need to ensure that they can deliver a compelling and immersive digital experience. This paper will show how digital innovation is necessary for quality higher education.*

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**INTRODUCTION**

India is a developing country and to achieve our goal we have to strength our higher education system. The continuing growth of the middle class in India has led to increased demand for higher education and we know that this demand cannot be met by the Indian higher education system. although the Indian government is planning to establish new universities and colleges in the near future, these will not be enough to provide places for all students who seek higher education .

Education is very important factor for the development of a country. We should make it appropriate according to the time and changing scenario of the world. Education provides an opportunity to reflect upon the social, economic, cultural and moral issues facing by a human being. India needs to focus on education for more educated and efficient people to drive our nation. In the world, there are many Indian who well known for their capabilities and skills. To develop India as a digital nation or to become a prosperous partner in global development, India has to strengthen higher education with *Digital Innovations*. As the world goes digital, higher education needs to follow along. Digitization will affect every activity, interaction, transaction and outcome at higher education institutions. Higher education is changing within today's digital economy and digital transformation and technology are creating this change. While the changes to higher education affect learning models and other aspects of an institutions, they also disrupt economic aspects in the business component of the school. Technology is also helping to make education more available and affordable to a wider variety of students. New forms of online education are competing with traditional higher education institutions. With the cost of traditional colleges rising, more students may opt for the lower cost and greater flexibility of online options, so colleges must find ways to complete with these alternatives.

While digitization is creating changes that higher education must respond to it. It can also help institutions adapt to new business models. digitization can provide support for changing management and staffing models. Institutions can use advanced analytics and artificial intelligence to come up with new workforce and staffing structures. Ideas for improving finances include changing the model to hire more adjacent faculty. Create automated support and use shared support staff.

Institutions can use also Big Data to shape their models and reduce costs for students. Many students go to college longer than they need to, technology can reduce this problem. Big Data can show institutions, advisors and educators when students through new systems. Measures like these can improve success rates and help students go through faster, which can streamline the system and reduce tuition costs for students. Colleges can

also use technology to complete with online education alternatives. They can create a blended learning experience that uses both classroom and mobile learning. This increase flexibility while also offering benefits of an in-person experience and the credentials of established institutions. They can also offer a progressive learning experience enhanced by technology and advancements. Institutions can use data and predictive insight to improve operations and management. This can help institutions keep up with changes and remain competitive. Educational institutions can be reluctant to progress since education and research generally take precedence over running the business. Also many colleges and universities tend to prefer traditional, tried and true approaches. He explains that shifting the perspective of the institutions can help it move forward with technology. After all, digitization can improve learning and research just as much as the business model.

Overall, the shape of the higher education field and higher education economics are changing with digitization and technology. Institutions are facing economic changes and they need to respond to these to remain competitive. Technology can help them adapt while supporting new models that provide growth and competitiveness.

### **HIGHER EDUCATION INSTITUTIONS FACE BARRIERS TO CHANGE**

Structure, culture and resources as the top three barriers to bring innovative solutions to their campus. In the face of these challenges, strong, transparent and supportive leadership is critical. In institutions where the chief academic officer really puts some teeth behind an initiative, some resources- whether its money or people or purchasing something that will help make a difference, that's when really expedite the change. Reimagine Education is a prestigious competition rewarding innovative initiatives aimed at enhancing student learning and employability. Technology, social change and the increasing cost have presented multiple challenges in higher education. It has added emphasis on the need to be innovative in an educational culture that tends to be wary of change

### **HIGHER EDUCATION NEEDS TO CHANGE**

Commonly said that , innovation is now prerequisite for survival. There is no doubt that higher education transformation is already underway, with every university leader indicating they are at least part way through their digital journey. *First of all.....it's not a matter of how to use new technologies within the current educational structure, it's a question of how the digital revolution is requiring a change in the structure and educational model..* Higher education needs to change but the innovations must align with institutions missions and need not always be revolutionary. A matter of fact that the old model will not service the future needs of educating the world and that it needs to fundamentally change or risk being made redundant. Students place a much higher priority on technologies to support internships and pathways to employment. Students and all others are agree on the importance of focusing on technology innovation that leads to improvements in the student experience. Digitising content, automating administrative processes and integrated systems might be considered 'digital hygiene' factors these days, however there seems to still be plenty of opportunity for transformation in this space. The main focus of digital innovation is create a more efficient and interactive student portal. Students are interested in alternative ways of learning as part of their university experience, although the current cohort are less interested in undertaking blended or fully online programmes.

### **STATE OF INNOVATION IN HIGHER EDUCATION**

Higher education experts reveal how their institutions approach digital transformation and what it takes to lead a successful project. Universities are focusing resources and manpower on improving outdated practices and technologies on campus with the latest innovations. A recent report from learning house and the online learning consortium surveyed academic administration in order to understand what university decision maker are really looking for right now and implementation strategies. "survey results show-many survey respondents and interviewees either called out technology specifically or gave examples of innovations that required new technology; some even equated innovation with technology.

While the implementation of new, cutting-edge tools is essential for planning an innovation agenda on campus, decision makers should understand the nuances of what innovation means for higher education institutions in order to make informed decision about campus integration.

- **What is higher education innovation-** when surveyed about what innovation actually means to higher education institutions, the only thing administrations could agree on was that there is no formal definition. "The implementation of new initiatives to drive growth , increase revenue, reduce cost, differentiate experience or adjust the value proposition." However the term innovation broke down into two distinct categories; problem solving and evolution. A university looking to solve problems may invest in education technology that alleviates some of the pressures of everyday tasks, while those looking to evolve may be more interested in technology that embraces new ways of learning campus.

➤ **Listen to user needs and create a plan-** while 50 percent of surveyed institutions said they are on the leading edge or fast followers in technology innovation. It is essential to have an idea before diving into a digital solutions project. One way is to understand the needs and wants of all players within the institution, from students to administrators, to create the most effective innovation strategy and sometimes students lend a significant voice to that strategy. Students drive innovation in actuality and probably in one of the more powerful ways because they shared their experiences that they have in one classroom with the faculty members in another classroom.

**Necessities of Digital Innovation in higher education**— Educators from all grade levels are coming to realize the benefits of digital innovation in classroom. Typically, education is one of the last industries to make extensive change, holding on to antiquated methods and practices. But through the digital transformation and the rise of educational technology, teachers have begun making drastic changes to their instructions, assessments and at much faster rate than expected. These current trends are making headlines in higher education because of the ways in which they are impacting student learning.

- **Augmented Reality/ Virtual Reality/ Mixed Reality** -Gone are the days where students are expected to sit quietly at their desks. Educational technology is succeeding in making learning collaborative and interactive. Augmented, virtual and mixed reality are examples of transformative technology that enhance teacher instruction while simultaneously creating immersive lessons that are fun and engaging for the student. Virtual reality has the capability of bringing the outside world into the classroom and vice versa. The idea of combining AR/VR/MR is highly anticipated.
- **Classroom Set Of Devices-** universities and colleges are moving away from BYOD or bring your own device and students no longer have to go to the technology lab for access to a computer or laptop. Recent years have shown an increase in classroom sets of computers that was made possible in part by federal funding. today's pervasive online environment poses exciting possibilities, ones that necessitate students are properly educated on Cyber Safety and individual responsibility.
- **Redesigned Learning Spaces-** Educators have since realized their classrooms must mimic the workforce, which has inspired them to create collaborative-friendly spaces to facilitate student learning. The onboarding of technology has supported their endeavor. 21<sup>st</sup> century classrooms are Smart Desks instead of individual seating. Students are going on virtual field trips instead of merely reading from a text, they are creating media instead of just looking at it. The redesigned learning space is laden with integrated technology, which means students aren't just using these things, but they are understanding how to use them in order to achieve a specific goal. colleges and universities are creating more informal campus learning spaces because they understand the importance creating and collaborating 24/7, not just when class is in session.
- **Artificial Intelligence-** The use of AI in higher education has already proven useful. Australia's deakin university used IBM Watson to create a virtual student advisory service that was available 24 hours a day, seven days a week. Another use for AI includes chatbots. Because chatbots are equipped with natural language progression, they have the human capability of answer questions about homework, helping students through a paperwork process like financial aid or paying bills and easing the workload of the people who would normally serve these roles. Other applications of AI in education include personalizing learning, evaluating the quality of curriculum and content and facilitating one-on-one tutoring with the use of Intelligent Tutoring Systems. Digital innovation doesn't aim to replace teachers, only to complement them.
- **Personalized Learning-** We are able to personalize learning more now than ever. Blended learning gives more responsibility to the student, as it involves less direct instruction from the teacher and more discovery based methods of learning. Blended learning is an examples of how students can control certain elements of their learning by making decisions about things like where and at what pace they move through material. Adaptive learning technology collects information about student behavior as they're answering questions and then subsequently uses that information to provide instant feedback in order to adjust the learning experience accordingly. Educational tools with adaptive Sequences continually analyze student data in real-time and make split second decisions based on that data. It automatically changes what comes next in a sequence, be it altered content or a different order of skills, in response to how student a student is performing.
- **Gaming-** playing and learning collide when classrooms utilize gaming as an instructional tool. Gaming Technology makes learning difficult subject matter more exciting and interactive. As the digital innovation

progresses, it is quickly being used to enhance educational games in every discipline. Virtual game worlds provide a unique opportunity to apply new knowledge and make mission-critical decisions, while identifying obstacles, considering multiple perspectives and rehearsing various responses. Because these games are designed to provide immediate feedback, students are intrinsically motivated to keep playing them, honing skills throughout.

New digital innovation models are exciting and offer previously unthinkable possibilities to students, but they require constant IT support. As educational institutions and colleges continue to jump on the bandwagon and adopt these digital transformation trends, we must consider the current paradigm for technology instruction and move toward a team-based approach. As student expectations increase, responsiveness to those needs must increase as well.

### **CONCLUSION**

Digital Innovation has come to play a pivotal role in virtually every area of education and we were delighted to see a very high standard of submission once again for the digital innovation in teaching or research category. The adoption of new digital approaches or infrastructure has led to innovation in research or modernised and enhanced the student experience and whether an innovation could be scaled within the institution. Reimagine Education is a prestigious competition rewarding innovative initiatives aimed at enhancing student learning and employability. Technology, social change and the increasing cost have presented multiple challenges in higher education. It has added emphasis on the need to be innovative in an educational culture that tends to be wary of change.

Digital innovation has driven major changes in the world of higher education. That world is now a true marketplace, offering students more options than ever. Those students approach their university experience as consumers, looking for the best return on their investment of money and time. As fees continue to rise at both traditional and nontraditional schools, students have clear expectations about the quality and convenience of the digital tools offered by their schools.

Site based student information systems were built to support traditional administrative and academic frameworks and are periodically upgraded in an attempt to accommodate new demands. They typically require a large investment of IT funds and staff and create complex subsystems for students to manage, with multiple accounts and logins. Under this kind of system, students still struggle with completing paperwork, scheduling and handling tasks such as financial aid and advising, which may have to be managed in person. Along with expecting the same level of digital convenience they're used to in daily life, these students are looking for specific tools to make it easier to manage all aspects of college life.

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**SKILL DEVELOPMENT IN TEACHER EDUCATION**

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**ABSTRACT**

*Developing skills is a prerequisite in which a person's knowledge is made to move his abilities efficiently in one direction and to work efficiently. He does any work in his style that gets attracted by other people. Skill the ability to use one's knowledge effectively and read to execute our plans with success there are many skills needed by students that are essential to learning.*

*Not only will these skills prepare our for our next level of education, they will also help we succeed at our current level. Some student skills include: such as Accountability, Analyzing information, Communication, Critical thinking, Digital literacy, follow direction Imagination, Initiative, Organization, Problem solving , Reading Time management Writing etc. There are many skills that assist a person in personal development . These skills can improve our life in various areas.*

*Personal life skills include: Adaptability Caring Common sense Cooperation Adaptability Curiosity Flexibility Friendship Initiative Integrity Patience Sense of humor communication Stress management etc.*

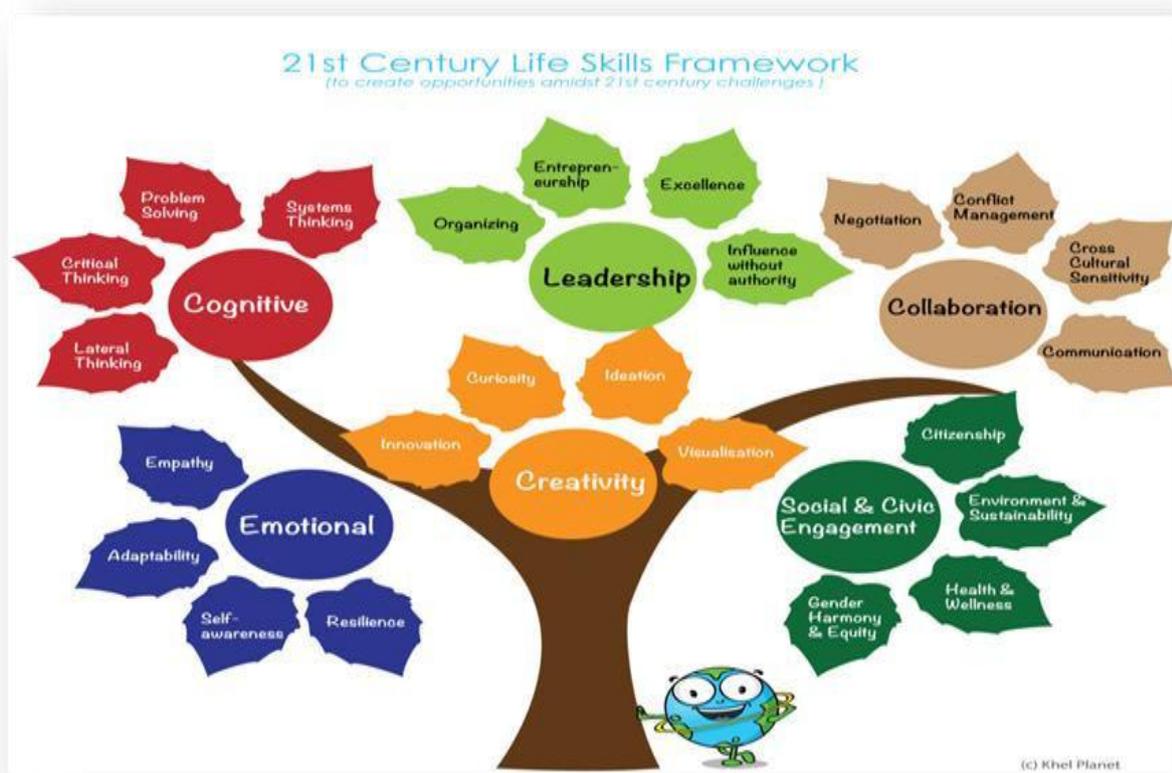
*Keywords: Life skills. Teaching skills Conceptual skill, Interpersonal skill, Communication skill, Decision making skill, Problem solving skill*

**INTRODUCTION**

A talent development is a capability to hold out a task with determined result typically at intervals associate quantity of your time energy each. Skill can be general and specific .three broad categories of skill are suggested and these are technical, human and conceptual

Life talent that's necessary or fascinating for full participation in lifestyle. Life skills are abilities for adoptive and positive behavior that enable human to deal effectively with demands and challenges of life this .this concept is also termed as psychological competency

In following figure there are six type of life skills – cognitive, leadership, collaboration, creativity, and collaboration, emotional and social &civic engagement which need in 21st century.



Any talent that's helpful in our life will be thought of a life talent. Tying our shoe laces, swimming, driving a automotive and employing a laptop area unit, for many individuals, useful life skills. Broadly speaking, the term 'life skills' is typically used for any of the talents required to deal well and effectively with the challenges of life.

Certain skills could also be additional or less relevant to you reckoning on your life circumstances, your culture, beliefs, age, geographic location, etc. However, in 1999, the World Health Organization identified six key areas of life skills:

- **Communication and interpersonal skills.** This broadly describes the skills needed to get on and work with other people, and particularly to transfer and receive messages either in writing or verbally.

**Decision-making and problem-solving.** This describes the skills required to understand problems, find solutions to them, alone or with others, and then take action to address them.

- **Creative thinking and critical thinking.** This describes the ability to think in different and unusual ways about problems, and find new solutions, or generate new ideas, coupled with the ability to assess information carefully and understand its relevance

- **Self-awareness and empathy,** which are two key parts of emotional intelligence. They describe understanding yourself and being able to feel for other people as if their experiences were happening to you.

- **Assertiveness and self-control.** These describe the skills needed to stand up for yourself and other people, and remain calm even in the face of considerable provocation.

- **Resilience and ability to cope with problems,** which describes the ability to recover from setbacks, and treat them as opportunities to learn, or simply experiences. It is also true that different life skills will more or less be relevant at different times your life.

For example: • when at school or university, you'll need to study skills. These may include understanding how to organize yourself for study, do research, and even write up a dissertation or thesis. These are not skills that everyone will need, but writing skills are likely to be useful in a variety of careers and jobs.

When buying a house, you may need to employ negotiation skills, and you will certainly need plenty of patience and good temper. These skills are probably to be high on your 'essential life skills' list if you have got children!

- You'll need to work on your employability skills to get a job, and will also need to think about how you apply for a job, and how you might cope in an interview;

- When you have a job, you may need to develop leadership skills, especially if you need to lead teams or groups;

- When you start a family, you'll need parenting skills.

You may also find that time management and organizing skills become much more important. However the most important life skill is the ability and willingness to learn by learning new skills, we increase our understanding of the world around us and equip ourselves with the tools we want to measure a additional productive and fulfilling life, finding ways to cope with the challenges that life, inevitably, throws at us.

Most people associate learning with a formal education, but learning can, and should, be a lifelong process that enhances our understanding of the world and improves the quality of our life.

### **TEACHING SKILLS**

The teaching skills area unit outlined as a gaggle of teaching acts or behaviours meant to facilitate students learning directly or indirectly.

Teaching skill Teaching offers the chance to change other people's lives permanently for the better. As an educator you'll be able to facilitate to develop somebody's subject information and perhaps even their mind and temperament.

Teaching is an incredibly rewarding thing to do and good teachers are needed everywhere: in schools and college classrooms to educate the young, as well as in the workplace and other settings to teach adults and colleagues. One-on-one lecturers could tutor somebody during a specific subject or for his or her wider personal development. However, teaching anyone also can be wearing, stressful and demanding. It is a responsibility and any slip is extremely visible.

People's minds and motivation vary a great deal and teachers have to find many different ways to connect with their students. Teaching is not always recognized for being the difficult task that it is in terms of status or financial reward. As well as subject data, there square measure another, more general qualities that teachers need

As well as subject data, there square measure another, more general qualities that teachers need.

**1. Enjoy communicating your understanding to others.** There is positively a performance part to most teaching. Our section on social skills, together with effective speaking, covers this in more detail, and there is a great deal of overlap with presentation skills.

**2. Have confidence.** Students will need the confidence to look calm and professional even when tired and stressed.

**3. Have great organizational skills.** Have you ready for the session and done any marking in time? Have you unbroken what's required for anyone within the cluster World Health Organization was away? If you are part of a teaching organization, have you feedback results to any interested colleagues?

**4. Work effectively in groups.** In a faculty or faculty, you will be a part of a gaggle that teach at your level or inside your subject. If so, you'll need to agree between you what's to be educated and the way to handle any difficulties.

**5. be able to deal with conflict.** There could also be students World Health Organization have to be compelled to be told to figure tougher, or a disagreement between students that you simply have to be compelled to facilitate to delineate

**6. Motivate the students to do their best.** This may need encouragement and/ or criticism, and probably a bit of both at different times.

**7. Empathies with Students.** If you'll see that your student's square measure exhausted, there may be no point in trying to teach a very complicated topic. You need to make a sense that you simply square measure all operating along towards identical goal. This means building up trust and rapport.

**8. Give feedback immediately.** Whether this takes the shape of comments on performance or marking written work, it needs to be constructive. Offer praise yet as criticism whenever doable and tell your students however they'll improve.

## CONCLUSION

Thus, we say that the existence of life skills in the constantly changing environment is an essential part of being able to face everyday challenges..... To cope with the increasing speed and transformation of modern life, it is necessary to deal with the ability to deal with stress and frustration. At the same time, the teachers will be encouraged to create a positive learning environment should protect the management and require appropriate discipline techniques. In our daily life, teachers and students are both good at teaching skills in a healthy environment.

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**EXPLORING FACTORS INFLUENCING ONLINE BUYING OF UNIVERSITY STUDENTS****Mamta Chawla<sup>1</sup>, Dr. Mohammed Naved Khan<sup>2</sup> and Dr. Anuja<sup>3</sup>**Research Scholar<sup>1</sup> and Associate Professor<sup>2</sup>, Department of Business Administration, AMU, Aligarh  
Associate Professor<sup>3</sup>, AIMA, Centre for Management Education, New Delhi**ABSTRACT**

*Huge growth in online buying is witnessed, led by China, India and other countries in the region.*

*Previous studies have highlighted that demographics played important role while considering buying online. Specifically students, even in the developing countries have been found as one of the early adopter segments in adopting new products and ideas. The research study examines online buying behavior of university students and the factors as drivers. Online survey has been conducted through structured research instrument to collect insights about student's preference and spending over internet. Statistical technique Principal Component Analysis was employed in the study and four important factors were extracted. These are termed as "Conscious choice", "product features", "pleasant buying experience" and "Delivery Risk".*

*Keywords: Online Buying, Exploratory Factor Analysis, University Students, India. JEL Classification: M31, L81, L86, D12*

**INTRODUCTION**

Not only developed western-countries but even Asian countries, with poor infrastructure and low Internet penetration rates, are equally adopting online buying. With the largest population of youth in the world coupled with increasing disposable incomes of the rising middle class, India is 5th largest retail market in the world. (money.livemint.com). Internet is user friendly, fast and enable access to information from anywhere around the world with no time limitation. For young students apart from being a source of academic information, it also allows to socialize with friends and family (Otuola, 2013). Numerous research work highlighted that the rate of internet usage in India is growing at very fast speed especially among younger generation in urban areas (Naik and Sankaranarayanan, 2014). Internet has empowered students with lots of information and encouraged buying online. Especially buying habits formed during early age are more likely

to be continued in the later part of the life as well. Further, students also play an important role as 'influencer' in the family buying. Therefore, current study focuses on the factors influencing online buying behavior of University students in India.

**BACKGROUND FOR THE STUDY**

Indian online retail sector is facing surge of online retailers resulting into increased competition. From grocery to electronics and even jewelry is available online and it is expected that number of online buyers will cross 120 million by 2020 (ASSOCHAM 2018). Established players like Future group, Tata's CLIQ (economictimes.indiatimes.com) and Reliance's AJIO into fashion e-retailing are to name a few foraying into e-commerce (Business-standard.com). As reported by IBEF (India Brand Equity Foundation)-

Online retail business is the next generation format which has high potential for growth in the near future. After conquering physical stores, retailers are now foraying into the domain of e-retailing. E-commerce is expected to be the next major area supporting retail growth in India. The industry is projected to touch US\$ 100 billion by 2020 growing from US\$ 30 billion in 2016. With growth in the e-commerce industry, online retail is estimated to reach US\$ 70 billion by 2020 from US\$ 3 billion in 2014

Amazon's Jeff Bezos expansion strategy for Indian market is a sign of huge potential in this industry. (economictimes.indiatimes.com). Even Indian top-retailer Defense Canteen has announced to go online (timesofindia.indiatimes.com). Furthermore the dynamics of online buying are different from offline buying. Apparels is one of the product category occupying maximum share of online retail sales followed by computers and consumer electronics (money.livemint.com) The drivers that engage a consumer and continue buying online have been researched thoroughly by number of scholars, to provide basis for future strategy formulation.

Interestingly, most of the primary online buying research studies used young students as a major proportion of the sample studied; either considering the segment as most representative of online buyers and/ or due to easy accessibility. But, it is worth mentioning that the student population is one of growing market segment that numbers of brands are targeting. Therefore, current research is directly addressing the requirement to gain insights into the online buying behavior of university students only. Main rationale for selecting segment is the potential power of this segment to form one of the opinion leaders in exploring and continuing with online for

retail shopping. In addition to increased internet penetration rate, easy availability of hand held devices i.e. smart phones, tablets has empowered this segment to influence the market trends. The likelihood of developing loyal customers by establishing initial retailer-customer ties, provided strong rationale for exploring this consumer group, and their behavioral intentions for online shopping (Makhitha and Dlodlo, 2014). Thus following research paves direction to undertake current research:

- What is current level of online buying of university students?
- What are the factors influencing their online buying?

### REVIEW OF LITERATURE

Considering that the aim of this research is to study online buying behavior of university students in India and to be diligent, it is impractical to include all the factors available in the literature in one research. Furthermore, the literature review suggests that there is no one particular element that has great influence on online purchase intentions and continuation but there are common constructs found e.g. TAM constructs are most extensively used as determinants of online buying (Jain, Goswami and Bhutani, 2014). Previous studies indicate that online buying behavior is influenced by number of factors. The most common constructs studied have been borrowed from different theories and models; which are discussed in the following section.

Most of the TAM models have been utilized in the present study. Technology Acceptance Model (TAM) is the most cited model (Cha, 2011) which explains adoption of Information Technology through adopting Theory of reasoned action (TRA- Fishbein and Ajzen, 1975). It is specific to information system usage which is dependent upon six variables namely: “perceived usefulness”, “perceived ease of use”, “attitude towards use”, “intention to use” and “actual usage” (Davis, 1989). Here “perceived usefulness” (PU) is defined as the degree to which a person believes that a particular system would enhance his or her job performance; “perceived ease of use” (PEU) is defined as the degree to which a person believes that using a particular system would be free of effort; “attitude towards use” is the user’s evaluation of the desirability of employing a particular information system application. “Behavioral intention to use” is a measure of the likelihood of employing the IT application. Davis (1989) asserted that PU and PEU represent the beliefs that lead to IT acceptance. Empirical tests suggest that TAM constructs predict intentions and usage. But it is assumed that usage is volitional, that is, there are no barriers that would prevent an individual from using an information system. Although, there are many factors preventing a person from using an application such as perceived user resources (Kieran et al., 2001) and perceived behavior control (Ajzen 2002).

Various TAM extensions have also suggested in the literature as TAM is the most parsimonious and generic model that is used to study both initial and continued IT adoption (Hong, Thong and Tam, 2006). Wixom and Todd (2005) extended TAM into ExTAM model. Another important extension is referred as TAM2 (Venkatesh and Davis 2000), which includes subjective norm as significant influencing PU and behavioral intention. Kim (2012) integrated model TAM with initial trust belief. Other studies examined relative strengths of the associations between the individual independent variables and online buying intention clearly indicated that Customer Service, Trust and Reliability can explain much of the variation in online buying intention (Johar and Awalluddin, 2011).

Perceived risk is another most used construct in the similar studies, defined as the subjective belief of consumer suffering a loss in search of a desired outcome (Jain, Goswami and Bhutani, 2014). It has stronger correlation with willingness to shop online than convenience (Zhou, Dai and Zhang, 2007). According to previous findings perceived risk has a negative influence on buying attitude towards online shopping (Pi et al., 2011). Various risks associated with online shopping behavior are categorized as- financial, product performance, psychological, physical and time/ convenience loss (Wani and Malik, 2013).

Trust has been identified as another variable playing an important role in building intention to buy and rebuy (Al-maghrabi and Dennis, 2012; Kaihong, 2012; Ibrahim et al., 2013; Liat, Shi Wuan and Wuan, 2014; Mou and Jason Cohen, 2014). Moreover, to overcome the inherent limitation of employing different Information System-adoption models, construct of trust, perceived risk and security concerns have been strongly established in the online buying literature.

Trust is critical in the online shopping context because the buyers and sellers normally complete the transaction through website and might not necessary meet each other face to face. The buyers, therefore, will be worried that their personal information and money will be transferred to third party without their knowledge. In addition, trust is important because it allows social control and provides buyers reason about reliability, capability and honesty of possible business partners. Thus, it is a challenge for businesses that engaged in e-

commerce to ensure that consumers have sufficient trust in order to attract them to purchase online (Yao & Li, 2009). Kim, Chung and Lee (2010) proposed that consumers will most likely to purchase online, if the website is perceived as trustful. In the context of online health services, study on university students in South Africa; it was reported that trust dimensions were influencing consumer attitudes and intentions (Mou and J Cohen, 2014)

Perceived trust has been reported as positively influencing intention, adoption and continuation behavior. Other related and equally important, extensively studied predictor variables were- risk (having inverse relation) and privacy and security concerns. Online security concern varies over the product category bought online (Cha, 2011). The literature on online buying dominates with the studies that emphasis that trust will increase if the online buyer believes buying and vendor positively and favorably. In contrast, trust will decline if the online buyers do not believe the trustworthiness and reliability of online medium and vendor thus resulting into lowering of continuation intentions to buy online.

Hedonic Motivation is linked with consumers who have experiential shopping behavior. These motivation been studied in the similar studies of students. Hedonists not only gather information to shop online but also seek fun, excitement, arousal, joy, festive, escapism, fantasy, adventure, etc. (Monuwe et al., 2004 cited in(Jain, Goswami and Bhutani, 2014)). Hedonic shopping motivation refers to the enjoyment of shopping for its own sake, the pursuit of fun, novelty, and excitement while shopping (Kim and Eastin, 2011). These characteristics match with the profile of university students, in the context of building positive attitude towards online buying. Hedonic shopping orientation as aspect of enjoyment had a significant positive relationship with attitude toward online shopping.

Another similar concept used in research is termed as “Recreational Shopping Consciousness”, as it is perceiving shopping as a pleasant activity and buying just for the fun of it (Park and Gretzel, 2010). Recreational shopping motives were reported to be positively influencing perceived usefulness. Contrastingly, in a Malaysian study, hedonic consumers reported to have no significant effect with attitude toward online shopping whereas utilitarian motives are found (Delafrooz et al., 2009) which are termed as perceived usefulness.

Online Buying Behavior refers to the actual buying by university through Internet, for which they can use their laptop or university PC or tablet or smart-phones or any combination of all these devices. The demographic characteristics like age, gender, stay- status, pocket money, current stream of education are used as control variables which influence various constructs on which online-buying-continuing-intentions of students depends.

Subjective Norms is defined as the perceived social pressure that most people who are important to him/her think he/she should or should not perform the behavior in question (Ajzen, 1991; Fishbein and Ajzen, 2011; Cameron et al., 2012). SN have been found to be strongly influencing intention to buy online (Turan, 2012) (Cha, 2011).

Product Characteristics Research studies focusing buying of different products online (E. Keisidou et al., 2009) e.g. books, travel, grocery (Hansen, 2005), electronics (Kim and Forsythe, 2010; Liu, Forsythe and Black, 2011; Bashir, 2013), e-ticketing (Sulaiman, Ng and Mohezar, 2008). Three major types of product: search, experience, and credence goods (Luo, Ba and Zhang, 2012). Search products are those that can be evaluated from externally provided information. Experience products, on the other hand, require not only information, but also need to be personally inspected or tried. Credence products are those that are difficult to assess, even after purchase and use (Brown, Pope and Voges, 2003) (Cha, 2011).

“Tactility” is to examine/ test, in terms of touch and sight, a product (Alkailani, 2009). Findings for this construct were found to have contrasting results in different cultural environments e.g. Chinese were not much concerned about the lack of face-to-face contact or the inability to touch and feel tangible products or credit as against Americans (Gong, Maddox and Stump, 2012). Study comparing online buying intention of “real” vs. “virtual” items reported different criterion employed for each by online buyer (Cha, 2011). Moreover, there is no uniformly accepted standard product classification available (Keisidou et al., 2009) so far in the context of online buying. For virtual items PEU, PU, enjoyment and security were not found significant, hence different strategies were proposed for both types of items.

In a Malaysian study it was reported that cheaper prices and wider selection were among dominant factors motivate to shop online (Delafrooz et al., 2009). Contrastingly, Indians were reported to be influenced with variety and easy access to the wide range of merchandise (Wani and Malik, 2013).

Online Buying Experience is another important construct studied in the current study as its unique which includes impression formed during navigation to placing an order, making a payment which can be advance

online payment or at the time of delivery, then to receiving the product. Only “online experience” is formed during navigation and doesn’t guarantee making a transaction (Zhou, Dai and Zhang, 2007). The factors significantly influencing continuation reported to be previous purchase experience i.e. satisfactory level and perceived risk with regard to the consumers’ confidence level and trust in online shopping (Ibrahim et al., 2013). In another words, satisfied “online buying experience” can be used as a strong predictor of continuance (i.e., continuance to buy) intentions even more than “perceived usefulness” because the effect of the latter decreases over time (Zhou, Dai and Zhang, 2007).

**RESEARCH METHODOLOGY**

A thorough literature review about the methodology adopted in the past guided the basis for the present study. Quantitative research is adopted using online survey method. Online survey is broadly accepted in online buying studies as being most relevant and resource efficient. This pilot study is part of the doctoral research work and utilized items from previous studies. Google Forms has been used for data collection and SPSS (Statistical Package for Social Science) software, version 19 for data analysis.

**SAMPLE DESIGN**

Non- probability convenience sampling procedure was used to share instrument with the University students studying in Delhi NCR. The rational for choosing University students studying in Delhi NCR is that they spend considerable time in browsing information over internet and are more likely to buy online. The target students comprised of only internet user University students, majorly studying BBA, B.Tech and MBA, even if they may or may not buy online. Delhi NCR is targeted in the previous as well as here students are coming from different parts of the country for higher education. Research instrument was administered during last week of February. Only 168 responses were considered out of 210 for statistical analysis.

**MEASURING INSTRUMENT AND DATA COLLECTION**

Number of recent studies, focusing on students internet usage and online buying behavior, identified in the literature(M, Selvaraj, & Panchanatham, 2014; Otunla, 2013)(Fang, 2014)(Liat, Shi Wuan and Wuan, 2014)(Makhitha, 2014)(Knežević, Jaković and Strugar, 2014) (Hossain, 2010)(Al-Swidi, Behjati and Shahzad, 2012)(Devi and Roy, 2012)(Chowdhury and Ahmad,

2011) (Saprikis, Chouliara and Vlachopoulou, 2010)(Simeonova et al., 2010)(Alyami, 2013)(Lee and Ngoc, 2010)(Saeid, 2010) The instrument employed in the current study contained measuring items adapted from above mentioned previous studies as pre-validated and suggested limited bias and errors. The research instrument contained 51 items excluding questions on demographics and online buying behavior. A five-point Likert scale was used to understand level of agreement ranging from 1- “Strongly Disagree” to 5- “Strongly Agree”. Question on preferred “online payment method”, “major items bought online” etc. were also asked. Research instrument was mailed to all the students enrolled in the section for collecting responses, who further shared the form link to their student friends.

**RELIABILITY AND VALIDITY**

Cronbach alpha coefficient value is the well accepted statically calculation of reliability for the social science instrument. According to Nunnally (1978), Cronbach alpha coefficients of less than 0.50 are deemed unacceptable; those between 0.50 and 0.69 are considered as being adequate, whereas those above 0.70 are regarded as being acceptable in social science enquiry. The sub-scale reliability values ranged between 0.598 and 0.784, while the standardized Cronbach alpha value for the entire scale was established at 0.785, indicating an acceptable level of internal consistency among the scale items (Makhitha and Dlodlo, 2014). Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy score (0.815) was well above the recommended 0.5 level (Malhotra, 1999).

**Table-1: KMO and Bartlett's Test**

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.836
Bartlett's Test of Sphericity	Approx. Chi-Square	2076.716
	Df	231
	Sig.	.000

**Sample Composition**

The sample consisted of 51% male and 48% female. Similarly age cohort in the University students was mostly in the age group of 18 to 23 years 75%. Out of which 16% Hostlers, 69% live in owned house and only a small 1% lives in friends place. As expected from a University student Delhi NCR, most of them were getting a good pocket money to spend i.e 19% getting Rs.3001 to Rs.5000/- and 29% getting more than Rs.5001/-.

**Table-2: Sample Demographics**

Characteristic	Group	Cases	Percentages
Gender	Male	92	48.7
	Female	97	51.3
Age	18 to 20 years	76	40.2
	21 to 23 years	67	35.4
	24 to 26 years	18	9.5
	27 years and above	28	14.8
Current Living Status	Own/ family house	131	69.3
	Hostel	31	16.4
	In friend's house	2	1.1
	Sharing a room or in a PG	25	13.2
Personal monthly average pocket money/ Income	Less than Rs 1000	21	11.1
	Rs 1001 - Rs 3000	76	40.2
	Rs 3001 –Rs 5000	36	19.0
	More than Rs 5001	56	29.6
Current Education stream	BA/ BBA/ BCom/ Other Non Technical Courses	16	8.5
	BTech/ BE/ Other Technical Courses	79	41.8
	MA/ MBA/ MCom/ Other Non Technical Courses	81	42.9
	MTech/ ME/ Other Technical Courses	13	6.9

Out of total 189 respondents 88 percent reported of buying online. Thus for identification of factors driving online buying through Factor Analysis is possible with 168 as the sample size. It is noticeable that a 61% of respondents are shopping from two or more years but in terms of monthly transaction almost fifty percent shop twice or less, highlighting online buying is still not too popular among students. Moreover in terms of amount 49% reported of spending less than

Rs.5000 in the last six months and Cash on delivery is preferred by most. But overall 60% preferred more than one mode of payment out of – card payment, online payment and cash on delivery (CoD). Moreover, in certain cases CoD is not applicable e.g. for recharges, bill payments and reservation etc. Most of them were using more than one device for buying. Interestingly, none of them reported about using tablets for buying. Following table presents major findings of the online buying habits of the sample respondents in detail:

**Table-3: Sample Descriptive: Online Buying Behavior**

	Group/ Categories	Cases	Percentages
Online buying	Yes	168	88.9
	No	21	11.1
Length of Online buying	For Less than 6 months	17	9.0
	Between 6 months to 1 year	10	5.3

	1 to 2 years	23	12.2
	2 to 4 years	41	21.7
	For more than 4 years	77	40.7
Frequency (monthly) of	Once in two months	46	24.3
Online buying	1 to 2 times	46	24.3
	3 to 4 times	65	34.4
	5 to 6 times	3	1.6
	More than 6 times	8	4.2
	Preferred Device Online	Mobile	33
buying	Laptop	11	5.8
	Personal Computer	4	2.1
	Tablet	0	0.0
	More than one device	120	63.5
Spending (In the last 6	Less than Rs.5,000	49	25.9
months) Online buying	Rs. 5,001- Rs.10,000	80	42.3
	Rs. 10,001- Rs.15,000	9	4.8
	Rs. 15,001- Rs.20,000	9	4.8
	Above Rs.20,001	21	11.1
	Payment Method in Online	Cash on Delivery	40
buying	Net Banking	3	1.6
	Debit Card	5	2.6
	Credit Card	6	3.2
	More than One Mode	114	60.3

**RESULTS AND ANALYSIS**

Exploratory Factor Analysis is performed to find out the factors responsible for online buying by the university students. As presented in the Table.1 KMO for online buying was 0.836 supported by Bartlett’s test of Sphericity of 0.000. As suggested by Hair et al. (1995) criterion, four factors have been identified using the

Eigen value criteria that suggest extracting factors with an Eigen value of greater than 1.0. The rotated factor matrix is displayed in Table-4.

The rotated Component Matrix resulted into four factors, which are proposed dimensions of online buying of university students. Out of 51 items total 22 items have been retained with factor loadings greater than 0.5. The identified four factors, explained 63 percent TVE (See Appendix-I). The extraction method used was principal component analysis in SPSS with Varimax rotation which has been widely accepted as a reliable method of factor analysis.

**Table-4: Rotated Component Matrixa**

	Component			
	1	2	3	4
I read online review of the product before buying	.827			
I select online stores, which I believe are honest	.806			
Online shopping prepares my shopping list( the cart option)	.757			
I feel that the online vendor is trustworthy	.699			
I received my product which I ordered from the site	.675			
There are no time restriction in online shopping	.651			
The website treats me as a unique person and responds to my specific need	.624			
I prefer to buy Branded Products online		.837		
For me brand is more important than discounts		.783		
I feel safe in my transactions with the website/online store		.777		
I do a product feature and price comparison before shopping online		.768		
I shop online as I get user/expert reviews on the product.		.767		
Online shopping gives the facility of easy price comparision. (Hence, price advantage)		.701		
My experience with online buying was better than what I expected.			.731	
Shopping online is enjoyable.			.699	
Information searching on the internet is fun rather than tedious.			.680	
I received my product by the time promised by the company			.560	
I prefer free shipment over discount			.502	
I use online shopping for buying products which are otherwise not easily available in the nearby market or are unique/new			.494	
I hesitate to shop online as there is a high risk that received items may not work properly.				.866
I might not receive the product ordered online.				.808
I am not sure about the authenticity of branded product sold online				.711

**DISCUSSIONS**

Descriptive analysis highlighted the important aspect of University online buying in terms of majority of them was buying online. Yet, the rate of buying was low with a small number of transactions per month and a small spending. The possible reason can be easy availability of products offline or can be lack of trust. EFA resulted into identification of four factors influencing online buying, which can be categorized into four constructs. Factor one termed as “Conscious choice” in which students check online review, form opinion about online stores trustworthiness, and prepare online shopping-list, anytime access, enjoy personalized experience and lastly utilise experience of product delivered at home. Factor two can be named as “product features” related in which they are checking brands, detailed product information, expert recommendations and comparison. Third factor can be named as “pleasant buying experience”, which includes liking for internet browsing, timely delivery at doorstep, availability and satisfactory past experience. Forth factor can be named as “Delivery Risk” which includes genuine-branded product risk, working of product risk and risk of receiving as ordered.

Contrastingly in a recent Indian study Mann (2017) identified five most important motives of youth to buy online- convenience and time-saving, new trend and fashion, product variety, better price and offers and lastly information depth (Maan, Kumar and Rani, 2017). Another study revealed four determinants namely- Anxiety (related to privacy, security, trust etc.), Ease of use (convenience, process ease, comparison etc.), Usefulness (time saving, different brands, enjoyment etc.) and lastly Price (lower prices and discounts). Risk was common important determinant, as in an online-health services study, on university students in South Africa, risk is not found sufficiently high to deter usage intentions (Mou and J Cohen, 2014). Whereas, in an Indian study Perceived Risk is found as most significant factor affecting online buying behavior (Jain, Goswami and Bhutani, 2014). In a recent comparative study, Indian consumers showed higher perceived risks as compared to UK-online buyers (Wani and Malik, 2013).

**CONTRIBUTION, LIMITATIONS AND FURTHER RESEARCH**

The strength of the current research lies in exploratory nature and application over university student segment. Current study in hand report, as an important source of knowledge, explores on prevailing patterns and few underlying factors influencing University student’s online buying, studying in Delhi NCR in particular. These insights can be utilized by online marketers and website designers targeting this youth population to be more effective. Thus, results can be helping in formulation of the marketing strategies. Academically findings of the present research can be utilized to frame new hypotheses to better map online buying behavior of university students in India.

However, the study has a limitation in that its results are restricted to University students, studying in Delhi NCR only. Further study attends only online buying and cannot be related to student buying behavior as such. And, although the sample size of 168 respondents may have been adequate for inferential statistical analysis, it may not present a true representation of the prominence of University students buying online, nationally. Furthermore, as of any self-reported survey the responses- bias cannot be ruled out. But this research provides sufficient platform for conducting a more detailed Nation-wide research to identify underlying currents of online buying behavior of University Students in India.

**CONCLUSION**

Online buying behavior of university students in India is different from offline buying. Current research attempts to explore nature of online buying behavior of university students to identify factors influencing. A thorough review of available literature pave way to identify most common constructs utilized by the researchers to explain the phenomenon in different context- online buying behavior of youngster etc. The primary research conducted in the current study helped to identify major four factors based upon statistical analysis technique- exploratory factor analysis. These factors are termed as “Conscious choice”, “product features”, “pleasant buying experience” and “Delivery Risk”. The most important factor is found to be “pleasant buying experience”. Thus, online marketers should concentrate on strategies to build better buying experience starting from navigation to order placement and ending till receiving the ordered product.

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**Appendix-I-Total Variance Explained**

Component	Initial Eigenvalues			Extraction Sums of Squared			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.520	29.636	29.636	6.520	29.636	29.636	4.419	20.086	20.086
2	4.599	20.904	50.540	4.599	20.904	50.540	4.101	18.641	38.727
3	1.601	7.275	57.815	1.601	7.275	57.815	3.060	13.910	52.636
4	1.200	5.453	63.268	1.200	5.453	63.268	2.339	10.632	63.268
5	.923	4.197	67.465						
6	.838	3.810	71.275						
7	.762	3.463	74.738						
8	.688	3.128	77.866						
9	.612	2.780	80.646						
10	.582	2.647	83.293						
11	.534	2.428	85.721						
12	.495	2.251	87.972						
13	.406	1.843	89.816						
14	.368	1.672	91.488						
15	.322	1.463	92.951						
16	.290	1.320	94.271						
17	.262	1.190	95.461						
18	.258	1.175	96.636						
19	.235	1.066	97.702						
20	.217	.989	98.691						
21	.175	.795	99.485						
22	.113	.515	100.000						

Extraction Method: Principal Component Analysis.

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**FINANCE AND CAPITAL MARKET**

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**ABSTRACT**

*Finance, specifically, in corporate terms, the system of internal control regarding the procurement and effective utilization of funds post identification of feasible investment opportunities pertaining to profitability promotion that adequately compensate for the cost and risk borne by the business undertaking/enterprise. Capital market, in India, has been significantly contributing towards the facilitation of moderate and long term finance provision from the surplus units to the deficit units. A Developing economy like India needs a growing amount of investor savings to flow to corporate enterprises. The level of equity market participation of the retail investors has been increasing over the past few years that evoked the need of studying the socio-economic profile of the retail investors, factors influencing the investment behaviour of retail investors, examining the trading practices of retail investors in equity markets, factors affecting the risk assumption abilities alongside the problems faced by retail investors. Historical evidences based upon secondary facts support the undertaken scope of the study. A comprehensive study involving macro-economic parameters influencing the primary and secondary securities market trends, corporate fundamental factors, technical indicators and investor's behaviour patterns were carried out to understand the performance of Indian capital market in recent times. The research elicits the opinion of the retail investors on the policy making of capital market thereby suggesting certain measures to the policy makers for the protection and promotion of investors.*

*Keywords: Financial market, Stock Exchange, Primary and Secondary Markets, Capital markets.*

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**INTRODUCTION**

Tracing the origin of finance, there is substantiation to demonstrate that it is as old as human life on earth. Originally a French word, it was adopted by English Speaking communities to mean "the management of money" which is in the modern era organised as a branch of economics. According to academicians, "finance is the procurement and effective utilisation of funds. It also deals with profits that adequately compensate for the cost and risk borne by the businesses". Finance, the science of money management and the actual process of acquiring the adequate quantum of required funds encompasses the oversight creation and study of money, banking credit, investments, assets and liabilities that makeup financial systems. Basic conceptuality of finance comes from one of the fundamental theories i.e. time value of money. Since individuals, businesses and government entities need funding to operate, the field is often separated into three main sub-categories: personal finance, corporate finance and government finance. Creating physical assets with the money, carrying on operating business activities and acquiring financial securities are all commitments of monetary resources at deferent times with an expectation of economic returns in the future. Internal controls/checks maintained in the work place are set off rules and regulations framed at the inception stage of the organisation and is altered depending upon businesses requirement with better futuristic decisions involving quantitative analysis of the organisation serves as an indicator of sectorial growth and desired returns. The fund raising process involves a number of stages, during the course of which a company appoints pivot financial advisors to deliver the objectives and goals of the company with having an access to a network of contacts including financial institutions, private equity investors, venture capitalists and debt financing investors.

**LITERATURE REVIEW**

Investors need to make rational decisions for maximizing their returns based on the information available by taking judgments free from emotions (Brabazon.T, 2000). Investors often want to hold a stock until it goes back up to the price paid for it no matter how long it takes. Successful investors' decision is based more on the desire to avoid that awful feeling associated with admitting mistake and overcome these adverse psychological influences (Iyer B and Baskar RK, 2002). The acknowledgement of emotionality and their empirical results suggest that the demographic factors influence the investor's investment decisions (Shanmugasundaram V and Balakrishnan V, 2010).

**RESEARCH METHODOLOGY**

The research paper is an attempt of exploratory research based on the secondary data sourced from journals, internet, articles, literatures, newspapers, previous research papers. The research design employed for the study is of descriptive nature. Focusing on the determined objectives strictly, the research design was adopted to have

greater precision and in-depth analysis of the research study. Available secondary data was extensively used for the study.

### **OBJECTIVES OF THE STUDY**

The contribution of Indian capital market towards the provision of medium and long-term finance to the deficient units.

To trace the retail investor's participation in the equity capital market over the past few years.

To study the socio-economic profile of the retail investors, investors buying behaviour and practices.

To assess the fundamental and technical factor for understanding the recent performance of the Indian capital market.

The hurdles commonly faced by small retail investors in the Indian capital market prior to arriving at an investment decision.

To recommend for the enhanced participation of the retail investors towards the contribution in strengthening the financial deepening process in India.

To highlight the steps taken by the government to strengthen the retail investor's capital base.

### **FINANCIAL MARKET**

The financial market is a broader term describing the mechanism, where trading of securities including the equities, bonds, currencies and derivatives occur. Some large financial markets including the New York stock exchange, NASDAQ, Tokyo stock exchange, London stock exchange and the forex markets trade trillions of dollars of securities on an intra-day basis. Financial market prices may not indicate the true intrinsic value of a stock due to macro-economic forces. The prices of securities are heavily reliant on informational transparency by the issuing company to ensure efficient and appropriate prices are set by the market. A financial market consists of two major segments: a) Money market and b) Capital Market.

### **MONEY MARKET**

Money market is a market for short-term funds, which deals in financial assets whose period of maturity is up to one year. The Indian money market consists of RBI (the leader of the money market), commercial banks, co-operative banks and other specialised financial institutions like (NBFCs) Non-Banking Financial corporations, LICs, UDIs etc., Operating in the Indian money market.

Money Market Instruments: Call Money, Treasury bill, Commercial Paper, Certificate Of Deposit, Repurchase agreement.

### **CAPITAL MARKET**

Capital market is an institutional arrangement for borrowing medium and long-term funds which provides facilities for marketing and trading of securities. It constitutes all long-term borrowings from banks and financial institutions, borrowings from foreign markets and raising of capital by issuing various securities such as stocks, debentures, bonds etc. It consists of two different segments namely primary and secondary market. The primary market deals with fresh securities and therefore, also known as new issue market; whereas the secondary market provides a place for purchase and sale of existing securities and is often termed as stock market or stock exchange.

### **PRIMARY MARKET**

The arrangement which facilitates the procurement of long-term funds by companies via making fresh issue of shares and debentures is usually done through private placement to financial institutions or by making public issue. The well-established legal procedure involving a number of intermediaries such as underwriters, brokers, etc. which form an integral part of the primary market, for e.g. Public sector undertakings such as ONGC, GAIL, NTPC and the private sector companies like TCS, jet-airways and so on.

### **SECONDARY MARKET**

Stock exchanges/stock markets across the entire globe constituting the well-versed and booming financial markets enabling the financial depth/Deepening to ensure the trading of deferent matured security instruments facilitate the mobilising of surplus funds from capital holders to deficit units. In the innovative era, most developed economies, the growth pattern of which depends upon the supply leading condition exaggerate the economic growth process resulting in a fast paced financial deepening. While in contrast, the developing or less developed economies depending upon the demand following conditions basically follow the pattern of strengthening the financial markets and trading in secondary market to result in a stabilised and promoted

economic growth. Required regulatory norms, stringent and transparent practices, information symmetry, globalised interconnections have all created a competent global environment. New York stock exchange, NASDAQ, London stock exchange, Tokyo stock exchange are the leading stock market indices evoked the competitiveness through technological advancements and easier compliance trading thereby generating more liquidity and velocity of securities dealing. BSE SENSEX, NSE (Nifty 50) in India, serve as the economic barometer and quantitative index to signify the prosperous growth in the external market to support the social external infrastructure.

#### **FACTORS RESPONSIBLE FOR GROWTH OF INDIAN CAPITAL MARKET**

- Growth of stock exchanges(BSE 1875, NSE)
- Development of financial institutions (Mutual Funds, Venture Capital Funds, Index Funds, Pensions funds etc.)
- Easier Compliance and growth in merchant banking services.
- Effective role of credit rating agencies (ICRA, CRISIL, Fitch India pvt.ltd.)
- Stricter corporate governance norms, enhanced transparency, stringent regulations, advent of newer security instruments, feasible investment avenues, magnified interest protection policies for investors.
- Setting up of National Securities Clearing Corporation (NSCC).

#### **CAPITAL MARKET FUNDS VS DEPOSITORY INSTITUTIONS LOANS**

In the capital markets case, intermediation occurs through the exchange of wide array of instruments including common and preferred equities, convertible bonds, corporate bonds, mortgage-backed securities, and other asset-backed securities. In the depository institutions case, intermediation differs in three important respects. First, the investor does not have a claim on the ultimate beneficiary of the funds. Second, the price of this claim does not typically fluctuate in response to the shifts in supply and demand. Third, the investor can not normally sell this claim to a third party. An important difference is that with a regular bank loan the lending is not securitized. Another difference is that lending from banks and similar institutions is more heavily regulated than capital market lending. Furthermore, bank depositors and shareholders tend to be more risk averse than capital market investors.

#### **ROLE OF RETAIL INVESTORS IN THE CAPITAL MARKET**

Retail investors play a prominent role in the capital market along with the foreign institutional investors and domestic financial institutions. But, it is deplorable that the household investors park their savings only 2% to 3% in capital market, perhaps because they have burnt their fingers in the market scams, manipulations and also on account of the higher volatility. No study about the securities market will be complete without the mentioning of investors and stakeholders particularly the retail investors. Retail investors are advised to trade with an abundant caution and with limited amount of capital to undertake the risk. As retail investors look for long-term investment in converse to the FIIs, FFIs, QIBs and HINs play for short-term gains, the government and its various agencies must look after the interests of the retail investors for building up the strong economy. There is growing concern about the safety and integrity of capital market at the international level so as to make the stock market safer, transparent and devoid of frauds and scams. Today, Indian securities market is one of the most robust and vibrant securities market in the world with latest technology, shortest settlement cycle, paperless transactions and screen based trading system, better corporate governance and faster dissemination of information. Although, price manipulations, increased volatility, repeated scams, ineffective corporate governance norms etc. have been the main reasons for keeping the retail investors away from the securities market. Safety of the invested money, liquidity of the instruments and return on the investment are the pivotal objectives while investing. A strike is needed to balance between raisers of capital and the interests of investors.

#### **FINANCIAL INNOVATIONS AND DEVELOPMENT IN INDIAN CAPITAL MARKET**

NSE pioneered the commencement of internet trading which led to the wide popularisation of the NSE in the broker community. The abolition of fixed charges in the form of commissions has intensified competition among the brokers, the creation of asset backed securities, reduced amount of equity required for working capital and further reduction in the financing cost. The development of scripless trading and book entry settlement with reduced back office paperwork has led to the reduction in transaction cost. Capital market insurance solutions offer a promising means of funding protection for even the largest potential catastrophes. Unit linked insurance plans (ULIP) - the capital market linked insurance products are the new best selling instruments in the insurance market. NSE also conducts online examination and award certification, under its programmes of NSE's certification in financial markets (NCFM). Currently, certifications are available in 9

modules covering different sectors of financial and capital markets. The introduction of committees for IPO issues regarding the mismanagement of funds. The facilitation of the process of demutualisation and corporatisation of stock exchanges and launching of the electronic order matching system for trading in gilt edged securities on its negotiated trading system allowed capital market to boom. Allowing MFs to float Gold Exchange Traded Fund Schemes which have permitted to invest primarily in gold and gold related instruments and guidelines for private placement of debt by listed companies

### **CHALLENGES IN THE DEVELOPMENT OF CAPITAL MARKETS**

The proper functioning of capital markets requires the several preconditions classification into 3 groups: sound macro-economic policy, strong institutional and legal setting and a well-functioning financial infrastructure. Without this precondition, the government efforts to develop local capital markets are bound to fail, resulting in shallow markets and duped investors and therefore generally advisable to sequence financial reforms such that these conditions are sufficiently in place before local capital markets are established.

### **BENEFITS TO THE RETAIL INVESTORS FROM THE CAPITAL MARKETS**

Wisely taken investment decisions putting into consideration the viability of the company, critical analysis of its fundamentals, past financial performance, management structure, business environment, market competitiveness and other macro environment factors turns out to be desirable and fruitful.

**Capital Appreciation:** It entails the difference between the purchasing and selling price of a share of a company which signify the capital gain.

**Dividend Payment:** A sum of money agreed upon by the directors of a company to be paid on proportional basis from the company's profit in a given financial year.

**Bonus Issue:** Incentive, entailing a shareholder to acquire additional shares from the company without necessarily paying for these shares.

**Participation in the Rights Issue:** Investors are opportune to participate in Rights issue of the company where the price is usually lower than the prevailing market price.

**Participation in Decision Making:** Right to attend annual general meeting of the company thereby participating in its decision making and exercising voting rights.

**Banking collateral and social security benefits:** Share certificates serve as collateral to obtain bank loans for individual use or business development. Buying of stocks could be used as individual preparation towards personal pension plan, therefore having an opportunity to considerably invest in the stock market during earlier age.

### **CHALLENGES FACED BY THE RETAIL INVESTORS**

**Inadequate Capital:** The small investor with less capital invested in the stock market trades for himself, not for a company. Although, small investors generally invest in stocks, mutual funds and index funds, investment choices available like options, futures, forwards and swaps are usually too complicated and expensive for small investors.

**Cost:** Small investors' lower degree of negotiating power allow brokerage firms to charge a higher percentage of management fees on small accounts thereby meaning a higher return for the year to break even. Funds, especially index funds, have very low annual fees.

**Diversification:** As a small investor, it's harder to build own diversified portfolio due to limitation of available resource to spread across various industries or companies.

**Information:** One other disadvantage from the small investor's point of view is the information asymmetry. Professional investors have research staffs that are constantly providing them with up to date information. As a small investor, it can feel one step behind our competitors. However, the internet has made a big dent in this disadvantage.

### **FINDINGS**

Analysis states a strong negative correlation between the number of listed fixed income products available to retail investors and depth of retail trading activity. There has been a higher degree of substitutability between listed fixed income and equity products. In fixed or partly negotiable fee model environments, reductions in brokerage fees are strongly positively correlated with increase in trading activity. Reduced trading fees in a market with a non-negotiable fee model has a positive influence levels of trading activity increase in cost-to-trade are associated with declines in depth of retail activity as there is a significant negative relationship

between increase in clearing fee and levels of trading activity. Moving from a fixed to a negotiable or even partly negotiable fee model has the effect of reducing cost-to-trade.

### **SUGGESTIONS**

The outcome of this research leads to the suggestion that the regulators must include the role of behavioural dimensions in its awareness campaigns due to the criticality of these factors in investment decisions. It is recommended that the investment analyst must incorporate behavioural factors in their analytical model qualitatively. The media must create awareness about the behavioural dimensions that are equally important like technical factors. This research also recommends appropriate measures to address the genuine apprehensions of the retail investors. There is need to increase the retail investor participation and this could be done by increasing the financial literacy and awareness, expanding the number of issues, providing diverse investment options, training and increasing the reach of intermediaries, enhancing investor protection measures, simplified norms and cost-effective services.

### **CONCLUSION**

The small investor's attitude towards debt instruments needs change, and that this will be impossible without a radical overhaul of the small savings schemes in India. There seems to be widespread misconception about pooled investment vehicles that needs to be removed as investments such as mutual funds can really fulfil the entire range of risk appetite for small investors while increasing the depth and width of primary and secondary debt capital markets. Finally some suggestions regarding market innovations in terms of a derivative product (Counter Party Risk Protection

Security) that may help allay small investors concerns while transacting in corporate securities and help fuel growth in these markets.

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**AUTOMATION IMPACT ON INDIAN STEEL INDUSTRY**

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**ABSTRACT**

*With the increased competition and demand in the global market, automation is becoming the necessity. Through the adoption of more efficient and advanced technologies, the increase in productivity in the manufacturing sector is effective in merging economic, environmental, and social development objectives. In the Indian steel industry modernization, a very important role has been played by automation for making it possible to compete in global market. The main advantage the Indian Steel industry is having the availability of domestic raw material and low labor cost. In the present work an attempt has been made by literature review to identify the automation parameters and their effects on the Indian Steel Industry*

*Keywords: Automation, Indian Steel Industry, Government Policies, Technological Advancements.*

**1. INTRODUCTION**

Indian steel industry has entered into a new developmental stage and on the world chart, India is at fifth place among countries producing highest crude steel. Per capita steel consumption is an indicator of the economic growth of a country. Due to the globalization of Indian economy and development of the industries using steel as raw material like automobile industry, railway, defense etc. in the country, the steel consumption in India is also increasing. The main advantage for the Indian Steel Corporations is that the availability of the domestic raw materials and low labor wages as compared to the rest of the world.

Going through the history, modern Indian steel sector started way back in 1907 when Tata Iron and Steel Company established its plant and the steel production started in India in 1913. After the liberalization of Indian economy and removal of large number of controls in 1991-1992, an era of development has been experienced in steel industry and as consequences India became the fifth largest crude steel producing country with China on the top. The use of new sophisticated automatic control techniques and opening up the steel sector to private sector in India made it possible to compete in the world market.

**2. STUDY AREA**

The present work focuses on the literature review on the automation and co-relating the advancement in automation with the development of the Indian Steel industry. Considering the domestic and global scenario of steel industry by studying the various reports published by Indian Government a comprehensive study is made to find the effects of automation on the Indian Steel corporations.

**2.1 Objectives of Research Study**

The paper focuses on the decision variables which the enterprises consider while automating its production system. An attempt has been made to segregate the decision variables from the available literature into three broad classifications which are: Internal variables, External Variables and competitive Variables.

**2.2 Evolution of Frame Work**

With the globalization of markets after World War II, the competitiveness in the global market has increased and there is increasing demand of good quality products. The literature on automation is reviewed under three cardinal dimensions which are Internal Scanning, External Scanning and Competitive Positioning. Eleven major parameters are explored under these three cardinal dimensions as shown in the Figure 1

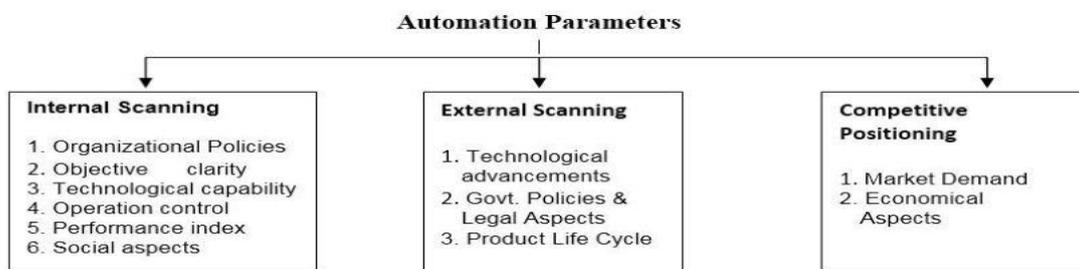


Figure-1: Decision Variables of Automation

**2.3 Exploratory Decision Variables from Literature Survey**

Total 42 number of research papers are scanned for exploring the variables of automation and the following 11 major parameters were explored from these papers under the 43 decision variables as shown in the Table 1 with the references given.

S. Adjuvant

**Table-1: Explored Parameters of Automation**

S. No.	Adjuvant dimensions	Decision Variables	Research papers
1	Organizational Policies	1. Organizational Structure 2.Firm size 3. Company’s strategy and goals	2,4,11,13,14,19,29
2	Objective clarity	4. R&D expenditure to sales ratio 5. Industrial standards	4,12,15,37
3	Technological capability	6. Innovation cycle 7. Safety 8. Engineering & material database 9. Interrelation between production units	1,4,5,6,8,9,11,12,13,14,18, 22,23,26,28,33,34,35
4	Operation control	10. Remote calibration 11. System accuracy 12. Supervision 13. Integration 14. Modeling	1,3,6,8,10,12,13,17,19,20,2 123,25,27,31,32,34,35
5	Performance index	15. Productivity 16. Price recovery factor 17. Yield 18.Throughput 19. Turnover	4,5,9,15,16,21,24,36
6	Social aspects	20. Labor force 21.Labor productivity 22. Motivation	4,7,10,16,19,21,22,26,36,3 7,38
7	Technological advancements	23. Hardware, Software and System ware 24. Neural Networks and Artificial Intelligence 25. Adaptability 26.Opacity	1,6,7,8,10,14,18,21,26,27,2 8 31,33,34,35,40,41
8.	Govt. Policies & Legal Aspects	27 Govt. Policies 28. Labor unions 29. Environmental awareness 30. Unemployment 31.Vocational education 32. Direct &indirect labor cost 33. Manufacturing pro activeness	1,2,4,17,19,22,23,25
9.	Product Life Cycle	34. Product Variety 35. Customer Services 36.Demand	3,4,5,7,8,11,15,18,26,38
10.	Market Demand	37. Market development 38.Market share 39. Competition 40.Integration of production & business studies	2,4,15,16,21,23,24,29,34,3 7,39,40,42
11.	Economical aspect	41. Sales per employee 42. Budgeting 43. Profits	2,11,12,14,17,22,24,27,28, 29,37,39,42

Table 2 shows the distribution of focus of research study over a span of time. The time span is divided into four parts and number of research articles studied is divided according to the parameters of automation given in Table No.1

Table-2: Distribution of Focus of Research Study over a Span of Time

S. No.	Adjuvant dimensions	Before1980	1980-1989	1990-1999	2000-2010
1	Organizational Policies		4	2	1
2	Objective clarity		1	2	1
3	Technological capability	2	8	3	5
4	Operation control	3	6	4	5
5	Performance index		2	4	2
6	Social aspects	4	3	2	1
7	Technological advancements	4	6	1	4
8.	Govt. Policies & Legal Aspects	1	2	4	1
9.	Product Life Cycle	2	1	5	1
10.	Market Demand		2	6	2
11.	Economical aspect		5	5	1

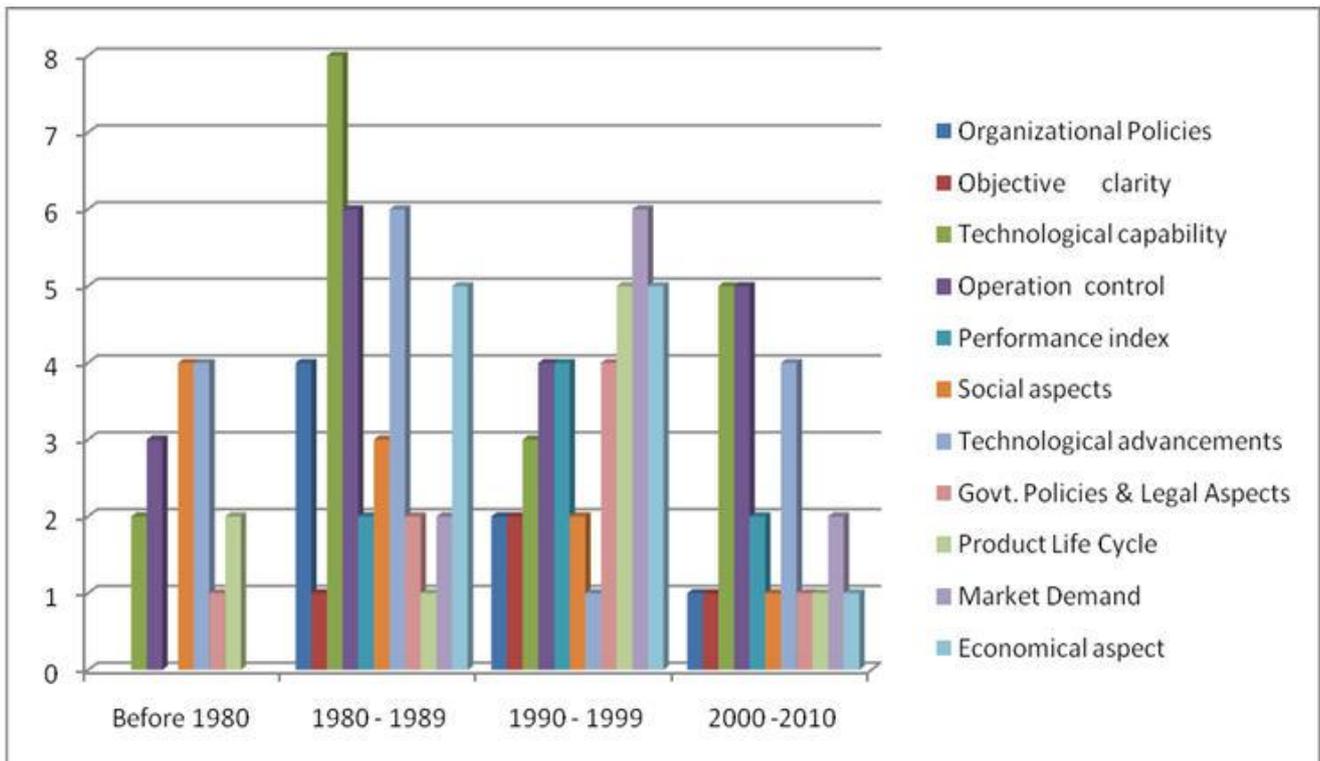


Figure-2: Graph of Focus of Research Study over a Span of Time

**3. CONCLUSIONS AND DISCUSSIONS**

From Table 2 and Figure 2 it can be concluded that before 1980 the main focus of the research was on the technological advancements and the effect of automation on the society and workers. In the decade of 80's the research had shifted to the technological capabilities and technological innovations so as to renovate the previous production system. Beside this the budgeting of the automation projects and profits were also studied during this period of time. But in 90's beside the technological advancements, the market behavior also was also studied to find the effects of the process of automation. Govt. and legal aspects

also played a major role during this decade. But during 2000-2010 technological advancements and capabilities and operation control were the major research topics. Over the period 2002 to 2007 the production of steel in India has increased by a compounded annual growth rate (CAGR) of 8 percent. In comparison to world average, projected growth in India is higher. Whereas in India consumption of steel per capita is far below the average of world and that of developed countries. The major changes in Government policies after the liberalization of Indian economy which caused the automation and development of Indian steel sector are:

1. Removal of large plant capacities that were reserved for public sector;
2. Elimination of restrictions on export;
3. Reduction in import tariffs from 100 percent to 5 percent;
4. Decontrol of domestic steel prices;
5. Encouraging the foreign investment, and giving high priority to the steel industries foreign investments.
6. Replacement of freight equalization scheme with system of freight ceiling.

The automation has affected the manpower requirement. For example in Rourkela Steel plant the manpower has declined from 21680 in 2006-07 to 19455 in 2009-10. Although for same period of time the labor productivity has increased. It is observed that due to automation introduced in Blast furnace, Steel Melting shops and reheating furnaces the output has increased by about 8-10% and in rolling mills the output has increased by 15% (Rajat Kumar Panigrahy, Ashok Kumar Panda and Srikanta Patnaik, 2011).

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## NIFTY 50: RISK &amp; RETURN ANALYSIS

Dr. Parul Bhatia<sup>1</sup>, Arpita Aggarwal<sup>2</sup> and Deeksha Khanna<sup>3</sup>Assistant Professor<sup>1</sup> and Student<sup>2,3</sup>, Apeejay School of Management, New Delhi**ABSTRACT**

India is one of the emerging and developing economies which have seen a lot of development in the stock market i.e. from the era of physical trading to online trading of shares. This has also increased the level of risk which the investors are facing. Due to which risk and return analysis is of utmost importance for an investor to look while investing in a developing market. Theoretically, it has been believed that risk and return in a stock market displays direct relation that if the risk rate is high then returns will also be high and vice-a versa. Therefore, in this study, to check whether the above stated relation exist the data of fifty stocks of the NIFTY 50 index with the market index for a period of 10 years starting from September 2009- June 2018 has been taken and the study is made on the daily basis data. NIFTY 50 has been used because it is one of the two main stocks indices in India which comprises of 50 stocks from 12 different industries. Further the tools used for the study includes measuring yearly average returns for the stock, beta, correlation between the risk& return and graphical analysis. The study made from the above tools will help us specifically establishes the relationship between market risk and return from a stock which shall be helpful for investors to plan their portfolios as per the market risk (beta values).

*Keywords: Beta, Nifty 50, Return, Market Risk*

**1. INTRODUCTION**

Investment is the action of putting money in someone's pocket in order to earn profits. But in finance, Investment got a broader perspective. It is broadly divided into two categories: financial investment and economic investment. Financial investment market deals with the investments made in financial instruments like shares, bonds and debentures etc. Whereas economic investment deals with those investments which are made with a purpose to create wealth in future, it includes investments in commercial and real estate properties

Therefore, we can say that in today's market an investor is surrounded by a number of options available to him for investment. But with the emergence of investment options there are rising expectations and risk in the market, which needs to be analyzed carefully before making an investment. That is why Risk and return analysis is of foremost importance with the Today's era markets which is not only developing but are emerging as a complex affair to study i.e. why if any investor wants to invest in a market or in any particular stock he/ she need to analyse various factors before investing. Risk and return are the main factors which are of the most important while making an investment decision.

Talking about the Return, it is the extra benefit or income earned by an investor after sacrificing their current income or consumption. Returns are measured in terms of regular income or capital appreciation. Whereas on the other hand, Risk can be defined as an uncertainty associated with any investment which deviates the amount of expected return from an investment. It is broadly divided into two categories: Systematic risk and Unsystematic risk. Systematic Risk is also known as Market risk or Undiversible Risk which are beyond the control of the company such as Inflation rate, Interest rate and Government Policies. Whereas Unsystematic Risk are known Diversible risk which are within the control of the company such as Interest Risk, Business Risk and Financial Risk. There are two common measurements of investment risk i.e. Alpha and Beta.

Beta is the historical measure of volatility which explains how an asset i.e. stock or a portfolio moves versus an index whereas Alpha is the historical measures the assets return on investment versus to the risk adjusted expected return. Depending upon the investor's reaction, volatility can be a blessing or a curse which means that if the investor is selling in a panic when everyone else is also selling then volatility can be a curse and it can be vice versa i.e. if investor anticipate volatility, it can be a blessing for him which can lead to a good investment. The key in this approach is that an investor should stay focused on buying investments with a margin of safety that means being disciplined in approach of buying and selling.

Further various models and procedures are being used by different – different investors to understand the risk and return.

When we compare with the world, India has a higher level of volatility in equity markets. Stock market risk is the tendency of stock prices to decrease due to the change in value of the market risk factors. Until now, Banking and financial services sector funds have accelerated on generating superior risk adjusted returns, they

suffer from the risk of portfolio concentration as a single stock accounts for equity portfolio in some gear. Depending upon the financial performance of the issuers and general economic, political, tax and market conditions, the market value of the investments will go up and down. Equity investment includes high risk at the same time it earns higher return unusually high returns may not be sustainable. The RBI i.e. Reserve Bank of India has taken the control of the banking industry; it is adversely used as the tool to control the external problems like inflation, interest rate, and money supply. Due to this, it reduces the real investor's interest as there is a high instability in the share price.

Though generally the objective of an investor is to earn higher returns in a competing market, as he/she is sacrificing their current consumption to earn additional returns or benefit in the upcoming future. Now, to achieve higher return it is said that investor needs to bear higher level of risk and vice-a-versa. So, to understand or check whether the above relationship exists our study investigated the Nifty 50 scrips movement behaviour from 2009 to 2018. In this study we have analysed the relationship between risk and return of the market with the particular company's stock for a period of 10 years.

## **2. OBJECTIVES OF THE STUDY**

- To analyse risk and return traits of nifty 50 stocks.
- To find the relationship between returns and risk with beta and standard deviation.
- To study individual returns of sample stocks on daily basis.
- To find out the best performing stocks on the basis of average returns.
- Comparing and Analysing the stocks of all the companies by graphical analysis of Average Returns and their beta values thus finding which companies are performing good according to the market.

## **3. LITERATURE REVIEW**

Literature Review summarizes the information from other researchers who have been studying the risk & return relationship from different environments. Following researches have been found to be extremely helpful in our research:

“B. Vijayalakshmi (2017) in her Study on Risk and Return Analysis of Selected Industries in India analyzed the risk-return relationship on individual securities and portfolios of NSE stocks. From the study made it was concluded that in both the cases of investment i.e., investment in individual securities and portfolios the relationship that exists between risk and return remains positive. Positive relationship means higher the risk, higher the return and vice-a-versa.”

“Dr. S Poornima and Swathiga P (2017) made study on the stocks of two different sectors i.e. Automobile and IT industry. Under these five stocks of each industry were analyzed to find out their risk and return with the help of CAPM (Capital Asset Pricing Model). And from the study made, it was analyzed that in the automobile sector the returns were high with low risk whereas in the IT industry the risks were high giving less return.”

“Surya Narayan (2011) studied the selected securities of Gulf market viz. Muscat Securities Market (MSM) to analyze the risk and return on the securities. The study was conducted for the period of six months on thirty securities in total of banking, manufacturing and services sector. Average returns from the securities, beta and correlation of individual securities were measured with the market index. And from the analysis made the result carried out was that during the period immediately after the global financial crisis the securities with less risk performed better.”

“Dr. S. Krishnaprabha1, Mr. Vijayakumar (2015) in their Study on Risk and Return Analysis of Selected Stocks in India found that the Pharmaceutical sector, FMCG sector (fast moving consumer goods) and IT sector gives high return with a low risk whereas in the banking and automobile sector the returns as less with the high risk. Further the Alpha of the FMCG, pharmaceutical sector and IT sector is found positive indicating the movement in the stock return is independent to the market return and is giving profitable returns.”

“Joseph Lakonishok and Alan C. Shapiro (1985) in their Study on Systematic Risk, Total Risk and Size as Determinants of Stock Market Returns analyzed the stock market returns and the other variables for a period of 19 years from 1962 to 1981. In which it was concluded that only size of the market affects the stock return not the risk variable.”

“Glenn N. Pettengill, Sridhar Sundaram and Ike Mathur (2009) in their Study on the Conditional Relation between Beta and Returns found out that positive relation between the return and beta can be seen in the case of expected returns rather than realized returns. Also, in the case of highly market negative returns inverse relationship exists.”

“Seha MTinic, Richard RWest (1984) in their Study on Risk and Return : January vs. the rest of the year studied the relationship between expected return and risk from 1935 to 1982. From the study made out they found out that a positive relationship between risk and return can be seen in the month of January whereas in the remaining eleven months risk premium is significantly not different from zero.”

Ali Argun Karacabey (2001) in their Study on Beta and Return: Istanbul Stock Exchange Evidence studied the data of Istanbul Stock exchange for a period of 11 years from 1990-2000. From the study made out they found that there exists a conditional relationship between beta and returns which can be used by investors and portfolio managers for making investment decisions.

Dr. T. Manjunatha made a study on how risk and return move in India market with the construction of portfolios. The study was made on Nifty stocks for the time period of 14 years and 6 months i.e. from 1st Jan 1996 to 30th June 2010. Conclusion derived from the study made was that in Indian market one can maximize the returns and minimize the risk by adding a greater number of stocks into their portfolios.

Rajesh P N carried out a study on the risk and return analysis of Indian market. He had analyzed the daily stock returns of Nifty and Nifty Junior for a period of 6 years and concluded that in Indian markets there exists no risk premium.

Yakov Amihud from New York University did research on risk and return relationship in which he introduces two econometric methods in order to improve the efficiency of the estimation which will lead to provide more powerful test statistics i.e. joint pooled cross-section and time-series estimation and generalized least squares. By using these techniques, he found that there is a highly significant relationship between average portfolio returns and systematic risk.

Pankunni.V from Kerela studied the relationship between beta and equity returns of the different stocks of listed in BSE for 15 years. In her research test of linearity between the beta and equity returns is attempted in order to know whether the market price and value of stock coincide. In the study she found that there is a significant relationship between the two but the relationship cannot be exactly found as linear. It was also studied that high beta stocks are earning more returns and both under and overpricing is found.

Kapil Chowdhry did the research in order to find the validity of CAPM for the Indian Stock Market in which he took 278 companies out of 500 companies listed on BSE through which it was found that there was no support evidence in providing the relationship between higher risk & return. But the study did not find any support of evidence on the ground of listed facts in contrast there was evidence in disproving the viability of CAPM in Indian context. So, in addition to that, the study conducted the test in order to investigate whether the CAPM captured all the aspects of reality by including residual variance of the stocks. The result which was obtained by the test conducted for the above did not clearly reject CAPM. In the light of the above findings, in his study he concluded that beta is not sufficient to determine the expected returns on securities or portfolios.

#### **4. SCOPE OF THE STUDY**

The dimensions of the study revolve around nifty 50 stocks for risk-return analysis for a period of 2009 to 2018 through which daily analysis is done of each stock. The period of 2009 to 2018 has been selected as that was the period after recession and this study investigates the performance of the stocks after that period till today i.e. 2018 so as to know how these stocks have been performing according to the market.

#### **5. RESEARCH METHODOLOGY**

For the study we have taken the securities of NIFTY50 Index companies which are mentioned below:

- Adani Ports and Special Economic Zone Ltd.
- Asian Paints Ltd.
- Axis Bank Ltd.
- Bajaj Auto Ltd.
- Bajaj Finance Ltd.
- Bajaj Finserv Ltd.
- Bharat Petroleum Corporation Ltd.
- Bharti Airtel Ltd.
- Bharti Infratel Ltd.

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- Cipla Ltd.
  - Coal India Ltd.
  - Dr. Reddy's Laboratories Ltd.
  - Eicher Motors Ltd.
  - GAIL (India) Ltd.
  - Grasim Industries Ltd.
  - HCL Technologies Ltd.
  - HDFC Bank Ltd.
  - Hero MotoCorp Ltd.
  - Hindalco Industries Ltd.
  - Hindustan Petroleum Corporation Ltd.
  - Hindustan Unilever Ltd.
  - Housing Development Finance Corporation Ltd.
  - I T C Ltd.
  - ICICI Bank Ltd.
  - India bulls Housing Finance Ltd.
  - Indian Oil Corporation Ltd.
  - IndusInd Bank Ltd.
  - Infosys Ltd.
  - Kotak Mahindra Bank Ltd.
  - Larsen & Toubro Ltd.
  - Lupin Ltd.
  - Mahindra & Mahindra Ltd.
  - Maruti Suzuki India Ltd.
  - NTPC Ltd.
  - Oil & Natural Gas Corporation Ltd.
  - Power Grid Corporation of India Ltd.
  - Reliance Industries Ltd.
  - State Bank of India
  - Sun Pharmaceutical Industries Ltd.
  - Tata Consultancy Services Ltd.
  - Tata Motors Ltd.
  - Tata Steel Ltd.
  - Tech Mahindra Ltd.
  - Titan Company Ltd.
  - UPL Ltd.
  - UltraTech Cement Ltd.
  - Vedanta Ltd.
  - Wipro Ltd.
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- Yes Bank Ltd.
- Zee Entertainment Enterprises Ltd.

Information about the same has been taken from secondary data sources i.e. Website of NSE.

Then for the research purpose we have calculated the daily returns, average returns, beta values and correlation between the individual stock and market returns.

Further two methods were used for the study which are:

1. Graphical representation and analysis of average returns and beta.
2. Correlation Analysis

In order to conduct the research through the above-mentioned methods, the variables studied are as follows:

Measurement of daily and average returns With the help of the daily close price of the individual securities we have calculated the daily and average returns.

Formula for the same is:

$$\text{Daily Returns} = (\text{Close price of the current day} - \text{Close price of the previous day}) / \text{Close price of the previous day} * 100$$

$$\text{Average Returns} = \text{Total of daily returns} / \text{No. of days}$$

Measurement of Beta values

Beta is a measure of systematic risk which most of the investors use to analyse the overall risk in the securities and to plan their investment portfolio.

It is calculated as follows:

$$\text{Beta} = \text{Covariance} / \text{Variance of the market}$$

Measurement of Correlation Values

Correlation measures the relationship between two and more variables. In this study, we have calculated the correlation between the returns of the individual securities and risk associated with them i.e. their beta values.

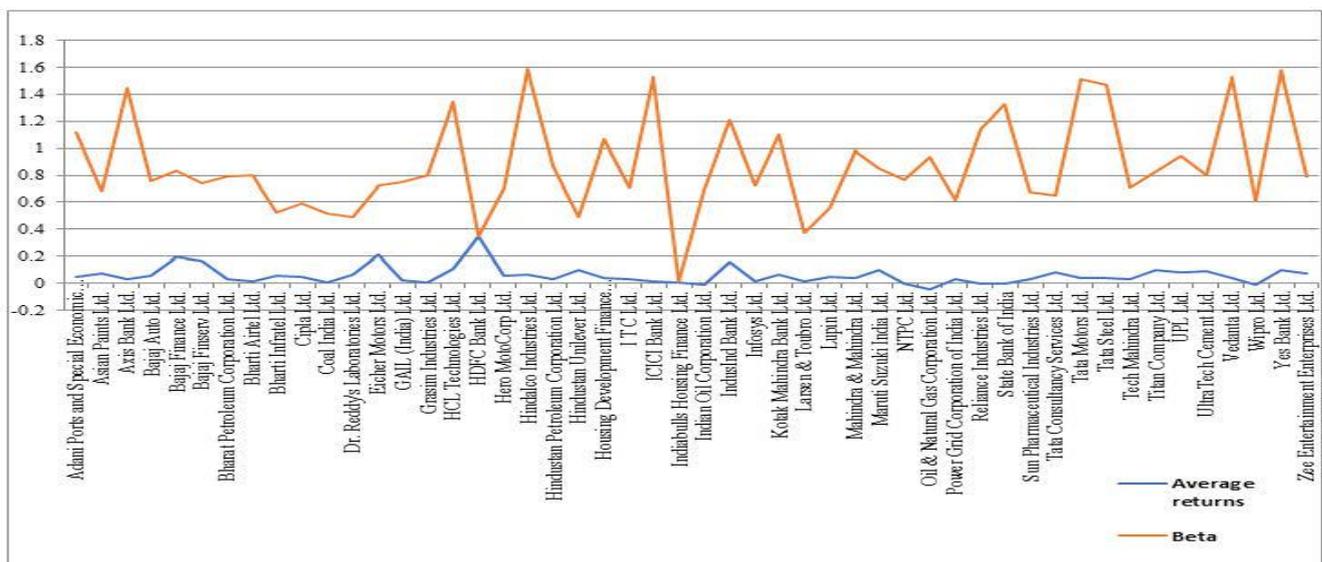
A positive correlation states direct relationship between the variables whereas negative defines the indirect relationship. Correlation is measured with the help of function in excel.

Statistical Tools Used for Analysis

Microsoft Excel 2016 has been used for the purpose of analysis.

## 6. DATA ANALYSIS

In the first method of graphical representation we have constructed a graph representing average returns and beta values of all the companies taken. The graph which we have prepared is shown below.

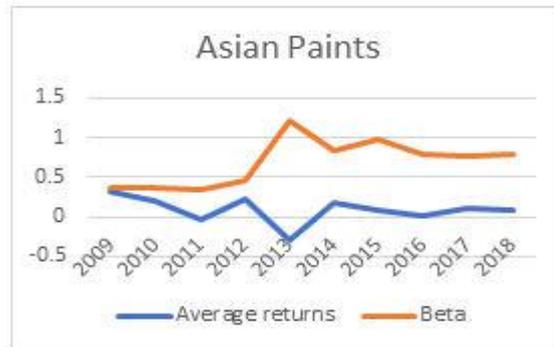


Now after analysing the movements in graphs regarding the risk and return values it can be interpreted that most of the companies are showing the positive risk-return relationship. As the risk is rising, returns are also increasing and vice-a-versa.

For example: In Bajaj Finance Ltd, Eicher Motors Ltd., Yes Bank ltd. etc.

But still there are companies such as Asian Paints, Bajaj Finserv, HDFC Bank etc. which are not showing the direct relationship between risk and return. They are found to be moving in the opposite directions at some points and their correlation is also negative. So, to understand the reasons behind the opposite movements we have further analyzed the individual companies. The analysis made is stated below: exceptional cases have been discussed below:

**1. Asian Paints Ltd.**



In the case of Asian Paints, it can be noticed that even with the rise of beta there is no rise in the average return.

Even at some points average returns are moving opposite to that of the risk, especially in the year 2011 and 2013. Reason for the low average return during the year 2011 was the closing of two major plants by company which gave a negative message in the market and share price of the company fall drastically. Then in 2013, Asian paints declared a stock split in the ratio 1:10, which reduced the stock price and hence the returns.

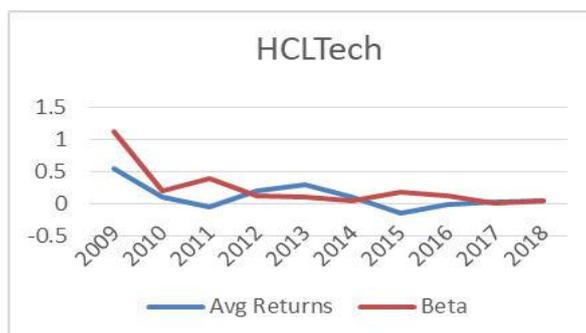
**2. Bajaj Finserv Ltd.**



In the case of Bajaj Finserv Ltd. we can see that in the year 2009 & 2010 risk and returns were moving in the same direction but then in 2011& 2013 reverse situations were noticed.

The reason behind the falling average return was announcement of 100% dividend in 2011 and issuance of right shares in 2013. And after 2013 as well returns were almost same or stable with the rising risk in the market

**3. HCL Technologies Ltd.**



In the case HCL Technologies Ltd. risk and returns from the very starting were seen to be moving in opposite directions. The reason behind the same was the company performing less profitable in the rising risk market. In 2011, there was a 83% decline in the net profit of the company. Then in 2015&2016 as well net profit of the company fall from the expected one which posed a adverse effect on the average returns.

**4. Hindustan Unilever Ltd.**



In case of Hindustan Unilever Ltd. it can be seen that the risk were continuously rising but the returns were stable or almost one and the same over the period of last 10 years. It means that even if the Hindustan Unilever was not able to earn the risk premium but it maintained its average return or share price in the risk market.

**5. TCS**



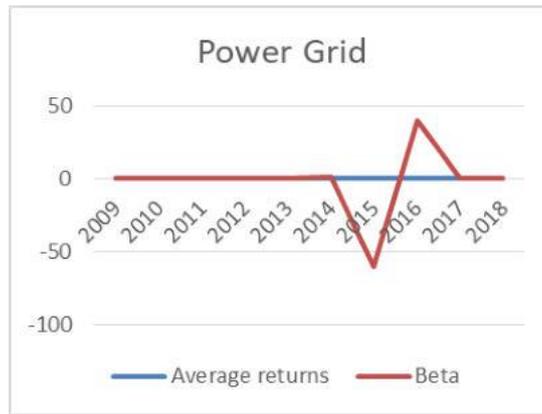
In the case of TCS, it can be noticed that with the rise of beta i.e. risk measure there is sufficient rise in the average return. Even at some points beta is reduced over the years but still average returns are moving positive to that of the risk, especially from the year 2013 and 2016. In 2018 even, the risk taken by the company was very minimal even though the company was earning sufficient returns. As India’s largest IT outsourcer, TCS is always been at the top among the other IT companies i.e. Wipro, Infosys etc. TCS has recently announced in the bonus shares for its shareholders in the ratio 1:1. There were some ups and downs in the IT a sector for some period but then TCS were able to recover from that and is performing at a stable level in the market as compared with competitors. According to financial express, in January this year shares of the company have made an all-time high on NSE.

**6. SBI**



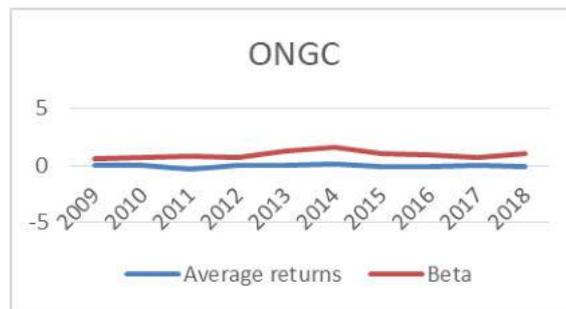
In the case of SBI, again no direct relationship between beta and return can be laid down. At some points there was rise in the beta measure but return either fall down or remained the same. In 2014, SBI gains after 1:10 stock split came into effect through which it became easy for the investors to acquire the stock at a low price and also improves the liquidity position. Though in 2014 the returns did not change till 2015 but it showed it’s after effect in further years. This is the reason that after this period the returns for the company rose again. Though beta value also rose but there were adequate returns also.

7. POWER GRID



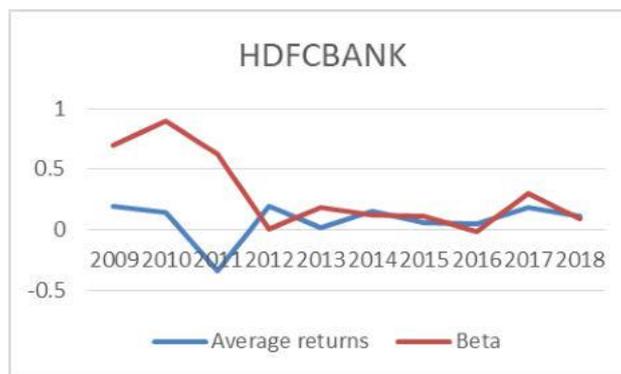
Power Grid is performing which is clear from the above graph. In 2009, the subsidiary named Power System Operation Corporation Limited was incorporated by the company which lead to negative returns as it was the time that the company was not able to focus on its main function which lead to negative returns. In 2013 the Company received its international rating from S&P and Fitch rating, for the first time. After that even company was not taking much risk but was able to earn some amount of return.

8. ONGC



From the above graph, we can see that average returns and beta of the ONGC are somewhat moving in a same direction. After 2011, with the rise in the risk there is a hike in the returns as well, stating a direct relationship of risk and return.

9. HDFC



As the 23-year-old organization, HDFC is the India’s second largest private sector lender and after observing its performance over the years, India has identified HDFC as DSIB (Domestic Systematically Important Banks) which made it the organization which is too big to fail. As can be seen in the graph above, the bank has performed very well during the period 2014 to 2018 i.e. higher the risk and higher the returns. The reason that the bank earned negative return during the period of 2011 was stock split in company’s share in the ratio 1:5 but after that period HDFC managed to earn adequate returns. Now, in the graphical representation method though we have tried to analyzed risk and return relationship through the movements of the average returns and beta values. But still to understand the relationship more precisely correlation Analysis is also made in the study. Under this correlation between average return and beta of each company is measured. The table of the correlation values is shown as below:

Company Name	Correlation	Company Name	Correlation	Company Name	Correlation
Adani Ports and Special Economic Zone Ltd.	0.469298659	Hero MotoCorp Ltd.	-0.0245994	Oil & Natural Gas Corporation Ltd.	0.177646177
Asian Paints Ltd.	0.656357436	Hindalco Industries Ltd.	0.1380642	Power Grid Corporation of India Ltd.	0.222943463
Axis Bank Ltd.	0.234547326	Hindustan Petroleum Corporation Ltd.	0.05400378	Reliance Industries Ltd.	0.890479849
Bajaj Auto Ltd.	0.832785799	Hindustan Unilever Ltd.	0.24876219	State Bank of India	0.193026392
Bajaj Finance Ltd.	0.616576636	Housing Development Finance Corporation Ltd.	0.33933062	Sun Pharmaceutical Industries Ltd.	0.781401678
Bajaj Finserv Ltd.	0.381000357	I T C Ltd.	-0.3793463	Tata Consultancy Services Ltd.	0.483558345
Bharat Petroleum Corporation Ltd.	0.003159554	ICICI Bank Ltd.	0.73111386	Tata Motors Ltd.	0.258919498
Bharti Airtel Ltd.	0.052333901	India bulls Housing Finance Ltd.	0.02078348	Tata Steel Ltd.	0.38175551
Bharti Infratel Ltd.	0.062446102	Indian Oil Corporation Ltd.	-0.3384091	Tech Mahindra Ltd.	0.619452305
Cipla Ltd.	0.384816875	IndusInd Bank Ltd.	-0.00662	Titan Company Ltd.	0.290673594
Coal India Ltd.	0.300573657	Infosys Ltd.	-0.2149568	UPL Ltd.	0.279367928
Dr. Reddy's Laboratories Ltd.	0.113764029	Kotak Mahindra Bank Ltd.	0.29873894	UltraTech Cement Ltd.	0.340462875
Eicher Motors Ltd.	0.039132288	Larsen & Toubro Ltd.	0.12652764	Vedanta Ltd.	0.387152473
GAIL (India) Ltd.	0.18482822	Lupin Ltd.	-0.0955026	Wipro Ltd.	0.107117804
Grasim Industries Ltd.	0.139665773	Mahindra & Mahindra Ltd.	0.10824042	Yes Bank Ltd.	0.148519477
HCL Technologies Ltd.	0.665160304	Maruti Suzuki India Ltd.	0.29774787	Zee Entertainment Enterprises Ltd.	0.498331415
HDFC Bank Ltd.	-0.187467	NTPC Ltd.	0.2091768		

Now from the above table we can see that scrips of 24 companies out of 50 are showing positive correlation value which indicates a direct risk and return relationship whereas rest of the 26 companies are having negative correlation. The reason behind the negative correlation in most of the companies is due to negative average return in them. And negative average return is an outcome of the stock split announced by these companies. But if we look into the returns and risk data of these companies keeping aside the returns of the stock split year they are indicating a direct relationship. Therefore, after analyzing the correlation data as well it can be interpreted that scrips of the Nifty50 index are undertaking direct risk and return relation.

### CONCLUSION

From the study made on risk and return relationship on the scrips of NIFTY50 Index it was found that most of the companies are having a positive relationship amongst the two i.e. with the rise in the risk factor their returns are also seen to be increasing and vice-a-versa. Though there were some exceptional cases as well in which risk and returns were moving in the opposite direction but that was due to the stock split majorly.

Therefore, after executing the whole study we have concluded that the scrips of blue-chip companies work on the positive risk and return relationship model.

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**TECHNOLOGY AND ITS APPLICATION: INTRODUCTION TO ROAD NAVIGATION**

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**ABSTRACT**

*Technology can be described as the application of scientific knowledge for real-world situations or collection of techniques, skills, methods, and processes used in the production of goods or services. Navigation can be explained as a technique of monitoring and controlling the movement of a vehicle from one place to another. Road navigation typically uses a satellite navigation device to get its position data which is then correlated to a position on a road. When new directions are needed routing can be calculated. Road navigation basically uses maps, landmarks, and in recent times known to be as computer navigation. Computerized navigation majorly depends up on GPS for current location information, a navigational map database of roads and navigable routes, and uses algorithms related to the shortest path problem to identify optimal and alternative routes to reach the destinations. In India, road navigation has experienced a boom during the decade 2010-2020 majorly due to introduction of smartphones and rapid growth of automobile industry. In fact, navigation is just not limited to starting point to destination journey, but has also made us filled with information related to services like petrol stations, restaurants, hospitals, tourists spot etc. Moreover, navigation is currently on a path where we would have autonomous cars which will entirely be functional on navigation systems. Road navigation has indeed made our daily life easy and is also continuing to mesmerize us with its immense applications in the real world.*

*Keywords: Technology, Road Navigation, GPS*

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**INTRODUCTION**

Road navigation is not a new technology for our world. It was first invented in 1961 by Hidetsugu Yagi in Japan. He designed a wireless-based navigation system which was intended for military- use. Apparently, it was failed because the technology was expensive, maps were inaccessible, batteries were primitive, display was poor, and the processing power could not meet up to the level of expectation. From 1966 onwards, various giant automobile manufactures like General motors, Toyota, Mitsubishi, Acura, Honda, Nissan, Mazda, BMW etc. entered the navigation industry and created remarkable history.

Road maps are based on vector database which can be explained as a representation of the world using points, lines, and polygons. Vector database are beneficial for storing data that has discrete boundaries, such as country borders, streets and land parcels.

**Concept of Road Navigation**

1. Form of Way (FoW) – FoW is the type of road depending up on its physical form and topography. Following are the types of FoWs without which navigation would never have been existed.
  - a. Dual Carriageway – It is the road with opposite direction of traffic flow with a physical barrier or divider in between whose length must be 40m at least.
  - b. Single Carriageway - It is the road with opposite direction of traffic flow with no physical barrier or divider in between usually divided by a painted line at center of road.
  - c. Roundabout – A circular barrier with the length of 8m in diameter, the traffic flow should be in one-way and should have at least 2 navigable roads.
  - d. Small Slip Road – It should have one-way traffic and is made to smoothen the traffic flow. Usually made to avoid 1 crossing and the physical barrier should have the length of 7.5m at least on one side.
  - e. Major Slip Road – It is designed between 2 roads crossing each other at different levels. They are usually found at the entry or exit of main roads/ highways. It is also known as ‘ramp’.
  - f. Freeways – These are the roads without speed limit which can be accessed by a ramp because either they are either elevated or depressed with minimum length of 2km.
  - g. Service Roads – These are the roads which originate from a freeway and gets merged in the same freeway. They are made to provide services like food courts, public convenience, fuel stations, automobile repairs etc.
2. Functional Road Class (FRC) – It is a method used for the classification of roads based upon its importance which critically depends up on the structure, purpose, use, road network and the construction of the road.

Following are the 10 categories of FRC which have been ranked in ascending order depending up on their functional importance.

- a. FRC 10 (Motorways) – These are the roads with highest importance as they connect at least 2 countries or regions. They are officially designated.
  - b. FRC 20 (Major roads of higher importance) – They are like FRC 10 but are not officially designated. They usually connect northern – southern or eastern – western extents within a country.
  - c. FRC 30 (Other major roads) – Roads which are used to travel among different states or regions.
  - d. FRC 40 (Secondary roads) – Roads like FRC 30 but are of lesser importance as they connect lesser important regions.
  - e. FRC 51 and FRC 52 (Local construction roads and Local roads of other importance) – These are local roads within FRC 40 connecting local areas.
  - f. FRC 60 (Local Roads) – These roads connect minor settlement in rural areas
  - g. FRC 70 (Local road of minor importance) – Roads like FRC 60 but connects more remote areas.
  - h. FRC 80 (Other Roads) – These are the footpaths, cycle tracks, stairs. In-short those roads which cannot be used by the vehicles.
3. Net 2 Class (N2C) – It is the classification of roads into categories as per the FRC values.

FRC	N2C
10	1
20	1
30	2
40	3
51	4
52	4
60	5
70	5
Unpaved/ Unmetalled Roads	6
Restricted/ Closed Roads	7

- 4. Vehicle Types – In road navigation, there are 7 types of vehicle, namely: Passenger Car, Residence, Taxi, Public Bus, Medium Truck, Heavy Trucks and Private Bus.
- 5. Grade Separate Crossing (GSC) – It is a crossing marked to differentiate roads at different level from ground level. Considering ground level as 0, the roads crossing over the flyovers will be at level 1 or at -1 in the case of underpass.
- 6. Maximum Dimension – It is the size, weight, length, and axle weight of the vehicle to the capacity of road.
- 7. Positional Accuracy – It is the accuracy used to build the source with relation to the real world in terms of GPS reading.
- 8. Speed Restriction – It is the maximum speed legally allowed to drive on a road which depends up on vehicle type, direction, weather and time.
- 9. Lanes - If the line is broken, you can overtake. If the line is continuous, overtaking is bit risky, hence not recommended. If the line is double it must not overtake as it is highly dangerous traffic violation.
- 10. Point of Interests (PoI) – It is the landmark important for guidance and mapping.
- 11. Anchor Points – Location of a legitimate position of a house numbers, anchor point acts as a location point for houses on a street for geocoding accuracy level.

**OBJECTIVES OF THE STUDY**

- 1. Awareness towards navigation maps
- 2. Purpose of using navigation maps
- 3. Scope of autonomous driving in India
- 4. Limitations of navigation maps

**METHODOLOGY**

A questionnaire was prepared with 10 questions and was distributed among family, friends and colleagues. The questionnaire majorly consisted of questions which was related to awareness of people regarding navigation technology, frequency of usage, application, technical know-how, future scope in India and limitations. The survey was shared digitally among all the respondents through WhatsApp application. WhatsApp was selected as a mode of filling up the questionnaire because it is an application used by almost everyone and to get prompt response is convenient for both respondent and surveyor. A sample size of 101 responses were recorded which gave dynamic answers as per respondent(s) understanding. The sample size was irrefutable of any specific age, but preference was given to the age of 18+ years because it is the legal age of driving in our country. The questionnaire was kept as simple as possible so that it doesn't take a lot of time and people can understand the question in one-go without any assistance.

**FINDINGS AND DISCUSSIONS**

As discussed above, Navigation can be explained as a technique of monitoring and controlling the movement of a vehicle from one place to another. Road navigation typically uses a satellite

navigation device to get its position data which is then correlated to a position on a road. When asked about the awareness regarding the navigation technology, 99 (98%) out of 101 responded that they are conscious about the navigation technology but the remaining 2 (2%) were not sure about the navigation technology.

Whilst studying the frequency of usage of the navigation technology in the day-to-day life, it was really astounded to see that out of 101 responses, 69 (68.3%) of the respondents are the occasional navigation user and 29 (28.7%) are the daily navigation user. The occasional users are comfortable with their daily commute from home to office and vice-versa which does not require the use of navigation on the daily basis. On the contrary, while travelling to new places other than usual ones, occasional users prefer navigation maps to cut-down the time to search routes for reaching at their destinations. Most of the occasional users also use this technology only in local areas of their destination to reach the exact spot and prefer to travel along main roads/ highways without maps. On the other hand, 28.7% of the daily navigation users mainly comprised of the people who use cab facilities like Uber, Ola to check the route. Daily users also had newly-started drivers who rely on navigation so that they don't make wrong directional judgement while concentrating on driving. There is a very small proportion of the respondents who are the rare navigation user which happens to be only 2 (2%) and 1 (1%) do not use the navigation technology at all.

According to the Psychology, every person is different and so is their priorities, preferences and decisions. The similar trend was observed while studying the main purpose of the respondents for using the navigation technology. Out of 101 responses, 48 (47.5%) use navigation technology just to check the alternate route because as a matter of fact, there are always more than one route to reach a destination, but it completely depends on the users what exactly they seek in a route like less traffic congestion, scenic beauty, preferring/avoiding toll roads, route with minor attractive spots etc. All these factors sum up to give a reason for finding the best alternative which is suitable to the user. Almost 25 (24.8%) samples use the navigation technology to check the traffic condition on their route to reach their destination. By doing this practice they get two options: (a) to see alternative route before starting their journey and (b) to wait till the congestion dissolves and the traffic moves smoothly and then they start their journey. Out of 101 responses, 20 (19.5%) are the ones which are completely dependent on the navigation maps to reach their respective destinations. It won't be wrong to say that these respondents cannot go out without navigation maps. It is good that these proportion of the people are completely utilizing the navigation technology. Some of them also use them very frequently to learn the routes so that they can be less dependent on these maps in the mere future. A small portion of 6 (5.9) respondents use the navigation technology just to check the near-by services like restaurants, fuel stations, medical assistance, automobile service, tourist spots, banks/ ATMs etc. at their location or on the route. 2 (2%) of the respondents do not use the navigation technology at all. It is quite possible that these are the respondents who are not aware about this technology as discussed above.

Navigation is a technology which is easily accessible by everyone. This trend can be easily seen on the application of this technology through various modes. 91 (90.1%) out of 101 responses are in the favor of using this technology through their smartphones. It is the cheapest and the most mobile way to use the navigation technology and it is one of the reasons that people prefer to settle for cheaper car models which offer in-built navigation because in today's time everyone has a smartphone so why to spend extra when you already have a solution in your pocket. A very small proportions of 3 (3%) respondents have purchased special navigation devices for their vehicles and 3 (3%) have in-built navigation system in their vehicle's infotainment system.

Again, it is completely depending on the personal preferences and comfort. As per the responses, 4 (4%) of the respondents do not use maps at all.

Everyone has their own comfort while driving their vehicle. While asking their way of using navigation technology I got many dynamic responses. Out of 101 samples, 50 (49.5%) respondents are comfortable in seeing the maps. Reason being that the user prefers to anticipate the route before reaching the decision point so that they can change the lanes while driving. 29 (28.7%) of responses are in the favor of listening to the directions rather than seeing the map. They prefer to give visual importance and alertness to driving than to see the maps. Almost 17 (16.8%) respondents prefer to get directions from the co-passenger. The co-passenger guides the driver from the personal knowledge or with the help of navigation systems. In short, it is the co-passenger who directs the driver. Only 1% of the respondent are in favor of listening and seeing the map, this is quite unsafe method because 2 of the senses i.e. visual and audibility is focused on map rather than on driving but if the respondent is comfortable we must appreciate it but should not encourage it. A sum of 3 (3%) of the samples do not use maps at all neither on daily or occasional basis. Last but not the least there is a 1 (1%) respondent who does not drive at all so for him/her the way of using navigation technology is as good as nothing.

It was very shocking to see that there is not much difference among the responses when people were asked with their preference for the plan of action if they are off their track. Out of 101 responses 54 (53.5%) respondents are in the favor of using the navigation technology to reach their destination or at least on right path in case if they are off-track. These people have full faith in the science and technology and believe that this technique will try to get them out because it the reason why this technology has been developed. On the other hand, 44 (43.6%) people prefer to ask the local people rather than trusting the navigation maps. When reason was asked for the same, most of them replied that it is the maps which made them off-track hence they prefer the old-school method of asking directions from the other to be on right path. A small proportion of the respondents of 2 (2%) give priority to their gut feeling for the direction on the occasions when they are off-track. They neither trust the maps, nor do they ask the people for right direction. Similar is the condition of the remaining 1 (1%) of the person who has responded none of the above, probably it is the one who is not aware about navigation technology and perhaps do not practice it.

One of the important questions asked in the questionnaire was if the respondents are satisfied with add-on features of navigation systems other than just providing directions. The outcome was quite expected that 97 (96%) out of 101 respondents are completely satisfied by the features other than to just provide with the direction. These respondents enjoy the features of alternative routes, traffic forecast, multiple destinations on same route, services along the route, shopping etc. A small share of 4 (4%) respondents believes that there is scope of further improvements. They are happy with the features provided by the navigation maps but they think that the technology should change as per the growing demand.

An autonomous car is a vehicle that can sense the nearby environment and can move with limited or no human input. The first automated car was developed in 1977 by Japan's Tsukuba Mechanical Engineering Laboratory. It was asked by the samples that, as per them, might this technology be successful in India or not. Out of 101 responses, 36 (35.6%) of respondents have a positive sense that the technology of autonomous car will not only should come in Indian markets but will also prove to be a huge success. On the other hand, 16 (15.8%) respondents are negative regarding the concept of autonomous cars in India. They think India is not ready for such complex technology especially where traffic violations are very common. Moreover, it is also believed that this technology will be very expensive for a common man, so it makes no sense even if it is introduced, it will be a huge flop. Large proportion of 51 (50.5%) of the samples think that it might be successful. They have confidence that since, human involvement in the work like driving would decrease, so will be the occasion of traffic congestions and accidents would come down. They are ready to welcome the technology and see how it performs in Indian conditions. It will be too early to decide it for them if it will be a success or not but majority of them hope that it just might work out of India.

This is the section when it was asked from the sample that if they are aware of such blessing-like technology that how does it operates and what makes it work. Principally, navigation systems need GPS connection which gets synchronized by at least 4 satellites to get the position in 3-dimensions (east, north and altitude). These satellites produce thousands of algorithms per second to provide us with distance, estimated time, and altitude from the sea level. In our smartphones, we do not have GPS, but a technology called A-GPS (Assisted GPS) which needs a data connection or internet connection which is connected to a server. The server can supply data, so the GPS doesn't have to wait to receive them from the satellites and it can also send an approximate location derived from cellphone towers. 55 (54.5%) out of 101 have a fair idea that how does the navigation

systems works. 36 (35.6%) respondents are not sure if the knowledge regarding the technical know-how is correct and enough to understand this technology. 10 (9.9%) samples are not at all aware of how this technology works. They prefer to enjoy the service rather than to know its working principle and concepts.

### CONCLUSION

If I summarize the above study, I can easily conclude that majority of the selected samples 98% are well-aware about the navigation technology. These are the people who prefer to use the navigation technology only at the time when it is required or occasionally rather than using it daily. It was also found that a large group of people were segregated on the purpose of using the maps as half of the respondents used navigation maps just to check alternate routes where as some of them used just to check the traffic condition before leaving for their destination and some needs

this technology just like a car needs fuel. 90% of the total respondents prefer to use navigation technology through their smartphones rather than opting for in-built systems in cars or special GPS systems because they are more convenient to use. Almost 50% of the respondents prefer to look at the maps while driving, followed by listening the instructions and then asking the co-passenger to guide them with directions. It was surprising to see that 53.5% of the respondents trusts the navigation technology in case if they are lost while driving because it is the main purpose of this technology but a proportion of 43.6% of the people give upper hand to asking for the direction from the people than relying on maps reason being there are many places which are not available on these navigation systems. It was very remarkable to see that 96% of the respondents are satisfied with the add-on information provided by the navigation technology other than mere directions. 50% of most samples thinks that autonomous vehicular technology might be successful in India. From the study it was found that the people are ready to welcome this new hi-tech, but the main concern is if the country could provide the conditions needed by the technology to sustain. Last but not the least, almost 90.1% of the respondents have at least some idea that how this navigation technology works. It was nice to see that people are aware regarding the technical know-how. Henceforth, it can finally be concluded that the study was successful in achieving all its objectives which were mainly: awareness towards navigation maps, purpose of using navigation maps, scope of autonomous driving in India and limitations of navigation maps

### LIMITATIONS

It is accepted worldwide that nothing is perfect. This implies on the navigation technology as well. There are many problems which people encountering while using navigation technology. From this survey, it can be easily depicted that majority of the respondents (90%) prefer to use navigation systems in their smartphones, hence, most of their problems are related to poor network which results in lack of accuracy, hanging of maps, GPS signal lost, etc. some of the responded also mentioned that navigation maps are fine on main roads and highways but they are not suitable for narrow areas. It was also found that many times navigation technology uses long route/ congested route which causes users to get late. It was also found by the users that maps many times makes us cross from the city's congestion and avoid the by-passes. Many times, users' needs alternate route, but the navigation map insist on 'U' turn and stick to the route shown by it. For interior and remote places, maps are not much useful either those areas are not digitized, or they are not updated.

### RECOMMENDATIONS

Apart from these limitations, respondents have also provided some possible suggestions for improvements like maps should be updated frequently because in major cities the road construction is carried out on large scale, so maps fail to give diversion routes. People have also mentioned that if technology allows us to know the road conditions (paved/ unpaved) and alerts if any while driving it would be more useful in limiting the speed as well as would alert us for caution. Last but not he least a suggestion was also provided by keeping women safety in mind that it should mark if the areas/ roads as safe or not based on time and situation with a proper safety indicator method.

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**TEACHERS IN SEARCH OF NEW PERSPECTIVE: EXPECTATIONS AND RESPONSIBILITIES**

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**ABSTRACT**

*The teaching profession has become more complex and demanding. The changes demand improvements in the working conditions, salaries and states. In the development of teachers' competence an appropriate use of new information technologies should be used as a powerful tool in the educational process. The individual teacher should be given professional autonomy to allow him/her to determine programmes, teaching method etc. so that best educational objectives may be achieved.*

*Along with expectations, teachers also have lots of responsibilities. Teaching is work of the most demanding sort, for teachers must make dozens of decisions daily, command a wide body of knowledge and to learn to react instantly, and be disposed to act wisely in difficult situation. And while there are principles and precepts, skill and techniques, to guide the work, teaching is also an activity with artistic aspects, a craft calling for reflection and judgement.*

*Keywords: Teachers, Teaching Profession, Expectations, Responsibility*

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**INTRODUCTION**

We each remember the great teachers who touched our lives, kindled our interest and pressed us to do our best. We hold powerful images of such teachers. They exhibited a deep caring and love for children. They conveyed a passion for the subjects they taught, captivating their students with that passion. They emphasize teaching's external aspects, not its inner workings. They approached their work with creativity and imagination, striving constantly to improve. As committed professionals, they were proud to be teachers. The images of teaching that we share are deceptive as well as compelling. If we fondly recall the great teachers of our past, we also typically see teaching as a humble undertaking. It concerns itself with the least powerful age group in society. It involves such seemingly routine activities as arranging seatwork, lecturing, reviewing and responding to students' effort, and disciplining their behaviour. Accomplished teachers realize that higher order thinking is the hall mark of successful learning at all levels. There can be no neat division of teaching labour along a basic to advanced skills continuum. All teachers must concern themselves with higher order skills, with the executive functions of reasoning, and with students' capacities to monitor their own learning. Accomplished teachers constantly assess and adjust their practice to maintain fidelity to students and to subjects, to knowledge and to skills, and to basic and advanced functions. Professionalism in teaching entails the ongoing pursuit of these unities. Hence, teachers regularly find themselves confronting hard choices- sometimes sacrificing one goal for another, sometimes making compromises. If the role of a teacher is to teach, the role of a student must be to learn. However, it has been agreed that learning is not only an exercise in reading and reciting facts, but in gaining a deeper insight of events and situations.

**TEACHERS' IMPORTANCE**

The importance of a teacher as an architect of our future generations demands that only the best and the most and competent members of our intelligentsia be allowed to qualify for this noble profession. It is unfortunate to find that generally the worst and the most incapable people of the society find their way into this profession. Anyone who fails to find an opening in any other walk of life gets into this profession and recklessly plays with the destiny of the nation. An important reason for this is understood to be the poor salaries of our primary and secondary teachers which are no better than that of clerks. A large number of our teachers is therefore, frustrated and uninterested. They have to go for part-time jobs to meet their basic needs. Again, the teaching profession also does not enjoy due respect in the society. The primary and secondary teachers are particularly at a disadvantage. Their status is lower than that of doctors, engineers, advocates, civil servants; even lower than that of semiliterate and illiterate traders. It would therefore require great commitment for an intelligent individual, however fond of education and training he may be to forsake the career of a doctor or engineer in favour of teaching. Therefore, while selecting good teachers, it must be borne in mind that better opportunities, prospects and perks are offered to the teachers.

**EXPECTATIONS OF TEACHERS**

When we speak of good teachers, it means that a teacher must be a model of faith and piety and should have a fairly good knowledge. A teacher should consider it his duty to educate and train his students and should feel responsible for it. He should feel that his students have been entrusted to him and he should avoid any breach of

the trust the society has reposed in him, he should be able to be a sociable person with his roots in the society, people should take him as their well-wisher and a sincere friend who cares for their children. It should be ascertained at all cost that a candidate for this profession has a natural acumen and aptitude for teaching.

Teachers need to actively participate in the social activities in a positive way and know the art of teaching with a deep insight into child psychology. Always dealing with the students in a just manner not losing any self-control is an important part of being a teacher, respecting their students, feelings, ego and trying to understand and resolve their difficulties with grace is important in being a teacher. He should be able to smile in the face of bitter criticism on his opinions, and should not feel ashamed or humiliated to accept his mistakes wholeheartedly. He should be proud of his culture, his national dress and his national language. He should be a missionary, a mentor, a reformer and a guide besides being a dedicated tutor. In other words, he should be a perfect teacher and a perfect educationist

### **DUTIES & RESPONSIBILITIES OF TEACHER**

The Teacher Must: -

- Attend the morning assembly daily on time.
- Address the students on moral principles, social and environment issues.
- Follow the conduct rules notified in CCS (Conduct) Rules 1964 & CCS(CCA) Rules 1965
- Maintain the Teacher's Diary regularly with the lesson plan.
- Reach the class on time for teaching.
- The teacher must evaluate the students from time to time
- Teachers who are also faculty in-charges will conduct regular meetings and discuss the methods to improve the performance of students in the subject.
- Teachers must make best use of the TLM money and Pupils' Welfare Fund to develop relevant teaching learning material.

#### **1. KNOWLEDGE OF THE SUBJECT**

- To have expert knowledge of the subject area
- To pursue relevant opportunities to grow professionally and keep up-to-date about the current knowledge and research in the subject area

#### **2. TEACHING**

- To plan and prepare appropriately the assigned courses and lectures
- To conduct assigned classes at the scheduled times
- To demonstrate competence in classroom instruction
- To implement the designated curriculum completely and in due time
- To plan and implement effective classroom management practices
- To design and implement effective strategies to develop self-responsible/independent learners
- To promote students' intrinsic motivation by providing meaningful and progressively challenging learning experiences which include, but are not limited to: self- exploration, questioning, making choices, setting goals, planning and organizing, implementing, self-evaluating and demonstrating initiative in tasks and projects
- To engage students in active, hands-on, creative problem-based learning
- To provide opportunities for students to access and use current technology, resources and information to solve problems
- To provides opportunities for students to apply and practice what is learned
- To engage students in creative thinking and integrated or interdisciplinary learning experiences
- To build students' ability to work collaboratively with others
- To adapt instruction/support to students' differences in development, learning styles, strengths and needs

- To vary instructional roles (e.g. instructor, coach, facilitator, co-learner, audience) in relation to content and purpose of instruction and students' needs
- To maintain a safe, orderly environment conducive to learning
- To comply with requirements for the safety and supervision of students inside and outside the classroom

**3. ASSESSMENT**

- To define and communicate learning expectations to students
- To apply appropriate multiple assessment tools and strategies to evaluate and promote the continuous intellectual development of the students
- To assign reasonable assignments and homework to students as per university rules
- To evaluate students' performances in an objective, fair and timely manner
- To record and report timely the results of quizzes, assignments, mid- and final semester exams
- To use student assessment data to guide changes in instruction and practice, and to improve student learning

**4. PROFESSIONALISM**

- To be punctual and be available in the university during official working hours
- To comply with policies, standards, rules, regulations and procedures of the university
- To prepare and maintain course files
- To take precautions to protect university records, equipment, materials, and facilities
- To participate responsibly in university improvement initiatives
- To attend and participate in faculty meetings and other assigned meetings and activities according to university policy
- To demonstrate timeliness and attendance for assigned responsibilities
- To work collaboratively with other professionals and staff
- To participate in partnerships with other members of the university's community to support student learning and university-related activities
- To demonstrate the ability to perform teaching or other responsibilities, including good work habits, reliability, punctuality and follow-through on commitments
- To provide and accept evaluative feedback in a professional manner
- To create and maintain a positive and safe learning environment
- To carry out any other related duties assigned by the department chairman

**5. GOOD BEHAVIOUR**

- To model honesty, fairness and ethical conduct
- To model a caring attitude and promote positive inter-personal relationships
- To model correct use of language, oral and written
- To foster student self-control, self-discipline and responsibility to others
- To model and promote empathy, compassion and respect for the gender, ethnic, religious, cultural and learning diversity of students
- To demonstrate skill when managing student behaviour, intervening and resolving discipline problems
- To model good social skills, leadership and civic responsibility Teachers are committed to students and their learning Accomplished teachers are dedicated to making knowledge accessible to all students.

They act on the belief that all students can learn. They treat students equitably, recognizing the individual differences that distinguish one student from another and taking account of these differences in their practice. They adjust their practice based on observation and knowledge of their students' interests, abilities, skills, knowledge, family circumstances and peer relationship.

Accomplished teachers understand how students develop and learn. They incorporate the prevailing theories of cognition and intelligence in their practice. They are aware of the influence of context and culture on behaviour. They develop students' self-esteem, motivation, character, civic responsibility and their respect for individual, cultural, religious and racial differences.

1. Teachers recognize individual differences in their students and adjust their practice accordingly.
2. Teachers have an understanding of how students develop and learn.
3. Teachers' mission extends beyond developing the cognitive capacity of their students.
4. Teachers treat students equitably.

Teachers are responsible for managing and monitoring student learning. Accomplished teachers create, enrich, maintain and alter instructional settings to capture and sustain the interest of their students and to make the most effective use of time. They also are adept at engaging students and adults to assist their teaching and at enlisting their colleagues' knowledge and expertise to complement their own. Teachers command a range of generic instructional techniques, know when each is appropriate and can implement them as needed. They are as aware of ineffectual or damaging practice as they are devoted to elegant practice. They know how to engage groups of students to ensure a disciplined learning environment, and how to organize instruction to allow the schools' goals for students to be met. They are adept at setting norms for social interaction among students and between students and teachers. They understand how to motivate students to learn and how to maintain their interest even in face of temporary failure. They employ multiple methods for measuring student growth and understanding and can clearly explain student performance to parents.

- Teachers call on multiple methods to meet their goals
- Teachers orchestrate learning in group settings
- Teachers place a premium on student engagement
- Teachers regularly assess student progress
- Teachers are mindful of their principal objectives
- Teachers work collaboratively with parents

#### **Teachers in search of new perspectives**

- While the psychological and material situation of teachers differs greatly from country to country, an upgrading of their status is essential if 'learning throughout life' is to fulfil the central function assigned to it by the Commission in the advancement of our societies and the strengthening of mutual understanding among peoples. Their position as master or mistress in the classroom should be recognized by society and they should be given the necessary authority and suitable resources.
- The concept of learning throughout life leads straight on to that of a learning society, a society that offers many and varied opportunities of learning, both at school and in economic, social and cultural life, whence the need for more collaboration and partnerships with families, industry and business, voluntary associations, people active in cultural life, etc.
- Teachers are also concerned by the imperative requirement to update knowledge and skills. Their professional lives should be so arranged as to accommodate the opportunity, or even the obligation, for them to become more proficient in their art and to benefit from periods of experience in various spheres of economic, social and cultural life. Such possibilities are usually provided for in the many forms of study leave or sabbatical leave. Those formulae, suitably adapted, should be extended to all teachers.
- Even though teaching is essentially a solitary activity, in the sense that each teacher is faced with his or her own responsibilities and professional duties, teamwork is essential, particularly at the secondary level, in order to improve the quality of education and adapt it more closely to the special characteristics of classes or groups of pupils.
- The Commission stresses the importance of exchanges of teachers and partnerships between institutions in different countries. As is confirmed by current activities, such exchanges and partnerships provide an essential added value not only for the quality of education but also for a greater receptivity to other cultures, civilizations and experiences.

- All these lines of emphasis should be the subject of a dialogue, or even of contracts, with teachers' organizations which go beyond the purely corporatist nature of such forms of collaboration: over and above their aims of defending the moral and material interests of their members, teachers' organizations have built up a fund of experience which they are willing to make available to policy-makers.

**Teachers know the subjects they teach and how to teach those subjects to students**

Teachers have a rich understanding of the subjects they teach and appreciate how knowledge in their subject is created, organized, linked to other disciplines and applied to real-world settings. While faithfully representing the collective wisdom of our culture and upholding the value of disciplinary knowledge, they also develop the critical and analytical capacities of their student. Accomplished teachers command specialized knowledge of how to convey and reveal subject matter to students. They are aware of the preconceptions and instructional materials that can be of assistance. They understand where difficulties are likely to arise and modify their practice accordingly. Their instructional repertoire allows them to create multiple paths to the subjects they teach, and they are adept at teaching students how to pose and solve their own problems.

- Teachers appreciate how knowledge in their subjects is created, organized and linked to other disciplines.
- Teachers command specialized knowledge of how to convey a subject to students.
- Teachers generate multiple paths to knowledge.
- Teachers appreciate how knowledge in their subjects is created, organized and linked to other disciplines.

**Teachers think systematically about their practice and learn from experience.**

Without personal and professional reflection, teachers cannot grow. Whether it is continuing their education in a formal setting, attending workshops, or examining educational journals, studies, and books, teachers must continue to move forward in their own education. We can only imagine what the future of our students will look like and we must be innovative in our thinking to help prepare them. It is our duty to initiate and welcome change, even when it takes us out of our comfort zone. When we make educated decisions based on action research and reliable data, we give all students the opportunity to grow.

Teachers are models of educated persons, exemplifying the virtues they seek to inspire in students- curiosity, tolerance, honesty, fairness, respect for diversity and appreciation of cultural differences and the capacities that are prerequisites for intellectual growth: the ability to reason and take multiple perspectives to be creative and take risks and to adopt an experimental and problem solving orientation.

Teachers draw on their knowledge of human development, subject matter and instruction, and the understanding of their students to make principled judgements about sound practice. Their decisions are not only grounded in the literature, but also in their experience. They engage in lifelong learning which they seek to encourage in their students. Striving to strengthen their teaching, accomplished teachers critically examine their practice, seek to expand their repertoire, deepen their knowledge, sharpen their judgement and adapt their teaching to new findings, ideas and theories.

**Teachers Are Members of learning communities**

Accomplished teachers contribute to the effectiveness of the school by working collaboratively with other professionals on instructional policy, curriculum development and staff development. They can evaluate school progress and the allocation of school resources in light of their understanding of state and local educational objectives. They are knowledgeable about specialized school and community resources that can be engaged for their student's benefit, and are skilled at employing such resources as needed. Teachers find ways to work collaboratively and creatively with parents engaging them productively in the work of the school

- Teachers contribute to school effectiveness by collaborating with other professionals.
- Teachers work collaboratively with parents
- Teachers take advantage of community resources.

There are some expectations of teachers from National board to enhance the Role of the Teachers

- Teachers are facing so many changes, which lead to contradictory demands on them from society. These changes demand improvements in the working conditions, salaries and status.
- In the development of teacher's competence an appropriate use of new information technologies should be as a powerful in the educational process.

- Measures must be taken to increase the number of women in the post of responsibility in educational sector.
- Where education is decentralized, steps have been taken to ensure sufficient financial resources to guarantee equality between regions, municipalities, etc.
- The individual teacher should be given professional autonomy to allow him/her to determine programmes, teaching methods etc so that best educational objectives may be achieved.
- Many reports show that the workload of teachers has increased during recent years. From this prospective serious step must be taken to review class size and working hours.
- Teacher's salaries have decreased in most countries. In order to ensure that teachers obtain decent salary and to retain good teachers in the profession there is a need to upgrade teacher's salary.
- There is a need to increase the status of teachers as they play a key role in all educational systems and the quality of education is determined by the quality of teaching in the classroom.
- All teachers must receive initial preparation for the profession at higher education level before starting to teach. Teachers must also receive regular in-service training, which will allow them to incorporate new developments in their teaching.

### **CONCLUSION**

Teachers employ technical knowledge and skill, yet must be ever mindful of teaching's ethical dimensions. The primary mission is to foster the development of skills, disposition and understanding, while responding thoughtfully to a wide range of human needs and conditions. They must acquire and employ a repertoire of instructional methods and strategies, yet remain critical and reflective about their practice, drawing lessons from experience. Teachers' professional responsibilities focus on instructing the students in their immediate care, while they participate as well in wider activities within the school and in partnership with parents and the community. Teachers also have the responsibility to question settled structures, practices and definition of knowledge; to invent and test new approaches; and, where necessary, to pursue change of organizational arrangements that support instruction. As agents of the public interest in a democracy, teachers through their work contribute to the dialogue about preserving and improving society, and they initiate future citizens into this ongoing public discourse. In the development of its assessment procedures and certification standards, the National Board has sought to represent these ideals faithfully and comprehensively.

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**EMPHASIS OF DISTANCE EDUCATION FOR DEVELOPING HUMAN RESOURCES IN INDIA:  
WITH SPECIAL REFERENCE TO IGNOU.**

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**ABSTRACT**

*The objective of this paper is to analyze the emphasis of distance education in for developing human resources (HRD) in India. The paper has been divided into three parts. First, part discusses the relationship between distance education and development of human resources in general and conceptual context & particular in India. Indian rank in HRD corresponding to other countries has also been highlighted in this part. Second part highlighted how distance education helped to learners to bring changes economically as well as socially in their personal life & social life as well. After getting degree from distance education institution i.e. Indira Gandhi National Open University (IGNOU) in this paper how they get benefit in their life. And the third & last part we discuss the futuristic model of distance training for the job learners with special reference of IGNOU in India.*

*Keywords of the study: Distance education, Education & Training, IGNOU.*

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**INTRODUCTION**

Distance education can play a crucial role in the economic development of a country by meeting human resources as per its needs. This system can cater to the requirement to those who are on the job. Their knowledge can be updated through continuing education programs. Due to the low level of education among the labor force in developing countries like India, its work efficiency and productivity is also low particularly in primary sector of the economy. The quality of the labor force is a very important consideration, when we look at the human resource development in a country. This is influenced by the development of education and training and the availability of professionals and facilities like doctors, teachers, hospitals, schools and colleges etc. In terms of quantity, this is very low in comparison to those who complete secondary and higher secondary education. Besides quantitative expansion of tertiary and professional education in the country, one of the important tasks of distance education has been to upgrade the quality of both instruction and output at the secondary and higher stages of education. Though, it is not an easy task through formal system alone.

Research evidences show that continuing education can improve work efficiency and productivity, and, thereby, contribute to economic growth. *Both work efficiency and productivity, besides a certain required level of education; depend upon training and orientation of human resource. These types of activities would include on-the-job training, upgrading courses, awareness courses etc., which are possible easily through distance education only.* On the other hand, this system can raise the employment opportunities in many ways, as it helps develop the necessary skills, attitude and motivation to match opportunities to fresh job seekers as well as self-employment.

**NATURE OF TRAINING AND EDUCATION IN THE WORKPLACE**

- Demand for skilled labour has risen significantly as a result of globalization and changes in technology and the organization of work. The process of skill development in the informal sector in a developing countries is more important since formal training institutions do not have the capacity to train all those who want to acquire skills, and few of those who want to acquire skills have the means to afford formal training.
- International labour organization estimates, over the next ten years the growth rate of the world's labour force will slow down, there will be still some 460 million new, young jobseekers. Only 3% of them will be in all parts of Europe and North America. Two-thirds will be in Asia.
- The ability to learn, to transform existing knowledge into new knowledge, is a source of competitive advantage of increasing significance. In such enterprises, daily learning has become an integral part of the job. Part of such learning relies on the exchange of tacit knowledge among employees.

**INDIA'S SCENARIO**

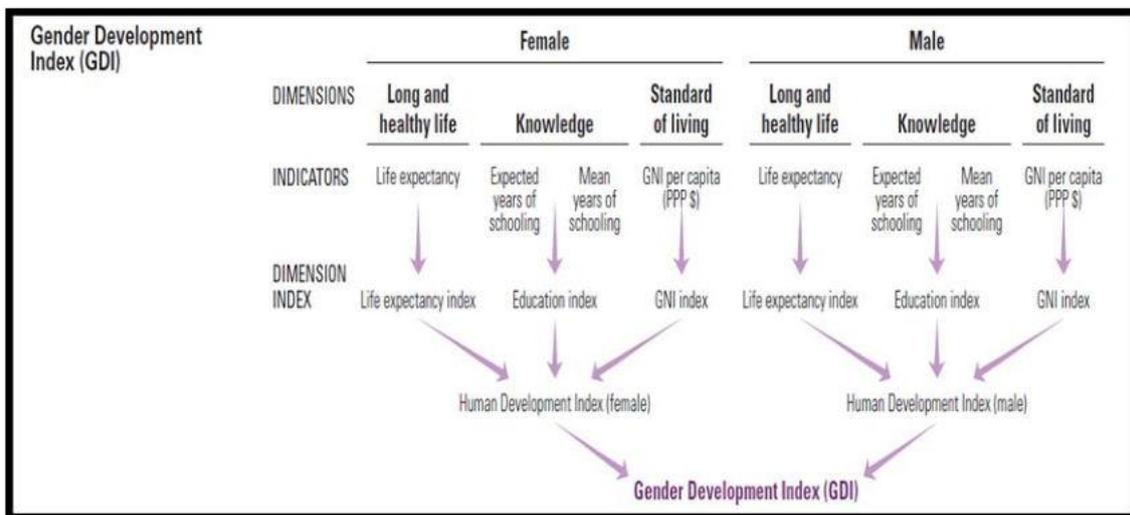
Since independence, there has been significant progress in human development in the country as reflected in broad indicators such as the improvements registered in educational attainments, health coverage, and in provision of basic social infrastructure. India ranks 115<sup>th</sup> out of 162 countries in terms of the UNDP are Human Development Index (HDI) and are classified in the group Medium Human Development with HDI of 0.571 in 2001. India's comparative position on Human and Gender Development is presented below. Though the overall

index on gender related development has improved in 2001 as compared to 1992, it is still low in comparison with the country’s human development levels (GOI, 2002).

Sr.No.	Country	Human Development Index		Gender Development Index	
		1992	2001	1992	2001
1	Norway	0.933	0.939	0.911	0.937
2	Australia	0.927	0.936	0.901	0.935
3	Sri Lanka	0.704	0.735	0.66	0.732
4	China	0.594	0.718	0.578	0.715
5	Indonesia	0.637	0.677	0.591	0.671
6	<b>India</b>	<b>0.439</b>	<b>0.571</b>	<b>0.401</b>	<b>0.533</b>
7	Pakistan	0.483	0.498	0.36	0.466
8	Bangladesh	0.364	0.47	0.334	0.459

Source: Government of India (2002), Economic Survey, 2001-02.

Table-1: Gender Development Index Parameters



Above table no 1 shows the Gender Development Index(GDI),

How GDI hierarchy flow works.

**Table 2: India’s global position on human and gender development**

The Table 2 indicates that India requires alternative strategy to increase its HRD ranks. Distance and ICT. This system can spread necessary awareness among those whom such awareness might help education can influence the quality of human resources in the areas of health, nutrition, education, large number of uneducated people, particularly women. In the process, distance education will call for interaction among people belonging to different areas of operation such as teachers, technologists, learners, administrators and other functionaries. This will enhance the possibilities of interfacing education with other aspects of social life.

**Role of Indira Gandhi National Open University in Human Resource Development of India**

In 1970, the Ministry of Education and Social Welfare organized a seminar on 'Open University' in collaboration with the Ministry of Information and Broadcasting, the UGC and the Indian National Commission for Cooperation with UNESCO. After the seminar recommendation, an open university in India has been established on an experimental basis. Starting in 1974, the government of India appointed an eight-member working group on the open university, the leading role was given to G. Parthasarathi, the then Vice-Chancellor of the Jawaharlal Nehru University.

The working group recommended establishing an open university by an act of parliament as early as possible. They recommended that the university should have jurisdiction over the entire country so that, once it is fully developed, any student even in the remotest corner of the country can have access to its instruction and degrees (Working Group Report, 1974).

The working group suggested several measures to be followed in instructional and management processes of the Open University which included: admission procedure, age relaxation, preparation of reading materials, setting

up of core group scholars in different fields, setting up of study centres, vehicle of curricular programs, live contact with teachers and so on. On the basis of the recommendations of the working group, the

Union Government prepared a draft bill for the establishment of a National Open University, but due to some reasons the progress was delayed.

In 1985, the Union Government made a policy statement for establishment of a national open university. A Committee was constituted by the Ministry of Education to chalk out the plan of action of the national Open University. On the basis of the report of the Committee, the Union Government introduced a Bill in the Parliament. In August 1985, both the Houses of the Parliament passed the Bill. Subsequently, the Indira Gandhi National Open University came into existence on 20 September 1985, named after the late prime minister.

In 1989, the first Convocation was held and more than 1,000 students graduated and were awarded their diplomas. IGNOU audio-video courses were first broadcast by radio and television in 1990 and IGNOU awarded degrees received full recognition by the University Grants Commission in 1992 as being equivalent to those of other universities in the country.

In 1999, IGNOU launched the first virtual campus in India, beginning with the delivery of and Information Sciences courses via the Internet.

The President of India is the Visitor of the University. The Board of Management is the principal Computer decision making body of the University. The authorities of the University include Board of Management, Academic Council, Finance Committee, Planning Board, Research Council, Distance Education Council and Schools of Studies. The overall functioning of the University is managed by these statutory authorities.

As per the IGNOU Act, the University shall Endeavour to advance and disseminate learning and knowledge by a diversity of means, including the use of any communication technology, to provide opportunities for higher education to a larger segment of the population and to promote the educational well being of the community generally, to encourage Open University and Distance Education systems in the educational pattern of the country and to coordinate and determinate the standards in such systems.

As of 2011 IGNOU has served over 3 million students in India and 40 other countries abroad. These are UAE, UK, Qatar, Kuwait, Oman, Bahrain, Saudi Arabia, Seychelles, Mauritius, Maldives, Ethiopia, Namibia, Kenya, Myanmar, Vietnam, Singapore, Indonesia, Malaysia, China, Nepal, Sri Lanka, Kyrgyzstan, Afghanistan, Fiji, France, Ghana, Gambia, Sierra Leone, Madagascar, Liberia, West Indies, Samoa, Lesotho, Malawi, Switzerland, Nigeria, Mongolia and Zambia.

IGNOU has 21 schools and a network of 67 regional centres, 2667 study centres, and 29 overseas centres (in 15 countries). Approximately 20% of all students enrolled in higher education in India are enrolled with IGNOU. IGNOU offers 226 academic programs comprising courses at certificate, diploma and degree levels.

**Table-3: Learners Profile in IGNOU**

Sr. No.	Convocation date	Total awards distributed	Sr. No.	Convocation date	Total awards distributed
1	21-Feb-89	1171	11	04.03.2000	53328
2	27-Apr-91	3807	12	03-Mar-01	62369
3	25-Apr-92	4907	13	21-Mar-02	78074
4	05-May-93	4444	14	22-Feb-03	81931
5	16-Apr-94	7580	15	21-Feb-04	74603
6	06.05.1995	9246	16	05.03.2005	71298
7	11.05.1996	12301	17	18-Feb-06	75174
8	08.03.1997	16149	18	17-Mar-07	111699
9	07.03.1998	25080	19	16-Feb-08	101346
10	14-Mar-99	33119	20	15-Mar-10	135000
			21	12-Apr-13	158387
<b>TOTAL</b>					<b>1121013</b>

According to above Table no 3, at present, around **1121013** students are on rolls in IGNOU. Of the total enrolment, 75.85% are from urban areas and rest of them belongs to rural areas. About 43.94% are unemployed and 42.86% are employed. Rest of the learners did not inform their status may be those were self employed or doing studies.

**RESEARCH EVIDENCE**

The author of this article conducted a study on 'Distance Education and Job Market of IGNOU Graduates' during 2010. The study examines to what extent to which distance education programs helped the development of human resource development in India. Some of the objectives of the study were intended to:

- Role of IGNOU degree in Indian job market;
- Examine how IGNOU programs facilitates learners job performance and
- Necessity of IGNOU degree for obtaining job.

**SAMPLE SIZE METHODOLOGY**

Survey research method was followed for the conduct of the study. The reference period of the study was from March 2007 to March 2010.

**DATA COLLECTION**

Data for the study were collected from two sources:

- (a) Published records;
- (b) Questionnaire administrated to sample learners.

**TOOLS**

The structured questionnaire was administrated for IGNOU students. A sample of 3500 successful graduates and post graduates who have successfully completed their degree during March 2007 to March 2010 were selected.

**FINDINGS**

The study which was conducted to examine the extent of IGNOU programs help in the development of human resources based on 1750 (50%) respondents. Analysis of data related to the objectives of the study led to the following findings.

**STATUS OF RESPONDENTS BEFORE JOINING IGNOU**

- ◆ A large percentage (52.98%) were doing regular job and 13.16% were studying in formal schools and colleges. Some of them (5.79 %) were doing both part time job as well as doing their studies. 9.57% of them were unemployed, 14.53 % were self employed and 3.97 % did not responded.

**Learner's objectives to enroll with IGNOU programs and utilization of degree**

- ◆ A large percentage of the respondents (50.59%) informed that their objective to enroll with IGNOU was to continue education while 36.23% who responded to get job. 9.32% respondents informed that their objectives were to get promotion, while 1.86% said their objective was social reasons. Rest of the respondents did not specify their objectives but any how managing their higher studies as well as many other distance courses. Most of the respondents informed that their objectives were fulfilled. And this is the achievement for distance education system.

**Learner's status after completion of program from IGNOU**

- ◆ *Of the 60.23% respondents who were on the job, 23.12% joined further education and 11.36% got increment.*
- ◆ *19.56 % respondents who were regular students, only 17.92% of them got job and 29.05% were self-employed.*
- ◆ *Of the 11.65 % respondents who were indulge in part time job, 53.62% of them opted for PG program, 33.43% got job.*
- ◆ *Among 14.97 % unemployed people some around 63.73% joined for further education program, 34.76% get job and 12.94% not satisfy with the distance education.*
- ◆ *Among 15.73% self employed people, only 33.07% were opted for further education and from them only 12.22% were interested to do job. Others are continuing with their business.*

**To what extent degree from IGNOU was necessary to get job.**

Those respondents who were unemployed and doing part time job before joining IGNOU programs and got regular job and promotion informed that:

- ◆ to become graduate was necessary to get job and promotion in their respective enterprises;

- ◆ it was one of the prerequisite for the job.

**To what extent IGNOU degree facilitates job performance**

- ◆ Most of the respondents (48.40%) informed that it helped a great deal to facilitate job performance;
- ◆ Few respondents (21.0%) informed that it helped partially.

**Learner’s views**

- ◆ Many of the respondents informed that the curriculum of various IGNOU programs was relevant and enabled him to acquire skills in their concerned fields.
- ◆ Other respondents informed that the study materials of IGNOU were high standards in terms of quality. The foundation course having positive impact on skill development because the contents of the study materials were relevant to their jobs.

**Success stories**

- ◆ Rajinder Kumar from Jhajjar (Haryana) informed that he was Assistant Teacher (JBT) in Government School. After completion of B.Ed degree from IGNOU, he got Post-Graduate Teacher position.
- ◆ Ravi Nair from Mumbai informed that IGNOU degree is helpful for his self-development and he can now communicate in English as well.
- ◆ Surindra Devi from Himachal Pradesh informed that degree from IGNOU helped in her personality development and in gaining knowledge.
- ◆ One of the respondents informed that degree from IGNOU helped him to become self-employed. Now he is running a magazine called ‘Yug Manas’

It has been established from the above evidences that distance education helped to everyone. It helped to unemployed, self-employed and employed learners to bring changes economically in their personal life.

There is possibility of relationship between training and solving of business problem. Training has to do with the target groups acquiring knowledge, skills, and attitudes that are useful to them immediately to improve performance on the job. On the other hand, education deals with the acquisition of knowledge, skills, and attitudes too, but not necessary for immediate improvement of performance on the job (Zane L. Berge, 2001). Distance training is also cost-effective as comparison to traditional classroom training as shown in the following Table 1. However, Constantine Osiakwan and David Wright’s (2001) study shows that total cost of Remote Access Distance Training (RADL) is higher than the total cost of classroom-based training (CBT). But, the profits from RADL are higher than the profits from CBT, since it is possible to charge students a higher price for RADL than the CBT. RADL is a distance training systems, in which students study at their workstations, which are connected to a training center via audio and computer links.

**Table-4: Comparison of Distance Training Costs V/S Traditional Classroom Training**

Distance Training			Traditional Training		
Distance training source	Average costs per participant In US \$	Class duration	Class room presenter	Average costs per participants in US \$	Class room duration
Tele learning	30	6 hours	Senior Manager (1)	40	8 hours
Online	10	6 hours	Mid Career Instruction (2)	55	8 hours
Self Paced Compute based	12.21	6 hours	Junior Instructor	20	8 hours

**Note: Actually delivery cost does not include course development cost.**

Source: Jo. L Longnecker (2001) Attracting, training and instructors for distance learning at the US general account office, Zane L. Berge (eds.) Sustain Distance Training, San Francisco: Jossey-Bass.

According to Table no 4, It has been proved from the studies conducted by Zane L. Berge (2001) and Constantine Osiakwan and David Wright’s (2001) that distance training is cost-effective and profit generating.

**FUTURE PROSPECTS**

But this system could not meet the needs of those employers (public and private sectors) who have demanded skilled labor due to globalization and changes in technology in their respective organization and those who require daily learning, which has become integral part of their job performance.

**TARGET GROUP**

Due to increasing diversification of the economy together with acceleration in economic growth has resulted in structural changes in the nature of the job market. As per the 55<sup>th</sup> Round (July 1999-June-2000) of the Survey on Employment conducted by the National Sample Survey Organization (NSSO) reveal that employment in absolute numbers was 397 million (in both organized and unorganized sectors). Of the total 397 million 28.11 million i.e. 7 percent employment was in organized sector.

Trends in organized sector employment reveal that employment in this sector has been declining due to slowing down in employment in public sector. This could be attributed to restructuring programs of the public sector, and the ban on recruitment in many State Departments/Institutions as part of the ‘economic drive’ to reduce government expenditure. The annual growth rate of employment has been increased in private sectors since 1995. However, this growth rate in private sector employment did not affect the slowdown in public sector employment since the private sector share of employment in the organized sector was only one third. Therefore, the growth rate in organized sector employment is now dependent on employment growth in the private sector.

**Manpower in the Public Sector by Branch**

India’s employment in the public sector by industry has been presented in the following Table 5.

**Table-5: Employment in the public sector by Industry**

<b>Branch</b>	<b>2000 (In Millions)</b>
Central Government	3.27
State Government	7.46
Quasi-Government	6.32
Local Bodies	2.25
<b>Total-1 (public sector)</b>	<b>19.31</b>
Private Sector	8.70
<b>Total –2 (organized sector)</b>	<b>28.11</b>
Employment in un-organized sector)	368.89
<b>Grant Total</b>	<b>397</b>

Source: Government of India (2001-2002) Economic Survey of India.

The above table 5 prevails that the bulk of manpower in organized sector consists in State and Quasi Government sector. Among the total labour force, women constituted about 17.2% of the organized sector (public and private sector). Among rural women workers, a majority of them are employed in agriculture as labourers and cultivators. In the urban areas, women workers are primarily employed in unorganized sectors such as household industries, petty traders and services, building and construction etc.

**Table-6: Growth of Employment by Sectors**

<b>Industry</b>	<b>% of employed workers</b>
Agriculture	59.8
Mining and Quarrying	0.6
Manufacturing	12.1
Electricity Gas etc.	0.3
Construction	4.4
Trade	9.4
Transport, Storage & Commn	3.7
Financial Service	1.3
Community Social & Pers. Services	8.4
<b>Total Employment</b>	<b>100.0</b>

According to Table no 6, there is a need for curriculum design in all the above industries. If we think to train all employees for their daily knowledge up gradation and the process of skill development, the existing class room

training methodology do not have the capacity to train all of them. Department of Personnel Training (DOPT), Government of India (GOI) had already initiated strategy in public sector. The Federation of Indian Chambers of Commerce and Industry (FICCI) recently organized a seminar on 'E-learning: Transforming corporate workshops', as an effort towards creating awareness on the benefits of e-learning in corporate environment. E-learning has emerged as a successful tool to impart education and training in a need based manner using various forms of media.

### **IGNOU-DOPT INITIATIVE**

The DOPT, Government of India has planned for the use of distance education methodology in a large scale to train the trainers. Three batch of the trainers have been trained in IGNOU (India) and UKOU (U.K) on designing self-learning material, audio/video, interactive multimedia on macro media director and online training through Web city. These packages are further developing training strategies, with the

support received from State Government and DOPT, Government of India, for wider State level and National level implementation as respective areas of specialization.

### **NEED FOR STRATEGIC PLANNING**

There is a need for strategic planning for the futuristic model.

- There should be planning board/committee. The members should be represented from Center and State Governments (public sector) and from FICCI and CII (private sector).
- Identify the goal of distance training programs
- Conduct an organizational analysis:
  - To find out opportunity for training and education database of participants
  - To find out the basic infrastructure
  - Provide accountability for the use of training resources
- Implementation an Evaluation **Perspective Model**

There is a need for the hour to have effective networking between all the existing online resources. This does not require additional resources but proper and effective utilization of the existing resources. For instance: Government of India had already initiated some projects in this direction. Project Initiated by the Department of Information Technology, Ministry of Communication and Information Technology, Government of India are:

1. **National Resource Centre for Online Learning NCST, Mumbai-URL: [www.ncst.ernet.in/vidyakash](http://www.ncst.ernet.in/vidyakash)**
2. **Virtual Campus Initiative for IGNOU One-year PG Diploma in IT-URL: [www.ignou.ac.in](http://www.ignou.ac.in)**
3. **Developing Web Based Digitized Collection for Distance & Continuing Education in IT-A Demonstrative Project on Internet Based Online Interactive Courseware IIT Delhi- URL:[www.iitd.ac.in/courses](http://www.iitd.ac.in/courses)**
4. **Design and Development of Internet Enabled Multimedia Courseware for a Virtual University, Pilani- URL:[bits-pilani.ac.in](http://bits-pilani.ac.in)**
5. **Development of Interactive Multimedia Information Services over a Hybrid Internet and Broadcast Digital TV networks IIT Kanpur, URL:<http://www.iitk.ernet.in>**
6. **Developing Web Based Intelligent Interactive Tutoring (web IIT) IIT Delhi- URL:[www.iitd.a.c.in/courses](http://www.iitd.a.c.in/courses)**
7. **Design and Development of Component Based Functionality in E-learning tools C-Dac, Hyderabad URL:[www.cdach.ernet.in](http://www.cdach.ernet.in)**
8. **Multimodel Digital Distance Education for IT & Other Critical Technologies, School of Educational Technology Jadavpur University, Kolkota.- URL:[www.jadavpur.edu](http://www.jadavpur.edu)**

### **SUGGESTION AND RECOMMENDATION**

- ◆ The existing training centers of IGNOU, State Open Universities (SOUs) and Correspondence Institutions (CCIs) should be used for support centers. Training facilities should be provided to these centers. Easy approachable to all the learners so that they can easily opt for any courses as per their requirement.
- ◆ Staff Training & Research Institutes of Distance Education (STRIDE) i.e. IGNOU should design and develop training package to train staff and faculty of these institutions. This will uplift the level of productivity.

- ◆ The training curriculum should be designed as per needs. The ICT should be used in to make optimum use of distance training programs. The basic information about the curriculum/programs should available on Web. be
- ◆ Possibilities for in-service training through distance mode should be explored for employees who are working in different occupation. Separate courses should be designed for sector wise workforce, so that a large numbers of human resources get benefited according to their need.
- ◆ STRIDE should develop programs for training and development of all the DTIs staff through Internet. Web-based training system can be developed which will provide interactivity among different students of the program from different locations in the world.

## CONCLUSION

The emphasis of distance education is very good for developing human resources in India, and it is very much helpful in human resource development. The above study helped to acquire skill and enrich professional development in their concerned areas. Peoples are very much interested to do distance education for their good working life, it shows that distance education is developing the human resources in India. Row tree (1998) comments that **“Most of the research over the last twenty years or so suggests that media do not differ greatly in their potential for helping people to learn. What makes a difference is not the medium itself but how well it is used and how keen the learners are to hear. Nevertheless, even if most media can do most things reasonably well, each does some things better than others”**. The planning of distance education seriously takes into account the human resource needs of the country on the one hand, and tries to base the design and development of educational programs on the other hand. Besides, provisions in support of the principles of lifelong education, training and updating (both in-service and pre-service) are made part of the continuing education programs, and should be considered as regular activities of a distance teaching institution.

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**A STUDY ON AWARENESS OF OPEN EDUCATIONAL RESOURCES AMONG PRE- SERVICE TEACHERS**

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**ABSTRACT**

UNESCO (2000) organized the Forum on the Impact of Open Courseware for Higher Education in Developing Countries. Open educational resource (OER) was one of the outcomes of the forum. The open educational resources are those resources that can be used for non-commercially purpose without the obligations of the copyright and is available for free. It implies that the teachers can use open educational resources for their teaching. The use of these freely available digital resources by the teachers is a compelling need of this digital world as the ethos of teaching and learning has transformed. The open educational resources include learning resources like courseware, content module, learning objects, online learning communities, etc. and teaching resources that provides teaching support to the teachers like free software, digital teaching aid, books, courses, etc. In India many such government initiative are taken to develop the open educational resources like digital content, courseware, online community support, and knowledge networks. The present study aims to explore the awareness of these open educational resources among pre-service teachers. The study adopted a survey method. The sample of the study comprises of the pre-service teachers enrolled in the B.Ed. programme at Lingaya's Lalita Devi Institute of Management & Sciences. The results of the study revealed that many of the pre-service teachers have a very limited awareness about the term open educational resources and they do not understand the broader concept of open educational resources.

*Keywords: OER, Pre-service teachers, Awareness*

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**INTRODUCTION**

Open educational resources (OER) are defined as teaching, learning and study resources that make use of suitable tools, such as open licensing, to permit their free reuse, constant improvement and repurposing by others for learning purposes. Open educational resources contain full courses, course tools, elements, textbooks, streaming videos, examinations, software, and any other tools, resources or procedures used to support access to understanding or that have an influence on teaching, learning and research.

The emphasis of OER is on the probability of taking innovative work from other providers and being able to familiarize and repurpose it to produce a new learning resource. In this sense, open means free to access and free to transformation. It is for this motive that one of the central features of an OER is the liberal licensing (e.g. Creative Commons), which enables this process.

**The general features of OER are**

- They can be any type of learning means used in an educational situation.
- They are frequently, though not completely, offered in a digital set-up.
- The digital set-up allows the reprocess, sharing, revision and repurposing of the resource for an altered learning setting than the original one.

**What OER are as well as are not OER are not just “Stuff on the Web”**

It can be seen from the explanations above that OER can be a widespread variety of educational resources – full courses, course resources, components, textbooks, streaming videos, examinations, software – which are usually offered in a digital set-up. As OER can be many kinds of resources, the question frequently asked is: what is the difference between “stuff on the web” and OER (Thomas, 2010)? Or more precisely: when is a Wikipedia page an OER?

A Wikipedia page is open allowing to the most widespread definition of open; it is also a resource. Though, it can only be an OER if it is used within a precise learning organization as an educational resource (Falconer et al, 2013: 63): “An OER can be a course, element, lesson, webpage, exercise or multimedia clip, but it must have a definite pedagogical purpose/setting” (McGreal, 2014: 51).

Wikipedia does have a clear educational course, which stimulates the use of Wikipedia content in learning settings.

On the contrary, there is the question of whether open data is an OER. Although, open data may permit reuse, distribution, revision and repurposing. It is a source of evidence, but its purpose is not directly instructive. In this sense, it is not inevitably an OER. Nonetheless, open data may be used as a learning resource in a learning setting; in this instance it would be OER.

### **OER are diverse from “Learning Objects”**

The essential difference between OER and other features of digital learning is their openness and lack of restraining patent, which enables the reuse and repurposing of the educational resources (Butcher and Hoosen, 2012). This leads to the benefits of division and teamwork.

The notion of enabling the division of digital resources is not new, and it is a typical of information resources offered in a digital set-up that they can be simply distributed with negligible costs once they have been established. In contrast to Reusable Learning Objects (RLO), OER believers and practitioners highlight the potential for sharing prevailing content over the design of context-neutral components for learning. In other words, it is argued that while the RLO improvements were concentrated on the mechanical side of instructional scheme, OER are much more focused on purely how to make prevailing content more open for entree and hence more handy (Kernohan and Thomas, 2012; Lane and McAndrew, 2010: 960).

### **OER are different from “Digital Learning Resources”**

Since allocation and reuse is such an essential aspect of OER, it has become common to pay attention to the “four Rs” of OER (Hilton et al., 2010; Wiley, Bliss and McEwen, 2014; Wiley, 2009):

- Reuse – to use the work exact. This is basically an issue of easy entree to existing resources.
- Review – to modify or change the work.
- Remix – to combine the work (precise or changed) with other works.
- Rearrange – to share the exact work, the revised work or the altered work with others.

### **The present status of open educational resources**

As we arrived the new era, the amount of learning content freely accessible on the Web was large and rising exponentially. With some exclusions, the resources were dispersed, were hard to find and use, and lacked the permits essential to ensure their quality. But despite the apparent confusion, many university librarians predicted that digitized collections of resources would be a major, if not the foremost, method for future library collections. Formerly at a 2002 UNESCO-sponsored, Hewlett-supported meeting of established and emerging world participants, the term “open educational resources” was invented. The acceptance on the OER conception since 2001 by international administrations, colleges and universities, specific faculty, and supporters in the open-source concept has been unusual. UNESCO, for example, has comprised the application of the OER conception as an aim in its current two-year plan. Some administrations and other international governments—the World Bank, OECD, the International Association of National Academies of Science, the Commonwealth of Learning, the European Union, and the European Organization of Open Universities—have also recognized the possible effect of OER and declared their concern in and support of it.

### **Scope of OER in Teacher-Education Programme**

1. Extended access to learning: Learners everywhere in the world can access OERs at any time, and they can access the material continually.
2. Scalability: OERs are easy to allocate broadly with little or no cost.
3. Expansion of class resources: OERs can increase textbooks and lectures where insufficiencies in information are marked.
4. Improvement of regular course content: For instance, multimedia material such as videos can supplement text. Offering information in multiple designs may help students to more simply learn the material being taught.
5. Rapid circulation: Information may be distributed rapidly (especially when compared to information printed in textbooks or journals, which may take months or even years to become accessible). Quick accessibility of material may increase the suitability and/or significance of the material being offered.
6. Less expense for learners: The use of OERs instead of outdated textbooks or course packs, etc. can considerably reduce the cost of course resources for learners.

7. Showcasing of improvement and ability: A wide viewers may learn of ability research interests and expertise. Possible students and contributors may be overwhelmed, and student and faculty employment efforts may be improved.
8. Links for alumni: OERs deliver an outstanding way for alumni to stay attached to the institution and continue with a program of lifelong education.
9. Constantly improved resources: Unlike textbooks and other stationary sources of information, OERs can be enhanced rapidly through direct editing by users or through solicitation and integration of user response. Trainers can take a current OER, adjust it for a class, and make the altered OER available for others to use.

### **Significance of OER in Teaching and Learning**

The importance of OER is broadly classified into Institution's perspective, Educator's perspective and Learner's perspective. The institution's perspective consist of refining recruitment by helping students find the right courses, increasing teamwork among students, faculties and other, interesting alumni as life-long learners and improving the public image of the institution.

The educator's perspective includes maintaining a record of teaching improvements allowing others to build upon them, nurturing connections with coworkers around the world, gaining publicity through improved status and leaving a legacy after leaving university.

The learner's perspective includes retrieving high-quality resources from some of the best academia in the world, appealing in informal learning, where permits are not needed, saving money on expensive necessary textbooks and learning through efficient materials that are significant to current issues.

### **Impact of OER on Teacher's Training**

Though there is not a great deal of study in respect to student achievement as new textbooks are accepted, there has been an emphasis on student achievement when OER are accepted. Studies have confirmed that no harm has happened as a consequence of the use of OER and that learners are performing at least as well as they did with the outdated resources. They have also shown improved student maintenance and student achievement using OER. Nonetheless, one would think if 50 percent of learners who never purchase the text now have access to resources, and wouldn't the achievement rates with early and constant access to resources be higher.

### **Requirement of Teachers' to know OER**

The use of OER leads to development in learner presentation and satisfaction. OER creates different customs and approval patterns than other online resources. It also lead to more fair access to learning, attending a broader base of learners than outdated education. The usage of OER is an effective way for enlightening retention for at-risk learners. It hints to critical reflection by professors, with indication of improvement in their preparation. OER acceptance at an institutional level leads to financial aids for learners and/or institutions.

### **Shortcomings of OER**

Ever since many OER sources allow any user to generate an explanation and post material, some resources may not be appropriate and/or precise. OER material is formed to stand alone, and meanwhile self-learning operators may access the material outside of a classroom setting, they will miss out on the argument and teacher response that describe for-credit classes and that make such lessons useful and appreciated.

While struggles are being made to make OERs accessible in multiple languages, many are only accessible in English, restraining their effectiveness to non-English speakers. Moreover, not all resources are traditionally suitable for all viewers. Some learners may have trouble using some OERs if they have a slow or unreliable internet association. Other OERs may require software that learners don't have and that they may not be capable to afford.

### **LITERATURE REVIEW**

Dominic Orr, Michele Rimini and Dirk Van Damme (2015) talks about OER in the perspective of educational programme and training. It compares and contrasts OER to other usually discussed modernizations in education: learning matters, digital learning resources, open data, Massive Open Online Courses (MOOCs), and open learning. It then goes on to describe how OER offer a special type of modernization possible capable of supporting new methods of teaching and learning. In contrast to other studies of OER, this report takes the opinion that OER should be reflected in the context of key challenges for educational organizations at present.

Christopher B. Mugimua (2010) in his article presents outcomes of creation and distribution method of open education resources (OERs) to support pre-service and in-service educators in Uganda and other African countries. It highlights the opinions of educators and the authoring team of the effect of their participation in

materials formation and distribution on their practice and professional progress. It also presents teachings learned during the growth and implementation method and the best practices for repeating this outreach program in Uganda and beyond. This article also shares perceptions into how the OERs can increase or contribute to effective lessons and learning particularly in under-resourced school circumstances in Africa, and also shares understandings on best practices on producing the authoring team of OERs.

Leigh Blackall (2008) in his article looks at what starts an open educational resource and studies the concerns and benefits to an educational organization that is moving to contribute in open educational resource improvement and to accept more open educational practices. It labels the primary steps in these ways being made by the Educational Development Centre at Otago Polytechnic, a tertiary educational and vocational training association in Southern New Zealand.

James J. Tuite (2018) said Open Educational Resources (OER) is supported as a means of creating high-quality educational resources easily obtainable on digital platforms to learners and teachers, generating a revolution in the distribution of educational materials and decreasing one cost barrier for higher teaching. Though, existing models of OER appear unmanageable with the re-establishment of supplementary materials being delivered “for profit” and funded for by learners. The achievement of MOOCs as a disturbing digital platform is inspected, and several other approaches are recommended including a partnership model and a discipline-specific funding model on existing platforms to guarantee the highest quality learning at the lowest potential cost to all learners.

### **THE STUDY**

In India many such government initiative are engaged to improve the open educational resources such as digital content, courseware, online community support, and information networks. The current study aims to explore the awareness of these open educational resources among pre-service teachers. The purpose for selecting this is that they are free to use. They offer the instructional support to the pre-service teachers for various courses. The objective of the study is to explore the awareness of alternatives to texts while retaining instructional quality.

### **METHODOLOGY**

The study adopted a survey method. The sample of the study comprises of the pre-service teachers enrolled in the B.Ed. programme at Lingaya's Lalita Devi Institute of Management & Sciences.

#### **Research objectives**

- To explore the awareness regarding open educational resources among the pre-service teachers.

#### **Participants and Setting**

The sample for the study is consisted of 50 students enrolled in B.Ed. programme for the academic year 2017-2019 at Department of Education, Lingaya's Lalita Devi Institute of Management & Sciences having awareness about the Open Educational Resources (OER).

#### **Tool and data collection**

A questionnaire having open and closed ended questions is constructed. The open ended questions aimed to explore the awareness of Open Educational Resources among pre-service teachers. The close ended questions are aimed to explore the knowledge of pre-service teachers regarding various digital learning content such as E-books etc. The questionnaire is circulated to all the 50 participants through Google form.

### **FINDINGS AND DISCUSSIONS**

The data collected shows that 54% of the respondents are familiar with the term open educational resources and 46% of the respondents were not aware of the term. The diagrammatic representation of selection of the sample is shown in Figure 1.

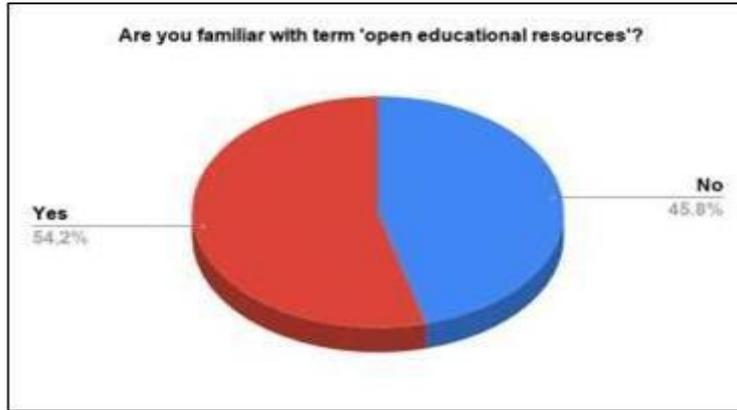


Figure-1: Percentage of respondents familiar with the term OER

From the above data, the further questions were asked related to certain free digital resources of OER. This is shown in the following table representing digital resources on the web that are copyright free.

Table-1: Free Digital Resources on the web

S. NO.	Free Resources	% age of respondents
1.	E-books	87.5
2.	E-Pathshala	91.7
3.	FOSS	37.5
4.	MOOCS	66.7
5.	NPTE & Swayam	66.7
6.	NROER	54.2

The awareness regarding different forms of free and open digital resources on the web that are copying free are shown in Figure 2.

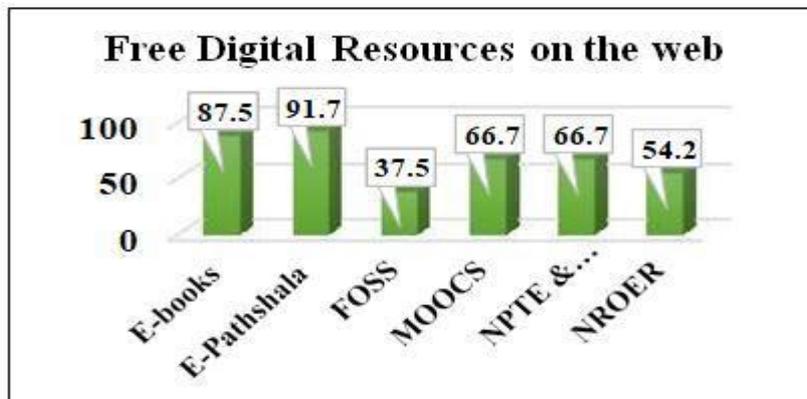


Figure-2: Free Digital Resources on the Web

The graphical representation in Figure 2 illustrated that majority of the participants have awareness regarding E-pathshala (91.7%) and the participants have least awareness regarding the FOSS (37.5%).

The 54% of the participants who are aware about the term ‘open educational resources’ were further inquired about the source from where they came to know about this term. The responses of the participants are shown in figure 3.



Figure-3: Sources of OER

As shown in figure 3, out of the total sample only 1% students have heard about OER from brochures, seminars and workshops, 2% from open universities and educational institutions, 3% from their friends and colleges/institutions, and 4% have heard it from the internet and digital media.

The 54% of the participants who were aware of the term were also asked to express their understanding about the open educational resources. Some of the commonly occurring responses are as follows:

- “OER is freely accessible books useful for teaching, learning, and research purposes.”
- “It a type of educational materials available for teachers as well as for students.”
- “It is available in various language and can be accessed by large population.”
- “OER is accessible to all.”
- “OER is a type of education which can be reused and modified.”
- “OER is a free online reading material and no regular classes are required for it.”

The responses given by the 54% participants highlights that they have a limited understanding of open educational resources. Majority of them only considers the digital material available on the web as OER. They fail to see the broader concept of open educational resources i.e. the OER not only includes digital material but courseware, FOSS, e-networks and all there resources that comes with copyright free license.

### CONCLUSION AND RECOMMENDATIONS

The paper have attempted to show that open educational resources plays an essential role in supporting professional development of teachers. The findings of the study revealed that pre- service teachers have a very narrow understanding about OERs and they fail to recognise that open educational resources include various kinds of resources which comes with a free copyright license and is not only limited to the digital content.

#### Certain recommendations on the OERs are as follows:

- The ICT course in the B.Ed. programme must talks extensively about the Open educational resources
- The B.Ed. programme must have the provision for hands of training of the various OER like FOSS, open courses, etc.
- Workshops and induction programmes can be conducted to provide exposure to the teachers.
- Republishing of modified resources should be encouraged by educators as per the convenient of the pre-service teachers.

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**DYNAMIC LEADERSHIP IN SCHOOLS THROUGH DIGITAL SYSTEM TO ADDRESS STUDENTS CONCERNS- AN INITIATIVE TO INTEGRATE TECHNOLOGY AND COUNSELING**

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**ABSTRACT**

*School is a complex organisation which has amalgamation of multi dimensional relationship between administrators-teachers, teachers-teachers, teachers-students and teachers-parents. An effective leadership has to take care of all dimensions to make school as an organisation grow and develop. Effective School leadership is easier to talk about in the abstract terms than to accomplish in reality. The educational institutions are meant to be centers of learning and development enabling a student to be independent, empowered and conscious of its responsibility. The schools and institutions form the backbone of any society and nation. Among many of its responsibilities, the schools need to assure safety and security to its students.*

*This research paper intends to explore the school practices of discipline, pedagogy, curriculum and assessment with a view to bring effective leadership focused on research of opinions and perceptions of stakeholders about students security and safety in the schools.*

*The findings of the qualitative research undertaken reveals that the stakeholders of the education process, i.e students, parents, teachers and administrators agree on a digital system of counseling for the redressal of students concerns to be used in schools, for a better, safe, non threatening and fear free learning environment in schools. This will act as whistleblower in the education system with non directive technique of counseling, driven and triggered by the participants of the education process.*

*This paper is a qualitative study of the school practices and suggests qualitative measures to improve the education system across all levels and counselling with a digital access tool of information, prompting the online input of views on any student concerns, by all the stakeholders in the education process.*

*Keywords: Digital Information System, online access, discipline, pedagogy, leadership, whistleblower, stakeholders*

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**INTRODUCTION**

“Children are sick of being called ‘the future’. They want to enjoy their childhoods, free of violence, now”. Paulo Pinheiro, 2007, UN General Assembly

“All children have a right to be protected against neglect, maltreatment, injury, and trafficking, sexual and physical abuse of all kinds, torture, exploitation, violence and degrading treatment.”

The Child Rights Charter 2003 of India-Article 21 "Right to life"

School is a place of teaching and learning where students engage in learning and teachers involve them in instructional process enabling them to develop fully, enhancing all aspects of their personality. In achieving these aims, school often tend to slacken and are not able to provide a total fear free environment.

The quality of the teacher-student relationship is of primary concern in providing such an environment. Effective teachers strive to develop a positive relationship with every students in the classrooms, and seek to promote positive relationships and a sense of community among the students themselves. Teachers develop social problem-solving and decision-making skills among students, establish and maintain close communication with each student’s parents or caregivers, and work hard to garner the parent’s support, provide academic instruction and activities that motivate learning, frequently monitor student behavior and respond immediately to signs of misbehavior, use praise and rewards strategically to maximize effectiveness in improving behavior while minimizing the risk of diminishing intrinsic motivation, by using praise and rewards in an informational rather than controlling manner are the effective teachers.

The common wisdom today is that school principals should be instructional leaders. But most principals face a major stumbling block, they don't know what instructional leadership means or how to do it. Effective school leaders are needed in thousands of schools and educational institutions across this country and world today.

**RATIONALE OF THE STUDY**

Some of the traits of effective and dynamic school leaders today are required to be both good administrators and good instructional leaders. Leaders need to have an explicit vision of what their school might be like and an

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optimist attitude. Leaders are the transformers and can bring positive changes in the school climates. A successful leader has to draw an inclusive plan to draw in parents, community members, school administrators, students and teachers to develop a larger school community and share the responsibilities.

William Parret and Kathleen Budge (2009) discovered that sustained school improvement usually began when leaders focused on essentials. These leaders rallied the staff to address basic questions and tasks. School leaders look beyond the usual boundaries of what is permissible and welcome nontraditional thinking and leaders.

Chanda Kochar (2017) in her article has mentioned some of the traits of a dynamic leader. A leader is required to be a system thinker. He is required to take care of all the people working under him. The entire organization should work as a centralized unit and problems related to all need to be solved by a leader. In terms of operations, a leader has to ensure that there is equal contribution from all. It is only a leader and his ways that can make this a possibility. She also believes that, a leaders should ensure that every individual works to the best of his abilities no matter what group or team he is working for. At the same time, he should keep the organizational strategy at the broader level in mind before taking any decisions. Precisely, a leader is supposed to take charge of resolving all brainstorming sessions resulting due to conflicts in views at the organizational level. Another important parameters described that a leader is expected to have integrity in his approach. This is because only then would he be able to set an example for his followers. Once the leader is honest in his own ways, his team would work to the best of its capabilities.

Not to forget perhaps the most important attribute a school leader can possess is the unquenchable thirst for knowledge. As John F. Kennedy said, "leadership and learning are indispensable to each other."

With strong domain knowledge, a leader is supposed to ensure that any deficiency in terms of talent and expertise in the organization is sorted with immediate effect.

Leaders in the schools settings have the prime task which is to guide their schools to better teaching and learning. Every effort has to be synchronized to achieve that prime goal. Leaders are responsible to make conducive environment to enable better teaching and learning.

With the advent of the Right to Education (RTE) Act in 2009 which states free and compulsory education to all children in the age group of 6-14 years; the role of school leader has greatly diversified. He is the person in charge of a school unit to comply with the guidelines and deliverables enshrined in the RTE. The Act casts a duty that the child belonging to weaker section and the child belonging to disadvantage group are not discriminated against and prevented from pursuing and completing elementary education on any ground. It is not just about complying with the RTE, it the duty of the school leaders to ensure the social harmony, inclusiveness and equality within the school premise. When it comes to equity and inclusiveness, it touches upon all genders of all castes and classes and children with different abilities.

Further, within the context of education, the process of inclusion involves strengthening the capacity of the education system to reach out to all learners, involving restructuring of the culture, policies and practices in schools so that they can respond the diversity of students in their classrooms. As an approach, inclusive education ensures not only the presence of all students in education in an inclusive classroom, but also assures their participation and achievement (Maheshwari and Shapurkar, 2015). Inclusion is therefore, not a category but a philosophy (Bailey, 2005). UNESCO views inclusion as "a dynamic approach of responding positively to pupil diversity and of seeing individual differences not as problems, but as opportunities for enriching learning" (2005).

The study aimed at exploring the school practices of discipline, pedagogy, curriculum and assessment with a view to bring effective leadership for inclusion based on research of opinions, responses and perceptions of stakeholders about students security and safety in the schools.

#### **OBJECTIVES OF THE STUDY**

1. To study the background of discipline practices in schools of India.
2. To explore the discipline practices at different stages of school in district Faridabad of Haryana.
3. To find out the opinion of students, teachers, parents and administrators towards school practices at different stages of school in district Faridabad of Haryana.
4. On the basis of the responses and opinions, suggesting a platform to address concerns of the students.

#### **METHODOLOGY**

This study is a qualitative research using interviews, questionnaire and focused group discussion for the students. The study also includes opinionnaire for collecting opinions of the teachers, parents and

administrators. It is also quantitative research using percentage analysis of discipline practices at different stages in school. The data was analyzed in the light of objectives both quantitatively and qualitatively.

**POPULATION**

The population under my study consists of students of different stages, that is, upper primary, secondary and senior secondary from school in District Faridabad. It also includes their teachers and parents as participants of the study.

**SAMPLE**

The researcher selected 120 students from 2 schools, 60 students from each school and 20 students from the classes VI, IX, and XI. The students of both gender will be selected equally for the study.

**Table-A: Sample of stakeholders and participants of the study**

Schools	Grades			Students	Teacher s	Parents
	VI	IX	XI			
S1	20	20	20	60	6	10
S2	20	20	20	60	6	10
Total	40	40	40	<b>120</b>	<b>12</b>	<b>20</b>

In order to explore the discipline practices at different stages of school in district Faridabad of Haryana, a sample of two schools was selected from schools of Faridabad district in Haryana state. A random sample of students was drawn from the students of two schools from the district. A semi structured questionnaire with the open ended questions and yes/no type questions was posed to the participants of the schools. Amongst those students, students which have a high and or a low negative perception towards discipline practices/ discipline will be selected for the in-depth interview and focused group discussion.

**TOOLS**

**Questionnaire**

A structured questionnaire in Hindi named as "Anushasan Prashnawali" was posed to the participants with "yes/no/rarely" options. Open ended questions were also used in the questionnaire to find the type of discipline practices , if any being inflicted on students. The responses of the questionnaire were tabulated and then analyzed using percentages.

Opinionnaire: An opinionnaire with questions was posed to the teachers and administrators. It will comprise open ended questions, to probe them on indiscipline issues and challanges faced by them in the classroom.

Focused Group Discussion: A focused group discussion with the students was conducted. The same was recorded through videography and the recording was documented. The researcher used observation as a tool to record students non-verbal cues. The students emotions and feelings was also be recorded.

**Analysis and Interpretation**

Out of students, teachers and parents of two schools , 87 % stakeholders suggested use of online App to address student concerns of school related violence and disciplinary practices . These stakeholders include students, parents and their teachers. The semi structured questionnaire was used to collect data from students and parents. The opinionnaire and focused group discussion was used to collect information from students and administrators about their own practices.

The data was qualitatively analyzed in the light of objectives. The participants in the study press for the implementation of mobile app as online whistleblower to raise concerns related to school, for which the redressal timeline to resolve issues and concerns of the students should be fixed to be 24 hours. This App should be functional as the centralised system similar to RTI , Right to information redressal system and should be implemented by the school authorities in collaboration with an autonomous body at the center.

The findings of the study enlighten the expectations of the stakeholders to redress their concerns on the school practices on discipline, safety and security concerns of their child, the evaluation and assessment partnership in the school and also on the use of technology to combat the issues of common platform to share the concerns.

**CONCLUSION**

The Indian economy has been developing and showing positive signs on various economic indicators. India is emerging as a global superpower but what forms the basis and what creative individual to contribute to this development is a proper Holistic education which still has lots of issues that need immediate attention.

A lot has been done ensure each citizen has proper access to education but from time to time there have been issues of grave concerns. The ever increasing population to India has put a lot of pressure on the existing systems especially the government schools that lack appropriate administration, funding and infrastructure. Considerable factions of the population do not have proper access to standard education due to higher cost of education. The curriculum followed in the schools promotes reading and mugging up chapters to score higher, it still lacks on the creative front. The teachers especially in the rural areas are not adequately trained.

In the past few years in the news there has been reports of negligence by the school administration, incidences of rape and murder of students, harsh disciplines and student suicides. A very back it was reported in the media that the midday meal give to the students as part of the government program was adulterated and had resulted in many students falling sick to a level that they had to be admitted in hospitals. Recently a student from a renowned private school was murdered by his school mate. A five year old girl was reported to be raped by the school peon. Two girls committed suicide when they were rebuked by the teacher for bunking the class. And to add to the horror a few days back 88 girls were forced to undress as a discipline. Such incidents time and again have shaken the trust in the education system.

The educational institutions are meant to be centers of learning and all round development enabling individual to be independent and conscious of its responsibilities and duties. The schools and Institutions form the backbone of any society. Among many of its responsibilities the schools need to assure safety and security to its students. The parents entrust the respective Institutions with great trust. But recent incidences urgently call for the scrutiny of existing administration and practices.

There is a need for awareness program that call for active participation of parents in their child's learning process. The parents need to ensure that their child is free from any form of fear that includes curriculum and examination base fear and also fear of any daily School activities. A child undergoes through a lot of stress the pressure as part of the schooling process. In such times it's the duty of the parents to support and help their children to cope up and enjoy the process. The parents need to be caring and regularly access the daily school experience of their children and take appropriate actions in anything unusual is found. Even the child needs to be aware the empowered to recognise and report as sort of negative behavior.

In the wake of recent events the government has issued legal guidelines to ensure safety and security of the students that include installing of security cameras, security audit of schools and limited access to outsiders. As per the new rules it is also required for the staff of undergo police verification and proper training to protect students from any form of abuse. It is also mentioned to organise orientation programmes and training for the school stakeholders to make sure that the guidelines are efficiently implemented at the ground level. The respective authorities need to continuously scrutinize the schools and assess them to ensure that the institutions execute their responsibilities properly and ensure proper legal framework are in place to ensure a constructive learning environment. The respective boards of education need to assess their approaches to learning time to time and adapt to the needs and circumstances of the students.

The issues can be addressed through proper collaboration between the government, institutions and parents. The objectives, values and practices to education need be revisited, properly understood and implemented with set goals that imports knowledge in a healthy, safe and constructive environment to the students. The key of safe and secure future is to ensure safe and secure learning to the students who are the future.

The researcher attempted to pen down the statements of the stakeholders urging the need of a common platform been shared through the use of an APP which can be easily accessible through mobile phones by all the participants of education process.

The participants in the study air their views for the implementation of mobile app as online whistleblower to raise concerns related to school, for which the redressal timeline to resolve issues and concerns of the students should be fixed to be twenty four hours. This App should be functional as the centralised system similar to RTI, Right to information redressal system and should be implemented by the school authorities in collaboration with an autonomous body at the center.

The Digital India campaign launched by Hon'ble Prime Minister can be encashed leverage in implementing common platform for schools in sync with government portals working together for redressal of common concerns of safety, security and school disciplinary action practices (SDAP) aiming to provide a safe learning environment.

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**A STUDY ON DIGITAL INNOVATION IN EDUCATION****Suraj Kumar<sup>1</sup> and Priyanka Tyagi<sup>2</sup>**<sup>1</sup>Department of Education, Saraswati Institute of Management & Technology, Kumaun University, Nainital<sup>2</sup>Assistant Professor, Lingaya's Lalita Devi Institute of Management & Sciences, New Delhi

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**ABSTRACT**

*When it comes to online learning in education, the model has been pretty straightforward - up until the early 2000s education was in a classroom of students with a teacher who led the process. Physical presence was a no-brainer, and any other type of learning was questionable at best traditionally education is centred on sources such as schools, teachers and print media. The learners reached the information sources by enrolling with schools, teachers and libraries. Prior to the digital era, information was not accessible by the majority of people, and even those accessed were unable to obtain current information with respect to today's context. The modern society wants to know the information as it happens and when it happens, and the world is moving from an information society to a knowledge society. Thus education is given the highest priority and brainpower is becoming the most valuable asset of an organization. Advances in digital technology have opened up many avenues of learning. Technology has made information accessible / transmittable from anywhere and by / to all groups of people. Education has reached most parts of the world and ICT has become an integral part of human life. This paper describes the process of generation, creation and acquisition of knowledge through the technology. The use of ICT to manage and organise explicit knowledge is highlighted. The paper also describes how technology is used to access and apply such knowledge. The paper relates how these technologies have been used in education and its impact in general. Using examples the paper highlights some of the changes that has taken place in the Indian education sector.*

*Keywords: Digitization, Cloud Learning, Education, Digital Education, Technology etc*

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**I. INTRODUCTION**

Owing to the steady economic growth and globalisation, education in India is no longer just a teacher talking to a bunch of students in a classroom. With more than 370 million internet users and hundreds of local as well as global business tycoons willing to invest in the future of education, online education in India has picked up pace. In fact, the e-learning market in the country is estimated to be worth more than \$3 billion. India is now the third largest online market for education in the world. This enables people to take better advantage of the resources available online. We have more than 1 million registered schools and 18,000 higher education institutions. However, 4 percent of children never start school, 58 percent don't complete primary schools, 90 percent don't complete secondary school and only 10 percent go on to college. What is going to happen to the 90 percent? This is where start-ups like Khan Academy enter the market with meticulously curate content, even in Indian languages, based on NCERT textbooks. In fact, online education helps people get access to a world-class learning experience when traditional higher education is simply not possible due to financial or personal constraints. Some may also suffer from physical or mental disabilities that make learning in a classroom impossible. For these students, online courses, specialisations and degree programs can offer an incredible opportunity to continue their education and build careers for themselves. These days, employers look for more than just the basic skill set in their employees, they look for a long-term relationship with the organisation. Often, appraisals and promotions are awarded on the basis of rescaling. This is where companies like Embibe and Simplilearn enter the picture with their courses for mid-level professionals. Similarly, UpGrad, which was launched in July 2015, also aims to create a flexible, industry-relevant learning experience for professionals. Alumni from respected business schools like IIT, Wharton, and UCLA also participated in this education revolution with their own venture called Slide Rule, through which they claim to help people discover the best online courses available in every subject.

**II. BASIC DIFFERENCE BETWEEN DIGITAL EDUCATION AND THE CLASS ROOM EDUCATION**

Gone are those days when classroom training was restricted to textbook learning, teachers using the blackboard to explain things and students writing down notes in copies. The traditional teacher-centered methods of teaching and task-based approaches to learning focused more on making notes and memorization. However, it's no more chalk and talk in most schools. Classroom teaching has become more and more interactive nowadays with the use of digital methods such as PPTs, video presentations, e-learning methods, practical demos, online training and other digital methods or platforms.

**III. ADVANTAGES OF TEACHER-LED CLASSROOM TRAINING**

This is an efficient method of presenting a large volume of study material to students.

1. It is a personal, face-to-face type of training.
2. Everyone gets the same information at the same time.
3. It is cost-effective.

**IV. HOW DOES DIGITAL EDUCATION BENEFIT THE CHILD?**

1. Interactive: Interactive: With digital education, classroom teachings have become more fun and interactive. Children tend to be more attentive. They are not only listening but also viewing it on the screen which makes their learning all the more effective. Here, sounds and visuals go hand-in-hand which is easy for the child to grasp.
2. Attention to details: Interactive Online presentations or practical sessions in educational content through interactive screen time help the students to pay more attention to details which enable them to complete their activities on their own.
3. Learn at his pace: Many a times, a student hesitates to ask a question to his teacher in classroom training. But with digital education, even if he does not understand anything at one go, he can attend the recorded sessions to clear his doubts. Technology enables a student to learn at his own pace
4. Learn at his pace: Many a times, a student hesitates to ask a question to his teacher in classroom training. But with digital education, even if he does not understand anything at one go, he can attend the recorded sessions to clear his doubts. Technology enables a student to learn at his own pace
5. External guidance: With online education, students can even further connect with distant counselors and faculty to seek guidance or resolve queries

**V. EMERGING TRENDS OF DIGITAL EDUCATION**

Digitalized classroom/Flipped Class rooms a growing Trend A complete revolution in the way we learn today has been brought by Technology. Teachers teaching in the classroom can capture the students and the full strength in the class by digital screens, thus facilitating each child to get the same base content and input from the teachers. This feature of digital era has increased the Student engagement as it combines various instructional styles. Each student gets in contact to world-class education, which is not easy to impart by the traditional white chalk and black board teaching. This new learning is more interesting, personalized and enjoyable. With this technological inclusion in the school teaching the students feel studying as enjoyable, easy, competent and above all interesting. The aim of a teacher however should be to create such an atmosphere which makes every student want to study.

**1. Video based learning.**

Video-based learning as a part of digital marketing has geared up in Indian Education Sector and has made education engaging, entertaining and exploring. It enables learning with a pedigree of learning out of leisure with creativity, fun and entertainment on cards via the wonderful Apps, podcasts, videos, interactive software, e books and online interactive electronic boards. Children are excited and operative with interest to manage the showcase via their intelligence, exploring the weak techno skills of teachers and assist them in public with pride and honour and recognition.

**2. Massive open online course (MOOCs) & other distant learning programs**

A massive open online course (MOOC) is an online course aimed at unlimited participation and open access via the web. India is considered to be the biggest market for MOOCs in the world after the USA. Since the population of India is huge, massive open online course (MOOC) are said to gateways for a lot of Indians in terms of bringing an educational revolution. Online distant learning programs give a great opportunity to avail high quality learning with the help of internet connectivity.

**3. K12 sector Game based learning**

K-12 School is a terminology used as Kindergarten through XII grade. Various start-up companies have been the contributor for this sector. Today the world is of Y-generation people who are acquainted with the technological developments taking around them, and they are also surrounded with the required skills and abilities. K-12 creates the game based learning environment, which enables the learner to easily get the word of education in India and give us a better self-trained Y generation.

1. Screen time help the students to pay more attention to details which enable them to complete their activities on their own. Quick completion: Using tabs, laptops or notepads, instead of pens and pencils, motivates children to complete their
2. Tasks quickly. Vocabulary: Active online screen time helps students develop language skills. By reading eBooks or accessing study
3. Materials online, they learn new words and expand their vocabulary. Learn at his pace: Many a times, a student hesitates to ask a question to his teacher in classroom training. But with
4. Digital education, even if he does not understand anything at one go, he can attend the recorded sessions to clear his doubts. Technology enables a student to learn at his own pace. User-friendly: The best thing about digital education is that it is user-friendly. You can very well access your curriculum
5. Wherever you are. You can learn on the go. Even if you miss certain classes, you can access the class notes and download files from the school website. Learn on his own: Also, nowadays, online study materials are easily available. Even if the entire education system is not
6. Digitalized, yet students can leverage the power of digital content depending upon their capabilities. So students, can access exclusive online study modules of various subjects, which help them to enhance their knowledge even without a teacher. External guidance: With online education, students can even further connect with distant counselors and faculty to seek

## **VI. MEDIA FOR EXPLICIT KNOWLEDGE**

Explicit knowledge could be represented using different media. Text, graphics, animation, sound and video are the media to represent them [3]. Unlike the traditional media in forms of books information stored digitally can be preserved without any forms of distortion and they can be accessed easily and quickly from any part of the world.

### **1. Text**

Text is one of the most effective components of representing knowledge. The words embodied as text, convey a powerful message and this has been widely used in handwritten and print media. Most data and information is represented through this medium. It is impossible to convey an unambiguous message without text. To convey a message effectively the message should be specific, definite, concrete and precise. Selection of suitable fonts and size is important for legibility and aesthetic effects. Learning is concerned, summarized text is used to identify the important points and detailed descriptions are for explanations and subsequent supplementary reading.

### **2. Animation**

Animation adds impact to a present unlike text and graphics these are day time based media. The visual imp animation is to harness the learning Animations usually take forms like object across the screen, user-con movement of an object, bitmap flipped full animation files. Authoring tools are to create such objects.

### **3. Sound**

All forms of verbal communication use Technology has been used to transmit across the universe. Teacher's voice ha the primary focus in delivering know Sound could be represented using com and MIDI (Musical Instrument Interface) and digital audio are the two file types used in multimedia system multimedia system requires the use of s music or special sound effects. When u education, speech should be short and integrated with other media. Impact on Academicians: Today's educational technology has almost forced a greater engagement between faculty and students and among students. It is helping faculty to focus more on the learning environment for their students. But it has also changed the way colleges do business. In the 1980s, when I was at Palomar College, we moved away from in-person registration lines to phone-in registration—and then, in the 1990s, to online registration. But are we ready for this where we focus more on ranks in university than what we actually know and can deliver. Indian education regulatory system puts a limitation on the scope of digital education. Students are worried about their grades and restrict themselves to the prescribed curriculum, faculties are in hurry to complete the syllabus, management concern is to secure top ranks in the university. An online degree or course is still not recognized in India. Online education in India has another major challenge that there is no proper grooming of the students on soft skill and personality development dueto which it has less preference in job market. Main objective of education is empowerment .Smriti Irani introduced apps to empower students and parents. But is this objective met? Putting NCERT books online is certainly appreciated but most of the apps still remain only a hype which prove to be useful for digital natives but not by digital immigrants.

Future of Digital Innovation in Education In India, while education technologies appears to have been taken quite seriously by many state governments and by certain private sector initiatives, most of these programmes are aimed at preparing students for the job market. In addition, the programmes are software- acentric, i.e. they emphasise the learning of a specific set of software tools. There is an urgent need to demystify this technology and de-emphasise the learning of specific tools. A balanced generic curriculum, where computers are relegated to their due place as tools, and where they extend the horizons of other subjects is a must. To enable technology in India, computer based learning system must be introduced from the junior level so that the students become computer savvy from very young age and are not afraid of using Education Technology when actually needed.

#### **4. Internet**

Internet provides a cost effective global network backbone. It connects users from anywhere, as long as they have access to the web. This has allowed users to host information on their computers and make them available for others. Such computers need to be dedicated for that purpose as users will be searching for information at different times. These sites are called web sites and they are connected to the web on 7x24. This technology intends to provide unrestricted access to information. An educational institute will publish all information relevant to the public through their web sites. This technology has made information accessible as it happens and people access them at any time they want to do so.

#### **5. Video Conferencing**

Telephone allowed voice communication among distant personnel. This has evolved not only to view a live video of the person but also to connect to a number of people. Although the technology is costly it is been used for scheduled meetings involving people internationally. Universities having campuses events involving these universities and w some local and overseas institutions already made use of this facility. V conferencing facilities are also available other places such as distant learning centre.

#### **VII. CONCLUSION**

Over the last five years computers have been introduced to most educational institutes although its ratio to a student is very high. By making the educators aware of the available technology and some taking initiatives to implement them, some forms of reforms may take place. Whatever Sri Lanka do with respect technology requirements the world will be flooded with information and some people will use them effectively. They would be the people who have developed their skills to the level of finding problem-relevant information and interpreting and applying them in solving of problems.

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**DIGITAL JOURNALISM: SOCIAL MEDIA MONITORING AND CHALLENGES****Sudeep R P Sonawane**

Multinational Print Media Editor and Writer

**ABSTRACT**

*'Digital Journalism: Social Media, Monitoring and Challenges' must give readers clarity on mother of all journalism – the print media or the newspaper. Readers must know the traditional media's development and its success over 400 years since the debut of the first printed pamphlet. It is necessary because traditional media pre-dates digital or social media by centuries. Its long presence gives new age media the advantage of learning, copying and adapting a successful model.*

*Daily, weekly newspapers, periodicals, journals, radio and television have successfully delivered news, features, opinions, and commentaries supported by photographs and statistical data to large audiences worldwide. People all over the world accept the conventional media as a reliable tool to read, hear and watch news. Digital journalism challenges this set pattern. Indeed, innovation and digital technology have redefined broadcasting, receiving, processing text and images. Content providers now deliver news instantly across continents. Consumers receive content in attractive digital formats on their gadgets. Postmodern man's creativity continues to redefine media business further. This places digital journalism at a higher level. Without a doubt, the old media faces many challenges, even extinction.*

*Clarity on rules, methods and technology used by the old media to deliver news will help readers understand a critique on new media journalism. This would help to assess and judge new age media, its practitioners and their credibility. This paper briefly mentions traditional media's successes in supplying news, commentaries, advertising, and marketing commercial content as well as political and war propaganda seen during the first and second World Wars.*

*This paper delves on the pros and cons of conventional media versus new age media – paper versus touch screen. The author lists threats to old media from social media. It talks about credibility, relevancy and longevity of old media. He discusses freedom of speech, right to information, rules, legislation, legal issues and protecting an individual's privacy. The paper does not make a case to muzzle freedom of speech and expression, but to protect other fundamental rights of citizens, public and private entities by ensuring their right to privacy and protecting personal data while doing digital journalism.*

*Keywords: Digital Media, Journalism, print media, social media*

**1. History of printed newspapers, radio and television**

Definition: Reputable dictionaries define a newspaper as, "a paper printed and distributed usually daily or weekly and contains news, articles of opinion, features, and advertising<sup>1</sup>".

Printed newspaper starts in Europe in the 17th century. It replaces handwritten news-sheets delivered to the local community. German journalist Johann Carolus publishes Relation aller Furnemmen und gedenckwürdigen historien (Collection of all distinguished and commmorable news), the world's first printed newspaper in 1605 (Refer Table One on page two). The World Association of Newspapers confirms this as the world's first newspaper.

Over centuries various newspaper owners and editors nurture the business of writing news, printing technology and methods of delivering newspapers to readers. The 20th century is unarguably the Age of Newspapers. From Europe to Asia and the Americas it remains the primary source information, though the radio and television challenge its supremacy in the second half of the century.

Guglielmo Marconi first broadcasts radio signal from Ireland to Canada in 1901. The radio gradually develops into a refined gadget to listen to news, music, and songs since radio station 8MK broadcasts the first radio news programme on August 31, 1920 from Detroit, Michigan. By the 1950s, almost every country has radio broadcasting channel. Governments own, control and manage radio stations<sup>2</sup>.

TABLE ONE

No.	WORLD'S OLDEST NEWSPAPERS	YEAR, PLACE, COUNTRY	FOUNDER/PUBLISHER	LANGUAGE
1	Relation aller Gunemmen un gedenckwürdigen Historien	1605, Strasbourg, Holy Roman Empire	Johann Carolus	German
2	Avisa Relation oder Zeitung	1609, Wolfenbittel, Holy Roman Empire	Lucas Schulte	German
3	Courante uyt Italien, Duytslandt, &c. (Weekly) (World's first broadsheet newspaper, folio size)	1608, Amsterdam, Holland, Dutch Republic	Edited and published by Caspar van Hilten	Dutch
4	Nieuwe Tijdinghen (Antwerp Gazette)	1620, Antwerp, Spanish Netherlands	Abraham Verhoeven	Dutch
5	La Gazette, originally Gazette de France	May 30, 1631, Paris	Theophraste Renaudot	French
6	Milano	November 28, 1640, Duchy of Milan	Malatesta Family	Italian
7	Bologna	June 28, 1642, Bologna, Papal States	Lorenzo Pellegrini	Italian
8	Post- och Inrikes Tidningar (Post and Domestic Times) Daily. Oldest currently published newspaper in the world. On January 1, 2007 it went online. www.poit.org	1645, Stockholm	Svenska Akademien (owner)  Horace Engdahl (Publisher)	Swedish
9	Oxford Gazette, renamed London Gazette in 1666. Oldest English broadsheet newspaper still published. www.thegazette.co.uk It is the 16 <sup>th</sup> oldest newspaper in Europe.	November 7, 1665.  As London Gazette from February 5, 1666.	Henry Muddiman. Current owner the British Government	England

10	Berrow’s Worcester Journal. First published as Worcester Post-Man then to Worcester Journal and then to its current name. www.berrowjournal.co.uk	1690, Worcester. From Oct 11, 1753 as Berrow’s Worcester Journal.	Founder Stephen Bryan (Worcester Post-Man). Bryan sold it to Harvey Berrow in 1748. Newsquest Media Group	England
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India, too, keeps pace with the pioneers. The Indian Broadcasting Company starts two radio stations in 1927. The Bombay station starts on July 23 and Calcutta station on August 26. The 1960s and ‘70s see radio stations expand rapidly, especially after FM stations start as an alternative to the Short Wave (SW), MW and LW formats.

According to data published by www.unesco.org there are around 44,000 radio stations worldwide<sup>3</sup>. AM/ FM radio accounts for 86% of the total time adults, between ages 25 and 54, spend listening to the three main audio platforms<sup>4</sup>.

Television broadcasting today enjoys a level that early 20th century inventors like Scot John Logie Baird, German Max Dieckmann, American Charles Francis Jenkins and Kenjiro Takayanagi, the father of Japanese television could not have imagined.

Russian scientist and Professor of Electricity Constantin Dmitrievich Perskyi<sup>5</sup> coins the word ‘television’. He first uses it in a paper he reads (in French) to the International Electricity Congress at the International World Fair held in Paris on August 24, 1900.

In 1930, The British Broadcasting Corporation (BBC) uses Baird’s invention for its first television broad- cast service. On November 2, 1936, BBC broadcasts the world’s first regular high-definition television service<sup>6</sup>. BBC broadcasts a 405-line broadcasting service using Emitron that EMI engineers, led by Isaac Shoen- berg, develop.

As years go by, early forms of televisions progress to cathode–ray tubes then transistors, digital, LCD, LED, OLED, Quantum dot, and HDR.

Research and development makes still and moving images hardware better. These make broadcasting fast, efficient and viewing television a wonderful experience to global audiences.

Watching entertainment, history, discovery, food, travel and tourism, news, features and panel discussions on high-grade televisions with large screens, backed by Dolby surround sound, is a pleasant experience that hand-held phones cannot match. A group of people can watch sport or news (refer table) on television and simultaneously discuss with one another while munching snacks and sipping drinks. A phone isolates the user. It engages one user and one of his hands. The advantage being he/she can watch live feed anywhere because the device uses wi-fi or telecom operator network signal to receive content without cables, unlike television.

**2. History of social media**

The digital world is much older than most people imagine. British mathematician and mechanical engineer Charles Babbage<sup>7</sup> originated the concept of a digital programmable computer in the middle of the 19th century, but he failed to build it. Around 100 years later, In 1953 International Business Machines (IBM) invents 701, its first electric and mass produced computer.

In 1973, Dave Woolley, a 17-year-old student at the Computer-based Education Research Laboratory (CERL), the University of Illinois, US, invents Talkomatic a multi-user chat room application on PLATO System<sup>8</sup>. Talkomatic becomes popular among online users of PLATO.

In the same year, CERL staff invents TERM-Talk, an instant-messaging application. Two users of PLATO communicate instantly by typing characters at the bottom of their terminals.

Later that year, Woolley develops PLATO Notes that enables conferencing and bulletin board forum to communicate with users. Three years later in 1976, Notes expands to enable any user to create a ‘notesfile’ on any subject. PLATO Notes serves as the inspiration for Lotus Notes. Former PLATO users Ray Ozzie, Len Kawell, and Tim Halvorsen develop it.

In 1980, Bulletin Board System (BBS) emerges as one of the earliest known forms of social media. Experts continue to develop the popular tool up to the late 1990s. Around the same time, many use Internet Relay Chat (IRC), and many continue to use it.

In the 1980s Operating Systems (OS) with a Graphical User Interface (GUI) emerges. OS such as Windows 95 and Mac OS become popular because they are easy to use. This sets the stage for early social media platforms to develop.

Information and Communications Technology software development speed up in the 1980s and 90s. British scientist Tim Berners-Lee<sup>9</sup> invents the World Wide Web in 1989. It is central to the development of the information age and is the primary tool billions of people use to communicate with each other on the Internet. Hardware innovation does not lag far behind. Larger and heavy computers make way for lighter and thinner ones. Personal computers become faster and smaller in the 1980s and 1990s. Large processors make way for smaller and faster chipsets. The phrase obsolete technology becomes common as development progresses rapidly. The Pentium series reiterates this. A series of Pentium<sup>10</sup> microprocessors such as 086, 186, 286, 386 and 486 produced by Intel arrive and disappear as quickly as they arrive in the early 1990s. Experts rate Pentium microprocessors higher than atom and Celeron series, but far below the core i3, i4, i5, i7 and i9 and the Xeon series. Computers and computing have refined exponentially in the last two decades. Today's generation may wonder what are Floppy Disk Drives, CDs and DVDs because they are obsolete now.

Instant messaging platform such as AOL Instant Messenger (AIM) debuts in 1997 (Discontinued December 15, 2017). MSN Messenger (1999), later known as Windows Live Messenger, adds competition as the industry grows. Wikipedia arrives in 2001. The 21st century welcomes innovative social media platforms such as Friendster, Orkut, Tagged, Flickr, Myspace<sup>11</sup> and Facebook<sup>(12) (13)</sup>. Writing commentaries and opinion articles, curiously labelled as blogging by the IT community, gains popularity.

Social media platforms that survive the threat of obsolescence now thrive, even as new ones appear sporadically. This includes popular blogs, instant messaging servers, and various social-networking platforms such as Facebook, MySpace, LinkedIn and Twitter. With advances in smartphone technology, almost all social media services now have their own mobile applications.

### **3. Traditional media: advantages and disadvantages**

Traditional media has grown from scratch. From sign language, using homing or carrier pigeons<sup>14</sup> for relaying messages to its modern face, the traditional media continues to expand. Its modern forms include letters, postal mail, newspapers, telephone, radio, and television. Speed is common to old and new media. In ancient era athletic runners delivered king's messages. Then man became smarter and trained pigeons to deliver messages to remote villages. Man's pursuit of excellence has added speed to everything. He added exponential speed to the digital world through inventions and algorithms. Two people separate by miles speak instantly on the telephone, thanks to Alexander Graham Bell. Radio and television added more speed, clarity and images to communicate across continents. It is slow and limited in reach. Although not impervious to malpractice or misuse, traditional media has wider acceptance. Proof is the large number of readers or subscribers, mainly because the print media has a longer presence of over four centuries. Its practitioners have developed it so much that people accept newspapers, radio and television as their primary sources of news.

### **Digital media: advantages and disadvantages**

Digital media has many facets. It is Internet and applications based. Using secure hypertext transfer protocol, it virtually exists in public domain, and its best feature is being interactive. A user accesses online content on the Internet using a computer, laptop, tablet and feature phone. The digital platform makes it sophisticated and fast. Many people use it simultaneously to communicate instantaneously with one another.

Digital platform beats conventional media comprehensively. Data transfer speed, multiple format support, presentation and compatibility with different types of gadgets give it a great edge. Text with artistic fonts, backed with images and statistical graphics, make it attractive. It has several advantages. Besides personal one-to-one correspondence or communication, multiple users can do the same instantaneously. It has added myriad opportunities and innovative methods to communicate and interact while doing online business, marketing products and services. Its various forms include email marketing, social media marketing, content marketing, Search Engine Marketing and Search Engine Optimisation.

The Internet's biggest advantage is being a fast, virtual and receive-and-read anywhere alternative to traditional form of physical distribution of newspapers, magazines, audio and video content. It significantly lowers cost of buying content. However, its access cost is high because consumers need expensive laptops, tablets or

feature phones to read, hear and watch content. The consumer pays thrice. He first buys a gadget. Next, he pays for data plan to telecom service provider and then pays subscription fee to content providers.

Digital media's best feature is anyone who has money can buy a digital device, Wi-Fi or 4G service and pay to read or watch videos. This is its fatal flaw. With millions of people using digital devices, there is a virtual tsunami of data online. News, genuine or fake, travels fast. Consumers cannot verify whether the information is genuine or fake. Digital media is destructive. False information destroys a person's character, reputation, and even ruins him/her financially. Radicals and terrorists abuse it to further their agendas and carry out mass killings.

Despite the potential threat of abuse, trolling, bullying and cybercrimes, the Internet, search engines such as Google, Bing, browsers like Chrome, and Explorer, private and public websites are here to stay. Experts will continue to further develop social sites like Facebook, Messenger, WhatsApp, Snapchat, Twitter, Instagram and several other phone-based applications.

### **Paper versus screen: practitioners, credibility and reputation**

Can one say, 'newspapers and magazines publish reliable news, and social media content is unreliable? Or, is it the other way around? What standards back reliability? Intelligent readers ask many such questions because they seek the truth and reliability of the source of information, whether published by traditional or social media.

The logo of one of India's oldest newspaper, The Times of India, says, 'Let Truth Prevail'. Other Indian newspapers, as well as all over the world, espouse similar lofty ideals. This shows publishers and newspaper owners have the intent to publish the truth, but do their editors and reporters strive to fulfil this ideal in all news reports they write and edit?

Many newspapers owners and their editors practised good morals in their journalism in the first half of the 20th century, and perhaps, many do even today. Loads of evidence supports this claim. There are good and bad editors. We must accept many publishers and editors have an agenda to push. We must concede many editors are pliable and subservient to their owners. They push company agenda by conniving with a coterie of reporters. There are corrupt reporters too. They either work individually or with cliques on the News Desk. Unethical journalists distort facts, suppress truth, and peddle lies on all topics - be it business, crime, social, cultural, religion, political and war propaganda to tell a different story.

#### **5.1 The practitioners**

Traditional media wins this race by a great distance. Many faultless reasons support this claim. Practitioners of this media usually come with university education. These days many come with degrees from journalism colleges. These well-trained journalists come with qualifications to write news reports, editorials, commentaries, analyses and features on many topics.

They have the competence to write high-quality reports on a wide range of topics. Chief Reporters often assign beats to them such as politics, government, administration, municipalities, legislation, law, crime, business, banking, finance, insurance, share and money markets, corporate, commerce, industries, science, technology, defence, aviation, education, health, environment, the performing arts, music, culture, human rights, labour, foreign affairs and sports.

Many journalists often write on more than three or four subjects. However, editors often delegate special beats to reporters because the vastness of the subjects mentioned above calls for specialisation. This is where a professional newspaper reporter beats an untrained citizen who practises social media journalism. The untrained citizen's only qualification to 'write news' and commentaries - known by the silly nomenclature of 'Blog' on the social media - is having a feature-load cell-phone and little else.

#### **5.2 Credibility**

An average citizen, skilful only with hand-held gadgets cannot match a professional news reporter's credibility and competence. He/she does not have the qualifications and the training honed in a newsroom to write quality news reports on various topics.

A young newspaper reporter writes news based on the principles learned in journalism schools. Experienced senior editors further guide young reporters in the newsroom. Reporters write news conforming to the basic format of Who, What, Where, When, Why - known as the five Ws in journalism. The crucial point here is the 'Who'. For example, a journalist reporting an accident will confirm the number of people dead and injured by validating the data. He/she will quote a police officer, fire brigade official and spokesperson of the hospital to confirm the number of dead or injured people. This 'who' gives credibility to the news report that cellphone brigade can never match.

A citizen's hopes of journalism begin and end with a hand-held gadget. He/she does not know how to write a report, what to write, and who to quote. His/her news is amateur work that lacks credibility. The only redeeming feature here is the video captured by his/her phone camera. Does aiming phone camera to the incident site need special skill? Even here, the well-trained newspaper photographer or television channel videographer beats citizen 'journalist' by the sheer quality of equipment and technical expertise.

### **5.3 Reputation**

Among thousands of media people, a few stand out in the crowd of mediocrity. Their consistently good work published or broadcast over many years earns them universal acceptance and builds reputation. Newspaper readers and television audiences recognise and identify many outstanding journalists by their name as a brand, rather than the newspaper or the channel where they work.

Public uploading content on social sites do not deserve such appraisals. Barring a few exceptions, the majority upload rubbish or copied content with their 'analyses'. Their only claim to fame is the number of 'likes' and subscribers. This is neither a measure of their success, reputation, nor does it certify their work. The few exceptions are usually journalists who have quit mainstream media and started their own channels on YouTube.

## **6. Monitoring and Challenges**

The Internet and cellphone-based social media applications pose many challenges. Lawmakers and governments face the difficult task of ensuring the right to express freely and protecting the rights of individuals, public and private institutions. Freedom of speech does not give anyone the right to target, malign, terrorise, ethnic profiling, racially abuse and pass derogatory comments on a person. Whether a particular religion, supporting a political party, culture, work, business, sport, cinema and music, everyone has the freedom to choose, practice and follow it.

New possibilities for free speech provided by the Internet have also been used to undermine people's human rights<sup>15</sup>. A section of amateur and paid practitioners of digital media are irresponsible and reckless. Sounds harsh, but it is the truth. They blatantly violate the spirit of free speech by spreading canards, strangely called trolls these days, under the cover of fake names that social media enable users to create and use. They pose many serious threats to targeted individuals, groups and institutions. Lies, fake news, deliberately disseminated wrong, abusive and offensive information either text, audio or video films via social media can damage reputation, integrity and malign character of public figures, citizens, public and private companies. Yes, it has many advantages, if practised responsibly, but, bad people outnumber good people so it does more harm than good. The disadvantages outnumber the advantages. This is why many countries are mulling strict regulatory norms to rein in the rogues who cause mayhem on social media. Several independent activists and various other groups in the world favour regulating social media for the greater good of the world.

### **6.1 Accountability**

Owners of [www.regulatesocialmedia.org](http://www.regulatesocialmedia.org)<sup>16</sup> insist, "Social media companies must be accountable to the democracies that make their businesses possible". In a commentary on the negative impact on social media, the authors say technology companies Google, Facebook, Twitter, SNAP and others are "hardly regulated and hardly accountable". The commentary goes on to say, "While these platforms present new opportunities to connect people around the world, they also create attack surfaces for bad actors that wish to spread misinformation, encourage terrorism, engage in online harassment, steal personal data, restrict free speech and suppress dissent. The age of unregulated social media must end. Now is the time to have these discussions before we end up with misguided rules."

### **6.2 Regulation**

In a commentary titled 'Do we really need to start regulating social media', published by [www.forbes.com](http://www.forbes.com) on July 30, 2018, Andrew Arnold argues US lawmakers are not the only ones pushing for "imposing new regulation on social media. In the United States, many legislators strongly suggested imposing some powerful regulations during the Facebook hearings. He makes a strong case for regulating social media, saying, "Some of the strongest proponents of social media argue that it is a matter of public interest to regulate social media. They say that regulating it may be as important as regulating tobacco or alcohol. Social media, they argue, empowers large corporations to control the flow of information. As long as they can afford to saturate social media feeds with posts that curate the information they want, anyone standing in opposition to that is essentially steamrolled because they don't have the resources to counter that."

## **7. What are governments all over the world doing to regulate social media?**

Public debate, dissent, hate-speech, online financial crime, terrorism and myriad other issues put intense pressure on governments to regulate the Internet and social media. It remains a complex administrative and

legal process for most countries. It is more difficult for democracies or societies that practice free speech. It is much easier for totalitarian regimes, dictatorships and kingdoms to muzzle contrary view or dissent.

In a paper titled ‘How countries are regulating Internet content’<sup>17</sup>, Professor Peng Hwa Ang<sup>18</sup> of Nanyang Technological University, Singapore, says, “There is not one universal model for Internet content regulation. Ultimately, each country’s regulation of the Internet is driven not by technology or law, but by the culture of the society. Each country has its own specific concerns and it is this rich variety of concerns that adds to the diversity of the Internet”.

Here below are few countries that enforce some form of the Internet or digital media regulations.

**7.1 The United States**

The Federal Communications Commission regulates all electronic communications in the US. The US has the most advanced regulations in this area. This is clear from the legal provision that says banning critics from social media is violation of the First Amendment. The US is currently debating whether a public official can legally suppress dissent or criticism by banning dissenters from social media pages administered by the public official. The country’s legal system is so advanced that it does not even spare its president. President Donald Trump recently appealed against the US District Court in New York decision that said ‘the President engaged in viewpoint discrimination when he blocked individuals from his social media account because they posted tweets that criticised him and his policies’.

Some key US federal laws cover the following infringements:- Communications Decency Act. It regulates indecency and obscenity in cyberspace. Computer Fraud and Abuse Act; Copyright Act; Children’s Online Privacy Protection Act; Electronic Funds Transfer Act and Electronic Communications Privacy Act that prohibits interception of wire, oral and electronic communication.

**7.2 British lawmakers push to rein digital gangsters**

British lawmakers added impetus to the move to regulate social media on February 18, 2019. A report<sup>19</sup> on fake news and disinformation on social media sites, released after one and a half year investigation by British Parliament’s Media Committee, urges tougher rules on Facebook to deter it from acting like “digital gangsters” and internationally violating data privacy and competition laws. The report slams Facebook saying, “The site’s structure seems to be designed to ‘conceal knowledge of and responsibility for specific decisions’. It is evident Facebook intentionally and knowingly violated both data privacy and anti-competition laws. Companies like Facebook should not be allowed to behave like ‘digital gangsters’ in the online world, considering themselves to be ahead of and beyond the law.” The report also accuses Facebook Chief Executive Officer Mark Zuckerberg of showing contempt for the UK Parliament by declining numerous invitations to appear before the committee. Refer Table 7.2.A.

<b>7.2.A BRITISH MEDIA PANEL LISTS SIX POINTS TO CHECK DIGITAL GANGSTERS</b>	
1.	Technical companies must have a code of ethics.
2.	Independent regulator should monitor them. Take legal action, if needed.
3.	Reform UK’s electoral laws and rules on foreign involvement in elections.
4.	Social media should remove sources of harmful content, including disinformation.
5.	Tax technical companies in UK to help fund any new regulator set up to oversee them.
6.	UK antitrust regulators should carry out a ‘comprehensive audit’ of the advertising market on social media.

On the day British lawmakers released their report, New Zealand government announced plans to levy new tax on Google and Facebook.

### **7.3 Indian Government's position on social media**

The Government of India does not regulate content on social media. It is committed to freedom of speech, expression and privacy of citizen, the Minister of State for electronics and IT S S Ahluwalia told the Parliament<sup>20</sup> on July 17, 2018

Replying to a question on fake news, the minister said, "The government does not regulate content appearing on social media sites, and law enforcement and security agencies may take action on specific case-to-case basis as per law in force."

The minister admitted many people misuse social media. "All sections of society access these platforms. The virtual and borderless nature of cyberspace helps this. Anyone can open account in any name including fake name from any part of the world, thus leading to misuse by some persons," he said.

Earlier in April 2018, the Ministry of Information and Broadcasting had issued an order to regulate digital media. The ministry had formed a ten-member panel to frame guidelines for websites. Cyber and media law experts had criticised this move because the panel did not include any representative from digital media and legal expert.

On March 24, 2015, India's Supreme Court<sup>21</sup> quashed Section 66A of the Information Technology Act terming it "unconstitutional in its entirety". "Police misused this section in various states to arrest innocent people for posting critical comments about social and political issues and political leaders on social networking sites<sup>5</sup>."

### **7.4 Global clampdown on social media**

Many countries have either banned or blocked and later revoked the ban on social sites. Main reasons include broadcasting negative text or audio-visual political content against ruling governments and dictators by the opposition party and dissenters. Other reasons include offensive content against particular religion, race and caste.

Afghanistan, Armenia, Bangladesh, Brazil, China, Eritrea, Finland, Germany, Indonesia, Iran, Libya, Malaysia, Morocco, North Korea, Pakistan, Russia, Sudan, Tajikistan, Thailand, Tunisia, Turkey, Turkmenistan, UAE, Uzbekistan, and Venezuela have banned or blocked Google, YouTube, Facebook and other sites for broadcasting content perceived objectionable either to the government or affected parties. Many of these countries revoked the ban after some time.

### **8. Does misuse of social media call for official monitoring and regulation?**

Like eminent social media experts, I am convinced overseeing, regulating and deterring people with wrong motives who misuse social media is crucial for an equitable society. It is easy to suggest, but difficult to do, given the complexities involved.

The 21st century social media has access to high technology. People can easily access online text, audio, images and video producing and editing software. Armed with these tools, people can easily alter text, audio and video content to spread lies and fake news.

Speed is the real danger of social media unlike a newspaper. At first glance, the consumer cannot find out whether the content he/she reads on a hand-held gadget is genuine or fake. Naïve consumers forward such content instantly without verifying. The irresponsible actions destroy victims. Besides distress, mental trauma and anger it inflicts monetary loss, damages family and professional relationships by sowing doubts through lies, incites violence, arson and affects a society's peace and prosperity.

Malicious and unintentionally inaccurate content broadcast by traditional media such as newspapers and radio, too, affects victims, however, its scope and impact is nowhere near the damage that social media inflicts.

For instance, a person reads some contentious news in the newspaper early morning. He/she may choose to tell a friend at workplace or marketplace, perhaps, three or four hours later in the day while social media tells thousands of people in an instant. It is like a nuclear chain reaction that is unstoppable once detonated. It spreads exponentially. This makes monitoring, policing and legislating laws to ensure justice to victims and punishing people indulging in online vilification campaigns through social media very complex and difficult.

### **9. Watchdog necessary to control social media tsunami**

I strongly make a case for an official regulator, monitor or a watchdog to control the tsunami of social media that is currently freely flowing in all directions in India as well as the world. This suggestion is not against freedom of speech or muzzling social media. I reject freedom of speech that destroys an individual's character, reputation and social status based on lies and hatred. Social and economic justice is the right all Indians enjoy

just as the constitution guarantees freedom of expression to all. Many people abuse the advancements made by information and communications technology. An official watchdog or a regulator empowered by laws passed by the parliament is necessary to control and deter such people. Just as worldwide legal systems enacted new laws to curb and deter new crimes, social media needs laws to protect the rights of victims and deliver justice to them.

#### **10. Conclusion: Why digital journalism needs a regulator?**

Advanced societies enforce laws that are fair to all. As societies evolve further, new laws or amending existing ones could help provide legal cover to users and victims of developments. Innovation often impinges unforeseen results. Rather than establishing a regulatory authority, review of the Intermediary Guidelines Rules<sup>22</sup> can be used as an opportunity to devise a mechanism that protects free speech while also effectively dealing with illegal content on the Internet in India as required<sup>23</sup>.

I am not suggesting something impossible. Governments have a responsibility to pass new laws to protect victims' rights. Lawmakers can do it. India, too, can propel digital innovation as a tool for sustainable development. India has traditional precedent for inspiration. Not long ago, women in villages would gossip about another person. Gradually, the tale would go around the village and at some point many people would discuss it openly. Senior people would raise the bogey of 'gaon ki eezut' (honour or reputation of the village). Finally, the village panchayat<sup>24</sup> (council) would call for a meeting, under the ubiquitous banyan tree circle, to discuss and arbitrate the contentious issue. If a village council can probe an issue triggered by gossip, why can't we do this in the 21st century? We cannot deny the many benefits of social media, if used responsibly. In its current unregulated avatar, it is just an efficient tool to broadcast 'gossip' and unverified content. The major difference being it is far more dangerous than two village women gossiping about, say a love affair of the local school-master with a young teacher, because it travels globally!

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**CROWDFUNDING AS A MODE OF FINANCING FOR ENTREPRENEURIAL DEVELOPMENT  
IN INDIA****Surbhi Gosain**

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**ABSTRACT**

India has been witnessing a rise in the number of new enterprises and young entrepreneurs. The entrepreneurship development is gaining momentum in India with various entrepreneurial development programmes (EDPs) introduced by the central and state governments. The accumulation of funds is the most important factor for starting an enterprise. The rise in number of young entrepreneurs with no previous experience has increased the competition among such entrepreneurs to secure funding for their venture. Moreover, securing funds is the most difficult for ventures which do not have profit maximisation needs such as social or innovative projects. Crowdfunding is a mode which has provided a solution for such ventures. Crowdfunding is a process of collecting a small amount of funds from different persons, collectively called a Crowd. The term crowd may comprise of friends, relatives or complete strangers who want to contribute. Crowdfunding is a recent trend in India with the emergence of more and more crowdfunding platforms. The objective of this study is to explore the Indian crowdfunding industry in the light of entrepreneurial development in India. The study is exploratory in nature. The study is based on qualitative data available in various journals, newspaper, reports and the major crowdfunding platforms. The study emphasizes on the process of crowdfunding which has emerged as a method adopted by various individuals to start their ventures. More and more people are opting for crowdfunding to collect money for their individual needs or for different projects. This method of financing has proved to be beneficial at large for social ventures and NGOs as well. The study specifically highlights the benefits and shortcomings of crowdfunding with respect to the entrepreneurial development in India.

*Keywords: Crowdfunding, Entrepreneurship, Entrepreneurial financing, Entrepreneurial development.*

**INTRODUCTION**

Entrepreneurship development has taken a paradigm shift with many new entrepreneurs coming with out-of-the-box ideas. Various government initiatives have created a market for these ideas. Some of these breakthrough ideas include app-based coaching tutorials, cab bookings, travel bookings and food delivery. With the launch of government schemes such as 'Make-in-India' and 'Startup India', entrepreneurship got a new boost. The development of entrepreneurs leads to the overall development of the economy of the country. Due to the rise in the number of entrepreneurs and a volatile business environment, gathering funds for starting a venture has become a difficult task. To start a business an entrepreneur has to compete with other entrepreneurs in order to secure funds. The limited access to the capital during the early stages of a venture becomes a roadblock to the entrepreneurial dreams of many individuals. Crowdfunding is a new mode for entrepreneurial financing. It involves the generation of finances in the form of small contribution by a large number of people. Like other sources of financing, crowdfunding too has some advantages and limitations but it has successfully evolved into a well-established mode of financing.

**SIGNIFICANCE OF THE STUDY**

This paper tries to explore the crowdfunding industry in India in the light of entrepreneurial development. It attempts to highlight the various source of entrepreneurial financing and how crowdfunding has evolved as an alternate mode of financing.

**OBJECTIVES OF THE STUDY**

The objectives of the study are as follows:

1. To understand the concept of entrepreneurship and entrepreneur.
2. To explore the entrepreneurial development scenario in India.
3. To identify various sources of entrepreneurial financing.
4. To understand the concept of crowdfunding as a source of financing.
5. To have an overview of the crowdfunding scenario in India.

**RESEARCH METHODOLOGY**

The study is exploratory in nature. This study primarily uses secondary data to analyse the current status of crowdfunding as an alternative mode of entrepreneurial financing. The secondary sources include the articles, reports, research papers in various journals and open sources. An effort has been made to explore the various aspects of crowdfunding and its relationship with entrepreneurial development in India. The study also uses data given on the website of the various crowdfunding platforms to analyse the rules and policies adopted by different crowdfunding platforms.

**LITERATURE REVIEW****Entrepreneurial Development in India**

Entrepreneurial development is important for any country for the purpose of economic development and growth. With the movements like 'Start-up India' and 'Make in India', entrepreneurship has received much needed boost. These movements have brought the process of entrepreneurship to the forefront in India with incubation centres or entrepreneurship development cells opening in educational institution across the country. Various students are opting for entrepreneurship as their first choice and are taking the role of the innovators. These young entrepreneurs are seen as future employers. Therefore, entrepreneurship not only gives the entrepreneurs a chance to earn their livelihood but at the same time create employment opportunities for other individuals as well. Entrepreneurship can be used as a way of eradicating inequality and poverty in society by structuring changes and promoting growth (Naudé, 2010).

The choice of becoming an entrepreneur is not easy. It involves many issues and challenges which must be overcome in order to start a venture. Some of the common challenges faced by all entrepreneurs are societal pressure, financial difficulties, technological issues, availability of resources and incompatible policy framework (Santhi & Kumar, 2011). There are various types of entrepreneurs in India based on their area of operation, gender and motives, for example rural entrepreneurs, women entrepreneurs and social entrepreneurs. These entrepreneurs face different kinds of challenges in addition to the common challenges faced by all entrepreneurs in India. Though several schemes and incentives are introduced by the central and state governments for the benefit of the young entrepreneurs there is still a long way to go. In, 2016 India was positioned at 98<sup>th</sup> place with a score of 24.9. The reason for a low rank was rigid rules and bureaucratic hindrances prevailing in the country (Ács, Szerb, & Autio, 2016). In 2017, India scored 25.8 with a rank of 68. Moreover, India was positioned at a 13<sup>th</sup> place in the Asia-pacific region (Ács, Szerb, & Autio, 2017). This indicates a jump in the entrepreneurial efforts undertaken in the country but there is still a need to create an environment which provides more support and better infrastructure to the entrepreneurs. In 2018, India was ranked at 68<sup>th</sup> position on Global Entrepreneurship Development Index which ranks 137 countries on the basis of their attitude and potential towards entrepreneurship in their countries. India was scored 28.4 whereas the USA which got the 1<sup>st</sup> rank was given a score of 83.6 and United Kingdom, ranked 4<sup>th</sup>, was scored 77.8 (Ács J. Z., Szerb, Lafuente, & Lloyd, 2018). This gives an idea of the difference between the entrepreneurial ecosystems in India and other developed nations.

**Sources of entrepreneurial financing**

An entrepreneur requires funds both for capital investment and working capital. Finance is the most prominent necessity for starting a new venture. It is not only required for the commencement of the business but it is also required for operating the business on a day-to-day basis. Therefore, an entrepreneur must plan in advance financial arrangement for his/her venture. Some sources of entrepreneurial financing are as follows:

**1. Personal investment**

Personal investment is the amount of money which the entrepreneur put into the venture from his/her own pocket. It is also referred to as internal funding since no outside person is approached for funds. An entrepreneur is the first investor of his/her venture with full control and no profit sharing.

**2. Venture capitalism**

Venture capital is the form of finance provided by investors who have experience in financing enterprises. These investors are called venture capitalists and are generally firm rather than a single person. They prefer to fund projects which are highly innovative. Venture capitalists not only provide with funds but also provide their expertise in setting up the venture (Ho & Wong, 2007). They often help with a pre-existing network of experts which may provide marketing assistance, technological aid and helps in recruiting top professionals. They play the role of mentor to the entrepreneurs (Denis, 2004). They are ready to assume more risk in return of high stakes and more control in decision making in the venture. Venture capitalists invest in those ventures which shows a higher growth rate. In return of their investment, they take a part of the equity in the venture and thereby having voting rights in the decision-making process (de Bettignie, 2008).

### 3. Angel investment

Angel investors are the individuals with high net worth who are willing to invest in new ventures. They provide seed money to the entrepreneurs who have somehow set up their ventures so that they can run their business. They are good for ventures in their early stage (Denis, 2004). They are capable of providing the amount of funds more than friends and family but less than venture capitalists. They bridge the gap between personal investment and venture capital (Ho & Wong, 2007). They can guide the entrepreneurs on the basis of their own experiences but cannot provide greater expertise as in case of venture capitalists. In return of their investment, they take a share in profit and seat on the entrepreneurial team. Dilution of control is less in comparison to venture capital.

### 4. Bank loan

Acquiring loans from the bank for starting a business is the most common practice adopted by various entrepreneurs. Bank loans require some tangible assets to be kept as collateral with the banks. This is often a problem as many young entrepreneurs from lower and middle-class families lack such collaterals. Moreover, banks provide loans to those ventures for which they believe that they will have a potential market in future. Availability of bank loans is hindered by the information asymmetry (Ho & Wong, 2007). This creates a difficulty for the projects which are highly innovative and have not been tested before.

### 5. Business incubators

They are the organisations which provide the entrepreneurs with the funds for setting up a business along with giving shape to their ideas. Incubators are the entities that help in developing the prototype of the product or blueprint for running your business, specifically in case of technology-driven ideas. In return for their assistance, they can either take a part of equity or profit (Block, Colombo, Cumming, & Vismara, 2018). They are basically helpful for students who have innovative ideas and are need of professional assistance to convert that idea into a commercial activity.

### 6. Crowdfunding

Crowdfunding is the process of pooling money by different individuals towards the fulfilment of common intention. It is a method of organising funds from a wide range of individuals (Mollick, 2014). The number of investors in crowdfunding is not limited to just a few individuals or a firm but it involves generating funds from various people who may or may not have any connection with each other or the entrepreneur.

Experience of entrepreneurs along with their educational qualification, gender and nationality also has an impact on the availability of external finance. Zaleski (2011) highlighted that investors prefer those ventures which have a competitive edge over others in their respective areas. It has also been noted that ventures run by male entrepreneurs are more preferred by outside investors than the ventures founded by females. Entrepreneurs with previous entrepreneurial experience are able to attract investors easily.

## DATA ANALYSIS

### What is Crowdfunding?

This process of financing in entrepreneurial development is gaining momentum. The concept of crowdfunding is based on the notion of gathering people belonging to different walks of life to finance a venture in which they have a shared belief. In crowdfunding, entrepreneurs instead of approaching the venture capitalists, angel investors or banks, approach the common people who lack knowledge about investing in a business proposal (Frydrych, Bock, Kinder & Koeck, 2014). These common people rely on their intellect and emotions while making the investment decision (Burton, Khavul, Siegal & Wright, 2015). In the case of crowdfunding, the funders contribute into the project in exchange for a sample product, services or appreciation or credit (Pathak & Kaur, 2016).

This concept of organising activity by taking a monetary donation from the public is not new rather it has been prevalent since centuries all across the globe. However, this phenomenon has developed into an organized form in the past few years. In recent times, it has been used as a way of promoting innovative and unique ideas. It has also been proved useful in case of social ventures which otherwise face difficulties in raising funds through traditional financing methods. Crowdfunding was adopted as a new method of financing for setting up ventures after the revolution in internet technology (Rossi, 2014). The term 'crowdfunding' was coined in the year 2009 by Michael Sullivan after he failed at incubating a video blog (Castrataro, 2011). With the emergence of web 2.0, the crowdfunding process went online from offline. This revolution of raising money through online web platforms paved the way for the popularity of this financing method. Over the years, crowdfunding has been adopted for more and more technologically innovative projects apart from being used for artistic and social projects.

**Different models of crowdfunding**

On the basis of these returns, crowdfunding can be diversified into four different models which are – Reward-based, equity-based, donation-based and debt-based. In reward-based crowdfunding, the funders are treated as first buyers of the product (Mollick & Kuppaswamy, 2014). Such type of crowdfunding is generally opted by the technology-driven ventures which take it as an opportunity to test their prototypes and arrange for the working capital at the same time (Rossi, 2014; Frydrych et al., 2014). Debt-based crowdfunding where entrepreneurs raise funds in the form of a loan at a flexible rate of interest (Mollick & Kuppaswamy, 2014). However, interest is not always mandatory and funders will only get back what they have contributed. Another model of crowdfunding is the donation model where the crowd act as donors for social ventures (Flanigan, 2017). Donation-based model is an easy way of collecting money for philanthropic, cultural or artistic projects. The recent development in the crowdfunding industry is the emergence of the equity-based model. In the equity-based model, investors get a stake in equity in return for their contribution. This model requires the formulation of rules and regulations as it involves the interest of shareholders and the concerns of investor protection due to the monetary return on investments (Burton et al., 2014).

**Mechanism of crowdfunding**

All types of entrepreneurs can opt to crowdfund as the decision of funding a particular venture lies in the hands of the crowd. The institution of crowdfunding consists of three stakeholders -entrepreneurs, crowdfunding platforms and the crowd. The term ‘crowd’ signifies the people who invest in the projects. They are also called donors, funders or project backers. Moreover, the terminology used for entrepreneurs in the crowdfunding market is creators, initiators or fund-seekers. The venture or the idea is denoted by the terms ‘Fundraiser’ or ‘Campaign’. Crowdfunding platforms are the websites which allow the entrepreneurs to develop and display their campaigns or fundraisers. They act as the interface between the crowd and the entrepreneurs.

There are different crowdfunding platforms which follow different policies. The rules and regulations vary from platform to platforms but the basic working mechanism behind the whole crowdfunding process is the same. The process of raising finances through crowdfunding begins with the selection of the appropriate crowdfunding platform. The entrepreneurs should choose the platform based on the type of the venture and the crowd following the platform. After the selection of the platform, the entrepreneur should design the fundraiser or campaign. Designing the campaign is the process which must be undertaken with utmost care and diligence. Campaign designing involves writing a product description explaining the idea and the motive behind the idea to the potential funders, attaching required videos and images, entrepreneur’s details, required an amount of funds and the time for which the campaign is open. The success of the campaign primarily depends upon the design of the campaign. Once the campaign is approved by the platform, it goes live to the audience of the platform i.e. the crowd. Campaigns are displayed on the platforms for the given period of duration. Funders can make contributions to the desired campaigns. A campaign is live on the platform for funding only to the duration which is mentioned in the campaign. The duration is specified in the form days left to the closing of the campaign. Funders can contribute to the campaign until it is live on the platform. On closure of the campaign, no contributions can be made. If the campaign has reached its goal i.e. the number of funds required, then it is termed as a success otherwise it fails (Jhaveri & Choksi, 2016; Gosain, 2017). Different platforms follow different rules over the issue of the funds collected during the live campaign. There are two approaches to deal with the funds collected – ‘All-or-Nothing’ or ‘Keep-it-all’. In the case of ‘all-or-nothing’, an entrepreneur is eligible to get the funds collected only if the campaign was a success and has reached its target amount. In the case of ‘keep-it-all’ approach, the entrepreneur will get the entire amount collected while the campaign was live even if the targeted goal is not achieved (Flanigan, 2017).

**Benefits and Limitations of crowdfunding**

Crowdfunding not only provides funds for setting up an enterprise but also enables an entrepreneur to test the viability of an idea and future of the venture. Crowdfunding allows an entrepreneur to establish a direct connection with potential future customers. The crowdfunding has its own benefits along with a chance of raising funds for a venture which are as follows:

**1. Demand forecasting:**

Crowdfunding enables an entrepreneur to judge the future of a venture. The number of funders contributing to a campaign gives an estimation of the future demand for the product (Agrawal, Catalini & Goldfarb, 2014). The funders are considered as future customers for the product.

**2. Marketing tool:**

The success of the crowdfunding campaign is associated with the social presence of the campaign which is dependent upon the size of the social network of the entrepreneur. Social network enables the crowd to verify

the profiles of the funder and improve the trust factor (Mollick, 2014; Frydrych et al., 2014). The entrepreneurs are required to share their campaigns across their social networks to create a web presence which ultimately helps in promoting the venture.

### **3. Low-cost capital:**

Other financing sources like venture capital, angel investor and banks charge a higher cost for the capital provided by them. Crowdfunding provides the capital for early-stage ventures at a cost which is comparatively lower than other sources of finance (Agrawal et al., 2014). In crowdfunding, the funds are collected from many people in the form of small contribution. Campaigns also provide a vast amount of information and future prospects about the project which may increase the interest of funders in the project. This leads to a low-cost capital.

### **4. Feedback:**

Feedback is another positive feature of crowdfunding. Crowdfunded projects have a vast number of investors which often provides feedback to the entrepreneur. This acts as a mechanism through which an entrepreneur can improve his/her plans, product designs, service quality or presentation (Agrawal et al., 2014). Funder's involvement enhances the shared interest in the project and social identification which in turn creates a wider base of potential customers (Belleflamme, Lambert & Schwienbacher, 2010; Ricardo, Sicilia & Lopez, 2018).

### **5. Social entrepreneurs:**

Donation-based crowdfunding is a good way of generating funds for non-profitable causes (Mendes, 2016). The traditional sources of finance prefer ventures with a profit motive. They are interested in such projects which can yield returns on their investments. However, with the emergence of crowdfunding NGOs and social entrepreneurs can raise funds for the causes which are beneficial to the society (Flanigan, 2017).

### **6. Women entrepreneurs:**

It has been noted that crowdfunding campaigns initiated by the women entrepreneurs are more successful than male entrepreneurs (Frydrych et al., 2014). It is more difficult for women entrepreneurs to access funds through traditional modes of financing due to societal pressures and gender bias.

Apart from these incentives of crowdfunding, there are other benefits as well. Crowdfunding also helps in establishing a brand image for the product from a very early stage. Further, funders apart from contributing the funds may also show interest in being the part of the entrepreneurial team. This adds to the workforce and talent to the young enterprises (Belleflamme, Omrani, & Peitz, 2015). Crowdfunding has opened investment opportunities for various inexperienced entrepreneurs who are often rejected by venture capital, angel investors and banks (Beaulieu, Sarker, & Sarker, 2015). Crowdfunding has proved to be beneficial for entrepreneurs who cannot provide collateral to the banks. Moreover, it provides an easy channel for communication with potential customers via social media (Gerber & Hui, 2014). Crowdfunding does not lead to dilution of control over the venture. It helps in creating a community for the product (Valanciene & Jegeleviciute, 2013).

Apart from the advantages crowdfunding also has certain limitations which are as follows:

#### **1. Risk of theft of idea**

Crowdfunding platforms are accessible to each and every one. They are public domain sites. The entrepreneurs are required to put all the necessary information in the campaign which is to be displayed on the crowdfunding platforms. Thus, there exists a risk of theft of idea and imitation (Agrawal et al., 2014). Moreover, many of the entrepreneurs lack copyright over such ideas and hence are at disadvantage of idea theft.

#### **2. Lack of professional assistance**

Venture capital or angel investors provide the entrepreneurs with a plethora of professional assistance and adds to their competences. When an entrepreneur opts for crowdfunding they do not have access to such assistance (Agrawal et al. 2014). The future of their venture depends entirely upon their own competences and networking. Crowdfunding limits access to the resources and well-established networks (Beaulieu et al., 2015).

#### **3. Public failure**

Crowdfunding is all about the public. Every information related to a campaign is available in public forum. This implies that even the failure of the project is known to everybody. Therefore, entrepreneurs may have a psychological impact of having a public failure which may also have an adverse effect on future funding (Kshetri, 2018).

Crowdfunding is still evolving with many countries identifying it as an alternative mode of finance. Crowdfunding lacks a proper structure especially in developing and underdeveloped countries. It is considered a

risky option due to lack of formulated regulations (Beaulieu et al., 2015). Another challenge in crowdfunding is to keep account of all the investors as many of them contribute anonymously (Valanciene & Jegeleviciute, 2013). Though crowdfunding has certain limitations as compared to other modes of finance but it still is an effective way of raising funds for creative, innovative and talented entrepreneurs.

### **Crowdfunding Industry in India**

Crowdfunding industry in India is in developing stage. The first crowdfunding platform was launched in 2010. Although there are four different models of crowdfunding only two are prevalent and operational in India. These two models are reward-based crowdfunding and donation-based crowdfunding. Since equity-based crowdfunding model incorporates risk of fraud and investor protection, therefore, it requires legalisation and validation from SEBI. Thus, there are no legal and valid equity crowdfunding platforms in India. There are several crowdfunding platforms operational in India which are as follows:

- **Ketto**

Ketto is a donation-based crowdfunding platform which was launched in 2012. It allows individuals, corporates and NGOs to raise funds through their platform. The individuals and corporates charge 5% of the amount of fund raised or Rs. 2000 whichever is higher. They charge young NGOs 5% of the amount of fund raised whereas established NGOs are charged at the rate of 6%. In addition to this, all entrepreneurs have to pay 3% as gateway charge and additional applicable taxes. It follows 'keep-it-all' model. Ketto provides the entrepreneurs with services of fundraising experts and marketing and advertising support (Join the ketto community today, n.d.).

- **Wishberry**

Wishberry is the first crowdfunding platform of India which was launched in 2009. It is a reward based crowdfunding platform. It provides consultation services, marketing and PR services and backers management tool. It follows the 'all-or-nothing' approach and charges the campaigners 10% of the amount raised only if the target is achieved, plus taxes. They also charge an additional price for consultation and marketing and PR services.

- **Milaap**

Milaap was launched in the year 2010. It has both donation-based as well as debt-based crowdfunding model. The fee charged by the platform ranges from 5% to 13.5% depending upon the package an entrepreneur choose. The platform provides three different packages with each offering different sets of services. Some of these services are campaign managers, multiple fundraisers, real-time support, promotional support, content creation and check pick-ups.

- **Impactguru**

Impactguru is a donation-based crowdfunding platform launched in 2014. The fee ranges from 5% to 12% depending upon the range of services provided by the platform. In addition to this 3% payment gateway fees is also charged. Some of the services provided by the platforms are promotional and marketing support, content creation, and customised strategy and campaign managers.

- **Fuel A Dream**

It is reward-based crowdfunding platform which was launched in 2015. It allows an entrepreneur to choose either 'all-or-nothing' or 'keep-it-all' approach. It charges Rs, 3000 as processing charge for a campaign along with a 6% contract charge for 'keep-it-all' campaigns. However, they waive the processing charge for group campaigns for social and charitable causes and charge 9% contract charge if the campaign adopts 'keep-it-all' approach.

- **Crowdera**

Crowdera is a global crowdfunding platform and has launched its operation in India in November 2015. It follows 'keep-it-all' approach. Crowdera does not charge any fee from entrepreneurs for its basic package apart from minimal transaction charges. It also provides premium packages which are however charged \$7 or \$17 per month depending upon the range of facilities offered.

- **Catapoolt**

It is reward-based crowdfunding platform which was launched in 2012. It offers the users services such as marketing, incubation, endorsement and distribution and sales apart from generating funds. They charge a fee of 10% on the amount of funds raised plus taxes. It follows 'keep-it-all' approach.

**CONCLUSION**

Entrepreneurship is a significant sector for the growth and development of any country. It not only creates new enterprises but also provides a boost to the economy. Creation of new enterprises leads to the creation of many employment opportunities. It also increases the production output and provides the people with a wide variety of commodity. Thus, the development of entrepreneurs is essential for the development of the nation. India has adopted various measures for the development of young entrepreneurs and to make entrepreneurship a mainstream occupational choice. Reward-based crowdfunding has been used by many young entrepreneurs to introduce innovative products into the market. Further, Crowdfunding gives an equal chance for women to arrange funds for their entrepreneurial ventures. Women are also choosing to crowdfund for the purpose of empowering other women.

Crowdfunding is a newly formalised mode of financing which has been adopted by entrepreneurs all across the world. This mode of financing is crowd-driven and allows the potential stakeholders of the venture to be the investors. As per the Global entrepreneurship index (2017), Product innovation is the strongest pillar for entrepreneurship in India with a score of 0.74 followed by competition and process innovation with a score of 0.65 and 0.59 respectively. The crowdfunding is a mode of financing which supports the product as well as process innovation better than any other modes of financing. An improvement of 10% in the conditions for the entrepreneurial sector of India can add \$3.3 trillion to the economy. The report concludes that the risk capital score of India is 0.17 which is very low as compared to other developing nations. Risk capital score depicts the financing of entrepreneurial ventures. Crowdfunding has still not reached its full potential in India. It has a great scope in a country like India With a large population base which can be converted into potential crowd funders.

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**RADIO AS A POLITICAL COMMUNICATION TOOL: A STUDY OF 'MANN KI BAAT' SHOW****Dr. Manasvi Maheshwari**

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**ABSTRACT**

*Radio has always been a medium of common man. It is easily accessible and economical to use. The penetration of radio is 92% area of the country and it reaches 99.19% of total population of India and it has been the most effective and powerful tool for mass communication.*

*Realising this importance of radio as a mass medium the BJP Government under the leadership of PM Mr Narendra Modi has initiated a new concept of Radio show that helps the government to connect with a wider audience hassle-free.*

*"Mann Ki Baat" as the name suggests 'to speak about public's opinion' is a show where the country's prime minister talks about different issues and problems that the citizens of the country are facing while using radio as a medium of communication.*

*The research focuses on how radio is used by the political leader as a medium of communication. The objectives of the study are; to study the use of radio as a communication medium by a political leader, to analyse the content of Mann Ki Baat show, to explore the perception of the listeners towards the show, to find out the importance of the show amongst the youth.*

*The study will be an exploratory research. The researcher will do content analysis of the show and will conduct a survey to find out perception of the listeners. The region of the study is Delhi NCR.*

*Keywords: Mann Ki Baat, Radio, Political Communication, Narendra Modi*

**I. INTRODUCTION**

Radio has been considered powerful tool of mass communication despite of rise in social media and emergence of digital age. Radio still holds a strong presence as a tool of communication especially in developing countries where internet and electricity issues are yet to be resolved. Its unique features make it stand ahead of all available medium of communication. All India Radio, the public broadcaster in India has reach of 99.19% of total population. Radio has enough potential to reach and influence listeners. Radio is a cost effective medium and if utilised properly can help in development of the country.

The studies have shown that if power of radio is used for political communication, not only will it increase the reach of the political message but can also influence the opinion and views of a large section of the society.

PM Narendra Modi has explored the power of radio. He is the first Prime Minister of India who has tried to reach his countrymen through radio through his monthly show *Mann Ki Baat*. In his unique show he has tried to inform and educate listeners. The first episode of *Mann Ki Baath* was on aired on AIR, 3<sup>rd</sup> October 2014. In the first episode Mr. Narendra Modi made a reference to the auspicious festival that commemorates a new beginning and indicated the importance of cleanliness in India. The show is aired across 422 radio stations and is backed by the official website [www.narendramodi.in](http://www.narendramodi.in) and [MyGov.in](http://MyGov.in) which is a citizen engagement social media platform. The 50<sup>th</sup> episode of *Mann Ki Baat* was aired on 25<sup>th</sup> November 2018.

The Prime Minister has clarified at various platforms that the show is not a political agenda or has nothing to do with politics but it is about people's aspiration. He has said that the show is reflecting people's views and concerns. Therefore, in this research, content analysis of 10 episodes of *Mann Ki Baat* has been done and survey of listeners has been conducted to understand role of *Mann Ki Baat* show.

**1.1 About Mann Ki Baat Show**

*Mann Ki Baat* is a radio show/programme hosted by Prime Minister of India, Narendra Modi. It is one of its kinds show wherein Prime Minister addresses the nation on various topics of national and social importance. The show is aired on All India Radio, DD National and DD news. Through this show the prime minister tries to connect with the common man and inform them about various schemes and initiatives of the government and also allows them to be a part of this show by sending their messages and audio clips through various government websites like My Gov App and Narendra Modi app. The first episode of the show was launched on 3<sup>rd</sup> October 2014 and till now there have been total 53 episodes that have gone on air. In the show the prime minister talks about taboo in the society, praises the good work being done by the citizens of the country to improve the society that helps in the development of the country. He also gives examples of achievers in various

fields and provides awareness about various schemes and laws that are made for the countrymen. All the shows that have been aired till now are available on different online platforms and can be accessed for free. Various websites also provide the script for these shows both in English and Hindi language.

## 2. Literature Survey

Researcher reviewed more than 30 research papers and articles on the format, content and relevance of *Mann Ki Baat* Show. The various researchers have mentioned about the relevance of radio as a medium to connect to large number of audience. The studies also conclude that the *Mann Ki Baat* show is one of its kinds and gaining popularity among the common people. Some of the excerpts are given here.

“In nations where Internet and electricity are limited, radio is the strongest medium for connecting isolated communities. Radio has the potential to reach further than newspapers and television, both in terms of audience numbers and geographical reach. Radio can be used as a platform for linkage and exchange between policy makers, government bodies, communities and researchers. There are potential benefits of linking radio with other forms of media such as the Internet and mobile phones. Radio has the ability to raise awareness and stimulate social change amongst the target audience. At a larger level, the *Mann Ki Baat* exemplifies a new method of communication. It is direct, it is wide in its reach and it is soft in the nature of the message. It is in tune with the 'Modi way' of doing things reaching out to the people without barriers.” (Shreeraj Gudi, Shreevatsa Gudi 2017)

(Abhijit Majumder, 2018) “In that way, it is a lot more intimate mass medium. The PM, perhaps mindful of that, has chosen for radio issues that resonate in the household like cleanliness, examinations and career, drug addiction, girl child, farmers, Siachen soldiers, handloom, festivals, yoga or gas subsidy. The topics are almost out of a modern Sangh pracharak's "vyakti nirman" kit, made to shape an individual's relationship with family and society. But in all this lie seeds of Modi and the RSS idea of nationalism. The radio show gently plants ideas of a stronger, more cohesive nationhood. Modi has not tried to hide his disappointment with and mistrust of mainstream media. While with social media he cut out journalists and started reaching the message directly to the people, with radio, he becomes his own messenger for even those who do not have a cell phone or a TV set.”

Siraj Quraishi, the Ex-Deputy Director General Doordarshan, India in the e-paper Greater Kashmir points out the importance of the programme *Mann Ki Baat* “To lend it widest reach and deepest penetration, the programme is aired by all stations / channels of AIR simultaneously. In order to boost the thrust further, the programme is repeated in all the regional languages of the country.... In order to cater to isolated, rural and less developed regions, Radio was chosen as the medium. Some channels of AIR have considerable footprint overseas as well.”

The paper establishes that public service broadcasting can be used efficiently to fulfill its prime purpose of “informing, educating and entertaining” the audience in the country. Public service broadcasting can be revived by government initiatives to gain the attention of the public which can then be accentuated by the internet. It can be a vital instrument to combat health issues by endorsing yoga and also recuperate home based textiles such as Khadi which facilitates self-reliance. The content brought by opinion leaders such as Prime Ministers can be recycled to generate higher revenue to public service broadcasting media to revive its lost glory of the past as both AIR and DD have the highest reach in India.” (Meghana, H. R. (2016).

Sripathy (2015) has shown how radio is a very effective tool. It also signifies about highlights and future of the *Maan Ki Baat*. However, it has not put anything related to effect on masses, their expectations and how to make show a better opportunity for development of intimacy between the leader and general population.

Jitendra (2017) in *dailyexcelsior.com* has given glimpse of how *Mann Ki Baat* show is concerned with health and well-being of the masses along with its agenda to spread awareness among people about current scenario. It has also worked as a driving force in achieving the objective of how the show is working for wellbeing of masses by not only having a show but also implementing the ideas talked and discussed in the show. This show has also made us understand that not only masses need to be fit but also the people who are the leaders need to be swift and fit with the current news. All this comes into effect when a leader who is responsible for a country's progress is enthusiastic about the same. (Dr. Jitendra. 2017)

## 3. Research Design

The study is an exploratory research. The tools used for data collection were survey using questionnaire and qualitative and quantitative content analysis.

To analyse the content of *Mann Ki Baat* show content analysis of the 10 episodes have been done. The episodes from the month of January to October 2018 were analysed on mentioned parameters. After listening to the show, following parameters were developed for the content analysis:

1. **Issues highlighted:** It was observed that in every episode some of the issues of National or Social importance were highlighted by the PM. He raised concerns and discussed importance of the subject matter. He gave information and created awareness as well.
2. **Famous Personalities mentioned:** In every show PM mentioned about famous personalities of sports, history, politics, science and technology, etc. to cite some examples or discussed about their role in nation building. These people are the one who have contributed in some way for the growth of the country.
3. **Festival/days of National/Social Importance:** In *Mann Ki Baat* show it was observed that in every episode PM has discussed about the important days, festivals, celebrations etc. He has wished people on the occasion, encouraged them to celebrate the day such as Yoga Day, Science Day, Doctor's Day etc.
4. **Mentioned about Narendra Modi App/My Gov App** – The PM has also spoken about Narendra Modi App/My Gov App on the show. He has invited feedback through the App, mentioned about people who have posted their comment or suggestion on the App or any service available on the App.
5. **Government Schemes:** The PM has time and again promoted government schemes on the show. He has informed, created awareness and educated people about the new schemes and their benefits.
6. **Listers' Feedback Source:** The most important part of the any show is the feedback system. In this show also PM mentions name of the listeners who have written to him through Apps, emails, letters, phone call. In his show he always mentions about the source that how people have connected with him.
7. **Appreciation:** It has been observed that PM on his show has always appreciated the efforts of common man who are working for the welfare of the society and nation. He mentions their name, role, contribution.
8. **Picked up topics raised by listeners:** In the show PM ensures that he picks up topics or issues raised by listeners.

To explore the perception and importance of the show survey was conducted using questionnaire. The sample size was 100 and area of study was Delhi NCR. Sampling technique used was simple random sampling. It was ensured that respondents have listened *Mann Ki Baat* show at least once.

#### 4. Data Collection and Analysis

##### 4.1 Survey

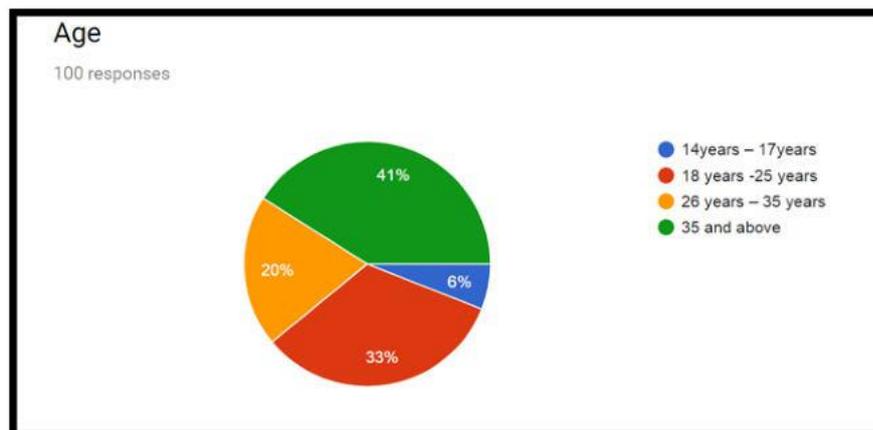


Fig. 1: Age of the Respondents

The respondents were of all age groups starting from 14 years and above.

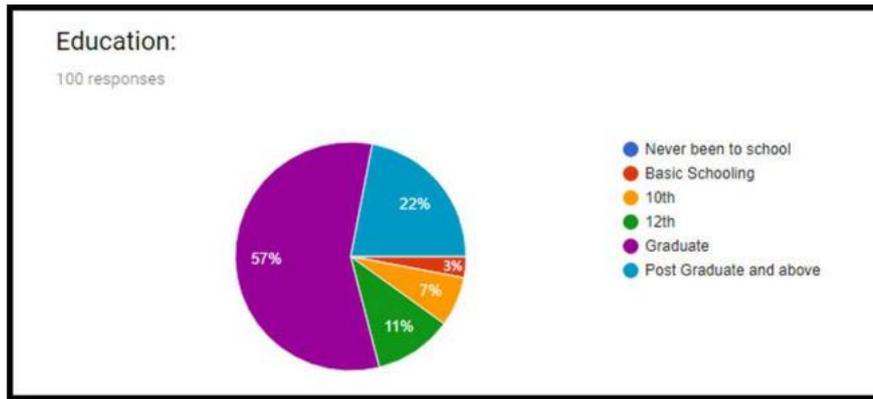


Fig. 2: Education of the Respondents

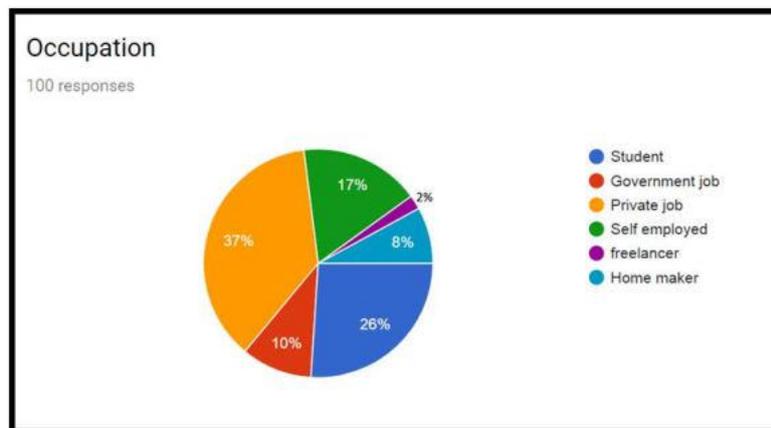


Fig. 3: Occupation of the Respondents

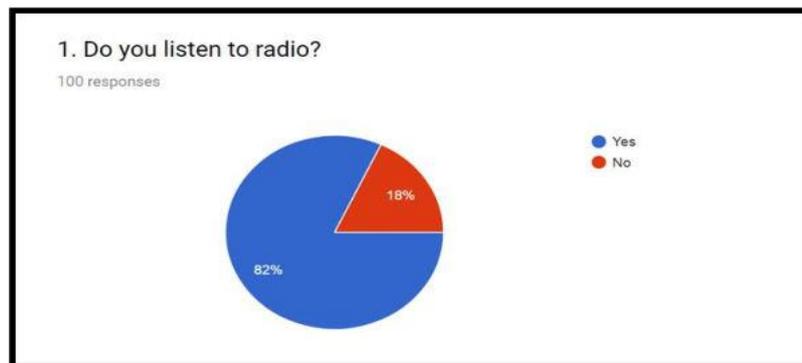


Fig. 4: Respondents listening to radio

82% of the respondents listen to radio whereas only 18% of the respondents don't listen to radio which clearly signifies that radio is still the most wide and large communication medium.

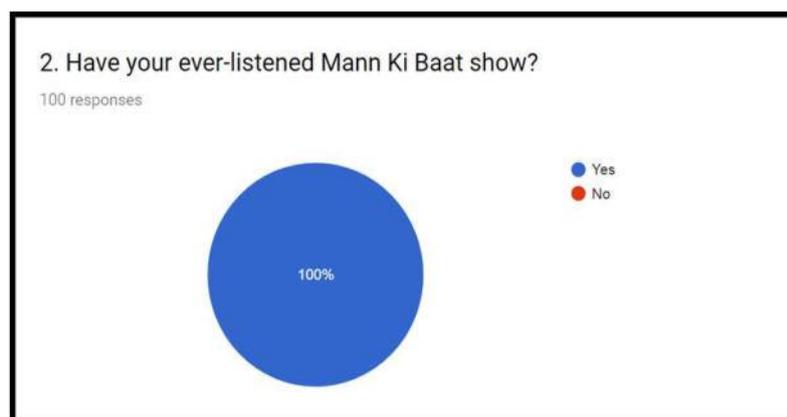
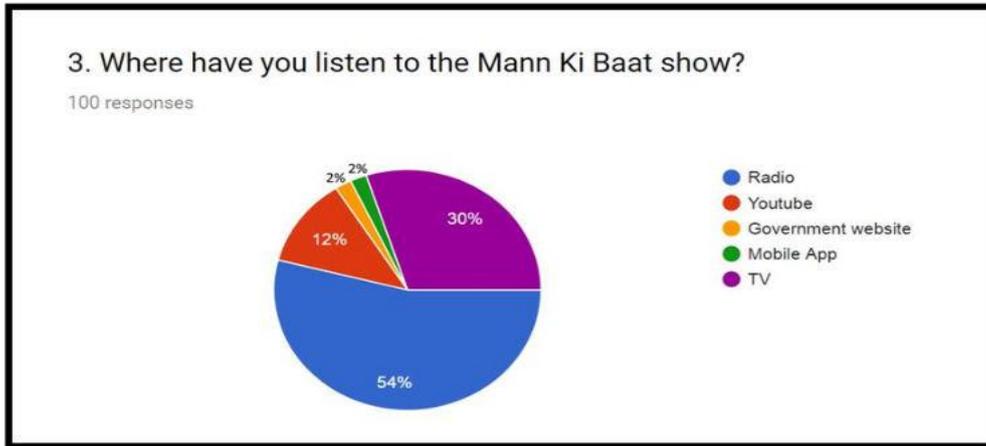


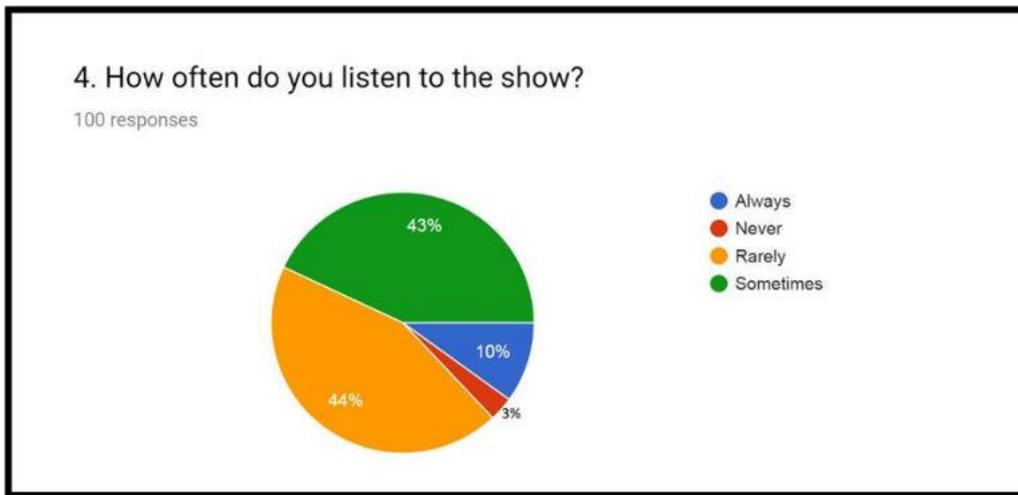
Fig. 5: Respondents have listened *Mann Ki Baat* show

All the respondents have listened to the Mann Ki Baat show atleast once.



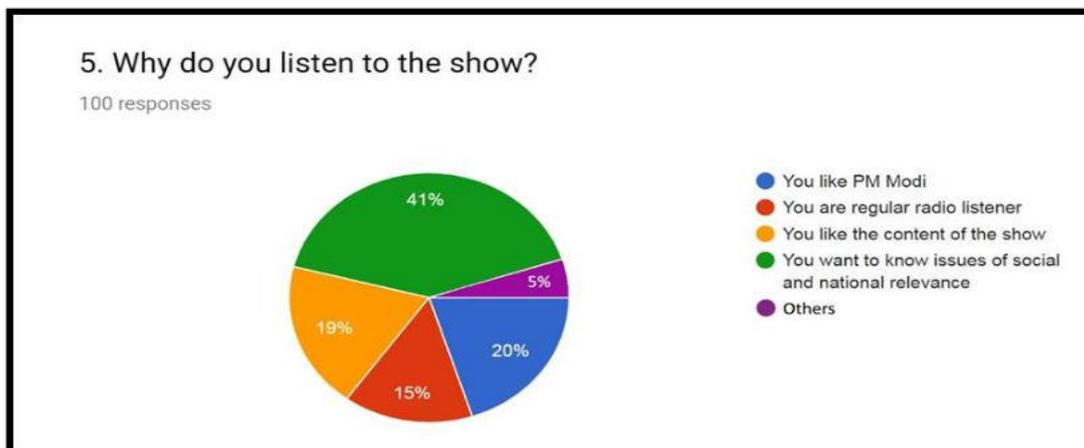
**Fig. 6: Where have the respondents listened the *Mann Ki Baat* Show?**

54% of the respondents listens the show on radio and 30% of the respondents listens it on television which shows that radio and TV are the two most preferred medium by the people for listening the show.



**Fig. 7: How often does the respondents listened the *Mann Ki Baat* show**

43% of the respondents listen to the show sometimes and a large 44% of the respondents listen to the show rarely. Only 10% of the respondents listen to the show always.



**Fig. 8: Why does the respondents listen the *Mann Ki Baat* show**

41% of the respondents listens the show to know the issues of social and national relevance, 19% listen because they like the content of the show, 20% listen because they like PM Modi, 15% listen the show because they are regular radio listener.

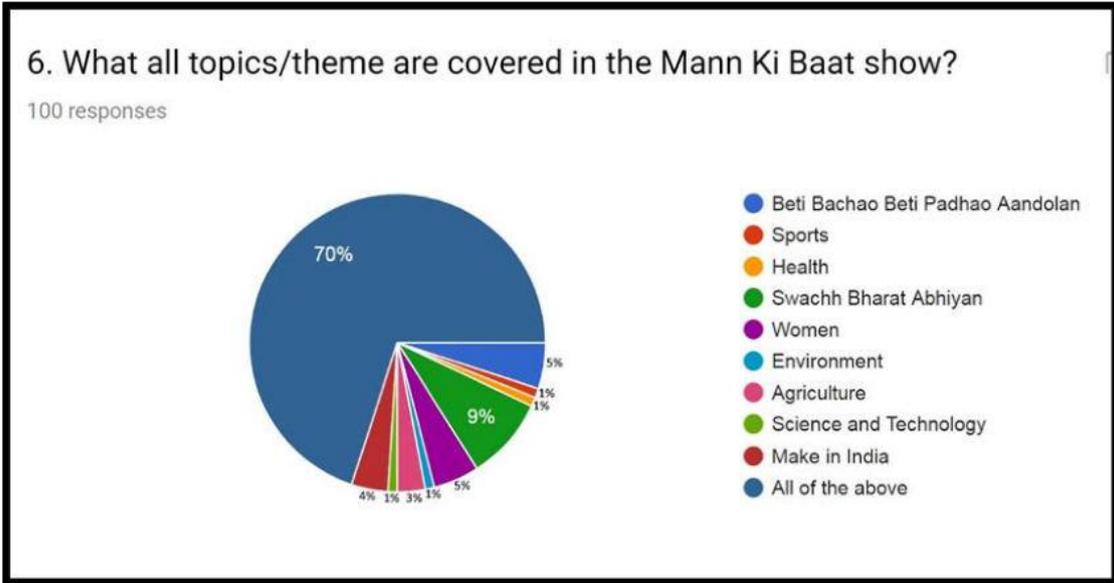


Fig. 9: What all topics are covered in the Mann Ki Baat show

70% of the respondents said All the mentioned topics were covered on the show.

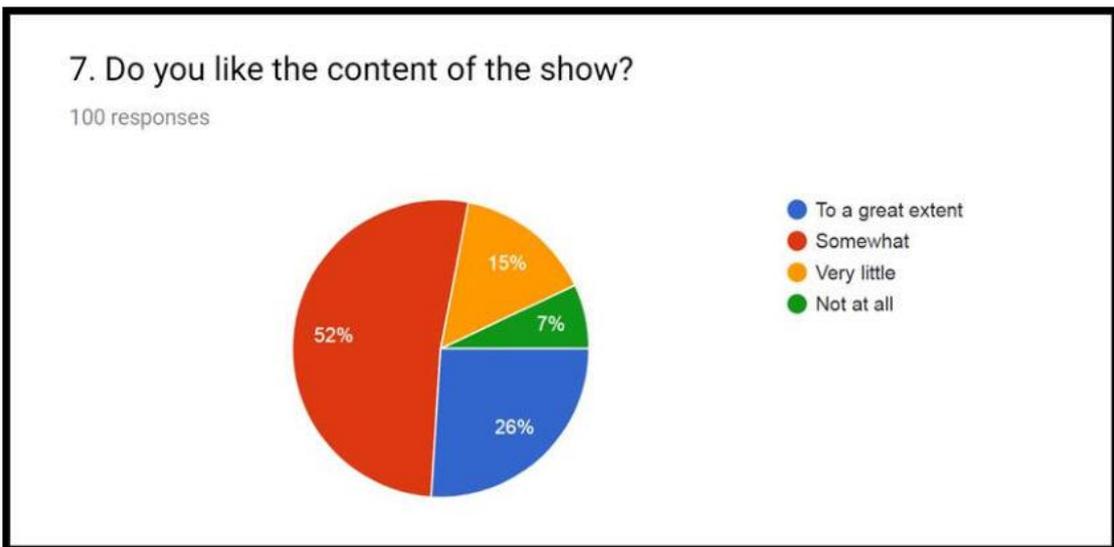


Fig. 10: Does the respondents like the content of the show

52% of the respondents says that they somewhat like the content of the show, 26% like the content to a great extent and 7% of the respondents does not like that content at all.

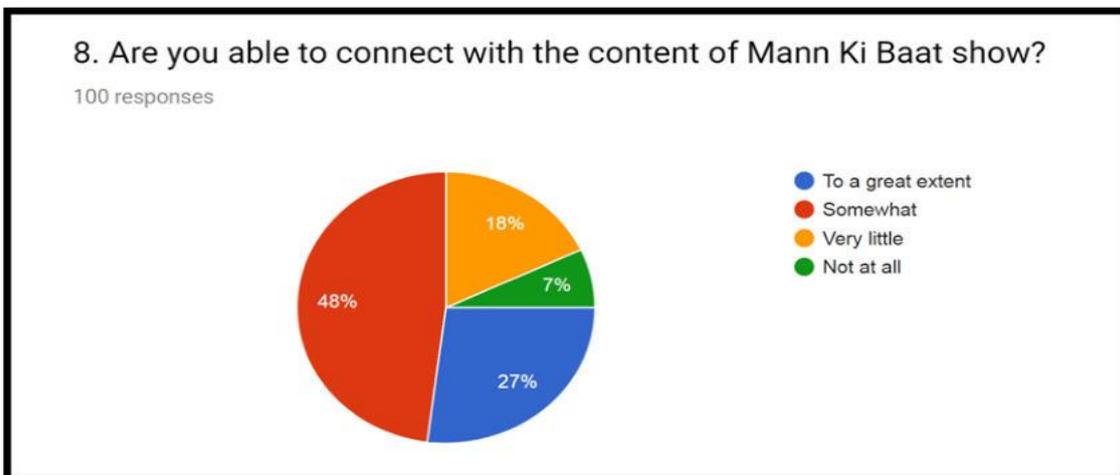


Fig. 11: Are the respondents able to connect with the content of the show

48% of the respondents said that they somewhat feel connected with the content of the show and 26% says that they feel connected to the content of the show to a great extent whereas 7% says that they do not connect with the content of the show at all.

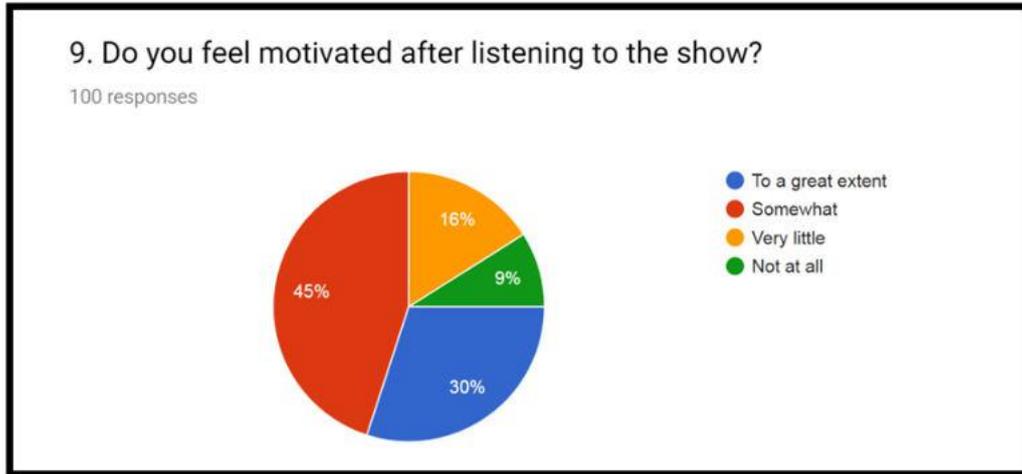


Fig. 12: Does the respondents feel motivated after listening to the show

45% of the respondents feel that they feel somewhat motivated after listening the show and 30% feels motivated to a great extent whereas 9% respondents said that they not at all feel motivated after listening the show.

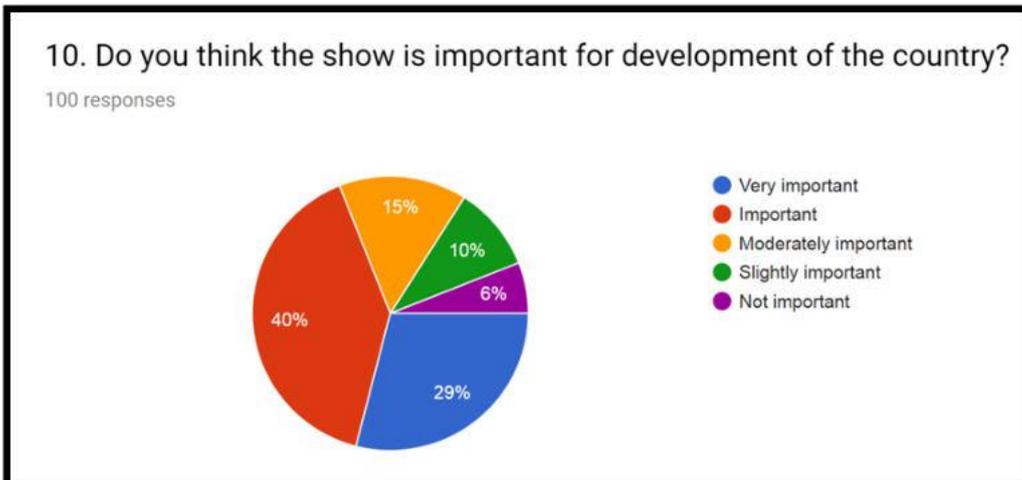


Fig. 13: Does the respondents think that the show is important for development of the country?

40% of the respondents said that the show is important for the development of the country whereas 6% replied that the show is not at all important for the development of the country.

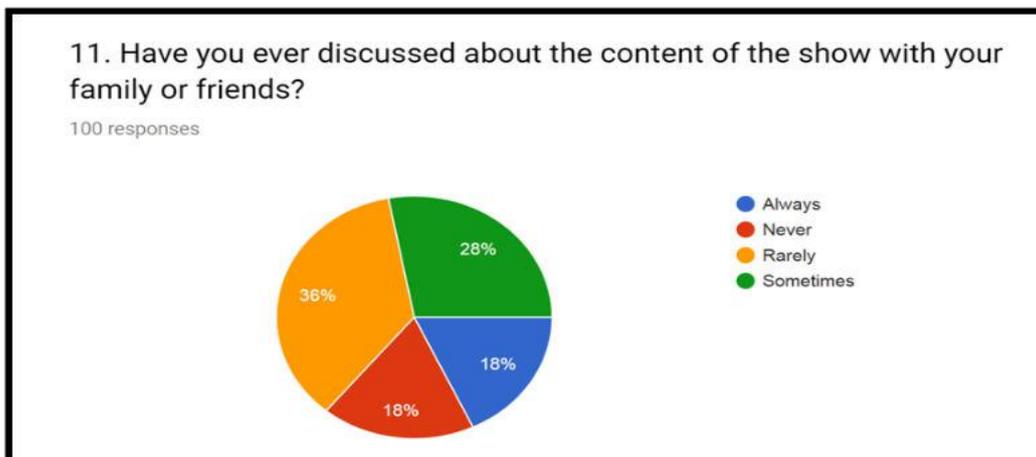
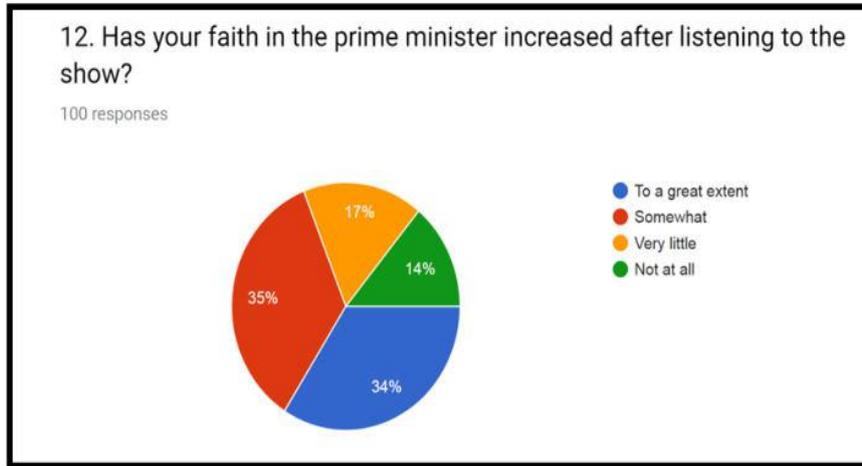


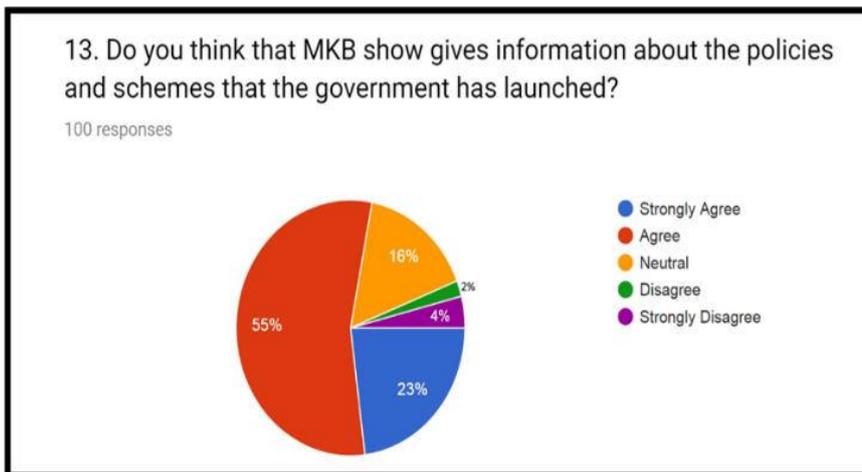
Fig. 14: Have the respondents discussed about the show with their family or friends

36% of the respondents have rarely discussed about the content of the show with their family or friends whereas only 18% always discusses about the content of the show with their family or friends.



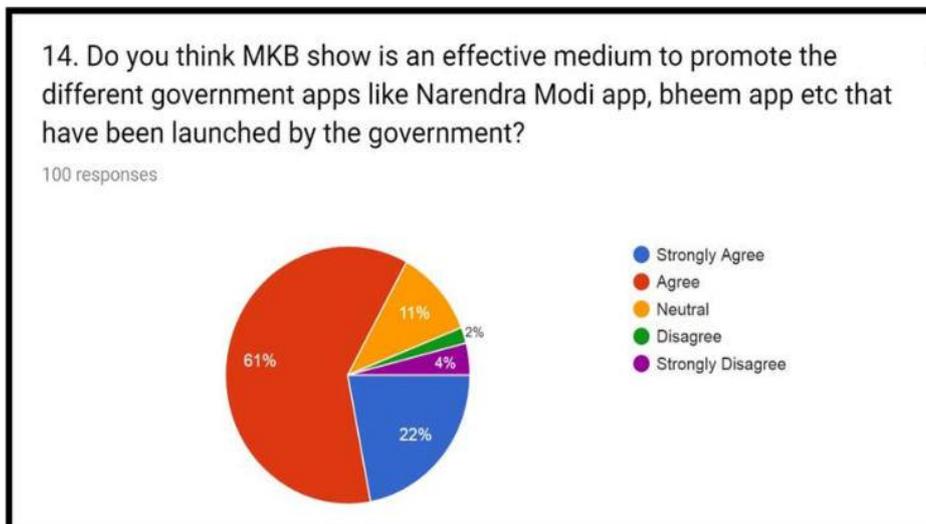
**Fig. 15: Have the respondents faith in Prime minister increased after listening the show**

35% of the respondents said that their faith in prime minister has somewhat increased after listening to the show and 14% says that faith in prime minister has not at all increased



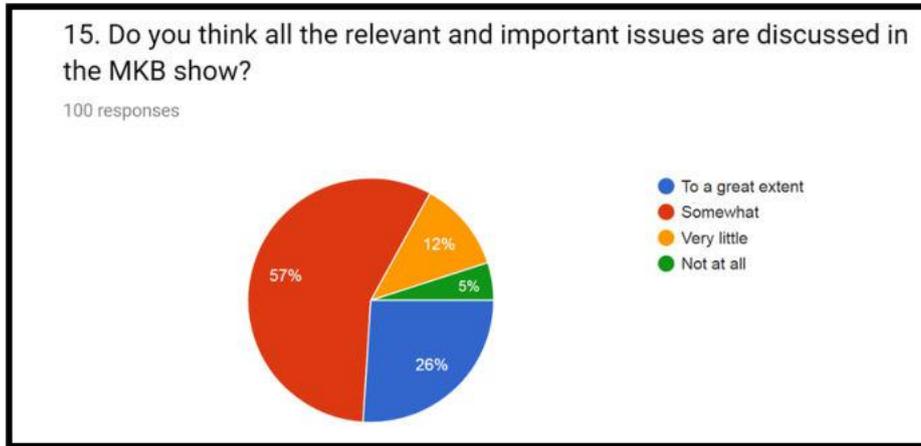
**Fig. 16: Does the respondents think that the show gives information about the policies and schemes that the government has launched?**

55% of the respondents agree that the show gives information about the government policy and schemes whereas 4% of the respondents strongly disagree with that.



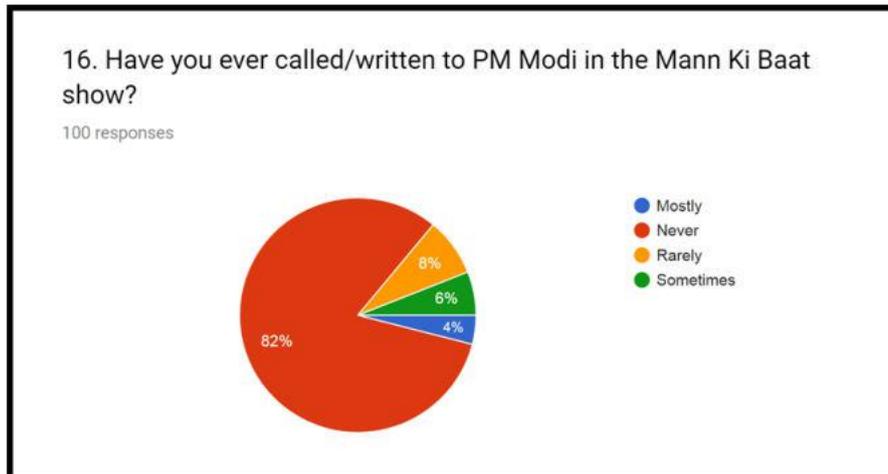
**Fig. 17: Does the respondents think that the show is effective medium to promote government apps**

61% of the respondents agree that the show is effective medium to promote government apps whereas 4% respondents strongly disagree with that



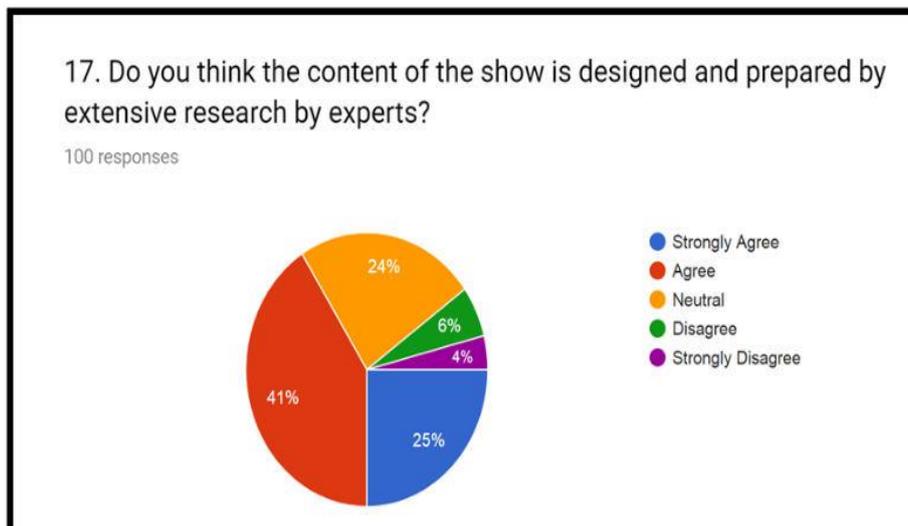
**Fig. 18: Does the respondents think all relevant and important issues are discussed in the show**

57% of the respondents think that important issues are somewhat discussed in the show whereas 5% respondents says that important issues are not at all discussed in the show



**Fig. 19: Have the respondents ever written/called to PM Modi in the show**

82% respondents have never written/called on the show whereas only 4% of the respondents mostly call/write to PM Modi in the show



**Fig. 20: Does the respondents think the content of the show is designed and prepared by extensive research by experts?**

41% respondents agree that content of the show is designed by experts whereas 4% strongly disagree with that.

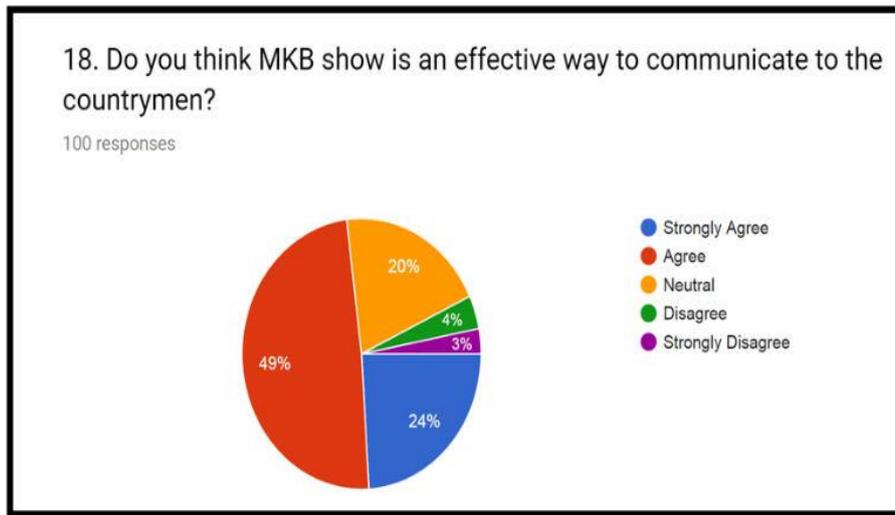


Fig. 21: Does the respondents think that the show is an effective way to communicate to the countrymen?

49% respondents agree that the show is an effective way to communicate to the countrymen whereas 3% strongly disagree with that.

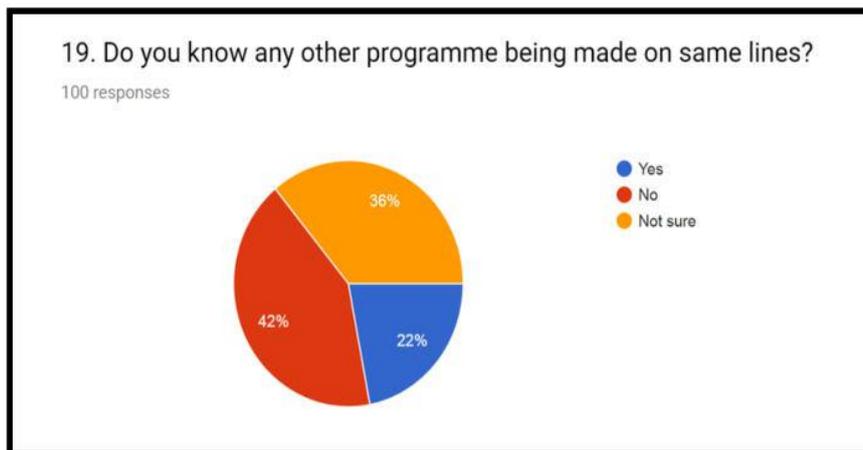


Fig. 22: Does the respondents know any other programme made on same lines?

42% respondents says that they don't know any other programme made on same lines whereas 22% says that they know other programmes made on same lines

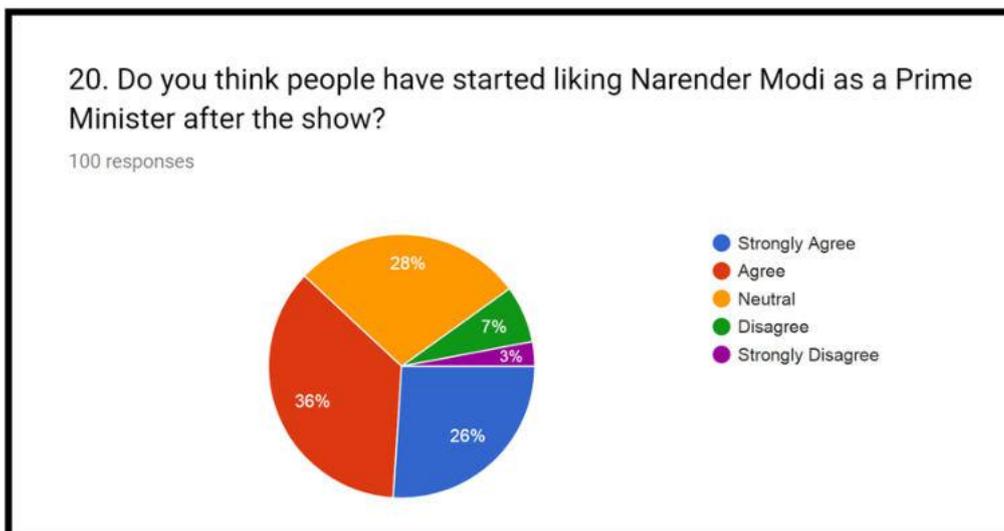


Fig. 23: Does the respondents think that people have started liking Narendra Modi as a Prime Minister after the show?

36% respondents agree that people have started liking Narendra Modi after this show whereas 3% strongly disagree with that.

**4.2 Content Analysis**

The qualitative content analysis was done on various parameters covered in the show. The parameters were developed after listening to all the 10 episodes. **Table 1** shows which all parameters were present in the episode starting with January 2018 to October 2018. The ✓ shows presence of the parameter.

Date	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct
Highlighted Issues of National/Social importance	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Famous Personality mentioned	✓	✓	✓	✓	✓	✓	✓			
Festival/days of National/Social Importance	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Narendra Modi App Mentioned	✓	✓	✓			✓		✓		
My Gov. App Mentioned	✓		✓			✓		✓		✓
Government Schemes	✓	✓	✓	✓				✓		
Listener’s Feedback Source	✓	✓	✓	✓	✓	✓	✓	✓		
Appreciation to common man	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Picked up topics raised by Listeners through App/ Call/Letter/Email	✓	✓	✓	✓	✓	✓	✓	✓		✓

**Synopsis of 10 episodes of Mann Ki Baat Show:**

Episode Parameters	January 2018	February 2018
Highlighted Issues of National/Social importance	<ol style="list-style-type: none"> <li>1. Women Empowerment, Nari Shakti, Rani Laxmi Bai, Women Fighter Pilots</li> <li>2. Health Care affordable</li> <li>3. SBA</li> <li>4. Padma Awards for common man</li> </ol>	<ol style="list-style-type: none"> <li>1. Artificial Intelligence</li> <li>2. Recycle Garbage</li> <li>3. Waste Management</li> </ol>
Famous Personality mentioned	<ol style="list-style-type: none"> <li>1. Kalpana Chawla’s achievements</li> <li>2. Mahatma Gandhi</li> </ol>	<ol style="list-style-type: none"> <li>1. CV Raman</li> <li>2. Aryabhata</li> <li>3. Jagdish Chanda Bose</li> </ol>
Festival/days of National/ Social Importance	<ol style="list-style-type: none"> <li>1. Republic Day celebrations</li> <li>2. Pravasi Bhartiya Diwas</li> </ol>	<ol style="list-style-type: none"> <li>1. National Science Day</li> <li>2. National safety Day</li> <li>3. International Women’s Day</li> <li>4. Holi Wishes</li> </ol>
Narendra Modi App	Mentioned	Mentioned
My Gov. App	Mentioned	Not Mentioned
Government Schemes	<ol style="list-style-type: none"> <li>1. Pradhan Mantri Jan Aushadhi Yojna, Jan Shakti Kendra, Amrit Stores</li> <li>2. Clean Morna River (SBA)</li> </ol>	<ol style="list-style-type: none"> <li>1. NDMA praising</li> <li>2. Aapda Mitra</li> <li>3. BIMSTEC</li> <li>4. SBA</li> <li>5. Gobar Dhan</li> <li>6. Trash Mahotsav by Raipur MCD</li> <li>7. Women involvement in SBA – Jharkhand</li> </ol>

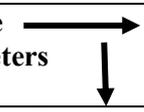
		Campaign 8. Elephanta gets Electricity
Listener's' Feedback Source	1. Mentioned about Letter from App 2. Mentioned name of listeners	1. Phone Call Recorded 2. Comment on App 3. Took name of listener
Appreciation	1. Common Man's effort	1. Raipur municipal cooperation
Picked up topics raised by Listeners through App/Call/Letter/Email	1. Nari Shakti & women empowerment 2. making healthcare affordable 3. Clean morna river under SBA	1. Artificial intelligence 2. Road safety

Episode Parameters	March 2018	April 2018
Highlighted Issues	1. Visit of ASEAN countries 2. Swastha Bharat	1. Commonwealth games winners 2. Fit India – Akshay Kumar 3. Water Harvesting
Famous Personality	1. Mahatma Gandhi 2. Baba Saheb Ambedkar	1. Rabindranath Jayanti
Festival/day of National Importance	1. Ram Navmi 2. Yoga Day	1. Ramzaan 2. Budh Purnima
Narendra Modi App	Comment on App	Not Mentioned
My Gov. App	Mentioned	Not Mentioned
Government Schemes	1. Jan Aushadi Kendra 2. Ayushman Bharat Yojna 3. New AIIMS being opened 4. TB free India 5. MBBS seats increased 6. Make in India 7. Smart City Mission 8. Urban Mission 9. Gram Swaraj Abhiyan	1. SBA internship 2. Doordarshan Programme 3. Good News India
Listener's' Feedback Source	Mentioned name of listeners	Mentioned name of listeners
Appreciation	1. Common Man's effort 2. Meghalaya farmers	1. Commonwealth participants 2. Common people on Fit India 3. Uttarakhand farmers
Picked up topics raised by Listeners through App/Call/Letter/Email	1. Promote Sanskrit language 2. Ground Water depletion 3. Keep water for birds during summer 4. Health of youngsters 5. Letters from farmers	1. Talking about Rabindranath Tagore's philosophy of living

Episode Parameters	May 2018	June 2018
Highlighted Issues	1. Praising Girls for voyage and climbed Mt Everest 2. Fit India – Kohli and Bollywood 3. Indoor and Outdoor Games importance 4. Beat Plastic Pollution	1. One year of GST 2. India vs Afganistan test match 3. How people are getting benefit from government launched schemes
Famous Personality		

Festival/day of National Importance	1. World Environment Day 2. International Yoga Day 3. Eid	1. International Yoga Day 2. DOCTORS DAY 3. Guru Nanak Jayanti 4. Shyama Prasad Mukherjee birthday
Narendra Modi App	Not Mentioned	Mentioned twice
My Gov App	Not Mentioned	Mentioned
Government Schemes	Not Mentioned	Not Mentioned
Listener's' Feedback Source	Phone call from Listener	Phone call from Listener
Appreciation	1. Six women commander on voyage 2. Common people on climbing Everest 3. Common Man's effort	1. Appreciating Indian & Afghanistan cricket team 2. Common Man's effort
Picked up topics raised by Listeners through App/Call/Letter/Email	Fading away of indoor and outdoor games like pithoo, Kho Kho etc and then also singing a POEM	1. Importance of doctors 2. Shyama Prasad birthday 3. Visit to Maghar in Gujarat

Episode Parameters	July 2018	August 2018
Highlighted Issues	1. Teenage football player stuck in cave 2. Poet Neeraj ji passes away 3. Students go to college 4. Smart Gaon app – 2 guys from America 5. Praising winners of world athletic championship	1. Kerala disaster and NDRF appreciation 2. Life of Atal Bihari Vajpayee 3. Most productive parliament session 4. Congratulating winners of Asian game Jakarta and praising sports 5. Safe construction of houses to prevent damage from natural calamities
Famous Personality	1. Lok Manya Tilak – death anniversary 2. Chandreshekhar Azad – paying him tributes	
Festival/day of National Importance	1. Ganesh Chaturthi	1. Rakshabandhan 2. Sanskrit day 3. Teachers day
Narendra Modi App	Not Mentioned	He said 'Many people'
My Gov. App	Not Mentioned	He said 'Many people'
Government Schemes		1. Lok Sabha - 21 bills passed 2. Rajya Sabha - 14 bills passed 3. bills for beneficial of youth and backward class 4. OBC commission was made 5. amendment bill to secure rights of SC and ST 6. criminal act amendment bill for strictest punishment 7. rape guilty - min sentence of 10 years 8. raping girls below 12 - death sentence 9. Triple Talaq bill passed by Lok Sabha but not Rajya Sabha
Narender Modi Website	Not Mentioned	Not Mentioned
Listener's' Feedback	1. Phone call from Listener	1. Phone call from Listener

Source		2. Comment on App
Appreciation	1. Common Man's effort 2. Winners of world athletic championship	1. Winners of Asian games
Picked up topics raised by Listeners through App/Call/Letter/Email	1. Visit Vithoba temple in pandharpur	2. Atal Bihari Vajpayee life 3. Safe construction of house
<b>Episode Parameters</b> 	<b>September 2018</b>	<b>October 2018</b>
Highlighted Issues	1. Praising the soldiers of country 2. Air force appreciation and women in air force 3. Abhilash tomy health concern 4. Talking about Gandhi and his work 5. Linking Gandhi's mantra with today's scenario 6. SBA success story both nationally and internationally 7. Hosting biggest sanitation convention of the world 8. 25 years of NHRC 9. Run for unity – tribute to sardar sahib birth anniversary ( brief talk )	1. Run for unity, talking about sardar sahib work and also statue of unity 2. Infantry day and sardar patel link 3. 2 line tribute to Indira Gandhi death anniversary 4. Praising sports by congratulating and meeting winners para games and summer youth olympics 2018 5. Successful Fifa under 17 world cup in India 6. Men's hockey world cup 2018 to be in India...praising hockey 7. Self 4 society' portal launched by myGov and IT and electronic industry 8. To adopt tribal tradition in our life for sustainable development 9. Stop burning purali in farming fields to stop pollution by taking example of Punjab farmer 10. Hundred years of world war end 11. Nor-East wins Oscar in arming sector 12. Wishing every one for month of festivals i.e. November
Famous Personality	Not Mentioned	Not Mentioned
Festival/day of National Importance	1. Air force day 2. Gandhi Jayanti 3. Birth anniversary of lal bahadur shastri 4. Navratri wishes	
Narendra Modi App	Not Mentioned	Not Mentioned
My Gov. App	Not Mentioned	Mentioned
Government Schemes	Not Mentioned	Not Mentioned
Listener's' Feedback Source	Not Mentioned	1. Comment on App
Appreciation	1. Soldiers of country 2. Women in air force	1. winners of para games and summer youth olympics 2018 2. Common Man's effort
Picked up topics raised by Listeners through App/Call/Letter/Email		1. To adopt tribal tradition in our life for sustainable development

## 5. Result and Discussions

The content analysis has revealed that a common style of presentation has been followed in all the episodes of Mann Ki Baat show. The format is such that, PM Modi starts the programme by highlighting issues of national and social importance such as women empowerment, water management, importance of fitness, waste management, importance of sports, pollution etc.

Out of 10 in 7 episodes PM mentioned about achievements of famous personalities such as Kalpana Chawla, Mahatma Gandhi, Lokmanya Tilak, Chandrashekhar Azad, Baba Saheb Ambedkar etc. He also talked about the special day or event happening in the following month such as Air Force day, Gandhi Jayanti, World environment day, International Yoga Day, Eid, Ram Navmi, Pravasi Bhartiya Diwas etc

The common topics mentioned in majority of episodes are sports, yoga, science, women power, fitness and health etc. In the show he has often heard talking about various policies, programmes of government like Aapda Mitra, Gobar Dhan, Pradhan Mantri Jan Aushadhi Yojna, Clean Morna River (SBA), Gram Swaraj Abhiyan with the aim of creating awareness and propagating his schemes. Even survey reveals that 78% of respondents think that Mann Ki Baat show creates awareness about government policies.

In the survey 83% respondents also said that the show is a good platform to promote government Apps and content analysis also showed that 6 out of 10 episodes PM mentioned about the MyGov App and Narendra Modi App.

In the survey 62% respondents also said that people have started liking Narendra Modi as Prime Minister of the country after watching/listening he show and 69% respondents said their faith in Prime Minister has increased after watching/listening the show that clearly shows that the show is improving the Prime Minister's image in the minds of the people and it can be said that the show is being used as a PR tool to build a good public image of the prime minister.

According to the content analysis and survey conducted, it has been observed that the show follows a structured format that includes talking about famous personalities of the country, mentioning the festivals of the following month, pinpointing issues of concerns like women empowerment, fitness and health, sports etc to arouse interest of the listeners.

The Prime Minister subtly conveys his message and promotes mobile applications launched by the government that includes MyGov App and Narendra Modi App. He also talks about various government policies and schemes that have been launched. All the topics are carefully chosen, and achievements are highlighted that builds positive image of the ruling government. The show has been used as a platform to share success stories of the ruling government, highlight their achievements and act as a PR tool to the Prime Minister.

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8. <https://www.mygov.in/campaigns/mann-ki-baat/>

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- **Electronic sources should include the URL of the website at which they may be found, as shown:**

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- **Unpublished dissertation/ paper:**

Uddin, K. (2000). A Study of Corporate Governance in a Developing Country: A Case of Bangladesh (Unpublished Dissertation). Lingnan University, Hong Kong.

- **Article in newspaper:**

Yunus, M. (2005, March 23). Micro Credit and Poverty Alleviation in Bangladesh. *The Bangladesh Observer*, p. 9.

- **Article in magazine:**

Holloway, M. (2005, August 6). When extinct isn't. *Scientific American*, 293, 22-23.

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Central Bank of India (2005). *Income Recognition Norms Definition of NPA*. Retrieved August 10, 2005, from <http://www.centralbankofindia.co.in/home/index1.htm>, viewed on

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# Emerging role of media in Democracy: A study of awareness and attitude in exercising right to vote among undergraduate students of Faridabad district of Haryana

UPASANA NASA,

Research Scholar, Jamia Millia Islamia,

M.Phil from Jamia Millia Islamia,

MBA, M.Com, M.Ed

Working with Lingaya's Vidyapeeth as Assistant Professor

## Abstract

India is a democratic nation and citizens of India enjoy and exercise power by act of casting their votes and electing their representative. Media plays a pivotal role in education for democracy and Social media act as an agent of developing democratic attitude and spreading the education for democracy.

Undergraduate students being young minds and the constant users of social media, have a possibility of getting mislead by false information. This research paper aims to hear the voice of the youth of Faridabad on the issue of democracy and aims to find out their democratic attitudes and also their level of processing the information received through social media like whatsapp, twitter, linkedIN, facebook, etc.

The decision of casting votes in the best possible way among these undergraduate students will not only contribute in the development of our nation, but also provide a new way of thinking and rationale the process of right to vote to a great extent.

Developing a fair and free mind of the young students is also required for the nation building. Conscious attitude towards bringing a change which would lead all to enlightened information should be the aim of social media and education for democracy.

Media has the power to enlighten the young minds and, so should be used as a conscious tool for the positive transformation in thinking and processing the information in the judicious manner.

**Keywords:** Media, Social media, Democracy, Right to vote, awareness, information, decision, public opinion

INTRODUCTION



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## Transcription

1 Emerging role of media in Democracy: A study of awareness and attitude in exercising right to vote among undergraduate students of Faridabad district of Haryana Abstract UPASANA NASA, Research Scholar, Jamia Millia Islamia, M.Phil from Jamia Millia Islamia, MBA, M.Com, M.Ed Working with Lingaya's Vidyapeeth as Assistant Professor India is a democratic nation and citizens of India enjoy and exercise power by act of casting their votes and electing their representative. Media plays a pivotal role in education for democracy and Social media act as an agent of developing democratic attitude and spreading the education for democracy. Undergraduate students being young minds and the constant users of social media, have a possibility of getting mislead by false information. This research paper aims to hear the voice of the youth of Faridabad on the issue of democracy and aims to find out their democratic attitudes and also their level of processing the information received through social media like whatsapp, twitter, linkedin, facebook, etc. The decision of casting votes in the best possible way among these undergraduate students will not only contribute in the development of our nation, but also provide a new way of thinking and rationale the process of right to vote to a great extent. Developing a fair and free mind of the young students is also required for the nation building. Conscious attitude towards bringing a change which would lead all to enlightened information should be the aim of social media and education for democracy. Media has the power to enlighten the young minds and, so should be used as a conscious tool for the positive transformation in thinking and processing the information in the judicious manner. Keywords: Media, Social media, Democracy, Right to vote, awareness, information, decision, public opinion IJRAR1AEP079 International Journal of Research and Analytical Reviews (IJRAR) 427

2 INTRODUCTION This research paper was conceived with an urge to explore the awareness of the youth of India about their right to vote, their perceptions about process of democracy, their opinion and their thinking influenced by media. People in India exercise their right to vote for over six decades now. They elect their representatives for forming government at national and state level. It is an essential for a healthy democracy for any nation. The essence of democracy is the freedom to voice one's fair opinion. Democracy is enriched by the fair voices and constructive opinions which can influence the policies of the government. Democratic government is a government that sustains itself through public opinion which is expressed through the medium of elections. Media especially social media influences the youth of the 21st century to a great extent. Media directly on directly impacts the public opinion and information on media. People's participation in the election process is what makes our democracy a participatory democracy. But people's participation does not end with their voting in elections. People's participation may be expressed through public debates, newspaper editorials,

demonstrations and their active involvement in governmental programmes. Even in respect of election process, it includes participation -in campaign, political discussion, working for political parties and standing as candidates. People s participation may be defined as, behaviour through which people directly express their political opinions. We must have observed that people quite often enter into discussion on political parties, leaders and candidates and express their opinions on various issues. They do so while travelling in a train or a bus, or at other public places. They also discuss policy decisions taken by the government. All such views take the form of public opinion and influence various aspects of democratic process, such as voting behaviour, and perceptions people hold about the functioning of the government. Public opinion is an organized and considered opinion of the people on any issues of public concern. It is an aggregate of views, based on reasons, aiming at ensuring the welfare of the whole community; and act as influencer in the decisions of governments, functioning of political parties and running of administration. A fair and free public opinion ensures a system in which no organ of the government overrules others and promotes a process to be responsive to the needs and aspirations of people and thereby protects rights, freedoms and liberty: and makes people conscious and eternally vigilant, every youth needs to be vigilant in order to protect democratic values..

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3 Rationale of the study: Right to Information (RTI) Act,2005 and Right to Education,2009 have empowered the people with respect to their rights. The mass media, including print and electronic, play a key role in influencing and formulating public opinion. Apart from central problems of economy, regional disparities, poverty, illiteracy, unemployment, and shortage of public welfare are economic problems that pose challenges to our economy. These challenges come both from prevailing domestic and international conditions and lack of provisions for a smooth functioning of democracy. The significance of education for efficient functioning of democracy was recognized in the Indian Constitution providing for, free and compulsory education to all children up to the fourteen years of age. Various governments at national and state levels have been making efforts to attain this goal. As per National Policy on Education 1986, a National Literacy Mission was set up in 1988 to plan and implement programmes for the removal of illiteracy under the ambit of SSA Sarva Shiksha Abhiyan. But the goal of universal literacy is yet to be attained. Currently a nation-wide programme known as Saakshar Bharat is being implemented. It aims at developing functional literacy and numeracy to non-literate and non-numerate adults in the age group of fifteen and above, to enable them to continue their learning beyond basic literacy and acquire equivalence to formal educational system. The Sarva Shiksha Abhiyan is a flagship programme for universalization of elementary education for children between 6-14 years of age. Further, the Parliament of India in 2009 passed the Right to Education Act through which education has become a fundamental right for all children of age group 6-14 years. Objectives of the study: 1.To study the rights to education of the students with respect to their right to vote. 2. To undertake a survey to explore the awareness on voting rights among students of Faridabad district of Haryana. 3. To explore the perception towards process of democracy among the students of Faridabad district of Haryana. 4. To find out their opinion about the role of media in influencing their voting behaviour among the students of Faridabad district of Haryana. 5. To undertake a case study of



students with respect to awareness of their rights to vote, voting behaviour and their attitude towards education for democracy. IJRAR1AEP079 International Journal of Research and Analytical Reviews (IJRAR) 429

4 Population The population in the study comprised of undergraduate students from Lingaya's Vidyapeeth in Faridabad district of Haryana. Sample The sample survey of 100 students were randomly done from sampling frame of 500 students of Lingaya's 'Vidyapeeth in Faridabad district of Haryana. The researcher selected 100 students from 5 schools, 20 students from each school, 20 students from Education, B.Tech, Management, Humanities and Computer Science were taken. The students of both gender were selected equally for the study. Table 1: Sample of Students selected at random from 4 departments of Lingaya's Vidyapeeth Schools/Department Students Dept S1 20 Education S2 20 B.Tech S3 20 Management S4 20 Humanities S5 20 Computer Science Total 100 METHODOLOGY It is a mixed research quantitative-qualitative Research. For Qualitative dimension in my research, I have conducted case study and exploratory research and focused group discussion. For quantitative dimension, the researcher has used descriptive survey method. IJRAR1AEP079 International Journal of Research and Analytical Reviews (IJRAR) 430

5 Table 2: Objective wise tabulation of type of research dimension explored in the mixed method of research. Objective Type of Research Population /Sample Tools 1. To study the rights Quantitative 100 undergraduate Data from internet to education of the dimension students and published students with respect to their right to vote. reports 2. To undertake a Quantitative 100 undergraduate Semi structured survey to explore the dimension students of 4 Questionnaire awareness on voting departments of rights among students Lingaya's of Faridabad district Vidyapeeth, of Haryana. Faridabad 3. To explore the Qualitative 100 undergraduate Focused group perception towards dimension students of 4 discussion process of democracy departments of among the students of Lingaya's Faridabad district of Vidyapeeth, Haryana. Faridabad 4. To find out their opinion about the role of media in influencing their voting behaviour among the students of Faridabad district of Haryana. 5. To undertake a case Qualitative 4 Students (1 from Case Study study of students with dimension each department) respect to awareness of their rights to vote, voting behaviour and their attitude towards IJRAR1AEP079 International Journal of Research and Analytical Reviews (IJRAR) 431

6 education democracy. for Delimitations of the Study 1. The researcher has delimited the study to Faridabad district of Haryana. 2. The Study is delimited to include undergraduate student only. 3.The study is limited to undergraduate students of Lingaya's Vidyapeeth only of Faridabad district of Haryana. 4. The research paper is delimited to include students of Education, B.Tech, management and Computer Science. Analysis and Interpretations: The data was analyzed in the light of objectives, quantitatively using percentages and then qualitatively. The paper intended to explore the awareness of undergraduate students about their Right to Vote,their voting behaviour and their attitude towards education for democracy. The gender wise analysis of the data depicts that 46% boys and 54% girls are aware of their right to vote,49% boys and 51% girls are also aware of public opinion. 48% undergraduate boys and 52% undergraduate students perceive that media influences Voting behaviour

## ENHANCED EXTERNAL COUNTERPULSATION EFFECTIVENESS ON CLINICAL PARAMETERS IN DIABETIC AND NON-DIABETIC CORONARY HEART DISEASE PATIENTS

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### ABSTRACT

**Objectives:** The objectives of the study were to assess the effectiveness of enhanced external counterpulsation (EECP) treatment on clinical profile comprising physiological, biochemical, and clinical symptoms of diabetic and non-diabetic coronary heart disease (CHD) patients.

**Methods:** A pretest–posttest designed prospective study with 163 diabetic and non-diabetic CHD patients enrolled in Science and Art of Living Heart Center (SAAOL), New Delhi, India. Angina severity was assessed using Canadian Cardiovascular Society (CCS) angina classification scale and dyspnea status was assessed using medical research council (MRC) scale. The study subjects were followed up for 12 months. Statistical analysis was done using the SPSS v21 software. Descriptive analysis with sample t-test for two independent groups and paired sample t-test for EECP effectiveness within the group was done.

**Results:** A minute difference in body mass index mean ( $30.1 \pm 5.86 - 29.9 \pm 5.62$  vs.  $27.5 \pm 4.17 - 27.16 \pm 3.88$ ) was observed in diabetic and non-diabetic CHD patients, but that was not statistically significant. A significant drop out in blood sugar fasting ( $166.7 \pm 41.9 - 150.1 \pm 23.7$ ), blood sugar postprandial ( $204.7 \pm 64.4 - 173.2 \pm 41.2$ ), and glycosylated hemoglobin ( $7.9 \pm 0.8$  to  $7.5 \pm 0.6$ ) was also observed in diabetic CHD patients from baseline to 12<sup>th</sup> month after completion of EECP treatment with significant  $p < 0.001$ , that may be due to EECP treatment. CCS angina classification score and MRC dyspnea score also significantly improved after EECP treatment.

**Conclusion:** EECP treatment may improve clinical symptoms of CHD and lower the blood glucose level in diabetic CHD patients. This treatment may be effective for CHD patients with diabetes mellitus.

**Keywords:** Enhanced external counterpulsation, Coronary heart disease, Angina, Dyspnea, Diabetes mellitus.

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### INTRODUCTION

Diabetes mellitus (DM) and coronary heart disease (CHD) are lifestyle-related diseases and the leading cause of morbidity and mortality around the world [1-3]. DM is the key risk factor for the development of CHD and is associated with 2-4 times higher risk of mortality [4-6]. Elevated blood pressure (BP) and diabetes raise the complication of CHD [7-10]. Almost 80% of diabetic mortality is due to atherosclerosis in cardiovascular patients. Prevalence of CHD in DM patients is 7.8% as reported by Maniarasu and Muthunayanan [11] and it has been demonstrated by Mohan *et al.* in Chennai urban population study that mortality rates in diabetic patients are two-fold higher as compared to non-diabetic patients in India [12].

Coronary artery of the diabetic patient exhibits a large content of lipid, atheroma, and macrophage infiltration and has the greater chance of atherosclerosis plaque that is more vulnerable to rupture in diabetes as compared to non-diabetic CHD patients. DM and CHD interact to accelerate the progression of myocardial infarction (MI) mortality [13,14]. MI is 2 to 3 times more common in diabetic patients and carries a worse prognosis [15]. Cecilia Low Wang *et al.* demonstrated that DM patients have the higher risk of MI (20.2% incidence rate found over 7 years) without any previous MI history as compared to non-diabetic patients [13].

Current non-pharmacological options for CHD treatment are percutaneous transluminal coronary angioplasty (PTCA), coronary artery bypass grafting (CABG), laser revascularization, enhanced

external counterpulsation (EECP), and gene therapy. Of these modalities, only EECP therapy is truly non-invasive and represents the effective clinical benefits in the profile of CHD patients. EECP is a U.S. Food and Drug Administration approved non-invasive therapy for CHD patients. It is out patient's procedure for long-term improvement in clinical symptoms of CHD patients [16-18].

EECP consists of 3 sets of pneumatic cuffs on lower calves, thighs, and buttocks which are inflated with compressed air (up to 300 mmHg) sequentially from diastole phase of the cardiac cycle to deflate in early systole. EECP treatment reduces aortic BP and myocardial oxygen demand, and studies showed that degree of diastolic augmentation during EECP may affect the long-term recovery from Canadian Cardiovascular Society (CCS) angina class and dyspnea [19-21]. EECP therapy demonstrates significant improvement in CCS angina class and medical research council (MRC) breathlessness scale in CHD patients [22].

Several studies documented the clinical effectiveness of EECP and proved the treatment as an adjuvant therapy for CHD patients [23-26]. It also has been observed that EECP improves the glycemic control in diabetes patients [27-28]. Several studies have shown significant improvement with lowering CCS classification breathlessness, BP in CHD patients but none of the study has compiled all clinical parameter in one study and not compared diabetic and non-diabetic CHD groups of patients in the larger amount of sample. Hence, this study was designed to evaluate the efficacy of EECP treatment on clinical parameters on diabetic and non-diabetic CHD patients.

## METHODS

### Study design and population

This study was designed as a pretest-posttest prospective study. A total of 212 subjects (106 in each group) were recruited based on consecutive sampling technique from Science and Art of Living (SAAOL) Heart Centre, New Delhi. The sample size has been calculated with the assumption of 18% risk of CHD in control group and 45% risk of CHD in diabetic patients [29] with an allowable error of 5% (95% power) and 5% level of significance using the nMaster v2.0 software. The calculated sample size was 85 per group, and it is considered to be 106 per group by taking 20% lost to follow-up into account. The formula is as follows,

$$n = \frac{(z_{1-\alpha} + z_{1-\beta})^2 [p_s(1-p_s) + p_t(1-p_t)]}{(p_t - p_s + \delta)^2}$$

Where  $p_s$  is the proportion in the treatment group and  $p_t$  is the proportion in control group.  $\delta$  is the superiority margin.

### Ethical approval and patient consent

Ethical approval for this study was granted by Institutional Ethics Committee of SAAOL Heart Center (Ref. No-IEC/SHRF/PhD/P-02/01.05.2016), New Delhi, India. Informed consent was obtained from all enrolled subjects before initiation of the study.

### Study protocol

Diabetic and non-diabetic CHD study subjects were enrolled in SAAOL Heart Center, New Delhi. The study subjects were divided into diabetic and non-diabetic CHD groups.

### Inclusion criteria

CHD with and without DM patients having angina and dyspnea symptoms aged 35–75 years, who did not respond to current treatment and not agreed to CABG and PTCA or percutaneous coronary intervention (PCI) with angina and dyspnea, and those willing to participate with valid written informed consent were enrolled in the study.

### Exclusion criteria

Patients having cardiac arrhythmia, coagulation disorder, deep vein thrombosis, vaso-occlusive disease, abnormal aortic aneurysm, cardiac valvular disorder, pregnancy, high BP (<180/110 mmHg), foot wounds, and dialysis history and unable to give valid written consent were excluded from the study.

Initiation of the study was done through screening of diabetic and non-diabetic CHD patients and enrolled as per the eligibility criteria. After enrollment, the demographic assessment with physical, chemical and clinical symptoms (CCS angina class severity and MRC dyspnea score) assessment were done and same were recorded.

### Physiological assessment

Physiological parameters including body mass index (BMI), systolic BP (SBP), and diastolic BP (DBP) and the pulse of all study subjects were assessed at baseline, treatment period, and follow-up period at 6<sup>th</sup> and 12<sup>th</sup> months. The height of study subjects was measured through stature meter height tape of Bio-plus. Weight was measured through Salter Goal Tracker weighing scale model 9063. BMI was calculated using formula  $\text{Weight (kg)} \div \text{Height}^2 \text{ (m}^2\text{)}$ . Pulse of all study subjects was assessed through ChoiceMMed MD300C2D pulse oximeter. Systolic and DBP were assessed through Diamond Clock model B.P monitor.

### Biochemical assessment

Cholesterol by cholesterol oxidase-peroxidase aminophenazone method, triglyceride (TG) by glycerol phosphate oxidase method, high-density lipoprotein (HDL) - cholesterol by immune inhibition method, blood glucose by glucose oxidase-peroxidase method, and glycosylated hemoglobin (HbA1c) assessed using an immunoturbidimetric method with the standard protocol of Transasia ERBA Chem 7 equipment.

### Clinical assessment

Angina status was assessed through CCS grading of angina pectoris. Breathlessness status was assessed using MRC scale.

### EECP therapy

The PSK-EECP machine was used for the treatment of CHD. PSK is the exclusive distributor of Vasomedical EECP device all over the world, and Vasomedical is the joint venture with PSK company.

EECP is an electro-mechanical system attached to two sets of three cuffs with a comfortable bed. During treatment, the patient lies on EECP comfortable bed and cuffs are wrapped around patient's legs and buttocks. The cuffs inflate and deflate at specific times between patient's heart beats. Cuffs inflate while the heart is at rest and deflate at the end of the rest period, just before next heartbeat. A continuous electrocardiogram, oxygen level, and counterpulsation graph were monitored at the time of EECP treatment. An experienced doctor gives this EECP treatment for the 1-h session per day in 7 consecutive weeks.

### Statistical analysis

The analysis was done using the SPSS v21 software. Descriptive statistics were presented in Mean  $\pm$  Standard deviation. Chi-square test was used to determine the significant difference between two groups.  $p < 0.05$  was considered for statistical significance. t-test for two independent samples with 95% confidence interval was presented to see the significant effect of CHD in diabetic and non-diabetic patients, and sample paired t-test was used to assess the EECP effect within the group.

## RESULTS

A total of 163 diabetic and non-diabetic CHD patients completed the study follow-up for 12 months. The total mean age of both the group subjects was  $59.6 \pm 9.5$  years in which diabetic CHD subjects were  $60.5 \pm 9.5$ , and non-diabetic CHD subjects were  $58.6 \pm 9.6$  years. Male population percentage was 50.4% in diabetic CHD and 49.6% in non-diabetic CHD group. Females were much higher in non-diabetic 53.3% as compared to diabetic CHD group 46.7%. Rural subjects were higher in non-diabetic group 55.3% and urban subjects were higher in diabetic CHD group 56.4%. A significant difference in education profile in both diabetic CHD and non-diabetic CHD group has been observed. A significant difference has been observed in occupation, income and socioeconomic status of diabetic and non-diabetic CHD subjects. The obesity rate was higher 63.1% in non-diabetic CHD group as compared to diabetic CHD group, and hypertension rate was higher in diabetes CHD group (51.6%).

The family history of heart disease has been observed higher in diabetic CHD group 62.5%, as compared to non-diabetic CHD group 37.5% and the same difference has been observed in diabetes family history which was greater in diabetic CHD group 83.3% as compared to non-diabetic CHD subjects 16.7%. Smoking history was higher in non-diabetic CHD group 51.9%, and similarly, tobacco consumption was 83% in non-diabetic CHD group. Physical activity was less in diabetes CHD group as compared to non-diabetic CHD group 53.2%. The ratio of stress was similar in both study groups. The non-vegetarian rate was higher in non-diabetic CHD group 53.1%. History of MI was higher in diabetes CHD group 54.9% with similar observation to PCI (62.9%) and CABG (58.7%). Single vessel CHD percentage was similar in both the groups but double vessel CHD percentage was 62.8% in non-diabetic CHD group and 37.2% in diabetes CHD group and the ratio of triple vessel CHD was higher in diabetic CHD group 60% as compared to non-diabetic CHD group 40%. The details of baseline results of both the groups are given in Table 1.

### Follow-up profile after EECP treatment

Collected data on BMI were analyzed through SPSS using independent and paired sample t-test and a minute difference in BMI mean ( $30.1 \pm 5.86 - 29.9 \pm 5.62$  vs.  $27.5 \pm 4.17 - 27.16 \pm 3.88$ ) was observed in diabetic and non-diabetic CHD group at 6<sup>th</sup> and 12<sup>th</sup> month

Table 1: Demographic and baseline characteristics of diabetic and non-diabetic CHD patients

S. No	Parameters	Total subjects n=163	Diabetic CHD n=82 (%)	Non-diabetic CHD n=81 (%)	*p
1	Age (years)	59.6±9.5 (Mean±SD)	60.5±9.5 (Mean±SD)	58.6±9.6 (Mean±SD)	0.183
2	Gender				
	Male	133	50.40	49.60	
	Female	30	46.70	53.30	0.714
3	Locality				
	Rural	85	44.70	55.30	
	Urban	78	56.40	43.60	0.135
4	Education				
	Illiterate	12	100.00	0.00	
	Up to class 5	7	28.60	71.40	
	Up to class 8	2	0.00	100.00	
	Up to class 10	5	60.00	40.00	0.001
	12 <sup>th</sup> or Diploma	38	35.70	64.30	
	Graduate/postgraduate	92	43.50	56.50	
	Doctorate	17	88.20	11.80	
5	Occupation				
	Unemployed	24	58.30	41.70	
	Unskilled worker	6	0.00	100.00	
	Skilled worker	5	20.00	80.00	0.002
	Clerical, shop owner	41	51.20	48.80	
	Semi professional	60	41.70	58.30	
	Professional	27	77.80	22.20	
6	Income per month (INR)				
	More than 38,600	91	38.50	61.50	
	19291-38599	34	26.50	73.50	
	14463-19290	10	20.00	80.00	0.002
	9634-14462	3	33.30	66.70	
	<1932	25	56.00	43.00	
7	Socioeconomic status				
	Upper Class	35	74.30	25.70	
	Upper middle	71	42.30	57.70	0.001
	Lower middle	26	30.70	69.30	
	Upper lower	12	33.30	66.70	
	Lower	19	73.70	26.30	
8	Obesity				
	No	38	55.30	44.70	0.485
	Yes	125	36.90	63.10	
9	Hypertension				
	No	72	48.60	51.40	0.753
	Yes	91	51.60	48.40	
10	Family history of heart disease				
	No	115	45.20	54.80	0.733
	Yes	48	62.50	37.50	
11	Family history of diabetes				
	No	127	40.90	59.10	0.973
	Yes	36	83.30	16.70	
12	Smoking				
	No	86	51.70	48.30	0.586
	Yes	77	48.10	51.90	
13	Tobacco				
	No	138	56.50	43.50	0.001
	Yes	25	16.00	83.00	
14	Physical activity				
	No	101	52.50	47.50	0.48
	Yes	62	46.80	53.20	
15	Stress				
	No	61	50.80	49.20	0.919
	Yes	102	50.00	50.00	
16	Diet				
	Veg	99	52.50	47.50	0.481
	Non-Veg	64	46.90	53.10	
17	MI				
	No	92	46.70	53.30	0.300
	Yes	71	54.90	45.10	
18	PCI				
	No	128	46.90	53.10	0.094
	Yes	35	62.90	37.10	
19	CABG				
	No	88	43.20	56.80	0.049
	Yes	75	58.70	41.30	

(Contd...)

Table 1: (Continued)

S.No	Parameters	Total subjects n=163	Diabetic CHD n=82 (%)	Non-diabetic CHD n=81 (%)	*p
20	Classification of CHD				
	Single vessel	70	50	50	0.058
	Double vessel	43	37.20	62.80	
	Triple vessel	50	60	40	

\*Significant at  $p \leq 0.05$ . CHD: Coronary heart disease, SD: Standard deviation, INR: Indian rupee rates, MI: Myocardial infarction, PCI: Percutaneous coronary intervention, CABG: Coronary artery bypass graft

Table 2: EECP effect on glycemic profile

S.No	Parameters	Mean $\pm$ SD			*p
		Baseline (n=82)	After 6 months of EECP (n=82)	After 12 months of EECP (n=82)	
1	BSF (mg/dl)	166.7 $\pm$ 41.9	149.7 $\pm$ 30.6	150.1 $\pm$ 23.7	0.0001
2	BSPP (mg/dl)	204.7 $\pm$ 64.4	176.8 $\pm$ 52.0	173.2 $\pm$ 41.2	0.0001
3	HbA1c (mg/dl)	7.9 $\pm$ 0.8	7.4 $\pm$ 0.6	7.5 $\pm$ 0.6	0.0001

\*Significant at  $p \leq 0.05$ . EECP: Enhanced External Counterpulsation, SD: Standard deviation, BSF: Blood sugar fasting, BSPP: Blood sugar postprandial, HbA1c: Glycosylated hemoglobin

Table 3: Follow-up result of diabetic and non-diabetic CHD patients

S.No	Parameters	Time interval	Mean $\pm$ SD		Difference between groups (*p)
			Diabetic CHD (n=82)	Non-diabetic CHD (n=81)	
1	BMI (kg/m <sup>2</sup> )				
		Baseline	30.1 $\pm$ 5.86	27.5 $\pm$ 4.17	0.546
		6 M	30.05 $\pm$ 5.97	27.13 $\pm$ 3.86	0.499
		12 M	29.9 $\pm$ 5.62	27.16 $\pm$ 3.88	0.506
		Difference within Group (p)	B-6 M B-12 M	0.664 0.252	0.173 0.199
2	SBP (mmHg)				
		Baseline	131.2 $\pm$ 15.1	132.6 $\pm$ 16.1	0.575
		6 M	124.3 $\pm$ 10.4	125.6 $\pm$ 12.2	0.43
		12 M	128 $\pm$ 12.2	129.3 $\pm$ 14.0	0.558
		Difference within Group (p)	B-6 M B-12 M	<0.001 <0.001	<0.001 <0.001
3	DBP (mmHg)				
		Baseline	84.1 $\pm$ 7.7	83.8 $\pm$ 7.8	0.793
		6 M	79.1 $\pm$ 6.1	78.6 $\pm$ 6.8	0.621
		12 M	81.9 $\pm$ 6.5	83.5 $\pm$ 6.9	0.126
		Difference within Group (p)	B-6 M B-12 M	<0.001 0.041	<0.001 0.658
4	Pulse (bpm)				
		Baseline	79.3 $\pm$ 6.1	78.3 $\pm$ 6.3	0.263
		6 M	76.8 $\pm$ 5.0	75.5 $\pm$ 5.1	0.257
		12 M	76.9 $\pm$ 3.9	78.2 $\pm$ 5.3	0.057
		Difference within Group (p)	B-6 M B-12 M	<0.001 <0.001	<0.001 0.934
5	Cholesterol (mg/dl)				
		Baseline	221.8 $\pm$ 47.2	216.1 $\pm$ 45.9	0.438
		6 M	198.7 $\pm$ 42.0	190.8 $\pm$ 40.9	0.225
		12 M	191.5 $\pm$ 40.6	199.1 $\pm$ 42.9	0.245
		Difference within Group (p)	B-6 M B-12 M	<0.001 <0.001	<0.001 <0.001
6	TG (mg/dl)				
		Baseline	192.7 $\pm$ 42.5	197.9 $\pm$ 42.1	0.435
		6 M	171.5 $\pm$ 38.0	173.9 $\pm$ 35.6	0.674
		12 M	172.9 $\pm$ 29.1	184.8 $\pm$ 38.1	0.027
		Difference within Group (p)	B-6 M B-12 M	<0.001 <0.001	<0.001 <0.001
7	HDL (mg/dl)				
		Baseline	39.9 $\pm$ 7.0	43.4 $\pm$ 8.0	0.004
		6 M	46.9 $\pm$ 7.3	49.5 $\pm$ 6.7	0.02
		12 M	48.0 $\pm$ 6.4	48.3 $\pm$ 7.6	0.806
		Difference within Group (p)	B-6 M B-12 M	<0.001 <0.001	<0.001 <0.001
8	LDL (mg/dl)				
		Baseline	143.2 $\pm$ 49.1	133.1 $\pm$ 49.9	0.193

(Contd...)

Table 3: (Continued)

S.No	Parameters	Time interval	Mean±SD		Difference between groups (*p)
			Diabetic CHD (n=82)	Non-diabetic CHD (n=81)	
9	6 M		117.5±43.5	106.5±43.9	0.11
	12 M		108.9±40.9	113.8±46.2	0.467
	Difference within	B-6 M	<0.001	<0.001	
	Group (p)	B-12 M	<0.001	<0.001	
	VLDL (mg/dl)				
	Baseline		38.5±8.5	39.6±8.4	0.435
10	6 M		34.3±7.6	34.4±7.1	0.674
	12 M		34.6±5.8	36.9±7.6	0.027
	Difference within	B-6 M	<0.001	<0.001	
	Group (p)	B-12 M	<0.001	<0.001	
	Non-HDL (mg/dl)				
	Baseline		181.8±48.1	172.7±49.1	0.233
11	6 M		151.7±42.7	141.2±43.2	0.121
	12 M		143.4±40.6	150.8±44.6	0.272
	Difference within	B-6 M	<0.001	<0.001	
	Group (p)	B-12 M	<0.001	<0.001	
	CCS class				
	Baseline		2.8±0.3	3.0±0.5	0.048
12	6 M		2.2±0.5	2.1±0.4	0.27
	12 M		2.2±0.7	2.0±0.6	0.569
	Difference within	B-6 M	<0.001	<0.001	
	Group (p)	B-12 M	<0.001	<0.001	
	MRC score				
	Baseline		3.2±0.09	2.8±1.0	0.003
12	6 M		2.9±0.2	2.9±0.2	0.537
	12 M		2.0±0.6	1.9±0.7	0.82
	Difference within	B-6 M	0.012	0.189	
	Group (p)	B-12 M	<0.001	<0.001	

\*Significant at  $p \leq 0.05$ . CHD: Coronary heart disease, BMI: Body mass index, SD: Standard deviation, M: Month, B: Baseline, SBP: Systolic blood pressure, DBP: Diastolic blood pressure, TG: Triglyceride, HDL: High-density lipoprotein, LDL: Low-density lipoprotein, VLDL: Very low-density lipoprotein, CCS: Canadian Cardiovascular Society, MRC: Medical research council

after completion of EECP treatment but that was not statistically significant. SBP, DBP, and pulse assessment were done at 6<sup>th</sup> and 12<sup>th</sup> months of study follow-up, but none of the parameters showed significant difference in comparative assessment of diabetic and non-diabetic CHD patients. A significant improvement in SBP, DBP, and pulse was observed in diabetic CHD within group with significant value  $p < 0.05$ .

Mean change in total cholesterol values has been observed in diabetic CHD patients, but that is not statistically significant as per the independent t-test analysis. A significant improvement within diabetic CHD group has been observed in total cholesterol values. A significant change in TG has been observed at 12 months, HDL cholesterol at 6<sup>th</sup> month, very low-density lipoprotein (VLDL) at 12<sup>th</sup> month with independent t-test for comparative group assessment of diabetic and non-diabetic CHD subjects. Paired t-test assessment of TG, HDL, LDL, VLDL, and non-HDL cholesterol showed a significant difference within the group from baseline to 12 months of treatment in diabetic and non-diabetic CHD group subjects, which can be due to EECP treatment. A significant difference in CCS angina classification score from baseline to 12<sup>th</sup> month of EECP treatment was observed in diabetic and non-diabetic within the group assessment using paired t-test, and MRC score also showed the significant difference within the group in this study which may be due to EECP treatment.

#### Diabetic CHD subjects glycemic profile

A significant drop out in blood sugar fasting (BSF) (166.7±41.9–150.1±23.7), postprandial (204.7±64.4–173.2±41.2) and HbA1c (7.9±0.8–7.5±0.6) values were observed in diabetic CHD patients at 6<sup>th</sup> and 12<sup>th</sup> months after completion of EECP treatment and that can be due to the effect of EECP in diabetic CHD patients. The diabetic CHD glycemic profile detail has been summarized in Table 2.

#### DISCUSSION

This pretest–posttest designed prospective study suggests that EECP is the safe and effective treatment for diabetic and non-diabetic CHD patients.

#### Effect of EECP on physiological parameters

The present investigation revealed the minute difference in BMI mean after EECP treatment in diabetic and non-diabetic CHD patients. We assume that EECP may improve BMI and for that, further research is required on EECP with special reference to BMI. A study done by McCullough *et al.* on the impact of BMI on outcomes of EECP therapy concluded that EECP yields benefits to CHD obese patients having higher BMI [23]. A significant difference in SBP, DBP, and pulse within diabetic and non-diabetic CHD group subjects was observed in this study with significant value  $p < 0.05$ . Dockery *et al.* observed similar findings in a prospective study [30] and Braith *et al.* [31] in a randomized sham-controlled study that can significantly decrease SBP and DBP [19, 20]. Nichols *et al.* [32], Kumar and Lahiri [33], and Subramanian *et al.* [24] also concluded that EECP treatment in patients with angina can reduce systolic and DBP.

#### EECP effect on biochemical parameters

In the present study, the difference in mean of total cholesterol, TG, HDL, LDL, VLDL, and non-HDL was observed in diabetic and non-diabetic CHD patients within the group after EECP and almost similar findings were observed by Braith *et al.* [31] and Tabary *et al.* [17]. A significant difference in mean of BSF (166.7±41.9–150.1±23.7), postprandial (204.7±64.4–173.2±41.2), and HbA1c (7.9±0.8–7.5±0.6) was observed in diabetic CHD patients from baseline to 12 months of study follow-up. Linnemeier and Martin *et al.* concluded in their studies that EECP might be effective, safe, and well-tolerated treatment option for diabetic CHD patients [27,28].

### Effect of EECP on clinical symptoms

In this study, the clinical symptoms (angina and dyspnea) of diabetic and non-diabetic CHD patients improved after EECP treatment. A significant improvement in CCS angina classification score was observed in diabetic and non-diabetic CHD patients within group assessment and significant difference within diabetic CHD group in MRC score has been observed in the present study.

In diabetic and non-diabetic CHD subjects, a comparative or between group assessments analysis did not show any significant difference using independent sample t-test. Kozdag *et al.* [26], Beck *et al.* [34], and Ozlem *et al.* [35] in their studies concluded that EECP treatment can improve clinical symptoms in CHD patients. In a research by Pettersson *et al.* [36] and Loh *et al.* [37] on the effectiveness of EECP revealed that EECP can give short- and long-term positive effects on clinical symptoms of CHD patients. In a research done by Yavari and Montazeri [38], it was found that EECP had beneficial clinical effects. Our study also demonstrates similar results and detailed information is describe in Table 3.

The results of the present study concluded the improvement in clinical symptoms and functional class of angina. Another study done by Nitu *et al.* [22] indicated that angina pain and dyspnea can be reduced by EECP treatment. Erdling *et al.* [39] and International EECP Patient Registry [40] also demonstrated that EECP could be more effective in patients having the history of severe angina. Our findings also verified significant effects of EECP in patients having CHD.

### CONCLUSION

The results of the present study reveal that EECP is beneficial and effective non-invasive treatment for diabetic and non-diabetic CHD patients who do not respond to routine treatment. This treatment may improve clinical symptoms and lower the blood glucose level in diabetic CHD patients.

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### AUTHOR'S CONTRIBUTION

All authors have contributed to accomplishing the research work of this study including planning, approval, enrollment, follow-up, the compilation of results and writing of the article.

### CONFLICTS OF INTEREST

The authors of this study did not have any conflicts of interest in the material presented in this study.

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## Design Service Volume, Capacity, Level of Service Calculation and Forecasting for a Semi-urban City

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### ABSTRACT

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**keywords:**

*capacity, level of service, design service volume, traffic survey, traffic growth, traffic forecasting*

The purpose of this research is to assess the traffic situations of the existing system by evaluating the Level of service as a key component. Traffic survey have been carried out for the analysis of AADT, Design service volume, capacity and Level of Service of the city road networks. By using AADT, the LOS have been estimated for the analysis of future traffic condition. Peak hour traffic survey data have been collected for the analysis of AADT and Level of Service. LOS has been converted into percentile form for the analysis of the future LOS. It has been observed that the LOS of the roads of the major traffic operations have mostly same LOS in the morning & evening peak hours which signifies that the traffic movement and the pattern of movement are same in both the traffic session of peak hours. The rapid decrease in LOS has been presented in results, which means, LOS will reduce from time to time and the unimproved existing traffic system will create a problem for motorists and pedestrians. Hence, the existing traffic systems must be evaluated in order to cope with future traffic demands and problems.

## 1. INTRODUCTION

Traffic has grown in recently years with urbanization. In the recent scenario traffic is the major consent for any developing nation [1]. Transportation infrastructure plays an important role in the economic and social development of any country. We are moving in the era of smart transportation systems, but we are focusing only on the developed cities [2]. As some of the rural areas have been grown since past few decades, which approached to the urban city. These cities are somewhere about to be called as urban cities which we can call semi-urban cities now. A study on the similar semi-urban city have been carried out for the evaluation of design service volume of the road, capacity of the roads and the level of service. The Design Service Volume of this type of area might vary from Design Service Volume (DSV) of rural area & urban area. Hence, the calculation of DSV as by equation 1 for Mid-sized city or semi-urban or semi-rural can be considered. Capacity of a route is the maximum hourly rate at which persons or vehicles can move in a reasonable order of a point or a lane of road, during a period of time under the prevailing conditions of path, traffic and control [3]. Capacity is considered as the maximum capability of a given transportation mode or its particular component to serve a certain volume of demand, during a specified period of time, under given conditions [4]. A researcher emphasized on the need of developing highway capacity norms for Indian highways [5]. The main emphasis of the study was the development of simpler techniques for evolving capacity norms, based on observed data. A researcher analyzed traffic characteristics in Vadodara Ahmedabad section of the National Highway Number 8 to identify management measures that will lead to better traffic

performance [6]. Level of service is defined as the qualitative measure of operational conditions with a traffic stream and their perception by drivers/passengers. Capacity standards are fixed normally in relation to the level of services (LOS) adopted for the design. In determining the level of service, quality terms of traffic flow at the point of drivers and passengers should be measured [7-8]. Level of service describes the conditions in terms of factors such as speed and travel time, freedom to manoeuvre, traffic interruptions, comfort, convenience and safety. Six level of services are recognized commonly, designated as A, B, C, D, E & F with level of service A representing the best operating condition /free flow and level of service F represents the worst/forced or breakdown flow. A researcher carried out study of level of service (LOS) of different segments, it was determined that for V/C ratio as well as for peak hour factor the LOS is F for the stretch path [9]. In determination of service level based on ATS and PTSF based on HCM 2000, generally, service level based on ATS in comparison to service level based on PTSF is in better condition, it means that divers have higher average speed and they almost pay no attention to traffic distance headway and time spent following, so, safety is less and disasters are more [10].

## 2. METHODOLOGY

To calculate the current level of service of the roads, the peak hour traffic data have been collected by the traffic survey method. The intersections of the maximum traffic operations have been identified for the conduction of traffic survey. The traffic survey data of peak hour have been converted into

Passenger Car Unit (PCU) for uniformity in the units as shown in Table 1. AADT have been also calculated by the traffic survey which is used in LOS forecasting. V/C method have been used to identify the LOS of the road as explained in Table 2. DSV for the urban roads & rural roads are already given in the IRC guidelines. Here, the DSV have been calculated for the semi-urban context which have traffic more than rural traffic & less than urban traffic. By the use of DSV, LOS will be calculated. The future LOS will be calculated by considering the city traffic as a whole. A generalized single LOS will be calculated for the complete city area roads of major traffic operations and will be forecasted according to the future. i.e., next 20 years.

### 3. DSV CALCULATION

As per IRC 64-1990, the DSV of Single lane road in plain area under Indian conditions is 2000 PCU/day and for urban context, it is 900 PCU/hr [11].

10 % of daily traffic volume is considered as peak hour traffic volume [12].

Hence, 200 PCU/hr.

Consider mid value of DSV between ideal condition & urban condition.

$$DSV_{(semi-urban\ city)} = (200 + 900)/2 \quad (1)$$

$DSV_{(semi-urban\ city)} = 550$  PCU/hr. (for the case of peak traffic hours).

### 4. CAPACITY & LOS ANALYSIS

In Table 1, the peak hour flow has been extracted in terms of vehicle per hour and PCU per hour for all the roads of study by taking mean of the two-hour traffic survey data. From the values obtained in this table as PCU per hour, level of services has been obtained. For the calculation of level of service, the Volume/Capacity ratio was first determined using design service volumes [13] and then the level of service was computed as shown in Table 3. Table 2 shows the Level of Service Criteria based on Volume to Capacity ratio.

**Table 1.** Peak hour flow of traffic at all sections of the road

Sr.No.	Road	Period	Total Vehicle/hr.	Total PCU/hr.
01	Thana Chowk Road	Morning Peak Hour	505	379.95
		Evening Peak Hour	559.5	334.45
02	Neelam Chowk Road	Morning Peak Hour	474.5	257.55
		Evening Peak Hour	500	276
03	Bata Chowk Road	Morning Peak Hour	340.5	178.2
		Evening Peak Hour	421.5	230.25

04	Churi Bazaar Road	Morning Peak Hour	439.5	237.1
		Evening Peak Hour	481.5	254.3
05	Mahila College Road	Morning Peak Hour	427	241.4
		Evening Peak Hour	435	236.55
06	Railway Station Road	Morning Peak Hour	640.5	450.8
		Evening Peak Hour	625.5	435.85
07	Ganga Sagar Chowk Road	Morning Peak Hour	598	420.55
		Evening Peak Hour	616	418.6
08	Old Bus Stand Road	Morning Peak Hour	517	375.1
		Evening Peak Hour	490	347.2
09	Bara Bazaar Road	Morning Peak Hour	445	297.95
		Evening Peak Hour	446	284.4
10	Chavaccha Mor	Morning Peak Hour	474	291.95
		Evening Peak Hour	508	311.05

**Table 2.** Level of service criteria based on V/capacity ratio

Sr.No.	LOS	Description	V/C
1	A	Free flow conditions with unimpeded maneuverability. Stopped delay at signalized intersection is minimum.	0.00 to 0.60
2	B	Reasonably unimpeded operations with slightly restricted maneuverability. Stopped delays are not bothersome.	0.61 to 0.70
3	C	Stable operations with somewhat more restrictions in making mid-block lane changes than LOS B. Motorists will experience appreciable tension while driving.	0.71 to 0.80
4	D	Approaching unstable operations where small increases in volume produce substantial increase in delay and decreases in speed.	0.81 to 0.90
5	E	Operations with significant intersection approach delays and low average speeds.	0.91 to 1.00
6	F	Operations with extremely low speeds caused by intersection congestion, high delay and adverse signal progression.	Greater than 1.00

**Table 3.** Level of service for all roads

Sr.No.	Location	Period	PCU/hr.	Width of road per lane (m)	No. of lanes	Design Service Volume (DSV)/hr	V/C ratio	LOS
01	Thana Chowk Road	Morning Peak Hour	379.95	3.75	1	550	0.690	B
		Evening Peak Hour	334.45	3.75	1	550	0.608	B
02	Neelam Chowk Road	Morning Peak Hour	257.55	3.5	1	550	0.468	A
		Evening Peak Hour	276	3.5	1	550	0.501	A
03	Bata Chowk Road	Morning Peak Hour	178.2	3.5	1	550	0.324	A
		Evening Peak Hour	230.25	3.5	1	550	0.418	A
04	Churi Bazaar Road	Morning Peak Hour	237.1	3.5	1	550	0.431	A
		Evening Peak Hour	254.3	3.5	1	550	0.462	A
05	Mahila College Road	Morning Peak Hour	241.4	3.5	1	550	0.438	A
		Evening Peak Hour	236.55	3.5	1	550	0.430	A
06	Railway Station Road	Morning Peak Hour	450.8	3.75	1	550	0.819	D
		Evening Peak Hour	435.85	3.75	1	550	0.792	C
07	Ganga Sagar Chowk Road	Morning Peak Hour	420.55	3.75	1	550	0.764	C
		Evening Peak Hour	418.6	3.75	1	550	0.761	C
08	Old Bus Stand Road	Morning Peak Hour	375.1	3.75	1	550	0.682	B
		Evening Peak Hour	347.2	3.75	1	550	0.631	B
09	Bara Bazaar Road	Morning Peak Hour	297.95	3.75	1	550	0.541	A
		Evening Peak Hour	284.4	3.75	1	550	0.517	A
10	Chavaccha Mor	Morning Peak Hour	291.95	3.5	1	550	0.530	A
		Evening Peak Hour	311.05	3.5	1	550	0.565	A

## 5. LOS ANALYSIS FOR FUTURE TRAFFIC GROWTH

Researcher employed “classical” statistical approaches to predicting traffic; going forward over the years, data driven approaches have become the most discussed field of analysis in the literature, with a rich variety of algorithmic specifications, as effectively exposed by Andrea and Federico [14]. The authors reviewed the last decade of literature, starting from 2004, citing for the previous period three papers: by Vlahogianni, et al. [15], for short-term traffic forecasting literature and related conceptual and methodological issues up to 2003; by Adeli [16] and by Van Lint and Van Hinsbergen [17], for neural network and artificial intelligence applications to short-term traffic forecasting. Traditional methods, generally based on quantitative measurements of average time between vehicles and thresholds, fail to take into account the inherent vagueness of the driving process [18]. As a result of different conditions and driver’s perception, level of service is different at the signalized and unsignalized intersections [19].

Escalona, et al. [20] studies the effect of two service-level measures on the design of a critical-level policy for fast-moving items. Level of Service analysis for future traffic growth helps to relate the future ease of movement of traffic on the existing traffic facilities or road networks. It helps to plan a better strategies of transport system planning including development of road networks, traffic furniture’s and related facilities. Table 3 Level of Service Criteria based on V/Capacity ratio shows the LOS & V/C ratio. LOS is converted into percentile for the generalized LOS value of the city traffic road network on the basics of AADT as shown in Table 4.

Considering the LOS of the various road networks of the city in a generalized condition, the Table 5 shows the percentile average analysis of the LOS.

The generalized LOS of the city traffic is related to the AADT of the city. Hence, future LOS analysis is totally depending upon the relation of LOS & AADT. AADT & LOS are inversely proportional to each other.

Table 6 shows the future LOS of the city road networks and Figure 1, represents the same also.

**Table 4.** Level of service criteria based on V/capacity ratio percentile

Sr.No.	LOS	Description	V/C (Percentile)
1	A	Free flow conditions with unimpeded maneuverability. Stopped delay at signalized intersection is minimum.	100
2	B	Reasonably unimpeded operations with slightly restricted maneuverability. Stopped delays are not bothersome.	90
3	C	Stable operations with somewhat more restrictions in making mid-block lane changes than LOS B. Motorists will experience appreciable tension while driving.	80
4	D	Approaching unstable operations where small increases in volume produce substantial increase in delay and decreases in speed.	70
5	E	Operations with significant intersection approach delays and low average speeds.	60
6	F	Operations with extremely low speeds caused by intersection congestion, high delay and adverse signal progression.	50

**Table 5.** Percentile average analysis of LOS

Sr.No.	Location	Period	LOS	Percentile
01	Thana Chowk Road	Morning Peak Hour	B	90
		Evening Peak Hour	B	90
02	Neelam Chowk Road	Morning Peak Hour	A	100
		Evening Peak Hour	A	100

03	Bata Chowk Road	Morning Peak Hour	A	100
		Evening Peak Hour	A	100
04	Churi Bazaar Road	Morning Peak Hour	A	100
		Evening Peak Hour	A	100
		Peak Hour	A	100
05	Mahila College Road	Morning Peak Hour	A	100
		Evening Peak Hour	A	100
		Peak Hour	A	100
06	Railway Station Road	Morning Peak Hour	D	70
		Evening Peak Hour	C	80
		Peak Hour	C	80
07	Ganga Sagar Chowk Road	Morning Peak Hour	C	80
		Evening Peak Hour	C	80
		Peak Hour	C	80
08	Old Bus Stand Road	Morning Peak Hour	B	90
		Evening Peak Hour	B	90
		Peak Hour	B	90
09	Bara Bazaar Road	Morning Peak Hour	A	100
		Evening Peak Hour	A	100
		Peak Hour	A	100
10	Chavaccha Mor	Morning Peak Hour	A	100
		Evening Peak Hour	A	100
		Peak Hour	A	100
Average Generalized LOS				93.5 B

**Table 6.** Future LOS on the basis of AADT

Year	AADT (PCU)	LOS
2017	15654.57	B
2018	17188.71	B
2019	18873.20	B
2020	20722.77	B
2021	22753.60	B
2022	24983.45	C
2023	27431.82	C
2024	30120.13	C
2025	33071.90	D
2026	36312.94	D
2027	39871.60	D
2028	43779.01	E
2029	48069.35	E
2030	52780.14	E
2031	57952.59	E
2032	63631.94	E
2033	69867.87	F
2034	76717.11	F
2035	84235.38	F
2036	92490.44	F
2037	101554.50	F

## 6. RESULT

(1) Level of service have been observed on the different roads in both morning session and evening session as shown in Table 3 & capacity shown in Table 1.

(2) At Thana Chowk road, the LOS is B with capacity of 379.95 PCU/hr. (higher traffic) in both morning and evening session. It means that there are reasonably unimpeded operations with slightly restricted maneuverability.

(3) At Neelam Chowk road, the LOS is A with capacity of 276 PCU/hr. in both morning and evening session. It means that there are free flow conditions with unimpeded maneuverability.

(4) At Bata Chowk road, the LOS is A with capacity of 230.25 PCU/hr. in both morning and evening session. It means that there are free flow conditions with unimpeded maneuverability.

(5) At Churi Bazaar road, the LOS is A with capacity of 254.3 PCU/hr. in both morning and evening session. It means that there are free flow conditions with unimpeded maneuverability.

(6) At Mahila College road, the LOS is A with capacity of 241.4 PCU/hr. in both morning and evening session. It means that there are free flow conditions with unimpeded maneuverability.

(7) At Railway Station road, the LOS is D with capacity of 450.8 PCU/hr. in morning session and LOS is C with capacity of 435.85 PCU/hr. in evening session. It means that there is approaching unstable operations where small increases in volume produce substantial increase in delay and decreases in speed in morning session and stable operations with somewhat more restrictions in making mid-block lane changes than LOS B in evening session.

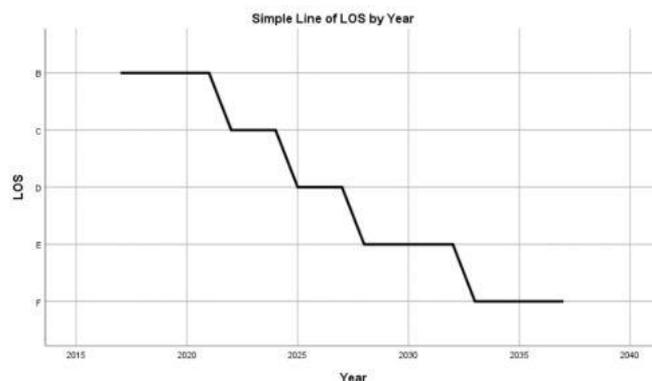
(8) At Ganga Sagar Chowk road, the LOS is C with capacity of 420.55 PCU/hr. in both morning and evening session. It means that there are stable operations with somewhat more restrictions in making mid-block lane changes than LOS B.

(9) At Old Bus Stand road, the LOS is B with capacity of 375.1 PCU/hr. in both morning and evening session. It means that there are reasonably unimpeded operations with slightly restricted maneuverability.

(10) At Bara Bazaar road, the LOS is A with capacity of 297.95 PCU/hr. in both morning and evening session. It means that there are free flow conditions with unimpeded maneuverability.

(11) At Chavaccha Mor road, the LOS is A with capacity of 311.05 PCU/hr. in both morning and evening session. It means that there are free flow conditions with unimpeded maneuverability.

(12) The generalized LOS of the city road found to be B.



**Figure 1.** Estimated LOS as per future AADT

(13) As shown in Figure 1, it has been found that, after 05 years, the LOS will decrease from B to C; after 03 years, from C to D; after 03 years, from D to E; after 05 years, from E to F, which means, LOS will reduce from time to time and the unimproved existing traffic system will create problem for the motorists and pedestrians.

(14) Despite of good level of service, maximum road cause congestion due to unauthorized parking and unauthorized markets besides the road.

## 7. CONCLUSIONS

It has been concluded that the city which is approaching to the urban city also needs to be evaluated in respect with the existing traffic conditions to plan a better transportation facility. The level of service represents the qualitative measures of the traffic movement through the city road networks. The Figure 1 represents the future condition of LOS which creates a serious cause to think of planning the cities approaching the urban cities. This research can also be executed in macro scopic level. This traffic systems may be simulated for a better result.

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