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### CONTENTS

#### ***Research Papers***

<b>UTILIZATION OF DEPOSITS FACILITY PROVIDED BY PRIMARY AGRICULTURAL COOPERATIVE BANK</b>	1 – 11
Jenica S	
<b>A STUDY OF HAPPINESS QUOTIENT IN HIGHER EDUCATIONAL INSTITUTE</b>	12 – 15
Dr. Rekha Attri and Rahul Bairagi	
<b>DEMONETIZATION AND INDIA GOING CASHLESS: GLIMPSE ON CURRENT SITUATION</b>	16 – 23
Dr. Sweta Gupta and Prof. K. S. Thakur	
<b>DETERMINATION OF OPTIMIZED GAIN VALUE FOR A TWO AREA INTERCONNECTED SYSTEMS WITH ENERGY SOURCES IN DEREGULATED ENVIRONMENT</b>	24 – 31
G. Ganesan @ Subramanian, I. A. Chidambaram and J. Samuel Manoharan	
<b>EFFECT OF SOME OXA-AZA HETEROCYCLES ON SEED GERMINATION OF TRITICUM AESTIVUM L (WHEAT) AND CUCURBITA MAXIMA L. (CUCUMBER)</b>	32 – 34
Deelip. K. Swamy, M. V. Deshmukh and S. V. Palande	
<b>EMOTIONAL INTELLIGENCE AND INNOVATIVE WORK BEHAVIOUR: EVIDENCE FROM BANKING SECTOR OF J&amp;K</b>	35 – 39
Dr. Mohd Rafiq Teli and Mubashir Majid Baba	
<b>MHD MIXED CONVECTION FLOW OF POWELL ERYING FLUID PAST A PERMEABLE SHRINKING SHEET WITH CHEMICAL REACTION</b>	40 – 47
S. Anuradha and R. Praveena	
<b>A COMPREHENSIVE ANALYSIS OF POVERTY IN KARNATAKA BY USING NSSO DATA</b>	48 – 54
Dr. Niranjana. R and Shivakumar	
<b>COMPARISON OF LS-SVM AND ANN METHODS FOR DOWNSCALING OF PRECIPITATION DATA FROM GCM TO REGIONAL SCALE FOR MALAPRABHA SUB BASIN</b>	55 – 62
Nagraj S. Patil, Shruti Kambalimath, Sneha Syamprasad and Shashikanth Kulkarni	
<b>DETERMINANTS OF NON-PERFORMING ASSETS OF BANKS IN INDIA: A PANEL DATA ANALYSIS</b>	63 – 68
Jayanti Bhattacharjee	
<b>STUDY ON THE EFFECTS OF PACKAGING AND STORAGE OF HIMSAGAR MANGO VARIETY</b>	69 – 72
Laureate R. Hynniewta, L. Jeebit Singh, A.K. Banik, Senjam Jinus Singh and Anjan Kumar Sinha	
<b>VARIABLE SELECTION FOR THE ACCELERATED FAILURE TIME MODELS</b>	73 – 85
S. Sathish Kumar and R. Elangovan	

<b>FIRE DETECTION AND MITIGATION SYSTEM USING FUZZY LOGIC</b>	86 – 91
Dr. N. Dhanasekar, Dr. A. Ravi, K. Manoj and S. Soundarya	
<b>PERFORMANCE ANALYSIS OF NANO PARTICLE ECO FRIENDLY CHILLING PLANT FOR FISH PROCESSING</b>	92 – 101
Sabanayagam S, Sivakumar M, Jagan P and Vikneswaran M	
<b>HUMAN DEVELOPMENT IN INDIA: EVIDENTIAL APPROACH</b>	102 – 106
Dr. Jyoti Achanta	
<b>PROBLEMS OF RUBBER CULTIVATORS IN KERALA: SOME EVIDENCE FROM ERNAKULAM DISTRICT</b>	107 – 116
Ali O P and Dr. Manoj P K	
<b>BANKING STRATEGY IN THE ERA OF ECONOMIC SLOWDOWN IN INDIA: NEED FOR A THRUST ON ICT INTEGRATION AND HOUSING FINANCE</b>	117 – 129
Dr. Manoj P K and Dr. Mini Joseph	
<b>NURSES MIGRATING FROM KERALA TO U.K: A STUDY OF THEIR CONSUMPTION BEHAVIOUR AND ITS IMPLICATIONS</b>	130 – 135
Reni Sebastian	
<b>A STUDY ON EXAMINE THE FINANCIAL LITERACY KNOWLEDGE OF MUSLIM SALARIED PEOPLE AS PER SHARIAH.</b>	136 – 144
Dr. Arvind S. Luhar and Ms. Shama A. Shah	
<b>MAJOR CHALLENGES IN FMCG SECTOR</b>	145 – 147
Dr. Ashok Mande	
<b>TEACHER FREEZING OF SECONDARY SCHOOL TEACHERS</b>	148 – 153
Amar Jyoti	
<b>A STUDY ON THE ROLE OF CEO's IN THE STRUCTURE OF CORPORATE GOVERNANCE</b>	154 – 157
Lakshmmamma H. R. and Dr. K. Ramachandra	
<b>RISKS AND FRAUD IN E-COMMERCE</b>	158 – 159
Dr. C. A. Dixit	
<b>OPTICAL AND STRUCTURAL PROPERTIES OF <math>\text{Eu}_2\text{O}_3</math> DOPED ALUMINIUM ZINC BORATE GLASSES</b>	160 – 162
Dilipkumar V. Meshram and Madhav N. Rode	
<b>COOLIE: A CRITICAL APPRECIATION OF THEMES IN THE NOVEL</b>	163 – 166
Dr. Asha g. Dhumal	
<b>DISCIPLINE OF PUBLIC ADMINISTRATION IN UNIVERSITIES</b>	167 – 170
Dr. Kalpna H. Gharge	

<b>ROLE OF ENGLISH LANGUAGE IN HIGHER EDUCATION IN INDIA</b>	171 – 174
Dr. Padmavat Nirmala S.	
<b>MANAGING A REMOTE WORKFORCE</b>	175 – 178
Dr. Purswani Khusbhu Jetho	
<b>NEW DIRECTION IN MANAGEMENT ACCOUNTING</b>	179 – 182
Dr. Purswani Jetho Chanchaldas	
<b>FACTORS INFLUENCING INVESTORS DECISION IN OPENING DEMAT ACCOUNT</b>	183 – 189
Dr. Syed Azhar and Ramesh Babu Nemani	
<b>A STUDY ON UNDERSTANDING POTENTIAL OF E-BIKES</b>	190 – 195
Prof. Mohammed Khaja Qutubuddin and Prof. SVVSV Prasad	
<b>ANALYTICAL APPROACHES TO PERFORMANCE EVALUATION</b>	196 – 200
Dr. G. Radha Kiranmayi	
<b>A STUDY ON OPTION PRICING MODEL IN DERIVATIVES</b>	201 – 209
Dr. P. Sairani	
<b>POST RECESSION – LEVERAGING THE HR STRATEGIES</b>	210 – 214
Prof. Mohammed Khaja Qutubuddin, Dr. P. Sai Rani and Prof. Ramanjana Reddy	
<b>SUCCESSION PLANNING MODEL FOR ACADEMIA: A CONCEPTUAL STUDY</b>	215 – 219
Mr. R. Ramanjana Reddy and Mr. Mohd Khaja Qutubuddin	
<b>UNDERSTANDING THE VARIOUS COMPONENTS THAT AFFECT THE CUSTOMER BEHAVIOUR AND RELATIONSHIP IN SELECT BUDGET HOTEL INDUSTRY</b>	220 - 223
Dr. C. V. Ranga Reddy and Prof. Mohammed Khaja Qutubuddin	
<b>FASD (THERAPEUTIC PHLEBOTOMY) – AN IMPORTANT TOOL OF TREATMENT OF UNANI SYSTEM OF MEDICINE</b>	224 – 230
Nuzhat Akhtar	
<b>A STUDY ON THE HR PROBLEMS THAT ARE FACED BY THE REAL ESTATE INDUSTRY IN BENGALURU</b>	231 – 234
Dr. T. Aswatha Narayana and S. Vijayalakshmi	
<b>A STUDY ON INSIGHTS OF URBAN CO-OPERATIVE BANKS IN KARNATAKA</b>	235 - 244
K. S. Mahadeva and Dr. T. Aswatha Narayana	
<b>ANALYSIS OF PROFITABILITY AND SOLVENCY DETERMINANTS OF PUBLIC NON-LIFE INSURERS</b>	245 - 249
Tanveer Ahmad Darzi	

<b>A BRIEF REVIEW ON THE BOTANICAL ASPECTS OF PHYLLANTHUS AMARUS COLLECTED FROM PATNA, BIHAR, INDIA</b>	250 - 253
Jitendra Kumar and Manoj Kumar	
<b>A RELEVANCE OF AMBEDKAR'S JOURNALISM IN TODAY'S CONTEXT</b>	254 - 258
Karnika Dubey	
<b>WOMEN AND VICTORIAN MORALITY, OBSESSION WITH CLASS REPUTATION, SOCIAL RESTRICTIONS AND GENDER DISCRIMINATION: A STUDY OF PORTRAYAL OF WOMEN CHARACTERS IN JANE AUSTIN'S PRIDE AND PREJUDICE</b>	259 - 263
Ms. Mrinalini B Chavan	
<b>ANALYSING THE ROLE OF TOURISM DEVELOPMENT AUTHORITIES IN ACHIEVING THE GOALS OF SUSTAINABLE TOURISM DEVELOPMENT THROUGH LOCAL GOVERNANCE IN KASHMIR DIVISION</b>	264 - 271
Dr. Aijaz Ahmad Khaki	
<b>AN EMPIRICAL STUDY ON THE PERCEPTION OF CMMI APPRAISAL IN A MID SIZED IT SERVICES ORGANIZATION IN INDIA</b>	272 - 275
Nanda M P and Dr. Sri Ram Kothapalli	
<b>INDO-US RELATIONS: AREAS OF CO-OPERATION AND CONFRONTATION</b>	276 - 280
Debarshi Khamrui	
<b>A NEW METHOD TO SOLVE TRANSPORTATION PROBLEMS WITH THE MAX MIN TOTAL OPPORTUNITY COST</b>	281 - 284
Dr. Madhukar Palve	
<b>DR. B. R AMBEDKAR AND RESERVATION POLICY: ANALYSIS AT PRESENT SCENARIO</b>	285 – 289
Purabi Kundu	
<b>AN ENDEVOUR TO THEORETICAL ANALYSIS ON MOVEMENT OF MODERN WOMEN FOR LIBERTY AND FUTURE SOCIETY</b>	290 - 296
Mrs. Purabi Kundu	
<b>WOMEN'S SAFETY AND SECURITY</b>	297 – 301
Baijayanti Ghosh	
<b>AMBEDKAR'S THOUGHTS ON DALIT AND WOMEN'S EDUCATION</b>	302 – 306
Buddhadeb Bag	
<b>SOCIAL JUSTICE AND THE DALIT CLASS: AMBEDKAR'S PERSPECTIVE</b>	307 - 313
Buddhadeb Bag	
<b>NATURAL RESOURCE UTILIZATION AND MANAGEMENT PRACTICES AND ASSOCIATED RURAL LIVELIHOOD PATTERNS IN THE HILL TERRAIN OF CENTRAL HIMALAYA</b>	314 – 321
Manisha Tripathi	
<b>USE OF MATHEMATICAL SOFTWARE FOR TEACHING: A CASE STUDY OF DISTANCE LEARNERS OF UNIVERSITY OF MUMBAI</b>	322 - 326
Mandar Bhanushe	

<b>REPRESENTATION OF ADIVASIS IN BOLLYWOOD: A MYTH OR A REALITY ?</b>	327 - 329
Ms. Manasi Kedari	
<b>STUDY OF TARGET MARKET STRATEGY OF TELECOM SERVICE PROVIDERS FOR RURAL MARKET</b>	330 - 335
Dr. Umaji Maske	
<b>EFFECT OF BULK AND CONCENTRATED (OIL CAKES) ORGANIC MANURES AND INORGANIC FERTILIZER ON VEGETATIVE GROWTH ATTRIBUTES OF BABY CORN</b>	336 – 339
S. Mullaimaran and Haripriya. K	
<b>EFFECT OF SOIL SOLARIZATION WITH ORGANIC AMENDMENTS AS A ORGANIC METHOD OF ROOT-KNOT NEMATODE CONTROL AND TOMATO NURSERY MANAGEMENT</b>	340 - 344
Mullaimaran. S and K. Haripriya	
<b>FARMERS' SUICIDE IN INDIA WITH SPECIAL REFERENCE TO MAHARASHTRA: A CRITICAL SOCIOLOGICAL ANALYSIS</b>	345 - 352
Dr. Gulab Pathan	
<b>THE EFFECT OF DEMOGRAPHIC CHARACTERISTICS ON PSYCHOLOGY OF RISK OF MUTUAL FUND INVESTORS</b>	353 - 360
Chetna Makwana	
<b>LIQUID-LIQUID EXTRACTION DIRECT SPECTROPHOTOMETRIC DETERMINATION OF RUTHENIUM FROM SUCCINATE MEDIA USING O-METHYL PHENYL THIOUREA: ANALYSIS OF RUTHENIUM CATALYST, BINARY AND TERNARY SYNTHETIC MIXTURES</b>	361 - 371
Yogesh S. Shelar	
<b>TITANIUM DIOXIDE NANOPARTICLES SYNTHESIZED BY SOL-GEL METHOD AND ITS CHARACTERIZATION</b>	372 – 376
Ravi Kant	
<b>FRONTIERS IN AIR QUALITY RESEARCH: INNOVATIONS, CHALLENGES, AND FUTURE DIRECTIONS</b>	377 – 389
N. Chandra Shekar and T. Chandra Shekar	

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**UTILIZATION OF DEPOSITS FACILITY PROVIDED BY PRIMARY AGRICULTURAL COOPERATIVE BANK**

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**ABSTRACT**

*The financial activities of the District Central Co-operative Banks (DCCBs) and affiliated PACSs reveal the significance of cooperative Banks in banking activities at the grass root level. Thus the PACSs have greater personal relation with its members. The beneficiaries are people as the PACS have direct relation with its members. Thus the service cooperative bank has direct relation with the people. They provide loans and accept deposit and provide various financial services. On the other hand a large chunk of people in our country consider bank accounts as a means to keep their hard-earned money safe. They wish to withdraw only the necessary amount as and when they need it. They have to be conscious about the financial services get from each bank and also in search for an institution from where these services available in easy and cheap.*

*So the present study reveal how the customers of the primary agricultural cooperative bank utilized their deposit facilities efficiently and whether they satisfy in their utilization.*

*Keywords: Primary Agricultural Cooperative Bank (PACB), utilization, deposit*

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**INTRODUCTION**

Financial services form the lifeblood of economic growth and development. A large country likes India majority of the population stays in the rural areas. Getting these financial services to these people is highly challengeable. At this point the development of cooperative financial institutions arise namely co-operative banks. Co-operative financial institutions especially Primary Agricultural cooperative Banks also known as Service Cooperatives Banks are considered to have immense potential to deliver goods and services in areas where both the state and the private sector have failed.

They take the responsibility of to keep an eye on the sector neglected by commercial banks. The bank would cater to a wide spectrum of customers ranging from small and marginal farmers and traders in the rural areas than in the urban. It would have the scope for allocating more funds for agriculture lending and also setting its priorities. Thus these, co-operative financial institutions have wider and deeper penetration in rural and semi-urban areas. In short Service Cooperatives Banks operate as a balancing Centre

But now a day other institutions like commercial banks provide modern financial services especially at this period of demonetization and cashless economy. The commercial bank provide the transaction into cashless world. New consumer functionalities are being built on exiting payment system like mobile payments, streamlined payments, integrated billing, and next generation securities will result the consumers from shifting their accounts from cooperative bank to commercial or other financial institutions. As the service cooperative bank is mainly supported by the deposits of members. To sustain in this competitive era and the shifting of members the service cooperative bank provide more financial services in addition to the banking and financial services (loans, deposits, banking accounts etc.).The merger of SBT with SBI is also affecting the baking needs of the state in a serious way.

To withstand these members bank must provide improved innovative, quality services with up graded technology linked services delivery and services management. Thus in order to sustain in this modern competitive era the Service co-operative bank must offer the services which are provided by other banks. For performing these financial services these banks needs a huge support both from members and non members and from the side of government also. The support mainly in terms of financial support that is the funds needed for the cooperative bank to perform these function.

PACBs have greater personal relation with its members. The beneficiaries are people as the PACBs have direct relation with its members. Thus the service cooperative bank has direct relation with the people. They provide loans and accept deposit and provide various financial services. The customers utilized the services of the primary agricultural cooperative banks.

*This study thus confines to the support that the Primary Agricultural Cooperative Bank provided to their customers and availed and the utilization of the financial services by the beneficiaries.*

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**OBJECTIVES OF THE STUDY**

1. To identify the awareness and pattern of utilization of deposit facility provided by primary cooperative banks in Kerala.
2. To assess level of satisfaction of customers on deposit facility provided by primary cooperative banks.

**HYPOTHESIS**

1. There is no significant difference in the awareness of deposit with respect to income of customers
2. There is no significant difference in the utilization pattern of deposit facility with respect to income of customers
3. There is no significant difference in the level of satisfaction of deposit with respect to income of the customers

**RESEARCH METHODOLOGY**

The validity of any research depends on the systematic collection of data and analysis of the same in a sequential order. In the present study, an extensive use of both primary and secondary data was made.

**Sources of data**

Both primary and secondary data are used for the study. In order to analyze the utilization pattern of customers of the customers, a descriptive study using primary data was considered as suitable. In order to study the objectives, the responses were collected through pre-determined set of questions in the form of structured and well-designed questionnaire.

The secondary sources of data are normally include published data from government offices, cooperative organizations, research institutes, NGOs etc. On the other hand, informal source of data is the research output brought out by a large number of researchers. The secondary data used in this study refers to the prevailing data on Registrar of Cooperatives Societies, Kerala and various other sources such as articles in journals and literature on the subject as well as data sources from internet. The data has been gathered from the published source such as journals of banking, related research articles, books, seminar reports, magazines, working paper, previous publications of the author, etc.

**Sampling design**

Simple random sampling or probability sampling technique is used to select the customers as sample. Under this sampling design, every item of the universe has an equal chance of inclusion in the sample. In the study simple random sampling method has been used. Respondents includes existing customers who belong to peroorkada service cooperative bank. Respondents are those who already have their account in that particular bank and are of different age, sex, religion, profession and family background. The sample size will be restricted to only 100, which comprised of mainly people from customers of peroorkada service cooperative bank.

**Data processing and analysis**

Statistical Package for Social Science (SPSS) is used to analyse the data. The primary data collected were tabulated and analysed with the help of SPSS (Version 20) keeping in view the objectives of the study. The data analysis was done using descriptive statistics in which mean, percentages and standard deviation were used. ANOVA, one sample t test, Spearman's rank correlation, Z- Test analysis were also used.

**Scope of the study**

The scope of the study is limited to selected deposits like fixed deposit, recurring deposit, saving deposit and current account

**Limitations of the Study**

Due to time and resources constraints, the present study suffers from the following limitations:

1. The study has been conducted in one district of Kerala i.e. Thiruvananthapuram and sample size is limited to 100 customers.
2. The study is based on primary survey which has been conducted through a structured questionnaire. The respondents might have deliberately given the responses which they actually do not experience and hence, subjectivity might be present in their responses.

**DEPOSITS**

A deposit was an important indicator of the success and efficiency of the credit agency. Mobilization of deposits at the institutional level would also help to absorb over dues and keep up the flow of credit in an



uninterrupted manner. Mobilization of deposits is highly depending on the degree of confidence so that the institutions can enjoy the support from the members and non-members. PACB offers deposit accounts viz., savings, fixed and other suitable deposits to the rural people engaged in different occupations. Various types of deposits are provided by the bank to their customers as follows:

### 1. Fixed Deposit

A fixed deposit (FD) is a financial instrument provided by banks which offers investors with a higher rate of interest than a regular savings account, until the given maturity date. It may or may not require the formation of a separate account. It is known as a term deposit or time deposit. They are considered to be very safe investments. An amount less than Rs. 1000 do not accept as fixed deposit. For fixed deposits, printed receipts from the counterfoil receipt books specifying the terms and conditions of deposits such as rate of interest, period, due date etc. are to be issued to depositors

### 2. Saving deposit

The main purpose of saving deposit account is to improve the saving habit among the customers. A member or a non-member can open a savings deposits account subject to the conditions prescribed under the bylaws or sub rules. Interest is usually paid on the lowest balance on any date in each month. The paying-in-slips, or chalans, which are filled in by the remitters, would be available for checking the amounts credited to their respective accounts. The minimum account balance for this account is Rs.100. For getting the benefit of cheque, balance of Rs.500 should be maintained in this type of account. If the account balance is less than Rs.500 and not operate continuously for 3 years, then the administrative rulers have a provision for closing the account.

### 3. Recurring Deposit

Recurring Deposit is a special kind of Term Deposit offered by banks which facilitate people with regular incomes to deposit a fixed amount every month into their Recurring Deposit account and earn interest at the rate of 9.5%. It is similar to making FDs of a certain amount in monthly installments, for example Rs 1000 every month. This deposit matures on a specific date in the future along with all the deposits made every month. Thus, Recurring Deposit schemes allow customers with an opportunity to build up their savings through regular monthly deposits of fixed sum over a fixed period of time. Minimum Period of RD is 24 months and maximum is 6 years. The Recurring Deposit can be funded by [Standing order (banking)]|Standing instructions] which are the instructions by the customer to the bank to withdraw a certain sum of money from his Savings/ Current account and credit to the Recurring Deposit every month.

### 4. Cash certificates

Cash certificates are a type of deposit that is purchased for a certain amount. The account holder purchases the cash certificate for a certain amount, but needs to make payments toward this amount only as long as the term of the certificate lasts. Typically, the account holder builds up to the full amount of the certificate, earning interest as the money is transferred to the account, like a reverse loan. Account holders make payments once every quarter. Cash certificates can last years, and holders can even borrow money against them if necessary.

### 5. Current account

Current bank account is opened by businessmen who have a higher number of regular transactions with the bank. It includes deposits, withdrawals, and contra transactions. It is also known as Demand Deposit Account. Current account can be opened in co-operative bank and **commercial bank**. In **current account**, amount can be deposited and withdrawn at any time without giving any notice. It is also suitable for making payments to creditors by using cheques. **Cheques** received from customers can be deposited in this account for collection. The customers are allowed to withdraw the amount with cheques, and they usually do not get any interest. Generally, current account holders do not get any interest on their balance lying in current account with the bank.

Other deposit includes Sakalya Deposit, Risk fund, Home safe deposit, endowment fund and so on

## DATA ANALYSIS AND INTERPRETATION

### 1. Demographic Profile of the Respondents

The initial phase of the analysis of any customer survey is to describe a profile of the respondents involved in the study. This section presents a profile of the respondents in terms of the background information relating to their personal characteristics such as gender and income. The purpose of this profile is to obtain a visualization of the bank customers responding to the questionnaire. The sample of study consists of 100 customers selected at random from the peroorkada service cooperative bank of Thiruvananthapuram. An analysis of the respondents based on gender and monthly income have been conducted and the findings are discussed as follows.

**Table no-1: Demographic Profiles of the Respondents**

	Demographic variables	N	%
<b>Gender</b>	Male	59	59.00
	Female	41	41.00
<b>Monthly income</b>	Low income	46	46.00
	High income	54	54.00
<b>TOTAL</b>		100	100.00

Source: Primary Data

As far as gender is concerned, it's being noted that the majority (59%) of the customers are *males*.

In terms of income the sample was drawn from two income groups' namely low income and the high income with a composition of 46% from low income and 54 % from high income group. Low income refers to 'monthly income below Rs.20,000' and High income refers to 'monthly income above Rs.20,000'.

## 2. AWARENESS OF FINANCIAL SERVICES

*Awareness of financial services refers to the knowledge or understanding of different financial services.* In this situation customers must have knowledge in areas like, accessing, acquiring, usage etc of *financial services*. ANOVA and MANOVA test is used to know whether there is any significant difference in the awareness about deposits among customers of different category of income.

### 2.1. Customers evaluation about awareness of deposits

The knowledge and understanding of a purchaser regarding services or institution providing the services is termed as customer awareness. In this case the bank was the institution and the service was different type of deposits. Awareness about deposits was studied using 3 point scales fixed as 2-3 denote *fully aware*, 2-1 denote *partially aware*, and 0-1 denote *unaware*. The response scale is fixed as 2. The mean is calculated by multiplying the number into concern weight assigned for the level of awareness.

The customers evaluation about awareness of different deposits studied separately. One-Sample t test compares the mean to a specified value; it is useful to know what the mean value is. The One-Sample t test procedure tests whether the mean of a single variable differs from a specified constant. The mean value is displayed in the One Sample Statistics table, and the constant is test value displayed in the One Sample t test table. A low significance value (typically below 0.05) indicates that there is a significant difference between the test value and the observed mean.

The knowledge and understanding of a deposits or institution providing the services these deposits is termed as customer awareness. Deposits include fixed deposit, recurring deposit, *saving* deposit and current. The present study was fixed the response scale as 2. Table no 2 presents the distribution of sample by their level of awareness with mean awareness score.

**Table no.-2: Level of awareness of deposits with mean awareness score and level of significance**

Deposit	Unaware	Partially aware	Fully aware	Mean	SD	t	Sig.
Fixed Deposit	4.00	14.00	82.00	2.78	0.50	15.472	0.000
Recurring Deposit	40.00	24.00	36.00	1.96	0.88	-0.457	0.649
Saving deposit	9.00	12.00	79.00	2.70	0.63	11.153	0.000
current account	37.00	23.00	40.00	2.03	0.88	0.340	0.734

Source: Computed Primary data

From table 2 it can be seen that 82 percent of the customers are fully aware and 4 percent of the samples are not aware about fixed deposit. The mean score of awareness about fixed deposit was 2.78 which were significantly higher than the mean of the response scale as the significance level of one sample t-test is less than 0.05. Hence the customers have fully aware about the fixed deposit.

The mean score of awareness about saving deposit was 2.70, which was significantly higher than the mean of the response scale as the significant level of one sample t-test is less than 0.05. Hence the customers have fully aware about the saving deposit.

At the same time mean score of awareness of recurring deposit was 1.96 which was slightly lower than the response scale. The significant level of one sample t-test was higher than 0.05. It means that there was no significant difference between the two values. Hence the customers are average awareness about recurring deposit.

Whereas considering the current account 40 percent are fully aware and 23 percent are partially aware. At the same time awareness of sample about current account was only at average level as the significance level of t-test was greater than 0.05.

From the table it indicates that the customers have high awareness about fixed deposit and saving deposit and they have average awareness about recurring deposit and current account.

## 2.2. Testing of hypothesis

### Hypothesis 1

There is no significant difference in the awareness of different types of deposits with respect to income of customers

To test the above hypothesis one way ANOVA was carried out for the comparing the overall mean scores of the various deposits. To know whether there exists any variation between the mean score of awareness of different deposits of different income group a null hypothesis was created as there is no significant difference in the awareness of deposits with respect to income of customers. The hypothesis is tested using ANOVA. The table no.3 indicates the mean score of awareness of respondent about different types of financial service by level of income.

**Table No-3: Mean score of awareness of respondent about different types of deposit by level of income**

Financial services	Low income		High income		ANOVA		MANOVA	
	Mean	SD	Mean	SD	F	Sig.	F	Sig.
Fixed Deposit	2.63	0.64	2.91	0.29	8.031	0.006	1.957	0.034
Recurring Deposit	1.70	0.79	2.19	0.89	8.347	0.005		
Saving deposit	2.80	0.50	2.61	0.71	2.388	0.126		
current account	1.93	0.85	2.11	0.90	0.994	0.321		

Source: Computed Primary data

The above table indicates the awareness of different financial services of the service cooperative bank with respect to income of respondents. While considering the fixed deposit and recurring deposit the high income category are more aware than the low income category as the significance levels of ANOVA test are below 0.05. The mean score of awareness about fixed deposit for high income group is 2.91 while it is 2.63 for low income group. The mean scores of low and high income groups for recurring deposit are 1.70 and 2.19 respectively. But these differences in the awareness level were not found to be statistically significant when considering the financial services individually. However the awareness level for all the financial services are considered as a whole, there is significant variation between high and low income groups as the significance levels of MANOVA is less than 0.05. From the result it is evident that there is significant difference in the awareness about financial services among customers of different income categories. Hence the results reject the null hypothesis that there is no significance difference in the awareness of financial services with respect to income of customers and accept the alternative hypothesis that there is significance difference in the awareness of financial services with respect to income of customers.

## 3. PATTERN OF UTILIZATION OF DEPOSITS

There are a number of financial services provided by the primary agricultural cooperative bank to help the people. A study on utilization patterns of financial services among the customers is useful for the bank management to create new services in accordance with their needs. In order to identify the utilization pattern of financial services provided by primary cooperative banks in Kerala, the utilization pattern about deposits, loans and other financial services are studied separately.

There was various type of deposit offered by the primary agricultural cooperative bank. The customers utilized these services in a wise manner so as to get good return, safety and tax deduction. For studying the pattern of utilization of deposit the hypothesis set as there is no significant difference in the utilization pattern of deposit with respect to income of customers.

### 3.1. Types of deposit maintain

To know the types of deposit that the customers have in the service cooperative bank, four type of deposit such as fixed deposit, recurring deposit, *saving* deposit and current account were identified and presented before the customers. Most of the customers of bank respond that they have more than one deposit account in the same bank.

**Table No-4: Distribution of sample by type of account**

Type of deposit*	n	%
Fixed deposit	71	77.17
Recurring deposit	14	15.22
saving deposit	72	78.26
current account	18	19.57
<b>Total</b>	<b>92</b>	

\*Multiple responses

From the table it can be seen that 78.26 percent of the customers have saving deposit and 77.17 percent of the customers have fixed deposit. The percent of those who have Recurring deposit, current account are 15.22 and 19.57 percent respectively.

The variation in the type of deposit maintain among customers of two income groups was estimated using chi square analysis. Table 5 presents the distribution of customers by type of deposit to the total income and level of income with test of significance.

**Table No-5: Type of account maintained and level of income with test of significance**

Type of account*	Low income		High income		Chi-square	Sig.
	n	%	n	%		
Fixed deposit	31	75.61	40	78.43	8.529	0.074
Recurring deposit	4	9.76	10	19.61		
saving deposit	35	85.37	37	72.55		
current account	4	9.76	14	27.45		

\*Multiple responses

The above table presents the distribution of customers by type of account and level of income. From the table it can be seen that the highest percentage (78.43%) of customers in the higher income category have fixed deposit than customers of low income. At the same time the corresponding percent among lower income group is 75.61 percent. Among high income group 19.61 percent have recurring deposit but the corresponding percentage among low income group was only 9.76 percent. While considering the saving deposit majority of low income customers that was 85.37 percent have account than high income category (72.55%). Among low income group only 9.76 percent of customers have current account and the corresponding responds for higher income group was 27.45 percent.

### Result

From the table it can be seen that the significance level of chi square is more than 0.05. The result indicates that there was no significant difference in the type of account among respondents of two income groups. It means that respondents of two income groups have same type of account with irrespective to their income. Hence the result revealed that there is no significant difference in the type of account with respect to the level of their income.

### 3.2. Proportion of income deposited

Every customers deposit only certain percent of their income in the bank. Table 6 presents the level of proportion of deposit to the total income and level of income with test of significance.

**Table no-6: Level of proportion of deposit to the total income and level of income with test of significance**

		less than 10%	10%-20%	20%-30%	more than 30%	Chi-square	Sig.
Low income	n	16	8	12	5	11.240	0.010
	%	39.02	19.51	29.27	12.20		
High income	n	13	17	5	16		
	%	25.49	33.33	9.80	31.37		
Total	n	29	25	17	21		
	%	31.52	27.17	18.48	22.83		

Source: Computed Primary data

Out of 92 customers 31.52 percent of customers only deposit less than 10 percent of their total income in the service cooperative bank. 27.17 percent of customers fall in 10 to 20 percent category and 22.83 percent of customers willing to deposit in more than 30 percent category. Only 18.48 percent of customers willing to deposit their 20 to 30 percent of income.

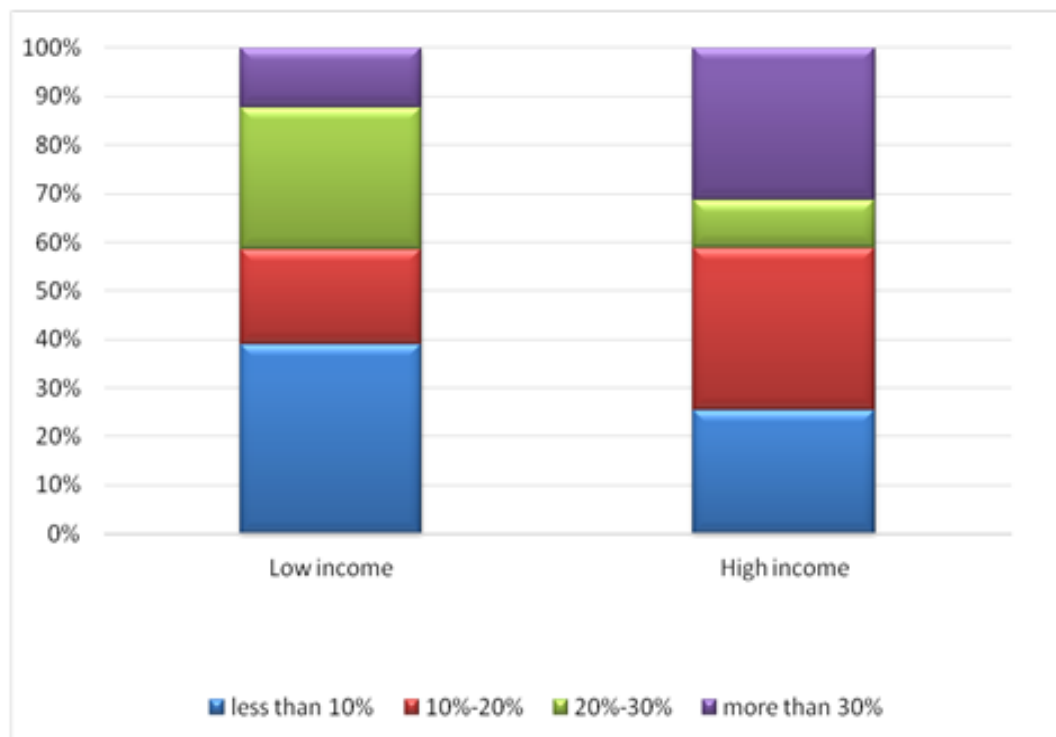


Figure No-1: level of proportion of deposit to the total income and level of income

Figure no.1 present the distribution of respondents by level of proportion of deposit to the total income and level of income. From the figure it can be seen that the highest percentage (39.02%) of respondent in the lower economic category deposit less than 10percent of their total income. At the same time the corresponding percent among higher income group is only 25.49 percent. Among the respondents in the higher income category, highest percentage (33.33%) deposit 10 to 20 percent of their total income. Among these group 31.37 percent deposit more than 30 percent of their total income. But the corresponding percentage among low income group is only 12.20 percent.

### Result

From the table it can be seen that the significance level of chi square is less than 0.05. From the above result it is evident that the pattern of proportion of deposit to the total income is significantly different among the two income groups of respondents. Hence the result revealed that there is significant difference in the pattern of proportion of deposit to the total income with respect to the level of their income. It means that customers of two income groups deposit different proportion of their total income.

### 3.3. Frequency of withdrawal

Customers withdraw deposits as and when required and may be weekly, monthly, yearly or occasionally. The variation in the frequency of withdrawal of deposit among customers of two income groups was estimated using chi square analysis. Table no.7 present the distribution of respondents by frequency of withdrawal of deposit and level of income with test of significance.

Table No-7: Frequency of withdrawal of deposit and level of income with test of significance

		Weekly	Monthly	Yearly	Occasionally	Chi-square	Sig.
Low income	n	8	13	8	12	6.735	0.081
	%	19.51	31.71	19.51	29.27		
High income	n	3	23	5	20		
	%	5.88	45.10	9.80	39.22		
Total	n	11	36	13	32		
	%	11.96	39.13	14.13	34.78		

Source: Computed Primary data

Majority of customers (39.13 %) withdraw their deposit monthly. 34.78 percent of customers withdraw their deposit occasionally. Only 11 percent of customers withdraw their deposit weekly.

As far as considering income wise, it can be seen that the highest percentage (45.10%) of customers in the higher income category withdraw monthly. At the same time the corresponding percent among lower income

group is only 31.71 percent. Both of the respondents in the higher and low income category withdraw majority of their deposit monthly. Among high income group 39.22 percent withdraw their deposit occasionally. But the corresponding percentage among low income group is only 29.27 percent. Among low income group only 19.51 percent of respondents withdraw their deposit yearly and the concern responds for higher income group is only 9.80 percent.

## RESULT

From the table it can be seen that the significance level of chi square is more than 0.05. The result indicates that there is no significant difference in the frequency of withdrawal among respondents of two income groups. Hence the result revealed that the frequency of withdrawal of deposit with respect to the level of their income is same.

### 3.4. Reasons for selecting particular bank for deposit

The customers prefer this bank due to any one any of the reason. While analyzing the reasons that influenced for selecting particular bank for deposit the grounds taken for the study are member in cooperative, location, efficient and speedy services, good rate of return, and safety of return and stability of the returns. The customers are directed to rank the concern factors. Customers have different considerations while selecting the bank for depositing their money. With financial service providers like service cooperative bank customers expect good service, convenient location, and attractive return and so on. The results are as follows:

**Table no-8: Ranks given by customers for the reasons for selecting particular bank for deposit**

	Mean	SD	Rank
Member in cooperative	4.11	1.47	4
Location	4.17	1.51	2
Efficient and speedy services	4.15	1.19	3
Good rate of return	2.85	1.34	5
Safety of return	4.36	1.40	1
Stability of the returns	1.36	0.99	6

Source: Computed Primary data

Ranking table was used for the purpose of analysis. The factor which was ranked first by a respondent was assigned the high score of 6; the one ranked second was given a score of 5 and so on. The scores obtained for a particular factor on the basis of conversion of ranks assigned by the respondents were summated and averaged to arrive at the mean scores of the particular factor.

Majority of the customers gave first rank to safety of the return with high mean score of 4.36., second rank to location with mean 4.17 and third preference to efficient and speedy services with 4.15 score and so on. The least ranks were given to stability of the returns, good rate of return and so on.

Spearman's Rank correlation coefficient was used to find out whether there is any significant difference between high income and low income category in the preference of selecting particular bank for deposit.

**Table no. 9 Ranks given by customers of low and high income group for the reasons for selecting particular bank for deposit**

	Low income	High income	Spearman's rank correlation	Sig.
Member in cooperative	2	4	0.486	0.329
Location	3	2		
Efficient and speedy services	4	1		
Good rate of return	5	5		
Safety of return	1	3		
Stability of the returns	6	6		

Source: Computed Primary data

Table no. 9 present the ranks given by customers of low and high income group for the reasons for selecting particular bank for deposit. From the table it is evident that the ranks given by low and high income groups for reasons for selecting particular bank for deposit is not significantly different as the significance level of Spearman's correlation is greater than 0.05. The correlation coefficient is 0.486.ie both low and high income group are positively correlated and there was no significant difference between them. It means that the reasons for selecting particular bank for deposit are similar among these two groups of customers. The low income

group of customers selects safety of return as their first reason for selecting the particular bank for deposit, while the first reason for high income group of customers is efficient and speedy service. When low income customers select the particular bank because of the reason that they are being member of that bank. At the same time convenient location is the second reason for high income group to select the bank. Convenient location is the third important reason for selecting the bank among low income customers while safety of return is the third important reason for high income group. The fourth important reason for low and high income groups are efficient and speedy service and being the member of that bank respectively. However, the last two reasons were identical for both groups.

Since significant value is greater than .05 (at the 95% level of confidence) that is 0.329, the correlation is not statistically significant and the null hypothesis must be accepted. That is there is no significant difference between preference of selecting particular bank for deposit and different category of income.

#### 4. CUSTOMERS RATING THE SATISFACTION OF DEPOSITS

In order to assess the extent of satisfaction which the customers derived from different financial services offered by the banks, respondents were asked about the actual level of satisfaction from different financial services, namely deposit, loans and other financial services. They were requested to rate their level of satisfaction on a 5-point scale: 5 being very much satisfied and 1 being very much dissatisfied. *For very much satisfied the weight is assigned as 5, satisfied as 4, neutral as 3, dissatisfied as 2 and for very much dissatisfied category as 1.* This study will give, to some extent, an idea about the efforts required for reaching near the expectation level of customers.

The satisfaction of deposit can be understood by asking the customers to rate their level of satisfaction of each type of deposit separately in a 5 point scale. *The distribution of sample by their level of satisfaction with mean satisfaction score and level of significance are as follows.*

**Table No-10: level of satisfaction on deposits with mean score and level of significance**

		very much dissatisfied	dissatisfied	neutral	Satisfied	very much satisfied	Mean	SD	t	Sig.
<b>Fixed deposit</b>	n	0	0	4	29	39	4.49	0.60	20.844	0.000
	%	0	0	5.56	40.28	54.17				
<b>Recurring deposit</b>	n	0	0	0	11	3	4.21	0.43	10.670	0.000
	%	0	0	0	78.57	21.43				
<b>Saving deposit</b>	n	2	0	5	41	23	4.17	0.79	12.428	0.000
	%	2.82	0	7.04	57.75	32.39				
<b>Current deposit</b>	n	0	0	5	11	2	3.83	0.62	5.718	0.000
	%	0	0	27.78	61.11	11.11				

Source: Computed Primary data

From the above table it can be seen that majority (54.17 percent) of customers were very much satisfied with fixed deposit and 5.56 percent remain neutral. The mean score of satisfaction found to be 4.29 which were significantly higher than mean of the response scale as the significance level of one sample t test is less than 0.05. The result indicates that the customers were generally satisfied with fixed deposit.

While considering recurring, saving deposit and current account the mean score of satisfaction were found to be 4.21, 4.17 and 3.83 respectively, which were significantly higher than mean of the response scale as the significance level of one sample t test is less than 0.05. The result indicates that the customers are generally satisfied with recurring deposit, saving deposit and current account.

From the table it indicates that the sample was satisfied with fixed deposit, recurring deposit, saving deposit and current account.

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**SUGGESTIONS**

- The bank must improve their owned fund by increasing their share capital. To increase share capital they have to admit more number of members, so necessary financial services must provided to attract the new customers
- The PACBs should be encouraged to mobilize more deposits to become financially strong so that the working capital gets strengthened and thus reduces the financial dependence of the PACBs on government and NABARD.
- The Co-operative Department in general and PACB in particular should take necessary steps to identify the factors responsible for the dissatisfaction with the services of the PACB find ways and means for rendering effective services to them
- Create awareness to the people about the different financial services introduced newly and also insist the members to use it.
- Introduce other new technology that the customers usually used in other banks in order to withstand with commercial bank and other financial services
- Adequate returns must give to the customers and the return must be stable, and then only get more customers.

**CONCLUSION**

Without help of co-operative banks millions of people in India would be lacking the much needed financial support. Service Co-operative banks take active part in local communities and local development banks take dynamic part in local communities and local development with a stronger commitment and social responsibilities. These banks are best vehicles for taking banking to doorsteps of common men unbaked people in urban and rural areas. Their presence in the social economic and democratic structure of the best justification for nurturing them and strengthening their base. These banks are sure to win in the race because they are people, by the people and of the people. Hence the increased supports by the bank enhance the uses of the bank and thereby get more deposits. At the same time from the utilization part of customers they must use maximum as the growth the service cooperative bank develop the economy very much. The introduction of Kerala owns bank is very apt as it helps to coordinate all the services into one.

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**A STUDY OF HAPPINESS QUOTIENT IN HIGHER EDUCATIONAL INSTITUTE**

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**ABSTRACT**

*In psychology, happiness is a mental or emotional state of well-being which can be defined by, among others, positive or pleasant emotions ranging from contentment to intense joy. Bhutan emphasises on Gross National Happiness and the country uses it as a formal development indicator instead of GDP. This study aims to explore the happiness quotient of the employees in higher educational institute. 217 students pursuing management course, 16 faculty members and 19 staff members were administered the Oxford Happiness questionnaire to study their happiness quotient.*

*Keywords: Happiness, Oxford happiness Scale, Higher Educational Institute*

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**INTRODUCTION**

Emotional intelligence or emotional competencies of individuals go a long way in determining how one deals with emotional demands at workplace. The parameters defining good life have been the subject of deliberation for many thinkers and psychologists. Once the physiological needs of the individuals are met, they transit to the post-materialistic phase where their objective is to achieve self-fulfilment and are more concerned about their happiness and satisfaction in life (Inglehart, 1990).

Love for others, pleasure in what one does, self-insight and realization of leading a good life have been some parameters stated for measuring contentment among individuals. Each individual can decide whether his or her life is worthwhile and this approach of an individual defining the quality of his life has been referred to as Subjective Well Being (SWB) or in broader terms it is termed as happiness quotient of the individual (Diener, 2000). In this study we aim to explore the happiness quotient of the employees in a higher educational institute.

**LITERATURE REVIEW**

Many aspects of individual's work-life, like perception of authority, interpretation of tasks assigned at workplace, assessment of situations and team dynamics are coloured by individual's emotional state (Hartel, Gough, & Hartel, 2008). Emotions come into play when the individual characteristics interact with environmental characteristics. Individual perception of workplace events, as favourable or unfavourable, is directly affected by the social features of the organizations. The way the leaders, managers and work-group members behave results in shaping the employees' attitude towards work (Church, 1995).

Fewer negative emotions at work are experienced by those individuals who are less likely to appraise the events negatively. This in turn results in happier and more satisfied employees (Hartel, Gough, & Hartel, 2008). The degree of job satisfaction is correlated to employee turnover, absenteeism and burnout. Creation of a highly supportive and participative work environment has been found to reduce the employee attrition and enhance their productivity (Vallen, 1993). When subjects during laboratory experiments of mood induction were put in good mood, a marked improvement was observed on problem solving, helpfulness, generosity and positive attitudes towards others (Argyle, 1987). Overall happiness of employees has a high correlation with job satisfaction and leads to increased work performance (Argyle, 1989). Emotions and perceptions on authority have been found to influence individual interactions of employees with their colleagues at workplace (Hartel, Gough, & Hartel, 2008). Psychological strain and interpersonal conflicts result in negative emotions in the employees leading to employee dissatisfaction which ultimately hampers the service quality of the employees (Paules, 1991). Judgements about one's life, satisfaction level based on various parameters at work, evaluation of emotions and moods (both positive and negative) were few of the components used to study subjective well-being of individuals (Diener, 2000). The mood of the respondents and other situational factors were found to have a significant effect on the responses received from the individuals (Bless, Bohner, Schwarz, & Strack, 1990). The response of a person in presence of someone else who was relatively worse off resulted in the respondent rating his happiness quotient higher and vice versa. The mode of communication (public versus private) also was reported to alter the responses of the people studied for their happiness index. It was therefore suggested that cognitive and communicative mechanisms need to be carefully monitored while studying the subjective well-being of the individuals (Strack, Schwarz, Chassein, Kern, & Wagner, 1990). People judge their well-being by comparing it to that of the society in which they live and it was found that raising the incomes of all does not increase the happiness of all because when the judgements of happiness are based on

material norms then in instances when the income of all is raised then the happiness does not increase proportionately (Easterlin, 1995).

The attitudinal, behavioural and performance outcomes of employees are related to their psychological resources of efficacy, hope, optimism and resilience (Avey, Luthans, Smith, & Palmer, 2010). Happiness increases the productivity (Oswald, Proto, & Sgroi, 2015) and it has been observed that the performance of employees scoring high on personal well-being and job satisfaction has been found to be high (Wright, Cropanzano, & Bonett, 2007).

## RESEARCH OBJECTIVES

The lifestyle of the present generation is so hectic that often they succumb to the pressures of high expectations of their parents. The adults in the working class too are undergoing a lot of pressure in maintaining a healthy work life balance. This research is focused on studying the happiness quotient of students, faculty and staff members in a higher educational institution.

## RESEARCH METHODOLOGY

Oxford Happiness Scale (Hills & Argyle, 2002) having high reliability (Cronbach's Alpha value of 0.78) was used to study the happiness quotient of the employees and students in a higher educational institution. This exploratory study used convenience sampling method where the questionnaire of the happiness scale was administered to 217 students pursuing management course, 16 faculty members and 19 staff members. Data analysis was done using SPSS 20.0.

## DATA ANALYSIS AND INTERPRETATION

Items marked (R) in the happiness scale questionnaire were scored in reverse. The scores given to all 29 questions (using the converted scores of the 12 items) were added. The score was then divided by 29 to get the happiness score. The score of 1-2 indicated that the respondent was not happy; a score of 2-3 meant somewhat unhappy; a score of 3-4 indicated that the respondent was not particularly happy or unhappy; a score of 4 indicated somewhat happy or moderately happy; a score of 4-5 meant pretty happy and finally a score of 5-6 indicated very happy. As seen in table 1, 36.5% of the respondents were neither happy nor unhappy while 53.8% of the respondents were pretty happy.

**Table-1: Happiness Quotient**

Happiness Quotient	Percent
unhappy	3.8
neither happy nor unhappy	36.5
pretty happy	53.8
very happy	5.8
Total	100.0

Gender wise happiness score of the respondents (refer table 2) reveals that higher number (64%) of females were pretty happy as compared to males (44.4%).

**Table-2: Gender \* Happiness score Crosstabulation**

Gender	Happiness score				Total
	Unhappy	Neither Happy nor Unhappy	Pretty Happy	Very Happy	
Male	7.4%	44.4%	44.4%	3.7%	100.0%
Female	0.0%	28.0%	64.0%	8.0%	100.0%

According to table 4, 10% of the staff members were unhappy, while 50% were neither happy nor unhappy. 14.4% of the students were unhappy and 35.6% of them were neither happy nor unhappy. Among the faculty members 40% of the respondents were neither happy nor unhappy while another 40% were pretty happy. However 6% of the faculty members were found to be unhappy.

**Table-3: Occupation \* Happiness Score Crosstabulation**

Occupation	Happiness score				Total
	Unhappy	Neither Happy nor Unhappy	Pretty Happy	Very Happy	
Faculty	6.0%	40.0%	40.0%	14.0%	100.0%
Student	14.4%	35.6%	45.6%	4.4%	100.0%
Staff	10.0%	50.0%	40.0%	0.0%	100.0%

As seen in table 4, the respondents ( 16.7%) having a monthly income less than 25000 rupees were unhappy as compared to those whose monthly income was more than 50000.

**Table-4: Income \* Happiness Score Crosstabulation**

Monthly Income Bracket	Happiness score				Total
	Unhappy	Neither Happy nor Unhappy	Pretty Happy	Very Happy	
Less than 25000	16.7%	50.0%	33.3%	0.0%	100.0%
25000- 50000	5.9%	29.4%	64.7%	0.0%	100.0%
50000-75000	0.0%	22.2%	77.8%	0.0%	100.0%
Above 75000	0.0%	45.0%	40.0%	15.0%	100.0%

As seen in table 5, with the increase in age the happiness of the individuals was seen to increase.

**Table-5: Age \* Happiness Score Crosstabulation**

Age	Happiness score				Total
	Unhappy	Neither Happy nor Unhappy	Pretty Happy	Very Happy	
18-25	4.8%	35.7%	54.8%	4.8%	100.0%
25-32	0.0%	50.0%	50.0%	0.0%	100.0%
32-40	0.0%	0.0%	100.0%	0.0%	100.0%
40-48	0.0%	33.3%	66.7%	0.0%	100.0%
48 above	0.0%	70.0%	22.0%	8.0%	100.0%

The regression test did not yield a very strong impact of the independent variables of age, gender, occupation and income on the happiness quotient of the respondents.

### LIMITATIONS AND SCOPE OF FUTURE RESEARCH

This study used the Oxford Happiness scale to arrive at the happiness quotient of respondents. A comparative analysis can also be done by using other established happiness scales and finding out the correlation between the scores received. Since the independent variables of age, income, occupation and gender did not have significant influence of the degree of happiness of the respondents, therefore there are some other factors which govern the happiness of individuals. A research can be carried out to explore these factors. This research can be replicated in different sectors and a comparative analysis can be done on the happiness quotient of individuals in different sectors.

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#### APPENDIX: THE OXFORD HAPPINESS QUESTIONNAIRE

INSTRUCTIONS Below are a number of statements about happiness. Would you please indicate how much you agree or disagree with each by entering a number alongside it according to the following code:

1=strongly disagree (SD); 2=moderately disagree (MD); 3=slightly disagree (Sl.D);

4=slightly agree (SA); 5=moderately agree (MA); 6=strongly agree (SA).

You will need to read the statements carefully because some are phrased positively and others negatively. Don't take too long over individual questions; there are no 'right' or 'wrong' answers and no trick questions. The first answer that comes into your head is probably the right one for you. If you find some of the questions difficult, please give the answer that is true for you in general or for most of the time.

S. No	Statement	SD1	MD2	Sl.D3	Sl.A4	MA5	SA6
1	I don't feel particularly pleased with the way I am (R)						
2	I am intensely interested in other people						
3	I feel that life is very rewarding						
4	I have very warm feelings towards almost everyone						
5	I rarely wake up feeling rested (R)						
6	I am not particularly optimistic about the future (R)						
7	I find most things amusing						
8	I am always committed and involved						
9	Life is good						
10	I do not think that the world is a good place (R)						
11	I laugh a lot						
12	I am well satisfied about everything in my life						
13	I don't think I look attractive (R)						
14	There is a gap between what I would like to do and what I have done (R)						
15	I am very happy						
16	I find beauty in some things						
17	I always have a cheerful effect on others						
18	I can fit in everything I want to						
19	I feel that I am not especially in control of my life (R)						
20	I feel able to take anything on						
21	I feel fully mentally alert						
22	I often experience joy and elation						
23	I do not find it easy to make decisions (R)						
24	I do not have a particular sense of meaning and purpose in my life (R)						
25	I feel I have a great deal of energy						
26	I usually have a good influence on events						
27	I do not have fun with other people (R)						
28	I don't feel particularly healthy (R)						
29	I do not have particularly happy memories of the past (R)						

Note: Items marked (R) were scored in reverse.

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**DEMONETIZATION AND INDIA GOING CASHLESS: GLIMPSE ON CURRENT SITUATION**

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**ABSTRACT**

*This paper attempts to get insight about the demonetization and varied issues that led the government to take such a stringent decision. Government's aim of making India a cashless economy and the measures taken to realize this goal has been discussed in the paper. Various modes of digital payment have been discussed and the consumers shifting to various cashless means have been detailed in the paper. This paper is conceptual in nature and secondary data has been used for the study. However, demonetization impacted most of the sector but it is difficult to predict the consequences of its ostensible and tangible impact and the Modi government's move towards digital India in such a short period of time. Some suggestions have been given at the end of the study to smoothen the way of digital payment system.*

*Keywords: Demonetization, digital payment system, cashless economy, transaction.*

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**INTRODUCTION**

India being traditionally cash based economy and in such a scenario demonetizing decision has been the major and most ambitious step to crack the problem of black money and corruption. Demonetization of 500 and 1000 rupee note was one of the moves to push India towards the digital economy. The aim of the demonetization is to eliminate societal corruption and to counterfeit currency. Though the move was all of a sudden that happened overnight and people were forced to look immediately for other payment options as these two notes were 86% of the total bank notes in circulation.

There were lot of reasons for reducing Indian economy dependence on cash. As per the Tufts University Study in 2014, The Cost of Cash in India is 21000 crore rupees annually. Also cashless payment system will make it more difficult for tax evaders to hide their income resulting in substantial benefit in the country's income.

According to the PricewaterhouseCoopers report 2015 India's unbanked population was approximate 233 million and even the banked people have the limited ability to use their debit and credit cards as there were only 1.46 million point of sale which accepts payments via cards. Ninety percent of the workforce in India works in an unorganized sector and it is very difficult for this sector to become cashless. More likely there is general preference for cash transactions in India by the merchants and buyers as they find it more convenient.

**LITERATURE REVIEW**

Kumudha, Dr. A., Laxmi, Dr. K. S., (2016), discussed about the role of internet and other technological innovations in the surge in digital marketing especially in Indian context. New trends in digital marketing, online shopping and payments, impact of demonetization etc. and their implications on customers are discussed in the paper. Cash based to cashless economy shifting i.e., digital and online transactions sudden increase, banking operations and the mind-set of the people has been discussed in the paper. Study show the need of opening more banking branches, availability of internet in rural areas and training of these people is utmost important to realize the goal of cashless economy.

Uk, Lokesh. (2017), aims to present about the consequences of demonetization of Rs. 500 & 1000 note and its impact on the Indian economy. Study discussed that the positive aspect of demonetization will appear in future though there will be short span crunch in the Indian financial market, real estate market, FMCG and automobile sector etc. Demonetization has created some chaos which was for short span of time but will be very effective in curbing down the problem of corruption and black money. Review of many financial experts has been discussed in the paper. Paper discussed the bright side that the banking sector will be able to provide more loans to industrial sector in future that will in turn result in generation of more employment and production but gradually the actual economic outcome of the demonetization will come.

Gunasundari K., Bama P. Sathiya., (2016), authors discussed about the increasing and unanimous acceptance of plastic money around the globe. The "Digital India" move and the Pradhan Mantri Jan Dhan Yojna (PMJDY), is motivating electronic payment and replacing physical payment prevalent in country. In PMJDY approximately 150 million Rupay cards has been issued in the last years and there were 400 million debit cards already in circulation. Technological innovations have made electronic transactions safer, secure and authentic. Now-a-days people prefer carrying plastic cards over cash intensifying a massive transformation in the banking sector.

Paper suggests that the cons are investment in the IT sector by service providers, security concerns and lack of awareness among the people who prefer physical money.

Patil.Sumit. (2014), discussed the usage and utility to customers about the credit cards. Plastic cards are used at a much higher rate than before and even though these offer benefits through product offerings at low cost, reward schemes, loyalty bonus points etc. but consumers are not able to use it effectively because of complex nature of its operation. Training and trial of plastic cards should be provided by the banks to make customers more confident in using their own cards. Findings of the study show that usage of plastic cards has increased for online payments with more preference to debit cards. Customers hardly exposed to discrepancies in online payment by cards. Increased usage of ATMs and fewer visits to bank because of 24x7 customer services has been the phenomena.

Kumari, Deepika., (2016), discussed about the methods, applications, challenges and concept of cashless transactions and the security issues related with it. Author focussed on the problem related to the authentication of user for cashless transaction. Different kind of user authentication methods and forthcoming authentication methods are discussed in the paper. Various barriers to the cashless transactions are highlighted in the study like IT infrastructure and its reach, lack of PoS in rural areas, customer awareness etc. are there which are hindering the progress of cashless transactions in India.

Muthulakshmi, E.Kamatchi., Kalaimani, G., (2016), study is primarily based on secondary data and throw lights on reasons of demonetization and history of demonetization in the world. Demonetization is done around the world for many reasons. Apart from India the recent sight of demonetization is the adoption of Euro currency among the nations of European Union. Firstly exchange rates for varied national currencies into Euro currency were fixed. With the introduction of Euro old currencies were demonetized though old currency remained convertible into Euro for a while. India has demonetized its currencies twice before. First time it was one and half year before the independence. On 12th January 1946 Rs. 1000, Rs. 5000 and Rs 10000 notes were taken out of circulation. In 1954 all the three notes were reintroduced and again demonetized on 16th January 1978. In 1946 demonetization was reported unsuccessful by the Direct Tax enquiry committee because only a very small proportion of total notes in circulation were demonetized. In 1978 demonetization amounted to Rs. 146 crore and total notes surrendered to RBI amounted to Rs. 125 crore as per data available till August 1981. Author suggests that current demonetization in India will affect the general public to some extent, but in long run such decisions are inevitable for the larger concern of the country.

Parmar, D. K., and Dave, S. K., (2017), the impact of demonetization on various sectors like agriculture, automobile industries, FMCGs, real estate and banking sector etc. have been detailed in this paper. Author advocates that it is difficult to ascertain the long term impact of demonetization at this stage but it is anticipated that the overall economy of the nation will improve due to decrease in unaccounted cash transaction.

Rao, Kavita., et. al, (2016), paper discusses very short term, short-term and medium-term impact of demonetization on the economy along with these various transition issues from cash based to cash less system and their implications have been discussed in the paper. Varied transition issues like infrastructure, consumer behaviour, banking system, language accessibility has been deeply discussed in the paper. There is urgency in such a scenario for upgradation of banking system and the supportive infrastructure for electronic payment. But it would be difficult in areas where there is intermittent supply of electricity and mobile connectivity. Paper provides insight over the extinguished money, if it is black it is rightly vanished from the system but if it is used in the authentic economic activity then the economy of the nation will contract.

Kumar, Piyush., (2015) the paper discusses the pros and cons of cash based and cashless transactions and the challenges faced by the government and people in moving towards cashless economy. Author is adherent to the fact that cashless transaction are the future of economic transactions. Paper suggests that the pre-requisite for having cashless economy is to have unique biometric IDs for each individual which could effortlessly support electronic payment system. Along with that, very high security would be needed to save people from cyber criminals.

## **RESEARCH METHODOLOGY**

Research Methodology is used to answer research problem in a systematic way which deploys various procedures and tools taken on for the research. Present study is conceptual and quantitative in nature and secondary data has been used. The secondary data has been compiled from the research papers, journals, reports, newspapers and websites. The present study is conceptual in nature so no statistical tools/techniques have been adopted.

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**OBJECTIVES OF THE STUDY**

1. To anticipate the probable consequences of the demonetization.
2. To assess the behaviour of people towards the cashless transaction system.
3. To know the pros and cons of cashless transaction system.
4. To evaluate the factors encouraging cashless transactions.

**EFFECT OF DEMONETIZATION**

Demonetisation is India's major transformation since Independence. It has been done because of the varied issues bothering the integrity, defence, corruption and economy of the country. Initially it created an environment of awful economic suspicious transparency but there existed rift between apparent gains and noticeable losses. Public sustained in chaos in the first few weeks of demonetization but the condition gradually improved. In the beginning demonetization reform appeared to disempower people from economic independence. Demonetization will help the government to exercise more control over the economy of the country and to keep sharp eye on money laundering in the criminal, illegal and terrorist activities. After approximately half year after the demonetization a clear picture of its benefits are yet to arise.

Many changes in cash based transactions have been made to discourage the people adopting cash based transaction. Limit has been imposed on the amount of cash deposits and withdrawals in the banks. People are facing problems especially in agrarian sector. Farmers are protesting in many states and government of MP has announced 2 lakh rupees cash payment and rest by RTGS to farmers for selling produce in mandis. There is chaos amongst the grain merchants as the cash withdrawal limit is set by the central government and it will be difficult to buy the produce from the farmers. This is only one example of the problems faced post demonetization and there are many more like digital literacy, technological infrastructure, internet connectivity etc. that government will have to face for going cashless. Long term impact of demonetization and benefits, if it carries any, will be realized after few years. How successful demonetization is? - cannot be comprehensively answered at this time.

**TYPES OF DIGITAL PAYMENT**

Condition when all the transactions are done through electronic channels and flow of cash in the economy is non-existent is termed as cashless economy. Electronic channels prevailing in India are debit and credit cards, direct debit, Immediate Payment Service (IMPS), National Electronic Fund Transfer (NEFT) and Real Time Gross Settlement (RTGS).

**Prepaid payment Instrument:** Transfer of funds digitally through cards or mobile phones is termed as prepaid payment Instrument by RBI. These include debit cards, credit cards, online banking and mobile wallet etc. These are of following four types:

**Open Type:** These are provided in joint association with banks, example: M-Pesa by Vodafone, master card, visa cards etc. These can be used to transfer funds to any mobile number linked with bank account and to withdraw cash from ATMs and banks.

**Semi-open Type:** These transactions are provided by companies in association with merchants having contract with these companies example Airtel Money/Ola Money. Users have to spend what they have stored in these wallets as they cannot withdraw cash or can get it back from these wallets.

**Closed Type:** Most of the e-commerce companies are using it example: Flipkart and Book My Show wallets. In this case some amount of money is locked with the merchant in unforeseen case of return or cancellation of the product.

**Semi-closed Type:** These allow users to buy goods and services from the listed merchant example E-wallet by Paytm. Users cannot get back cash and cannot withdraw it from the wallet. They have to be careful while storing the cash in the wallet.

**DIFFERENT MODES OF CASHLESS TRANSACTIONS**

**Plastic money:** Oldest way of cashless transactions. It is in the form of cards i.e. debit, debit cum ATM, credit and prepaid cards which are issued by the banks or other institutions and their existence may be physical or virtual. Plastic money can be used to withdraw money from ATM, to deposit cash at CDM, to make online payments to make payments or PoS swiping for purchases.

**Net Banking:** Online method of fund transfer done through bank accounts. Users need internet access to log in to bank account so as to transfer fund to another bank account, credit card or to third party via NEFT, IMPS, RTGS at very nominal transaction cost.



**E-Wallet:** When transactions are made using any kind of electronic device like computers or smart phones, it is termed as E-Wallet. Bank account is linked with E-Wallet with the help of driving license, health cards, and other ID proof. User need to download any E-Wallet like SBI Buddy (provided by almost all the banks), register mobile number and then connect Debit/ Credit card or Net banking with it. Finally transactions can be made

**Mobile Wallet:** A type of virtual wallet or a kind of E-Wallet that is available on mobile phones. This service is provided by the several service providers through mobile apps that means apps need to be downloaded and cash is transferred through credit or debit card in this wallet means cash is stored in mobile phone to make online and offline payments. Users can make online payment or pay bills through this wallet without furnishing card details each time.

**UPI (Unified Payment Interface):** It is a kind of payment system in which in which fund can be transferred between two different parties in which bank account is involved. Every bank has mobile app. User need to register mobile number to the bank and to down load UPI app into smart phones after that they need to generate unique ID & to set UPI pin. After these steps transactions can be done without sharing your credit details or wallet password.

**USSD (Unrestricted supplementary Service Data):** The best thing for this transaction is that a simple featured mobile phone is sufficient; user does not need to have any computer or smart phone. For this reason it is also known as quick codes. User need to register mobile phone to bank account then dial \*99# into phone, dial four numbers before the short name of bank, select option of fund transfer, dial MMID of person to whom money is to be transferred, dial the users MPIN and amount and then dial four digit of bank account number of user. USSD also be used to recharge the balance on user's SIM card to deliver OTP.

**UIDAI (Aadhar Enabled Payment System):** Aadhar card linked with bank account also provides safe and secure transfer, enquiry, withdrawal, deposit and interbank transaction.

#### **ADVANTAGES OF THE CASHLESS ECONOMY**

1. Black money: Cash based economy is a favoured place for underground market which promotes activities like money laundering, criminal activity, human trafficking, drug trafficking, terrorism etc. It is easy to keep track of all the transactions in the cashless economy and hence more risky to conduct criminal transaction that harms national economy and integrity.
2. Inhibits circulation of fake currency in the economy
3. Reduces the chances of tax evasion. It has resulted in increase in the number of tax payers in the country and consequently greater revenue for the state and more fund available for national and welfare activities.
4. Reduces the cost of currency operation in the country which is approximately 21000 crore rupees.
5. Brings down the risk involved in carrying huge amount of cash.
6. Curbs down corruption.
7. Cost per transaction will be reduced in long run.
8. Will bring more transparency and accountability in the system.
9. Stops funding to terrorism as it is done by black money holders.
10. Illegal political funding will also be curbed down. Maximum funding in the political party is not disclosed by the party and donor as well.

#### **CHALLENGES IN CASHLESS TRANSACTION**

1. In a country like India there is a lack of infrastructure for setting up a cashless economic system. Deficiency in digital infrastructure and internet connectivity, inefficient banking systems and digital payment interface as well as meagre penetration of PoS are few of the major hurdles which are needed to be overcome to establish cashless system.
2. Illiteracy is one of the major hurdles in the adoption of cashless system in India. As per UNESCO, India's illiterate population is largest in the world and is approximately 287 million adults are illiterate in India.
3. Digital literacy is a must in a country like India where most of the citizens especially the rural people are not aware of the financial and digital instruments available. Additionally if they know about the availability they don't know how to transact using these instruments.

4. There is a remarkable difference in urban-rural amenities distribution in India in almost every sphere either it is education, health, employment or digital connectivity Urban people enjoys high speed internet connectivity while rural people are deprived of internet connections. Despite more than 200 million people having smart phones there is still some time for rural people to transact flawless through their mobile phones.
5. Poor internet access in India. Only 26% of India has internet access.
6. Hacking and cybercrime is also posing challenges to cashless transaction. According to Economic Times report about 3.2 million debit cards information of major banks of India were compromised including SBI, HDFC, YES and AXIS. Digital infrastructure is in nascent stage in India and more prone to cyber frauds and attacks. Establishment of secure and robust payment interface; defence against attacks and institutionalised cyber security architecture is must for going cashless.
7. Financial inclusion is a must for cashless system means that each and every individual in the country must hold bank account with debit/credit cards and should have access to online banking facilities. Though Pradhan Mantri Jan Dhan Yojna was successful in promoting financial inclusion but 23% of these accounts have been found dormant and labelled as zero balance account. RBI's research found that financial inclusion is lower in states with more rural population and higher female population.
8. People are resistant towards the usage of digital payments and they found it complex process to use cards, mobile banking and at PoS terminal. There is a need to run large scale digital literacy program to change the mind-set, attitude and behaviour of people.
9. In India in the year 2014 there were 18 ATMs and 13 bank branches for one lakh adults. 18% ATMs are set up in the rural India.
10. Though the number of debits grew twice during 2013 to 2015, but PoS terminals set up by the banks is nowhere near to counter the cash problem. People might have debit cards but availability of PoS terminals is insignificant.

#### **GOVERNMENT INITIATIVE FOR PROMOTING CASHLESS TRANSACTIONS**

It is very difficult for India to go cashless in such a scenario. RBI is mulling much to overcome demonetization and is promoting new age small finance and payment banks to give a thrust to a financial inclusion and also initiating for innovative banking solutions. There are many people who used electronic mode of payment for the first time because of cash crunch. Shortage of cash has increased the mode of digital payment but still there are number of difficulties in making India cashless. To reduce dependence on cash government is working at various levels. To push cashless transactions government has taken many initiatives like (Press Information Bureau Government of India Ministry of Finance, 08-December-2016 18:20 IST, Package for Promotion of Digital and Cashless Economy):

1. Reduction in the merchant discount rate (MDR) and point of sale (POS) fees
2. Discount of 0.75% on digital payment at central government Petroleum PSUs
3. 10% discount for toll payments on national highways
4. Discount of 0.5% for monthly or seasonal railway tickets on digital payments from 1<sup>st</sup> Jan 2017 on suburban railway networks. Free accidental insurance of up to Rs 10 Lakh on buying online ticket in railways.
5. Discount or credit of up to 10% on the insurance premium sold through the customer portraits of public sector insurance companies on digital payments.
6. 2 POS devices will be deployed in 1 lakh villages with population of less than 10,000. Government through NABARD will extend financial support.
7. Service tax relief on MDR for small transactions. No service tax on digital transaction charges up to Rs. 2000 per transaction.
8. Rural regional banks and cooperative banks have to issue "Rupay Kisan Cards" to 4.32 crore kisan credit card holders. Government will support this through NABARD.
9. Waiver of charges for small value transactions under Immediate Payment Service (IMPS), Unified Payment Interface (UPI) and Unstructured Supplementary Service Data (USSD) based \*99# platform;

broadening Prepaid Payment Instrument (PPI) reach by enhancement of limits; introduction of a new category of PPIs; permitting banks to issue PPIs to a larger set of entities; and permitting National Payments Corporation of India (NPCI) to launch (a) the common app for UPI; and (b) National Electronic Toll Collection (NETC) system.

10. Central Government Departments and PSUs to bear transactions fee/MDR charge on digital payments, State Government being advised to do the same so that the charges related to the digital transactions shall not burden consumers.
11. UPI renders person to person to person as well as merchant to person transaction. BHIM (Bharat Interface for Money), which was recently developed and launched by NCPI will function as a common app for any bank. BHIM app allows money transaction through UPI accounts and also allows payments to users who do not have UPI linked/based bank accounts.

The above mentioned scenario has created perfect market place for various types of digital system. To make the cashless plan work, the Indian government is focusing on all the strategies like financing system, internet and public relations to implement the cashless economy in shortest amount of time. Many people doubt online security and awareness need to be created especially in the rural areas. It could be done with the help of post-offices, cooperative banks, banks and other financial institutions. Along with this educative programs and training is must to help people in installing and using the digital system.

### PAYMENT SYSTEM STATISTICS

Digital transaction activity gradually grew up in December 2016 along with remonetisation. The table below shows a description of selected categories of digital payments system over past few years.

Payment System Indicators						
System	Volume in million					
	2011-12	2012-13	2013-14	2014-15	2015-16	% change
<b>RTGS</b>	55.04	68.52	81.11	92.78	98.34	43.5
<b>CCIL operated Systems</b>	1.87	2.26	2.56	3.03	3.13	38.1
<b>Paper Clearing</b>	1341.87	1313.5	1257.31	1196.51	1096.37	-16.5
<b>Retail Electronic Clearing</b>	512.44	694.07	1108.32	1687.44	3141.53	352.6
<b>NEFT</b>	226.11	394.13	661.01	927.55	1252.88	217.9
<b>Immediate Payment Service</b>	0.1	1.23	15.36	78.37	220.81	17852.0
<b>National Automated Clearing House</b>			86.5	340.17	1404.08	
<b>Cards</b>	5731.61	6398.4	7219.13	8423.99	10038.7	56.9
<b>Credit Cards</b>	322.15	399.13	512.03	619.41	791.67	98.3
<b>Usage at ATMs</b>	2.19	2.52	2.96	4.29	6.00	138.1
<b>Usage at PoS</b>	319.96	396.61	509.08	615.12	785.67	98.1
<b>Debit Cards</b>	5409.46	5999.2	6707.10	7804.57	9247	54.1
<b>Usage at ATMs</b>	5081.92	5530.2	6088.02	6996.48	8073.39	46.0
<b>Usage at PoS</b>	327.54	469.05	619.08	808.09	1173.61	150.2
<b>Prepaid Payment Instruments</b>	30.6	66.94	133.63	314.46	748.02	1017.4
<b>m-wallet</b>		32.7	107.51	255	603.98	1747.0
<b>PPI Cards</b>		33.76	25.60	58.91	143.47	325.0
<b>Paper Vouchers</b>		0.48	0.53	0.55	0.56	16.7
<b>Mobile Banking</b>	25.56	53.30	94.71	171.92	389.49	630.8

Source: RBI Monthly Bulletin, Various Issues, Table No.43: Payment System Indicators.

Payment System Indicators							
System	Value In Rupees Billion						
	2011-12	2012-13	2013-14	2014-15	2015-16	% change	% change
<b>RTGS</b>	1079790.59	1026350.05	904968.04	929332.89	1035551.64	14.4	11.4
<b>CCIL operated Systems</b>	406071.18	501598.49	621569.63	752000.42	807370.42	29.9	7.4
<b>Paper Clearing</b>	99012.14	99982.25	93316.04	85434.14	81860.79	-12.3	-4.2
<b>Retail Electronic Clearing</b>	20575.3	31881.14	47856.29	65365.51	91408.14	91.0	39.8
<b>NEFT</b>	17903.5	29022.42	43785.52	59803.83	83273.11	90.2	39.2
<b>Immediate Payment Service</b>	0.42	4.33	95.81	581.87	1622.26	1593.2	178.8
<b>National Automated Clearing House</b>			214.81	1220.88	3801.83	1669.9	211.4
<b>Cards</b>	15510.77	18637.36	22159.58	25415.27	29397.65	32.7	15.7
<b>Credit Cards</b>	978.73	1243.93	1556.72	1922.63	2437.02	56.5	26.8
<b>Usage at ATMs</b>	12.6	14.42	16.87	23.47	30.41	80.3	29.6
<b>Usage at PoS</b>	966.13	1229.51	1539.85	1899.16	2406.62	56.3	26.7
<b>Debit Cards</b>	14532.05	17393.44	20602.86	23492.65	26960.63	30.9	14.8
<b>Usage at ATMs</b>	13997.73	16650.08	19648.35	22279.16	25371.36	29.1	13.9
<b>Usage at PoS</b>	534.32	743.36	954.51	1213.49	1589.27	66.5	31.0
<b>Prepaid Payment Instruments</b>	62.01	79.22	81.05	213.42	487.58	501.6	128.5
<b>m-wallet</b>		10.01	29.05	81.84	205.84	608.6	151.5
<b>PPI Cards</b>		49.62	28.36	105.35	253.77	794.8	140.9
<b>Paper Vouchers</b>		19.6	23.63	26.24	27.97	18.4	6.6
<b>Mobile Banking</b>	18.21	59.90	224.18	1035.3	4040.91	1702.5	290.3

Source: RBI Monthly Bulletin, Various Issues, Table No. 43: Payment System Indicators.

Government is striving hard to adopt comprehensive digital mode of payment for economic transactions. The tables above show that the mode of digital payment has grown gradually over the last five years. Over the period 2011-12 to 2015-16, development of payment system, both in volume and value terms is observable.

Volume of electronic transaction is low as compared to transaction through cards or prepaid payment instruments. Volume of transactions may be more through card payments and prepaid payment instruments as these are one to one but the comparative value is less. Government has announced many incentive schemes such as Lucky Grahak yojana for consumers, and the Digi Dhan Vyapar yojana for merchants to promote digital modes of payments.

## SUGGESTIONS

Efforts are being made to augment the recognition of digital payments in India, it is equally important to ensure safety and security of such transactions. Furthermore digital transactions should be incentivised more so as to bring the behavioural shift and to increase the base of consumers carrying on cashless transactions. People in India are habitual of cash based transaction and they finds that the procedures of digital transactions are complex. Therefore the process of digital transaction should be made easier and training at root level should be provided to the citizens. Government is promoting cashless payment system through newspapers, television etc. and some sort of training programs are also in progression. People have access to television and some training programs for deploying digital transactions could be broadcasted on television. It will bring the attitudinal change and will help in building confidence in the senior citizens and rural people towards the usage of cashless transaction system. This will make people aware about the cashless alternatives available to them and gradually they will use it practically.

Privacy and security issues are also associated with cashless transactions. Biometric authentication of individuals in digital transaction will reduce the risk of cybercrimes and frauds. It will take some time to develop digital systems using biometric authentication for cashless transactions. However internet connectivity is not so good in each area of the country but digital transactions are not in routine by all the people who have good internet access. Widespread practical training program will help the people in using digital mode of payments.

**CONCLUSION**

Indian government is trying to comprehend the goal of cashless economy which could only be realized by the participation of people. Certainly participation by citizens through digital payment gateways has increased. But for complete adoption of cashless transaction system it is essential that awareness and education about the digital mode of payment is to be raised up. Indian government took the step of demonetization and encouraged digital transactions. Demonetization was expected to be a relevant measure to curb down the black money, money laundering in various criminal, corruption, terrorist and illegal activities. Insights have been collected and assembled on the current issues of demonetization and digital transaction and the paper gives insight into the challenges and opportunities that are present in the Indian economy and also elucidates the Indian government's long term ambitions of cashless economy in the country.

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**DETERMINATION OF OPTIMIZED GAIN VALUE FOR A TWO AREA INTERCONNECTED SYSTEMS WITH ENERGY SOURCES IN DEREGULATED ENVIRONMENT****G. Ganesan @ Subramanian<sup>1</sup>, Dr. I. A. Chidambaram<sup>2</sup> and J. Samuel Manoharan<sup>3</sup>**Research Scholar<sup>1</sup> and Professor<sup>2</sup>, Annamalai University, Annamalainagar, ChidambaramProfessor<sup>3</sup>, Bharathiyar College of Engineering & Technology, Karaikal**ABSTRACT**

*This manuscript deals with a new methodology of attaining the results of various energy sources in an integrated market systems treated in a deregulated environment. Using integral square error criterion, optimal controller gains  $K_P$ ,  $K_I$  are determined through a conventional PI controller based on the performance index curves in Thermal – Thermal, Hydro – Thermal, Thermal-Diesel, Thermal-Gas and Thermal-Gas systems. An allowable disturbance of 0.1% is also introduced for the above systems using Matlab simulink under regulated environment with bilateral contracts. The simulated results shows the improved dynamic response for two area Thermal – Thermal systems gives satisfactory operation and remains stable.*

**Keywords:** Load- Frequency Control (LFC), PI controller, Energy sources, Integral square area criterion, Automatic Generation Control (AGC).

**I. INTRODUCTION**

The wide-spread use of electric clocks, the need for satisfactory operation of power stations running in parallel and the relation between system frequency and the speed of the motors has led to the requirement of close regulation of power system frequency. Since the control of system frequency and load depends upon the governors of the prime movers we must understand governor operation.

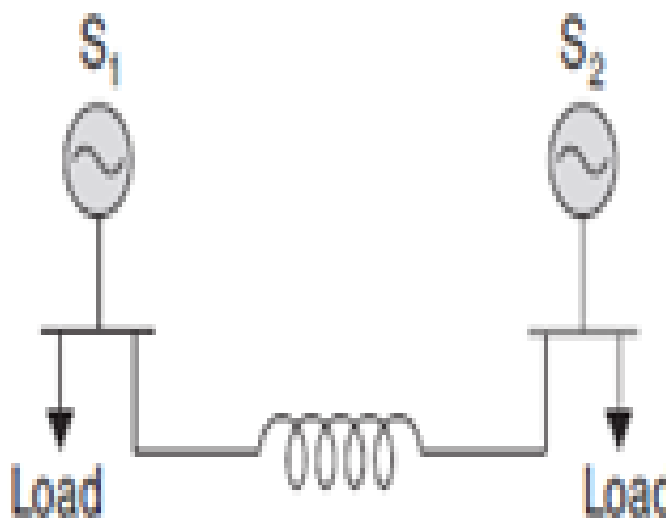


Fig-1: Two plants connected through tie-line

If the system consists of a single machine connected to a group of loads the speed and frequency change in accordance with the governor characteristics as the load changes. If it is not important to keep frequency constant no regulation control is required. The frequency normally would vary by about 5% between light load and full load conditions. On the other hand if constant frequency is required the operator can adjust the speed of the turbine by changing the governor characteristic as and when desired. If a change in load is taken care of by two machines running in parallel as shown in Fig. 20.2, the complexity of the system is increased. The possibility of sharing the load by the two machines is as follows: Say, there are two stations  $S_1$  and  $S_2$  interconnected through a tie-line. If the change in load is either at  $S_1$  or  $S_2$  and if the generation of  $S_1$  alone is regulated to adjust this change so as to have constant frequency, the method of regulation is known as Flat Frequency Regulation. Under such situation station  $S_2$  is said to be operating on base load. The major drawback of flat frequency regulation is that  $S_1$  must absorb all load changes for the entire system thereby the tie-line between the two stations would have to absorb all load changes at station  $S_2$  since the generator at  $S_2$  would maintain its output constant. The operation of generator  $S_2$  on base load has the advantages when  $S_2$  is much more efficient than the other station and it is desirable to obtain maximum output of  $S_2$ .

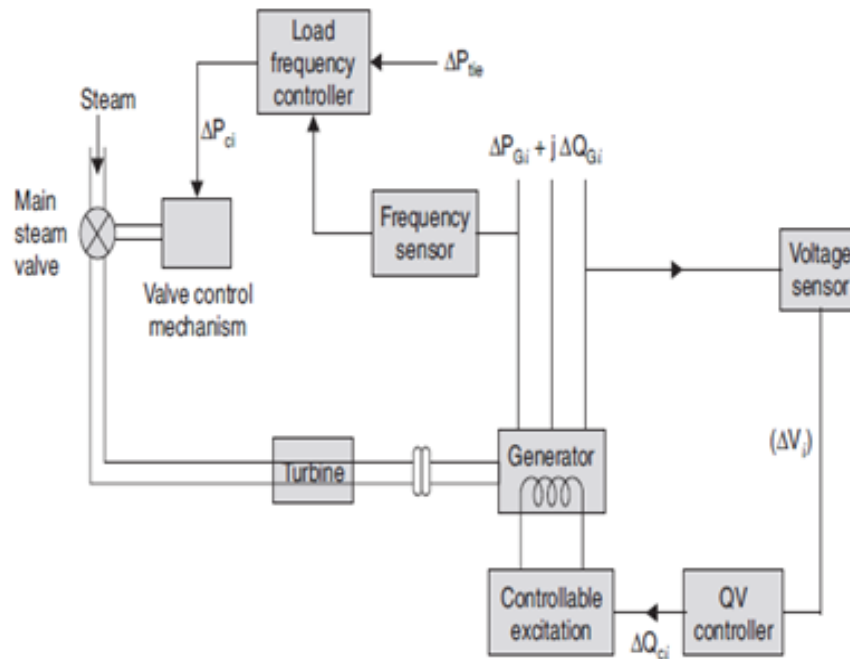


Fig-2: Schematic diagram of load frequency and excitation voltage regulators of a turbo-generator

The main objective of the load frequency controller is to exert control of frequency and at the same time of real power exchange via the outgoing lines. The change in frequency and the tie-line real power are sensed which is a measure of the change in rotor angle  $\delta$ , i.e., the error  $\Delta\delta$  is to be corrected. The error signals, i.e.,  $\Delta f$  and  $\Delta P_{tie}$  are amplified mixed and transformed into a real power command signal  $\Delta P_{ci}$  which is sent to the prime mover to call for an increment in the torque. The prime mover, therefore, brings change in the generator output by an amount  $\Delta P_{Gi}$  which will change the values of  $\Delta f$  and  $\Delta P_{tie}$ . The process continues till the deviation  $\Delta f$  and  $\Delta P_{tie}$  are well below the specified tolerances.

## II. MODELLING OF POWER SYSTEMS IN A DEREGULATED ENVIRONMENT

### A. Two area Hydro – Thermal system

Fig.3 shows the Thermal non reheat power system and Fig.4 shows Reheat Power System with GRC and GDB non-linearities [3]. The contractual power exchange between any two areas is being carried out by tie line. The amount of power transfer is directly proportional to the strength of tie line. Recently there is a voice to increase more interconnection of hydro and thermal areas rather than thermal, due to easy availability of water source. The following section describes the modeling of thermal and hydro system separately.

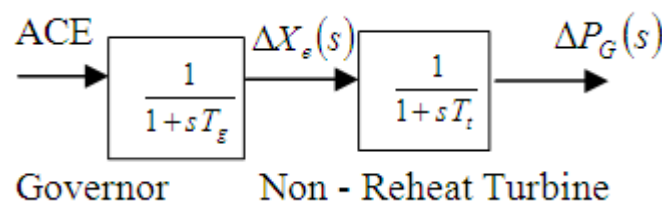


Fig-3: Thermal non-Reheat Power System

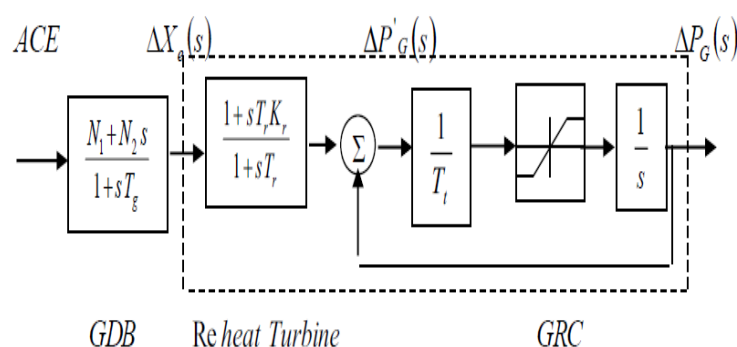


Fig-4: Transfer function of a Thermal Reheat Power System with GRC and GDB non-linearities

Simulation of the hydro-thermal model needs to develop the same. Here, transfer function model of LFC system is proposed. Each component in the LFC system is modeled in block diagram with the help of transfer function, say, governor, turbine, power system etc.

### B. Two area Thermal – Diesel system

Diesel generating sets are used in places without connection to a power grid, or as emergency power-supply if the grid fails, as well as for more complex applications such as peak-logging, grid support and export to the power grid [5].

Proper sizing of diesel generators is critical to avoid low-load or a shortage of power. Sizing is complicated by the characteristics of modern electronics, specifically non-linear loads. In size ranges around 50 MW and above, an open cycle gas turbine is more efficient at full load than an array of diesel engines, and far more compact, with comparable capital costs; but for regular part-loading, even at these power levels, diesel arrays are sometimes preferred to open cycle gas turbines, due to their superior efficiencies. The diesel electric power plants are used as Peak load plant and can be easily started or stopped at a short notice to meet the peak demand or as Mobile plants which can be mounted on trailers can be used for temporary or emergency purposes or as standby unit.

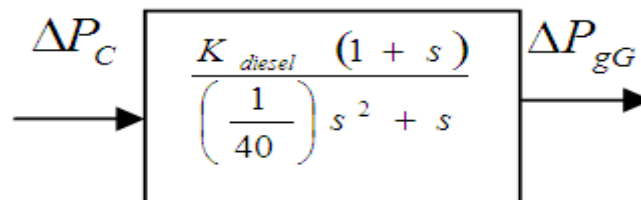


Fig-5: Transfer Function representation of a Diesel Power Plant

The diesel power plant has the following drawbacks like high operating cost, high maintenance and lubrication cost, capacity is restricted, Noise problem, cannot supply overload, unhygienic emissions and the life of the diesel power plant is less (7 to 10 years) as compared to that of a steam power plant which has a life span of 25 to 45 years.

### C. Two area Thermal - Gas Power Plant system

Gas turbines are used to power aircraft, trains, ships, electrical generators, pumps, gas compressors and tanks [6]. A power station, also referred to as a power plant or power house and sometimes generating station or generating plant, is an industrial facility for the generation of electric power. Most power stations contain one or more generators, a rotating machine that converts mechanical power into electrical power. The relative motion between a magnetic field and a conductor creates an electrical current. The energy source harnessed to turn the generator varies widely. Most power stations in the world burn fossil fuels such as coal, oil, and natural gas to generate electricity. Others use nuclear power, but there is an increasing use of cleaner renewable sources such as solar, wind and wave.

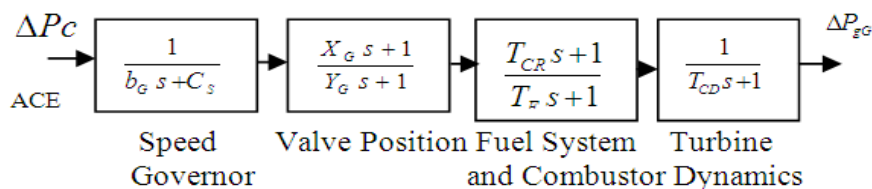


Fig-6: New transfer function LFC model with single stage reheat turbine in heavy duty gas system area are considered for deregulated environment.

### D. Two area Thermal – Thermal system

The model for Thermal – Thermal system interconnected power systems with integral control scheme to design optimal controllers and stability studies of these power system models have been dealt with in this area. The discrete versions of these power system models have also been obtained [13-14].

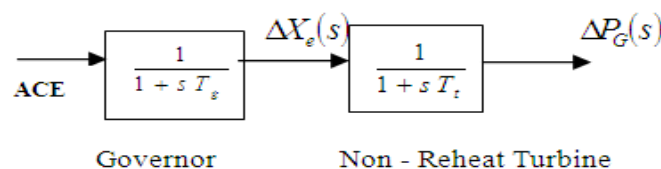


Fig-7: Transfer function of a Thermal Non-Reheat Power System



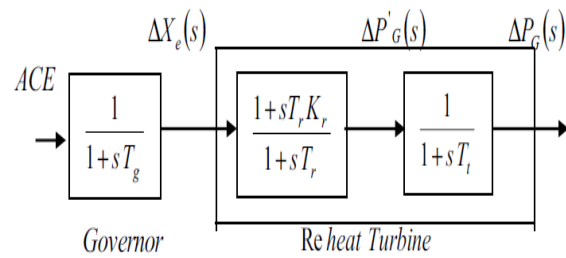


Fig-8: Transfer function of a Thermal Reheat Power System

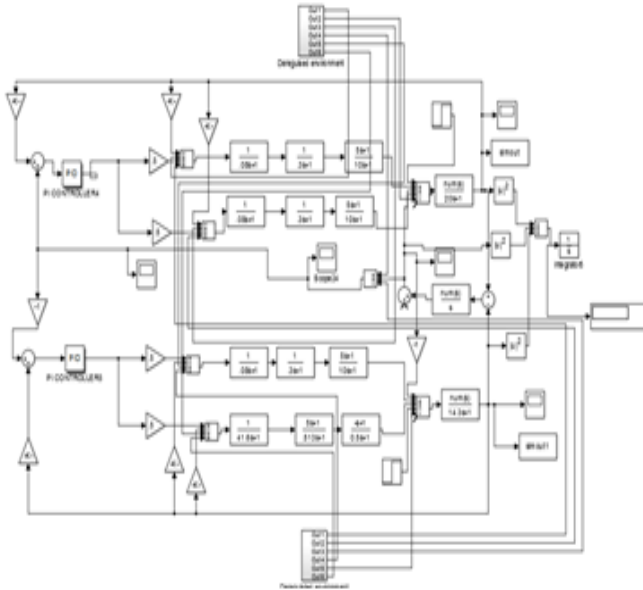


Fig-9: Simulation model of Two area Hydro – Thermal System

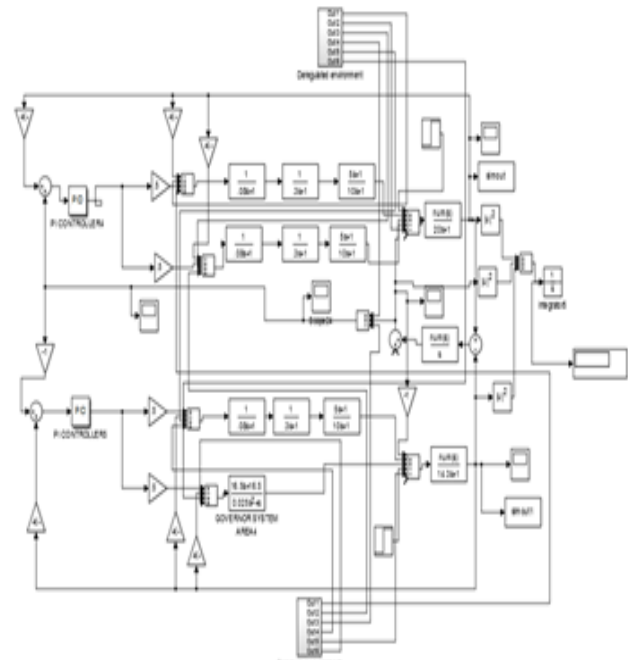


Fig-10: Simulation model of Two area Thermal - Diesel System

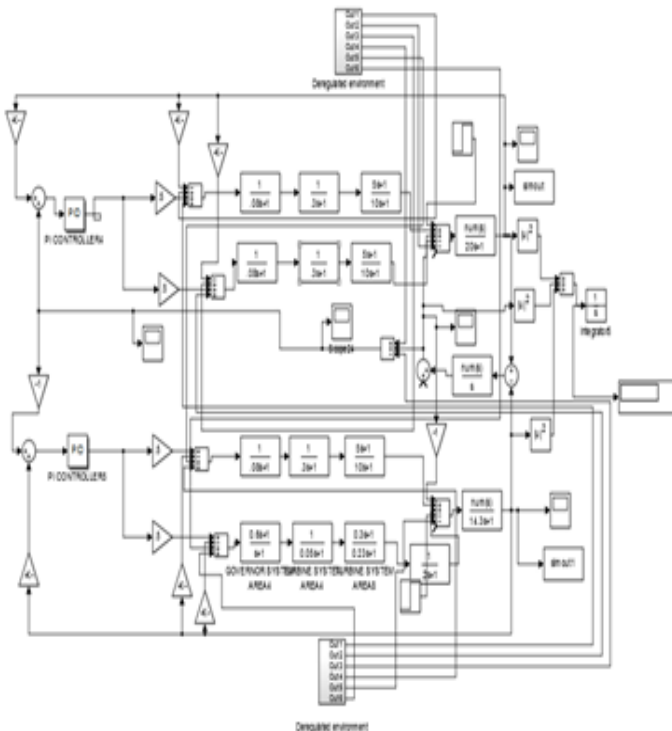


Fig-11: Simulation model of Two area Thermal - Gas System

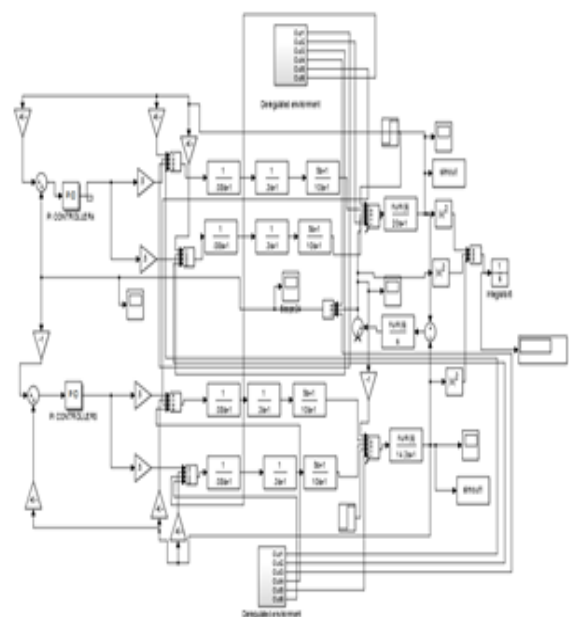


Fig-12: Simulation model of Two area Thermal – Thermal System

### III. SIMULATION RESULTS AND INTERPRETATIONS

The below figures shows the two area power systems with energy sources and their fast response

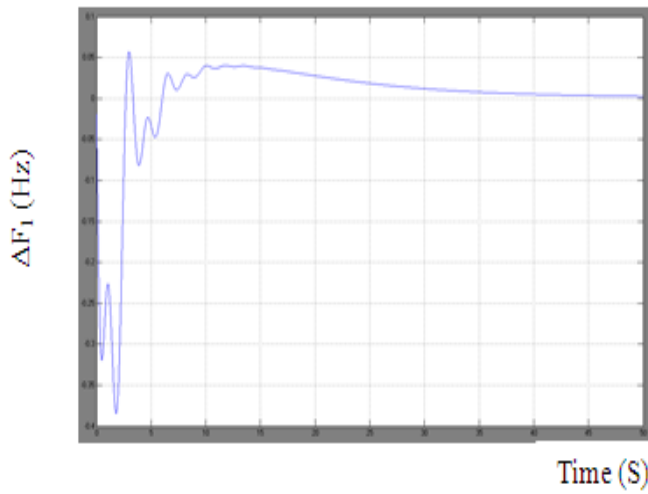


Fig-13:  $\Delta F_1$  (Hz) vs Time (s) for two area hydro-thermal system

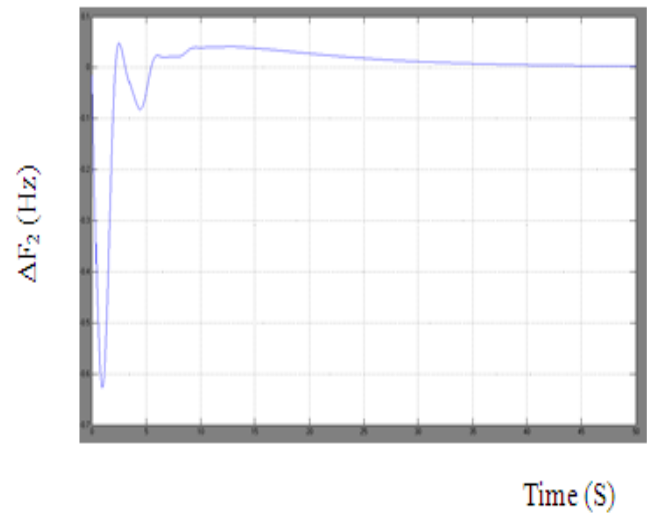


Fig-14:  $\Delta F_2$  (Hz) vs Time (s) for two area hydro-thermal system

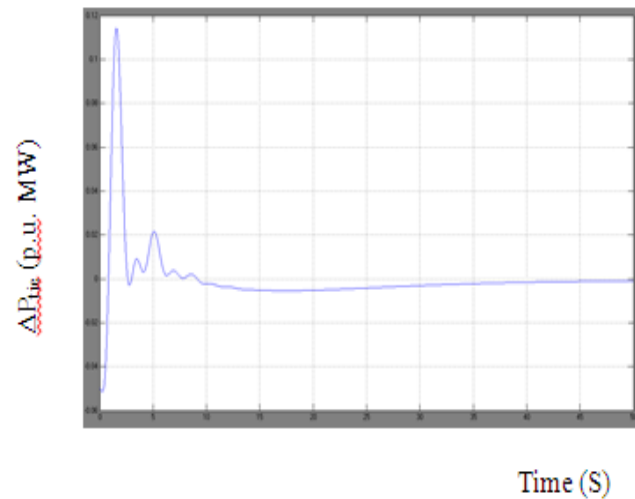


Fig-15:  $\Delta P_{the}$  (p.u. MW) vs Time (s) for two area hydro-thermal system

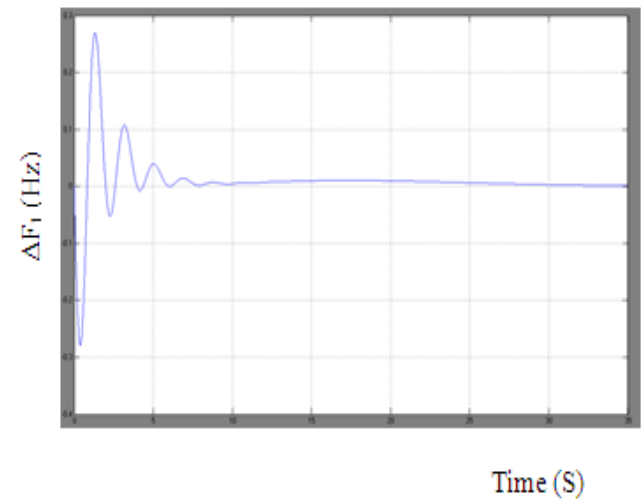


Fig-16:  $\Delta F_1$  (Hz) vs Time (s) for two area thermal-diesel system

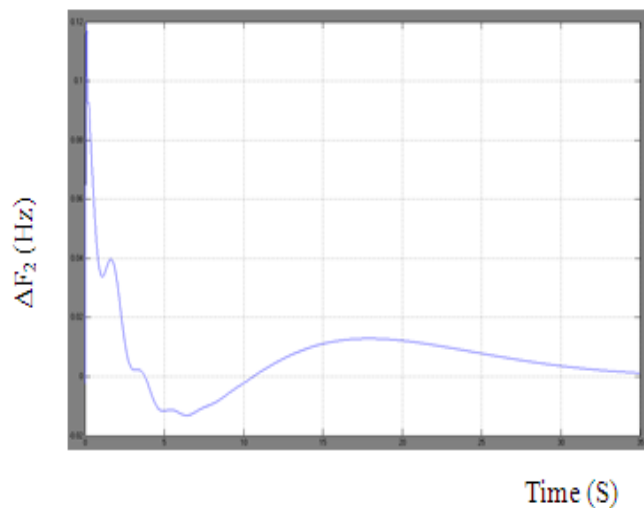


Fig-17:  $\Delta F_2$  (Hz) vs Time (s) for two area thermal-diesel system

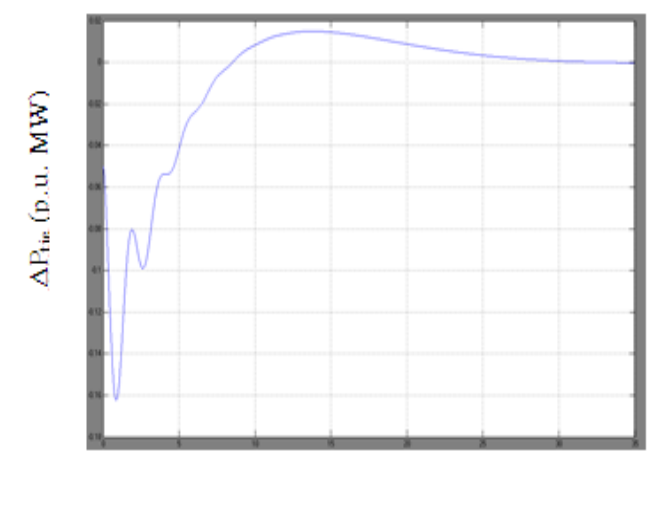


Fig-18:  $\Delta P_{the}$  (p.u. MW) vs Time (s) for two area thermal-diesel system

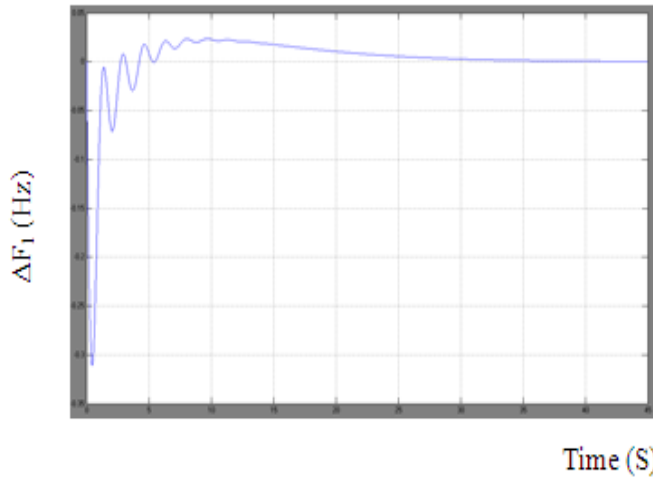


Fig-19:  $\Delta F_1$  (Hz) vs Time (s) for two area thermal – gas system

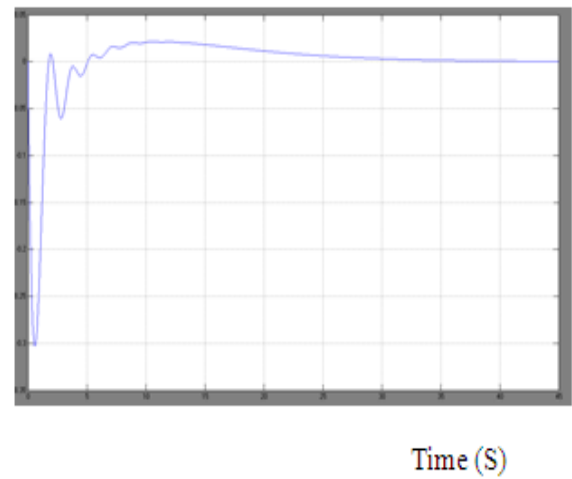


Fig-20:  $\Delta F_2$  (Hz) vs Time (s) for two area thermal – gas system

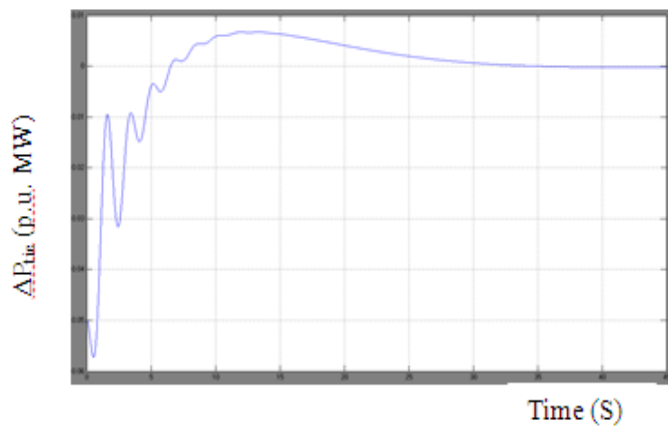


Fig. 21:  $\Delta P_{tie}$  (p.u. MW) vs Time (s) for two area thermal – gas system

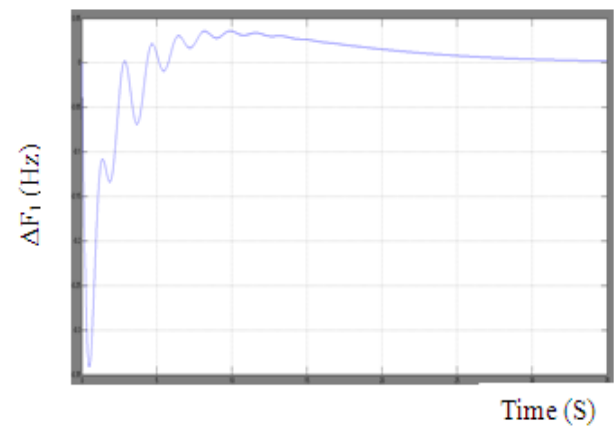


Fig. 22:  $\Delta F_1$  (Hz) vs Time (s) for two area thermal – thermal system

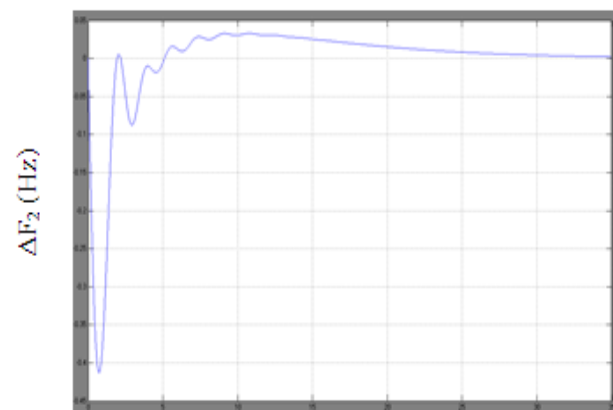


Fig. 23:  $\Delta F_2$  (Hz) vs Time (s) for two area thermal – thermal system

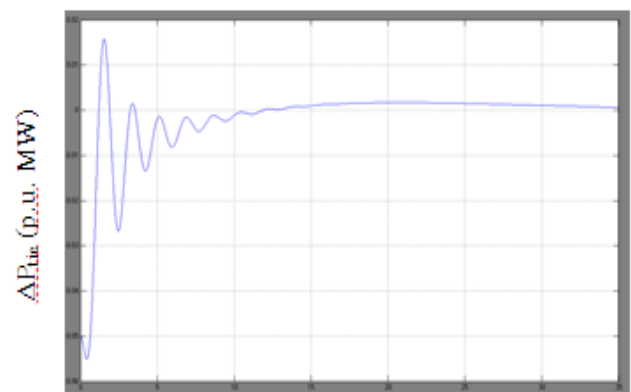


Fig. 24:  $\Delta P_{tie}$  (p.u. MW) vs Time (s) for two area thermal – thermal system

Table-1: Optimum gain values for energy source of RPS in deregulated field.

Plant	Controller	Area - I		Area - II	
		$K_P$	$K_I$	$K_P$	$K_I$
Thermal – Thermal RPS with Hydro unit	PI controller	0.3884	0.232	0.1210	0.175
Thermal –Thermal RPS with Diesel unit		0.3185	0.267	0.3102	0.2903
Thermal –Thermal RPS with Gas unit		0.380	0.250	0.1216	0.168
Thermal –Thermal RPS with Thermal unit		0.3169	0.2012	0.1208	0.162

The simulation results obtained shown in Table. 1 reveals that the dynamic response of the system of the two-area interconnected Restructured Power System (RPS) with energy source ensures a better dynamic response than that of the RPS without energy source unit. Integral square Error (ISE) technique is used to obtain the optimum PID-controller gains.

## CONCLUSION

In transient stability analysis, the power interchange between two area system with different units has been carried out with their frequency domain study. The frequency response of two area deregulated systems supported by Thermal-Thermal units gives best and robust operation. A new version of Load frequency control with a new reach of obtaining the results of various energy sources in a integrated market systems with a deregulated environment shows that two area Thermal – Thermal systems can be suggested for all operations instead of the second area be Hydro, Diesel and Gas.

## APPENDIX

### a. Hydro – Thermal [19]

Rating of each area = 2000 MW, Base power = 2000 MVA,  $f^0 = 60$  Hz,  $K_{p1} = K_{p2} = 120$  Hz / pu MW,  $T_{p1} = T_{p2} = 32$  sec,  $T_{t1} = T_{t2} = 0.25$  sec,  $T_{g1} = T_{g2} = 0.25$  sec,  $R_1 = R_2 = 5$  Hz / pu MW,  $\beta_1 = \beta_2 = 0.2083$  pu MW / Hz,  $T_{12} = 0.5441$  pu MW / Hz,  $a_{12} = -1$ ,  $\Delta P_{D1} = 0.01$  pu MW

### b. Thermal –Diesel [15]

$K_{\text{diesel}} = 16.5$ ,  $X_G = 0.6$ sec,  $Y_G = 1.1$  sec

### c. Thermal - Gas turbine [16]

$b_G = 0.049$ sec,  $C_s = 1$ Farad,  $T_{CR} = 0.01$ sec,  $T_F = 0.239$ sec,  $T_{CD} = 0.2$ sec

### d. Thermal – Thermal [13]

Rating of each area = 2000 MW, Base power = 2000MVA, Frequency = 60 Hz, Power System gain =  $K_{pi} = 120$  Hz/p.u MW, Power system time constant  $T_{pi} = 20$  s, Speed regulation coefficient of each area  $R_i = 2.4$  Hz/p.u MW, Generator time constant  $T_{gi} = 0.08$  s, Turbine time constant  $T_{ti} = 0.3$  s, Frequency bias coefficient  $\beta_i = 0.425$  p.u MW/Hz

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**EFFECT OF SOME OXA-AZA HETEROCYCLES ON SEED GERMINATION OF TRITICUM AESTIVAM L (WHEAT) AND CUCURBITA MAXIMA L. (CUCUMBER)****Deelip K. Swamy<sup>1</sup>, M. V. Deshmukh<sup>2</sup> and S. V. Palande<sup>3</sup>**Assistant Professor<sup>1</sup>, Department of Chemistry, Pratibha Niketan Mahavidyalaya, Nanded<sup>2</sup>P.G. Department of Chemistry, Science College, NandedAssistant Professor<sup>3</sup>, Department of Chemistry, VIVA College, Mumbai**ABSTRACT**

Present investigation deals with bioassaying of synthesized Triazolobenzisoxazole compounds namely 1,2,4-triazolo-(3,4-b)1,2-benzisoxazole and 3-hydroxy-1,2,4-triazolo-(3,4-b)1,2-benzisoxazole. The compounds were used to find out their plant regulatory activity in the confined environment of laboratory. Experiment was undertaken to investigate their effect on germination of seeds of two plants viz. *Triticum aestivum* L (Wheat) and *Cucurbita maxima* L. (Cucumber).

**Keywords:** 3-hydroxy-1,2,4-triazolo-(3,4-b)1,2-benzisoxazole, plant regulatory activity, seed germination, 1,2,4-triazolo-(3,4-b)1,2-benzisoxazole.

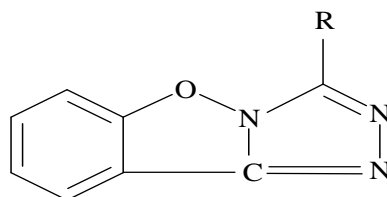
**INTRODUCTION**

In the biological process physiology of the plant, growth & development are related to the chemical reaction taking place in the plant bodies. From the earlier reports it is found that some of the fused triazole systems are very active as plant protective agents and as plant growth stimulants. Allen<sup>1</sup> reported wide applications of 3-amino 1,2,4-triazole. Amizol and some of its derivatives have been found to be useful as defoliants. The defoliating effect of this compound appears to be due to the destruction of chlorophyll<sup>2</sup>. Much work was carried out on the chemical nature of auxins<sup>3,4,5</sup>. Some derivatives of the following type Indole-3-acetaldehyde, Indole-3-pyruvic acid, Indole-3-acetonitrile, Indole-3-ethanol, indicated their close relationship to the parent structure Indoleacetic acid. The effect of Benzothiazolyl hydrazones and naphthathiazolyl hydrazones on seed germination was studied for the seeds of Wheat, Kakadi and Devdangar<sup>6</sup>. The compounds synthesized were evaluated for various types of bioassay screening. Hence, studies were undertaken to observe the effect of the synthesized compounds on seed germination. For this purpose the seeds of Wheat and Cucumber were selected.

**EXPERIMENTAL****Materials and Physical measurements**

The chemicals and reagents used for the synthesis were obtained from commercial sources. Solvents were distilled from an appropriate drying agent. All other chemicals and solvents were of analytical grade.

Triazolobenzisoxazoles namely 1,2,4-Triazolo-(3,4-b)1,2-benzisoxazole<sup>7</sup> analogue of 1,2,4-triazolo(3,4-b)1,2-benzothiazole<sup>8</sup> and 3-Hydroxy-1,2,4-triazolo-(3,4-b)1,2-benzisoxazole were prepared<sup>7</sup>.



R= H: 1,2,4-Triazolo-(3,4-b)1,2-benzisoxazole

R= OH: 3-Hydroxy-1,2,4-triazolo-(3,4-b)1,2-benzisoxazole

Fig-1: Structure of Triazolobenzisoxazoles

**Seed Germination**

Ten seeds of each plant were soaked in 50 ml of 5 ppm solutions of the compounds for 4 hrs. The seeds were then spread on wet filter paper in petridishes. The Petridishes and filter paper were sterilized before use. The filterpapers were moistened with solutions of the compounds. The experiment was conducted for seven days and percentage germination, shoot length, fresh weight and dry weight were measured. Carbohydrate content was estimated by anthrone method (Yemm and Willis, 1954) at the end of fourth day. A set of control and standard (Indole acetic acid 5 ppm, Cytokinin 5 ppm and Gibberellic acid 5 ppm) was also kept for comparison. The results obtained are presented in tables 1-2.

**RESULTS AND DISCUSSION**

a) Effect of some triazolobenzisoxazole on the germination of *Triticum aestivum* (Wheat).

Sr. No.	Treatment/ R	% Germination	Fresh Wt. (gm)	Dry Wt. (gm)	Length of root (cm)	Length of shoot (cm)	pH	Conductance (mhos)	Protein (µg/ml)	Carbohydrate (µg/ml)
1.	-H	40	0.47	0.018	7.33	3.3	6.89	1.29	375	17.0
2.	-OH	40	0.47	0.014	5.7	2.2	6.75	1.30	400	15.0
3.	Water	70	0.65	0.018	5.02	2.34	7.0	1.32	500	19.0
4.	Cytokinin	80	0.53	0.016	3.72	5.07	6.90	1.35	700	13.2
5.	Gibberellic acid	90	1.13	0.020	4.15	3.75	6.83	1.40	600	18.1
6.	Indole acetic acid	60	0.71	0.021	5.03	3.28	6.69	1.28	450	20.0

**Table-1**

The results presented in table (1) indicate that the percentage germination is somewhat less than control and standard but shoot lengths are much more larger than the standards. As regards the residual weight the best results were with cytokinin. Dry weight is more in simple triazolo-(3,4-b)1,2-benzisoxazole than 3-hydroxy-1,2,4-triazolo-(3,4-b)1,2-benzisoxazole. The shoot length in 3-hydroxy-1,2,4-triazolo-(3,4-b)1,2-benzisoxazole is less than un-substituted triazolobenzisoxazole. Presence of hydroxyl group has got inhibitory effect on shoot lengths. As far as protein values are concerned the value is more in 3-hydroxy as compared to unsubstituted compound but when we compare this result with carbohydrate it is found that carbohydrate contents are more in 1,2,4-triazolo-(3,4-b)1,2-benzisoxazole where as it is less with 3-hydroxy- compound. pH values are almost neutral with slight variation in Gibberellic acid and 1,2,4-triazolo-(3,4-b)1,2-benzisoxazole. Results are inclined towards acidity, might be due to acidic compound formation during physiological changes.

It is also observed that when the conductance is decreased shoot length increases in the treated compound. Protein values also show some sort of interrelation in treated compound though the protein contents are more, root length increases, strange enough cytokinin treated seeds show the highest protein value while the shoot length is more.

In the treated compound root length is more as compared to shoot length; it is nearly 2.5 times more than shoot length. Reverse is the case in cytokinin treated seeds where shoot length is more and root length is lowest compared to other treatments.

When comparison is done between 3-hydroxy1,2,4-triazolo-(3,4-b)1,2-benzisoxazole and simple 1,2,4-triazolo-(3,4-b)1,2-benzisoxazole the results are better Gibberellic acid treated seeds are giving good results with simple 1,2,4-triazolo-(3,4-b)1,2-benzisoxazole.

b) Effect of some triazolobenzisoxazole on the germination of *Cucumis sativus* (Cucumber).

Sr. No.	Treatment/ R	% Germination	Fresh Wt. (gm)	Dry Wt. (gm)	Length of root (cm)	Length of shoot (cm)	pH	Conductance (mhos)	Protein (µg/ml)	Carbohydrate (µg/ml)
1.	-H	70	2.18	0.392	6.21	7.14	6.72	1.48	725	37
2.	-OH	60	1.48	0.236	4.98	4.98	6.78	1.35	900	35
3.	Water	50	1.98	0.270	5.20	6.40	7.20	1.32	800	30
4.	Cytokinin	90	1.00	0.198	0.55	0.99	7.00	1.41	200	20
5.	Gibberellic acid	60	0.73	0.124	1.61	2.36	6.92	1.50	575	31
6.	Indole acetic acid	90	1.52	0.241	3.20	4.67	6.98	1.31	800	17

**Table-2**

The next seed selected are from the family of (*Cucumis sativus*). In this case percentage germination of seed is identical to the germination of Gibberellic acid but less than cytokinin and Indoleacetic acid. The results with compounds are definitely better than control. The residual weight with simple 1,2,4-triazolo-(3,4-b)1,2-benzisoxazole is the highest even better than the results with cytokinin, gibberellic acid and Indoleacetic acid. While results with 3-hydroxy-1,2,4-triazolo-(3,4,-b)-benzisoxazole are identical with Indoleacetic acid. Cytokinin and Gibberellic acid practically reduces the dry weight. Protein contents are highest with 3-hydroxy1,2,4-triazolo-(3,4-b)1,2-benzisoxazole where as the results with parent compound is more or less like Indoleacetic acid and the results are compared with cytokinin and 3-hydroxy1,2,4-triazolo-(3,4-b)1,2-benzisoxazole, protein values are nearly four times greater a worth noting factor. pH does not show any marked changes. It is almost same in all. The highest conductance is with Gibberellic acid next to it is simple 1,2,4-triazolo-(3,4-b)1,2-benzisoxazole. Cytokinin stands third, in other treatment conductance is almost equal. In this experiment we find when the conductance is in between 1.31 to 1.35 protein contents are in between 800 to 900 µg/ml. As the conductance increases protein contents are reduced.

Shoot lengths are more in treated compounds as compared to the standards taken. In cytokinin shoot and root lengths are negligible which shows there is no marked influence or there may be inhibition in germination. In general results are good with the treated compounds. In between three standards Indoleacetic acid appears to be more effective.

### CONCLUSION

The results from all the tables indicate that the oxa-aza compounds are showing plant regulatory activity for Cucumber with more germination for 1,2,4 triazolo-(3,4,-b)1,2-benzisoxazole and 3-hydroxy-1,2,4-triazolo-(3,4,-b)1,2-benzisoxazole. However both the compounds, which are growth promoter for Cucumber, are found to be retarder for Wheat.

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**EMOTIONAL INTELLIGENCE AND INNOVATIVE WORK BEHAVIOUR: EVIDENCE FROM BANKING SECTOR OF J&K**

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**ABSTRACT**

*The study aims at exploring the impact of Emotional Intelligence of banking employees on their Innovative Work Behaviour (IWB). The impact is examined through an empirical study involving 246 banking employees of three major banks of Kashmir region, using correlation and regression analysis. The results revealed that Emotional Intelligence of employees positively and significantly influenced the Innovative Work behaviour among the employee surveyed.*

*Keywords: Emotional Intelligence, Innovative Work behaviour, Banking Sector.*

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**INTRODUCTION**

In the face of globalization and rapid technological advancements, Organisations are encountering the challenges of varying customer demands and increased competition. Ganadela (2006) confirms that organisations have recently been facing pressures and challenges, highlighted in the lack of available resources, the multiplicity of objectives, the low levels of productivity, increasing societal needs, the low level of satisfaction of beneficiaries and employees, etc. To ensure the survival and continuity in the light of the rapid changes and to maintain a competitive edge, organisations requires dynamic changes and need to bring innovation in their product, service; introduce new technology, new managerial or administrative practices and bringing changes in all the other elements of the organisation. To build an innovative workplace employees are heavily relied upon and must bring innovations in their processes, methods and operations (Ramamurthy *et al.*, 2005). In order to be effective and ensure long-term success in this endeavor, organisations shouldn't confine innovation only to the research and development professionals but should also encourage and develop the innovative potential of all of their employees and promote innovative work behaviour (IWB). Innovative Work Behaviour helps to develop new and creative ideas and encompasses their implementation. IWB among employees is of crucial importance for organisations in order to match the customer expectations and remain competitive in the market. Consequently, a myriad of research studies have been conducted in order to identify the factors that cultivates and promotes the innovative work behaviour among employees. In particular, Emotional Intelligence (EI) has been identified as one of the key contributor in enhancing IWB (Jafri *et al.*, 2016). Fenwick (2003) found that emotion plays an important role in employees' readiness to create and innovate. A central motivator for the employees is the link of their personal project to a worthwhile social purpose, which embedded both identity and desire and which in turn, fueled innovative learning (Fenwick, 2003). The present study aims to empirically test and measure the relationship between Emotional Intelligence of the employees and Innovative Work Behaviour in context of financial institutions. The justification of the present study lies in the fact that the current theoretical understanding of the consequences of organisational climate is largely based on the studies conducted in western contexts lacking evidence in Asian perspective.

**EMOTIONAL INTELLIGENCE**

Emotional Intelligence is a construct that is still evolving having emerged in the last two decades. Mayer and Salovey (1993) defined emotional intelligence as "the ability to perceive emotions, to access and generate emotions so as to assist thought, to understand emotions and emotional knowledge and to reflectively regulate emotions so as to promote emotional and intellectual growth". Emotional Intelligence has its roots in the concept of 'social intelligence', first identified by E.L. Thorndike in 1920. Emotional Intelligence (often given the acronym EQ, the emotional-intelligence equivalent of IQ) encompasses social intelligence and emphasizes the affect of emotions on our ability to view situations objectively and thus to understand ourselves and other people. It is the ability to sense, understand, and effectively apply the power of emotions, appropriately channeled as a source of energy, creativity and influence.

There is a plethora of definitions on the term "Emotional Intelligence" given by prominent authors. Gardner (1983) described Emotional Intelligence as "encompassing adaptive skills, whereby an emotionally intelligent person has a deep awareness of his/her emotions and the ability to label and draw upon those emotions as a resource guide to guide one's behaviour". Salovey and Mayer (1990) defined Emotional Intelligence as "the subset of social intelligence that involves the ability to monitor one's own and other's feelings and emotions, to discriminate among them and to use this information to guide one's thinking and actions". In the opinion of Goleman (1995) "Emotional Intelligence is being able to motivate oneself and persist in the face of frustrations;

to control impulses and delay gratification; to regulate one's mood and keep distress from swamping the ability to think; to empathise and to hope". Cooper and Sawaf (1997) define Emotional Intelligence as "the ability to sense, understand and effectively apply the power of and acumen of emotions as a source of human energy, information, trust, creativity and influence". Goleman (1998) observes "Emotional Intelligence is the capacity for recognising our own feelings and those of others, for motivating ourselves, and for managing emotions well in ourselves and in our relationships". According to Bar-On (2000) "Emotional Intelligence is an array of non-cognitive capabilities, competencies and skills that influences one's abilities to succeed in coping with environmental demands and pressures".

### INNOVATIVE WORK BEHAVIOUR

Innovative Work Behaviour (IWB) is described as the intentional creation, introduction and application of new ideas within a work role, group or organisation, in order to benefit performance (Janssen, 2000). The concept of IWB is more applied in nature as it results in innovative outputs and aims to benefit the organisation through these innovative outputs. Employee's behaviours aimed towards making new products, processes and services are included in Innovative work behaviour (Scott and Bruce, 1994). The two concepts of creativity and IWB are thought to be overlapped and used interchangeably by many researchers (De Jong, 2006). IWB is defined by De Jong (2006) as "Individuals' behaviours directed toward the initiation and intentional introduction of new and useful ideas, processes, products or procedure within a work role, group or organisation." IWB is individual's future oriented and self-initiated behaviour. These actions are aimed at changing or bringing improvement in one's current situation (Parker *et al.*, 2006; Janssen, 2000).

### EMOTIONAL INTELLIGENCE AND INNOVATIVE WORK BEHAVIOUR

Employees with higher Emotional Intelligence tend to have a better relationship with their co-workers (Wong and Law, 2002). This in turn leads to more informational exchange among co-workers, which enables them to create ideas and generate original solutions to problems at work, which is characterized as idea generation. In addition, employees with high EI are more likely to have peace of mind, stable life and be more focused. This assists them to evaluate the utility of innovative ideas, introduce innovative ideas into the work environment in a systematic way, which is characterized as idea realization. Lastly, employees with high EI tends to stay positive (Ivcevic *et al.*, 2007), which leads them to inspire their co-workers to embrace innovative ideas. With their positivity, employees are likely to display a broad way of thinking and flexibility (Ivcevic *et al.*, 2007). This, in turn, fosters their ability to mobilize support for innovative ideas, and acquire approval for innovative ideas which is characterized as idea promotion. Therefore, it can be concluded that properly managed emotions among employees can lead to an emotionally intelligent work force which consequently will promote Innovative work behaviour among employees. Corroborating with this conclusion, in a study among 332 employees working in state-owned and private banks in Turkey, Orhan (2012) found that there is a significant relationship between employees' EI and IWB. Based on the above discussion, it is postulated that:

**Hypothesis: Emotional Intelligence will have a positive and significant relationship with Innovative Work Behaviour.**

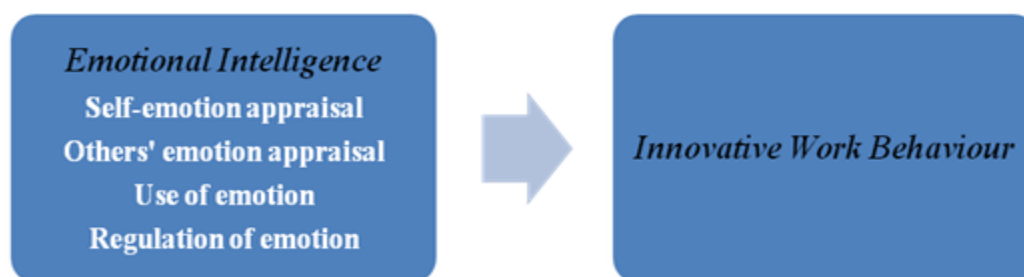


Figure-1: Theoretical model

## METHOD

### Sample and Procedure

Three hundred full-time employees belonging to three banking organisations located in the state of Jammu and Kashmir were surveyed. The employees completed the survey of their own accord during their regular scheduled work hours at their respective work sites. To encourage employees to share free and frank opinion, we assured them of anonymity through both verbal and written means. We further guaranteed that only group data will be communicated to the organisations. Survey questionnaires were distributed and retrieved by the researchers in sealed envelopes. Eighty two percent (N=246) of the participants returned the questionnaires.

Based on the survey participants' responses, we found that their average age was 41.39 years. Of the 246 respondents, 59.10 percent were males and 40.90 percent were females. On an average, the employees had 6.88 years of work experience.

### Measures

**Emotional Intelligence (EI):** In 2002, Wong and Law developed a self-report EI scale named as the Wong and Law EI Scale (WLEIS) based on the work of Salovey and Mayer (1990). In the present study Wong & Laws (2002) scale was used to measure emotional intelligence. Respondents indicated the extent of agreement with each statement on a 5-point scale (1 = Strongly disagree to 5 = Strongly Agree). Cronbach alpha coefficient of the scale was 0.82. The WLEIS contains 16 items Likert-type self-report statements. Wong and Law (2002) explained that EI is an ability to understand one's own emotions and those of others and to control emotions in diverse situations and they suggested that EI consists of four dimensions. Others' emotion appraisal (OEA), Use of emotion (UOE), Self-emotion appraisal (SEA), and Regulation of emotion (ROE).

The first dimension, Self-Emotion Appraisal (SEA) is the ability to express one's own emotions. This relates to individual's ability to understand their deep emotions and be able to express these emotions naturally. The Second dimension, the Others' Emotion Appraisal (OEA) is the ability to perceive and understand others' emotions. It relates to people's ability to perceive and understand the emotions of those people around them. The third dimension, the Use of Emotion (UOE) is the ability to use one's own emotion information in one's performance and productive activities. A person who is highly capable in this dimension would be able to encourage him or herself to perform better continuously. Lastly, the fourth dimension, Regulation of Emotion (ROE) is the ability to control one's own emotion based on appropriate behaviour in a given situation.

**Innovative Work Behaviour (IWB):** IWB was measured through an adopted instrument from Zaman (2006). The scale consisted of 22 items rated on five point Likert scale. Respondents indicated the extent of agreement with each statement on a 5-point scale (1 = Strongly disagree to 5 = Strongly Agree). Cronbach alpha coefficient of the scale was 0.79.

### RESULTS

Descriptive statistics including mean and standard deviation of all scales and subscales were calculated. Table 1 shows the mean and standard deviations of all the variables in the study. The mean score of Emotional Intelligence (EI) is reported to be 4.03 with a standard deviation of 0.63 whereas mean score of Innovative Work Behaviour (IWB) is 3.59 with a standard deviation of 0.57. The mean scores depict that the perception of employees regarding the two variables under study i.e. Emotional Intelligence and Innovative Work Behaviour is fairly positive. The results depict that employees perceive themselves well apprised of their emotions. This indicates that the employees possess a fair level of emotional intelligence. Further, the mean score obtained with respect to IWB scale indicates that the employees perceive their work behaviour as fairly innovative. The reliability of the results is supported by the lower values of standard deviations indicating that the responses do not show much variability and are reliable.

**Table-1: Descriptive Statistics of Emotional Intelligence and Innovative Work Behaviour (N=246)**

Construct	Mean Score	Standard deviation
Emotional Intelligence	4.03	0.63
Innovative Work Behaviour	3.59	0.57

Source: Data compilation by the authors for the present study

The correlation matrix in Table 2 reveals that Emotional Intelligence has significant positive correlation with the Innovative Work behaviour ( $r = 0.572$ ,  $p < 0.05$ ). The matrix shows that Emotional Intelligence of employees has a positive and a significant relationship with the Innovative Work behaviour of the employees surveyed. The results of regression analysis in Table 3 show that Emotional Intelligence has a significant positive impact on Innovative Work behaviour. The value of  $R^2 = 0.47$  shows that 47% variance is explained by independent variable (Emotional Intelligence) in dependent variable (Innovative Work behaviour).

**Table-2: Correlation analysis (N=246)**

Construct		Innovative Work Behaviour
Emotional Intelligence	Pearson Correlation	.572*
	Sig. (2-tailed)	.012

Source: Data compilation by the authors for the present study

Note: \* $p < .05$

**Table-3: Regression analysis (N=246)**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.572 <sup>a</sup>	.467	.393	.24441

a. Predictors: (Constant), VAR00002(Emotional Intelligence)

Source: Data compilation by the author for the present study

Further, it may be observed from figure 2 that maximum positive influence on employees innovative work behaviour is created by Others' Emotion Appraisal (OEA) ( $\beta = .29$ ;  $p < .01$ ), followed by Regulation of Emotion (ROE) ( $\beta = .25$ ;  $p < .01$ ), Self emotion appraisal ( $\beta = .19$ ;  $p < .05$ ) which is in turn followed by Use of emotion ( $\beta = .17$ ;  $p < .05$ ).

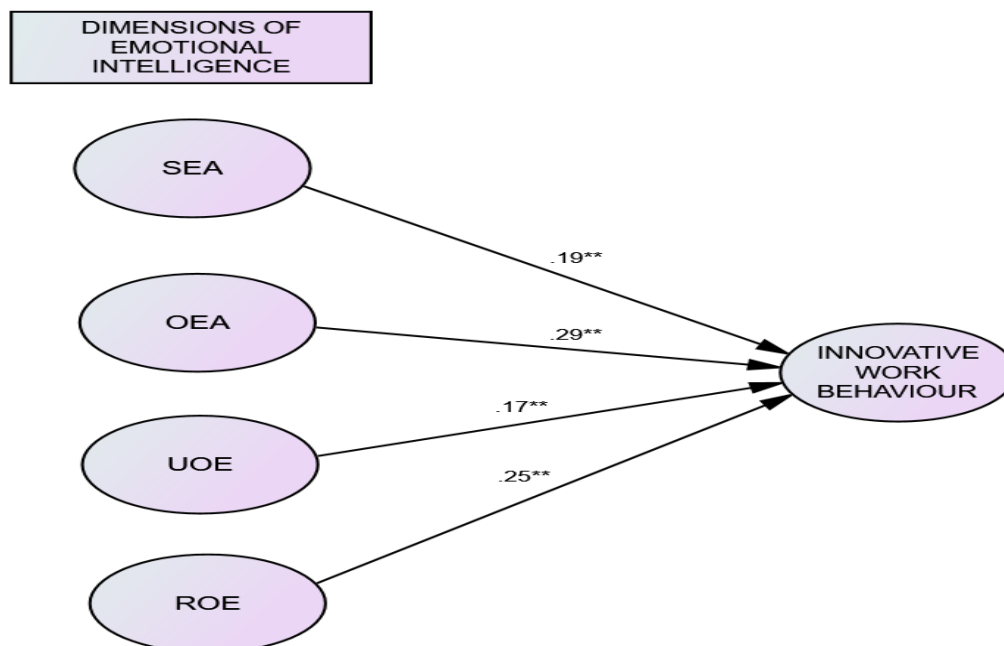


Figure-2: Impact of Emotional intelligence dimensions on Innovative Work Behaviour

Note: SEA= Self emotion appraisal; OEA= Others' emotion appraisal; UOE: Use of emotion; ROE: Regulation of emotion

## DISCUSSION

The results of the present study provide ample support for the proposed theoretical model (Figure 1). The hypothesis of the present research study postulated a positive relationship between employee Emotional Intelligence and employee Innovative Work Behaviour. The results of the data analysis support such a postulation. Organisations need to go beyond the specified contractual relationships and provide individuals with resources and opportunities to enhance their Emotional intelligence. A positive evaluation of Emotional Intelligence will lead to promotion of Innovative Work behaviour among employees. The findings indicate that the employees those with higher Emotional intelligence are more inclined to demonstrate positive and innovative work behaviour that goes beyond expectations. Furthermore, they are more capable of understanding their emotions, have the ability to utilize their emotions to the benefit of the work, and understand their co-worker's emotions which in turn leads to collaboration and enhanced feedback at the work place and generates opportunities for innovations and Innovative Work Behaviour.

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## MHD MIXED CONVECTION FLOW OF POWELL EYRING FLUID PAST A PERMEABLE SHRINKING SHEET WITH CHEMICAL REACTION

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### ABSTRACT

*In this investigation, Mathematical model has been formulated for MHD mixed convective Powell-Eyring fluid flow past a permeable shrinking sheet with radiative flux and chemical reaction. The governing boundary layer equations are transformed by similarity transformation and then solved by implicit finite difference method. The non-dimensional parameters such as fluid parameters  $\epsilon$  and  $\delta$ , suction parameter  $S$ , Magnetic parameter  $M$ , mixed convection parameters  $\lambda_1$  and  $\lambda_2$ , Brownian parameter  $Nb$ , Thermophoresis parameter  $Nt$ , Prandtl number  $Pr$  and Lewis number  $Le$  are examined on the velocity, temperature and concentration profiles. The novel characteristics of non-dimensional parameters are analyzed numerically and graphically.*

**Keywords:** MHD, Powell-Eyring fluid, Shrinking sheet, Mixed convection

### 1. INTRODUCTION

Investigation of MHD mixed convection flow of Powell-Eyring fluid has become the most important area of many Industrial and technological applications, for example, polymer expulsion, drawing of copper wires, nonstop extending of plastic movies and manufactured filaments, hot moving, wire drawing, glass-fibre, metal expulsion, and metal turning. Powell and Eyring [1] discussed the Mechanism for relaxation theory of viscosity. Cramer and Pai [2] analysed the Magnetofluid Dynamics for Engineers and Applied Physicists. Gupta [3] studied the Heat and Mass Transfer on a stretching sheet with suction and blowing. Grubka and Bobba [4] examined the Heat transfer characteristics of a continuous stretching surface with variable temperature. Yoon and Ghajar [5] discussed about a note on the Powell-Eyring fluid model. Heat transfer in a viscous fluid with viscous dissipation and internal heat generation over a stretching sheet were analysed by Vajravelu and Hadjinicolaou [6]. Pop and Nakamura [7] explored the laminar boundary layer flow of power law fluids over wavy surfaces. Barletta and Rossi [8] studied the mixed convection heat transfer in a vertical tube with uniform wall heat flux of viscous dissipation. Vajravelu [9] analysed the viscous flow over a nonlinearly stretching sheet. Anwar et al. [10] analysed the Mathematical and numerical modelling of non-Newtonian thermo hydrodynamic flow in non-Darcy porous media. Sanjayanand and Khan [11] investigated the effect of viscoelastic boundary layer flow over an exponentially stretching sheet with heat and mass transfer. Veena et al. [12] illustrated visco-elastic fluid past a stretching sheet with viscous dissipation, heat transfer and internal heat generation. Lakshmi Narayana and Murthy [13] discussed the Free convective heat and mass transfer in a doubly stratified with porous medium saturated with power law fluid. Sharma and Singh [14] investigated the effect of variable thermal conductivity and Magnetohydrodynamic flow near a stagnation point of heat source/sink with linearly stretching sheet. Zueco and Beg [15] explored the effect mass transfer non-Newtonian flow through a channel with couple stress. Islam et al. [16] explored the Homotopy perturbation analysis of slider bearing with Powell-Eyring fluid. Labropulu et al. [17] studied the Non orthogonal stagnation point flow towards a stretching surface in a non Newtonian fluid with heat transfer. Ali et al. [18] examined the Unsteady shrinking sheet with mass transfer in a rotating fluid. Rana and Bhargava [19] numerically investigated heat transfer flow of a nanofluid over a nonlinearly stretching sheet. Noreen et al. [20] discussed MHD boundary layer flow of tangent hyperbolic fluid towards a stretching sheet. Mixed convection radiative flow of Maxwell fluid near a stagnation point with convective condition were studied by Hayat et al. [21]. Turkyilmazoglu [22] explored the heat transfer fluid flow of a MHD mixed convection viscoelastic fluid over a permeable stretching surface by solved analytically. Liu et al. [23] analysed the Flow and heat transfer for three dimensional flow over an exponentially stretching surface. Hayat et al. [24] studied the Melting heat transfer in the stagnation point flow of Powell-Eyring fluid. Hussain et al. [25] explored the Radiative hydromagnetic flow of Jeffrey nanofluid an exponentially stretching sheet. Hayat et al. [26] analysed the three dimensional flow of couple stress nanofluid over a nonlinearly stretching surface with convective condition. Ellahi et al. [27] studied the mixed convection of shape effect MHD nanofluid over a vertical stretching permeable sheet. Abdul et al. [28] derived Eyring-Powell non-Newtonian Fluid from a horizontal circular cylinder with Biot number effects. Prasad et al. [29] found the free convection boundary-layer flow of a Nanofluid from an isothermal sphere in a non-Darcy porous medium for non similar computational solutions. Ravikumar et al. [30] analysed the Theoretical investigation of an unsteady MHD free convection heat and mass transfer flow of a non-Newtonian fluid flow past a permeable moving vertical plate in the presence of thermal diffusion and heat sink. Abbas et al. [31] explored numerically the binary chemical reaction with thermal radiation on stagnation point flow of casson

fluid over a stretching/shrinking sheet. Ska et al.[32] discussed the Effect of magnetic field on the slip flow of nanofluid induced by a non-linear permeable stretching surface. Salahuddin et al.[33] described numerically MHD flow of Cattaneo-Christov heat flux model for Williamson fluid over a stretching sheet with variable thickness. Eid [34] explored the heat generation of chemical reaction effect on MHD boundary-layer flow of two-phase nanofluid model over an exponentially stretching sheet. Hayat et al.[35] analysed chemically reactive flow of third grade fluid by an exponentially convected stretching sheet. Babu et al.[36] investigated Heat and mass transfer in mhdEyring-Powell nanofluid flow due to cone in porous medium. Abegunrin et al.[37] examined the Comparison study of two non-Newtonian fluids and boundary layer analysis over an upper horizontal surface of paraboloid of revolution. Sheikholeslami [38] numerically investigated the simulation of magnetic nanofluid natural convection in porous media. Agbaje et al.[39] presented the effect unsteady non-Newtonian Powell-Eyring nanofluid flow over a shrinking sheet with heat generation and thermal radiation. Astick et al.[40] explained MHD mixed convective Flow of a Non-Newtonian Powell-Eyring Fluid over a Permeable Exponentially Shrinking Sheet. The main motivation of the current analysis is to study the effect MHD mixed convective flow of Powell-Eyring fluid over a permeable exponentially shrinking sheet with chemical reaction and Radiative heat flux.

## 1. MATHEMATICAL FORMULATION

Let us consider MHD mixed convective flow of Powell-Eyring fluid over a permeable exponentially shrinking sheet. For flow analysis, we assume that shrinking velocity and surface temperature are in exponential nature.

The velocity  $u_w = ae^{\frac{x}{L}}$  is the shrinking sheet with the variable surface temperature  $T_w = T_\infty + be^{\frac{2x}{L}}$  and variable magnetic field  $B(x) = B_0 e^{\frac{x}{2L}}$  is applied to the normal sheet. Induced magnetic field is not taken into account. We assume that  $T_w > T_\infty$  indicates heat surface and assisting flow,  $T_w < T_\infty$  indicates cooled surface and opposing flow.

The equations for Eyring–Powell fluid model as follows

$$\frac{\partial u}{\partial x} + \frac{\partial v}{\partial y} = 0 \quad (1)$$

$$u \frac{\partial u}{\partial x} + v \frac{\partial u}{\partial y} = \left( v + \frac{1}{\rho \beta_1 c} \right) \frac{\partial^2 u}{\partial y^2} - \frac{1}{2 \rho \beta_1 c^3} \left( \frac{\partial u}{\partial y} \right)^2 \frac{\partial^2 u}{\partial y^2} - \frac{\sigma B^2(x)}{\rho} u + g \beta_T (T - T_\infty) + g \beta_C (C - C_\infty) \quad (2)$$

$$u \frac{\partial T}{\partial x} + v \frac{\partial T}{\partial y} = \frac{k}{\rho c_p} \frac{\partial^2 T}{\partial y^2} + \tau \left( D_B \frac{\partial C}{\partial y} \frac{\partial T}{\partial y} + \frac{D_T}{T_\infty} \left( \frac{\partial T}{\partial y} \right)^2 \right) - \frac{1}{\rho c_p} \frac{\partial q_r}{\partial y} \quad (3)$$

$$u \frac{\partial C}{\partial x} + v \frac{\partial C}{\partial y} = D_B \frac{\partial^2 C}{\partial y^2} + \frac{D_T}{T_\infty} \frac{\partial^2 T}{\partial y^2} \quad (4)$$

Under the boundary conditions

$$u = -u_w(x), v = -v_w(x), T = T_w(x), C = C_w(x) \text{ at } y = 0 \quad (5)$$

$$u \rightarrow 0, T \rightarrow T_\infty, C \rightarrow C_\infty \text{ as } y \rightarrow \infty \quad (6)$$

Where Radiative heat flux  $= q_r = -\frac{4\sigma}{3k} \frac{\partial T^4}{\partial y} = -\frac{16\sigma T^3}{3k} \frac{\partial T}{\partial y}$ ;  $\rho$  = density;  $\nu$  = kinematic fluid viscosity;  $\beta_T$  = thermal expansion coefficient;  $g$  = gravitational acceleration;  $L$  = the reference length;  $k$  = thermal diffusivity;  $c_p$  = specific heat,  $v_w = v_0 e^{\frac{x}{2L}}$  is the variable suction velocity with  $v_0$  being constant.

$C_w = C_\infty + be^{\frac{2x}{L}}$  = Wall concentration.

The Similarity transformations are

$$u = ae^{\frac{x}{L}} f'(\eta), v = -\sqrt{\frac{av}{2L}} e^{\frac{x}{2L}} \left[ f(\eta) + \eta f'(\eta) \right] \quad (7)$$

$$\eta = \sqrt{\frac{av}{2Lv}} e^{\frac{x}{2L}} y, T = T_{\infty} + be^{\frac{2x}{L}} \theta(\eta), C = C_{\infty} + be^{\frac{2x}{L}} \phi(\eta)$$

Using above similarity transformations (7) in partial differential equations on (1) to (4), they are converted into the ordinary differential equations as given below

$$(1 + \varepsilon) f''' + f f'' - 2f'^2 - \varepsilon \delta f'^2 f''' - 2M f' + 2\lambda_1 \theta + 2\lambda_2 \phi = 0 \quad (8)$$

$$\left( \frac{1}{Pr} + Nr \right) \theta'' + f \theta' + N_b \theta' \phi' + N_t (\theta')^2 = 0 \quad (9)$$

$$\phi'' + Le f \phi' + \frac{N_t}{N_b} \theta'' = 0 \quad (10)$$

and the reduced boundary conditions are

$$f(0) = S, f'(0) = -1, \theta(0) = 1, \phi(0) = 1$$

$$f'(\infty) \rightarrow 0, \theta(\infty) \rightarrow 0, \phi(\infty) \rightarrow 0 \quad (11)$$

Where the non-dimensional parameters are

$$Pr = \frac{\mu c_p}{k}, M = \frac{\sigma B_0^2 L}{(a\rho)}, Le = \frac{\nu}{D_B}, N_b = \frac{\tau D_B (\phi_w - \phi_{\infty})}{\phi_{\infty} \nu}, N_t = \frac{\tau D_T (T_w - T_{\infty})}{T_{\infty} \nu}, \lambda_2 = \frac{g \beta_c b L}{a^2}$$

$$\delta = \frac{a^3 e^{\frac{3x}{L}}}{(4\nu L c^2)}, Nr = \frac{16\sigma \tilde{T}^3}{3\rho c_p k}, S = v_0 \sqrt{\frac{2L}{(av)}} > 0, \beta = \frac{(ax)^3}{2x\nu C^2}, \varepsilon = \frac{1}{(\nu\rho\beta_1 c)}, \lambda_1 = \frac{g\beta_t b L}{a^2} \quad (12)$$

## 2. RESULTS AND DISCUSSION

In this investigation, Mathematical model has been formulated for MHD mixed convective Powell-Eyring fluid flow past a permeable shrinking sheet with Radiative flux and chemical reaction. The governing boundary layer equations transformed by similarity transformation and then solved by implicit finite difference method. The non-dimensional parameters which are involved in the reduced ordinary differential equations have analyzed numerically and graphically. The main focus of the present section is to demonstrate the numerical results of velocity, temperature and concentration profiles in graphical form.

Figures 1 -6 represent the variation of non-dimensional parameters such as fluid parameters  $\varepsilon$  and  $\delta$ , suction parameter  $S$ , Magnetic parameter  $M$ , mixed convection parameters  $\lambda_1$  and  $\lambda_2$  on velocity profile. Increasing values of fluid parameters  $\varepsilon$  and  $\delta$ , suction parameter  $S$ , Magnetic parameter  $M$  decrease the velocity profile as shown in the figure 1-4. It is observed that increasing values of  $\lambda_1$  enhances velocity profile for assisting flow and reverse nature in opposing flow in figures 5 and 6. Mixed convection parameters  $\lambda_2$  can be depicted in the figure 7 and 8. Higher values of  $\lambda_2$  increment the nature of assisting flow in velocity profile and decrease the velocity profile for opposing flow.

Figures 9-13 demonstrated to study the characteristics of fluid parameter  $\varepsilon$ , Magnetic parameter  $M$ , Brownian parameter  $N_b$ , Thermophoresis parameter  $N_t$  and Prandtl number  $Pr$ . The variations of for fluid parameter  $\varepsilon$ , Magnetic parameter  $M$ , Brownian parameter  $N_b$ , Thermophoresis parameter  $N_t$  on temperature profile are showing an increasing tendency and temperature profile showing decreasing tendency for higher values of Prandtl number.

Figures 14,15 and 16 illustrate the impact of Brownian parameter  $N_b$ , Thermophoresis parameter  $N_t$  and Lewis number  $Le$  on concentration profile. It is clear that there is reduction in concentration profile for Lewis number  $Le$  whereas the opposite effects are obtained in case of Brownian parameter  $N_b$  and Thermophoresis parameter  $N_t$ .



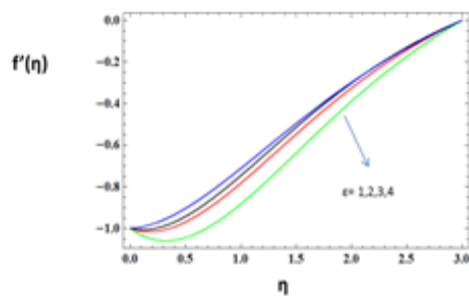


Figure.1.Influence of fluid parameter  $\epsilon$  on Velocity Profile

$\delta=0.1, M=0.1, S=2.7, \lambda=-0.1, Pr=1, Nb=1, Nt=1, Nr=1, Le=0.5$

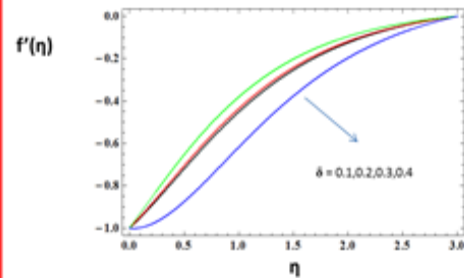


Figure.2.Influence of fluid parameter  $\delta$  on Velocity Profile

$\epsilon=0.1, M=0.1, S=2.7, \lambda=-0.1, Pr=1, Nb=1, Nt=1, Nr=1, Le=0.5$

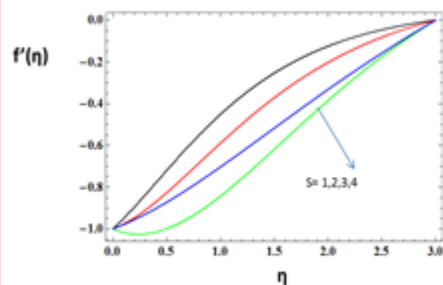


Figure.3.Influence of suction parameter  $S$  on Velocity Profile

$\delta=0.1, M=0.1, \epsilon=0.2, \lambda=-0.1, Pr=1, Nb=1, Nt=1, Nr=1, Le=0.5$

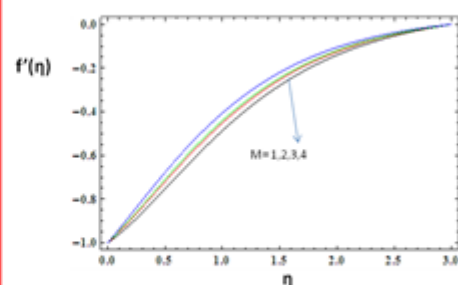


Figure.4.Influence of magnetic parameter  $M$  on Velocity Profile

$\delta=0.1, \epsilon=0.1, S=2.7, \lambda=-0.1, Pr=1, Nb=1, Nt=1, Nr=1, Le=0.5$

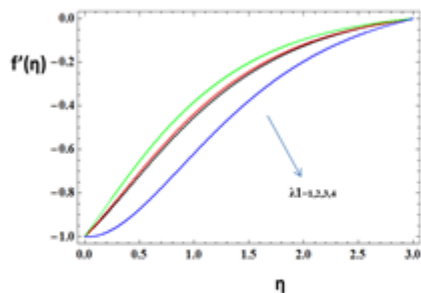


Figure.5.Influence of mixed convection parameter  $\lambda_1$  on Velocity Profile for opposing flow

$\delta=0.1, M=0.1, \epsilon=0.2, Pr=1, Nb=1, Nt=1, Nr=1, Le=0.5$

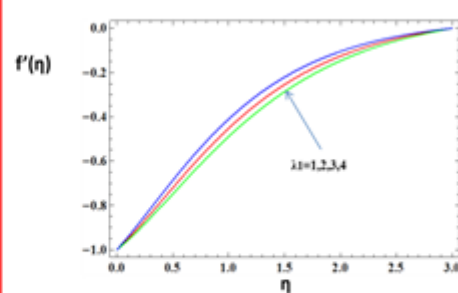


Figure.6.Influence of mixed convection parameter  $\lambda_1$  on Velocity Profile for assisting flow

$\delta=0.1, M=0.1, \epsilon=0.2, Pr=1, Nb=1, Nt=1, Nr=1, Le=0.5$

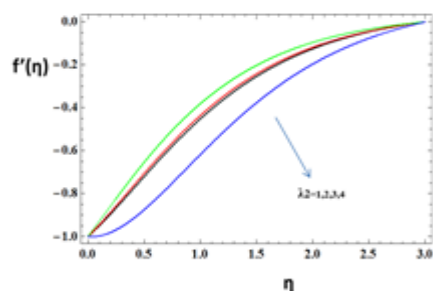


Figure.7.Influence of mixed convection parameter  $\lambda_2$  on Velocity Profile for opposing flow

$\delta=0.1, M=0.1, \epsilon=0.2, Pr=1, Nb=1, Nt=1, Nr=1, Le=0.5$

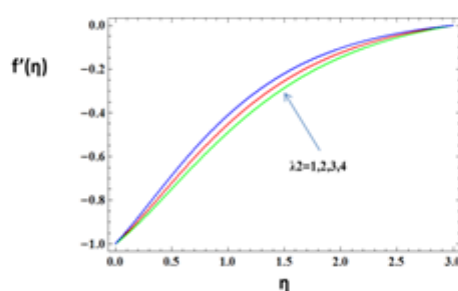


Figure.8.Influence of mixed convection parameter  $\lambda_2$  on Velocity Profile for assisting flow

$\delta=0.1, M=0.1, \epsilon=0.2, Pr=1, Nb=1, Nt=1, Nr=1, Le=0.5$

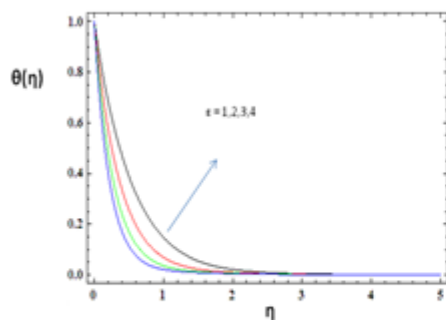


Figure 9 Influence of fluid parameter  $\epsilon$  on Temperature Profile  $\delta=0.1, M=0.1, S=2.7, \lambda=0.1, Pr=1, Nb=1, Nt=1, L=0.5$

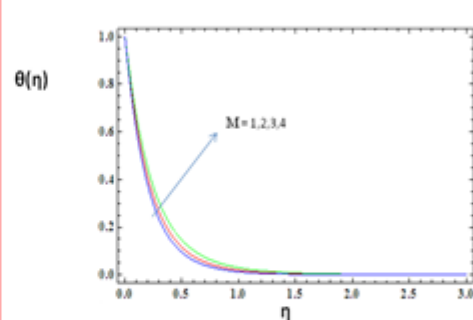


Figure 10 Influence of magnetic parameter  $M$  on Temperature Profile  $\delta=0.1, S=2.7, \lambda=0.1, Pr=1, Nb=1, Nt=1, L=0.5$

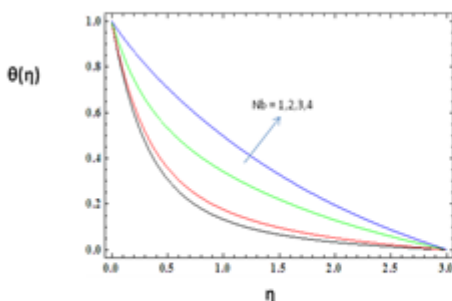


Figure 11 Influence of Brownian parameter  $Nb$  on Temperature Profile  $\delta=0.1, S=2.7, \lambda=0.1, Pr=1, M=1, Nt=1, L=0.5$

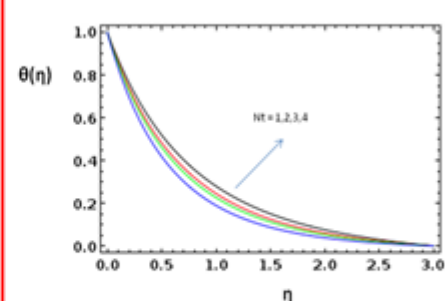


Figure 12 Influence of Thermophoretic parameter  $Nt$  on Temperature Profile  $\delta=0.1, S=2.7, \lambda=0.1, Pr=1, M=1, Nb=1, L=0.5$

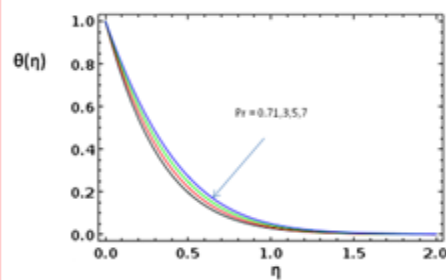


Figure 13 Influence of Prandtl number  $Pr$  on Temperature Profile  $\delta=0.1, S=2.7, \lambda=0.1, Nt=1, M=1, Nb=1, L=0.5$

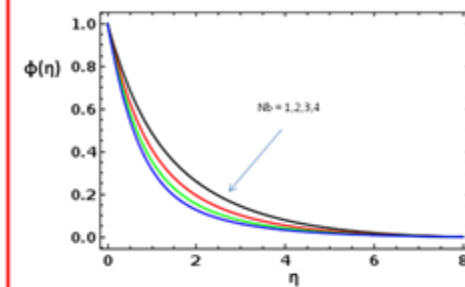


Figure 14 Influence of Brownian parameter  $Nb$  on Concentration Profile  $\delta=0.1, S=2.7, \lambda=0.1, Nt=1, M=1, Pr=1, L=0.5$

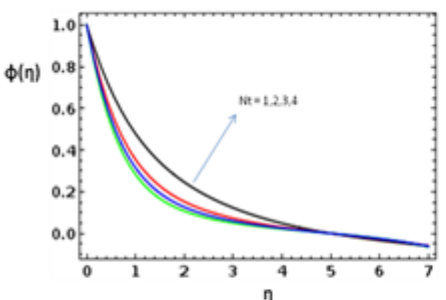


Figure 15 Influence of Thermophoretic parameter  $Nt$  on Concentration Profile  $\delta=0.1, S=2.7, \lambda=0.1, Nb=1, M=1, Pr=1, L=0.5$

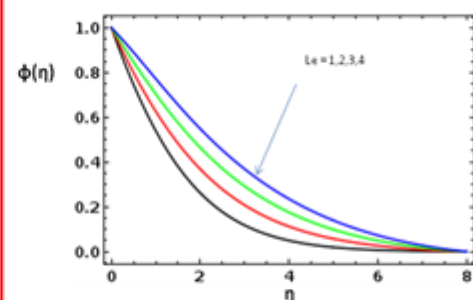


Figure 16 Influence of Lewis Number  $Le$  on Concentration Profile  $\delta=0.1, S=2.7, \lambda=0.1, Nb=1, M=1, Pr=1, Nt=1, L=0.5$

### 3. CONCLUSION

An Investigation on MHD mixed convective Powell-Eyring fluid flow past a permeable shrinking sheet with radiative flux and chemical reaction against the non- dimensional parameters such as fluid parameters  $\varepsilon$  and  $\delta$ , suction parameter  $S$ , Magnetic parameter  $M$ , mixed convection parameters  $\lambda_1$  and  $\lambda_2$ , Brownian parameter  $Nb$ , Thermophoresis parameter  $Nt$  Prandtl number  $Pr$  and Lewis number  $Le$  are examined. The conclusions are as follows:

- Increasing values of fluid parameters  $\varepsilon$  and  $\delta$ , suction parameter  $S$ , Magnetic parameter  $M$  decrease the velocity profile.
- It is observed that increasing values of  $\lambda_1$  enhances velocity profile for assisting flow and reverse nature in opposing flow
- Mixed convection parameters  $\lambda_2$  can be depicted in the figure 7 and 8. Higher values of  $\lambda_2$  increment the nature of assisting flow in velocity profile and decrease the velocity profile for opposing flow.
- The variations of for fluid parameter  $\varepsilon$ , Magnetic parameter  $M$ , Brownian parameter  $Nb$ , Thermophoresis parameter  $Nt$  on temperature profile are showing an increasing tendency.
- Temperature profile shows decreasing tendency for higher values of Prandtl number.
- It is clear that there is reduction in concentration profile for Lewis number  $Le$  whereas the opposite effects are obtained in case of Brownian parameter  $Nb$  and Thermophoresis parameter  $Nt$

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## A COMPREHENSIVE ANALYSIS OF POVERTY IN KARNATAKA BY USING NSSO DATA

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## ABSTRACT

The study attempts a comprehensive analysis of poverty in Karnataka, by using unit level Household consumption Expenditure data of 61<sup>st</sup> (2004-05) and 68<sup>th</sup> (2011-12) rounds of NSSO regions. The study estimates level of household poverty at NSS Division level and across socio-religious groups. The NSS regions have consisted four regions in the state such as Coastal & Ghats, Inland Eastern, Inland Southern and Inland Northern. The poverty estimates reveal significant geographic imbalances, with much higher levels and concentration of poverty in the northern districts. The poverty ratio is measure by making use of Head-count Ratio (HCR). The HCR measures poverty as a proportion of households living below the poverty line (BPL). The study make use of Tendulkar Methodology, according to which poverty (overall) in Karnataka is Rs.418 and Rs.588 of 61<sup>st</sup> round (2004-05) and Rs.902 and Rs.1089 for 68<sup>th</sup> round for both sectors. The results indicate that poverty in the state decline by 12.74 per cent, between 2004-05 and 2011-12. The incidence of poverty among social group wise reduced by 19.67% in Scheduled Tribes, 20.66% in Scheduled Caste, 15.9% in OBC & 4.5% and the estimates poverty in religion wise reduced by 13.45% in Hindu and 11.46% in Muslims communities.

**Keywords:** Measurement of Poverty, Division wise across Socio-Religious Groups. **JEL Classification:** 132, 139

## INTRODUCTION

Poverty is a multidimensional phenomenon and it is the greatest challenge to the mankind. Poverty is defined as deprivation in well-being. It must be seen as the scarcity of basic capabilities rather than simply taking into thought the monetary aspect which forms a usual dimension as to whether the person is poor or not<sup>1</sup>. Amartya Sen in his book, 'Poverty and Famines' importance of diverse concepts of poverty which has to be taken under deliberation for the effective understanding of poverty. In broad terms the poverty is defined as the inability to acquire the basic goods and services essential for survival with distinction. It also includes low levels of attainment, education and health, poor access to sanitation and clean water, insufficient physical security, and inadequate capacity and opportunity to better one's life<sup>2</sup>.

In India context, poverty is measured in terms of a specified normative poverty line reflecting the minimum living standard of people. The official approach has laid emphasis on ensuring a subsistence minimum and hence, on eradicating absolute poverty<sup>3</sup>. The measurement of poverty is a complex exercise and the estimates are broadly based on household per capita consumption expenditure from NSSO survey. India's first decade of independence (1951 - 1975), the percentage of population living in poverty increase from 47 to 56 percent. During the next decade, that poverty rate was come down sharply success 26 percent by 1999–2000. Between 1974 and 1999-2000, the poverty rate reduced by 53%, exceeding the millennium development goal of a 50% reduction over a 25-year period. In headcount ratio (below the poverty line), the number of poor people rises gradually from 171 million in 1951 to a 321 million in 1974, before falling to 260 million in 1999-2000<sup>4</sup>. Poverty fell little during the slow growth period from Independence to 1974. After 1975, economic growth began to fasten. In the agricultural sector pricing reforms and new technologies (the "green revolution") had faster growth in production and less susceptibility to fluctuations in monsoon rains. Between 1975 and 1990, the GDP percapita increase at an annual rate of 2.4 percent and also increase agricultural output at 3.0 percent. During the faster growth period of the 1980s and 1990s poverty fell substantially. Since India became part of the global economy and underwent economic reforms in 1991, Poverty is a complex event in its content and scope.

The poverty was declining in India 1990s it was having a different status in rural and urban sectors. The rural poverty was roped little at 10% in second (1993-94) period and it was 8.33% at first period (1991-92). The

<sup>1</sup> Mubashshir Sarshar (2010)

<sup>2</sup> World Bank (2006)

<sup>3</sup> M.H. Suryanarayana (2010)

<sup>4</sup> James W. Fox (2002)

poverty ratio as estimated by expert groups, in rural sectors poverty was gradually comes down during pre-reforms period, in 1973-74 56.4%, in 1989-90 34.4%. But after 1990-91 poverty was increased sharply during the first one and half year in 1990-91 that is 35%, in 1992-93 is 44% and 37.5% in 1993-94 poverty was recorded<sup>1</sup>. World Bank (2005) estimates 42% of India's population decline below the international poverty line of \$1.25 a day having reduced from 60% in 1980 and Planning Commission of India measure 27.5% of the population was living below the poverty line in 2004–2005 its reduced from 51.3% in 1977–1978, 36% in 1993- 1994 and 27.5% in 2004-05. Tendulkar committee in 2011-12, estimates 21.9 percentage of the population are poor that is 269.9 millions of population is living below the poverty line<sup>2</sup>. Generally the measurement of poverty is a complex exercise and the estimates are broadly based on household per capita consumption expenditure. As per the estimates of Tendulkar committee in 2011-12, 21.9 per cent of the populations are poor that is 269.9 millions of population is living below the poverty line (GoI 2014). Globally two-third of the world population is living below the international poverty line which is measured in terms of Purchasing Power Parity (PPP), of \$ 1.90 per day.

Poverty in Karnataka, according to planning commission (1962) government of India, estimates 50.5 percentage (153.3 lakhs) of population below the poverty line in 1972-73 and 32.1 percent (136.6 lakhs people) in 1987-88. Later Expert Group (Lakdawala committee)1993-94 using their own methodology to defined poverty line of Rs.58.22 monthly per capita and find out 54.47 percentage (which is 170.67 lakhs) of poor below the poverty line in 1973-74, 37.53 percentage (158.6 lakhs people) below the poverty line in 1987-88 and 25.0 percentage (138.89 lakhs people) below the poverty line in 2004-05. As per Tendulkar Committee (2005), 33.4 percentage (185.7 lakhs people) below the poverty line in 2004-05 and 20.9 percentage (129.8 lakhs people) below the poverty line in 2011-12. It can seen that 13th position among major states and higher poverty among southern sates both Rural and Urban sectors. According to Rangarajan committee (2011) the poverty rate 21.9 percent that is 135.7 lakh populations are below the poverty line. In Karnataka, the Government policy response to all alleviate deprivation has been on several fronts. There are some programmes are concerned with poverty alleviation by providing productive assets and inputs like livestock and pump sets (Integrated Rural Development Programme (IRDP)) and employment generation (Public Work Programme). The former is targeted to households belonging to Schedule Castes, Scheduled Tribes, agriculture labour, and marginal labour and bonded labour families. The employment programmes are designed to be self-targeted by fixing wages such that poor households will participate therefore the current emphasis on targeting only the poor and cost-efficiency of programmes.

Poverty estimates at state level are based on the Household Consumer Expenditure Surveys conducted by National Sample Survey Organization (NSSO). The states wise surveys are conducted on quinquennial term basic. The last survey conducted in 2009-10 (66<sup>th</sup> round) and the NSSO was conducted another large sample survey in the year of 2011-12 (68<sup>th</sup> round). The Planning Commission occasionally estimates below the poverty line and poverty ration at state level for every quinquennial round. The commission was adopted of methodologies which are recommendation made by experts. In recently the planning commission was adopted Tendulkar methodology by suggested of expert group. Even though several representations were suggesting Tendulkar poverty line is to low and to review the methodology was constituted under the chairmanship of Rangarajan Committee report is expected only in mid 2014 planning commission updated poverty line as per Tendulkar committee methodology.

In India Dadabhai Naoroji was the first person to discuss about the concept of poverty line. After independence, there have been several efforts to develop mechanisms methodologies to construct poverty line and also identify the number of poor in the country. In 1962, the Planning Commission constituted the working group to define the poverty line based on minimum calorie requirements suggested by the Indian Council for Medical Research (ICMR) 2,200 calories for rural and 2,100 calories for urban sectors. The monetary value of these calories for a family of 5 people is fixed at Rs.100 per month or Rs.20 per capita per month in 1960-61 prices for urban sectors. In 1979 the planning commission constituted Task Force committee to estimate the percentage of population below the poverty line the committee fixed 2400 calorie per capita per day in the rural sector and 2100 calories calorie per capita per day in urban sector and estimated Rs.49.09 & Rs.56.64 monthly per capita for all India rural and urban sectors. Planning Commission (1984) did not re-defined the estimation methodology of poverty, it adopted the methodology of earlier task force committee, and accordingly fixed Rs.89.50 and Rs.115.65 as Monthly Per capita Consumption Expenditure (MPCE) for rural & urban sector

<sup>1</sup> Basanta K, (1988)

<sup>2</sup> GoI, Planning Commission Report (2014)

sectors as particularly. According to estimates 45.65 per cent rural sector and 40.79 per cent of urban sector and overall 44.48 per cent of the population is below the poverty line in India. The planning commission constituted the expert group under the chairmanship of Tendulkar. The Tendulkar committee did not construct a poverty line but they espouse earlier expert group of Lakdawala methodology. Tendulkar fixed Rs.447 & Rs.579 per capita per month consumption expenditure for both rural and urban sector which is based on minimum calorie requirements is 2100 calorie for rural and 1776 calorie for urban sector. In 2012 the Rangarajan Committee computed the poverty level based on average requirements of calories of 2,155 kcal per person per day for rural sectors and 2,090 kcal per person per day for urban sectors. According to the estimates of Rangarajan 30.9 per cent (260.5 million poor people) in rural sector and 26.4 per cent (102.5 million poor people) of the population is below the poverty line in urban sectors and overall 29.5 per cent (363 million people) at all India level of population is poor.

The main objective of this current study is to provide a profile of poverty and social disparity in Karnataka. So the study is intended to examine the level of poverty by dividing the households into those belonging to scheduled castes (SC), scheduled tribes (ST) and OBCs in the region. To design effective policies and strategies to reduce poverty, it is vital to understand the characteristics of a given region. It can shed light on whether poverty is increasing or decreasing and on whether economic growth is benefiting the poor. Poverty profiles of regions can help governments identify the poor by region, by different social groups, level of education, gender, or form of employment. Economists are concerned specifically with the monetarily-measurable dimension related to individual or household income and consumption. Methodologically, this is just one perspective and inequality can be linked to inequality in skills, education, opportunities, health and assets. The current research will, in reviewing the literature, give attention to the relationship between poverty and income inequality and the non income inequality dimensions. There exist several studies on assessments and determinants of poverty both a macro and micro level-Interstate and Intrastate studies focus on spatial divergence in poverty. However the empirical analyses on poverty focusing at region level on socio-religious groups are scanty. The study in respect to Karnataka since this gap by analyzing the status of district wise and division wise poverty across socio-religious groups.

The study makes use of specific poverty line for Karnataka based on Tendulkar Methodology i.e. Rs.418 and Rs.588 for rural & urban sector of 61<sup>st</sup> round (2004-05) and Rs.902 and Rs.1089 for rural & urban sector 68<sup>th</sup> round (2011-12) of NSSO data. The study 27 districts into four NSS regions based on National Sample Survey (NSS) classification i.e. Coastal & Ghats<sup>1</sup>, Inland Eastern<sup>2</sup>, Inland Southern<sup>3</sup> and Inland Northern<sup>4</sup>. The primary issue is which measure of poverty is to be used for poverty estimation, most usually the Headcount Ratio, Poverty Gap Index, and Squared Poverty Gap Index. The study using MPCE of Mixed Reference Period<sup>5</sup> (MRP) to measures incidence of mean poverty i.e. Head Count Ratio (Hp): which is defined as the "Percentage of population which is below the poverty line". The is an important value addition to the existing list of literature on poverty in Karnataka the study is significance value addition because it examines the extent, intensity of poverty covering two quinquennial rounds for Scheduled Castes, Scheduled Tribes, OBC and two major religions of the state, Hindus and Muslims. The section following presents of Poverty estimates at regional level of both rural and urban sectors along with brief description. Section III estimates the incidence of poverty across social groups and religious groups for both rural and urban sectors. Finally, section IV focuses on findings and conclusion.

### STATUS OF POVERTY IN KARNATAKA

Karnataka is the seventh largest State in terms of geographical sector (191791 sq.km) & according to 2011 census it is home to 6.11 crore population accounting for 5.05% of India's Population and 133.57 lakh households as against 104.02 lakh households in 2001. While its population density increased from 276 in 2001 to 319 in 2011, indicating an increase of about 15.6%. The 61 percent of the state population lives in rural

<sup>1</sup> **Coastal and Ghats:** Consist of Dakshina Kannada, Udupi and Uttara Kannada

<sup>2</sup> **Inland Eastern:** Consist of Chikkamagalur, Hassan, Kodagu and Shimoga

<sup>3</sup> **Inland Southern:** Consist of Bengaluru (Rural), Bengaluru (Urban), Chamarajanagar, Kolar, Mandya, Mysore and Tumkur

<sup>4</sup> **Inland Northern:** Consist of Bagalkot, Belgaum, Bellary, Bidar, Bijapur, Chitradurga, Davanagere, Dharwad, Gadag, Gulbarga, Haveri, Koppal and Raichur

<sup>5</sup> MRP = consumption data for five non-food items viz., clothing, footwear, durable goods, education, and institutional medical expenses are collected using 365-day recall period and 30-day recall period for the remaining items.



sectors and the decline in the proportion of rural population is 4.58 percent between 2001 to 2011. Karnataka is one of the above national average states in the country in majority of socio-economic indicators. It is faced with inter-regional and intra-regional disparities since its reorganization in 1956. Many historical, political and economic factors are responsible for these disparities along with the influence of regional diversities seen across the regions of the state. The share of Karnataka's GSDP in All India GDP is 7.5 percent during 2016-17. The GSDP in the state is consistently growing at an average growth rate of 7.64 percent for the period 2012-13 to 2016-17, which is above the national average of 6.84 percent growth rate of GDP for the same period<sup>1</sup>.

**Table No-01: Incidence of Household Poverty in Karnataka**

Round	Rural	Urban	Total
2004-05	37.50	25.88	33.92
2011-12	24.53	15.28	21.18
<b>Total</b>	<b>30.83</b>	<b>19.79</b>	<b>27.11</b>

**Source:** Authors estimate based on 61<sup>st</sup> and 68<sup>th</sup> round of NSS data.

Poverty can be a useful policy tool for focusing resources and development efforts in poor sectors. The study attempt to identify where the incidence of poverty in rural and urban sector was improperly distributed in Karnataka during 2004-05 (61<sup>st</sup> NSS round) and 2011-12 (68<sup>th</sup> NSS round) rural poverty declining by 12.97% and urban poverty was 10.06% during 2004-05 to 2011-12. In 2004-05 the total poverty is 33.92% which is come down by 21.18% in 2011-12 so around 12.74% declining during the study period.

**Table No-02: Incidence of Poverty by across Socio-Religious Groups in Karnataka**

Sector	Round	ST	SC	OBC	Others	Hindu	Muslim
Rural	2004-05	50.53	57.37	35.87	23.72	38.28	35.82
	2011-12	30.81	37.06	20.75	21.62	24.15	29.92
Urban	2004-05	55.70	41.22	32.14	14.31	23.01	40.30
	2011-12	33.69	24.96	15.09	8.77	13.23	24.51

**Source:** Authors estimate based on 61<sup>st</sup> and 68<sup>th</sup> round of NSS data.

Table 02 shows that, incidence of headcount ratio across socio-religious groups in rural & urban Karnataka comprehensive set of poverty estimates for Scheduled Casts (SCs), Scheduled Tribes (STs) households at the state level and for rural and urban sectors separately are uniformly higher for the SCs and STs Communities, irrespective of the deprivation. In 2004-05, higher the poverty ratio consist in SCs (57.37%), and STs (50.53%), is greater than others categories which are Other Backward Classes (OBC) of 35.87% and other categories where only 23.72% in rural sectors & in urban sectors because of OBC and Others is higher the monthly per capita consumption is more than SCs and STs. In 2011-12, there is declining the total percentages of poverty ration in all categories but the higher the poverty ratio seen in SCs (37.06%) and STs (30.81%) are rest of other categories. In religion group where found higher the poverty ratio consist in Muslims household against Hindus household respectively in state.

**Table No-03: District wise Level of Household Poverty in Karnataka**

NSS Regions	Districts	Rural		Urban		Total	
		2004-05	2011-12	2004-05	2011-12	2004-05	2011-12
Coastal & Ghats	Dakshin Kannada	15.3	1.5	8.9	1.9	13.7	1.6
	Udupi	4.4	22.7	42.2	21.4	5.8	22.4
	Uttar Kannada	59.2	19.3	63.5	20.1	60.5	19.6
Inland Eastern	Chikkamagalur	11.8	10.4	27.6	24.6	14.1	14.7
	Hassana	20.2	11.3	37.5	13.9	22.9	11.6
	Kodagu	11.5	1.2	5.6	2.8	11	1.5
	Shivamogga	22.6	32.5	13.3	22.3	19.1	29.3
Inland Southern	Bangalore (U)	15.5	0	2.6	1.7	4.5	1.5
	Bangalore (R)	34.7	15.2	22.9	2.2	33	13
	Chamarajagara	22.2	1.3	37.1	4.1	24.4	1.6
	Kolar	30.8	4.7	20.1	2.5	28.4	4.2

<sup>1</sup> Karnataka Economic Survey Report 2014-15

<b>Inland Northern</b>	Mandya	29.6	18.9	50.5	4.1	31.7	16.4
	Mysuru	20.8	20.7	18.6	7	20	15.5
	Tumkur	30.6	14.4	3.4	5.9	25.8	13
	Bagalkot	42.8	32.1	66	45	47	35.8
	Belgaum	36.3	27.5	38.1	32.3	36.6	28.8
	Ballari	60.3	33.1	64.6	53	61.3	40.8
	Bidar	54.7	32.5	29.8	45.9	51.3	35.1
	Bijapur	30.6	21.4	47.5	28.5	35.4	23.1
	Chitradurga	56.3	48.3	55.1	40.4	56.1	46.7
	Davangere	70.8	23	62.4	23.8	69.1	23.3
	Dharwad	13.7	57.3	32.1	15.5	23.8	34
	Gadag	49.4	25.6	47.4	15	48.7	21.8
	Gulbarga	65.1	38.9	49.4	32	61.2	37.2
	Haveri	72.5	31.3	75.3	52.2	73	33.7
	Koppal	26.2	42	56.6	34.6	29.4	40.7
	Raichur	63.9	37.6	80.7	38.2	68.6	37.7
<b>Total</b>		<b>37.5</b>	<b>24.5</b>	<b>25.9</b>	<b>15.3</b>	<b>33.9</b>	<b>21.1</b>
Source: Authors estimate based on 61 <sup>st</sup> and 68 <sup>th</sup> round of NSS data.							

Incidence of household poverty at NSS region level under districts in Karnataka, there is no significantly ratio for both rural and urban sectors of 2004-05 and 2011-12. Above the table 03 reveals, in 2004-05 (61<sup>st</sup>) round there higher poverty ratio in Davangere of 69.1%, is followed by Raichur 68.6%, Ballari 61.3%, Gulbarga 61.2%, and Uttar Kannada 60.5%. Meanwhile, in 2011-12 (68<sup>th</sup>) round higher the poverty ration in Chitradurga district was 46.7% is followed by Ballari 40.8% and Koppal was 40.7% and the lower the poverty ration in Bengaluru urban of 1.5% is followed by Kodagu 1.5%, Dakshin Kannada 1.6% and Chamarajnagara 1.6%.

**Table No-04: NSS Region wise Incidence of Poverty in Karnataka**

NSS Region	Rural			Urban		
	2004-05	2011-12	% of Change	2004-05	2011-12	% of Change
Coastal & Ghats	26.98	12.72	-(2.03)	38.16	10.45	-(3.95)
Inland Eastern	17.81	16.88	-(0.13)	20.52	20.21	-(0.31)
Inland Southern	27.47	11.89	-(2.22)	7.91	2.45	-(0.78)
Inland Northern	49.91	34.29	-(2.23)	50.66	33.89	-(2.39)
<b>Total</b>	<b>37.65</b>	<b>24.53</b>	<b>-(1.87)</b>	<b>25.88</b>	<b>15.29</b>	<b>-(1.51)</b>
Note: Figures of change are in percentage points per annum.						
Source: Authors estimate based on 61 <sup>st</sup> and 68 <sup>th</sup> round of NSS data.						

Above the table shows incidence of poverty for NSS regions in Karnataka. It reveals that extent and depth of poverty within Karnataka is the highest in the inland northern region, in both rural and urban sectors. The overall change in poverty from 61<sup>st</sup> round to 68<sup>th</sup> round is declined by 1.87 per cent in rural sector and 1.51 per cent in urban sectors. The values referred in the above table are of two periods 2004-05 and 2011-12. The poverty estimates reveals significant geographic imbalances with much higher level of poverty resolute in the northern districts. There is aggregate decline in rural and urban poverty by 12.74 per cent during the period of 2004-05 to 2011-12.

**Table No-05: Incidence of Poverty across Social Groups by NSS Region in Karnataka**

Sector	Social Group	Coastal & Ghats			Inland Eastern			Inland Southern			Inland Northern		
		2004-05	2011-12	% Change	2004-05	2011-12	% Change	2004-05	2011-12	% Change	2004-05	2011-12	% Change
Rural	ST	51.29	30.9	-(2.91)	27.21	62.89	(5.09)	27.34	1.95	-(3.62)	63.83	36.24	-(3.94)
	SC	56.11	47.62	-(1.21)	36.23	13.14	-(3.29)	45.78	15.06	-(4.38)	67.12	50.93	-(2.31)
	OBC	33.41	6.97	-(3.77)	16.21	19.26	(0.43)	24.74	11.3	-(1.92)	54.22	30.38	-(3.40)
	Others	14.1	1.11	-(1.85)	8.41	0	-(1.20)	18.15	16.94	-(0.17)	30.94	28.76	-(0.31)
	<b>Total</b>	<b>26.98</b>	<b>12.72</b>	<b>-(2.03)</b>	<b>17.81</b>	<b>16.88</b>	<b>-(0.13)</b>	<b>27.47</b>	<b>11.89</b>	<b>-(2.22)</b>	<b>49.91</b>	<b>34.29</b>	<b>-(2.23)</b>
Urban	ST		0	0	20.92	0	-(2.98)	24.98	2.26	-(3.24)	81.96	52.58	-(4.19)

	SC	35.59	23.13	-(1.78)	39.47	49.28	(1.40)	25.73	7.68	-(2.57)	59.64	48.86	-(1.54)
	OBC	55.9	19.9	-(5.14)	23.03	15.93	-(1.01)	8.69	2.32	-(0.91)	63.39	33.08	-(4.33)
	Others	22.08	0.6	-(3.06)	8.73	14.5	(0.82)	2.12	0.12	-(0.28)	33.38	23.81	-(1.36)
	<b>Total</b>	<b>38.16</b>	<b>10.45</b>	<b>-(3.95)</b>	<b>20.52</b>	<b>20.21</b>	<b>-(0.04)</b>	<b>7.91</b>	<b>2.45</b>	<b>-(0.78)</b>	<b>50.66</b>	<b>33.89</b>	<b>-(2.39)</b>

Note: Figures of change are in percentage points per annum.

Source: Authors estimate based on 61<sup>st</sup> and 68<sup>th</sup> round of NSS data.

Poverty estimates for socio-religious groups of Karnataka is shown in table 05 & 06. The incidence of poverty across social groups is consistently high among STs and SCs followed by OBC and Others for both rural and urban sectors during 2004-05 and 2011-12. Above the table shows that, Higher the proportion of percentage of population is below the poverty line in STs and SCs of 61<sup>st</sup> round in all regions. The larger the poverty consist in Inland Northern region of all categories i.e. SCs are 67.12 per cent, followed by STs are 63.83 per cent, OBC 54.22 percent and others 30.94 per cent in rural sectors and in urban sector higher the percentage of poverty in STs are 81.96 percent is followed by OBC 63.39 percent, SCs 59.64 percent and others 33.38 percent. In 68<sup>th</sup> round it can be reduced by heterogeneously. The lower the poverty ratio shows in Inland Southern region among social groups both rural and urban sectors of 2004-05 and 2011-12. Depicts that Poverty declines per annum among most expelled social groups is 2.03 per cent points in Coastal & Ghats, is followed by 0.13% points in Inland Eastern, 2.22 per cent points in Inland Southern and 2.23 % points in Inland Northern rural sectors. And in urban sectors it is clear that Coastal & Ghats performed relatively better in addressing poverty which shows the change of 3.95 per cent. Whereas Inland Eastern reduced poverty by only 0.04 per cent points, during the period 2004-05 to 2011-12. In urban sector, the STs Sample population is very low hence the result shows in zero values.

**Table No-06: Incidence of Poverty in Religion Group by NSS Region in Karnataka**

Sector	Religion Group	Coastal & Ghats			Inland Eastern			Inland Southern			Inland Northern		
		2004-05	2011-12	% Change	2004-05	2011-12	% Change	2004-05	2011-12	% Change	2004-05	2011-12	% Change
Rural	Hindu	26.75	13.85	-(1.84)	17.92	17.09	-(0.11)	28.54	11.98	-(2.36)	50.47	33.92	-(2.36)
	Muslim	33.72	0	-(4.81)	20.23	0	-(2.89)	11.41	9.58	-(0.26)	48	37.12	-(1.55)
	<b>Total</b>	<b>28.17</b>	<b>12.58</b>	<b>-(2.22)</b>	<b>18.03</b>	<b>16.88</b>	<b>-(0.16)</b>	<b>27.75</b>	<b>11.89</b>	<b>-(2.26)</b>	<b>50.29</b>	<b>34.28</b>	<b>-(2.28)</b>
Urban	Hindu	34.51	10.14	-(3.48)	24.31	18.76	-(0.79)	7.22	1.11	-(0.87)	45.31	31.75	-(1.93)
	Muslim	57.25	14.63	-(6.08)	16.04	29.39	(1.90)	12.89	5.4	-(1.07)	67.25	40.59	-(3.80)
	<b>Total</b>	<b>39.45</b>	<b>11.5</b>	<b>-(3.99)</b>	<b>21.26</b>	<b>20.41</b>	<b>-(0.12)</b>	<b>8.14</b>	<b>1.75</b>	<b>-(0.91)</b>	<b>51.13</b>	<b>34.06</b>	<b>-(2.43)</b>

Note: Figures of change are in percentage points per annum.

Source: Authors estimate based on 61<sup>st</sup> and 68<sup>th</sup> round of NSS data.

Above the table 06, shows that, the Muslim households are comparatively poorer in rural as well as in urban sectors; however the poverty among Muslims declined slightly faster than that of Hindus for both rural and urban sectors during 2004-05 and 2011-12. In the religious group, Muslims are in the highest poverty which is more than Hindus in all regions of Karnataka. Higher the level of household poverty ratio is found in Inland Northern among Hindu & Muslim religion is 50.29 per cent in 2004-05 and 34.28 per cent in 2011-12 in rural sector and 51.13 per cent in 2004-05 and 34.06 per cent in 2011-12 both rural and urban sectors. Whereas, lower the poverty ratio found in Inland Southern region among religions groups for both rural and urban sector during 2004-05 and 2011-12. In rural sectors religion groups' poverty rate per annum is declining about 2.22 per cent points in Coastal & Ghats, 0.16% points in Inland Eastern, 2.26% points in Inland Southern and 2.28 % points in Inland Northern. In urban sectors the same has been found 3.99% points in Coastal & Ghats, 0.12% points in Inland Eastern, 0.91 per cent points in Inland Southern and 2.43 % points in Inland Northern in urban sectors between 2004-05 to 2011-12.

## CONCLUSION

The poverty of India is of great importance today even though so many measures have been taken by various Governments and International Organization to alleviate the global poverty. Since the Government of Karnataka also has initiated of various poverty alleviation programmers in both rural and urban sectors have achieved to eradicate extreme poverty in the state. Regionally disaggregated poverty estimates show that there is considerable heterogeneity in the extent and depth of poverty in the state. The urban poverty in the state is higher than the rural poverty, while the level of poverty is higher Northern and Eastern region that the Southern and Coastal & Ghats. The expansive picture that emerges from the poverty estimates reveals significant geographic imbalances, with much higher levels and concentration of higher level of poverty in Inland northern districts across Social and Religious groups. The incidence of mean poverty across social groups was consistently high among STs and SCs followed by OBC and others in both rural and urban sectors and Muslim religious households are comparatively poorer in rural as well as urban sectors of poverty among Muslim

declined faintly faster than that among Hindus during 2004-05 and 2011-12. Poverty by NSS region is the decline in a year of -1.18% in rural sector and -1.51 in urban sectors this is the mean negative values and total 12.74% reduced in the state of two periods of 2004-05 & 2011-12. Remnants the incidence of poverty in social group wise reduced by 19.67% in Scheduled Tribes, 20.66% in Scheduled Caste, 15.9% in OBC & 4.5% of others and the estimates poverty in religion wise reduced by 13.45% in Hindu and 11.46% in Muslims communities between the study period.

#### **ACKNOWLEDGEMENT**

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**COMPARISON OF LS-SVM AND ANN METHODS FOR DOWNSCALING OF PRECIPITATION DATA FROM GCM TO REGIONAL SCALE FOR MALAPRABHA SUB BASIN**

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**ABSTRACT**

*The Climate Change impact studies on hydrology often rely on climate change information at finer spatial resolution. However, General Circulation Models (GCMs), which are among the most advanced tools for estimating future climate change scenarios. GCMs operate on a coarse scale. Therefore, the output from a GCM has to be downscaled to obtain the information relevant to hydrologic studies. In the present paper, Least Square Support Vector Machine (LS-SVM) approach is proposed for statistical downscaling of precipitation at monthly time scale, which is applied to Malaprabha sub basin in India. First, climate variables affecting spatio-temporal variation of precipitation in the study area are identified and the sensitivity analysis of the predictors is carried out using Pearson's coefficient of correlation. LS-SVM downscaling model is developed to downscale precipitation at a monthly scale. Further, the model is applied to downscale future precipitation data for the study area. Results show the increasing magnitude of precipitation and a shift of rainy months in the future period. LS-SVM is compared with the Artificial Neural Network (ANN) model and the performance is evaluated. The  $R^2$  values for LS-SVM and ANN are 0.745 and 0.448 respectively, which show that LS-SVM is best suitable model for downscaling precipitation for the study area.*

*Keywords: Artificial Neural Network (ANN), General Circulation Model (GCM), Least Square Support Vector Machine (LS-SVM), Pearson's coefficient, Predictors, Precipitation.*

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**1. INTRODUCTION**

The change of condition of water between solid, fluid and gas includes exchange of heat which impacts atmospheric flow and global circulation of both water and heat (Asrar and Dozier, 1994). The investigation of climatic framework requires a basic joining of exploratory methodologies that incorporate hydrological parts and its interrelationship which facilitate includes climatic variability, land spread change, watering system and stream direction and so on. A far reaching learning and comprehension of the different hydrological parts inside hydrological cycle is required to consider the impacts of these segments. Examination of these climatic frameworks and their linkages characterize the basic inquiries that the General Circulation Models (GCMs) are endeavoring to reply.

General Circulation Models (GCM) are the numerical models created by considering the material science required in area surface, sea and barometrical procedures in type of an arrangement of direct also, non-direct incomplete differential conditions. They give us the data of future climatic variables up to coming 100 years considering the anthropogenic exercises however this data is accessible at such a coarse resolution (around 300Kms matrix measure) that it can't be utilized straight forwardly for any investigation at neighborhood or local level (Wigley et al., 1990; Carter et al., 1994).

Downscaling is a method to get to the climate data at different higher scales and use it in an effective way for further investigation at lower scales as required by water resource scientists and managers. The utilization of downscaling is bound to the scale issues - spatial and temporal. Statistical and Dynamic are two climatic downscaling approaches. Statistical downscaling method is the easiest way to handle the climate data for effective watershed management. (Patil et al., 2015).

**1.1 Methods of downscaling**

'Downscaling' is a general concept that embraces various methods for increasing the spatial resolution and reduce some of the biases in order to improve the usability of climate scenarios. Often, scenarios from comparatively coarse-resolution global climate models (GCMs) are implied, even though this is not a prerequisite. Basically, there are two fundamentally different approaches to this, dynamical downscaling and statistical downscaling.

**1.1.1 Statistical downscaling**

Statistical downscaling, or empirical statistical downscaling (ESD), takes a statistical approach to the same problem. A reference dataset (often one or several time-series of meteorological station data) is used to calibrate the climate scenario data. The main principle is to find a statistical relationship between the observational

dataset and a corresponding reference period of the climate model data. Originally, a major focus was to adapt GCM scenario data for use as input to impact models, typically a hydrological model.

### 1.1.2 Dynamic downscaling

Dynamical downscaling makes use of a regional climate model (RCM) having higher spatial resolution (typically 10–50 km) over a limited area and ‘fed with large-scale weather’ from the GCM at the boundaries of the domain. A regional climate model is conceptually similar to a global climate model; both focus on the dynamical and physical processes that governs the weather and thus the climate, the basic physical processes are the same although the parameterizations differ because of the different resolution, and the numerical approaches for solving the equations are similar.

### 1.1.3 Least Square Support Vector Machine

The LS-SVM is a mainstream form of the SVM that has been utilized for arrangement and capacity estimation. The adaptation has been proposed by Suykens and Vandewalle (1999). The LS-SVM is a more rearranged adaptation of the SVM, safeguarding the first characteristics of SVM (Zhou et al., 2011), yet has low computational expense and great speculation execution (Sachindra et al., 2011). Not at all like the SVM that discovers arrangement by utilizing complex quadratic programming, has the LS-SVM understood an arrangement of straight conditions. The LS-SVM is subjected to fairness requirements and the squared mistake terms. It is a more improved calculation not at all like the SVM where the model unpredictability (which is controlled by the quantity of concealed layers) takes after the raised enhancement issue. This empowers the LS-SVM to get prepared with far less exertion. It is utilized for powerful non-direct capacity estimation since it can deal with profoundly non-straight and boisterous information also, while the SVM must be connected to static issues like grouping and capacity estimation (Anandhi et al., 2008, Tripathi et al., 2006. LS-SVM is run utilizing the MATLAB/C tool compartment for Least Squared Support Vector Machine in the MATLAB environment.

### 1.1.4 Artificial neural network

ANNs are considering the physiology of the cerebrum, with a movement of "center points" prepared to pass information between each other in a similar way to cells in the psyche. A neuron is a little cell that gets signals from various sources and responds the readied respect other interfacing neurons. It is made out of a Core, a cell body known as Soma, Dendrites goes about as information channels and an Axon which serves as a yield channel. The axon closes in a specific contact called Synaptic Intersection in which it joins axon with dendrite to the following neuron. For a full depiction of ANN theory, see Priest (2000) or Picton (2000). ANNs have been associated on a couple of past occasions to issues within environment science.

## 2. STUDY REGION

The study area is the catchment of Malaprabha, a Sub-basin of Krishna basin situated in Karnataka state of India. It has a catchment area of 11589 km<sup>2</sup> arranged around 15°30' N and 15°56' N latitudes and 74°12' E and 75°15' E longitudes (see Fig.1). It gets an annual average precipitation of 1051 mm. It has a tropical rainstorm atmosphere where the majority of the precipitation is restricted to a couple of months of the storm season. The south–west (summer) storm has warm winds blowing from the Indian Ocean creating bounteous measure of precipitation amid June–September months. The Malaprabha Sub-basin is one of the real helps for the dry locales of north Karnataka. The Malaprabha reservoir supplies water for watering system to the areas of northern Karnataka with an irrigable zone of 218191 hectares and the mean yearly precipitation in the repository order zone is 576 mm (Suresh and Mujumdar, 2004).

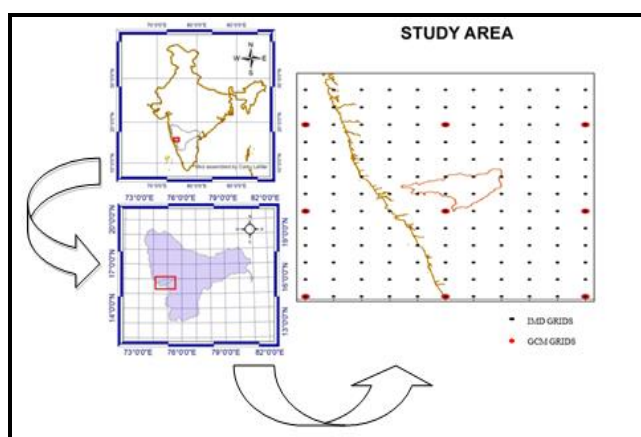


Fig-1: Location map of the study region in Karnataka State of India

#### 4. DATA DESCRIPTION & EXTRACTION

GCMs are accessible at coarse framework scale and ranges between 250Kms to 600Kms. These are scientific models created by considering material science required in area, sea and climatic forms in type of an arrangement of direct and nonlinear incomplete differential conditions. They anticipate climatic variables all around at coarse determination.

In fifth assessment report (AR5) of IPCC, four Representative Concentration Pathways (RCP's) were given and characterized by their aggregate radiative driving (total measure of human outflows of GHGs from all sources communicated in Watts per square meter) pathway and level by 2100. The Canadian GCM models have considered RCP4.5 as the future situation which speaks to adjustment without overshoot pathway to  $4.5 \text{ W/m}^2$  at adjustment after 2100.

Most recent AR5 report of IPCC has given different GCMs out of which CanCM4 at network size  $2.5^\circ \times 2.5^\circ$  created by Canadian Center for Climate Modeling and Analysis (CCCMA) has been chosen taking into account the ability score. It gives authentic information from 1961 to 2005 and also the information comprised of future predictions by future projections RCP4.5 from 2006 to 2035. The information was extracted to cover the whole Malaprabha Sub-basin with  $3 \times 3$  framework focuses.

The variables or the indicators given by the CanCM4 GCM models incorporate atmospheric, area, maritime and ice variables and among them atmospheric variables have been considered here. Inside the atmospheric variables there are numerous variables and each of them is accessible at 22 pressure levels that are 1000, 925, 850, 700, 600, 500, 400, 300, 250, 200, 150, 100, 70, 50, 30, 2, 10, 7, 5, 3, 2 and 1(in millibar). The predictor variables are downloaded in .net or netcdf format which are not readable easily. To convert these variables in to a readable format (excel), MATLAB programming is used. For model calibration and validation, Indian Meteorological Department (IMD) observed gridded precipitation data for the Sub-basin is utilized. The precipitation data accessible at network size of  $0.5^\circ \times 0.5^\circ$  was changed over to monthly basis from daily. The IMD data is extracted for January 1971 to December 2005.

#### 5. METHODOLOGY

The methodology adopted in the present study is presented below Figure 2 includes all the stages of downscaling the GCM data to regional scale. Here, CanCM4 is the GCM model selected for the study and the variables are extracted using MATLAB programming. Screening of predictor variables is done using Pearson's coefficient is explained in the section of sensitivity analysis of predictors. Two statistical methods LS-SVM and ANN are used for downscaling and are compared with each other. GCM (CanCM4) grids of size  $2.5^\circ \times 2.5^\circ$  is been overlaid and  $3 \times 3$  matrix of GCM grids is taken into consideration which cover the study area (Figure 3). IMD grids of size  $0.5^\circ \times 0.5^\circ$  for precipitation are also been overlaid on the delineated Sub-basin. Three IMD stations (see Table 1) considered for downscaling i.e., S1, S2 and S3, cover the study area.

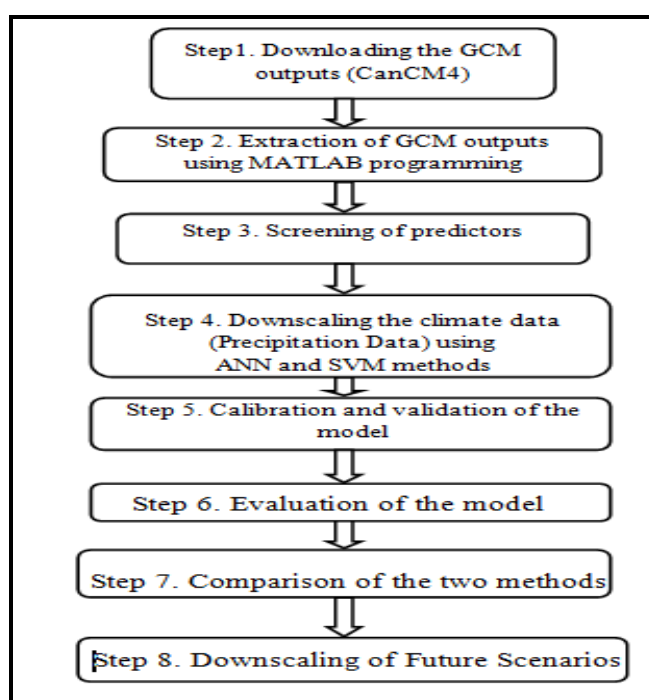


Fig-2: Workflow Process for Statistical Downscaling



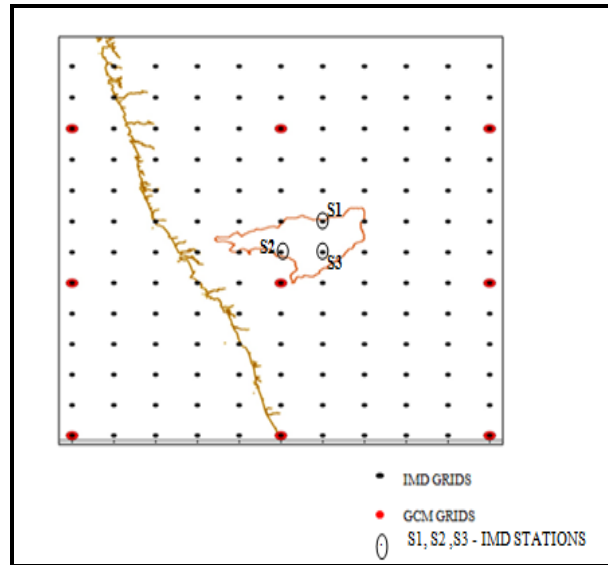


Fig-3: IMD grids superimposed on GCM grids for Malaprabha Sub-Basin

**Table-1: Location of downscaling points (coinciding IMD grids) for precipitation**

Point	Latitude (North)	Longitude (East)
S1	16° 00' 00"	75° 00' 00"
S2	15° 30' 00"	75° 00' 00"
S3	15° 30' 00"	75° 30' 00"

## 6. SENSITIVITY ANALYSIS OF PREDICTORS

All the GCMs produces distinct forecast for the future, considering the anthropogenic exercises and the discharge rates of Green House Gasses (GHG's). They all have their own particular suppositions and create distinctive variables or indicators which incorporate barometrical, soil, maritime and ice variables.

The variables suggested by the CanCM4 GCM model incorporate environmental, area, maritime and ice variables and among them climatic variables have been considered here. Among the climatic variables there are numerous variables and 4 variables out of 18 are accessible at 22 pressure levels that are 1000, 925, 850, 700, 600, 500, 400, 300, 250, 200, 150, 100, 70, 50, 30, 2, 10, 7, 5, 3, 2 and 1(in millibar).

Karl Pearson's coefficient of relationship has been ascertained to decide the fitting indicators. The count of connection conceded from station to station contingent upon the nature and attributes of the barometrical flow variables and the predictand (for this situation, precipitation) to be downscaled. Just indicators which demonstrated sensible association with the predictand have been utilized as a part of the study (Anandhi et al., 2006).

Six predictor variables (ua, ta, zg, pr, rlds and hfls) were screened as potential predictors which impact the predictand (precipitation) for Malaprabha Sub-basin, based on the value ranges of Pearson's correlation coefficient. The r values show that only 6 variables at different pressure levels (Table 2) out of 18 variables are most influencing the predictand for the Sub-basin under consideration.

**Table-2: List of Predictors**

Sl. No.	Predictor variable	Name of the Predictor	Pressure levels	R
1	ua	Eastward Wind	1000	0.1046
2	ta	Air Temperature	700,600,400,300, 250,200,150	0.1065,0.1131,0.1177,0.1365,0.1344,0.1855,0.1037
3	Zg	Geopotential Height	250,200,150,100, 70,50,30,20	0.1045,0.1093,0.1092,0.1079,0.1131,0.1198,0.1131,0.1081
4	Pr	Precipitation	-	0.1818
5	rlds	Surface downwelling longwave flux in air ( $Wm^{-2}$ )	-	0.1315
6	hfls	Surface upward latent heat flux ( $Wm^{-2}$ )	-	0.1112



## 7. RESULTS AND DISCUSSIONS

### 7.1 Calibration and validation of LS-SVM

Calibration of the model in LS-SVM is nothing but training the model with the historical training set of data (1971-1995). Once the model is trained, validation is done using IMD observed data for the test data set (1996-2005). Fig.4. shows the snap shot of the interface for training of the model using the MTLAB programming. Further, model is run for the future data set (2006-2035) for predicting the future precipitation of the Sub-basin.

The hyper parameters chosen are gamma equal to 700 and sigma square equal to 5 after a number of trails (Figure 5). As indicated by Figure 6, the model over-anticipated the low precipitation occasions and under-anticipated in the high precipitation occasions. The execution in this station might be because of the nearness of high precipitation occasions in the test data set, which may have created the model to measure its segments mistakenly (NOTE: Unlike ANN, SVM naturally alters weights relying upon the information and the yield).

### 7.2 Results of ANN

The ANN model Calibration and Validation was done utilizing the ANN tool manager. It's a trial and error process where the neurons and the layers are selected to get the desired results. The Input data extracted from the 3 surrounding grid points are bifurcated in the ration 70:30. The first 70% of the data were trained in ANN with that of IMD observed monthly mean rainfall. The rest 30% of the input data were then compared with that of IMD station data for the performance evaluation.

ANN toolbox manager is used for training the model (Figure 7). The inputs provided for the network are the IMD observed station data in monthly scale time series and the GCM outputs of the surrounding grid points. Number of iterations were carried out with different values for weights and the performance was observed. It is a trial and error process which needs to be continued till the optimum results are obtained. Figure 8 shows the performance of ANN.

The performance of ANN was weaker in comparison with LS-SVM in case of downscaling of precipitation data (see Table 3). The  $R^2$  values for LS-SVM and ANN are 0.745 and 0.448 respectively. This may be due to the uncertainties involved in GCM outputs, which are well considered in LS-SVM function estimation. Whereas in ANN, elimination of the uncertainties is not involved as ANN is only a training and validation process. The consideration of suitable inputs may also be the reason for weaker performance of ANN. The results of ANN proved weaker in comparison with LS-SVM with past researches (Tripathi et al., 2010). Hence ANN is not considered as a perfect model for downscaling future projections for the three stations. Table 3 gives the comparison of statistical models LS SVM and ANN with the IMD data.

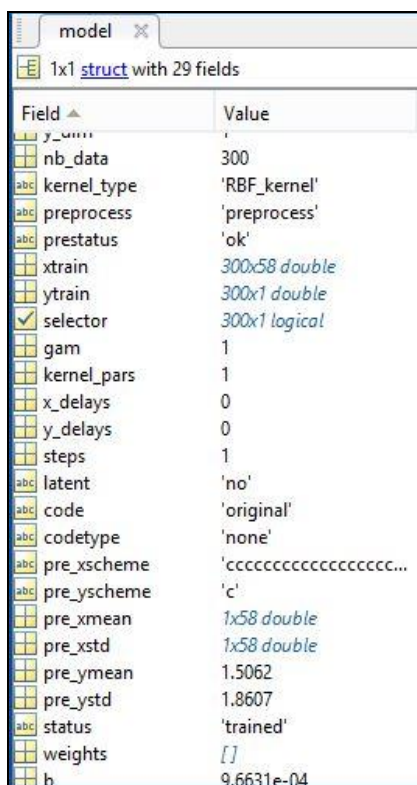


Fig-4: Training of the model

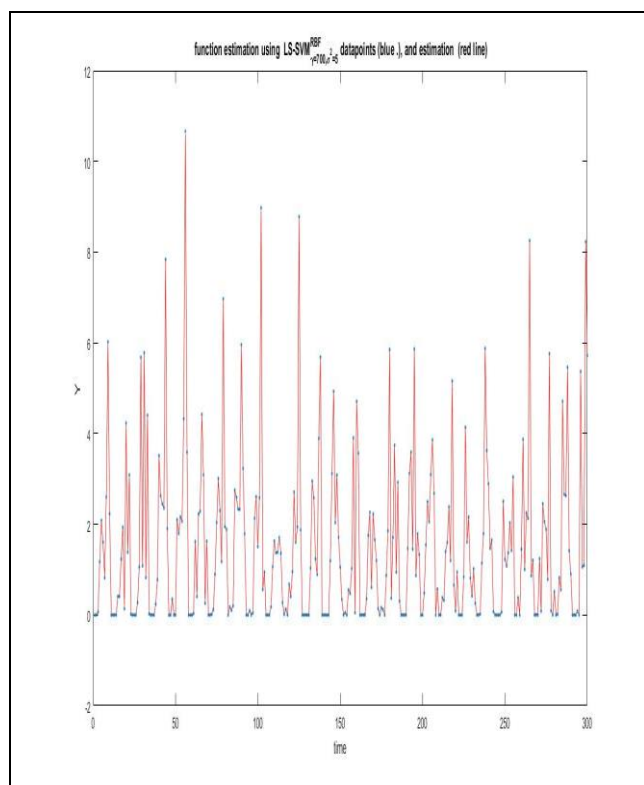


Fig-5: Function estimation by LS-SVM

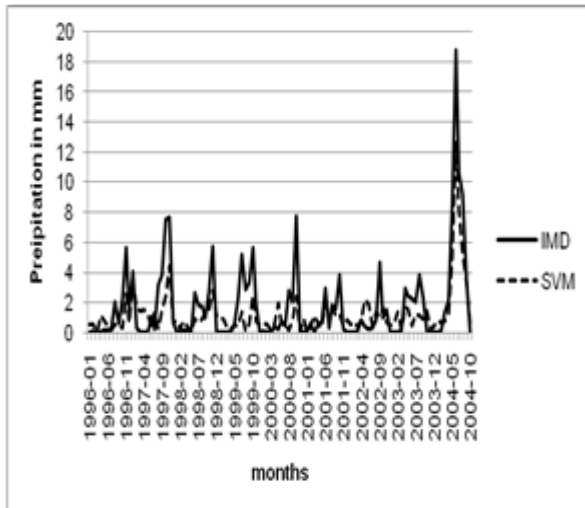


Fig-6: Obtained precipitation from LS-SVM in mm

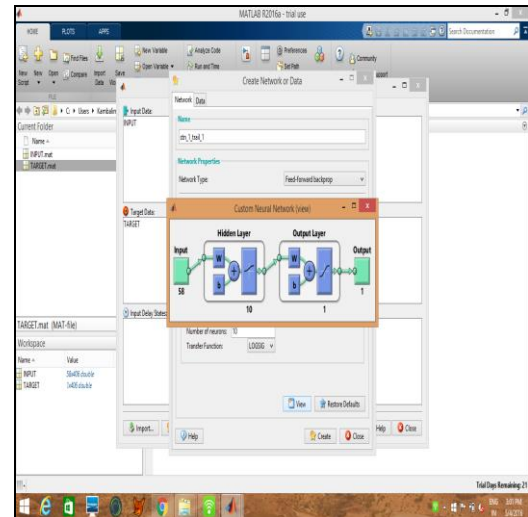


Fig-7: Model set up for ANN

### 7.3 Prediction for future (2006-2035) using LS-SVM

LS-SVM method was used for predicting the future precipitation (2006-2035) for all the three stations. Results show the increasing pattern of precipitation as well as increase in frequency of high precipitation events annually in the three stations, as indicated by Figures 9, 10 and 11 for station S1, station S2 and station S3 respectively.

## 8. SUMMARY AND CONCLUSIONS

The study emphasized on downscaling precipitation on a monthly basis at a regional level scale and produce precipitation data for a future time period. The exploration additionally centered on investigating different statistical downscaling procedures, drawing examinations amongst them and deciding the assessment criteria to survey the execution of a downscaling model.

LS-SVM Model effectively downscaled the precipitation data on a monthly basis. Training set was taken from 1971-1995 (and the hyper parameters were chosen as gamma 700 and sigma square as 5) and validation was accomplished for a time period of 1996-2005. Model performed well for all the three stations which were considered for downscaling in the Malaprabha Sub-basin.

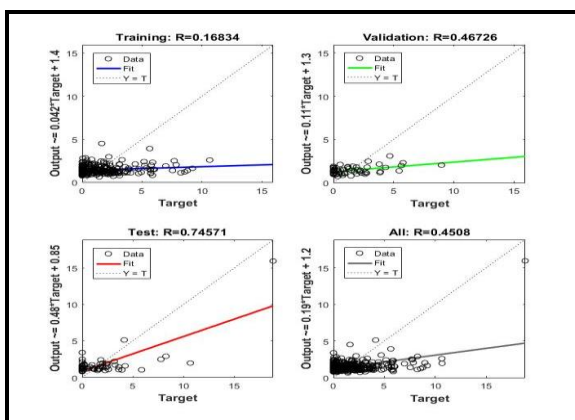


Fig-8: Performance of ANN

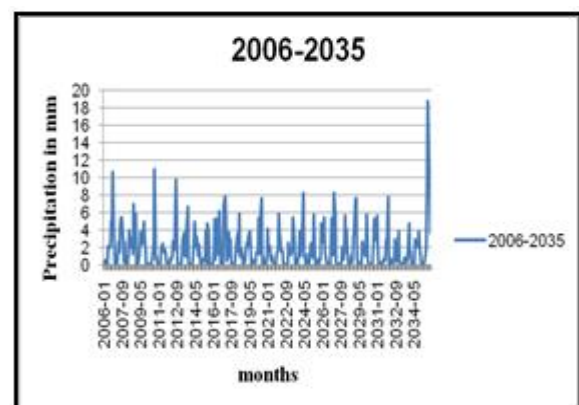


Fig-9: Future prediction of rainfall for station S1

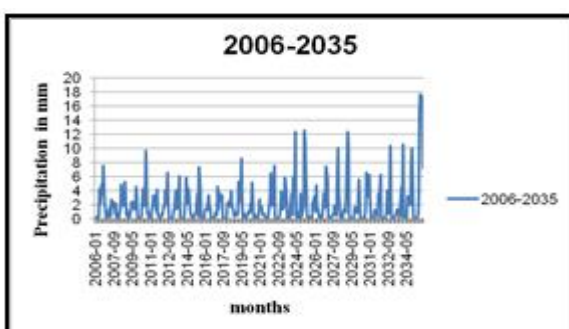


Fig-10: Future prediction of rainfall for station S2

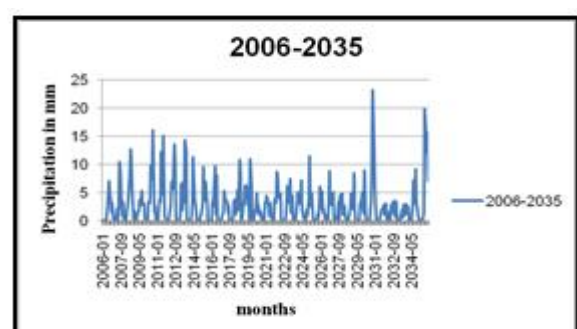


Fig-11: Future prediction of rainfall for station S3

Sensitivity examination was accomplished for determination of potential predictors which impact the predictand (precipitation). Karl Pearson's coefficient was utilized for performing the sensitivity analysis. Six predictor variables (ua, ta, zg, pr, rlds and hfls) were screened as potential predictors which impact the predictand (precipitation) for Malaprabha Sub-basin, based on the value ranges of Pearson's correlation coefficient. The Pearsons' coefficient values show that only 6 at different pressure levels out of 18 variables are most influencing the predictand for the Sub-basin under consideration. The variables which include both the thermodynamic and dynamic parameters and which have a physically meaningful relationship with the precipitation of the Sub-basin are chosen as the probable predictors.

Bias correction was finished by the technique for standardization which proficiently expelled the inclination in the data. Unlike temperature, the downscaled results for precipitation largely vary with the methods of downscaling as well as the seasons. Comparison of the two downscaling methods (LS-SVM and ANN) was accomplished for same training and test sets of data. LS-SVM turned out to be the best reasonable model when compared with ANN.

**Table-3: Statistical comparison of ANN and LS-SVM downscaling model simulations**

Station name	Observed (IMD)		SVM simulated value					ANN simulated value				
	Mean (mm)	Stdev (mm)	Mean (mm)	Stdev (mm)	R <sup>2</sup>	NSE	R	Mean (mm)	Stdev (mm)	R <sup>2</sup>	NSE	R
1	1.7551	2.8222	1.2559	1.6206	0.745	0.9175	0.8636	1.4751	0.8280	0.441	0.9740	0.6694
			-0.39(%)	-0.74(%)				-0.18(%)	-2.40(%)			
2	2.1118	4.6988	1.9504	3.3338	0.782	0.9940	0.8847	1.4538	0.4768	0.033	0.9699	0.1949
			-0.08(%)	-0.40(%)				-0.45(%)	-8.85(%)			
3	2.9221	5.4177	2.1924	3.2932	0.812	0.9364	0.9013	1.3674	0.4864	0.042	0.9502	0.2151
			-0.33(%)	-0.64(%)				-1.13(%)	-10.13(%)			

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**DETERMINANTS OF NON-PERFORMING ASSETS OF BANKS IN INDIA: A PANEL DATA ANALYSIS****Jayanti Bhattacharjee**

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**ABSTRACT**

*The higher incidence of NPAs constraining bank credit flow has drawn the attention of many researchers. The restrained credit flow has constrained the effectiveness of monetary transmission and risks overall financial stability of the country. All these developments stress the need to identify the factors that led to the high NPA share of the banks and thereby weakened credit growth of the economy. The paper strives to undertake an econometric analysis for a deeper understanding of the issues relating to high NPA share of the banks in India. We restrict our study to the 2005 to 2017 time period as the new definition of classification of assets into NPAs with a 90-day overdue period was introduced since March 2004. We run a static Random Effects Model and a dynamic panel data model using the Blundell and Bond (1998) System -Generalized Method of Moments (SGMM). The present study shows that contemporary economic activity, low CRAR, operational inefficiency and investment in non-approved securities by the banks in India have led to the growth of NNPA's of banks during the period. The PSBs are found to be prone to having more stressed assets as compared to Indian private and foreign banks in the level form of the model.*

*Keywords: Bank Credit, Non-Performing Assets, Panel Regression*

**INTRODUCTION**

Indian economy witnessed a slowdown in growth in the recent years from the double digit growth rate of 10.26 per cent in 2009 (World Bank). There is a general agreement that tepid growth in bank credit has been a major obstacle to launching the economy into a 8 percent plus growth trajectory. Economic Survey has pointed out the "twin balance sheet (TBS) problem" as the biggest constraint to growth today. India's leading corporate sector has too much debt on their balance sheets; this keeps them from making fresh investment. Banks are weighed down by a mountain of bad loans; this comes in the way of credit growth. TBS has impacted upon the growth rate by affecting both the demand for credit and the supply of it. As the world economy boomed in the mid-2000s and the Indian economy along with it, Indian firms embarked on an investment spree. Much of the investment went into infrastructure and related areas such as telecom, power and steel. Banks vied with each other to finance these projects. This resulted in a credit boom: non-food credit doubled in the period 2004–05 to 2008–09. In India, banking crisis is a recurrent phenomenon. Since the liberalisation reforms of 1991, there have been two major banking crisis episodes, the first took place during 1997–2002, and the second, started in the aftermath of the 2008 global financial crisis and is yet to be resolved. Companies raised record levels of debt from the international markets as well. As a result, the debt to equity ratio in Indian companies shot up above normal levels. Companies were taking on risk in anticipation of huge growth opportunities. Growth opportunities diminished considerably with the onset of the global financial crisis (GFC) in 2007. During an economic boom, complacency and buoyant perception underestimates risks, and generally asset migration to non performing asset (NPA) status remains muted. On the contrary, during recession, credit risks on loans magnify and many of them become delinquent. Increasing credit risk requires additional capital infusion by banks for maintaining their loan portfolios. A slowdown in infrastructure investment in India began in the post GFC period due to policy paralysis of the government. However, government successfully persuaded the public sector banks (PSBs) to expand credit to infrastructure sector which led to rise in their NPA share in the post-crisis period. Moreover, the share of NPAs of the PSBs jumped sharply in 2016 following the RBI directive of asset quality review in 2016.

Master Circular on Prudential norms on Income Recognition, Asset Classification and Provisioning pertaining to Advances, dated 1 July, 2015 defines an asset, including a leased asset, as non performing when it ceases to generate income for the bank. The non performing asset (NPA) definitions were tightened since March 31, 2004, consistent with international standards. RBI defines NPA as a loan or an advance where interest and/ or instalment of principal remain overdue for a period of more than 90 days in respect of a term loan. A similar norm of 90-day overdue is suitably applied for bills purchased and discounted; securitisation and derivative transactions undertaken. Agricultural loans are treated as NPAs, if loan instalments remain overdue for two/one crop seasons for short/long duration crops. Within NPAs, an asset is termed as "substandard" if it remained an NPA for less than 12 months, beyond which it is termed as "doubtful." The worst quality of NPAs are termed "loss" assets, which are identified as a loss by the bank itself or by the auditors or the RBI, provided the amount is not written off wholly by the bank.

The higher incidence of NPAs constraining bank credit flow has drawn the attention of many researchers. The restrained credit flow has constrained the effectiveness of monetary transmission and risks overall financial stability of the country. All these developments stress the need to identify the factors that led to the high NPA share of the banks and thereby weakened credit growth of the economy.

### **LITERATURE SURVEY**

Rajaraman and Vasishtha (2002) observed that the incidence of NPAs in banks is due to weak operating efficiency in some, but otherwise for others. Das and Ghosh (2005) examined the inter linkages between credit risk, capital, and productivity changes in a simultaneous equations framework, where they used NPAs as a proxy for credit risk. The estimated results for the NPA equation revealed that a higher capital ratio reduced NPAs in general, while the coefficient for productivity was statistically not significant. There was an indication of an inverse “U” shaped relation between NPA and bank credit growth. Some empirical work has been done to analyse the non-performing asset (NPA) problem of the Indian banking sector (Rajaraman and Vasishtha 2002; Mohan 2003; Ranjan and Dhal 2005; Reddy 2004; Das and Ghosh 2007, Chipalkatti and Rishi (2007). Dhar and Bakshi (2015) have analysed the role of various factors explaining the variation in NPAs. They observed that an increased proportion of lending to sensitive sectors aggravated NPA problems, and higher capital adequacy and better net interest margin reduced the same.

Samantaraya (2016) has made an econometric analysis of the major determiners of loan delinquencies in banks operating in India. He observes that excessive credit growth in the past is a major reason that has led to current NPAs. Other factors such as contemporary economic conditions, capital adequacy and overall levels of efficiency of the banks have also affected the incidence of NPAs. Majumdar (2016) is of opinion that meta-static corruption may be affecting India's financial sector. Sengupta and Vardhan (2017) have explored the two major NPA episodes in post-liberalisation India and analyses them in a comparative framework. The Economic Survey (2016-17) argues convincingly that the TBS problem has arisen primarily because of irrational exuberance on the part of investors, commensurate exuberance amongst banks flush with funds. Bringing credit growth back on track requires restoration of the health of PSBs (Panagariya 2017). The paper tries to empirically estimate the factors that led to the surge in NPA share in India.

Growth of GDP and credit growth of the Scheduled Commercial Banks have been pro- cyclical till 2011 (Fig. 1). However, since 2012 while growth of GDP recovered, plummeted credit growth continued its trend. It is claimed that the slowdown in credit growth has been due to sluggish demand, but differences in the performance of the PSB and private sector banks point to supply side constraints. The large volume of NPAs of the PSBs has led their credit growth to decline. Figure 2 shows the comparative performance of banks in the last few years.

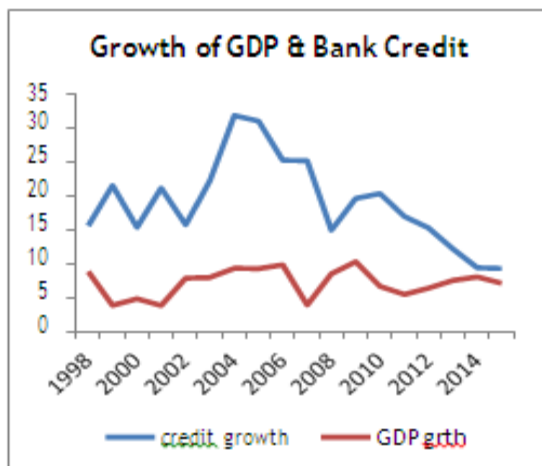
Another interesting aspect of the Indian economy deserves attention. Majumdar (2016) has studied the relationship between the rate of interest and the extent of corporate leverage for the period 2003-04 to 2013-14. He observed that while the interest rate in India rose from 5.7% in 2003-04 to 8.5% in 2013-14, the average debt-to-equity ratio has also followed suit. The average levels of debt had risen from 8.5 times to a high of 14.6 times equity in 2010-11. This unnatural corporate behaviour of Indian firms signals a major crisis. ‘Priority sector lending’ provided by the banks are not based on commercial consideration. As such, many such loans may not be of good quality and there is high probability of loan losses (Samantaraya 2016). Dhar and Bakshi (2015) observed that an increased proportion of lending to sensitive sectors aggravated NPA problems, and higher capital adequacy and better net interest margin reduced the same.

The figure 3 below shows that the credit share of the PSBs is biased towards non-priority sectors in the last few years. There has been an increase in borrowing of lower quality firms which has further added to the woes of the banks. Increase in such loans has eventually led to increase in the size of bad loan portfolios of the banks. Fig. 4 shows that the distribution of Scheduled Commercial Banks (SCBs) by Capital Adequacy Ratio (CRAR) since 1995-96. It shows that number of foreign banks having CRAR above 10 percent have been the highest, followed by private banks, nationalised banks and Sbi and Associate banks. This phenomenon reveals that foreign banks have been more conservative and cautious in lending to risky activities as compared to asset it possesses. As a result, the NPA problem was not critical in the foreign banks and can be excluded from the study.

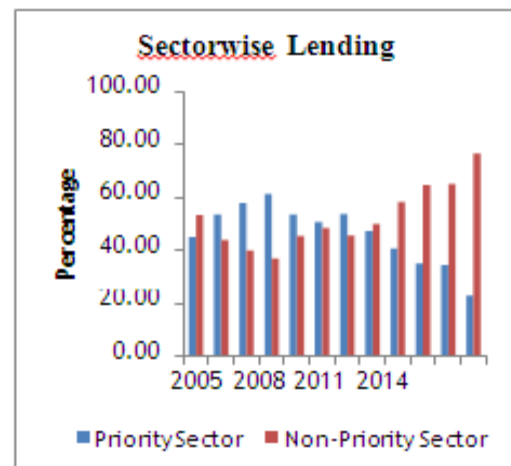
The Basel II requirements started being applied to Indian banks' loan portfolios from 2009 onwards. The corporate debt-to-equity ratio also registered a marked increase during the 2009-2014 period. All these developments points to the fact that RBI has been lax in its audit and supervision of banks' credit appraisal and lending processes.



Fig-1 Growth of GDP and Bank Credit of SCB Fig-3 Sector-wise lending by PSBs

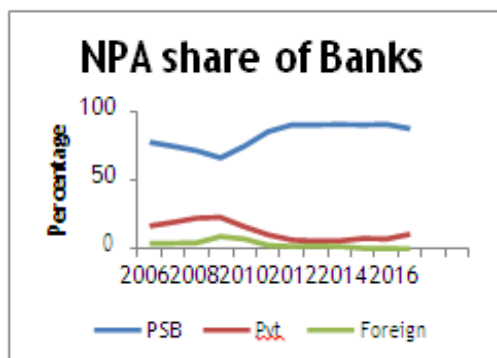


Source: Handbook of Statistics on Indian Economy



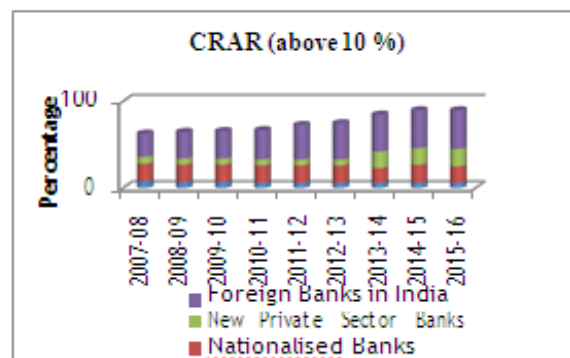
Source: Statistical Tables Related to Banks in India

Fig-2: NPA share of Banks



Source: Handbook of Statistics on Indian Economy

Fig-4: Distribution of SCBs by CRAR above 10%



Source: Handbook of Statistics on Indian Economy

The paper strives to undertake an econometric analysis for a deeper understanding of the issues relating to the high NPA share of banks in India. We restrict our study to the 2005 to 2017 time period as the new definition of classification of assets into NPAs with a 90-day overdue period was introduced since March 2004. Our article's contribution to the literature is threefold. Firstly, the study focuses on the post-2004 period given the new definition of classification of assets into NPAs. Secondly, we incorporate ratio of investment in non- approved securities to total investment to reflect the corruption practices of banks. Thirdly, to counter the possible endogeneity among the variables and the weak instrument problem associated with Arellano and Bond (1991) estimator, we run a dynamic panel using the Blundell and Bond (1998) System -Generalized Method of Moments (SGMM).

## DATA AND METHODOLOGY

Drawing from related literature, the set of major factors that might have led to the high NPA share of the banks include contemporary economic activity (GDP), bank-specific variables such as ratio of priority sector lending to total lending (PS), capital adequacy ratio (CRAR) reflecting the conservativeness of the banks towards risky assets, return on assets (ROA) reflecting the profitability and overall efficiency of banks to generate earnings, corruption reflected by ratio of investment in non-approved securities to total investment (INA). Fig. 2 shows that the PSBs have the largest share of NPAs in India. So, we have incorporated a dummy for PSBs in our model.

The study is conducted over the period 2005 to 2017. The sample of banks has been determined primarily by the availability of data. Our data consists of a balanced panel of 533 observations covering 41banks for the period 2005-2017. In addition to a static panel data model we also use a dynamic panel data model in which current NNPA share is regressed on lagged NNPA share and a set of explanatory variables.

$$\ln Y_{it} = \lambda \ln X_{it} + \delta \ln Z_{it} + \text{DPSB}_i + \mu_i + \eta_t + u_{it} \dots (1)$$

$Y_{it}$  = Natural log of NNPA of bank  $i$  at time period  $t$

$X_{it}$  = Natural log of bank specific explanatory variables of bank  $i$  at time period  $t$

$Z_t$  = Natural log of growth of GDP of India at time  $t$

DPSBi = Dummy for Public Sector Bank  $i$

$\mu_i$  = bank-effect

$\eta_t$  = period-effect

$u_{it}$  = error term that varies across banks and time periods

One methodological concern is the problem of possible endogeneity among the explanatory variables which can be countered using the Instrumental Variable method of estimation. However, it is extremely difficult to find good instruments. An alternative solution entails using lagged values of the explanatory variables, thereby ensuring that they are predetermined with respect to the dependent variable. The recommended estimator in this case is GMM suggested by Arellano and Bond (1991) which basically differences the model to get rid of the individual specific effects and along with it any time-invariant regressor. The first difference model is:

$$\Delta \ln Y_{it} = \gamma \Delta \ln Y_{it-\tau} + \lambda \Delta \ln X_{it} + \delta \Delta \ln Z_t + \Delta \eta_t + u_{it} - u_{it-\tau} \dots \dots \dots (2)$$

This also gets rid of any endogeneity that may be due to the correlation of these individual effects and the right-hand side regressors. The moment conditions utilize the orthogonality conditions between the differenced errors and lagged values of the dependent variable. This assumes that the original disturbances are serially uncorrelated and the differenced error is MA (1) with unit root. However, this method suffers from weak instrument problem that biases the estimated coefficients. The Blundell and Bond (1998) System-GMM was developed to address this weak instrument problem; this method adds a level equation to the First Difference equation to construct a system which is estimated using differenced values of the variables as instruments. For random walk-like variables, past changes may indeed be more predictive of current levels than past levels are of current changes so that the new instruments are more relevant.

## ESTIMATION AND RESULTS

Based on Hausman test results we find Random Effect model to be the most appropriate. With random effects in Model 1, the coefficient of GDP, investment in non-approved securities (INA) and dummy for PSBs (DPSB) are found to be positive and significant, while the coefficient of the ratio of priority sector advances to total advances (PS) and return on assets (ROA) is negative and significant. The coefficient of capital adequacy ratio is negative though insignificant in Model 1.

The positive and significant coefficient of GDP in Model 1 reflects the pro-cyclical behaviour of the level of GDP and NNPA's of the Scheduled Commercial Banks. It is also observed that the PSBs are prone to having more stressed assets as compared to Indian private and foreign banks as reflected by the positive and significant coefficient of the DPSB. The positive and significant coefficient of ratio of investment in non-approved securities to total investment (INA) indicates that the increase in corruption practices of banks have led to the increased share of NNPA's. It is observed that one percent increase in return on assets on the average significantly reduces the proportion of NNPA's by 0.44 percent. The counter-intuitive sign of the ratio of priority sector advances to total advances may be due to the decline in the share of priority sector advances to total advances since 2012.

To counter the problem of possible endogeneity among the explanatory variables we resort to the System-GMM suggested by Blundell and Bond (1998) to estimate the influence of these variables on growth of NNPA's of the 41 Scheduled Commercial Banks. In Model 2, the dependent variable is growth of NNPA. The overidentification and AR(1) and AR (2) tests in estimations using System-GMM do not indicate problems with the instrument selection or the general specification of the models.

We find that lagged growth of NNPA's renders a positive and significant influence on current growth of NNPA's. The coefficient of ratio of priority sector lending to total advances (PS) retains its sign and significance even after controlling for endogeneity. The negative and significant coefficient of ratio of priority sector lending to total advances (PS) may be due to decline in the ratio of PS and drastic increase in the share of non-priority sector lending since 2012 (Fig. 3). The coefficient of return on assets (ROA) turns insignificant when we control for endogeneity in Model 2. This may be due to low ROA of the PSBs, the major contributor of NPAs of banks in India. Surprisingly, the coefficient of CRAR turns positive and significant in Model 2. A higher CRAR indicates that the bank is conservative and has been cautious in lending to risky activities as compared to capital it possess. Fig. 2 shows PSBs to be having the largest share of NPAs while Fig. 4 shows that share of



PSBs having CRAR above 10% is nominal. The counter-intuitive sign of capital adequacy ratio (CRAR) in Model 2 corroborates the facts. Model 2 also shows that the higher growth of GDP is attributable to the higher growth NNPA share, lending support to the fact that government successfully persuaded the PSBs to expand credit to infrastructure sector which led to rise in their NPA share in the post-crisis period. The paper emphasizes that the ratio of investment in non- approved securities to total investment (INA), proxy for corruption practices of banks remains positive significant in explaining growth variation of NNPA's even after controlling for endogeneity. Our findings are in line with those of Majumdar (2016) that meta-static corruption may be affecting India's financial sector. The dummy for PSBs have been dropped in SGMM because of its time invariant characteristics. However, it must be noted that the intercept term is significant in both Model 1 and Model 2. This can be taken to imply that there are other factors which are not captured in the model.

**Table-1: Regression Results for Random Effects and System Generalized Method of Moments**

Variables	Model 1 RE	Model 2 SGMM
Constant	-18.99 (0.00)	-5.97 (0.00)
$\Delta \ln \text{NNPA}(-1)$		0.84 (0.00)
Ratio of priority sector lending to total advances (PS)	-0.48 (0.05)	-0.87 (0.00)
Ratio of investment in non-approved securities to total investment (INA)	0.16 (0.07)	0.06 (0.07)
Return on Assets(ROA)	-0.44 (0.00)	-0.02 (0.34)
Capital Adequacy Ratio(CRAR)	-0.63 (0.252)	0.06 (0.01)
Dummy for PSB (DPSB)	1.73 (0.00)	
GDP	2.71 (0.00)	0.95 (0.00)
Model Summary		
Between $R^2$	0.524	
BP-LM	445.02 (0.00)	
Hausman	3.92 (0.78)	
AR(1) (p-value)		-3.20 (0.00)
AR(2) (p-value)		-1.00 (0.316)
Sargan test (p-value)		39.64 (0.999)
Total observations	533	492

Source: Author's calculation

## CONCLUSION

The panel study involving the various factors influencing NPAs of SCBs in India shows that contemporary economic activity, low CRAR and investment in non-approved securities by the banks have contributed to the growth of the NNPA's of banks during the period 2005 to 2017. The negative but insignificant coefficient of return on assets (ROA) and the positive significant coefficient of CRAR show the lax in the lending approach and operational efficiency of the banks in India. As a result PSBs with lowest CRAR are the banks having the largest share of NPAs. To keep growing in a booming economy, firms have kept borrowing despite high interest rates. The cost of borrowing of the firms increased and thereby their ability to repay the loans worsened. The entire credit evaluation and banking supervision of India's banks have been flawed, for having allowed un-creditworthy borrowers to take huge loans. The political economy of financial sector corruption could also be a reason for the loan delinquencies of PSBs in India. The study prescribes the banks to improve operational efficiency and profitability to keep their NPAs under control. The present scenario calls for deep and detailed independent appraisal of banks by the RBI. Also, greater autonomy and more flexibility in hiring man-power needs to be given to the banks. Some initiatives are presently underway, especially the formation of Bank Boards Bureau, re-capitalisation of the banks to meet the Basel III norms and such many other changes under the Mission Indradhanush strategy. These initiatives, if successful, can go a long way in facilitating independent decision-making at all levels free from unwarranted interventions.

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## STUDY ON THE EFFECTS OF PACKAGING AND STORAGE OF HIMSAGAR MANGO VARIETY

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## ABSTRACT

The study on effect of packaging and storage condition on the shelf life and chemical composition of mango cv. Himsagar was carried out at Department of Post Harvest Technology of Horticultural Crops, Faculty of Horticulture, BCKV, Nadia. The fruits of cultivar were harvested at fully mature but unripe stage and were packed in different packages (Un-perforated LDPE, Perforated LDPE, Plastic crate, CFB box and Perforated LDPE with CFB box) and placed in cold store ( $12\pm1^{\circ}\text{C}$ ; 85-90% RH) whereas control was without packaging under ambient condition. The fruits were examined for biochemical parameters viz., TSS, titratable acidity, ascorbic acid, total sugar, reducing sugar and  $\beta$ -carotene content. Data revealed that packaging and storage period had significantly affected the various chemical constituents of fresh Himsagar mango. There was a gradual decrease in acidity and ascorbic acid content of mango, whereas, TSS, total sugar and reducing sugar contents increased during storage. Packing Himsagar mango in LDPE bag of 100 gauge thickness with 1% perforation and 3 ply CFB with 5% perforation at temperature  $12\pm1^{\circ}\text{C}$  proved to be the best treatment for it recorded more gradual increase in TSS and total sugar than other treatments up to 12<sup>th</sup> day. It also showed maximum shelf life and maximum retention of nutritional quality for the cultivar. But, as per sensory quality the maximum score was attained in CFB box ( $T_4$ ) for Himsagar.

**Keywords:** Biochemical parameter, Cold storage, Fresh Himsagar, Packaging.

## INTRODUCTION

Mango (*Mangifera indica* L.) belongs to the order Sapindales in the family Anacardiaceae. India ranks first in mango production contributing over 45.5% of total production in the world. The total production in India is about 180.02 lakh tons which is 22.1% of total fruit production. The total area under mango is 25 lakh hectare accounting to 35.8% of total area under fruits with a productivity of 7.2 MT/ha (Anon., 2013).

Due to its adaptability to a wide range of soil and climatic conditions, relatively hardy nature of the tree, the low cost of raising and maintenance and above all the excellent dessert quality of the fruit, cultivation of mango has spread throughout the length and breadth of the country (Singh, 1995).

Himsagar is an early variety of mango. The fruit is medium in size, ovate to ovate-oblique in shape. Peel is medium thick; pulp is firm, cadmium yellow in colour and fibreless. Flavour is delightful, well blended with a tinge of turpentine and taste is very sweet having abundant juice (Srivastava, 1998). However, it cannot be stored for a long period of time mainly due to early senescent feature. The fruit develops blackish stains and spoils within a very short period with a maximum storage duration of five to seven days. It most likely fails to tolerate minimum transportation hazards (Siddiqui and Dhua, 2009).

In order to overcome these hurdles there is a necessity to find suitable post-harvest techniques to increase shelf life of mango fruits. Proper temperature management during handling and storage retards ripening and preserves fresh-market quality while extending shelf life (Johnson *et al.*, 1998) as at these temperatures the physiological and biochemical changes within the fruit will be greatly reduced. Good packaging protects fruits from physiological, pathological and physical deterioration in the marketing channels and retains their attractiveness. It also contributes a great deal to quality image of product both in domestic and export markets. Thus, scientific packaging and storage reduces the post harvest losses and marketing costs substantially, which enables the producer to fetch a competitive price. The current investigation, thus, aims to develop post harvest management options that can optimize marketing of Himsagar mango without loss of quality.

## MATERIALS AND METHODS

Fruits of Himsagar cultivar of mango harvested at fully mature but unripe stage were obtained from Horticulture Research Station, BCKV, Nadia district, West Bengal. Harvesting of fruits was done in the early morning hours. The stalks of fruit were cut up to a size of about 1 cm with secateurs and which they were washed in tap water and then in distilled water containing 50 ppm of chlorine ( $\text{CaCl}_2\text{O}_2$ ), to reduce the microbial load. The fruits were then surface dried under electric fan. The mango fruits were then packed in LDPE, plastic crates, CFB box and LDPE+ CFB box in cold storage at  $12\pm1^{\circ}\text{C}$  and relative humidity (RH) at 85-95%. Readings were then taken after 3 days interval. Treatment details are given in table 1.

**Table-1: Treatment details used for packaging of mango**

T <sub>1</sub>	Un-perforated LDPE in cold storage
T <sub>2</sub>	Perforated LDPE (1% perforation) in cold storage
T <sub>3</sub>	Plastic crate in cold storage
T <sub>4</sub>	Corrugated Fibre Board Box (5% ventilation) in cold storage
T <sub>5</sub>	LDPE (1% perforation) + CFB (5% ventilation) in cold storage.
T <sub>6</sub>	without any packaging in ambient temperature

**Chemical Analysis:** The mango samples were analysed for various constituents. The TSS was determined by refractometer (0-32°B). Titratable acidity was determined using A.O.A.C. (1990) method. Reducing and total sugars were determined using Lane and Eynon method while beta carotene and ascorbic acid content was estimated according to procedure described by Ranganna (1991).

**Sensory evaluation:** 1-9 Hedonic scale suggested by Ranganna (1991) was followed.

## RESULTS AND DISCUSSION

Packaging and storage had significant effect on various chemical constituents, considered in this study, of fresh Himsagar mango. TSS content of mango fruits gradually increased during storage. The increase in TSS content during storage could be due to losses in water through the respiration and evaporation during storage and concentration of juices (Wills *et al.*, 1980). Cua (1989) also attributed such increase to the conversion of starch into sugar by hydrolysis of the polysaccharide. The maximum TSS was observed in T<sub>5</sub> for cultivar. The film packagings with CFB box and reduced storage temperature improved the maintenance of TSS could be due to the fact that aging through reduced respiration rate and other undesirable metabolic changes was reduced (Pongener *et al.*, 2011).

The reducing and total sugars of mango fruits that were treated with various treatments showed a trend similar to TSS content. The initial increase in total sugars of fruits under different packages might be due to loss of water from the fruits and conversion of polysaccharides and pectic substances into sugars. The increase in total sugars with the storage interval up to 12 days might be due to the hydrolysis of starch, yielding mono-and-disaccharides (Ryall and Pentzer, 1982). Fruit sugar contents (reducing and total sugars) have been reported to increase during the ripening process in storage (Fuchs *et al.*, 1980). Lower sugar content in fruits from polythene packaging treatment was due to lower rate of metabolic processes.

**Table-2: Effect of packaging and storage on TSS, reducing and total sugars**

Treatments	TSS (°B)					Reducing sugars					Total sugars				
	0 day	3 day	6 day	9 day	12 day	0 day	3 day	6 day	9 day	12 day	0 day	3 day	6 day	9 day	12 day
T <sub>1</sub>	5.0	8.0	12.1	15.1	15.1	1.86	2.66	4.66	5.29	5.30	3.55	4.62	7.20	9.01	9.12
T <sub>2</sub>	5.2	7.1	12.0	14.8	15.1	3.48	2.44	4.40	5.42	5.56	3.62	4.20	7.28	9.05	9.60
T <sub>3</sub>	4.9	6.0	10.0	14.1	14.1	3.38	2.01	4.07	5.23	5.11	3.44	3.61	6.10	8.40	8.46
T <sub>4</sub>	5.2	9.1	13.0	16.0	16.2	3.42	2.80	4.81	5.67	5.52	3.62	5.40	7.85	9.67	9.63
T <sub>5</sub>	5.2	8.0	17.0	18.0	16.9	1.72	3.69	5.68	5.87	5.76	3.61	4.87	10.23	10.89	10.29
T <sub>6</sub>	5.1	11.1	14.0	14.1	14.1	1.96	3.24	5.58	5.58	5.59	3.50	6.60	8.40	8.47	8.54
SEm (±)	0.09	0.23	0.27	0.19	0.26	0.04	0.06	0.10	0.09	0.09	0.05	0.14	0.12	0.17	0.14
C.D 5%	NS	0.72	0.82	0.75	0.80	0.13	0.25	0.31	0.27	0.28	NS	0.67	0.89	0.53	0.73

The total titratable acidity of fruits showed a decreasing trend during storage for all the treatments. Such decrease in acidity following storage of fruits has also been reported by Maini *et al.* (1984). The decrease in acidity during storage could be attributed to the use of organic acids as respiratory substrate during storage and by conversion of acids into sugars. However, maintenance of acidity in polythene packed fruits during storage might be due to the decreased hydrolysis of organic acids and subsequent accumulation of organic acids which were oxidized at a slow rate because of decreased respiration. The results are in conformity to similar findings of Venkatesha and Reddy (1994).

There was a decreasing trend of ascorbic acid content in the fruits of all the treatments during the storage period. The loss in ascorbic acid content with the progress of storage period could be attributed to rapid conversion of L-ascorbic acid into dihydro-ascorbic acid in the presence of L-ascorbic acid oxidase (Bashir and Goukh, 2002). Among treatments, ascorbic acid content of samples with perforated LDPE and CFB packaging in Himsagar showed highest retention of ascorbic acid. Barth *et al.* (1993) attributed the higher ascorbic acid concentration to lower peroxidase activity (an important factor for ascorbic acid oxidation in plant tissue) in package in response to the low O<sub>2</sub> and high CO<sub>2</sub> concentration inside the polymeric packaging.

It was observed that the carotenoids content of the pulp increased steadily as the storage period increased. The increase in the carotenoids of the pulp maybe attributed to the concurrent increase of pigment synthesis in the pulp as the storage advanced and does not just involve a simple unmasking of carotenoids (Kays, 1991; Fennema 1996). Similar result was reported in mango cultivar Dashehari (Periyathambi, 2013) packaging and storage.

**Table-3: Effect of packaging and storage on acidity, ascorbic acid and beta carotene**

Treatments	Total acidity (%)					Ascorbic acid (mg/100gm fruit)					Beta Carotene (mg/ 100gm fruit)				
	0 day	3 day	6 day	9 day	12 day	0 day	3 day	6 day	9 day	12 day	0 day	3 day	6 day	9 day	12 day
T <sub>1</sub>	1.16	1.037	0.701	0.517	0.400	44.12	35.00	32.39	28.43	19.64	689	1854	4168	7510	7577
T <sub>2</sub>	1.16	1.025	0.711	0.602	0.304	44.93	37.63	32.99	26.82	20.46	689	1707	3957	7415	9403
T <sub>3</sub>	1.16	0.910	0.615	0.515	0.400	44.86	33.26	30.62	23.04	17.52	692	1597	3587	6367	9318
T <sub>4</sub>	1.16	0.902	0.619	0.616	0.408	45.09	36.94	33.09	27.73	19.25	688	1756	3710	7289	9510
T <sub>5</sub>	1.66	1.026	0.704	0.411	0.400	44.14	38.21	39.98	31.55	26.75	689	1902	4545	7598	9913
T <sub>6</sub>	1.17	0.915	0.608	0.430	0.299	43.80	31.59	26.11	24.01	22.11	689	2456	7578	7908	7915
SEm (±)	0.01	0.021	0.013	0.012	0.008	0.80	0.93	0.91	0.66	0.52	10.39	48.31	96.74	130.20	55.88
C.D 5%	NS	0.065	0.039	0.036	0.024	NS	2.86	2.81	3.04	2.60	NS	148.86	298.10	301.19	272.17

Among the different treatments CFB box in cold store received the highest scoring for sensory evaluation in Himsagar. This is mainly due to the fact that treatment effectively reduced physiological loss in weight and spoilage loss and also effectively retained firmness, colour change and nutrient loss of fruits during storage. This finding is also supported by Sharma and Singh (2010).

In Himsagar T<sub>1</sub> (Un-perforated plastic) recorded the least sensory which can be mainly attributed to the low fruit quality and strong aldehydic flavour of fruit that render it unacceptable for consumption (Lakshmana *et al.*, 2013).

**Table-4: Sensory Score for Himsagar variety**

Treatments	Colour			Flavour			Overall		
	6 day	9 day	12 day	6 day	9 day	12 day	6 day	9 day	12 day
T <sub>1</sub>	5.8	6.6	1.0	4.0	6.8	1.2	9.8	13.4	2.2
T <sub>2</sub>	6.2	6.8	7.6	6.2	7.0	8.4	12.4	13.8	16
T <sub>3</sub>	6.8	7.1	7.8	6.1	6.8	7.8	12.9	13.9	15.6
T <sub>4</sub>	6.9	7.5	8.6	5.3	7.3	8.6	12.2	14.8	17.2
T <sub>5</sub>	7.1	7.8	8.5	4.4	7.4	7.7	11.5	15.2	16.2
T <sub>6</sub>	8.2	1.1	1.2	8.4	1.0	1.0	16.6	2.1	2.2
SEm (±)	0.67	0.41	0.71	0.73	0.51	0.42	1.4	0.92	1.13
C.D 5%	0.002	0.002	0.003	0.001	0.001	0.003	0.003	0.003	0.006

## CONCLUSION

Based on the above investigation it can thus be concluded that mango cultivar 'Himsagar' can be packed in LDPE bags of 100 gauge thickness with 1% perforation and CFB with 5% perforation at a temperature of 12±1°C for up to 12 days with minimal loss in biochemical quality and acceptable eating quality.

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# VARIABLE SELECTION FOR THE ACCELERATED FAILURE TIME MODELS

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## ABSTRACT

*In the statistical area of survival analysis, accelerated failure time model (AFT) is a parametric model that provides an alternative to the commonly used proportional hazards models, whereas a proportional hazards model assumes that the effect of a covariate is to multiply the hazard by some constant. AFT model assumes that the effect of a covariate is to accelerate or decelerate the life course of a disease by some constant. This is especially appealing in a technical context where the 'disease' is a result of some mechanical process with a known sequence of intermediary stages. If the effects of treatment are to accelerate (or delay) the event of interest rather than having a longer term impact, the accelerated failure time model should replace the proportional hazards model as the model of choice. In this paper it is proposed to study the variable selection for the accelerated failure time model as an alternative to the cox proportional hazards model. Numerical examples are also provided.*

**Keywords:** Survival Analysis, Accelerated Failure Time Model, Proportional Hazard Model.

## 1. INTRODUCTION

The accelerated failure time model or accelerated life model relates the logarithm of the failure time linearly to the covariates for a more detailed study refer to Kalbfleisch and Prentice (1980); Cox and Oakes, (1984). As a result of its direct physical interpretation, this model provides an attractive alternative to the popular Cox (1972) proportional hazards model for the regression analysis of censored failure time data. The presence of censoring in failure time data creates a serious challenge in the semi parametric analysis of the accelerated failure time model. Several semi parametric estimators were proposed around 1980, Buckley and James (1979) providing a modification of the least-squares estimator to accommodate censoring and Prentice (1978) proposing rank estimators based on the well-known weighted log-rank statistics. The asymptotic properties of the Buckley James and rank estimators were rigorously studied by Ritov (1990), Tsiatis (1990), Lai and Ying (1991) and Ying (1993) among others. As cited in the literature in the statistical area of survival analysis, accelerated failure time model (AFT) is a parametric model that provides an alternative to the commonly used proportional hazards models, whereas a proportional hazards model assumes that the effect of a covariate is to multiply the hazard by some constant. AFT model assumes that the effect of a covariate is to accelerate or decelerate the life course of a disease by some constant. This is especially appealing in a technical context where the 'disease' is a result of some mechanical process with a known sequence of intermediary stages. If the effects of treatment are to accelerate (or delay) the event of interest rather than having a longer term impact, the accelerated failure time model should replace the proportional hazards model as the model of choice. In this paper it is proposed to study the variable selection for the accelerated failure time model as an alternative to the cox proportional hazards model. Numerical examples are also provided.

## 2. THE ACCELERATED FAILURE TIME MODEL

For  $i=1, \dots, n$ , let  $T_i$  be the failure time for the  $i$ th subject and let  $X_i$  be the associated  $p$ -vector of covariates. The accelerated failure time model specifies that

$$\log T_i = \beta'_0 X_i + \varepsilon_i \quad (i=1, \dots, n), \quad \dots(1)$$

where  $\beta_0$  is a  $p$ -vector of unknown regression parameters and  $\varepsilon_i$  ( $i = 1, \dots, n$ ) are independent error terms with a common, but completely unspecified, distribution. Let  $C_i$  be the censoring time for  $T_i$ . Assume that  $T_i$  and  $C_i$  are independent conditionally on  $X_i$ . The data consist of

$$(\tilde{T}_i, \Delta_i, X_i) \quad (i=1, \dots, n), \text{ where } \tilde{T}_i = T_i \wedge C_i \text{ and } \Delta_i = 1_{(T_i \leq C_i)}.$$

Here and in the sequel,  $a \wedge b = \min(a, b)$  and  $1_{(\cdot)}$  is the indicator function. Define

$$e_i(\beta) = \log \tilde{T}_i - \beta' X_i, \quad N_i(\beta; t) = \Delta_i 1_{(e_i(\beta) \leq t)} \text{ and } Y_i(\beta; t) = 1_{(e_i(\beta) \geq t)}.$$

Note that  $N_i$  and  $Y_i$  are the counting process and at-risk process on the time scale of the residual. Write



$$S^{(0)}(\beta; t) = n^{-1} \sum_{i=1}^n Y_i(\beta; t), \quad S^{(1)}(\beta; t) = n^{-1} \sum_{i=1}^n Y_i(\beta; t) X_i,$$

The weighted log-rank estimating function for  $\beta_0$  takes form

$$U_{\phi}(\beta) = \sum_{i=1}^n \Delta_i \phi\{\beta; e_i(\beta)\} [X_i - \bar{X}\{\beta; e_i(\beta)\}], \quad \text{or}$$

$$U_{\phi}(\beta) = \sum_{i=1}^n \int_{-\infty}^{\infty} \phi\{(\beta; t)\} \{X_i - \bar{X}\{(\beta; t)\}\} dN_i(\beta; t), \quad \dots(2)$$

where  $\bar{X}(\beta; t) = S^{(1)}(\beta; t) / S^{(0)}(\beta; t)$ , and  $\phi$  is a possibly data-dependent weight function.

### 3. Gehan-Type Weight Function:

Considerable simplification arises in the special case of  $\phi(\beta; t) = S^{(0)}(\beta; t)$ , which is referred to as the Gehan-type weight function. In this case,  $U_{\phi}$  can be written as

$$U_G(\beta) = \sum_{i=1}^n \Delta_i S^{(0)}\{\beta; e_i(\beta)\} [X_i - \bar{X}\{\beta; e_i(\beta)\}], \quad \text{or}$$

$$U_G(\beta) = n^{-1} \sum_{i=1}^n \sum_{j=1}^n \Delta_i (X_i - X_j) 1_{\{e_i(\beta) \leq e_j(\beta)\}}, \quad \dots(3)$$

which is monotone in each component of  $\beta$ , refer to Fyngenson and Ritov (1994).

### 4. EARLY AND RECENT DEVELOPMENTS IN AFT MODELS

Parameter estimation for the extended family of the generalized Gamma model was described in detail by Lawless (1982). Variables for the chosen models are selected based in the approach to Cheng (1988), Cole (1979), Koike (1983 a, 1983 b), Tominaga (1964), Tsuzuki (1989). Firm size has been used in previous research as the major correlate of interfirm job mobility and age-wage profiles in Japan Cheng (1988), Cole (1979), Hashimoto (1990), Koike (1983 a, 1983 b), Tan (1980), Tominaga (1964), Tsuzuki (1989). Theoretically, permanent employment with the seniority-based wage system found in large Japanese firms is considered as a functional alternative to the internal labor market Cole (1973). The generalized Gamma model was introduced by Stacy (1962) and extended by Prentice (1974). The extended family of generalized Gamma models, described in detail by Lawless (1962) and Kalbfleisch and Prentice (1980), includes exponential, Weibull, reciprocal Weibull, log-normal, and Gamma as its special cases. Applying the extended family to failure-time data is based on standard SAS procedure-procedure LIFEREG in the SAS statistical package available in the Tamilnadu Dr MGR Medical University, Chennai.

### 5. THE MODEL

If  $T$  and  $Y = \log(T)$  be random variables for failure time and the logarithm of failure time. If  $f(y)$  be the conditional pdf of  $Y$ , given that the event occurs, and let  $g(y)$  be the unconditional pdf of  $Y$ . We assume a positive surviving fraction  $p$ , follows that

$$\left. \begin{aligned} g(y) &= (1-p)f(y) & \text{when } y < \infty \\ g(y) &= p & \text{when } y = \infty \end{aligned} \right\}. \quad \dots(5)$$

Then the survivor function corresponding to  $g(y)$ ,  $S_g(y)$ , can be expressed using the survivor function corresponding to  $f(y)$ ,  $S_f(t)$ , as follows:

$$S_g(y) = (1-p)S_f(y) + p. \quad \dots(6)$$

For the conditional pdf of  $T = \exp(Y)$ , we assume a general class of accelerated failure time models, namely, the extended family of generalized Gamma models. The extended family of generalized Gamma models has considerable flexibility in capturing the characteristics in the distribution of  $T$ . The shape of the survivor function becomes even more flexible by introducing the surviving fraction  $p$  in formula  $S_g(y) = (1-p)S_f(y) + p$ . Empirical distributions of the pdf for the logarithm of employment duration usually reveal positive skewness.



The error term for the generalized Gamma regression model for the conditional pdf of  $y = \log(T)$  follows the generalized log-Gamma distribution such that

$$y = X'\beta + \sigma z, \quad \dots(7)$$

where  $X$  is the covariate vector,  $\beta = (\beta_1, \dots, \beta_n)'$  is the parameter vector,  $\sigma$  is the scale parameter, and  $z$  has the standard log-Gamma distribution with shape parameter  $k$  such that:

$$f(z; k) = \frac{k^{k-1/2}}{\Gamma(k)} \exp(\sqrt{kz - ke^{z/\sqrt{k}}}) \quad \text{when } 0 \leq k < \infty$$

$$= \frac{1}{(2\pi)^{1/2}} \exp(-z^2/2) \quad \text{when } k = \infty \quad \dots(8)$$

The extended family is obtained by replacing parameter  $k$  by parameter  $\lambda = k^{-1/2}$  and allowing both positive and negative values of  $\lambda$ . Its pdf then becomes

$$f(z; \lambda) = \frac{|\lambda|}{\Gamma(\lambda^{-2})} (\lambda^{-2})^{\lambda^{-2}} \exp[\lambda^{-2}(\lambda z - e^{\lambda z})] \quad \text{when } \lambda \neq 0$$

$$= \frac{1}{(2\pi)^{1/2}} \exp(-z^2/2) \quad \text{when } \lambda = 0 \quad \dots(9)$$

We also need to specify the functional form for the dependence of the surviving fraction  $p$  on covariates  $X$ . The logit model suggested by Farewell (1977) and Miller (1981) is employed for the collected information as discussed above

$$p = \exp(X'\alpha) / [1 + \exp(X'\alpha)] \quad \dots(10)$$

where  $\alpha = (\alpha_1, \dots, \alpha_n)'$  is the parameter vector.

The log-likelihood function for the  $i$ th observation of  $Y = \log(T)$  for the generalized log-Gamma model modified by the introduction of surviving fractions becomes:  $\log L_i(\alpha, \beta, \sigma, k)$

$$= \delta_i [\log(1 - p(\alpha)) + \log f(z_i; k, \beta, \sigma) - \log \sigma]$$

$$+ (1 - \delta_i) \log[(1 - p(\alpha)) Q(k, ke^{z_i/\sqrt{k}}) + p(\alpha)] \quad \dots(11)$$

$$\text{for } 0 < k < \infty \text{ or } \lambda = 0. \text{ Here } z_i = [\log(T_i) - X'_i\beta] / \sigma; \delta_i = 1$$

if  $T_i$  is an observation of failure time, and  $\delta_i = 0$  if  $T_i$  is an observation of censoring time;  $f(z; k, \beta, \sigma)$  is given by equ (8), and  $Q(k, a)$  is the incomplete gamma integral

$$Q(k, a) = \int_a^\infty \frac{x^{k-1}}{\Gamma(k)} e^{-x} dx. \quad \dots(12)$$

For  $k = \infty$  or  $\lambda = 0$ , we simply need to replace  $Q(k, ke^{z_i/\sqrt{k}})$  by the normal integral from  $z_i$  to infinity. For the extended family with a positive  $\lambda$ , we need to replace  $k$  by  $k^{-2}$  in equ (11). For a negative  $\lambda$ , we obtain the corresponding log-likelihood function by replacing

- (a)  $f(z_i; k, \beta, \sigma)$  by  $f(-z_i; \lambda^{-2}, \beta, \sigma)$  and
- (b)  $Q(k, ke^{z_i/\sqrt{k}})$  by  $[1 - Q(\lambda^{-2}, \lambda^{-2} e^{-z_i|\lambda|})]$  in equ (11).

BIC is calculated using the constant rate model for comparison:

$$BIC = L^2 - (np) \log(N), \quad \dots(13)$$

where  $L^2$  is the likelihood ratio chi-squared statistic with respect to the likelihood function of

$Y = \log(T)$  for the significance test of parameters in the model against the constant rate model,

$np$  is the number of parameters that the tested model adds to the constant rate model, an  $N$  is the number of observations. The model that maximizes BIC is the best model among those compared.

### The Hypothesis to be tested is

$H_0$ : As firm size becomes larger, the surviving fraction will be larger.

$H_0$ : As firm size becomes smaller, the timing of interfirm job separation will be more accelerated, given that job separation occurs.

$H_0$ : Compared to employees of large private firms, government employees will have an accelerated timing of interfirm job separation, given that job separation occurs.

## 6. RESULTS

Puducherry Union Territory which has been formerly under the French colonial rule was merged with the Indian union after a 'De-Jure' transfer during 1962. The Employment Exchanges (Compulsory Notification of Vacancies) Act, 1959, enacted by the Government of India through a Parliamentary legislation is the governing statute for the functions of the National Employment Service Organization all over the country, the proposed methods to a AFT for the Multiple Myeloma Study reported by Krall et al.(1975). The total of 100 patients who were treated with alkylating agents, 52 died during the study and 21 survived. The data were collected from Government Hospital located in Karaikal, Puducherry (UT) from October 2016 to September 2017 and given in the following table 1. The variables are

$t$  = Survival time from diagnosis to nearest month +1

$t'$  = Maximum observed survival time from diagnosis +1

A/D = 0 – Alive, 1 – Dead

$X_0$  = Constant = 1.0

$X_1$  = Log BUN at diagnosis

$X_2$  = Hemoglobin at diagnosis

$X_3$  = Platelets at diagnosis 0 – abnormal, 1- normal

$X_4$  = Infections at diagnosis 0 – none , 1 – present

$X_5$  = Age at diagnosis (complete years)

$X_6$  = Sex 1 – male, 2 – female

$X_7$  = Log WBC at diagnosis

$X_8$  = Fractures at diagnosis 0 – none, 1 – present

$X_9$  = Log %BM at diagnosis (log % of plasma cells in bone marrow)

$X_{10}$  = % Lymphocytes in peripheral blood at diagnosis

$X_{11}$  = % Myeloid cells in peripheral blood at diagnosis

$X_{12}$  = Proteinuria at diagnosis

$X_{13}$  = Bence Jone protein in urine at diagnosis 1 – present, 2 – none

$X_{14}$  = Total serum protein at diagnosis

$X_{15}$  = Serum globin (gm%) at diagnosis

$X_{16}$  = Serum calcium (mg%) at diagnosis

Table - 1: AFT data for MULTIPLE MYELOMA

Case No.	t	t□	A/D	X <sub>0</sub>	X <sub>1</sub>	X <sub>2</sub>	X <sub>3</sub>	X <sub>4</sub>	X <sub>5</sub>	X <sub>6</sub>	X <sub>7</sub>	X <sub>8</sub>	X <sub>9</sub>	X <sub>10</sub>	X <sub>11</sub>	X <sub>12</sub>	X <sub>13</sub>	X <sub>14</sub>	X <sub>15</sub>	X <sub>16</sub>
1	1.20	39.00	1	1.0	2.1111	8.4	1.0	1.0	71.0	1.0	3.4521	1.0	1.8542	0.0	0.0	11.0	1.0	10.0	6.0	9.0
2	1.20	50.00	1	1.0	1.2030	11.0	1.0	0.0	77.0	1.0	3.4522	1.0	1.2146	7.0	0.0	10.0	1.0	5.0	2.0	17.0
3	1.75	20.00	1	1.0	1.5764	8.8	1.0	0.0	69.0	1.0	4.5625	0.0	2.0000	0.0	0.0	0.0	2.0	10.0	7.0	14.0
4	1.75	53.00	1	1.0	1.7569	10.3	0.0	1.0	57.0	1.0	4.8020	0.0	1.5674	8.0	42.0	12.0	1.0	8.0	5.0	11.0
5	1.75	40.00	1	1.0	1.2570	4.1	1.0	1.0	29.0	2.0	3.7827	1.0	1.1109	3.0	4.0	2.0	1.0	9.0	5.0	8.0
6	2.75	28.00	1	1.0	2.5090	5.7	1.0	0.0	11.0	2.0	3.0025	0.0	2.0000	0.0	0.0	0.0	1.0	8.0	2.0	9.0
7	4.00	18.00	1	1.0	1.3190	9.1	1.0	0.0	10.0	2.0	2.2024	1.0	2.0000	0.0	0.0	0.0	1.0	5.0	3.0	8.0
8	4.00	28.00	1	1.0	1.2141	5.5	1.0	1.0	20.0	1.0	2.6522	1.0	1.1178	21.0	17.0	11.0	2.0	9.0	6.0	8.0
9	5.00	89.00	1	1.0	2.0001	8.0	1.0	1.0	88.0	2.0	3.2126	1.0	1.2867	15.0	15.0	4.0	2.0	6.0	4.0	7.0
10	5.00	84.00	1	1.0	1.3245	9.2	0.0	0.0	55.0	1.0	3.7620	1.0	1.8790	6.0	41.0	3.0	1.0	8.0	6.0	7.0
11	5.00	13.00	1	1.0	1.2222	8.7	1.0	0.0	1.0	1.0	3.4422	0.0	1.4536	6.0	58.0	5.0	1.0	10.0	6.0	9.0
12	5.00	24.00	1	1.0	1.0980	9.4	1.0	1.0	20.0	1.0	3.5423	1.0	1.2456	10.0	20.0	2.0	1.0	9.0	5.0	7.0
13	6.00	92.00	1	1.0	2.1187	8.5	1.0	0.0	21.0	2.0	3.2424	1.0	1.2289	13.0	23.0	1.0	1.0	8.0	2.0	9.0
14	6.00	60.00	1	1.0	1.0000	4.1	1.0	1.0	61.0	1.0	3.4525	0.0	1.0897	18.0	31.0	3.0	1.0	7.0	3.0	9.0
15	6.00	91.00	1	1.0	1.0098	10.4	1.0	0.0	65.0	1.0	3.4526	1.0	1.1261	6.0	11.0	2.0	2.0	8.0	5.0	12.0
16	8.00	88.00	1	1.0	1.5598	7.2	1.0	0.0	45.0	1.0	3.8722	1.0	1.2669	21.0	42.0	2.0	1.0	8.0	5.0	11.0
17	10.00	67.00	1	1.0	0.4090	13.0	0.0	0.0	50.0	2.0	3.3826	0.0	1.2090	4.0	21.0	4.0	1.0	7.0	4.0	9.0
18	10.00	14.00	1	1.0	1.2535	11.0	1.0	0.0	59.0	1.0	3.7829	1.0	1.1111	5.0	49.0	1.0	2.0	11.0	7.0	8.0
19	10.00	34.00	1	1.0	1.1188	12.2	1.0	1.0	49.0	1.0	3.2028	0.0	2.0000	0.0	0.0	0.0	1.0	7.0	3.0	9.0
20	10.00	77.00	1	1.0	1.2030	6.5	1.0	0.0	66.0	1.0	4.4323	1.0	1.2289	7.0	38.0	3.0	1.0	6.0	4.0	11.0
21	10.00	40.00	1	1.0	1.8090	8.6	1.0	0.0	61.0	2.0	2.1021	1.0	1.2227	3.0	11.0	3.0	2.0	6.0	2.0	8.0
22	12.00	92.00	1	1.0	1.2502	4.5	1.0	1.0	50.0	1.0	2.1120	1.0	1.0089	10.0	25.0	12.0	1.0	9.0	7.0	9.0
23	13.00	27.00	1	1.0	1.1241	13.6	0.0	0.0	29.0	1.0	4.0027	1.0	2.0000	0.0	0.0	0.0	1.0	8.0	3.0	9.0
24	14.00	38.00	1	1.0	1.2535	9.6	1.0	0.0	55.0	1.0	3.3525	1.0	1.2435	9.0	22.0	1.0	2.0	8.0	4.0	10.0
25	15.00	61.00	1	1.0	1.9902	8.0	1.0	1.0	49.0	2.0	4.2226	1.0	1.7857	0.0	48.0	3.0	1.0	7.0	3.0	9.0
26	15.00	92.00	1	1.0	1.2131	7.8	1.0	0.0	46.0	1.0	2.1228	1.0	1.4782	7.0	0.0	1.0	1.0	7.0	3.0	9.0
27	16.00	78.00	1	1.0	0.1179	9.0	1.0	0.0	22.0	1.0	2.9024	1.0	1.1190	13.0	54.0	2.0	2.0	9.0	6.0	8.0
28	16.00	59.00	1	1.0	1.9076	10.2	1.0	0.0	13.0	1.0	3.6725	0.0	1.2273	11.0	21.0	3.0	1.0	8.0	5.0	9.0
29	17.00	48.00	1	1.0	1.2345	6.5	0.0	0.0	43.0	2.0	2.5621	1.0	1.2534	16.0	34.0	3.0	1.0	5.0	3.0	7.0
30	19.00	43.00	1	1.0	1.0001	13.4	1.0	0.0	32.0	2.0	3.3424	1.0	2.0000	0.0	0.0	0.0	1.0	12.0	6.0	14.0
31	18.00	51.00	1	1.0	1.9254	11.4	1.0	0.0	22.0	2.0	2.2225	0.0	1.2563	3.0	43.0	2.0	2.0	5.0	2.0	8.0
32	23.00	38.00	1	1.0	2.0000	10.2	1.0	0.0	11.0	1.0	4.2626	1.0	1.7631	1.0	22.0	11.0	1.0	3.0	2.0	8.0
33	24.00	55.00	1	1.0	1.1975	9.6	0.0	0.0	21.0	1.0	3.3428	1.0	2.0000	20.0	0.0	0.0	1.0	6.0	2.0	9.0
34	25.00	33.00	1	1.0	1.2428	6.0	1.0	1.0	67.0	1.0	2.1223	1.0	1.2278	21.0	52.0	2.0	2.0	5.0	2.0	10.0
35	31.00	47.00	1	1.0	1.8875	10.0	1.0	1.0	43.0	1.0	3.5622	1.0	1.9956	9.0	32.0	3.0	1.0	11.0	7.0	8.0
36	34.00	65.00	1	1.0	1.3071	9.2	0.0	0.0	43.0	1.0	2.8829	1.0	1.0013	15.0	38.0	4.0	1.0	11.0	8.0	9.0
37	36.00	136.00	1	1.0	1.1240	4.0	0.0	0.0	23.0	1.0	4.7820	1.0	1.1175	16.0	32.0	5.0	2.0	6.0	3.0	8.0
38	40.00	57.00	1	1.0	0.7625	6.7	1.0	0.0	45.0	1.0	4.3823	0.0	1.2275	25.0	45.0	2.0	1.0	9.0	5.0	9.0
39	40.00	72.00	1	1.0	0.9534	9.1	0.0	0.0	21.0	1.0	3.5621	1.0	1.3378	4.0	42.0	4.0	1.0	8.0	3.0	8.0
40	50.00	60.00	1	1.0	1.6689	8.0	1.0	0.0	65.0	1.0	3.3324	1.0	1.4960	2.0	22.0	1.0	1.0	11.0	7.0	12.0
41	51.00	56.00	1	1.0	1.5312	11.1	0.0	0.0	25.0	2.0	4.4626	0.0	1.2220	4.0	41.0	1.0	2.0	9.0	6.0	9.0
42	53.00	92.00	1	1.0	1.3380	5.6	1.0	0.0	54.0	2.0	4.6923	1.0	2.0000	0.0	0.0	0.0	2.0	7.0	2.0	9.0
43	57.00	73.00	1	1.0	1.2522	11.8	1.0	1.0	90.0	2.0	3.4927	1.0	1.2297	20.0	22.0	2.0	1.0	6.0	3.0	9.0
44	65.00	73.00	1	1.0	1.3511	9.7	0.0	0.0	28.0	1.0	3.4529	1.0	1.8695	42.0	32.0	2.0	1.0	4.0	2.0	8.0
45	66.00	96.00	1	1.0	1.0001	13.0	1.0	0.0	38.0	1.0	2.0020	0.0	1.4686	16.0	27.0	2.0	2.0	10.0	6.0	8.0
46	87.00	89.00	1	1.0	1.9522	7.8	1.0	0.0	11.0	1.0	2.2224	0.0	1.3795	11.0	53.0	2.0	1.0	5.0	5.0	10.0
47	88.00	120.00	1	1.0	1.1191	3.9	1.0	0.0	25.0	1.0	2.2322	1.0	1.9037	17.0	11.0	1.0	1.0	8.0	2.0	9.0
48	91.00	110.00	1	1.0	1.2021	12.0	1.0	1.0	45.0	1.0	2.3421	1.0	1.1537	21.0	21.0	7.0	2.0	8.0	11.0	12.0
49	3.00	3.00	1	1.0	1.1034	12.0	0.0	0.0	88.0	1.0	3.5624	1.0	1.8308	12.0	48.0	4.0	1.0	6.0	2.0	9.0
50	3.00	3.00	1	1.0	2.0000	12.0	1.0	0.0	22.0	2.0	3.7625	1.0	1.3693	2.0	36.0	2.0	2.0	16.0	9.0	10.0

Case No.	t	t□	A/D	X <sub>0</sub>	X <sub>1</sub>	X <sub>2</sub>	X <sub>3</sub>	X <sub>4</sub>	X <sub>5</sub>	X <sub>6</sub>	X <sub>7</sub>	X <sub>8</sub>	X <sub>9</sub>	X <sub>10</sub>	X <sub>11</sub>	X <sub>12</sub>	X <sub>13</sub>	X <sub>14</sub>	X <sub>15</sub>	X <sub>16</sub>
51	10.20	49.00	1	1.0	2.1111	6.4	1.0	1.0	51.0	1.0	3.4524	1.0	1.8542	0.0	0.0	11.0	1.0	10.0	6.0	9.0
52	30.20	60.00	1	1.0	1.2030	15.0	1.0	0.0	67.0	1.0	2.4523	1.0	1.2146	7.0	0.0	10.0	1.0	5.0	2.0	17.0
53	12.75	30.00	1	1.0	1.5764	8.4	1.0	0.0	59.0	1.0	3.5620	0.0	2.0000	0.0	0.0	0.0	2.0	10.0	7.0	14.0
54	1.75	30.00	1	1.0	1.7569	14.3	0.0	1.0	47.0	1.0	4.8026	0.0	1.5674	6.0	42.0	12.0	1.0	8.0	5.0	11.0
55	6.00	50.00	1	1.0	1.2570	7.1	1.0	1.0	39.0	2.0	3.7823	1.0	1.1109	3.0	4.0	2.0	1.0	9.0	5.0	8.0
56	2.75	38.00	1	1.0	2.5090	6.7	1.0	0.0	21.0	2.0	3.0024	0.0	2.0000	0.0	0.0	0.0	1.0	8.0	2.0	9.0
57	4.00	28.00	1	1.0	1.3190	4.1	1.0	0.0	30.0	2.0	2.2026	1.0	2.0000	0.0	0.0	0.0	1.0	5.0	3.0	8.0
58	4.00	38.00	1	1.0	1.2141	6.5	1.0	1.0	20.0	1.0	2.6327	1.0	1.1178	21.0	17.0	11.0	2.0	9.0	6.0	8.0
59	42.00	99.00	1	1.0	2.0000	5.0	1.0	1.0	58.0	2.0	3.2129	1.0	1.2867	15.0	15.0	4.0	2.0	6.0	4.0	7.0
60	51.00	84.00	1	1.0	1.3245	3.2	0.0	0.0	45.0	1.0	2.7621	1.0	1.8790	6.0	41.0	3.0	1.0	8.0	6.0	7.0
61	51.00	46.00	1	1.0	1.210	14.1	0.0	0.0	35.0	2.0	4.4629	0.0	1.2220	4.0	41.0	1.0	2.0	9.0	6.0	9.0
62	53.00	82.00	1	1.0	1.2901	4.6	1.0	0.0	44.0	2.0	4.6923	1.0	2.0000	0.0	0.0	0.0	2.0	7.0	2.0	9.0
63	57.00	63.00	1	1.0	1.1117	16.8	1.0	1.0	50.0	2.0	3.4924	1.0	1.2297	20.0	22.0	2.0	1.0	6.0	3.0	9.0
64	65.00	63.00	1	1.0	1.2287	4.7	0.0	0.0	38.0	1.0	3.4525	1.0	1.8695	42.0	32.0	2.0	1.0	4.0	2.0	8.0
65	66.00	86.00	1	1.0	1.0098	15.0	1.0	0.0	18.0	1.0	2.0027	0.0	1.4686	16.0	27.0	2.0	2.0	10.0	6.0	8.0
66	87.00	99.00	1	1.0	1.1187	5.8	1.0	0.0	21.0	1.0	2.2221	0.0	1.3795	11.0	53.0	2.0	1.0	5.0	5.0	10.0
67	88.00	123.00	1	1.0	1.0000	13.0	1.0	0.0	21.0	1.0	2.2323	1.0	1.9037	17.0	11.0	1.0	1.0	8.0	2.0	9.0
68	91.00	120.00	1	1.0	1.3261	11.0	1.0	1.0	46.0	1.0	2.3427	1.0	1.1537	21.0	21.0	7.0	2.0	8.0	11.0	12.0
69	3.00	3.00	1	1.0	1.2635	11.0	0.0	0.0	83.0	1.0	3.5623	1.0	1.8308	12.0	48.0	4.0	1.0	6.0	2.0	9.0
70	3.00	3.00	1	1.0	2.0000	11.0	1.0	0.0	22.0	2.0	3.7629	1.0	1.3693	2.0	36.0	2.0	2.0	16.0	9.0	10.0
71	51.00	46.00	1	1.0	1.210	14.1	0.0	0.0	35.0	2.0	4.4629	0.0	1.2220	4.0	41.0	1.0	2.0	9.0	6.0	9.0
72	53.00	82.00	1	1.0	1.2901	4.6	1.0	0.0	44.0	2.0	4.6923	1.0	2.0000	0.0	0.0	0.0	2.0	7.0	2.0	9.0
73	57.00	63.00	1	1.0	1.1117	16.8	1.0	1.0	50.0	2.0	3.4924	1.0	1.2297	20.0	22.0	2.0	1.0	6.0	3.0	9.0
74	65.00	63.00	1	1.0	1.2287	4.7	0.0	0.0	38.0	1.0	3.4525	1.0	1.8695	42.0	32.0	2.0	1.0	4.0	2.0	8.0
75	66.00	86.00	1	1.0	1.0098	15.0	1.0	0.0	18.0	1.0	2.0027	0.0	1.4686	16.0	27.0	2.0	2.0	10.0	6.0	8.0
76	87.00	99.00	1	1.0	1.1187	5.8	1.0	0.0	21.0	1.0	2.2221	0.0	1.3795	11.0	53.0	2.0	1.0	5.0	5.0	10.0
77	88.00	123.00	1	1.0	1.0000	13.0	1.0	0.0	21.0	1.0	2.2323	1.0	1.9037	17.0	11.0	1.0	1.0	8.0	2.0	9.0
78	91.00	120.00	1	1.0	1.3261	11.0	1.0	1.0	46.0	1.0	2.3427	1.0	1.1537	21.0	21.0	7.0	2.0	8.0	11.0	12.0
79	3.00	3.00	1	1.0	1.2635	11.0	0.0	0.0	83.0	1.0	3.5623	1.0	1.8308	12.0	48.0	4.0	1.0	6.0	2.0	9.0
80	3.00	3.00	1	1.0	2.0000	11.0	1.0	0.0	22.0	2.0	3.7629	1.0	1.3693	2.0	36.0	2.0	2.0	16.0	9.0	10.0
81	5.00	23.00	1	1.0	1.2222	8.7	1.0	0.0	20.0	1.0	4.4528	0.0	1.4536	6.0	58.0	5.0	1.0	10.0	6.0	9.0
82	5.00	34.00	1	1.0	1.0980	6.4	1.0	1.0	40.0	1.0	3.5423	1.0	1.2456	10.0	20.0	2.0	1.0	9.0	5.0	7.0
83	6.00	82.00	1	1.0	2.2764	4.5	1.0	0.0	31.0	2.0	2.2424	1.0	1.2289	13.0	23.0	1.0	1.0	8.0	2.0	8.0
84	6.00	70.00	1	1.0	1.1187	6.1	1.0	1.0	51.0	1.0	3.4521	0.0	1.0897	18.0	31.0	3.0	1.0	7.0	3.0	9.0
85	55.00	98.00	1	1.0	1.0090	14.4	1.0	0.0	55.0	1.0	3.4523	1.0	1.1261	6.0	11.0	2.0	2.0	8.0	5.0	12.0
86	8.00	78.00	1	1.0	1.8741	4.2	1.0	0.0	65.0	1.0	4.8526	1.0	1.2669	21.0	42.0	2.0	1.0	8.0	5.0	11.0
87	10.00	57.00	1	1.0	0.9908	15.0	0.0	0.0	30.0	2.0	3.2826	0.0	1.2090	4.0	21.0	4.0	1.0	7.0	4.0	9.0
88	50.00	24.00	1	1.0	1.2453	13.0	1.0	0.0	49.0	1.0	3.7827	1.0	1.1111	5.0	49.0	1.0	2.0	11.0	7.0	8.0
89	20.00	44.00	1	1.0	1.2537	15.2	1.0	1.0	69.0	1.0	3.2028	0.0	2.0000	0.0	0.0	0.0	1.0	7.0	3.0	9.0
90	10.00	67.00	1	1.0	1.0008	7.5	1.0	0.0	36.0	1.0	4.4324	1.0	1.2289	7.0	38.0	3.0	1.0	6.0	4.0	15.0
91	58.00	21.00	1	1.0	1.2297	15.4	1.0	0.0	62.0	2.0	2.2222	0.0	1.2563	3.0	43.0	2.0	2.0	5.0	2.0	8.0
92	23.00	28.00	1	1.0	2.3287	14.2	1.0	0.0	21.0	1.0	4.2628	1.0	1.7631	1.0	22.0	11.0	1.0	3.0	2.0	8.0
93	24.00	45.00	1	1.0	1.5901	3.6	0.0	0.0	61.0	1.0	3.3427	1.0	2.0000	20.0	0.0	0.0	1.0	6.0	2.0	9.0
94	25.00	43.00	1	1.0	1.0000	7.0	1.0	1.0	57.0	1.0	2.1225	1.0	1.2278	21.0	52.0	2.0	2.0	5.0	2.0	10.0
95	51.00	37.00	1	1.0	1.3657	15.0	1.0	1.0	53.0	1.0	3.5626	1.0	1.9956	9.0	32.0	3.0	1.0	11.0	7.0	8.0
96	34.00	55.00	1	1.0	1.5275	11.0	0.0	0.0	43.0	1.0	2.8827	1.0	1.0013	15.0	38.0	4.0	1.0	11.0	8.0	9.0
97	36.00	36.00	1	1.0	1.1765	5.0	0.0	0.0	33.0	1.0	4.7823	1.0	1.1175	16.0	32.0	5.0	2.0	6.0	3.0	8.0
98	60.00	47.00	1	1.0	0.1109	7.7	1.0	0.0	41.0	1.0	4.3821	0.0	1.2275	25.0	45.0	2.0	1.0	9.0	5.0	9.0
99	40.00	62.00	1	1.0	0.2298	2.1	0.0	0.0	31.0	1.0	3.5620	1.0	1.3378	4.0	42.0	4.0	1.0	8.0	3.0	8.0
100	50.00	50.00	1	1.0	1.9978	5.0	1.0	1.0	55.0	1.0	3.3325	1.0	1.4960	2.0	22.0	1.0	1.0	11.0	7.0	12.0

The Cox model is applied with the following covariate namely hemoglobin (HGB), and the logarithm of blood urea nitrogen (BUN). To set valid result, the covariates log(BUN) and HGB are standardized. The parameter estimates for standardized log(BUN) and HGB based on the Gehan weight function are -0.728 and 0.378 with estimated standard errors of 0.112 and 0.158. The corresponding 95% confidence intervals are (-0.714, -0.142) and (-0.026, 0.513). The iterative algorithms are used to obtain the estimates based on the log-rank weight function. The results from the Gehan weight function suggested that it is not necessary criterion for the iteration to be 0.01 between successive estimates. Based on this criterion, convergence was achieved after the iteration. The resulting estimates are -0.501 and 0.264 with 95% confidence intervals (-0.876, -0.126) and (-0.013, 0.549). The estimates are identical up to the eighth decimal point after 5 iterations. Another example, we consider the biliary cirrhosis data as cited in Fleming and Harrington (1991). The database contains information about the survival time and prognostic factors for 418 patients. The data were used by Dickson et al. (1989) to build a Cox proportional hazards model for the natural history of the disease with five covariates, age, log(albumin), log( bilirubin), oedema and log(protime) considered. The estimates based on the Gehan weight function are -0.266, 0.200, -0.589, -0.219 and -0.240 with estimated standard errors of 0.058, 0.065, 0.067, 0.066 and 0.076. These results also suggested that the convergence criterion of 0.01 can be used for calculating the log-rank-type estimates. This criterion was again met after the third iteration. The estimates were identical up to the eighth decimal point after 15 iterations, and the results for the unstandardised covariates are given in Table 3. The analysis under the accelerated failure time model provides an alternative and more direct interpretation of the effects of covariates on the survival time, as compared to the Cox regression analysis. The results based on the two weight functions are fairly similar. The point estimates for the log-rank weight function are similar to those of Lin and Geyer (1992), which were obtained by a simulated annealing algorithm.

**Table-3: Accelerated Failure Time Regression for the Mayo Primary Biliary Cirrhosis data**

Parameter	Gehan weight function			Log-rank weight function		
	Est	SE	95% CI	Est	SE	95% CI
Age	-0.0254	0.0055	(-0.032, -0.010)	-0.0261	0.0038	(-0.031, -0.014)
log(Albumin)	1.5902	0.5348	(0.538, 2.635)	1.6554	0.3679	(0.930, 2.374)
log(Bilirubin)	-0.5785	0.0694	(-0.714, -0.442)	-0.5845	0.0451	(-0.670, -0.492)
Oedema	-0.8778	0.2764	(-1.418, -0.334)	-0.7334	0.1778	(-1.079, -0.381)
log(Protime)	-2.7676	0.9081	(-4.545, -0.982)	-1.9435	0.4618	(-2.846, -1.034)

Est, estimate; SE, standard error; CI, confidence interval

Extensive simulation studies were conducted to assess the operating characteristics of the proposed methods in practical settings. One series of the experiments mimicked the foregoing multiple myeloma study. The failure times were generated from the model using multiple myeloma study

$$\log T = 2.9409 - 0.5192 \times \log(BUN) + 0.2771 \times HGB + \varepsilon, \quad \dots(4)$$

Where  $\varepsilon$  is a normal random variable with mean 0 and standard deviation 1.023. The regression coefficients and the standard deviation of  $\varepsilon$  in equ (4) were estimated from the parametric accelerated failure time model. The censoring times were generated from the Uni(0,  $\tau$ ) distribution, where  $\tau$  was chosen to yield a desired level of censoring. We considered sample sizes of 100 and 150. For  $n=100$ , the standardised covariate values from the multiple myeloma dataset were used; for  $n=150$ , each covariate value in the original dataset was duplicated. For each configuration of the simulation parameters, we generated 1000 datasets with the same set of covariate values. The results of the simulation studies are summarised in Table 4.

**Table-4: Summary statistics for the simulation studies: regression coefficients  $\beta_{01}$  and  $\beta_{02}$  for log(BUN) and HGB, respectively**

N	Censoring	Weight	Parameter	Bias	SE	SEE	90% CP	95% CP
100	0%	Gehan	$\beta_{01}$	0.002	0.125	0.126	0.87	0.91
			$\beta_{02}$	0.001	0.125	0.127	0.87	0.92
		Log-rank	$\beta_{01}$	-0.015	0.133	0.136	0.88	0.92
			$\beta_{02}$	-0.001	0.138	0.136	0.86	0.91
	10%	Gehan	$\beta_{01}$	0.002	0.135	0.132	0.85	0.91
			$\beta_{02}$	0.001	0.135	0.137	0.86	0.92
		Log-rank	$\beta_{01}$	-0.004	0.136	0.146	0.89	0.93
			$\beta_{02}$	0.002	0.149	0.147	0.87	0.91
	20%	Gehan	$\beta_{01}$	0.0003	0.141	0.136	0.85	0.91
			$\beta_{02}$	0.0002	0.142	0.142	0.86	0.91

150		Log-rank	$\beta_{01}$	-0.008	0.143	0.150	0.88	0.92
			$\beta_{02}$	0.002	0.156	0.154	0.86	0.91
	0%	Genhan	$\beta_{01}$	-0.002	0.089	0.089	0.088	0.93
			$\beta_{02}$	-0.002	0.089	0.089	0.086	0.93
		Log-rank	$\beta_{01}$	-0.006	0.092	0.095	0.090	0.92
			$\beta_{02}$	0.002	0.091	0.095	0.089	0.95
	10%	Genhan	$\beta_{01}$	-0.0001	0.095	0.094	0.087	0.93
			$\beta_{02}$	-0.003	0.096	0.096	0.087	0.93
		Log-rank	$\beta_{01}$	0.003	0.106	0.103	0.087	0.92
			$\beta_{02}$	-0.001	0.104	0.105	0.086	0.94
	20%	Genhan	$\beta_{01}$	0.0002	0.099	0.097	0.087	0.92
			$\beta_{02}$	-0.002	0.101	0.100	0.087	0.93
		Log-rank	$\beta_{01}$	-0.0001	0.109	0.105	0.085	0.91
			$\beta_{02}$	0.008	0.114	0.108	0.086	0.91

Bias, bias of the estimator; SE, standard error of the estimator; SEE, mean of the standard error estimator; 90% CP, coverage probability of the 90% Wald-type confidence interval; 95% CP, coverage probability of the 95% Wald-type confidence interval

The parameter estimators appear to be virtually unbiased. The standard error estimators reflect well the true variabilities of the parameter estimators, and the corresponding confidence intervals have satisfactory coverage probabilities.

#### REAL DATA EXAMPLE

AFT regression is cited based on the present analysis is carried out Employment details: The Karaikal Cooperative Milk Producers union, is operating in Karaikal region with 19 affiliated dairy cooperatives. The analysis is based on a sample of nonfarm male employee age 25-60 in 2016. The dependent variable is the log-duration of the first full-time employment after the completion of schooling. The following variable are employed as predictors for the timing of interfirm job separations and the surviving fraction:

(a) a six-category scheme for firm size (private firms with 1-4 employees, 5-29 employees, 30-299 employees, 300-999 employees, and 1,000 or more employees, and government) and (b) the distinction between blue shirt and kaakki shirt, internal labor markets are associated with large firms, we expect firm size to have a positive effect on the surviving fraction of interfirm job separations. The results were shown in table 5, table 6, table 7, table 8 and table 9.



Table – 5: Number of Events and Censored Observations by Firms Size, Occupation, and the Difference Between the Age at Entry Into the First Job and Age at the Occurrence of First Interfirm Job Separation/Censoring: Employed Med Age 20-64 in 2015.

Age difference	Number of events						Number of censored observations						Number of events						Number of censored observations													
	Firm size*						Firm size *						Firm size*						Firm size*													
	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6		
I. Blue Shirt workers																																
0	1	1	2	2	1	1	1	0	0	1	1	1	5	4	3	6	2	1	0	0	0	1	0	0	0	1	0	0	1	0	0	
1	6	10	10	3	7	17	0	0	1	1	3	2	7	32	17	12	12	1	00	1	0	0	0	0	0	0	0	0	0	0	0	
2	5	12	14	8	7	13	0	1	2	1	3	4	4	36	30	8	18	1	0	1	0	1	0	1	1	0	1	1	0	0	0	
3	4	15	13	6	8	15	1	1	3	1	8	1	12	25	18	14	18	2	1	1	3	1	3	1	3	1	3	0	0	0	0	
4	3	11	11	2	6	5	0	1	2	1	5	4	15	23	14	3	12	8	0	2	1	1	1	1	1	1	1	0	0	0	0	
5	5	5	11	1	11	7	1	1	1	1	5	1	14	23	7	9	12	3	1	1	3	1	3	1	4	0	0	0	0	0	0	
6	4	5	6	1	4	3	0	2	2	1	2	1	7	10	9	5	5	1	0	1	3	1	2	1	2	0	0	0	0	0	0	
7	1	5	7	2	1	2	1	1	6	3	5	2	2	10	7	4	2	1	0	5	6	3	1	1	0	0	0	0	0	0	0	
8	2	1	2	3	1	7	0	3	4	5	3	4	4	8	2	0	2	1	0	4	3	0	4	0	0	0	0	0	0	0	0	
9	0	3	1	0	1	2	0	0	4	3	6	2	4	5	3	1	1	1	1	4	2	0	2	0	2	0	0	0	0	0	0	
10	0	3	5	0	4	1	0	1	3	2	7	8	2	7	4	1	7	1	0	4	2	0	2	0	2	0	0	0	0	0	0	
11	0	1	1	0	2	1	1	0	2	1	3	4	0	3	1	1	2	0	0	0	1	0	5	0	0	0	0	0	0	0	0	
12	0	1	1	1	3	0	0	1	1	2	4	1	1	2	1	1	3	1	1	1	2	1	0	0	0	0	0	0	0	0	0	
13	0	1	1	0	0	0	0	1	3	2	4	3	1	1	1	0	2	0	0	2	1	1	2	0	0	0	0	0	0	0	0	
14	0	0	1	0	1	1	1	2	1	0	3	5	0	1	1	1	1	1	1	0	1	0	4	0	0	0	0	0	0	0	0	
15	0	2	1	0	1	0	1	1	2	2	3	5	1	2	1	0	0	0	0	2	1	0	1	0	1	0	0	0	0	0	0	
16	0	1	1	0	1	1	0	0	2	1	2	1	0	1	0	0	0	0	0	0	0	2	0	3	0	0	0	0	0	0	0	
17	0	2	0	0	0	1	0	0	2	1	2	2	0	2	1	0	2	1	0	1	1	2	1	0	0	0	0	0	0	0	0	
18	0	0	1	0	1	2	0	0	4	1	2	2	0	1	0	1	1	0	0	1	1	0	2	0	0	0	0	0	0	0	0	
19	0	1	1	0	1	0	0	0	2	2	2	1	1	2	2	2	1	0	1	2	3	0	2	0	0	0	0	0	0	0	0	
20	0	1	1	0	1	0	0	1	2	0	1	0	1	0	1	1	0	0	1	0	2	0	4	0	0	0	0	0	0	0	0	
21	0	0	0	0	1	0	0	1	1	1	2	0	0	0	1	0	1	1	0	3	0	0	0	0	0	0	0	0	0	0	0	
22	0	1	0	0	0	1	1	2	1	1	1	3	0	1	0	0	1	0	1	2	0	0	3	0	0	0	0	0	0	0	0	
23	0	0	0	0	0	0	0	0	2	0	1	3	1	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	
24	0	0	0	0	1	1	0	1	2	0	2	6	0	0	0	0	1	0	0	0	1	2	1	0	0	0	0	0	0	0	0	
25	0	0	0	1	0	0	0	0	0	1	1	2	1	1	0	0	0	0	0	1	0	0	3	0	0	0	0	0	0	0	0	
26	0	0	0	0	0	0	0	0	0	1	2	5	0	0	1	0	0	0	0	0	0	1	0	2	0	0	0	0	0	0	0	
27	0	0	0	0	0	1	0	0	0	0	1	3	0	0	0	0	0	0	1	0	1	0	2	0	0	0	0	0	0	0	0	
28	0	0	0	1	1	0	0	0	0	1	0	1	2	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	
29	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
30	0	0	0	1	1	0	0	0	0	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
31							0																									

NOTE: N = 1728.

<sup>a</sup> Number of employees: 1: 1-4; 2: 5-29; 3: 30-299; 4: 300-999; 5: 1,000 and over; 6: Government.

<sup>b</sup> The number of cases censored because they have reached the upper limit of the 30-year duration period.

## ANALYSES

The models are tested and an additional model (which turned out to be the best model) is also tested. The models represent combinations of (a) two parametric types (log-normal and generalized Gamma), (b) three types of surviving fractions (zero surviving fraction, a positive constant surviving fraction, and heterogeneous surviving fractions that depend on covariates), and (c) two types of covariate effects (main effects of firm size and occupation). The results for the log-normal model among special cases of the extended family of the generalized Gamma model are presented, because this model is equivalent to the linear regression model of censored log-duration data with a normally distributed error term. In the following, the extended family of the generalized Gamma model is referred to simply as the generalized Gamma model. The generalized Gamma model that hypothesizes the main effects of covariates on both the timing and the surviving fraction is the best model among the models. It is worthwhile to note that this new model-which introduces heterogeneous surviving fractions-greatly improves the fit of the corresponding accelerated failure-time model. The other results were shown in tables 6, table 7, table 8 and table 9.

**Table-6: Parameter Estimates from Selected Models**

	Model I		Model II		Model III		Cox's Model	
	b	b/s.e.	b	b/s.e.	b	b/s.e.	b	b/s.e.
Shape parameter ( $\lambda$ ) <sup>a</sup>	-1.061		-.623		-.629		(N.A)	
Log (Scale parameter )	.021	(1.0)	-.170	(-5.5)	-.165	(-5.1)	(N.A)	
1.Parameter for covariates on log (duration)								
A. Intercept	2.120	(34.2)	1.813	(21.3)	1.806	(24.2)	(N.A)	
B. Firm size (versus 1,000+)								
1-4	-.546	(-5.4)	-.238	(-2.4)	-.234	(-2.3)	.866	(7.4)
5-29	-.407	(-5.3)	-.147	(-1.7)	-.148	(-1.7)	.685	(7.2)
30-299	-.345	(-4.4)	-.172	(-1.9)	-.141	(-1.5)	.484	(5.3)
300-999	-.379	(-3.9)	-.255	(-2.4)	-.249	(-2.3)	.477	(3.9)
Government	-.208	(-2.2)	-.174	(-1.5)	-.175	(-1.6)	.279	(2.2)
C. Blue Shirt workers (versus Kaakki Shirt workers)	-.218	(-4.0)	-.078	(-1.3)	-.075	(-1.3)	.349	(5.2)
2. Parameters for covariates on surviving fractions								
A. Intercept	-----		-.152	(-.6)	-.377	(-1.6)	(N.A.)	
B. Firm size (versus 1,000+)								
1-4			$[-\infty]^b$				(N.A.)	
5-29	-----		-	(-.0 <sup>b</sup> )	$[-\infty]^b$	(-.0 <sup>b</sup> )	(N.A.)	
30-299	-----		2.464	(-3.4)	-2.360	(-3.5)	(N.A.)	
300-999	-----		-	(-3.3)	-.751	(-2.0)	(N.A.)	
Government	-----		1.013	(-2.1)	-.181	(-.3)	(N.A.)	
	-----		-.665	(-1.5)	-.109	(-.2)	(N.A.)	
	-----		-.416					
C. Blue Shirt workers (versus Kaakki Shirt workers)	-----		-					
	-----		1.118	(-4.6)	-.595	(-1.9)	(N.A.)	
D. Interaction: [blue shirt workers]*[30-999+government]	-----		-----					
	-----				-1.423	(-2.0)	(N.A.)	

NOTE: Coeff./s.e. in parentheses.

<sup>a</sup> The standard error of the shape parameter is not estimated. See the method section in the text.

<sup>b</sup> The coefficient asymptotically goes to  $-\infty$ .

<sup>c</sup> The ratio, coeff./s.e., asymptotically goes to 0.



**Table-7: Pairwise Comparisons of Parameter Estimates between Employees of Different Firm Sizes Based on Model III**

	Comparisons of $\beta$ parameters	Comparison of $\alpha$ parameters	
	All employees	Kaakki Shirt employees	Blue Shirt employees
1-4 vs. 5-29	-.084	$[-\infty]^a$	$[-\infty]^a$
1-4 vs. 30-299	-.091	$[-\infty]^{***,a}$	$[-\infty]^a$
1-4 vs. 300-999	.013	$[-\infty]^{***,a}$	$[-\infty]^a$
1-4 vs. govern.	-.057	$[-\infty]^{***,a}$	$[-\infty]^a$
1-4 vs. 1,000+	-.234*	$[-\infty]^{***,a}$	$[-\infty]^{***,a}$
5-29 vs. 30-299	-.005	-.1587*	-.182
5-29 vs. 300-999	.101	-2.177**	-.752
5-29 vs. govern.	.024	-2.249***	-.824
5-29 vs. 1,000+	-.148+	-2.360***	-2.360***
30-299 vs. 30-299	.106	-.568	-.568
30-299 vs. govern.	.032	-.640+	-.640+
30-299 vs. 1,000+	-.141+	-.751*	-2.176***
300-999 vs. govern.	.032	-.070	-.070
300-999 vs. 1,000+	-.249*	-.181	-1.606**
. govern. vs. 1,000+	-.175+	-.109	-1.534*

NOTE: \*\*\*  $p < .001$ ; \*\*  $p < .01$ ; +  $p < .10$  \*The significance level is based on the one-degree-of-freedom likelihood ratio test that compares Model III with the model that imposes the parametric equality of relevant two effects.

**Table-8: Estimated Surviving Fraction From Model III by Firm Size and Occupation**

Firm size	Kaakki Shirt	Blue Shirt
1-4	.000	.000
5-29	.060	.032
30-299	.242	.040
300-999	.361	.070
1,000+	.404	.272
Government	.378	.073

**Table-9: Correlations Between Two Sets of Parameter Estimates Based on Model I**

	$\alpha_1$	$\alpha_2$	$\alpha_3$	$\alpha_4$	$\alpha_5$	$\alpha_6$
$\beta_1$	.000 <sup>b</sup>	.014	-.102	-.128	-.144	.102
$\beta_2$	.000 <sup>b</sup>	-.243	-.146	-.152	-.177	.055
$\beta_3$	.000 <sup>b</sup>	-.047	-.341	-.141	-.171	.024
$\beta_4$	.000 <sup>b</sup>	-.017	-.107	-.323	-.127	.100
$\beta_5$	.000 <sup>b</sup>	-.005	-.101	-.106	-.291	.051
$\beta_6$	.000 <sup>b</sup>	.041	.021	.062	-.038	-.243

<sup>a</sup> Subscripts indicate for both  $\alpha$  and  $\beta$ : 1: 1-4 employees (versus 1,000+); 2: 5-29 employees;

3: 30-299 employees; 4: 300-999 employees; 5: government; 6: blue shirt workers (versus kaakki shirt workers)

<sup>b</sup> The estimate asymptotically goes to 0.

## CONCLUSION

Using the new models yields the following findings for the analysis of interfirm job mobility in Karaikal: Among Blue Shirt workers, the surviving fraction is about 34-39% for government and large private firms with 300 or more employees and about 22% for medium-sized firms. Among blue Shirt workers, the surviving fraction is about 25% for private firms with 1,000 or more employees and is not significantly larger than 0 for other firms. This tendency is weaker than that for blue shirt workers in government and large private firms. Significant differences are found only between employees of the largest private firms and those of all other firms, with the latter group having a relatively accelerated timing of job separation. This may be due to a higher starting salary for employees in the largest private firms as compared to that of employees in other firms. Controlling for firm size, Blue Shirt workers have a significantly larger surviving fraction than do Kaakki Shirt workers, especially for government and private firms with 30-999 employees. Controlling for differences in surviving fraction and firm size, there is no difference in the timing of job separations between blue shirt and

kaakki shirt workers. Table 6 presents correlations between the two sets of parameter estimates derived from the variance-covariance matrix of parameter estimates derived from the variance-covariance matrix of parameter estimates from model, which uses the same set of covariates for  $\alpha$  and  $\beta$  parameters. Even for the pair with the largest absolute value of correlation, however, one can explain less than 10% [ $.114 = .339^2$ ] of the variability of the other. Finally, the models introduced in this paper require a richer data set in terms of information about the survivor function near the end of the normal period of risk. The models introduced in this paper can be considered improvements of accelerated failure-time models. Although representative accelerated failure-time models can be applied using SAS-LIFEREG, they carry a built-in assumption of a zero limiting survival probability. But because this assumption may not be realistic in the analysis of most life events, except for death, these models likely will have a poor fit with data Wu (1990). On the other hand, for any given accelerated failure-time model, we always can test whether the additional regression model for the surviving fraction improves the fit. If it does, then we not only obtain a better fitting model but also gain deeper and more accurate insights into the data.

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**FIRE DETECTION AND MITIGATION SYSTEM USING FUZZY LOGIC**

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**ABSTRACT**

*Fuzzy based fire detection and mitigation system. It's an intelligent self controlled smart fire extinguisher system which is assembled with multiple sensors, actuators and operated by microcontroller unit. It takes input signals from various sensors placed in different position of the monitored area and combines then integrated with fuzzy logic to identify fire breakout locations. Here data fusion algorithm has been adopted which facilitates the system to discard deceptive fire situations such as: cigarette smoke, welding etc.*

*During the fire hazard Safe from fire notifies the fire service and others by text messages and telephone calls. In addition ringing fire alarm is provided and it announces the fire affected locations. To prevent fire from spreading, this system helps to electric circuits of the affected area, and releases the extinguishing gas pointing to the exact fire locations. Overall performance is evaluated & Investigate reliability through experimental tests. Flame sensors, temperature sensors and gas sensors were used.*

*Keywords: Fuzzy, Arduino, Sensor, Smoke Detectors, Thermal Detectors*

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**INTRODUCTION**

Fire, especially in buildings, can spread quickly and cause great loss of life and property. Therefore early fire detection and warning is imperative. Fire detectors, smoke detectors and temperature detectors have been widely used to protect property and give warning of fires. Explosions are in a different category. Each type of fire is the object of specific technical prescriptions as regards prevention, intervention and the behaviour of the population affected. It is also relevant to note that many fires have a criminal origin and that in times of armed conflict or crisis as well as of indirect wars human intervention also provokes major accidents.

A system and method for automatically detecting fires in select areas, and reacting thereto to put out the fires. A stationary, earth orbit satellite, pilotless drone aircrafts or piloted aircraft contains one or more infrared detectors and optical means for detecting small fires when they first occur in fields and wooded areas, preferably where man made campfires and trash dumping are prohibited. Expert system logic, such as fuzzy logic, is used to prioritize dangerous areas to assist in directing fire fighting. Such information, or select portions thereof, is automatically transmitted to one or more earth bound and/or aircraft contained receivers where fire fighting equipment such as helicopter and aircraft containing drainable water or other fire fighting agents is available for immediate dispatch to the fire zone.

**FIRE DETECTION SYSTEMS**

A fire alarm system has a number of devices working together to detect and warn people through visual and audio appliances when smoke, fire, carbon monoxide or other emergencies are present. These alarms may be activated automatically from smoke detectors and heat detectors or may also be activated via manual fire alarm activation devices such as manual call points or pull stations. Alarms can be either motorized bells or wall mountable sounders or horns. They can also be speaker strobes which sound an alarm, followed by a voice evacuation message which warns people inside the building not to use the elevators. Fire alarm sounders can be set to certain frequencies and different tones including low, medium and high, depending on the country and manufacturer of the device. Detection systems are designed to discover fires early in their development when time will still be available for the safe evacuation of occupants. Early detection also plays a significant role in protecting the safety of emergency response personnel. Property loss can be reduced and downtime for the operation minimized through early detection because control efforts are started while the fire is still small. Most alarm systems provide information to emergency responders on the location of the fire, speeding the process of fire control.

To be useful, detectors must be coupled with alarms. Alarm systems provide notice to at least the building occupants and usually transmit a signal to a staffed monitoring station either on or off site. In some cases, alarms may go directly to the fire department, although in most locations this is no longer the typical approach.

**COMPONENTS OF A FIRE CONSIST OF**

- Smoke (particulate and aerosol)
- Heat
- Light Radiation

- Fire detection devices are built to detect one or a combination of these components. While all components are necessary for a fire to exist, all components may not exist at a detectable threshold. Detectors will be selected that will detect the elements that may exist in a fire for the ambient conditions that are present. It also should be realized the similar non-fire components might exist in the same ambient conditions, which could cause unfavorable false alarm conditions.
- Devices used for fire detection include smoke detectors, thermal detectors, flame detectors, fire-gas detectors, and other devices.
- Smoke detectors sense visible or invisible particles of combustion generated by burning, smoldering, or the incipient stage of combustion. These devices fall into two categories -- photoelectric and ionization.
- Thermal detectors sense the high temperature or the temperature rise caused by a fire.
- Flame detectors sense the radiation produced by a fire.
- Fire-gas detectors sense the gases produced by a fire.
- Other detectors sense some phenomenon other than smoke, thermal, flame, or fire-gas to detect a fire.

### **SMOKE DETECTORS**

There are three types of smoke detectors: Ionization, photoelectric, and combination.

#### **Ionization**

The ionization smoke detector is widely used. Its capability to detect smoke originating from fire is best utilized for clean-burning fires that produce small particles during combustion. The ionization smoke detector consists of an alpha particle producing a radioactive source, a smoke chamber, and charged detector plates.

- The alpha source causes the air within the smoke chamber to become ionized and conductive
- As smoke particles enter the smoke chamber, the smoke particles attach themselves to the ionized air molecules and the air in the chamber becomes less conductive
- When the air conductivity within the chamber drops below a predetermined level, the alarm is triggered
- A photoelectric smoke detector is the most common smoke detector used today. It detects smoke by using either the principle of light obscuration or light scattering. Its capability to detect smoke originating from fire is best utilized for fires that produce large particles during combustion.
- Spot type photoelectric smoke detectors using the light obscuration principle have a light emitting device, usually a light-emitting diode (LED), a smoke chamber, and a photosensitive device that receives the light directly from the light source and produces a monitored current.
- Smoke that enters the smoke chamber reduces the intensity of tech light reaching the photosensitive device, which reduces the monitored current. When the intensity drops below a certain level, the sensor control circuitry detects a drop in the current produced by the photosensitive device. When the current falls below a preset threshold, the smoke alarm is triggered.
- Spot type photoelectric smoke detectors that use the light scattering principle are constructed similarly to the detectors that use the light obscuration principle except that the photosensitive device is set so that it cannot see the light source directly. When smoke enters the chamber, the smoke particles reflect the light from the source into the photosensitive receiver. When sufficient light intensity is detected, the alarm is triggered.

### **BEAM DETECTOR**

Beam smoke detectors are line-type photoelectric detectors consisting of a separate light source and photosensitive receiver. These devices are usually installed in large open areas where there is an unobstructed line of sight between the light source and the receiver and where the use of spot-type detectors would be economically unfeasible due to the number of detectors required.

### **AIR SAMPLING SMOKE DETECTORS**

For environments where detection of smoke is most critical, an air-sampling system provides the earliest possible detection. An air sampling or aspirating type fire detection system is a self-contained smoke detection package comprised of five primary components:

- Air-sampling system
- Aspiration system

- Filter assembly
- Detector
- Control system

It uses a network of pipes to continuously draw air samples and direct them to a central smoke detector.

The system operates with a network of sampling pipes that extend into the protected area. The pipes are usually made of a thermoplastic material. An internal aspirator continuously draws air into the piping network. The systems use either a filter assembly or laser particle counting technology to filter out airborne dust and debris particles, which helps to eliminate false readings.

## THERMAL DETECTORS

### Fixed Temperature

- Fixed Temperature Thermal Detectors can respond to:
- Fixed temperature limit
- Rapid rate of change of the temperature in the protected area
- Combination of these types of detection

Typical fixed temperature spot-type smoke detectors contain a bimetallic switch element that closes at a specified temperature limit. The switch is normally composed of two metals, each having a different temperature coefficient of expansion. As this bimetallic element heats the metal with higher coefficient of expansion, it causes the switch to bend or curve, closing the switch; thus indicating an alarm condition.

### Rate of Rise

Rate-of-Rise Thermal Detectors measure the rate at which the air temperature changes during a fire event. Measuring the change in temperature provides a faster alarm response than measuring the temperature level in a space.

## FLAME SENSOR

A flame detector is a sensor designed to detect and respond to the presence of a flame or fire. Responses to a detected flame depend on the installation, but can include sounding an alarm, deactivating a fuel line (such as a propane or a natural gas line), and activating a fire suppression system. When used in applications such as industrial furnaces, their role is to provide confirmation that the furnace is properly lit; in these cases they take no direct action beyond notifying the operator or control system. A flame detector can often respond faster and more accurately than a smoke or heat detector due to the mechanisms it uses to detect the flame.

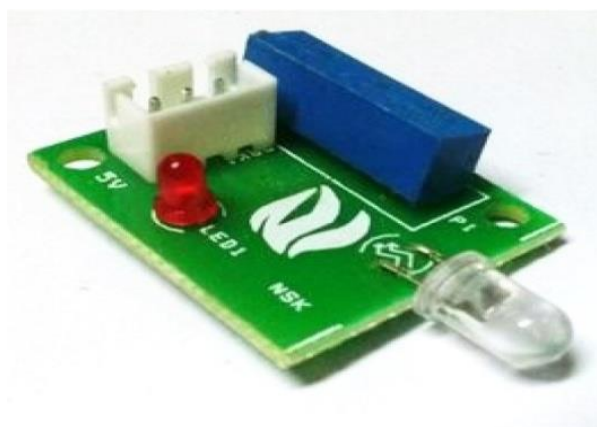


Fig-1: Flame sensor

A flame sensor "senses" a weak DC signal from the AC power sent to the igniter which via the phenomenon of flame rectification in which the polarity of power sent through a flame is rectified to DC, flame is a poor conductor so the signal is mere micro amps .3 to .5 usually and the flame sensor is nothing more than a rod insulated by a ceramic base so it is not in contact with anything, the flame sensor is a rod that's all and wired to the sensor termination the control board. if the unit has no flame sensor it uses the burner ground or burner assembly to transmit this signal, this is why cleaning the sensor with steel wool will often fix a flame sensing fault.

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graph LR
    FD[Flame detector] --> Arduino[Arduino Atmega 328P]
    Temp[Temperature] --> Arduino
    GS[Gas sensor] --> Arduino
    Arduino --> SM1[Servo Moto]
    Arduino --> SM2[Servo Moto]
    Arduino --> Alarm[Alarm]
    Arduino --> GS2[GS]
    SM1 --> SW[Sprinkler for water]
    SM2 --> SG[Sprinkler for gas]
  
```

The diagram illustrates the system architecture. Three input modules (Flame detector, Temperature, and Gas sensor) send data to a central processing unit, the Arduino (Atmega 328P). The Arduino then sends control signals to four output modules: two Servo Motors, an Alarm, and a Gas sensor (GS). The first Servo Motor controls the Sprinkler for water, and the second Servo Motor controls the Sprinkler for gas.

89



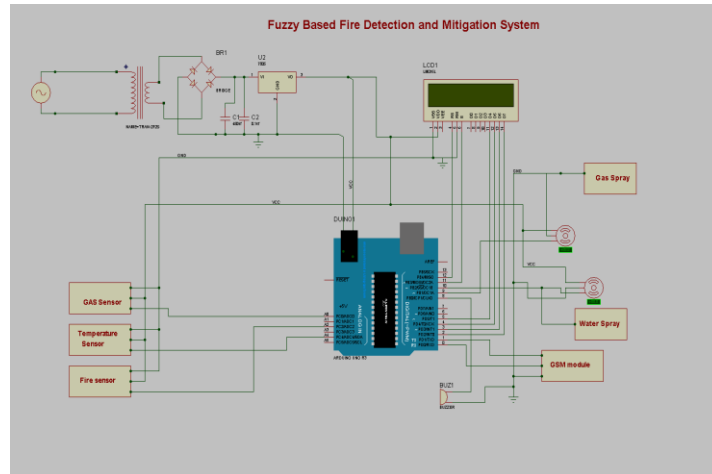


Fig-4: Circuit diagram

### SYSTEM EQUIPMENT AND EXPERIMENTAL SETUP

Fuzzy logic has been chosen to decide exact location of fire Because fire could rise in any location within the monitored area. Since the number of sensors to detect the fire are mounted on different positions of the sensor deployment area, sometimes detecting the fire location precisely becomes difficult. Without the fuzzy logic from the actual readings of the adjacent sensors, relative position of the fire can be determined. Since, the exact angle from three or four different sensors mounted in different location, one single location point can be estimated.

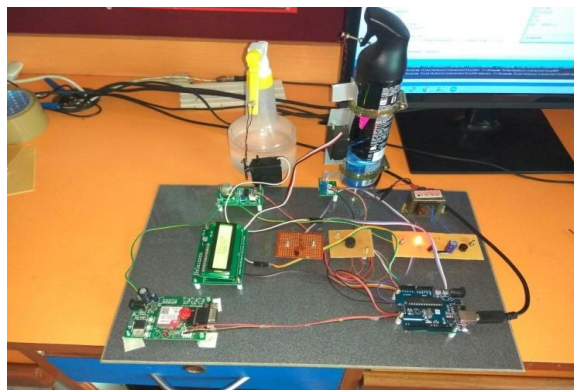


Fig-5: Experimental Setup ( SideView)

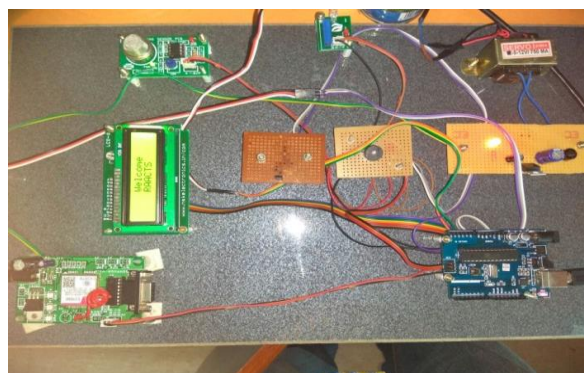


Fig-6: Experimental Setup (Frontview)

### CONCLUSION

There is an immense need of implementation of automatic fire extinguishing system to protect lives and assets from fire hazards. In this paper full fire protection system is explained. This system takes most of the preliminary initiative to prevent fire from spreading and does all necessary activities. Hence it's a complete package of fire protection system. This type of system is absolutely necessary for the perspective of Bangladesh. Garments factories, industries, multi complex shopping malls, super shops, this type of system is not only a requirement must be mandatory. Government should impose rule that SFF or automatic fire extinguisher system must be installed. Hence, this noble system can be used in every smart buildings and cities to protect invaluable lives and assets from fire and assure safety.



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**PERFORMANCE ANALYSIS OF NANO PARTICLE ECO FRIENDLY CHILLING PLANT FOR FISH PROCESSING**

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**ABSTRACT**

*In the present work, the feasibility of utilizing R404a as refrigerant along with nano particle ( $Al_2O_3$ ) as additive in nano particle Eco Friendly chilling plant for Fish processing is presented. The performance analysis used  $Al_2O_3$  as nano particle with five combinations for the assessment for R404a. The best performance of the system was identified using the comparison of system parameters like COP, compressor work input, refrigerating effect, compressor suction and discharge pressure and temperature at all the state points of the system. The COP analysis was with R404a along with nano particle of  $Al_2O_3$ . Since the emphasis has been laid on COP and evaporating temperature not given primary importance and hence the study concludes that the mixture of R404a offering the COP of 3.23 with 3%  $Al_2O_3$  having 34.37 kJ/kg-K work input to the compressor along with highest refrigerating effect of 110.99 kJ/kg-K can be used as an alternative refrigerant for nano particle Eco friendly chilling plant for fish processing at the temperature range of -8 °C. The performance characteristics of the system may provide a guideline for the cold chain application in fisheries and its allied applications.*

*Keywords: Percentage of nano particle, Eco friendly chilling plant, Refrigeration effect, Coefficient of Performance (COP).*

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**INTRODUCTION**

In 1956 G.M.B Dobson measured the ozone level in the Arctic region as 320 DU (Dobson units) and it was below 150DU during spring time, when compared to the normal level of 450DU, which was an unknown phenomenon and was named as ozone hole. Before the harmful effect on the ozone layer was identified in 1974 by Frank Sherwood Rowland and his postdoctoral associate Mario J. Molina in comparison with Nitric Oxide produced by soil bacteria through the production of  $NO_2$ , the CFC's lead the world of refrigeration industries for over 6 decades.

In early 1980's scientists have identified the steady decline of about 4% per decade in the total volume of ozone in earth's stratosphere (the ozone layer) which is known as ozone depletion and a much larger springtime decrease in stratospheric ozone over earth's polar regions named as ozone hole comparing to the ozone layer measured earlier in Dobson units abbreviated as "DU". These components greatly contributed towards global warming and also quantified it as 8500 times more than that of  $CO_2$  over a hundred years. These findings kindled the interest of HVAC engineers on production and the usage of HFC and HC refrigerants and also the ban on CFC's & HCFC's as the Montreal protocol agreement on 16<sup>th</sup> September 1987 and came into force on 1<sup>st</sup> January 1989. According to the Montreal protocol signed in 1989 the refrigerants which are friendly to environment with zero ozone depletion potential and near zero global warming potential are required to be used in refrigerators and HVAC systems to regulate production and trade of the ozone-depleting substances such as CFC's and HCFC's.

The London, Copenhagen, Montreal and Beijing amendments came into force on 10<sup>th</sup> August 1992, 14<sup>th</sup> June 1994, 10<sup>th</sup> November 1999 and 25<sup>th</sup> February 2002 which were responsible for the established of final expiration of HCFC's as 2030. So the search continues on the possible alternatives for the refrigerants which are acceptable in terms of thermo physical, thermodynamic properties and less harmful for the environment. Even though the protocol banned the production and usage of CFC's, it gave a ten year grace period to the developing nations for the usage of these refrigerants with less than 0.3kg per capita and special help to minimize the usage.

Michael Uhlmann and Stefan S. Bertsch (2012) have derived the improved control strategies for heat pumps using on-off cycling as capacity control through the evidence of performance losses of 1 - 2% for short cycling times of air source heat pumps and 5% efficiency gain in the case of geothermal heat pumps by the recovery of the ground probe during the off time. J.H. Lee et al (2002) have suggested the numerical code to predict the performance of Condenser and found the acceptable deviation of calculated and experimental values with the use of R-22 were 10.1% greater than experiment data and with the use of R-407C the results were 10.7% less

than experiment data and thus they suggested the numerical code to be used as a design tool to develop better condenser paths.

Zanjun Gao et al (2012) have studied the absorption refrigeration system with the binary mixture of Trifluoromethane (R23) and N, N-dimethyl formamide as a promising new working fluid and found the average relative deviation of 1.8% between experimental and calculated values of system parameters. Pradeep Bansal, Edward Vineyard and Omar Abdelaziz (2012) have studied the alternative technologies for refrigeration such as thermo-acoustic refrigeration, thermoelectric refrigeration, thermo-tunneling, magnetic refrigeration, Sterling cycle refrigeration, pulse tube refrigeration, Malone cycle refrigeration, absorption refrigeration, adsorption refrigeration, and compressor driven metal hydride heat pumps. They suggested going for integrated heat pump system serving both heating and air conditioning applications in domestic applications.

X. Boissieux, M.R. Heikal and R.A. Johns (2000) studied with the use of Mixtures R407C (R32/R125/R134a of quality 0.23:0.25:0.52), R404a (R125/R143a/R134a of quality 0.44:0.52:0.04) and Isceon 59 (R125/R134a/R600 of quality (0.47:0.50:0.03) and stated that the Dobson and Chato correlation provided the best prediction for these refrigerant mixtures and the Shah correlation fitted the measurements of the local heat transfer coefficients well and seems to cope well with refrigerant mixtures.

Ruixiang Wang, Qingping Wu and Yezheng Wu (2010) have confirmed the normal working of Residential Air Conditioners with the use of the mixture of R410a/MNRO as working fluid. The cooling/heating Energy Efficiency Ratio of the Residential Air Conditioners increased about 6% by replacing the Polyol-Ester oil VG 32 lubricant with MNRO (mineral-based nano-refrigeration oil).

Jianyong Chen and Jianlin Yu (2008) have Confirmed the new refrigeration cycle having the Evaporator circuit of two branches to realize Lorentz cycle with the advantage of Temperature glide (NRC) using the binary non-azeotropic refrigerant mixture (R32/R134a) results in 8 to 9% COP raise and 9.5% increase in Volumetric Refrigerating Capacity. Ki-Jung Park and Dongsoo Jung (2009) have reduced the charge of the system up to 58% due to its low liquid density and found that the COP of the system using Mixture of R170/R290 of quality 0.06:0.94 was higher than that of R22 and have 16.6–28.20C lower compressor discharge temperatures, this in turn increases the life of the system.

Primal Fernando et al (2004) have performed a study on traditional refrigeration system under typical Swedish condition and found that the charge of about 200 grams is the best choice for the heat pump providing a COP between 3.5 and 4 using R290 as a Refrigerant. Dongoo Jung et al (2000) have Examined the Performance of R290 / R600a Mixture of quality or mass fraction 0.6 : 0.4 in Domestic Refrigerators and Suggested the COP increase of 2.3%. Three to four Percentage (3-4%) of Higher Energy efficiency at faster Cooling rate as well as shorter compressor on-time and Lower compressor Dome temperatures were confirmed with this mixture compared to CFC12 – R12.

D.J. Cleland, R.W. Keedwell and S.R. Adams (2009) have quantified the system performances and stated that the system with mixture of propane and ethane (Care-50) reduced energy use by 6–8% under similar system cooling capacity relative to HCFC-22. With propane (Care-40), energy use decreased by 5% but cooling capacity was 9% lower. S.Anand, S.K. Tyagi (2012) have revealed the fact that the exergy destruction is least when the system is 25% charged and also COP of the system is high when the system is 50% charged due to higher refrigerating effect and reduced compressor work and Exergy efficiency of the system is highest when the system is 100% charged. So he suggested that the system must run with the optimum balance between the exergy efficiency and energy savings.

Andrey Rozhentsev and Vjacheslav Naer (2009) have studied the stationary modes the operating parameters of the system Using 3-component non-azeotropic mixtures of hydrocarbons – isobutane ( $\text{CH}(\text{CH}_3)_2\text{CH}_3$ ) / ethane ( $\text{CH}_3\text{CH}_3$ ) / methane  $\text{CH}_4$ ) as a refrigerant which corresponded to their design / calculated values varying with the refrigerant working mixture compositions and ambient temperatures (that is the heat load) within the following ranges: discharge pressure – (12.3, ..., 13.4) bar; suction pressure – (0.8, ..., 1.3) bar; compressor input power – (385, ..., 435) W. The air temperature in the low-temperature chambers of the 1st and 2nd type for the considered modes was as low as (-80... -95) $^{\circ}\text{C}$  while the average temperature along the evaporator was of (-85...-105) $^{\circ}\text{C}$ , correspondingly.

D.Y. Lee et al (2002) have predicted the effect of the refrigerant change from R22 to R407C on the Chiller performance and measured that the cooling capacity decreases by 10–20% and the COP by 20–30% depending on the temperature condition. It is found that the main reason for the decrease in the Chiller performance is the

decrease in the heat transfer coefficient of R407C compared with that of R22 based on the three factors which are thermodynamic properties, compressor efficiency, and heat transfer.

The Figure 1 shows the experimental setup consists of three compressors for accommodating three different nano particles along with individual oil separate (ensuring no nano particle beyond oil separator along the refrigerant cycle, air cooled condenser (assisted by fan), thermostatic expansion valve and an evaporator section. The compressor used in this system is Kirloskar KCN414LAL-B230H. A four row air cooled condenser of 1TR capacity is used to facilitate the proper condensing area ensuring the system pressure never increases beyond a limit. An Individual oil separator was connected to separate the oil and nano particle correspond to its compressor from the compressor discharge and the separated oil and nano particle was directed to the compressor doom through the suction line of the compressor. Charging valves of individual nature were also provided to facilitate the charging for performance testing. The experimental setup was placed on a platform along with a blast freezer type evaporator unit capable of handling -20°C inside.

### EXPERIMENTAL SETUP

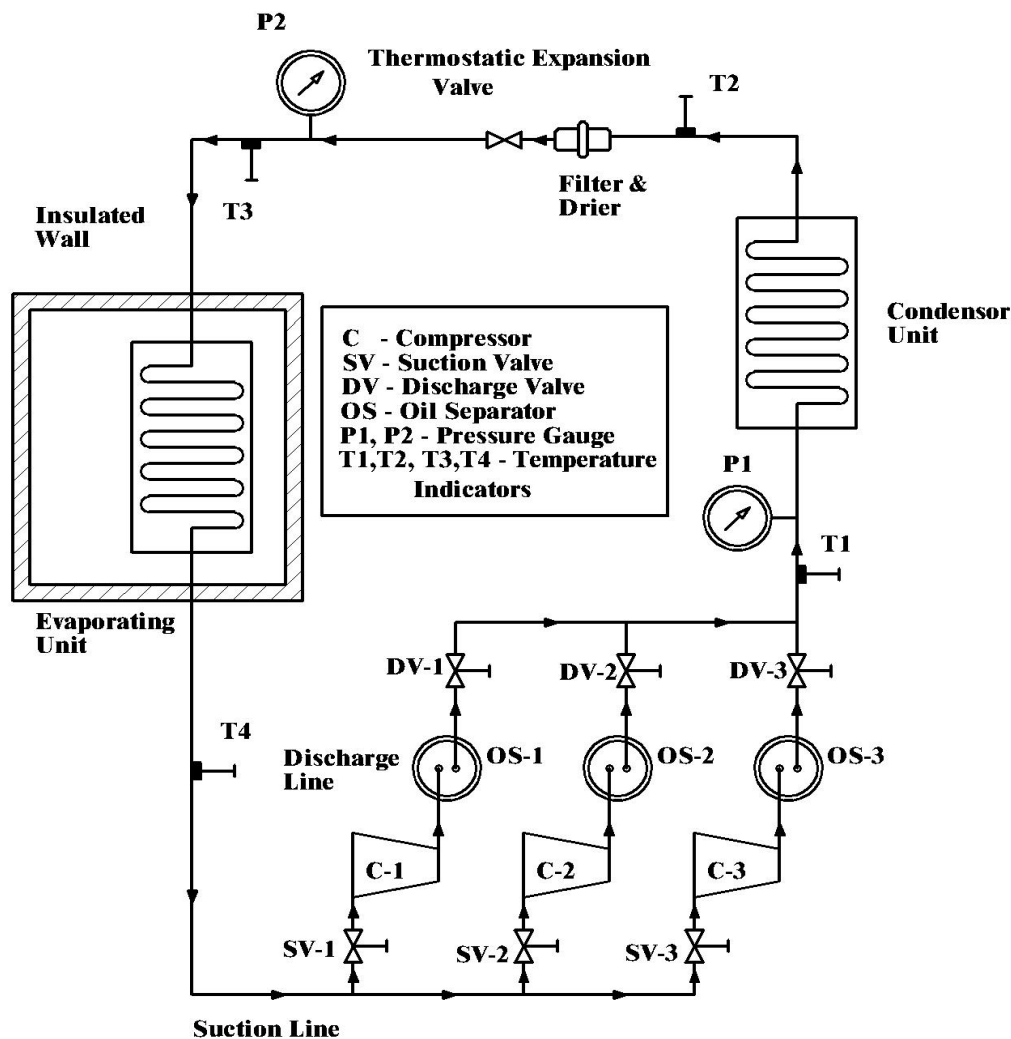


Fig-1: Schematic diagram of experimental setup of nano particle eco friendly chilling plant for fish processing

This setup was used for conducting COP analysis of R404a with nano particle of  $\text{Al}_2\text{O}_3$ . For the realization of different requirements of each compressor this nano particles Eco-friendly refrigeration unit considered the TES2:068Z3403 with orifice sizes of "1", in size to accommodate the variation in cooling load. Thermometers and pressure gauges are used to measure the temperatures and pressures of the unit at various places as well as suction and discharge. Initially the system was flushed with nitrogen gas to eliminate impurities, moisture and other foreign materials inside the system, which may affect the accuracy of the experimental results.  $\text{Al}_2\text{O}_3$  mixed with the compressor oil through suction valve provided for each compressor and the R404a refrigerant is charged into the setup. Refrigerant is allowed to work and the COP for the system was analyzed. COP was found to be more when the nanoparticles were added rather than the COP of R404ac without nanoparticle. Temperatures and Pressures are recorded at frequent intervals. The work input to the compressor, Refrigerating

effect and COP during tests was measured after attaining the steady-state condition during every testing trial. The measured values were used to study the performance characteristics of the refrigerator. Figure 2 shows the Photographic view of nano particle eco friendly chilling plant for fish processing.



Fig-2: Photographic view of nano particle eco friendly chilling plant for fish processing

### REFRIGERANT CHARGING

The system was subjected to leak test with nitrogen at 31.74 bar. The system was kept idle for 60 hours and checked for pressure drop to ensure zero leak. Then the system was evacuated to the vacuum level. After completing the evacuation test, the system was ready for charging the refrigerant mixture. Initially high boiling refrigerant was charged through charging valve followed by medium boiling refrigerant and then by the low boiling refrigerant as per the thermodynamically correct mass fraction. A digital mass balance was used to have accurate mass of charged quantity.

### TESTING METHODOLOGY

After charging the mixture with desired mass fraction, the system was started with uniform ambient temperature. Before starting the system, pressures at discharge side and suction side were equalized by the use of the bypass line and extra volume to ensure less starting torque of the compressor. After the starting of compressor the valve was closed. Different observations like temperatures at each state point, pressures at each state point, power consumption of compressor and evaporator heat load were recorded. All the observations were made after getting the equilibrium condition of the system. The equilibrium state was arrived by adjusting the heater load and evaporator refrigerating effect. The unchanged temperature of secondary medium ensured this equilibrium state.

The nano particle was charged at different composition for their corresponding compressors and before initiation they were checked for its correctness by digital physical balance with accuracy of 1 mg. The different combinational testing were executed and the readings were recorded for analysis.

### HEAT LEAK TEST

The heat leak test was carried out to find heat infiltration into the evaporator tank from ambient temperature and different secondary fluid temperatures. Initially the temperature of secondary fluid in the evaporator tank was brought down and then the system was stopped. Then the time taken for every one degree increment of secondary fluid temperature was recorded.

The non return valve connected at the end of the evaporator coil ensured no influence of back flow of refrigerant that would heat the secondary fluid. The heat infiltration was calculated using the following Equation 1.

$$\text{Calorimeter Heat Gain} = (m \cdot C_p \cdot \Delta T) / \Delta t \quad (1)$$

where,  $m$  is total mass of secondary fluid in the evaporator tank (kg)

$C_p$  is specific heat of secondary fluid ( $\text{kJ kg}^{-1} \text{K}^{-1}$ )

$\Delta T$  is difference of initial and final temperature ( $^{\circ}\text{C}$ )

$\Delta t$  is time taken for  $\Delta T$  increase of temperature (seconds)

The calculated amount of evaporator heat infiltration for particular secondary fluid temperature was added to the load indicated in the wattmeter. Hence the exact load on evaporator was estimated.

### UNCERTAINTY ANALYSIS

$$Z_i = Z_i \pm \partial Z_i \quad (2)$$

The theoretical COP of the refrigeration system is expressed as

$$\text{COP}_{\text{th}} = \frac{h_{e,o} - h_{e,i}}{W_c} \quad (3)$$

Hence the COP of the system is a function of enthalpy and work of compression, enthalpy is a function of pressure and temperature. The work of compression was given by

$$W_c = \left( \frac{n}{n-1} \right) * P_s * c * \left[ \left( \frac{P_d}{P_s} \right)^{\frac{n}{n-1}} - 1 \right] \quad (4)$$

The uncertainty in COP calculation using linear variables is expressed as (Holman 2000),

$$\delta \text{COP}_{\text{th}} = \left[ \left( \frac{\partial T_{e,i}}{T_{e,i}} \right)^2 + \left( \frac{\partial T_{e,o}}{T_{e,o}} \right)^2 + \left( \frac{\partial P_{e,i}}{P_{e,i}} \right)^2 + \left( \frac{\partial P_{e,o}}{P_{e,o}} \right)^2 + \left( \frac{\partial P_s}{P_s} \right)^2 + 0.2 \left( \frac{\partial P_s}{P_s} \right)^2 + 0.2 \left( \frac{\partial P_d}{P_d} \right)^2 \right]^{\frac{1}{2}} \quad (5)$$

The temperature and pressure values of system are considered for  $32^{\circ}\text{C}$  ambient temperature and 4 row condenser and given as

$$\begin{aligned} T_{e,i} &= -11 \pm 0.1^{\circ}\text{C} & T_{e,o} &= -4.0 \pm 0.1^{\circ}\text{C} & P_{e,i} &= 4 \pm 1 \text{ psig} \\ P_{e,o} &= 4.1 \pm 1 \text{ psig} & P_s &= 4 \pm 1 \text{ psig} & P_d &= 17.5 \pm 1 \text{ psig} \end{aligned}$$

The values given above are substituted in the Equation 4.5.

$$\delta \text{COP}_{\text{th}} = \left[ \left( \frac{0.1}{-11} \right)^2 + \left( \frac{0.1}{-4} \right)^2 + \left( \frac{1}{0.4} \right)^2 + \left( \frac{1}{0.41} \right)^2 + \left( \frac{1}{0.4} \right)^2 + 0.2 \left( \frac{1}{0.4} \right)^2 + 0.2 \left( \frac{1}{1.75} \right)^2 \right]^{\frac{1}{2}}$$

$$\delta \text{COP}_{\text{th}} = 0.02047 \text{ or } 2.047 \%$$

The value of  $\delta \text{COP}_{\text{th}}$  shows the uncertainty value in theoretical calculations varying about 2.047% from the original value.

Theoretical COP with the uncertainty correction

$$= \text{COP}_{\text{th}} \pm (2.047/100) * \text{COP}_{\text{th}}$$

**MODELLING AND GOVERNING EQUATIONS**

Exergy or availability is a thermodynamic property that represents the maximum work that can be obtained from a fluid stream in a reversible process until it reaches the thermodynamic equilibrium with the surroundings. Exergy analysis can be used to evaluate the performance of thermodynamic system. Unlike energy, exergy is not conserved but it will be destroyed.

With the experimental data obtained from the tests, the exergy analysis is carried out to find exergy loss of the “three compressor system” in order to obtain a quantitative measurement of the system inefficiency. Under the assumption that the change of kinetic and potential energy is negligible and the ambient temperature is  $T_0$ , the exergy is given by the equation.

$$\psi = h - T_0 s \quad (6)$$

$$\psi = \left( h - h_0 \right) - T_0 \left( s - s_0 \right) \quad (7)$$

**RESULTS AND DISCUSSIONS**

The performance analysis of nano particle Eco-friendly chilling plant for fish processing using R404a was performed. The system was charged at different composition for their corresponding compressors and before initiation they were checked for its correctness by digital physical balance with accuracy of 1 mg. The different combinational testing was executed and the observations were recorded and results were plotted as graphs and plots. The following are the interpretations and conclusions of the results of this experimental study.

**Table-1: Observations with and without  $Al_2O_3$** 

Sl. No	Percentage of $Al_2O_3$	Discharge Temperature (T1) in k	Condensing Temperature (T2) in k	Evaporating Temperature (T3) in k	Suction Temperature (T4) in k	Cabin Temperature in k	h1 h <sub>sup</sub> = hg+cpv(tsat-tsab) in kj/kg-k	h2 h <sub>sub</sub> = hl-cpl(tsat-tsab) in kj/kg-k	h3 (throttling T2=T3) in kj/kg-k	h4 h <sub>sup</sub> = hg+cpv(tsat-tsab) in kj/kg-k	Compressor Work input (WD) (h1-h4) in kj/kg-k	Refrigerating Effect (RE) (h4-h3) in kj/kg-k	COP (COP=RE/WD)
<b>Observations without <math>Al_2O_3</math></b>													
1	-	332.50	309.00	265.00	271.00	268.40	409.76	253.32	253.32	365.94	43.82	112.62	2.57
2	-	332.90	309.00	265.00	271.00	268.40	409.40	253.19	253.19	365.94	43.45	112.75	2.59
3	-	333.00	309.00	265.00	271.00	268.40	408.61	253.04	253.04	365.94	42.67	112.90	2.65
4	-	333.50	310.00	265.00	271.00	268.40	411.17	255.01	255.01	368.29	42.88	113.28	2.64
5	-	334.00	309.80	265.00	271.00	268.40	411.87	254.67	254.67	368.29	43.58	113.62	2.61
<b>Observations with <math>Al_2O_3</math></b>													
6	1%	326.30	309.00	265.00	269.00	267.60	401.04	253.32	253.32	364.04	37.00	110.72	2.99
7	2%	327.00	309.00	265.00	269.00	267.60	400.95	253.19	253.19	364.04	36.91	110.85	3.00
8	3%	326.00	309.00	265.00	269.00	267.60	398.40	253.04	253.04	364.04	34.37	110.99	3.23
9	4%	326.70	309.40	265.00	269.00	267.60	401.60	254.00	254.00	366.46	35.14	112.46	3.20
10	5%	327.00	309.90	265.00	269.00	267.60	402.02	254.84	254.84	366.46	35.56	111.62	3.14

Figure 3 shows the Variation of compressor Work Input for different percentage of Nano particle ( $Al_2O_3$ ). It is observed that the decrease in work input to the compressor is due to the excess energy stored inside the compressor reducing the unnecessary work for compression which increasing the refrigerating effect with the increase in percentage of nano particle during operation. Further the increase in percentage of nano particle into the system increases the work input to the compressor through utilizing more amount of work supplied rather in compression into increasing the output temperature instead of increasing the discharge pressure.

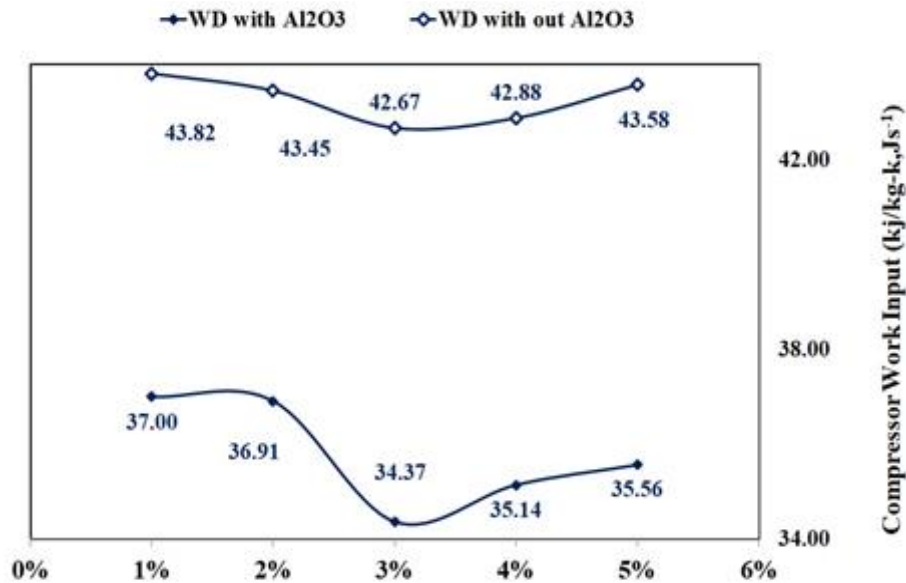


Fig-3: Variation of compressor Work Input for different percentage of Nano particle (Al<sub>2</sub>O<sub>3</sub>)

The maximum and minimum values of work input to the compressor observed were 34.37 and 37 kJ/kg-K for the mixture with Al<sub>2</sub>O<sub>3</sub> and 42.67, 43.82 kJ/kg-K for the mixture without Al<sub>2</sub>O<sub>3</sub>. Among which the minimum value lies for 3% of nano particle. Lower the work input to the compressor and higher the COP being the best operating conditions of any refrigerating system, the recommended percentage of nano particle (Al<sub>2</sub>O<sub>3</sub>) as 3% when used along with R404a with 34.37 kJ/kg-K work input to the compressor.

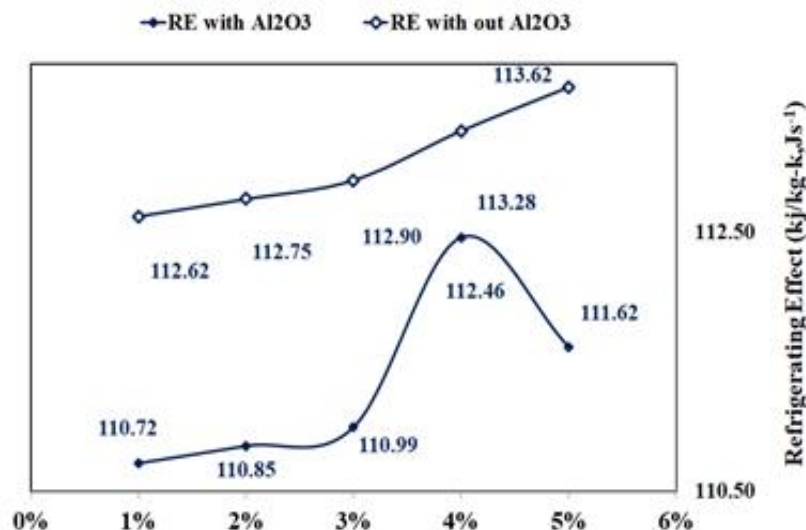


Fig-4: Variation of Refrigerating Effect for different percentage of Nano particle (Al<sub>2</sub>O<sub>3</sub>)

Figure 4 shows the Variation of Refrigerating effect for different percentage of Nano particle (Al<sub>2</sub>O<sub>3</sub>). It is observed that the increase in Refrigerating effect is due to the excess energy stored inside the compressor reducing the unnecessary work for compression and thus saving the work required to achieve the same refrigerating effect as well as with high value of refrigerating effect and its corresponding work input, yielding higher COP with the increase in percentage of nano particle during operation. Further the increase in percentage of nano particle into the system reduces the Refrigerating effect through utilizing more amount of work supplied rather in compression into increasing the output temperature instead of increasing the discharge pressure.

The maximum and minimum values of Refrigerating effect were 112.90 and 112.62 kJ/kg-K for the mixture without Al<sub>2</sub>O<sub>3</sub> and 110.99, 110.72 kJ/kg-K for the mixture with Al<sub>2</sub>O<sub>3</sub>. Among which the optimum value lies for 3% of nano particle. The lower value of refrigerating effect yields low value of COP and vice versa. Lower the work input to the compressor, higher values of refrigerating effect and higher the COP being the best operating conditions of any refrigerating system, the recommended percentage of nano particle (Al<sub>2</sub>O<sub>3</sub>) as 3% when used along with R404a with 110.99 kJ/kg-K as Refrigerating Effect.



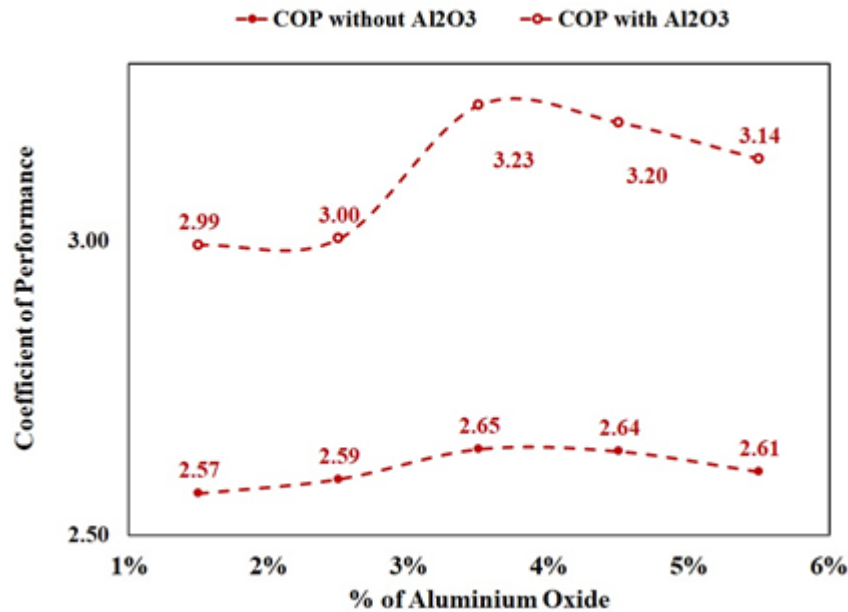


Fig-5: Variation of Coefficient of performance for different percentage of Nano particle ( $\text{Al}_2\text{O}_3$ )

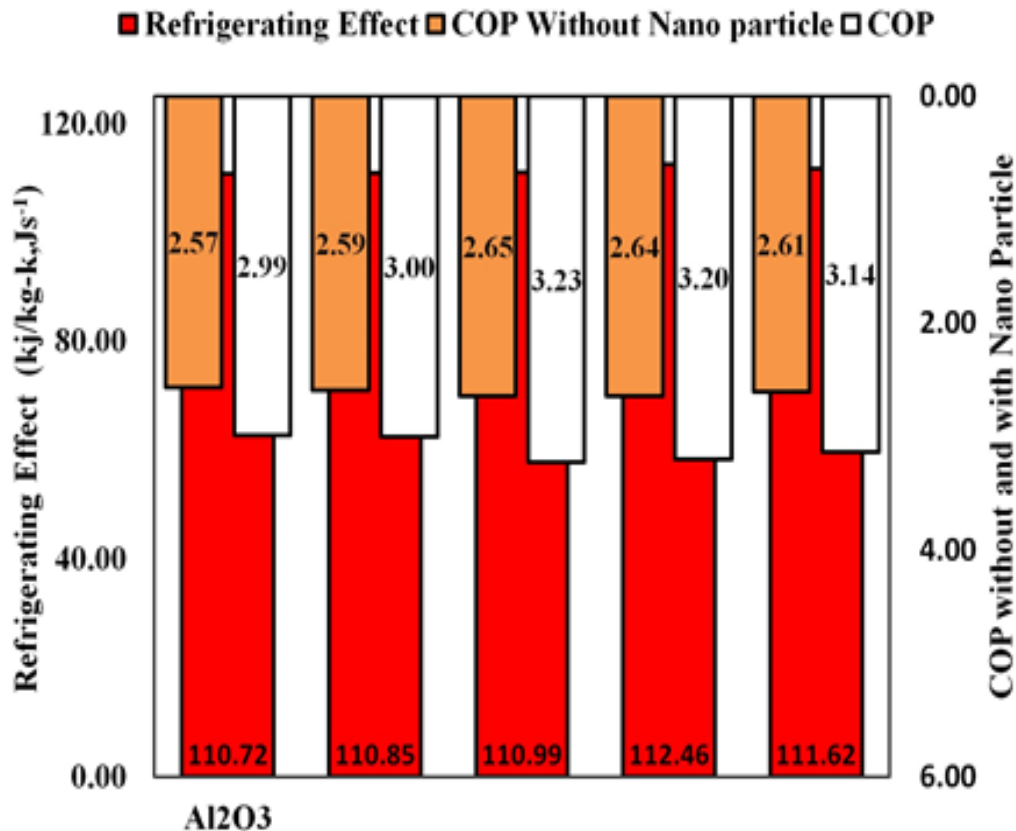


Fig-6: Comparison of Effect of Nano Particles on COP, Refrigerating Effect and Work Input to the Compressor with the Refrigerant mixture R404a

Figure 6 compares the Effect of Nano Particles on COP, Refrigerating Effect and Work Input to the Compressor with the Refrigerant mixture R404a for without and with nano particles during operation. The trend of reduced work input and increased refrigerating effect compared with the system operation without nano particle and along with nano particle were shown in figure 6. The maximum COP observed was 3.23 which correspond to 3%  $\text{Al}_2\text{O}_3$  which has 34.37 kJ/kg-K compressor work input and 110.99 kJ/kg-K refrigerating effect as well as increased COP as compared to the system without nano particle ( $\text{Al}_2\text{O}_3$ ).

Lesser the work input to the compressor, higher the refrigerating effect and better the COP being the expectations from the system it is obvious from the figure 6 that 3% of  $\text{Al}_2\text{O}_3$  yields very less work input (34.37 kJ/kg-K) along with highest refrigerating effect (110.99 kJ/kg-K) along with 3.23 as its corresponding COP and

thus recommendations emulate the system working with R404a as refrigerant has to be loaded with 3%  $\text{Al}_2\text{O}_3$  nano particle for optimized performance. Thus the study recommends that the R404a along with 3%  $\text{Al}_2\text{O}_3$  nano particle can be used for the optimized operation of nano particle Eco friendly chilling plant for fish processing.

## CONCLUSION

Thermodynamic investigations on nano particle Eco friendly chilling plant for fish processing aims at finding an alternative refrigerant mixture for CFC and HCFC refrigerants which fulfils the requirements of error free working of the system in the range of 264K (-8 °C) taking care of environmental friendly, exergic and energy efficiency aspects during its life cycle.

The performance analysis was done on nano particle Eco friendly chilling plant for fish processing using five combinations of nano particles for R404a. The best performance of the system was identified using the comparison of system parameters like COP, compressor work input, refrigerating effect, compressor suction and discharge pressure and temperature at all the state points of the system. Mind provoking findings that lead the recommendation is given for the reviewers as an essence of this experimental study.

Since the emphasis has been laid on COP and evaporating temperature not given primary importance and hence the study concludes that the mixture of R404a offering the COP of 3.23 with 3%  $\text{Al}_2\text{O}_3$  having 34.37 kJ/kg-K work input to the compressor along with highest refrigerating effect of 110.99 kJ/kg-K can be used as an alternative refrigerant for nano particle Eco friendly chilling plant for fish processing at the temperature range of -8 °C.

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**HUMAN DEVELOPMENT IN INDIA: EVIDENTIAL APPROACH**

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**ABSTRACT**

*Unitary Index developed in 1960s combines a large set of social variables in the areas of nutrition, shelter, health, education, leisure, security, and social and physical environment. Similarly Physical Quality of Life Index [PQLI] developed during 1970s combines infant mortality, life expectancy at birth and adult literacy. International Human Suffering Index [IHSI] of the 1980s integrated a large set of variables such as expectation of life at birth, calorie intake, availability of clean drinking water, secondary enrollment, inflation rate, infant immunization and other indicators dealing with civil rights and political freedom. Finally the Human Development Index [HDI] of the 1990s which is most widely used as indicator of development. All indices of development has one common feature, all these multi-variable indices of development is that they try to combine a number of indicators, generally proxies for various aspects of economic and social life, into one index of development.*

*Keywords: Human Development, Human Development Index [HDI] , Economic Development,*

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**INTRODUCTION**

The concept of human development is most widely discussed in academic literature, political arena as well as policy discussion. At the same time the concept of human development is most misunderstood in terms of what constitute human development and parameters defining human development. The concept of human development was introduced in the early 1990s sought to shift focus from national income as an indicator of development to expanding choices available to peoples. Before the concept of human development came on the forefront, the concept of economic development was the buzz word in literature and policies. Social scientists have made many attempts to device more welfare sensitive measurement of development which incorporates other measures of social development along with economic development. Unitary Index developed in 1960s combines a large set of social variables in the areas of nutrition, shelter, health, education, leisure, security, and social and physical environment. Similarly Physical Quality of Life Index [PQLI] developed during 1970s combines infant mortality, life expectancy at birth and adult literacy. International Human Suffering Index [IHSI] of the 1980s integrated a large set of variables such as expectation of life at birth, calorie intake, availability of clean drinking water, secondary enrollment, inflation rate, infant immunization and other indicators dealing with civil rights and political freedom. Finally the Human Development Index [HDI] of the 1990s which is most widely used as indicator of development. All indices of development has one common feature, all these multi-variable indices of development is that they try to combine a number of indicators, generally proxies for various aspects of economic and social life, into one index of development.

**ECONOMIC DEVELOPMENT AND HUMAN DEVELOPMENT**

The concepts of human development and economic development concepts that are related to one another in that both measure a country's overall development in terms of economic wealth and human welfare. While human development is very much focused on the wellbeing of people, the concept of economic development covers a wide spectrum of social and economic factors. Both the concepts viz. economic development and human development measures are used to determine the overall development in a country or region. While the measures of economic development are very broad and include a wide spectrum of elements such as economic growth, standards of living, infrastructure, international trade, environmental health, public safety, social justice, life expectancy, literacy, health, etc. the concept of human development is a component that makes up economic development. Various measures such as HDI, GEM, and HPI were developed to measure human development in terms of health, education, standard of living, income, poverty, gender equality, etc. Human development can lead to economic development, as when more people have better education, health and standard of living that will increase the levels of productivity, investment and economic growth which can eventually result in economic development<sup>1</sup>. Human development is defined as the process of enlarging people's freedoms and opportunities and improving their well-being. Human development is about the real freedom ordinary people have to decide who to be, what to do, and how to live<sup>2</sup>.

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<sup>1</sup> UNDP

<sup>2</sup> Amartya Sen

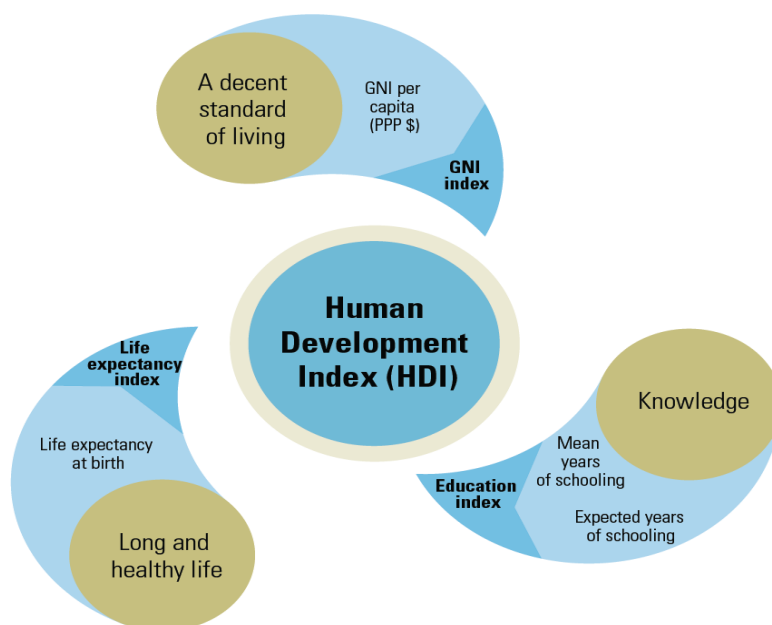
The concept of human development was developed by economist Mahbub ul Haq during 1970s. According to him existing measures of human progress failed to account for the true purpose of development, to improve people's lives. He was of the strong belief that the commonly used measure of Gross Domestic Product [GDP] failed to adequately measure well-being. Dr Mahbub ul Haq along with Nobel Laureate Amartya Sen published first Human Development Index in 1990 which was commissioned by the United Nations Development Programme.

In 1990 the first Human Development Report introduced a new approach for advancing human wellbeing. Human development – or the human development approach - is about expanding the richness of human life, rather than simply the richness of the economy in which human beings live. It is an approach that is focused on people and their opportunities and choices<sup>1</sup>.

### HUMAN DEVELOPMENT INDEX

The Human Development Index [HDI] was developed by the United Nations as a metric to assess the social and economic development levels of countries. HDI is based on four principal areas of examination for the purpose of ranking countries; mean years of schooling, expected years of schooling, life expectancy at birth and gross national income per capita. HDI makes it possible to follow changes in development levels over time and to compare the development levels of different countries. The main emphasis of HDI is on individual countries with specific focus on their opportunities to realize satisfying work and lives. Evaluation of a country's potential for individual human development provides a supplementary metric for evaluating a country's level of development besides considering standard economic growth statistics, such as gross domestic product [GDP]. HDI can also be used to examine the various policy choices of nations in terms of policy decisions.

The HDI was created to emphasize that people and their capabilities should be the ultimate criteria for assessing the development of a country, not economic growth alone. The HDI can also be used to question national policy choices, asking how two countries with the same level of GNI per capita can end up with different human development outcomes. These contrasts can stimulate debate about government policy priorities<sup>2</sup>.



Source: [www.hdr.undp.org](http://www.hdr.undp.org)

To measure human development more comprehensively, the Human Development Report also presents four other composite indices. The Inequality adjusted HDI discounts the HDI according to the extent of inequality. The Gender Development Index compares female and male HDI values. The Gender Inequality Index highlights women's empowerment. And the Multidimensional Poverty Index measures non-income dimensions of poverty.<sup>3</sup> The countries with highest and lowest HDI are presented in table below;

<sup>1</sup> <http://hdr.undp.org/en/humandev>

<sup>2</sup> <http://hdr.undp.org/en/content/human-development-index-hdi>

<sup>3</sup> Human Development Report 2015

Countries with highest HDI : 2017		
HDI Rank	Country	HDI Score
1	Norway	0.953
2	Switzerland	0.944
3	Australia	0.939
4	Ireland	0.938
5	Germany	0.936
6	Iceland	0.935
7	Sweden	0.933
7	Hong Kong, China (SAR)	0.933
9	Singapore	0.932
10	Netherlands	0.931
Source: HDI 2017, UNDP		

Countries with Lowest HDI :2017		
HDI Rank	Country	HDI Score
180	Mozambique	0.437
181	Liberia	0.435
182	Mali	0.427
183	Burkina Faso	0.423
184	Sierra Leone	0.419
185	Burundi	0.417
186	Chad	0.404
187	South Sudan	0.388
188	Central African Republic	0.367
189	Niger	0.354
Source: HDI 2017, UNDP		

It can be seen from the data that Norway achieved the highest position in terms of HDI ranking [1<sup>st</sup>] and score [0.953] followed by Switzerland [2<sup>nd</sup> rank, score 0.944] and Australia [3<sup>rd</sup> rank, score 0.939]. On the other side Niger is at the bottom end with HDI rank of 189<sup>th</sup> and score of 0.354 followed by Central African Republic [188<sup>th</sup> rank, score 0.367] and South Sudan [187<sup>th</sup> rank, score 0.388].

#### HUMAN DEVELOPMENT INDEX: INDIA

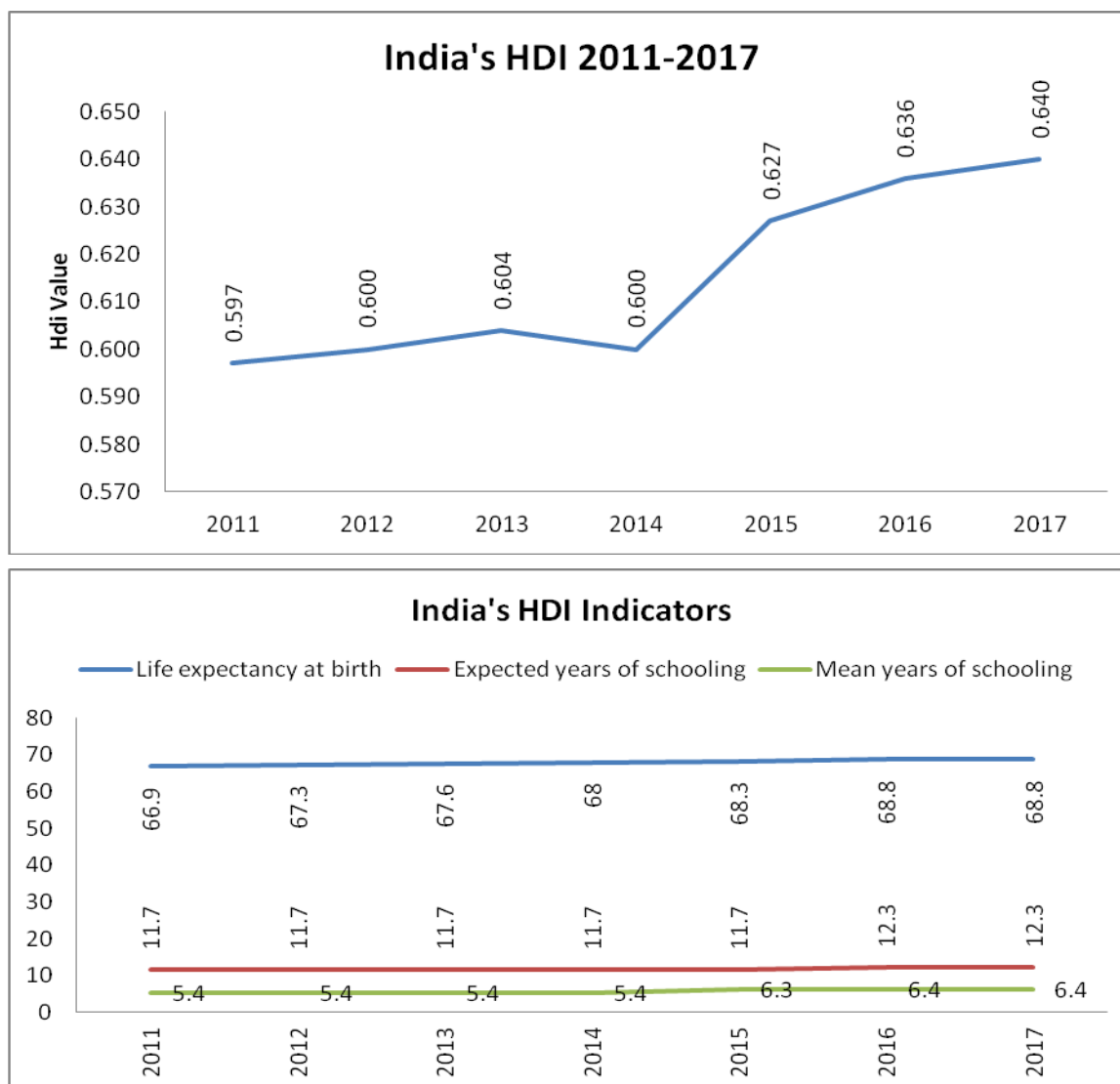
According to human development report 2017 released by UNDP, India continued to rank low in the Human Development Index [HDI], but climbed one notches to the 130th rank among 189 countries in the latest UNDP report on account of rise in life expectancy and per capita income.. As per the report India's HDI value for 2017 is 0.640, which puts the country in the medium human development category, positioning it at 130 out of 189 countries and territories.

It is important to note that between 1990 and 2017, India's HDI value increased from 0.0427 to 0.640, an increase of 50 per cent or an average annual increase of about 1.54 per cent.

Life expectancy at birth in India has remained stable at 68.8 during the year 2016 and 2017 which was marginally higher from 68.3 years during 2015.

Similarly India's Gross National Income [GNI] per capita was \$6353 during 2017 which was higher than \$6026 registered during 2016 and \$5663 in 2015. India's GNI per capita has increased by about 406.22 per cent between 1980 and 2017 according to the report.

Human development report also highlighted that the expected years of schooling is stagnant at 12.3 since 2016 and mean years of schooling at 6.4 has not changed since 2016.



The performance of India in terms of Human Development Index since 2011 is presented in table and graph above. It can be seen from the data that HID score of India has improved from 0.597 in the year 2011 to 0.640 in the year 2017. Thus HDI score of India has improved by nearly 7.2 percent over a period 2011- 2017.

During the period 2011 and 2017, India's life expectancy at birth increased from 66.9 years to 68.8 years [2.84 percent]. During the same period mean years of schooling increased by 5.4 years, to 6.4, registering an increase of 18.52 percent and expected years of schooling increased from 11.7 years to 12.3 years in 2017 registering the growth of 5.13 percent.

According to the UNDP, India's 2017 HDI of 0.640 is below the average of 0.638 for countries in the medium human development group and above the average of 0.607 for countries in South Asia.

From South Asia, countries which are close to India in 2017 HDI rank and to some extent in population size are Bangladesh and Pakistan, which have HDIs ranked 136 and 150, respectively.

## CONCLUSION

The concept of human development is most widely discussed in academic literature, political arena as well as policy discussion. At the same time the concept of human development is most misunderstood in terms of what constitute human development and parameters defining human development. The concept of human development was introduced in the early 1990s sought to shift focus from national income as an indicator of development to expanding choices available to peoples. Norway achieved the highest position in terms of HDI ranking [1<sup>st</sup>] and score [0.953] followed by Switzerland [2<sup>nd</sup> rank, score 0.944] and Australia [3<sup>rd</sup> rank, score 0.939]. On the other side Niger is at the bottom end with HDI rank of 189<sup>th</sup> and score of 0.354 followed by Central African Republic [188<sup>th</sup> rank, score 0.367] and South Sudan [187<sup>th</sup> rank, score 0.388]. HID score of India has improved from 0.597 in the year 2011 to 0.640 in the year 2017. Thus HDI score of India has improved by nearly 7.2 percent over a period 2011- 2017.

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**PROBLEMS OF RUBBER CULTIVATORS IN KERALA: SOME EVIDENCE FROM ERNAKULAM DISTRICT**

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**Abstract**

*Rubber and rubber products have become an indispensable part of our everyday lives. There isn't a single day in our lives passing without using any of the rubber products. The state Kerala is the leading producer of natural rubber in India contributing more than 80% of the total area and production of rubber. Natural rubber production has played an important role in the socio economic development of the s Kerala. But the declining trend in the price of rubber in recent years have made the life of millions of cultivators miserable. Falling price has adversely affected the production and productivity of rubber in the state. This paper examines the current problems and challenges facing by small rubber growers in Kerala. This is a piolet study conducted by the researcher as part of his research work on 'rubber economy of Kerala-presents problems and prospects'. Primary data for this study was collected from 40 rubber growers of 'Nellikuzhi' and 'Paipra' panchayath in Ernakulam district through a structured questionnaire using random sampling technique. The study reveals that falling price of rubber has affected the life and livelihood of many cultivators. The study emphasis the need for reviewing the policy of the government towards rubber sector on an urgent basis.*

*Keywords: Natural rubber, Socio economic development, livelihood.*

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**Introduction**

Natural rubber (NR) is derived from latex of the *Hevea Brasiliensis* tree. The rubber tree is a native of the Amazon River basin in South America. It is a unique renewable resource of nature. Natural rubber (NR) occupies a dominant position among the plantation crops in India. India is the sixth largest producer of natural rubber in the world. In the year 2015, India produced 575 thousand tonnes of natural rubber, down from 705 thousand tonnes in the previous year. India contributes around 5% of the world natural rubber production. Kerala contributes to about 75 per cent of the planted area and about 89 per cent to the national production. Kerala is the single largest rubber producing state in India accounting for 91 per cent of total NR production. Kerala and TN are considered to be the traditional rubber growing regions in the country. Kerala holds a near monopoly position in the cultivation and production of natural rubber in India and the state has been maintaining this unique position since the introduction of natural rubber cultivation in the country. But, Kerala's relative share has been gradually coming down over the years. The present empirical study is an attempt to look into the problems of rubber cultivation in Kerala from the perspective of the rubber cultivators in central Kerala viz. those of Ernakulam district in Kerala.

**Relevance and Significance of the Study**

Price instability and market uncertainties of primary commodities have been a recurring phenomenon caused by the abandonment of the protectionist trade policies by India since 1990s. These policy changes opened various challenges for Indian rubber market and there by the rubber growers of the country. Rubber growers in the country are vulnerable to large risks caused by price fluctuations due to demand and supply situations and changes in domestic and international prices. Price of Natural rubber had been increasing continuously with minor fluctuations till 1995. The period from 1994 to 1998 was the most turbulent in domestic price trend of natural rubber. In June 1995 RSS-4 price shot up sharply to Rs. 6171 per quintal from Rs. 2,599 a quintal in March 1995, after that the price began to fluctuate widely. Since 2000-01, rubber price again showed an upward movement which continues till 2011 with minor fluctuations. The price of rubber was 3036/q in 2000-01 which improved consistently up to 20,805/q in 2011. But since 2011, rubber price shows a sharp downward trend. With a recorded growth rate of -33.455% in the price of natural rubber during 2010-11 to 2014-15 the present market price (around Rs 120/kg) is not even 50 per cent of what prevailed a few years ago. Around 13 lakhs of small rubber cultivators are facing crisis due to fall in price.

The price volatility and the subsequent market uncertainties have adversely affected the production and productivity of natural rubber in India in the last couple of years especially from 2012. The country produced 844,000 tons of NR in 2012-13, down 6.6 percent from 903,700 tonnes produced a year ago and 645,000 tonnes of NR during 2014-15, down 16.7 per cent from 774,000 tonnes produced a year ago. The production is again reduced to 562,000 in 2015-16, down 12.9 percent from 645,000 tonnes produced last year. Thus it shows a

continuous declining trend in the total production of natural rubber from 2012. The productivity of natural rubber has also showing a negative trend since 2012. India was enjoying the first position in terms of productivity of natural rubber in the world during 2011-12 with an amount of 1841 kg/hectare. It reduced to 1813 kg/hectare in 2012-13, and 1629 kg/hectare in 2013-14. The trend has further deteriorated in recent years. The productivity of natural rubber is 1437 kg/hectare in 2015-16. Among the reasons for the drastic decline in production and the productivity of natural rubber in India, instability in the prices of natural rubber is the major one. Adverse weather, high wage rates, lack of skilled laborers etc. are the other reasons.

The present study is aimed to understand the problems and challenges of rubber growers especially small rubber cultivators in Kerala. Recent years have witnessed unprecedented volatility in rubber price. Rubber growers in the state is going through a difficult situation as the price of natural rubber has crashed down to Rs120 /kg or below in recent years which is just half of the price prevailed before in the market. Declining trend in the prices of rubber has pushed natural rubber production to the lowest in the country. Rubber growers find it difficult to meet the cost of production, as a result many of them have stopped tapping rubber which has led to a decline in the productivity of rubber in the country. Thus, the present study throws light on various problems facing by the small rubber growers in the wake of declining price of natural rubber.

### **Literature Review**

Sunanda (1991) in her study, made an attempt to analyze the mismatch between the upward trends in the disbursement of formal agricultural credit and stagnant agricultural performance in Kerala. The study revealed that the quantum of credit disbursed by institutional agencies increased manifold during the period of analysis in the state as a whole. The study concluded that a large number of small and marginal farmers were still facing paucity of credit and this affected their agricultural performance. Jaiprakash (1994) in his work studied the major problems faced by Commercial Banks, RRBs, PACS and LDBs while providing credit to the poor. The study revealed that RRBs and PACS suffered from lack of trained and honest personnel who could tackle the rural credit related problems as also socio-economic problems prevailing in the rural society. The study further observed that officials of CBs, RRBs, PACS, LDBs and authorities of Block and DRDA also indulged in corrupt practices while providing loans. Meshram (1995), in his study in Maharashtra, entitled "Institutional Rural Credit in India" revealed that credit institution had succeeded in helping the people who were economically backward, by supplying them agriculture inputs and loans and advances on easy terms to start subsidiary occupations to tackle the problems of poverty and unemployment.

Bhagavathi (1997) conducted an investigation into the problems of management of rural branches of commercial banks in Assam. The study found that in the state of Assam, agricultural financing was faced with problems like poor awareness of farmers about bankable schemes, improper use of credit, recurring tendencies of flood, unsatisfactory records of land or tenancy rights, inadequate irrigation facilities and smallholdings. Gupta (1998) studied the measures for improving the Commercial Banks credit delivery system as well as simplification of procedures for agricultural credit. He found that present banking system had so many redundant formalities for sanctioning even short-term agricultural credit. He also identified the constraints faced by CBs in increasing the flow of farm credit. Joshi (1998(a)) analyzed the role of commercial banks in rural credit and development in India and found that there was inadequacy of institutional credit to rural sector, especially to the agricultural sector. He further noticed that amongst the various regions of the country, there is incongruity in advancing of loans to priority sector, i.e.; western and southern regions account for 55.5 percent of PSA of PSBs, whereas north – eastern and eastern regions account for only 13.4 percent of the same. He concluded that for strengthening the agriculture and rural development, the multi-agency rural credit system has become a crucial element of the ongoing financial sector reforms (FSRs).

Mohanachandran (2000) in his doctoral dissertation, made an attempt to study the impact of priority sector lending by commercial banks in the rural development of Kerala by considering loan utilization, overdues etc.; and examined the role of PSBs in generating income and employment, creating assets, improving savings and investment and improving social conditions. He concluded that the PSA helped majority of borrowers in improving their income levels and employment. George Biju (2002) in his doctoral thesis made an attempt to analyse the role of commercial Banks in agricultural financing in Kerala. He found that total advances and the share of agriculture increased in India and Kerala substantially, especially during the last three decades. The amount of utilization of loan for agriculture was more than 90 percent of the total amount disbursed. Repayment performance was better and overdue was quite low. Shetty (2004) analysed the distributional issues in bank credit. He found that the share of agriculture in total bank credit had steadily increased under the impulse of bank nationalization and reached 18 percent towards the end of 1980s, but thereafter the achievements has been almost completely reversed and share of agriculture has dipped to less than 10 percent in the later 1990s.

Ramakumar, R and Chavan, Pallavi (2007) analysed the revival of agricultural Credit in India during 1999-2000. The growth of agricultural credit from commercial banks and RRBs, which was 1.8 per cent between 1990 and 2000, increased to 19.1 per cent between 2000 and 2007. The share of credit supplied by commercial banks and RRBs in total agricultural credit increased from 30.1 per cent in 2000 to 52 per cent in 2007. It is observed that the revival of agricultural credit was inspired by the announcement by the central government in 2004 that the flow of agricultural credit would be doubled between the period FY 2004-'05 and FY 2007-'08.

Manoj P K (2009), in his detailed macro level study "Revival of Indian Agriculture for Sustainable Development: A Global Perspective" in *Asian Journal of Environmental Science*, has made a detailed study of India's agricultural sector, its prospects and issues citing major international developments in the field. Based on the findings of his study the author has made some pragmatic suggestions for the revival of Indian agricultural sector in the ongoing reforms era in India.

Selvaraj and Balajikumar (2015) studied the Role of Commercial Banks in Providing Agricultural Credit in Tamil Nadu (Extent and Factors Influencing Investment) In this study they have made an attempt to find out the extent of capital investment in agriculture made by the sample farmers and the factors that had influenced the capital investment in agriculture. Further, an attempt has also been made to analyze the relationship between various factors and level and capital investment. Capital investment in agriculture made by farmers and the level of capital investment made were measured with the help of a scale constructed with the help of ten selected components. The study revealed that the number of farmers and the level of capital investment made by them are found to be more in the case of those who had reported medium level of investment, followed by the number of farmers who had reported a low level of investment and those who had reported high level of investment. The personal factors influencing the level of capital investment in agriculture, namely, educational qualifications and the size of family had a role to play in establishing the level of capital investment in agriculture. The other personal factors of farmers such as their experience in farming, use of communication media and their participation in training programmes had also a lot to do with the level of capital investment. Manoj P K (2015) in his study titled "Gramin Banks for Financial Inclusion: A Study of the Performance of Kerala Gramin Bank in Malappuram District with a Focus on Agricultural Credit", published in *International Journal of Entrepreneurship & Business Environment Perspectives* has studied role of Regional Rural Banks (RRBs) which are also called as *Gramin Banks* in financial inclusion in India. With special reference to a particular RRB (Gramin Bank) in India located in Kerala (and also the only one in the whole of Kerala now) viz. Kerala Gramin Bank (KGB), the author has made a detailed study of its agricultural credit portfolio. Based on the findings of his study, the author has made suggestions for superior performance of KGB in financial inclusion front, particularly in the agricultural credit segment.

Javid Ahmed Dar (2015) studied the Trend and Growth of Flow of Credit to Agriculture after 1991 in India. The study found that the share of institutional credit, which was little over 66.3% in 1991, increased manifold to over 68.8 per cent in 2010, reflecting concomitantly a remarkable decline in the share of non-institutional credit from around 30.6 per cent to about 29.7 per cent. He suggested that the provision of extending formal credit to agriculture should be the central to the concern of policy makers, planners and development economists, because the significance of agriculture sector in India is not restricted to its contribution to GDP, employment and livelihood creation only, but on account of its complementarity with other sectors of the economy.

Ali O. P., and Manoj P K (2017) in their study entitled as "Price Volatility and Its Impact on Rubber Cultivation in India – An Analysis of Recent Trends" published in *Journal of Academic Research in Economics (JARE)*, have sought to make a macro level analysis of the impact of price volatility on rubber cultivation in India. Based on the findings of their study, the authors have suggested strategies for the sustained growth of rubber economy in India. In another study by the same authors, viz. Ali O. P., and Manoj P K (2017) entitled "A Review of Current Noticeable Trends in Institutional Credit to Agriculture in India" published in *ZENITH International Journal of Business Economics & Management Research (ZIJBEMR)*, the authors have sought to trace the major developments in the institutional credit to agriculture in India. Based on the findings of their study the authors have suggested some macro level suggested for the sustained growth of India's agricultural sector by way of ensuring effective and timely agricultural credit to the agriculturists.

### **Objectives of the study**

1. To study the impact of fall in rubber prices with reference to farmers in Ernakulam district;
2. To study the socio economic profile of the rubber farmers in Ernakulam district of Kerala.

### Research Methodology

The study used both primary and secondary data. The primary data were collected through sample survey from the selected rubber growers. Small Rubber growers from Ernakulam districts constitutes the population of the study. Kottayam, Pathanamthitta and Ernakulam are the three major rubber producing districts in Kerala. Considering the convenience and accessibility, the researcher chose Ernakulam district for the study. Ernakulam districts consists 8 taluks in which Thodupuzha, Muvattupuzha and Kothamangalam are the three taluks that cover largest area under rubber cultivation. Paipra panchayat from Muvattupuzha taluk and Nellikuzhi Panchayat from Kothamangalam taluk were selected on a random basis. A total of 40 rubber growers -20 growers from each panchayat - were interviewed by the researcher using a structured questionnaire to elicit the information about rubber cultivation and the present problems that they confront. Simple random sampling method was used to select the respondents. The secondary data were collected from official website of Rubber Board, various publication on rubber published by Rubber board and other related agencies. Common statistical tools like, growth rate, ratios, graphs, tables etc. are used for data analysis and interpretation.

### Scope of the Study

As mentioned in the introduction, this is a preliminary study conducted by the researcher as a part of his research work on rubber economy of Kerala. This study will provide the researcher an insight on how to conduct his empirical study on problems of rubber growers in the state of Kerala. Moreover, it is a pre testing of the research instrument i.e. questionnaire which will help the researcher to understand the validity and reliability of the questionnaire used for the field enquiry. This preliminary study will also useful to evaluate feasibility, time and cost and to improve upon the study design prior to perform a full-scale research project. Since this is a pilot study, the scope of the study is restricted to two panchayats in Ernakulam district viz. Nellikuzhi and Paipra.

### Analysis and Discussion

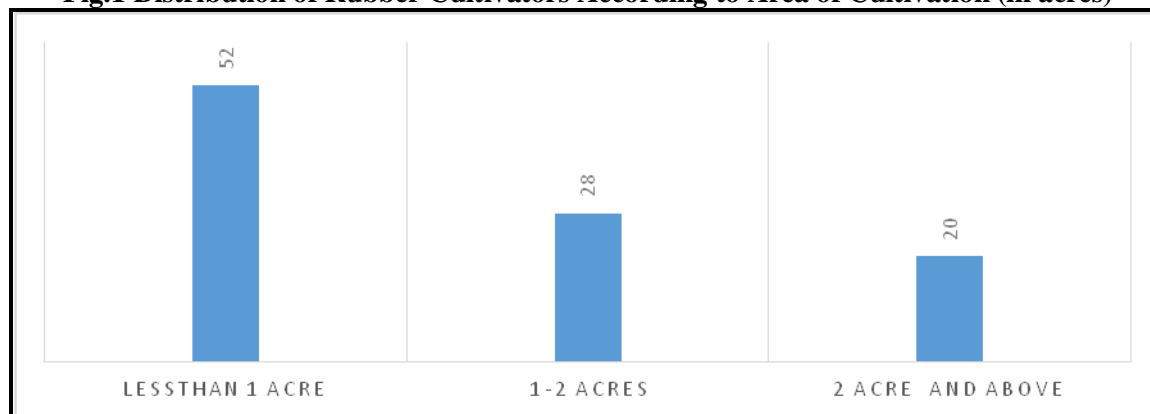
The salient demographic features such as: gender, age, and education of the rubber cultivators are summarized in Table 1.

**Table 1**  
**Demographic features of Rubber Cultivators**

Demographic variables	Frequency	Percentage
<b>Gender</b>		
Male	40	100
Female	0	0
<b>Age (in Years)</b>		
21-30	0	
31-40	2	5
41-50	26	65
Above 50	12	30
<b>Educational Status</b>		
Primary	21	52.5
Secondary	12	30
Higher Secondary and Above	7	17.5

Source: Field Survey

- ❖ All the respondents interviewed by the researcher were male cultivators. Among the respondents, 65 percent of the cultivators belong to the age group of 41-50 and 30 percent belong to the age group above 50. So the respondent of the sample relatively belonged to the middle ages.
- ❖ Most of the respondents have only primary education and only 17.5 percent of the cultivators hold a higher secondary or above qualification.
- ❖ As revealed in many other studies related to rubber, small growers constitute more than 90 percent of rubber cultivation in the state. Present study shows that, among the respondents, 52 percent have less than 1 acres area under rubber cultivation. 28 percent of respondents have 1 to 2 acres of land under rubber cultivation and 20 percent have 2 acres or above. The results reveals that most of the local growers interviewed by the researcher are not full time rubber cultivators. Some of them are running small business and few of them are going for casual jobs too. Agriculture and animal husbandry are the other major source of income for many of these families. It is noted that 20 percent of the respondents who own more than 2 acres of land practice rubber growing as their full time job. Most of the growers have inherited the land from their ancestors.

**Fig.1 Distribution of Rubber Cultivators According to Area of Cultivation (in acres)**

Source: Field Survey

- ❖ Among the respondents, 74 percent of growers have been in rubber cultivation for 15 years and above. The remaining respondents are cultivating rubber for more than 10 years.
- ❖ Majority of the farmers (more than 75 percent) are not practicing inter cropping or multiple cropping methods of cultivation as their rubber trees are grown well. Most of the rubber growers have of the opinion that inter cropping in rubber plantation can be done only during the first three to four years when the trees are small. Once the rubber trees grow up, the shade of the trees will prevent the growth of other crops and hence cultivating another crops like pineapple, ginger or plantain is not possible in rubber plantation after the first 3-4 years.
- ❖ The study reveals that most of the small growers are not keeping any proper accounts on the quantity of rubber produced each year and cost incurred for cultivation. The tapping charge prevailing at present is Rs200 to 250 per 100 rubber trees. This charge is same in both the panchayats as almost all respondents gave the same reply.
- ❖ The study reveals that continuous price fluctuations for the rubber in the market is the major challenge facing by the growers. All the respondents interviewed by the researcher responded that falling price and its volatile nature is the main problem of them. This phenomenon has been existing in the market for the last two decades. Integration of our economy with world economy due to the implementation of neo-liberal economic policies have contributed much in this regard.
- ❖ To understand the intensity of price instability, an analysis of trend in the price of rubber since 1990 is given in the following table. Average market price of rubber in India was Rs.2129 per 100 kg in 1990-91. There was an upward moving trend in price till 1995 as the price increased to 5204/100kg during this period. The period 1996 to 2000 was a period of high instability. Rubber price has again showed an upward trend since 2001. It continued till 2010 even though there were some declining trend in some years. But since 2012, rubber price shows a constant negative trend which is still continuing.

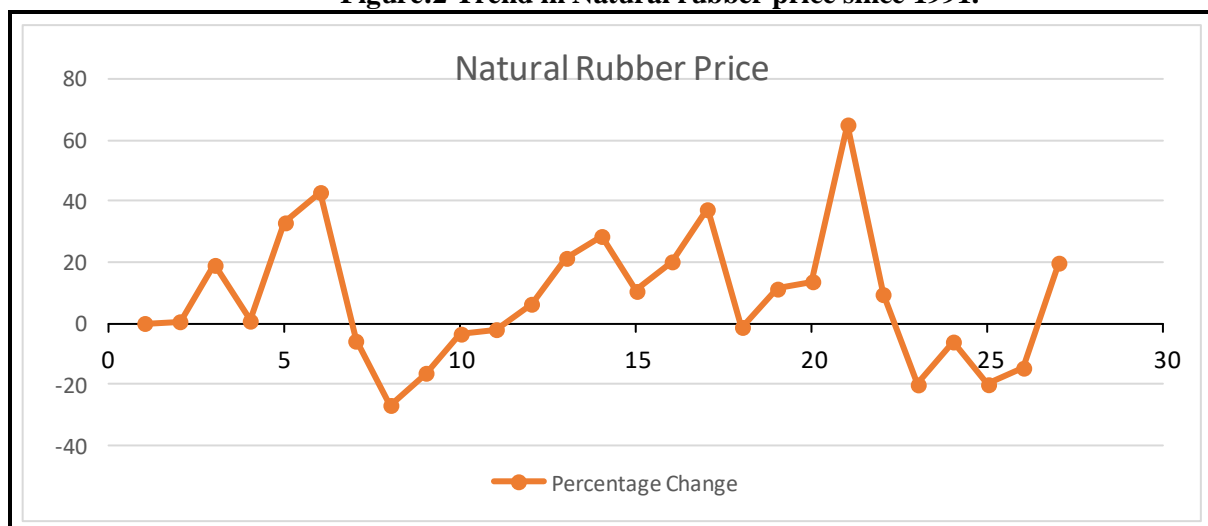
**Table: 2****Table: Natural Rubber Price during post liberalization period.**

Year	Actual Price(Rs 100/kg)	Percentage Change
1990-91	2129	
1991-92	2141	0.56
1992-93	2550	19.10
1993-94	2569	0.75
1994-95	3638	33.08
1995-96	5204	43.05
1996-97	4901	-5.83
1997-98	3580	-26.95

1998-99	2994	-16.37
1999-00	3099	-3.51
2000-01	3036	-2.03
2001-02	3228	6.32
2002-03	3919	21.41
2003-04	5040	28.60
2004-05	5571	10.54
2005-06	6699	20.25
2006-07	9204	37.40
2007-08	9085	-1.30
2008-09	10112	11.30
2009-10	11498	13.71
2010-11	19003	65.27
2011-12	20805	9.48
2012-13	17682	-20.20
2013-14	16602	-6.10
2014-15	13257	-20.14
2015-16	11306	-14.7
2016-17	13549	19.83

Source: Rubber Growers Guide ,2017

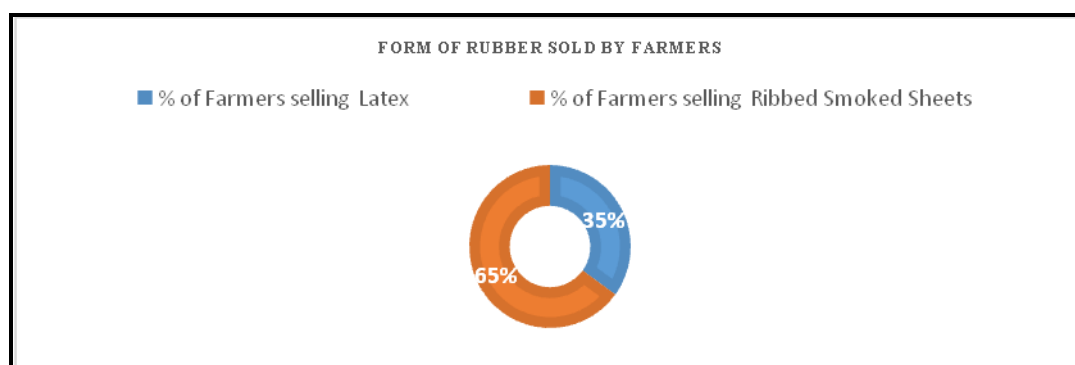
**Figure:2 Trend in Natural rubber price since 1991.**



Source: Based on data shown in Table 2.

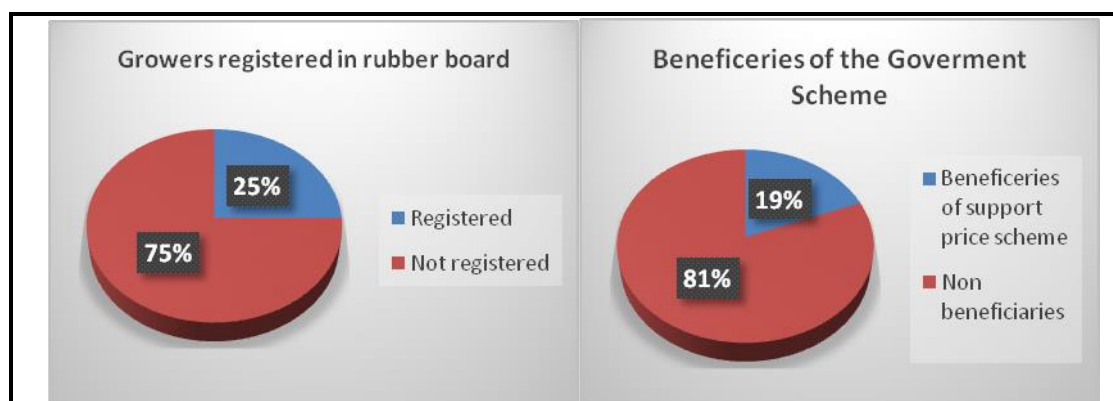
- ❖ It is clear from the above table and graph that Natural rubber price in the country has been showing a wide fluctuation in the post liberalization period. This wide range of price instability has affected the rubber cultivation in different dimensions. The upward moving trend of price has attracted thousands of farmers in the state to rubber cultivation. This period was a period of great changes in Kerala's agriculture sector. Many farmers who were cultivating foods crops have shifted to rubber cultivation which resulted in a decline in food production in Kerala. Many paddy fields were converted in to rubber plantations during this period. From 47,5083 hectares in 1990-91, the total area under rubber has increased to 71,1560 hectares in 2010, around 70 % increase in the area under rubber during this period.

- ❖ There is a sharp decline in Production and productivity of rubber in the state since 2011. From 903700 tonnes in 2009-10, the production has decreased to 562000 tonnes in 2015-16, i.e. -56.20 % decrease. Productivity of rubber was 1841 kg per hectare in 2011-12 where it fell down to 1437 kg per hectare 2015-16 i.e. -21.94 % decrease. This sharp declining trend in production and productivity shows the lack of interest among the growers to continue the cultivation. The study revealed that most of the farmers are not giving proper care for rubber plantation. Most of them are not interested in providing regular care for their rubber trees including use of fertilizers, weeding etc. It is interesting to note that the total area under rubber and the total tappable area in the country has increased substantially after 1990. But the production and productivity is decreasing. This shows that rubber growers are hesitant to continue the cultivation and the major reason behind the unwillingness is the continuous price fall.
- ❖ All most all the rubber growers interviewed by the researcher responded that climatic changes have affected the production of rubber a lot. According to them, monsoon rain is unpredictable in the state in recent years. Earlier, there were some fixed months for 'Edavappathy' and 'Thulavarsham' in the state. But in recent years, there exist a wide range of variation in rain fall and month of rain in the state which has affected rubber production in different ways. It has been pointed out that the inter-annual and intra-seasonal variability has been increasing in the state recent decades. Kerala is experiencing an increasing uncertainty in rainfall as the State received deficit monsoon consecutively for more number of years during the current decade, at the same time there was heavy rain and flood this year.
- ❖ Low price, low production due to climatic variation and mono cropping, non-availability of tappers are the major problems pointed out by most of the cultivators. Out of the total respondents 20 per cent of the respondents quit rubber cultivation due to fall in the rubber prices.
- ❖ Among the respondents, 62 per cent of growers depend on hired labors for tapping. 38 per cent of the respondents do not hire labors for tapping. Those who do not hire tappers tap the rubber by themselves. Respondents who are mainly dependent on rubber cultivation tap rubber themselves. Those who use own labor for tapping, rubber is the only source of lively hood for them. It is understood from their response that those who are utilizing own labour are able to maintain and continue the rubber cultivation than those who hire labors for tapping during the period of price fall as rubber is the only source of income for such people which compel them to continue in the field to maintain their life. Rubber growers who are depending only on rubber cultivation couldn't quit as they do not have any other source of income.
- ❖ Falling price has also affected the tapping days. Out of the total respondents, only 30 percent of growers are tapping the rubber daily. More than 50 percent of growers tap the rubber on alternate days and the remaining 30 percent of growers tap the rubber once in three days. This data shows that frequency of the tapping depends on the price of rubber. Declining price compel the farmers to reduce the tapping days in order to reduce the cost of tapping expenses. The 30 percent who tap the rubber daily are those who use own labor for tapping and the income from the rubber is the only source of revenue for them.
- ❖ Tapping charges for 100 tree is around Rs 200 i.e. Rs 2 per trees Farmers with small land holdings may find it difficult to meet the expense of tapping especially when the rubber prices are falling down.
- ❖ 35 percent of the farmers are selling their product as latex. They prefer selling rubber in latex form because all the process and expenses to convert latex in to Ribbed Smoked Sheet(RSS) can be avoided in this case. But those who sell ribbed smoked sheet prefer it because they can stock the sheet for long period and can sell it when the market is favorable for them. Thus most of the farmers (65 percent) prefer to sell as RSS. Most of them are aware about the grading of rubber. They know the market value of RSS-4 and hence, everyone produces RSS-4.





- ❖ All most all the respondents unanimously opined that cost of production has been increasing in recent years. Production cost has increased due to the increase in the cost of materials used for rubber production. The cost of fertilizers, pesticides, the cost of rain guards, cups and knives has increased considerably. Tapping charges has also increased to Rs.200 for 100 rubber trees. Increasing cost of production clubbed with falling price make the rubber cultivation unattractive now a days.
- ❖ Rubber roller and smoke house are the two major requirements for the production of rubber sheets. Among the respondents, only 30 percent of rubber growers own a rubber roller. Most of the respondents are from financially backward families who could not afford to buy rollers. They use the rollers of other growers and give one day's production (rubber sheets) in a year as the rent. Regarding smoke house, 56 percent of the respondents have separate smoke house. Those who have no firehouses, uses their fire kitchen at home to smoke the rubber sheets.
- ❖ Among the respondents, 70 per cent had an opinion that rubber cultivation will become profitable when the rubber price come up to the range of Rs.250. 30 per cent responded that the minimum profitable price to make rubber cultivation profitable is Rs250- Rs300.
- ❖ To the question on how the falling price of rubber affected the life of farmers, most of them responded that, falling prices have a negative impact on their life. Most of them have curtailed their spending on food, travel, entertainment, house construction and socialization. Some of the growers who started house construction when the price of rubber was high have stopped the construction as they are not able to afford the expenses due to low price of rubber.
- ❖ Among the respondents, 75 percent of the growers have not registered their plantation under rubber board. Only 25 percent of the growers have registered their plantation. As a result, majority of the growers are not aware about various schemes of the board for the welfare of rubber growers. With falling rubber prices, Government of Kerala has announced a support price scheme. Under the scheme, small rubber growers with 2 hectare of land or below are eligible to get an assured price of Rs150 for 1kg of RSS4 sheets. But 60 percent of the growers are not aware of this support scheme initiated by the government. One of the condition for getting the benefit of the scheme is that growers should register their plantation with rubber board. Since 75 percent of the respondents are not registered their plantation, they are not eligible for this scheme. Another 6 percent of the growers who registered their plantations are not utilizing the scheme as they find it difficult to complete the other formalities for sanctioning the scheme. Those who receive the benefit of the scheme have the opinion that the scheme supportive for the growers though it includes a lot of procedures



- ❖ Most of the respondents have the opinion that import policy of the government is the main reason for decline in rubber price. Out of the total respondents 73 per cent expressed this opinion blaming the government policies related to rubber. Another 20 percent of respondents opined that global factors such as falling crude oil price, currency movements, increased production and consumption of synthetic are the reasons affecting the price of rubber. Reducing the quantity of import of rubber by formulating a suitable import policy in favor of rubber cultivators is the only solution for protecting the interest of the growers. This is the suggestion put forward by majority of growers.



### Concluding Remarks

The result of the study discloses that the rubber growers especially small growers in the state are confronting serious problems to be addressed urgently by the Government and policy makers. The living conditions of majority of them is very poor. Their earnings from the rubber sector is not sufficient to meet their expenditure and hence some of them have already quit the cultivation. Price volatility has adversely affected the production and productivity of rubber in the state. The sector has been reeling under crisis for the past three years, forcing a large number of the rubber growers to abandon cultivation due to high tapping charges and low prices. Import policy of the government is considered as the main reason behind the declining price of natural rubber in the country. In this context, reviewing the import policy of the government in favor of cultivators is the urgent solution to save millions of cultivators who mainly depends on rubber as their livelihood.

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**BANKING STRATEGY IN THE ERA OF ECONOMIC SLOWDOWN IN INDIA: NEED FOR A THRUST ON ICT INTEGRATION AND HOUSING FINANCE**

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**Abstract**

*It is well recognized that at present India is passing through an era of acute economic slump. Hence, there is an urgent need for kick-starting the recession-hit Indian economy from the clutches of slowdown by way of appropriate revival strategies. Given the economic slump on the one hand and the unprecedented challenges faced by the financial system in the country, like, growing NPAs, declining profitability, eroding capital base and there is a marked fall in the growth of credit off-take also. At this crucial juncture, this paper looks into the vital need for a banking strategy that focuses on adoption of Information and Communication Technology (ICT) on the one hand and retail banking thrust with a focus on housing finance on the other hand. While ICT adoption ensures enhanced customer service and operational efficiency, retail banking thrust with a focus on housing finance ensures revival of the economy through linkage effects of housing investments, risk diversification etc. Retail banking is the only feasible strategy for public sector banks (PSBs) in the current era of PSB consolidation. This strategy suits well with the national goal of 'Affordable Housing for All by 2022'.*

*Keywords: ICT, Digital India, Retail Credit, Housing finance, Linkages, Risk diversification.*

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**Introduction**

It is well recognized that at present India is passing through an era of acute economic slump. Recent analyses by many a national and international agency has underscored this fact regarding Indian economy. This trend is in tune with the global economic slowdown also. In this scenario, there is an urgent need for kick-starting the recession-hit Indian economy from the clutches of slowdown. This in turn necessitates the adoption of suitable macro level strategies that are capable of initiating an economic revival. Besides the general slowdown in Indian economy, financial system of the country is facing unprecedented challenges, like, mounting NPAs, falling profitability, eroding capital base. Moreover, there has been a marked fall in the growth of credit off-take also. At this crucial juncture, this paper looks into the vital need for a banking strategy that focuses on adoption of Information and Communication Technology (ICT) on the one hand and retail banking thrust with a focus on housing finance on the other hand. While ICT adoption ensures enhanced customer service and operational efficiency, retail banking thrust with a focus on housing finance ensures revival of the economy through the linkage effects of housing investments, risk diversification etc. Retail banking is the only feasible strategy for public sector banks (PSBs) in the current era of PSB consolidation. This strategy suits well with the national goal of 'Affordable Housing for All by 2022'. Better ICT integration augers well with the growing expectations of today's discerning customers; as ICT brings in the added benefit of enhancing the competitiveness of banking products and services, especially the retail banking products like housing finance.

**Objectives of the Study**

- To make a broad study of the present condition of Indian economy, the slowdown faced by the economy and its implications, and the need for remedial strategies;
- To study the significance of the adoption of Information and Communication Technology (ICT) in delivering retail banking products like housing finance in a competitive environment, and the macroeconomic implications of such a strategy; and
- To suggest strategies for the sustained growth of the retail credit portfolio of banks, especially the housing finance segment, and hence sustained growth of the economy.

**Relevance and Significance of the Study**

As waves of electronic revolution are sweeping across the globe, fast advances in the field of Information and Communication Technology (ICT), an outcome of the electronic revolution, are invading every facet of human life. ICT adoption is bringing about radical changes in the way in which organizations are being managed, business operations are being performed and state governance is being done. Indian economy is no exception to the above global trend and so also is the case of banking and financial services industry (BFSI) in India. 'Digital India' is a national goal of the country and the fast pace at which ICT advances are embraced by the BFSI sector in India has resulted in rapid growth of the Financial Technologies ('Fin-Tech') entities in India. On the one hand, there is fast-paced ICT integration and a boom in Fin-Tech units. On the other hand, Indian economy

is facing an acute economic slump and this is reflected in all facets of the economy including the banking sector of the country. Focus on retail advances, particularly housing finance, enables banks to diversify risks, maintain asset quality, reduce bad debts, create employment avenues, and lure the new generation customers. Above all, this strategy helps to kick-start the recession-hit sectors of the economy because of the vast linkages of housing industry. The role of banks in meeting this key goal by fulfilling the housing finance needs of the masses will be more vital in the future, since the market share of housing finance companies (HFCs) that has already been falling.

### Relevance and Significance of the Study

Kiran Keswani (1997) [11] in his paper, 'The contribution of building centres to low-cost housing in India' in *Building Research & Information* has studied the reasons for the slow growth in low-cost housing projects in India. The author has suggested that the Government should assume the role of a facilitator rather than a provider. A three-pronged strategy has been suggested for promoting low cost housing viz. (i) examining critically the archaic laws on housing, (ii) disseminating information on technical aspects of house building, and (ii) training in updated technologies on low-cost housing. Peer Smets (1999) [30], in his paper 'Housing Finance Trapped in a Dilemma of Perceptions: Affordability Criteria for the Urban Poor in India Questioned' in *Housing Studies* has argued that a definitional issue associated with formal housing finance and 'eligibility' for the same in terms of 'affordability criteria in one go' has resulted in exclusion of the vast majority of the urban poor from availing finance from formal sources of finance. The author has advocated the need for 'incremental housing' and also the need to assess the 'affordability in a phased in manner' and 'not in one go'. Manoj P. K. (2003) [13] in his research paper, 'Retail Banking: Strategies for Success in the Emerging Scenario' in *IBA Bulletin* has suggested strategies for the sustained growth of the retail credit portfolio of banks, that mainly comprises of housing finance, as a safer way of increasing business and also kick-starting the then recession-hit industry of India. 'Linkages' – both forward and backward – of housing with large number of other industries, and the positive effect of such linkages for bringing about faster economic growth have been pointed out in the paper. Manoj P. K. (2004) [14] in his another research paper, 'Dynamics of Housing Finance in India' in *Bank Quest* has pointed out the growing appetite of commercial banks (CBs) towards housing credit, the falling share of housing finance companies (HFCs) in the market, and allied aspects. Some macro level strategies for the sustained and balanced growth of housing finance in India are suggested. The relevance of promoting secondary mortgage market (like, RMBS), alternative models like Housing Micro Finance (HMF) etc. has been noted. In a Working Paper 19 titled, *Housing Microfinance: Designing a Product for the Rural Poor*, released by Institute for Finance Management and Research (IFMR) (2007)[7], has noted the utmost importance of promoting Housing Micro Finance (HMF) – an alternative model for housing finance for the poor – for addressing India's chronic housing problem, which in turn is primarily that of the poor and marginalized in the country, like the LIG (Low Income Group) and EWS (Economically Weaker Sections). Only models like HMF could cater to such deprived sections that are not served by the formal sector agencies. So, models like HMF are required to solve India's 'real housing problem'. The report seeks to design the suitable HMF model for the Indian poor. Manoj P. K. (2008) [15] in his paper, 'Learning from Cross-country Experiences in Housing Finance: A Microfinance Approach' in *Journal of Global Economy* has suggested suitable macro level strategies for promotion of housing micro finance (HMF) in the Indian scenario by appropriately replicating the successful and time-tested models like HMF or other similar alternative housing finance models prevalent elsewhere in the world. A research paper on HMF by Manoj P. K. (2010)[21], "Prospects and Problems of Housing Microfinance in India: Evidence from "Bhavanashree" Project in Kerala State" in *European Journal of Economics, Finance and Administrative Sciences* has studied in detail the utmost importance of HMF for balanced and equitable housing development in India, and hence rapid economic development of the country. Strategies for promotion of HMF in India have been suggested, along with specific and category-wise strategies for the HMF based in Kerala and sponsored by the state government namely 'Bhavanashree'. Manoj P. K. (2010) [18] in his paper, 'Benchmarking Housing Finance Companies in India: Strategies for Enhanced Operational Efficiency and Competitiveness' in *European Journal of Economics, Finance and Administrative Sciences* has made a detailed analysis of the relative competitive position of the leading housing finance companies (HFCs) in India and has suggested strategies for the enhanced operational efficiency and competitiveness of HFCs.

The management consultancy organization, KPMG (2010) [11], in its Industry Report (Advisory), 'Affordable Housing – A key growth driver in the real estate sector?' has sought to discuss the immense growth prospects of real estate players in the affordable housing market in India, given the huge demand and grossly under-penetrated market, very favourable Governmental policies etc. The demand and supply constraints, the

relevance of PPP in the real estate sector etc. have also been dealt in detail. In a paper by Manoj P. K., (2010) [19] 'Determinants of Successful Financial Performance of Housing Finance Companies in India and Strategies for Competitiveness: a Multivariate Discriminant Analysis' in *Middle Eastern Finance and Economics*, has attempted to find the determinants of superior financial performance of HFCs. Using the tool Multivariate Discriminant Analysis (MDA), Discriminant Function having five distinct parameters (selected from the total 21 parameters used for MDA) which significantly influence the financial performance of HFCs has been derived. Yet another paper by Manoj P. K. (2010) [17], 'Financial Soundness Housing Finance Companies in India and Determinants of Profitability: A 'CAMEL' Approach along with ROE Decomposition Analysis' published in *International Journal of Business Policy & Economics* has employed the methodology of 'CAMEL' ranking along with ROE decomposition analysis to identify the determinants of profitability of HFCs. A research paper by Manoj P. K. (2011) [22], 'Determinants of Profitability of Housing Finance Companies in India and Strategies for Competitiveness: a Multiple Partial Correlation Approach' in *International Journal of Business Intelligence and Management* has suggested competitive strategies for various groups of HFCs with the help of the basic parameters that significantly influence the respective groups of HFCs.

A joint research paper by Hrushikesh Mallick & Mantu Kumar Mahalik (2015)[5] 'Factors determining regional housing prices: evidence from major cities in India', in *Journal of Property Research* has sought to identify the factors determining the housing prices with respect to 15 major cities in India using data relating to 16 Quarters (4 years, 2010 to 2013). It has been noted that fundamental factors are more significant than speculative factors. In a research paper by Manoj P. K. (2015) [25], "Socio-Economic Impact of Housing Microfinance: Findings of a Field-based Study in Kerala, India", published in *International Research Journal of Finance and Economics*, the reasons for the failure of 'Bhavanashree' – the HMF initiative of the Government of Kerala have been studied in detail. The author suggests strategies for effective implementation of HMF projects based on the "learning from the failure of 'Bhavanashree' project" in Kerala. The research report by the agency IFMR (2015) [8] entitled as *Affordable Housing Finance Sector: Overview* makes a detailed analysis of the need, relevance and significance of affordable housing in India in the context when the national goal of 'Affordable Housing for All by 2022' is implemented by the Government of India. The crucial role that HFCs have to play in this context is specially noted in the IFMR report. The fact that there is a gradual re-emergence of HFCs since 2013, thus overtaking the CBs in growth rate and significantly improving their market share has been specifically pointed out. In a paper by Manoj P. K. (2015) [23], "Deterrents to the Housing Microfinance: Evidence from a Study of the Bankers to 'Bhavanashree' in Kerala, India", in *International Research Journal of Finance and Economics*, the major problems associated by the bankers in financing 'Bhavanashree', the HMF initiative of the Government of Kerala, has been dealt in detail. Various issues like the unclear land tenure, fragile institutional framework of the HMF and its parent (mentor) 'Kudumbashree' etc. have been studied in detail. Suggestions have been made to the Government based on the findings of the study, for the purpose of enabling more meaningfully implement HMF initiatives in the future, 'Bhavanashree' initiative being more or less a failure. In a research article by Manoj P K (2015) [24], "Housing Microfinance: A Study on Quality, Cost and Default Rate with Respect to 'Bhavanashree' in Kerala", in *International Research Journal of Finance and Economics*, a detailed and critical study of the asset quality, administrative (transaction) costs, and default rates in respect of the HMF initiative of the Government of Kerala ie. 'Bhavanashree' has been made. Suggestions are made for more effective implementation of HMF projects by the Government. Another paper by Manoj P. K. (2016) [26], "Real Estate Investment Trusts (REITs) for Faster Housing Development in India: An Analysis in the Context of the New Regulatory Policies of SEBI" in *International Journal of Advance Research in Computer Science and Management Studies* has made an exploratory study of the utmost relevance of REITs in a developing country like India for promotion of its housing and real estate sector and hence the whole economy. BCG (2018) [2] in its report, *Digital Lending* has sought to highlight the immense opportunity for digital lending in India. According to BCG, it is a USD 1 Trillion opportunity over the next 5 years and the stakeholders can utilize the same. Industry research agency, India Brand Equity Foundation (IBEF) (2018) [6] in its report on Real Estate industry in India has pointed out the tremendous growth prospects of the real estate industry in India which is estimated to attain the size of USD 1 Trillion by 2030. Its estimated size as of 2019 is 3.7 Million Square feet and it is the fourth largest sector in terms of FDI flows. Rapid urbanization, growing affordability, and Governmental commitment to attain 'Affordable Housing for All' etc. brighten the prospects of India's real estate sector.

In view of the foregoing discussions, it is noted that though there are a number of studies on housing finance, studies that focus on the need for ICT integration in the context of retail banking like housing finance are

scarce. This study seeks to bridge this research gap and it studies the need for a banking strategy that focuses on ICT adoption and housing finance.

### Methodology of the Study

The study is descriptive-analytical and exploratory in nature. It is descriptive as it describes the developments in the field of retail banking with a focus on housing finance. The paper is analytical too as it analyzes the relevance of a banking strategy that focuses ICT adoption and retail banking, for tiding over the present slump in the Indian economy. The present study is primarily based on secondary data from authentic sources like RBI, NHB, and CRISIL.

### Current Status of the Economy, Banking System and Housing Situation in India

There is a steadily falling trend in respect of GDP of India over the last few quarters and this is very prominent since the fourth quarter of 2016 (Q4, 2016) (Figure I) and this falling trend is expected to continue in FY 2019 also.

Figure I: Real GDP Growth Rate in India: A Clearly Declining Trend since Q4 2016.



Source: CRISIL (Sept. 2018) [3]

It may be noted that there has been a declining trend in the financial stability of banks in India, particularly the public sector banks (PSBs) as is evident from the fast eroding capital base and also near-zero and negative return on assets (ROA) (Table I). This in turn points to the need for a revival in the banking sector, particularly among the PSBs which still the backbone of the Indian financial system in spite of their declining share in the banking business. Higher exposure to relatively less risky advances like housing finance ensures greater business growth and better profitability because of better asset quality or lower NPAs.

Table I: Return on Assets (ROA) of Major PSBs in India

Sl. No.	Names of Major PSBs in India	ROA (Percent)
01.	Allahabad Bank	-0.10
02.	Bank of Baroda	-0.41
03.	Bank of India	-0.52
04.	Central Bank of India	-0.24
05.	Corporation Bank	0.003
06.	Dena Bank	-0.66
07.	Indian Overseas Bank	-0.87
08.	IDBI Bank	-0.76
09.	Oriental Bank of Commerce	0.08
10.	Syndicate Bank	0.24
11.	UCO Bank	-0.63
12.	United Bank of India	0.14

Source: *Mathrubhumi*, Daily [Print], Kochi Ed., dt. 20.02.2018

Considering the housing finance segment of banks which is one of the major components of retail credit, it may be noted that there is enough scope for promoting it. In fact, the mortgage to GDP ratio in India is still at a very low level of about 9 percent (as of 2012, and it is about 10 percent as of 2018) and is one of the lowest in the whole world. This fact points to the scope for promoting the housing finance portfolio of banks. (Table II).

Table II: Mortgage to GDP Ratio of India vis-a-vis Selected Other Countries

(In Percentages)

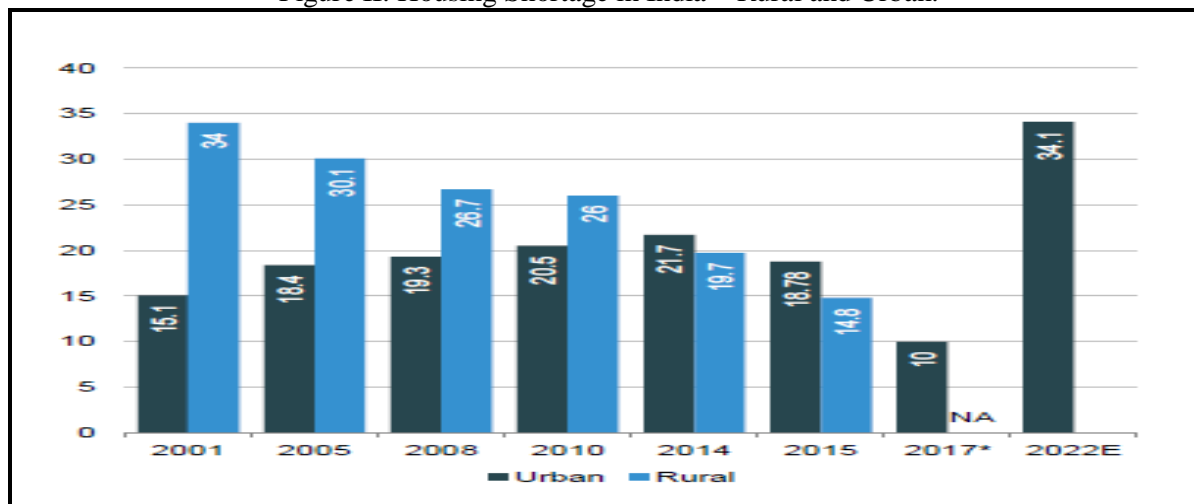
India	China	Thailand	Korea	Malaysia	Singapore	Taiwan	Hong Kong	USA	UK
9.0*	12	17	26	29	32	39	41	80	86

Source: European Mortgage Federation (2007), Asian Development Bank (2007) &amp; NHB (2013).

Note: \* NHB, as of 2012 (approx.), Report on Trend and Progress of Housing in India, 2013, p.105.

Because, housing shortage is a reality in India even after 70 years of independence. Though there is a gradually falling trend in housing shortage in rural India, it is still acute in urban areas of the nation and is showing a generally growing trend over the years. (Figure II).

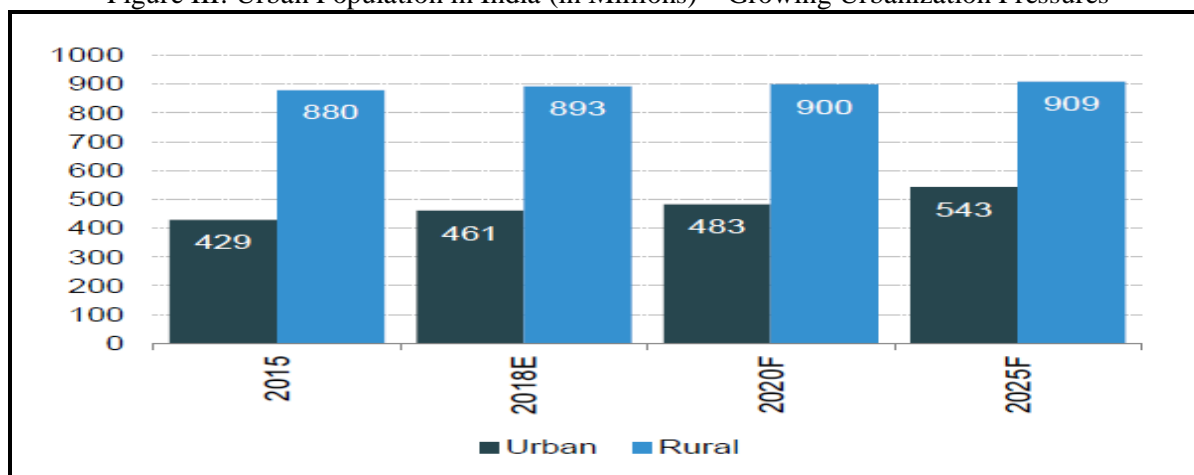
Figure II: Housing Shortage in India – Rural and Urban.



Source: IBEF (July 2018) [9]

Urban housing problem in India growing because of the growing urbanization in the country. The national goal of 'Affordable Housing for All by 2022' gives another dimension to the urgent need for solving the growing urban housing problem. Further, this fact points to the need for focusing on urban areas for housing finance because urban housing problem is more acute in India. (Figure II & Figure III).

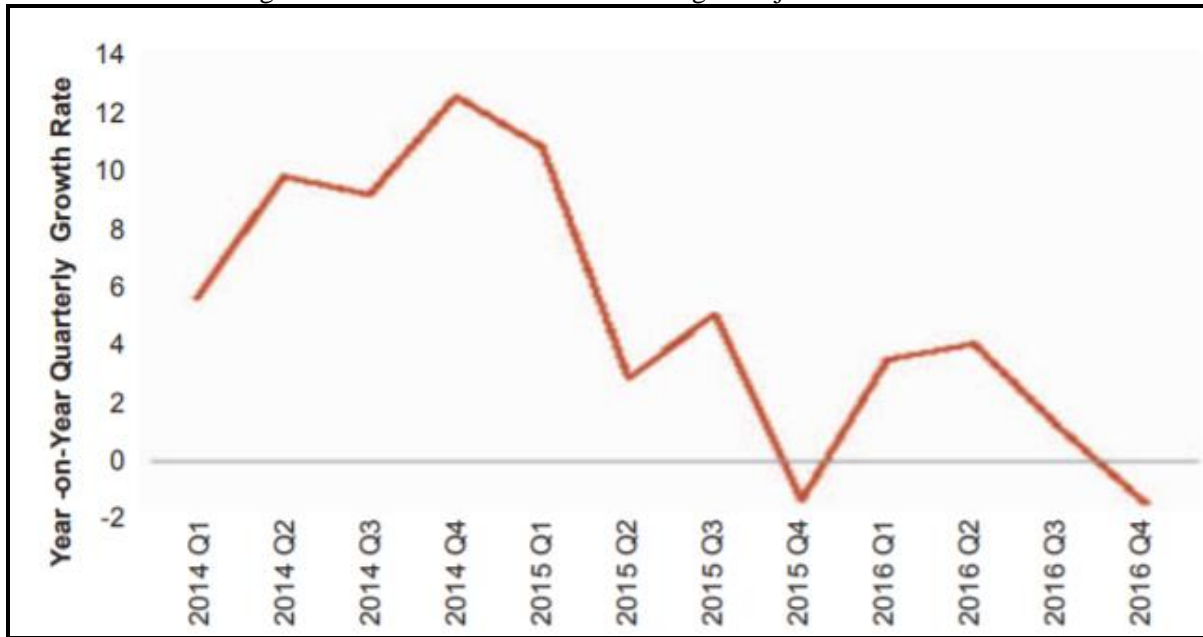
Figure III: Urban Population in India (in Millions) – Growing Urbanization Pressures



Source: IBEF (July 2018) [9]

There is only a constantly falling trend in the real estate prices across eight major cities in India (Figure IV). This suggests that major cities in India have almost saturated as far as housing and residential real estate development is concerned. While focusing on solving the housing finance needs of the urban populace, there is a need to pay more attention to the suburban areas (eg. Tier II and Tier III cities) where the scope for housing development is more, particularly the affordable housing segment which is a priority area in India, going by the national commitment of the Government of India viz. *Affordable Housing for All by 2022*.

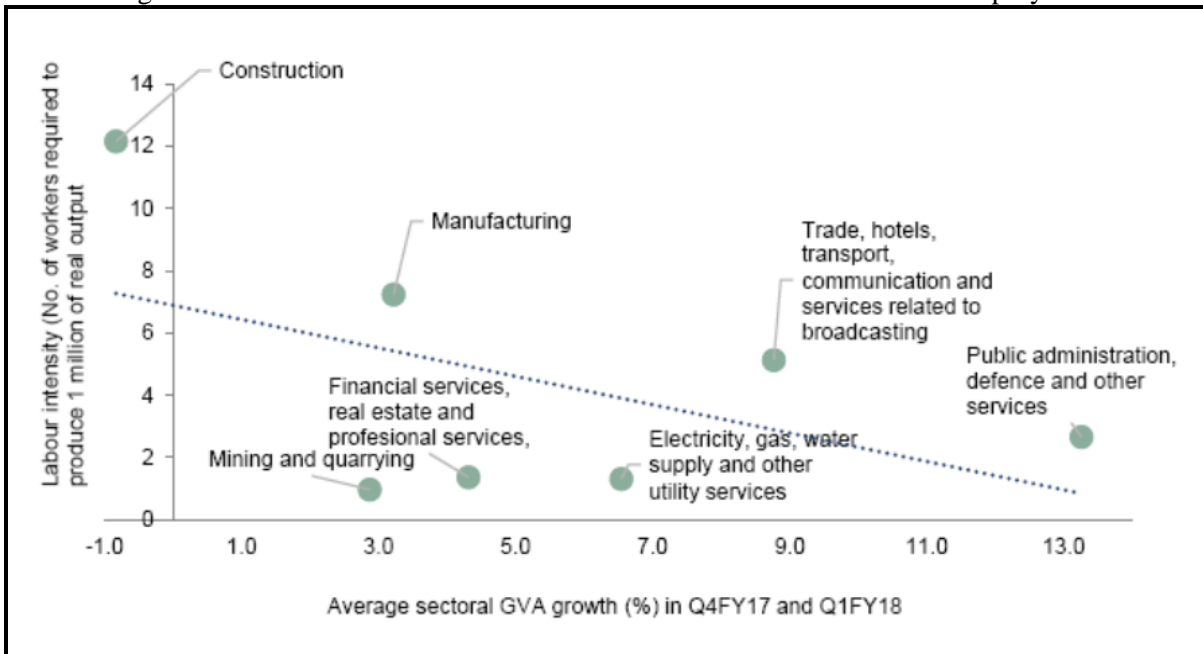
Figure IV: Real Estate Prices across Eight Major Cities in India



Source: Knight Frank and Economic Survey 2016-17; Adapted from, NHB (2017) [33]

The general slump in the construction industry in India, which includes primarily the housing construction industry affects the employment creation in the country because construction is one of the most labour-intensive sectors and it requires as high as 12 workers to produce Rs. 1 million worth output. Deceleration in housing construction sector hence would adversely influence the employment generated in the country. Or, in other words, promotion of housing construction in India has a vital role (Figure V).

Figure V: Deceleration in Labour-Intensive Construction sector affects Employment

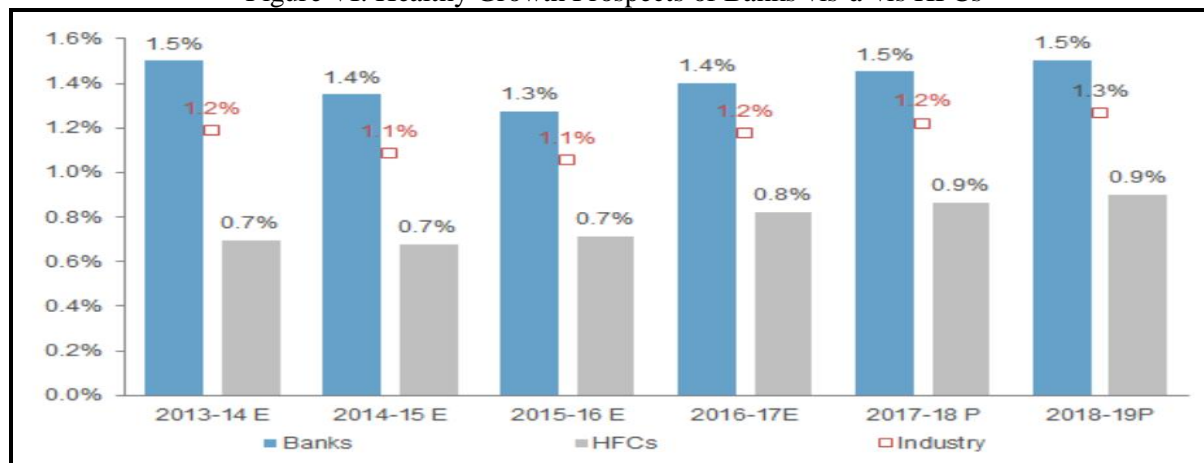


Source: CRISIL (Sept. 2018) [3]

The housing loan market in India has been growing over the years and the trend is likely to continue in the future also; the two major players in this market being Commercial Banks ('Banks' in short) and Housing Finance Companies ('HFCs', in short). In view of the liquidity issues of NBFCs (including HFCs), Banks will have a greater role in the housing finance market in the future. It is noted that banks would have higher growth prospects than the HFCs, because of a reversal in the growth rates of HFCs vis-à-vis Banks. (Figure VI).



Figure VI: Healthy Growth Prospects of Banks vis-à-vis HFCs



Source: CRISIL (2018) [4]

### Better ICT Integration by Banks in ‘Digital India’ Era: Need and Implications

Reforms initiated in Indian banking sector since 1992 has resulted in this sector, which was overwhelmingly dominated by the Government-controlled Public Sector Banks (PSBs) and significantly oriented towards fulfilling certain social obligations till then, to work on business lines. Like private sector banks and foreign banks, PSBs too started working on business lines, based on profitable business models. The pressures of ‘LPG’ (Liberalization, Privatization and Globalization) could succeed in injecting ‘commercial sense’ and ‘profit orientation’ in Indian banking sector, primarily the PSBs. LPG has brought about fierce competition too. To withstand competition and to maintain profitability and market share in the globalised markets it has become essential for banks to deliver high quality service at low cost. The real impetus towards ICT adoption in India was basically the banking sector deregulation measures initiated in 1992. A serious thrust on ICT adoption was given by the Reserve Bank of India (RBI) only in 1999-2000, because of two reasons. First, for the specific purpose of a smooth transition for the year 2000. Second, for the general purpose of ensuring overall technological upgradation of Indian banks essentially to facilitate payment and settlement, enhanced customer service and profitability. Of late, the Demonetisation (DeMo) drive since 08<sup>th</sup> Nov. 2016 by the Government of India has given another impetus for ICT adoption by banks. Modern customers being very discerning, customer centricity is a vital need for business success. So, ICT integration has become an imperative for survival and growth, particularly in respect of retail banking products. The growing trend of ICT adoption in the ongoing era of ‘Digital India’ has vital impact on the operations and business models of banks in India. The rapid pace of technological innovations would radically change their business models for retail banking including housing finance. Indian banking sector has been following the above global trend only since the 2000s. Of late, the ongoing consolidation process among the PSBs has given another need for ICT integration. Though, Indian banks have been quite late in adopting ICT and other technological innovations, of late, there has been growing adoption of digital banking by banks in India. (Figure VII). BCG’s report (2018) [2] has noted that digital banking will exceed USD 1 Trillion over the next 5 years, and that retail banking portfolio of banks has witnessed a CAGR of about 16 percent over the last 5 years. It is noted that total retail loans that could be disbursed digitally in the next 5 years would be over USD 1 Trillion. Annual disbursements 5 years hence would be 5 times of current levels. (BCG, 2018)[2].

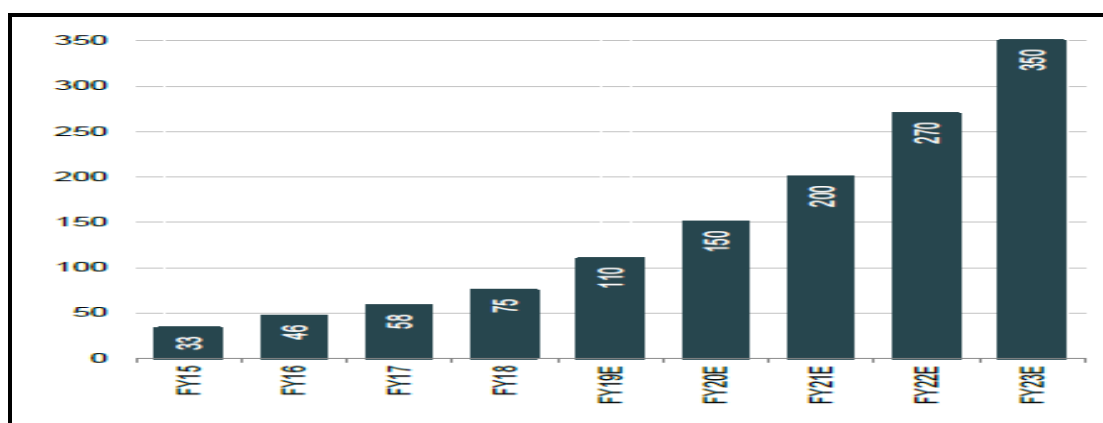


Figure VII: Digital Lending by Banks in India (USD Billion). (Source: IBEF, 2018)[9].

BCG's study has noted that the digital footprint (i.e. access to internet) of customers in the financial services category is 50 percent. Of the customers with digital footprint, 55 percent have been noted to be digitally influenced. That is, 28 percent (i.e. 55 percent of 50 percent) of the total population are digitally influenced. Besides, of the customers with digital footprint, 47 percent are digital purchasers. Thus, 23 percent (i.e. 47 percent of 50 percent) of the total population are digital purchasers. That is, as high as 82 percent of the digitally influenced customers are digital purchasers. So, the drop-off is very less. (Figure VIII). (BCG, 2018) [2].

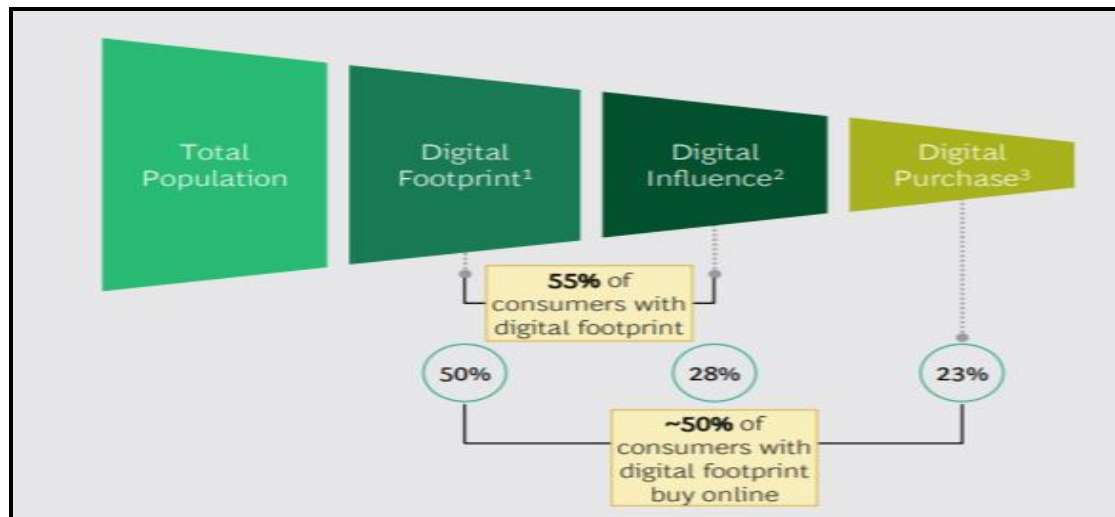


Figure VIII: Nearly one-fourth (23 percent) customers purchase retail loans digitally.  
(Source: BCG Google 2018 Digital Lending Survey (N=2364)[2].

It is noted that there is a gradual but definite shift towards various digital channels from the traditional channels in the banking industry in India as is evident from the high positive growth rates over the years. At the same time, there is a gradual fall in the transactions by way of physical branches and this is reflected in the high negative growth rates year after year. Regarding the use of ATMs also, there has been a falling growth rates over the years and of late it is estimated as negative also for FY 2018. Hence, it may be inferred that there is clear and definite shift towards different transactions from the conventional 'brick and mortar' banking and even the transactions through ATMs are less preferred by the highly discerning modern customers. (Figure IX).

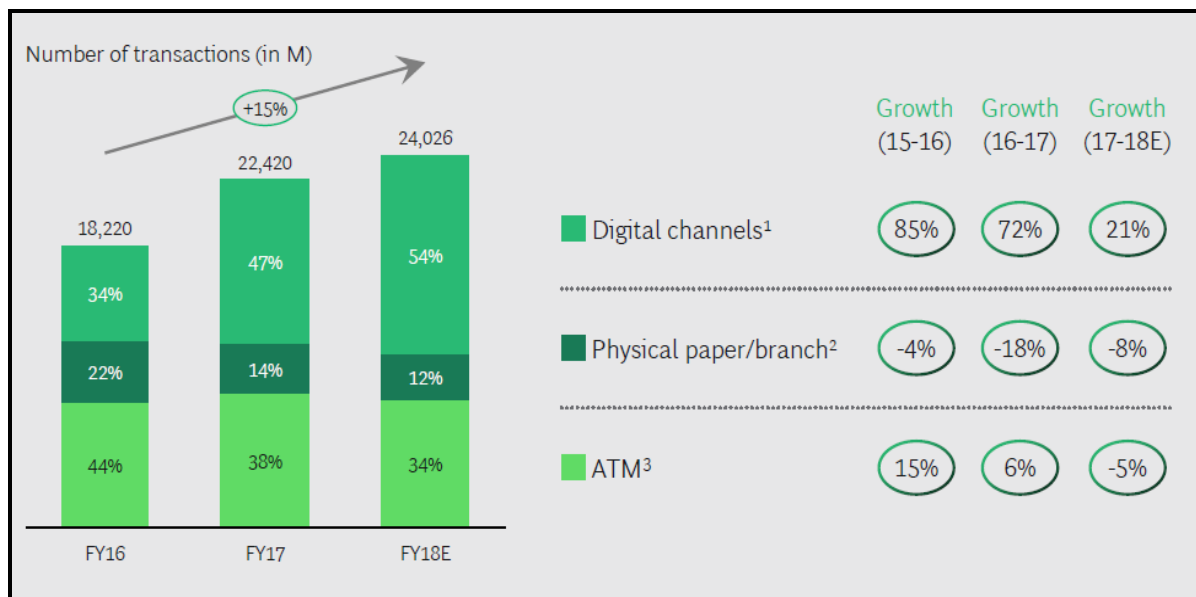


Figure IX: Fast Shift in Transaction Profile of Banks.  
Source: BCG Google 2018 Digital Lending Survey (N=2364), p.15. [2].

Among the various digital channels for delivery of banking products, mobile banking is becoming more popular. This is particularly true in respect of rural customers because rural tele-density is constantly on the rise in India. Hence, for faster promotion of various retail banking products, the use of delivery channels like mobile banking makes good business sense; as the modern customers prefer such delivery channels.

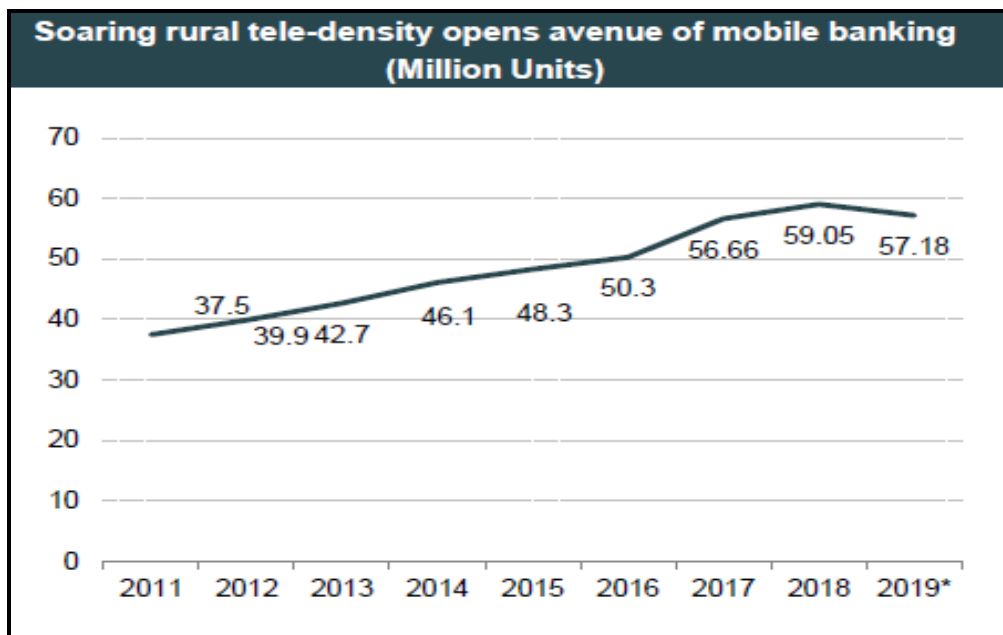


Figure X: Growing Rural Tele-density – Better Scope for Mobile Banking.

Source: IBEF, 2018 [9].

The disposable income and hence the purchasing power of the rural population is on the rise in rural areas. Hence, a focused approach towards promoting various retail banking products including housing loans in rural areas, is advisable. This approach ensures that economic activities in the country are of balanced and equitable nature. (Figure XI).

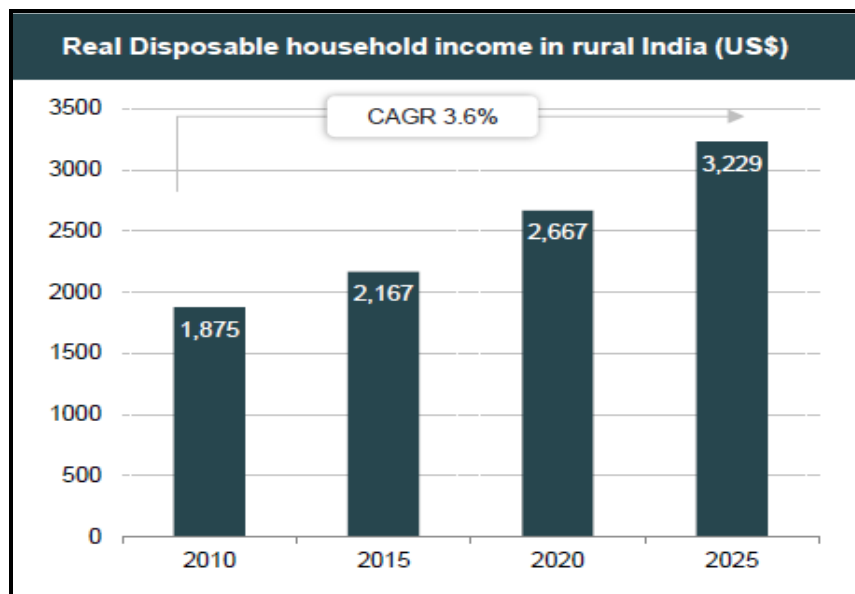


Figure XI: Rising Real Disposable Income in Rural India. (USD).

Source: IBEF, 2018 [9].

### Medium Term Strategy for Banks in ‘Digital India’ Era: Some Suggestions

Taking into account the national goal of ‘Affordable Housing for All by 2022’ in India and also the ‘Digital India’ initiative, of the Government of India and hence having a pan-India presence, let us now try to design the medium term strategy for the banks that can take care of the national goals and at the same time help tide over the present situation of economic slowdown. Whether the economic slump is cyclical or structural in nature, investment in housing can act as a suitable remedial strategy. So, promotion of retail credit by banks, particularly housing credit is meaningful, especially when we consider the vast linkages of housing industry with not less than 269 allied industries. Investment in housing can kick-start many a recession-hit sector in the economy and is a top employment generator also. Hence, the medium term banking strategy should be that of ‘retail credit with housing finance thrust’. Another vital need for the banking strategy is that of ICT integration. ICT ensures better competitiveness, significantly improve operational efficiency by reducing cost, and can

enable better customer service also. Modern ICT-based tools like data mining can be of immense use because of their ability to generate relevant knowledge from large amounts of unorganized business data.

Another vital need for the banking strategy is that of ICT integration. ICT ensures better competitiveness, significantly improve operational efficiency by reducing cost, and can enable better customer service also. Modern ICT-based tools like data mining can be of immense use because of their ability to generate relevant knowledge from large amounts of unorganized business data. Moreover, given the imminent invasion by the financial technologies (Fin-Tech) companies and also the ever growing expectations of today's discerning customers, banks have to constantly innovate their products and services, particularly in respect of the retail banking portfolio. Here, ICT acts as the means (enabler) and also the end. So, from the viewpoint of competition too ICT integration at all levels, especially in respect of retail credit, is an imperative for the survival and growth of the banks.

Public sector banks (PSBs) and Old Private sector Banks (OPBs) have to pay more attention to ICT adoption because they often lag behind the New generation Private sector Banks (NPBs) and Foreign Banks (FBs) in ICT adoption. This in turn enables them to catch up with NPBs and FBs in customer service and operational efficiency; especially in respect of retail credit wherein customer service and control of operating costs are vitally significant.

There is another reason for the PSBs to take special interest in retail credit. As consolidation process is going on among the PSBs, the only feasible strategy that can 'keep them moving' in the short and medium terms is that of focusing on retail credit with due respect to ICT integration and constant product innovations. Focusing on large corporate or industrial advances or on project financing by these PSBs which are already heavily burdened with the issues of bad-debts (NPAs) and falling profitability and productivity will not at all be sensible in the short or medium term. Identifying their synergies and designing suitable business models would require some more time during which they can focus on retail credit.

PSBs need to be especially cautious in this regard. As consolidation is going on among the PSBs, the latest being the consolidation among 10 PSBs with a view to retain the large 4 PSBs alone (viz. PNB, CB, UBI and IB), the only feasible strategy that can 'keep them moving' in the short and medium terms is that of focusing on retail credit with due respect to ICT integration and constant product innovations. Focusing on large corporate or industrial advances or on project financing by these PSBs which are already heavily burdened with the issues of bad-debts (NPAs) and falling profitability and productivity will not at all be sensible in the short or medium term. Identifying their synergies and designing suitable business models would require some more time during which they can focus on retail credit.

Use of advanced ICT platforms that can support competitive tools like data mining and knowledge discovery is very desirable for any progressive bank for its survival and growth. Such platforms enable high level of customer engagement and facilitate targeting different customer segments with tailor-made products. Modern payment technologies like RFID (Radio Frequency Identification) need to be adopted to remain competitive in the market. ICT investments, further, should focus on improving responsiveness, resiliency and enterprise-wide collaboration. Strategic tie-ups and resource sharing among the banks can bring in enhanced efficiency in the use of technology. This is especially relevant for the PSBs which are undergoing consolidation. Among the various digital channels of service delivery by the banks in India, mobile banking deserves special attention as the use of the same is fast picking up, particularly in the rural areas of India.

Customer centricity has a vital role to play in banking industry in the future. Sustainable business models that ensure continued customer loyalty or long term relationships have to be followed consistently by all banks, including 'traditional' banks like PSBs and OPBs. Owing to their 'high-tech' nature, NPBs and FBs are far ahead of PSBs in ICT adoption. So, in view of the growing competition in banking industry adoption high-end technological platforms becomes an imperative for the PSBs for their survival and growth.

Huge investments in ATMs are not advisable for banks as the growth rate in the use of ATMs is gradually on the decline. Similar is the case of physical branches in which case also a consolidation would be more desirable. Because of the fast advances in ICT and also the discerning nature of modern customers, innovation of all types on an ongoing basis is a vital for retaining and attracting the customers. So, every product needs to be designed meticulously based on a clear understanding of the customer's quality value proposition. Banks need to focus on specialized customer segments, as a 'one-size-fits-all' policy no longer appeals the modern customers. To identify the target customer segments banks have to adopt scientific market research studies and use advanced ICT tools like data mining.

Given the discerning nature of modern customers, provision of more high technology (Hi-Tech) products and delivery channels is an imperative for survival and growth of any bank, rather than a choice. The growing trend in computer literacy and the ever-growing affinity to modern products among the younger generation make the above strategy more meaningful. Also, it is essential to effectively defend the threat by specialized (niche) players, including the Fin-Techs which are growing fast.

With growing adoption of ICT-based applications, there are mounting trend in scams, information/cyber security issues, data leakages, frauds etc. So, setting up robust systems for risk management relating to information/cyber security should be a top priority for all banks.

From the part of the Government, it is advisable if it encourages a dynamic secondary market for housing finance, like, residential mortgage backed securitization (RMBS) is yet to emerge in India. The Government has to facilitate a vibrant RMBS market in India so that it acts as a new source of finance for the housing sector, particularly for the HFCs which are grappling with liquidity problems. Equally important is the need to promote the real estate investment trusts (REITs) in India. This in turn would promote the commercial real estate directly; and residential real estate too, but indirectly. Conscious efforts for encouraging the market innovations like RMBS and REITs are required in India for housing development. Special focus on residential REITs (those focusing on residential buildings) is an urgent need.

Given the growing disposable income and hence purchasing power of the rural population in India and after all the constantly growing rural tele-density, it is advisable to have a special focus on rural customers. Hence, rural banking should become a business strategy rather than a regulatory compulsion. As noted earlier, channels like mobile banking is quite effective in rural areas also as is evidenced by its constantly growing penetration.

Whatever is the level of ICT adoption, any banking service needs to have a human touch in order to be holistic and comprehensive. This 'human factor' in banking services must ensure adequate customer touch points for all products by way of meticulous planning.

All the above strategies have direct impact on the technological platform of the respective banks. A few other relevant strategies that can ensure superior performance of banks include, inter alia, enhanced transparency and strict corporate governance, enlarged accountability, adoption of international standards in accounting and reporting etc. More flexibility in human resource management (HRM) policies is required, especially for the PSBs and OPBs. This enables low cost and more flexible labour options (like, off-shoring). Besides, provisions to attract and retain the talent are required, which in turn may need more functional autonomy for the banks.

### **Concluding Remarks**

In spite of issues like growing NPAs, need for recapitalization etc., particularly for the PSBs in India, it may be noted that still Indian banking system is adequately stable, resilient and reasonably equipped to comply with global regulatory norms. When NBFCs (including HFCs) are grappling with problems of liquidity, asset-liability mismatch, falling profitability and so on, banks in India are still healthier and more stable. However, banks in India have to play a greater role in the current situation of the country that is characterized by economic slowdown. Almost every sector in Indian economy is facing a slump, and the growingly worsening case of NBFCs (including HFCs) is no exception here. Notwithstanding the fast growth of digital transactions in India, regarding ICT adoption by banks in India, there appears to be good scope for improvement, particularly in respect of PSBs – still the backbone of the Indian banking system, in spite of their losing prominence. In fact, ICT upgradation and consolidation in banking industry are mutually reinforcing in nature and results in significant cost savings for the respective banks, which are mostly the PSBs. Need for restructuring the banks by adopting stronger customer orientation with robust technological platform assumes vital significance today. The recent governmental policies are all in the right direction. Focus on retail credit products like housing finance ensures better credit off-take during this slowdown phase and will also enable gradual recovery of the whole national economy because of the vast linkage effects. ICT adoption makes the whole process as above more cost-effective, transparent and customer-friendly.

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**NURSES MIGRATING FROM KERALA TO U.K: A STUDY OF THEIR CONSUMPTION BEHAVIOUR AND ITS IMPLICATIONS**

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**ABSTRACT**

*Over the years there has been a constant rise in the migration of nurses from India to United Kingdom (UK) and such other advanced nations of the world. Of the nurses migrating abroad, majority belong to Kerala state in India. The paper makes a study of the consumption behavior of the nurses migrating from Kerala to UK, implications of such behavior, and makes suggestions for suitable policy initiatives that make their remittances and consumption conducive for the economic growth of the home state.*

*Keywords: Migration, Non-Resident Keralites, Remittances, Consumption.*

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**1. INTRODUCTION**

Over the years, there has been steady rise in the immigration to United Kingdom (UK) since 1945. This trend has been very clear in the post-2000 period. Other immigrants have come as asylum seekers, seeking protection as refugees under the United Nations 1951 Refugee Convention, or from member states of the European Union, exercising one of the European Union's Four Freedoms. In fact, about 70 percent of the population increase between 2001 and 2011 censuses was due to foreign-born immigration. In fact, as high as 7.5 million people (11.9 percent of the population) were born abroad. This paper seeks to study in detail the consumption behavior of nurses migrating from Kerala and its implications on the state.

**2. RELEVANCE AND SIGNIFICANCE OF THE STUDY**

In the past decade, the size and characteristics of immigration to the United Kingdom have changed significantly. Immigrants are more numerous, more mobile and more diverse than ever before. The experience of immigration is different; immigrants are coming from a broader array of countries, staying for shorter period of time, enjoying significant engagements with communities outside of the United Kingdom and are no longer settling solely in cities. In parallel, UK immigration policy has undergone radical changes. Public opinion and other forces have prompted policy makers to focus their efforts on combating illegality and on flows of asylum seekers. At the same time, economic pressures have dictated the need to have selection systems so the country can attract desirable economic immigrants. Despite the current recession, immigration to the UK is expected to remain at approximately 150,000 net migrants per year. Globally, more than 232 million people are international migrants – a number that continues to rise. Advances in transportation and communication have increased the capacity and desire to move. Migration today is more widely distributed across more countries. The data-rich research offered here, based on credible sources, sketches migration flows, the sending of remittances, admission levels, enforcement actions and more for countries around the world. Net UK migration increased to 212,000 in the year to September 2013, pushing it further away from the conservatives' target of below 100,000 according to official estimates. Though there are many studies on inter-state migration in India and its impact, like, the study by Dr. Manoj P K and Neeraja James (2014) [7] on migration of housing construction workers to Kerala from other states, studies involving migration from India to other countries are very scarce. This study looks into migration of nurses from Kerala to UK, and focuses on their consumption behavior.

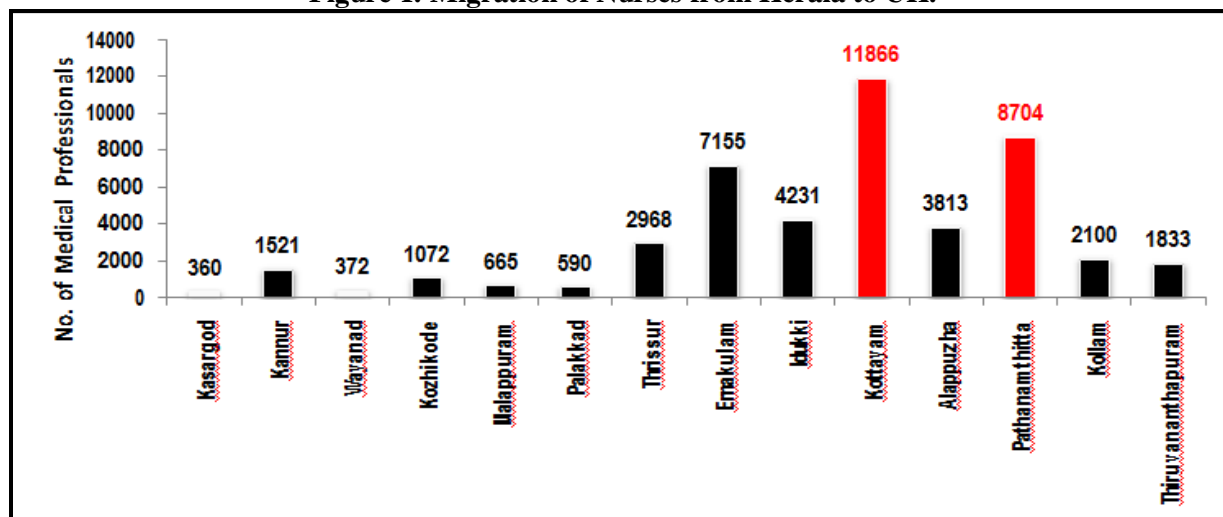
**3. OBJECTIVES OF THE PAPER**

- (i) To make a cursory review of the trend of nurses migrating from Kerala to U.K;
- (ii) To study the behavior relating to the consumption pattern of the migrant nurses; and
- (iii) To suggest policies which make their consumption behavior beneficial for the state.

**4. METHODOLOGY OF THE STUDY**

As part of this research study, a field study was conducted among the households of international health workers (nurses) in Kerala. The methodology adopted has been a multi-stage sampling. In the first stage, two districts in Kerala with the highest concentration of nurses viz. Kottayam (11866 nurses) and Pathanamthitta (8704 nurses) were selected using Purposive (Deliberate) sampling, based on the statistics on the number of nurses published by Dept. of Economics and Statistics, Govt. of Kerala. (Figure I).



**Figure-I: Migration of Nurses from Kerala to UK.**

Dept. of Economics and Statistics, Govt. of Kerala. (2013)

In the second stage, from these two selected districts (viz. Kottayam and Pathanamthitta) a total number of 600 nurses were selected on a pro-rata basis, based on the relative concentration of the nurses in these districts. Accordingly, 350 nurses and 250 nurses respectively were selected from Kottayam and Pathanamthitta districts. In the third stage, 350 households corresponding to the 350 nurses in Kottayam district and another 250 households corresponding to the rest 250 nurses in Pathanamthitta district were selected. Suitable number of households from various Panchayats and Municipalities in the respective districts were selected on a pro-rata basis, using the Govt. statistics relating to the distribution of migrant nurses. For this Random sampling (Lottery) method was used.

##### **5. NURSING PROFESSIONALS IN KERALA: NATURE OF THEIR MIGRATION TO UK**

As per 2011 Census, the total population in Kottayam is 1.97 million. The male population is 0.97 million and the female population is 1.01 million. The total working population in the district is 0.74 million. The literacy rate of the Kottayam is 97.21. The total population in Pathanamthitta is 1.20 million in 2011. The male and female population is 0.56 and 0.64 million respectively. The total working population is 0.39 million, and the literacy rate of the district is 96.55. As already noted, the two districts of Kottayam and Pathanamthitta were selected deliberately because the chunk of nursing professionals in Kerala is migrated from these two districts. As per the statistics available of the Dept. of Economics and Statistics, Govt. of Kerala as of 2013, as high as 25 percent of the nursing professionals working abroad are from Kottayam district, and the Pathanamthitta district records the second position with 18 per cent share of nurses.

Kottayam and Pathanamthitta districts together account for 43 per cent of the total migrant nurses from Kerala. Besides, the statistics indicate that 16 percent of the total international migrants from Kottayam district are from the medical field and that for Pathanamthitta district it is 8 per cent. A sample of 350 households were chosen randomly from Kottayam district using lottery method and another 250 from Pathanamthitta district. Thus, a sample of 600 households with international migrant nurses were surveyed. Representation of rural, semi urban and urban areas of both Kottayam and Pathanamthitta districts was ensured by adopting pro-rata method for sample selection. Thus, a sample of 350 nurses from Kottayam district representing 5 Taluks and 21 City or Panchayat areas have been selected. Also, a sample of 250 nurses from Pathanamthitta district representing 45 households from 3 Taluks and 15 City or Panchayat areas have been selected. The field survey was conducted during vacation time of migrants. Face to face discussion with the sample nurses was done in 54 percent of the cases. A detailed study of the consumption pattern of the migrant nurses from Kerala would throw light on finding the policy measures to optimally utilize their savings and investments for the economic development of Kerala; as Kerala is getting nearly Rs. 1 Trillion every year as remittances from Non-Resident Keralites (NRKs) and a large share of NRK remittances includes the remittances by migrant nurses.

##### **6. HOUSEHOLD CONSUMPTION EXPENDITURE OF NURSES MIGRATING FROM KERALA TO UK**

The consumption expenditure of household is a well-accepted indicator in academics to understand the living standards and welfare of families. In this section of analysis, the monthly consumption expenditure

(MCE) of migrant families in different items is sought to be estimated. The average monthly consumption expenditure (MCE) of migrant families is Rs. 18650. The major share of MCE is reported in food (44.64 percent), medical expenses (28.73 percent), non-food (12.55 percent) and education (6.90 percent). The average MCE of migrant families in food is Rs.8325. The per capita MCE of migrant households in medical expenses and education is Rs.5358 and Rs.1286. After food, the migrant families spend more on medical expenses and education. It is significant indicators in identifying how migrant health workers' families in the State are conscious about the overall welfare of their family in terms of health and education. This situation appears to be one major factor which is contributing to Kerala's higher levels of human development indicators. The statistics show that migrant families spend a good amount on alcohol and on tobacco products. They spend nearly Rs.285 monthly for alcohol and Rs.120 for tobacco products. Kerala being one of the leading alcohol consuming state in India, it is noted that there is a significant relation between migrant families and alcohol consumption in Kerala. (Table I).

**Table-I: Monthly Consumption Expenditure of Households**

Items	Average Expenditure (in Rs.)	Total Expenditure (in Rs.)	Percentage to Total Expenditure
Food	8325	832500	44.64%
Non-Food	2341	234100	12.55%
Cigarette	110	11000	0.59%
Other Tobacco Items	10	1000	0.05%
Alcoholic Item	285	28500	1.53%
Medical Expense	5358	535800	28.73%
Education	1286	128600	6.90%
Other Expense	935	93450	5.01%
Total Expenditure	18650	1864950	100.00%

Source: Field Survey

The average MCE of migrant families who live in 'luxurious' houses is Rs.23594. Their per capita MCE on food is Rs.9337. They spend Rs.6724 for medical expenses and Rs.2288 for education. Their average MCE on alcohol is Rs.449. It is noted that all these figures are higher than overall average MCE of migrant families. Migrant families who live in 'very good' houses have reported that their MCE is Rs.16001. They spend Rs.8444 for food, Rs.4689 for medical expenses and Rs.458 for education. The average MCE of migrant families who are from 'good' housing condition is Rs.9177. They spend Rs.4846 for food and Rs.2731 for medical expenses. They have reported no amount for education and alcohol items. The 'poor' migrant families have reported an MCE of Rs.6750. Their expenditure on food is Rs.4000, and on medical expenses is Rs.1000. Details in Table II.

**Table-II: Monthly Consumption Expenditure (House type-wise)**

Type of House	Items	Average Expenditure (in Rs.)	Total Expenditure (in Rs.)	Percentage of Total Expenditure
Luxurious	Food	9337	457500	39.57%
	Non-Food	3663	179500	15.53%
	Cigarette	112	5500	0.48%
	Other Tobacco Items	20	1000	0.09%
	Alcoholic Item	449	22000	1.90%
	Medical Expense	6724	329500	28.50%
	Education	2288	112100	9.70%
	Other Expense	1000	49000	4.24%
	Total Expenditure	23594	1156100	100.00%
Very Good	Food	8444	304000	52.77%
	Non-Food	1156	41600	7.22%
	Cigarette	14	500	0.09%
	Other Tobacco Items	-	-	-

	Alcoholic Item	181	6500	1.13%
	Medical Expense	4689	168800	29.30%
	Education	458	16500	2.86%
	Other Expense	1060	38150	6.62%
	Total Expenditure	16001	576050	100.00%
Good	Food	4846	63000	52.81%
	Non-Food	769	10000	8.38%
	Cigarette	385	5000	4.19%
	Other Tobacco Items	-	-	-
	Alcoholic Item	-	-	-
	Medical Expense	2731	35500	29.76%
	Education	-	-	-
	Other Expense	446	5800	4.86%
	Total Expenditure	9177	119300	100.00%
Poor	Food	4000	8000	59.26%
	Non-Food	1500	3000	22.22%
	Cigarette	-	-	-
	Other Tobacco Items	-	-	-
	Alcoholic Item	-	-	-
	Medical Expense	1000	2000	14.81%
	Education	-	-	-
	Other Expense	250	500	3.70%
	Total Expenditure	6750	13500	100.00%

Source: Field Survey

The religion wise analysis shows that the average MCE of Hindu migrant families is Rs.21323. They spend Rs.11577 for food, Rs.4846 for medical expenses, Rs.463 for education and Rs.308 for alcohol. The Christian migrant families report that their average MCE is Rs.18250. It is lower than Hindu migrant families. Christian migrant families spend Rs.7839 for food, Rs.5435 for medical expenses, Rs.1409 for education and Rs.282 for alcohols. Their food expenditure is lower than Hindu migrant families, but expenditure on medical and education is higher than Hindu migrant families (Table III).

**Table-III: Monthly Consumption Expenditure (Religion-wise)**

Religion	Items	Average Expenditure (in Rs.)	Total Expenditure (in Rs.)	Percentage (%) to Total Expenditure
Hindu	Food	11577	150500	54.29%
	Non-Food	1930.8	25100	9.05%
	Cigarette	0	0	0.00%
	Other Tobacco Items	77	1000	0.36%
	Alcoholic Item	308	4000	1.44%
	Medical Expense	4846	63000	22.73%
	Education	463	6000	2.16%
	Other Expense	2123	27600	9.96%
	Total Expenditure	21323	277200	100.00%
Christian	Food	7839	682000	42.95%
	Non-Food	2402	209000	13.16%
	Cigarette	126	11000	0.69%
	Other Tobacco Items	0	0	0.00%
	Alcoholic Item	282	24500	1.54%
	Medical Expense	5435	472800	29.78%
	Education	1409	122600	7.72%
	Other Expense	757	65850	4.15%
	Total Expenditure	18250	1587750	100.00%

Source: Field Survey

**7. CONSUMPTION BEHAVIOR OF MIGRANT NURSES: ITS IMPLICATIONS ON KERALA ECONOMY**

Now concluding the discussion on consumption behavior and also assimilating with it other relevant empirical findings from the field survey, the overall picture of the economic impact of remittances of the international migrant nurses is as follows. It may be noted that 49 percent of migrant families live in a 'luxurious' houses and 36 percent of families live in 'very good' houses. The average landholding size of migrant families is 50 cents. Hindu migrant families own 29 cents per family and Christian migrant families own 53 cents per family. The average remittance per migrant household is 5.59 lakhs per annum. The data clearly establish a significant relationship between household structure and remittances. The migrant families who reside in 'luxurious' houses receive the remittance amount of 6.20 lakhs, and the 'very good' houses receive 5.38 lakhs. Those with 'good' and 'poor' households receive 3.41 and 0.50 lakhs respectively. The average remittances of Hindu migrant families is 1.59 lakhs while that of Christian families is 6.19 lakhs. The estimates show that 30.20 percent of total remittances are utilised for day-to-day expenses of families and 23.21 percent is used for medical expenses. The average savings of migrant family is 4.86 lakhs. The average savings of Hindu migrant families is 6.23 lakhs and Christian families is 4.66 lakhs. The data reveal that 78 percent of migrant families have some kind of investments.

The major investment areas of migrant families are land, building and gold. 63 percent of migrant families invested in gold, 44 percent of migrant families invested in land and 25 percent migrant families invested in buildings. The average investment of migrant families is 49.58 lakhs. The average investment in land is 38.17 lakhs and in buildings is 8.95 lakhs. The average investment in gold is 2.28 lakhs. The average investment among Hindu migrant family is 39.95 lakhs and among the Christian family is 51.01 lakhs. Christian migrant families invest more in land and building. However, Hindu migrant families invest more in gold. The average monthly consumption expenditure of migrant families is Rs.18650. The major chunk of consumption expenditure is made for food, medical and education purpose. The average monthly expenditure for food is Rs.8325. The average expenditure for medical and education is Rs.5358 and Rs.1286 respectively. Migrant families spend Rs.285 for alcohol and Rs.120 for tobacco products per month. The consumption expenditure of Hindu migrant families is Rs.21323. They spend Rs.11577 for food, Rs.4846 for medical expenses, Rs.463 for education and Rs.308 for alcohol. The average consumption expenditure of Christian migrant families is Rs.18250. It is lower than Hindu migrant families. Christian migrant families spend Rs.7839 for food, 5435 for medical expenses, Rs.1409 for education and Rs.282 for alcohols. Their average expenditure on medical and education is higher than the Hindu migrant families. In short, health migrant workers from Kerala contribute a huge amount as remittances, and its welfare impact on migrant families is well evident in Kerala state. Besides, it has also been noted that there is a significant relationship between the remittances of nurses and their investments in the home country. Higher remittances would promote more investments and hence more development. This is in line with the Neo-Classical Micro theory of migration. In short, migration of nurses leads to local economic development.

**8. SUGGESTIONS BASED ON THE FINDINGS OF THE STUDY AND OTHER EMPIRICAL FINDINGS**

- (i) Given the higher costs of securing health education in India as per international standards, and higher costs to get job visa from of international recruiting agencies, the Government should take steps to make it inclusive by providing cost effective and/or Government-supported health education and training to the poor among all social groups. Further, the Government should take suitable policy measures to regulate the intermediary recruiting agencies so as to prevent them from exploiting the trained health professionals; the Government may network directly with international health institutions to recruit professionals from Kerala.
- (ii) Even if international health migrant workers from Kerala lead a satisfactory life abroad, many of the migrant workers feel that they are underpaid, and they face certain racial discrimination from foreign nationals. So, the Government should take steps to protect the interests of migrant nurses from Kerala in ensuring parity in salary, protection from social discrimination. The Government should take up the matter with UN organisations (like, ILO and WTO) to resolve such issues.
- (iii) As the study has revealed that the majority of migrant workers looks for a permanent residency status in foreign countries and most of them are not willing to return to India. This situation may restrict the future flow of remittances to Kerala. It is revealed that international migrants are not keen to invest their earnings in a productive manner in Kerala, and that chunk of their savings goes to unproductive investments like land and gold. As this would adversely affect the economic interests of Kerala,

the Government should take steps to divert the remittances to more productive sectors of the economy. Further, there should be focus on utilizing the knowledge of the trained and skilled migrants to improve the state's health sector. This may encourage many of them to return to Kerala also.

- (iv) The Government should frame policies to attract the international health tourists by utilising the connection and experience of international health migrant workers from Kerala, and the state should take initiatives to build various health infrastructures at par with global standards. This would expand the capabilities of Kerala state to optimize its comparative advantage in terms of internationally trained human resources in the healthcare sector.
- (v) Finally, as international migrant health workers generate a huge amount of remittances to the State, the government should adopt certain policy measures to protect the aged family members of migrant workers and their domestic wealth. In this regard, the Government should introduce a separate social security scheme for the family members of international health migrant workers.

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**A STUDY ON EXAMINE THE FINANCIAL LITERACY KNOWLEDGE OF MUSLIM SALARIED PEOPLE AS PER SHARIAH.**

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**ABSTRACT**

*Financial literacy is also the combination of consumers' or investors' understanding of financial products and concepts and their ability and confidence to appreciate financial risks and opportunities, to make informed choices, to know where to go for help, and to take other effective actions to improve their financial well-being. They further explained the number of reasons why financial literacy is especially important today. First, financial products and services are increasingly complex and accessible from a growing number and type of providers. Second, at the same time as the increase in number and complexity of the financial products and services, individuals are also being asked to take more responsibility for important financial decisions, such as investing for their retirement. Finally, large numbers of consumers are entering financial markets for the first time, both because income is growing in developing countries and because new financial institutions, such as microfinance providers, and new technologies, such as branchless banking, which have made it easier for consumers to participate in financial markets. The financial crisis has also led to the renewed focus of the world to Islamic Finance. The recent financial crisis has shifted the attention of the world towards the importance of financial literacy to not only ordinary man but to the sophisticated investor in particular. The crisis has revealed the severity of the consequences that people have made through their lack of knowledge especially when it comes to making decision on investment in the financial markets. The global financial crisis has also accelerated awareness of the need to improve financial literacy among the Muslim population. The purpose of this paper is to examine the financial literacy knowledge of Muslim salaried people. A survey questionnaire is distributed to 400 Muslim respondents using convenient sampling technique as the preliminary investigation. The study findings justify further refinement and show that the survey instrument is appropriate in a wider study of a representative sample of the Islamic Financial literacy knowledge of Muslim salaried people.*

*Keywords: Islamic finance, Shariah, Financial literacy, Knowledge, Islamic financial awareness, Islamic financial institutions.*

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**INTRODUCTION**

Islamic financial knowledge means the stock of knowledge that one acquire through education and/or experience specifically related to essential Islamic finance concepts and products. Therefore, Islamic financial literacy simply refers to financial literacy specific to Islamic financial products and concepts. Financial literacy has also important implication on wealth planning and management of individuals. Financial literacy affects financial decision making of which ignorance of the basic financial concepts can be linked to lack of retirement planning, lack of participation in stock market and poor borrowing behaviour. This will not only prevent individuals from accumulating wealth but also may witness the diminishing in their wealth due to wrong financial decisions. Financial skills and competence which are based on financial knowledge and understanding actually are influenced by attitudes towards the use of money, such as spending and saving. In fact, financial skills and competence are know-how that are shown in the practices and habits formed in everyday and long-term financial management.

Financial literacy is an active process, in which communicating information is only the beginning and empowering consumers to take action to improve their financial well-being is the ultimate goal. Financial literacy is critical for promoting access to finance by creating incentives and environments that promote desired financial behaviors such as saving, budgeting, or using credit wisely. Financial literacy is also the combination of consumers' or investors' understanding of financial products and concepts and their ability and confidence to appreciate financial risks and opportunities, to make informed choices, to know where to go for help, and to take other effective actions to improve their financial well-being. The financial crisis has also led to the renewed focus of the world to Islamic Finance. The Islamic financial industry has been shelled with various different types of financial instruments and assets for not only Muslim investor but also the non-Muslim investors to choose from. Financial literacy is a measure of the degree to which one understands key financial concepts and possesses the ability and confidence to manage people finances through appropriate, short-term decision-making and sound, long-range financial planning, while mindful of life events and changing economic conditions. Financial literacy is an active process, in which communicating information is only the beginning

and empowering consumers to take action to improve their financial well-being is the ultimate goal. Financial literacy is critical for promoting access to finance by creating incentives and environments that promote desired financial behaviors such as saving, budgeting, or using credit wisely. Financial literacy fall into five categories: (i) knowledge of financial concepts, (ii) ability to communicate about financial concepts, (iii) aptitude in managing personal finances, (iv) skill in making appropriate financial decisions and (v) confidence in planning effectively for future financial needs. Financial literacy is a measure of the degree to which one understands key financial concepts and possesses the ability and confidence to manage personal finances through appropriate, short-term decision-making and sound, long-range financial planning, while mindful of life events and changing economic conditions. Financial literacy defined by OECD is the combination of consumers' or investors' understanding of financial products and concepts and their ability and confidence to appreciate financial risks and opportunities, to make informed choices, to know where to go for help, and to take other effective actions to improve their financial well-being.

### **LITERATURE REVIEW AND HYPOTHESIS FORMULATION**

A review of literature is a text of scholarly papers, articles which includes the status of knowledge of the research area including substantive findings as well as theoretical and methodological contributions in the study. This review of literature deals with past studies conducted on the subject, to generate understanding in the area, extensive review of literature was carried out by the researcher. All the sections of the study have undergone gradual change and evolved at present level. The study is conducted in the field of Islamic financial planning of Muslim salaried people and relevant literature is reviewed to find the gap in the literature and accordingly frames the problems, hypothesis and objectives for the research study.

**According to Lusardi (2008)** have stated financial literacy affects financial decision-making of which ignorance of the basic financial concepts can be linked to lack of retirement planning, lack of participation in stock market and poor borrowing behaviour. This will not only prevent individuals from accumulating wealth but also may witness the diminishing in their wealth due to wrong financial decisions.

**Walstad et al. (2010)** found that the effectiveness of financial literacy education has been mixed. However, their study offers additional evidence that well-defined and properly implemented financial education programs in high school can increase students' financial knowledge.

**Abdul Hamid & Mohd.Bordin (2001)** stated that a study conducted in Malaysia in 1994, regarding knowledge on Islamic banking showed that almost 100 percent of the Muslim population was aware of the existence of the Islamic bank. However, out of these, only 27.3 percent completely understood the differences between Islamic bank and conventional banks; and only 38.7 percent patronize the Islamic bank strictly because of religion.

**Bley and Kuehn (2004)** in their study investigates the relationship between university student knowledge of relevant financial concepts and terms in conventional and Islamic banking, the impact of religion and language, and other individual variables on preferences for financial services. Findings of the study suggest that knowledge of conventional banking terms and concepts was higher among these students than was Islamic banking terminology. Review of the literature suggests that people had little knowledge on Islamic financial product. Several studies have been undertaken on knowledge on conventional financial products. The review of the literature thus suggests that very little work has been done to link knowledge of Islamic financial product to access and choice of financial products. Few studies have been undertaken on Islamic banking products and no such study has been undertaken on the financial literacy on these products.

**Miller et al. (2009)** in their study explained that, financial literacy is an active process, in which communicating information is only the beginning and empowering consumers to take action to improve their financial well-being is the ultimate goal. Financial literacy is critical for promoting access to finance by creating incentives and environments that promote desired financial behaviour such as saving, budgeting, or using credit wisely. Financial literacy is also the combination of consumers' or investors' understanding of financial products and concepts and their ability and confidence to appreciate financial risks and opportunities, to make informed choices, to know where to go for help, and to take other effective actions to improve their financial well-being.

**Huston (2010)** stated that, financial knowledge is an integral dimension of, but not equivalent to, financial literacy. Financial knowledge is the stock of knowledge acquired through education and/or experience specifically related to essential personal finance concepts and products. Hence, an Islamic financial knowledge would be the stock of knowledge that one acquire specifically related to Islamic finance concepts and products.

**Pellinen et al. (2011)** explained that, Financial skills and competence which are based on financial knowledge and understanding actually are influenced by attitudes towards the use of money, such as spending and saving.

In fact, financial skills and competence are know-how that are shown in the practices and habits formed in everyday and long-term financial management.

**Mahadzir ahmad (2010)** explained that, Muslims must seek to understand Islamic finance because it is a religious duty. If Muslims do not care about the prohibition of *riba*, *maysir* and *gharar* and continue to consume conventional financial products, then the Islamic financial system will never be developed. Perpetuating the conventional financial system is certainly sinful for Muslims.

**Bhabhaet. al (2014)** stated that financial literacy as a mishmash of awareness, knowledge, skill, attitude and behavior essential to make sound financial decisions and also finally achieve individual financial wellbeing. The level of financial literacy between a people is different, and the differences in the level of the literacy will influence the behavior. However, there is still limited study on financial literacy that focus on Islamic finance concept. For this study, Islamic financial literacy will examine either it will affect the attitude of the business owner in adopting Islamic financing. This paper defined the Islamic financial literacy as the degree to which individuals have a set of knowledge, awareness, and skill to understand the fundamental of Islamic financial information and services that affect its attitude to make appropriate Islamic financing decisions.

**Abdullah and Anderson (2015)** pointed out that financial knowledge stating that Islamic financial knowledge means the stock of knowledge that one acquire through education and/or experience specifically related to essential Islamic finance concepts and products. Therefore, Islamic financial literacy simply refers to financial literacy specific to Islamic financial products and concepts.

**Ahmad (2010)** states that it is consumers' responsibility themselves for four reasons: only consumers themselves can look after their own best interests and best known of their financial affairs, availability of wide range and complexity of financial products and financial education being a religious duty. The latter is unique to Islamic finance it is sinful for Muslims to propagate the interest-based system and hence, the importance for Muslims to be knowledgeable of Islamic finance.

**Murphy (2013)** states that in recent years, numerous studies have been conducted to provide theoretical and empirical evidence on financial literacy. However, most of these studies focused on demographic factors affecting financial literacy. Thus, based on the review of literature, this study has examined other factors affecting Islamic financial literacy, namely hopelessness, religiosity and financial satisfaction. Hopelessness refers to the negative effect on several components of financial behavior and well-being.

**Chen and Volpe (2002)** states that for instance have raised the suggestion that gender is a significant variable impacting the level of FL. Their findings suggest that women, in comparison to men, are more risk-averse when making financial decisions, and are consequently less financially literate. More importantly they find that lack of confidence may explain why men are more financially knowledgeable than women. Their study thus show that factors that are likely to impact on women's financial ability include the lack of financial knowledge, reluctance to take risk and lack of confidence. Possible reasons identified for the lack of confidence and risk taking displayed by women in financial skills may be due to their traditional role as part of society, who undertakes the role of homemaker and other career duties which may be more significant in affecting their financial decision makings.

**Van Rooj et al. (2011)** conclude that those with low literacy were much less likely to invest in stocks. They devise two special modules for the Household Survey in Netherland to measure FL and study their links to stock market participation. They find that the majority of respondents demonstrated a basic financial knowledge and have some grasp of concepts such as interest compounding, inflation, and the time value of money. However, many respondents could not distinguish between bonds and stocks, the link between bond prices and interest rates, and the basics of risk diversification; thus, confirming that FL does influence financial decision-making.

**Bell (2009)** states that a person who is satisfied with his financial position has a tendency to capitalize the surplus money, explore numerous opportunities as well as gather more knowledge about various financial opportunities. Thus, greater financial satisfaction improves the level of financial literacy.

**Sabri (2011)** explained that Religion often plays an essential role in influencing how individuals cope with financial decision. In other words, a person is actually fundamentally tied to his religious practices whenever he reacts with his own money.

## OBJECTIVES OF THE STUDY

To study and examine the financial literacy knowledge of Muslim salaried people as per Shariah.



**PROBLEMS OF THE STUDY**

It is quite evident that Muslim salaried people before taking investment decision they screen the do and don't of the investment opportunity from the principles of Quran.

**HYPOTHESIS OF THE STUDY**

Null Hypothesis ( $H_0$ ): Quran principles are not significantly affecting the investment decision of Muslim salaried people.

Alternate Hypothesis ( $H_1$ ): Quran principles are significantly affecting the investment decision of Muslim salaried people.

Therefore the researcher has justified the linkages between the title, objective, problem and hypothesis. The efforts taken on review of literature are worthwhile.

**RESEARCH METHODOLOGY**

"Research design is the conceptual structure within which research is conducted. Research design indicates the blue print for the collection, measurement and analysis of data. The design includes an outline of what the researcher plans and frames the research work. It explains how samples are selected, sample size determined, how data is collected and which statistical methods are used for data analysis".

Quantitative research approach is being used for the study as a quantitative research enables the researcher to examine association and differences among the variables. To carry out research effectively, Data is collected from primary sources and secondary sources.

**Universe of the study:** The study covers all the 52 railway station areas of Mumbai city dealing with Western line, Central line and Harbour line.

**Sample of the study:** To assess the quality of the study, the universe mentioned above is not possible for an individual to reach all areas of Mumbai city. Therefore, within Mumbai city there are 52 railway station areas, the researcher has purposely selected 40% of Western line, Central line and Harbour line viz. 20 areas for the research study. The researcher collects the filled questionnaire from 400 respondents including female/ male Muslim Financial planner in order to know the behavior of Muslims in Islamic financial planning and management. This research design fulfills the sample size determination suggested by R.V. Krejcie and D.W. Morgan.

**DATA COLLECTION**

Primary data collection involved Mumbai city, there are 52 railway station areas, the researcher has purposely selected 40% of Western line, Central line and Harbour line viz. 20 areas for the conducting the study. The researcher collects the filled questionnaire from female/ male Muslim salaried people from selected railway station, colleges, schools and companies. The researcher also visits to all Muslim minority institutions. The survey enumerators facilitated 20 respondents from each of the 20 areas selected of the Mumbai city in completing the questionnaire.

**Table-1: Demographic Description of the Respondents**

Demographic Variable	Demographic Categories	Number	(%)
<b>Area</b>	Western line	200	50
	Central line	140	35
	Harbour line	60	15
<b>Gender</b>	Female	152	38
	Male	248	62
<b>Age</b>	Less than 20years	4	1.0
	20-30years	112	28
	31-40years	174	43.5
	41-60years	110	27.5
<b>Education</b>	Graduation	208	52.0
	Post-graduation	129	32.3
	Professional	63	15.8
<b>Occupation</b>	Private	82	20.5
	Public	68	17
	Profession	250	62.5
<b>Annual Income (in INR)</b>	Less than 2 lakh	12	3.0

	2-3.5 lakh	88	22.0
	3.5 -5 lakh	285	71.3
	5 lakh and above	15	3.8
<b>Annual Savings (in INR)</b>	Less than 10,000	78	19.5
	10, 000-20,000	82	20.5
	20, 000-40,000	209	52.3
	40,000 and above	31	7.8
<b>Savings Objective</b>	Children's education	129	32.3
	Retirement	19	4.8
	Home purchase	180	45
	Children's Marriage	17	4.3
	Health care	52	13
	Others	3	.8

### ANALYSIS AND RESULTS

In the present study researcher used this analysis for hypothesis testing. For testing the hypothesis or test of significance, following tests are performed.

i) 'z' test for two independent samples at 95% confidence level.

ii) **Kolmogorov-Smirnov** test for two independent samples at 95% confidence level.

For analysis researcher used statistical package SPSS version 21. In addition to this, excel add-in Mega Stat is also used. Depending upon the type of data statistical methods are chosen. Statistical analysis is categorized as descriptive analysis and inferential analysis, which is often known as statistical analysis.

**Table-2: Descriptive statistics parameter related to financial literacy knowledge of Muslim salaried people as per Shariah.**

Statistical	tools	Financial awareness is necessary for making investment in Shariah based products.	Muslim salaried people are getting better expert opinion from Shariah advisory committee regarding investment decision.
N	Valid	400	400
	Missing	0	0
	Mean	3.86	2.91
	Median	4.00	2.00
	Mode	4	2
	Std. Deviation	.930	1.209

### Interpretations

- Mean value related to statement financial awareness is necessary for making investment in Shariah based products is 3.86 with low standard deviation value 0.930 indicates that most of respondents agree with this statement. Median value 4 and modal value 4 support this. Hence we may infer that financial awareness is necessary for making investment in Shariah based products.
- Mean value related to statement Muslim salaried people are getting better expert opinion from Shariah advisory committee regarding investment decision is 2.91 with low standard deviation value 1.209 indicates that most of respondents agree with this statement. Median value 2 and modal value 2 support this. Hence we may infer that Muslim salaried people are getting better expert opinion from Shariah advisory committee regarding investment decisions.

**Table-3: Opinion of respondents related to financial awareness is necessary for making investment in Shariah based products.**

	Opinion of the respondents	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	9	2.3	2.3	2.3
	Disagree	14	3.5	3.5	5.8

	Neutral	108	27.0	27.0	32.8
	Agree	161	40.3	40.3	73.0
	Strongly Agree	108	27.0	27.0	100.0
	Total	400	100.0	100.0	

**Interpretation**

1. Majority of the respondents (67.3%) are either strongly agree or agree with the statement that financial awareness is necessary for making investment in Shariah based products.
2. Regarding statement financial awareness is necessary for making investment in Shariah based products almost (5.8%) of respondents are either strongly disagree or disagree.

**Table-4: Opinion of the respondents related to Muslim salaried people are getting better expert opinion from Shariah advisory committee regarding investment decision.**

	Opinion of the respondents	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	29	7.3	7.3	7.3
	Disagree	174	43.5	43.5	50.8
	Neutral	53	13.3	13.3	64.0
	Agree	93	23.3	23.3	87.3
	Strongly Agree	51	12.8	12.8	100.0
	Total	400	100.0	100.0	

**Interpretation**

1. Majority of the respondents (36.1%) are either strongly agree or agree with the statement that Muslim salaried people are getting better expert opinion from Shariah advisory committee regarding investment decision.
2. Regarding statement that Muslim salaried people are getting better expert opinion from Shariah advisory committee regarding investment decision almost (43.5%) of respondents are either strongly disagree or disagree.

For testing above hypotheses we compare median rating scores with score 3 (which gives positive agreement opinion rating score).

**TESTS OF NORMALITY**

Before selecting statistical test we test normality of data as follows:

We use **Kolmogorov-Smirnov** test for testing normality and results of which are tabulated below

**Table-5: Tests of Normality- Kolmogorov-Smirnov**

	Kolmogorov-Smirnov <sup>a</sup>		
	Statistic	df	Sig.
effect of Quran principles on the investment decision of Muslim salaried	0.151	400	0.000

**OBSERVATIONS AND INTERPRETATIONS**

From the above table it is observed that significant p value 0.000 for k-s tests is less than 0.05 clearly indicates that data for different characteristics related to effect of Quran principles on the investment decision of Muslim salaried people is not normal. Hence we use non parametric **one sample sign test** for testing significance of different characteristics related to effect of Quran principles on the investment decision of Muslim salaried people.

**ONE SAMPLE SIGN TEST**

To test above null hypothesis we use **one sample sign test** with hypothesized mean value 3

The details of which are tabulated as follows.

**Table-6: One sample nonparametric sign test of median vs hypothesized score 3 for effect of Quran principles on the investment decision of Muslim salaried people**

	Median score	Sample size	Calculated 'z' value (one tailed, upper )	Significant P value
Hypothesized scores different characteristics related to effect of Quran principles on the investment decision of Muslim salaried people.	$\mu_0 = 3.0$	n= 390	z = 18.48	p =0.000
Observed Mean rating scores for different characteristics related to effect of Quran principles on the investment decision of Muslim salaried people.	M= 4.4			
<b>Critical z values:</b> 1. At 5% level of significance the corresponding z value is 1.645 2. At 1% level of significance the corresponding z value is 2.326				

**OBSERVATION**

From the above table it is observed that 'z' value for null hypothesis is 19.50 which is greater than +1.645 (also greater than +2.326). Also p value is 0.0000 which is less than 0.01. **Hence we reject null hypothesis at 5% & 1% level of significance.**

**INTERPRETATION**

On the basis of above data it can be inferred that Median rating scores for different characteristics related to effect of Quran principles on the investment decision of Muslim salaried people is greater than or equal to 3.

**FINDINGS**

Quran principles are significantly affecting the investment decision of Muslim salaried people.

**DISCUSSION AND FINDINGS**

1. Out of total 400 respondents, 365(91.25%) of respondents have awareness regarding the Shariah rules governing the Islamic investment opportunities and 35(8.75%) do not have awareness regarding the Shariah rules governing the Islamic investment opportunities. Majority of the graduate male respondents with age category of 31-40 years have awareness regarding the Shariah rules governing the Islamic investment opportunities available for Muslim Salaried People in Mumbai.
2. Out of total 400 respondents, 189(47.25%) of respondents consult Shariah advisory committee for screening the Shariah based investment products, 162(40.5%) of respondents consult Shariah advisory firm for screening the Shariah based investment products, 47(11.75%) of respondents consult Shariah advisory firm for screening the Shariah based investment products and only 2(0.5%) of respondents consult other than the Shariah governance. Majority of the graduate male respondents with age category of 31-40 years consult Shariah governance committee for screening the Shariah based investment products in Mumbai.
3. Mean value related to statement financial awareness is necessary for making investment in Shariah based products is 3.86 with low standard deviation value 0.930 indicates that most of respondents agree with this statement. Hence we may infer that financial awareness is necessary for making investment in Shariah based products.
4. Mean value related to statement Muslim salaried people are getting better expert opinion from Shariah advisory committee regarding investment decision is 2.91 with low standard deviation value 1.209 indicates that most of respondents agree with this statement. Hence we may infer that Muslim salaried people are getting better expert opinion from Shariah advisory committee regarding investment decision.
5. Out of total 400 respondents, 269(67.3%) are either strongly agree or agree with the statement that financial awareness is necessary for making investment in Shariah based products and 23 (5.8%) of respondents are either strongly disagree or disagree.
6. Out of total 400 respondents, 144(36.1%) are either strongly agree or agree with the statement that Muslim salaried people are getting better expert opinion from Shariah advisory committee regarding investment decision and 203(43.5%) of respondents are either strongly disagree or disagree.

Hence from the above findings it is revealed that **“financial awareness and better expert opinion from Shariah governance is necessary for making investment in Shariah based product”**.

### **CONCLUSION**

Rural areas Muslims still not much educated and do not believe to take risk and to make investment to secure future. They do not have much financial literacy knowledge about to make investment their money in financial market as compare to urban areas Muslims. They do not have awareness of Shariah rules related to Islamic financial planning and investment of savings.

### **SCOPE FOR FURTHER STUDIES**

Researcher has tried to evaluate the impact of Islamic financial planning on the investment behavior of Muslims such as investment in Shariah product, Awareness of Shariah rules and Quran principles, Shariah investment advice, Investment pattern and Savings pattern of Muslims, Investment objective and Financial literacy knowledge of Muslims. Further study can be conducted with reference to its impact on stock market performance, banking sector, growth rate, wealth creation and such other parameters.

### **LIMITATIONS OF THE STUDY**

The geographical limitation of the primary data collection is confined to Mumbai city only. Respondents' opinion can be biased.

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**MAJOR CHALLENGES IN FMCG SECTOR**

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**Abstract**

*The Indian FMCG market offers a level playing ground for both domestic and international players. All Indian brands and international brands enjoy higher acceptance in the urban market, the rural market is often dominated by the regional and local producers. The Consumer Market, especially Fast Moving Consumer Goods (FMCG), sector in rural and semi-urban India is estimated to cross \$20 billion by 2018 and \$100 billion by 2025, according to an AC Nielsen survey. The Indian FMCG sector has to work with very complex distribution system comprising multiple layers of numerous small retailers between company and end customer*

*Keywords: FMCG Sector, India*

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**Introduction**

The Indian FMCG companies enjoy a diverse industrial base and offer a variety of products to consumers, namely toiletries, personal care products, soaps, detergents, oral hygiene, packaged foods, beverages, grooming products, healthcare products, plastic products, bulbs, batteries, glassware etc. It is the fourth largest sector in India, creating employment for more than 3 million people in the country with a market size of over Rs 110,000 crore (around \$22 billion) and is estimated to grow to over Rs 185,000 crore (around \$37 billion) by 2014. FMCG Industry is characterized by a well-established distribution network, low penetration levels, low operating cost, lower per capita consumption and intense competition between the organized and unorganized segments Fast Moving Consumer Goods (FMCG) goods are popularly named as Consumer Packaged Goods. Items in this category include all consumables (other than groceries/pulses) people buy at regular intervals.

The most common in the list are toilet soaps, detergents, shampoos, toothpaste, shaving products, shoe polish, packaged foodstuff, and household accessories and extends to certain electronic goods. These items are meant for daily or frequent consumption and have a high return. Subsets of FMCGs are Fast Moving Consumer Electronics which include innovative electronic products such as mobile phones, MP3 players, digital cameras, GPS Systems and Laptops. These are replaced more frequently than other electronic products. White goods in FMCG refer to household electronic items such as Refrigerators, T.Vs, Music Systems, etc.

The fast moving consumer goods (FMCG) sector is the fourth largest sector of the economy with the size of about more than Rs 500 billion. FMCG sector generally includes a wide range of frequently purchased consumer product such as soaps, dairy products, confectionary, soft drinks, fruits and vegetables and batteries. FMCG products usually have a low unit cost but large volumes. Top ten FMCG companies in India consist of both global players such as HUL, Nestle, Cadbury, P&G and Indian companies such as Amul, Asian Paints, Dabur etc. In the FMCG sector the supply chain performance is a key factor. The FMCG industry is characterized by complex distribution network and intense competition forcing firms to constantly work on supply chain innovation. Companies with better supply chain system will perform well, whereas those with poorly managed supply chains will find it tough to even survive in the competitive market.

**Objectives of the study**

- To study the FMCG sector in India
- To study the Major Challenges in FMCG sector

**FMCG Sector in India**

Fast Moving Consumer Goods (FMCG) can be defined as packed goods that are consumed or sold at regular and small intervals. The prices of the FMCG are relatively less and profits earned through such sales are more volume based. The organized FMCG retailing in India is a new concept and is fast catching up in urban and semi-urban India.

The FMCG Sector in India has witnessed a range of recent developments. Tax deductions on various items, rise in the penetration levels and per capita consumption are some of the major developments in FMCG. The FMCG Sector in India is the fourth largest sector in the Indian economy. As per the reports of the 2018-19 financial years, the market size of the sector was registered as USD 13.1 billion. The FMCG Sector in India involves a strict competition between the organized and unorganized sectors of consumer durables. India offers an abundance of raw materials (Some product categories such as jams, toothpaste, skin care products, hair care

products, etc have experienced a low per capital consumption as per a report presented in 2018.), low-priced labor costs, and also has a presence across the entire value chain.

Approximately 200 million people are expected to become the consumers of processed and packaged foods by the year 2010. The major activities of the food-processing sector are permitted 100% foreign equity or 100% NRI and Overseas Corporate Bodies (OCB) investment to meet the rising demand of the consumers. The recent developments in FMCG, it is assumed that the consumption of the FMCG products will have a satisfactorily growth with the rising income level of Indian populace in both the rural and urban areas. The market size of the Indian FMCG Sector is expected to reach USD 33.4 billion by the year 2020. The Indian government has declared several tax sops for the FMCG sector in India. It has emphasized on the infrastructural developments in the same. The consumption of health and personal care products in FMCG sector has increased in the recent past with rise in disposable income especially among the early stages group in India. A few of the FMCG product are:

- Toiletries
- Soaps and detergents
- Cleaning and disinfecting agents
- Cosmetics
- Non-durables
- Pharmaceuticals

Further, the packaged food products and drinks are also sold under the FMCG, since these items are consumed or bought at regular intervals. Furthermore, recently the electronic items like mobile phones, MP3 players, external hard drives, etc, which has less life owing to its technological development, has also been brought under the gamut of FMCG sector.

**Table no 1 Fast Moving Consumer Goods companies operating in India**

Companies		Electronics Brand in India	FMCG retail outlets operating in India
Britannia	ITC	LG	FoodWorld
Procter & Gamble	Heinz	Samsung	Subiksha
Coca-Cola	Reckitt Benckiser	Nokia	Landmark
PepsiCo	Nestle	Motorola	Health & Glow
Wilkinson	Unilever	Sony	Shahnaz Husain
Lakme	Tata Tea	Videocon	LG & Samsung
Amul	Marico	Panasonic	
Dabur		Phillips	
Kissan		Canon	
Parle			

Source: [business.mapsofindia.com/automobile/top-automobile-companies](http://business.mapsofindia.com/automobile/top-automobile-companies).

**Table No 2 The Top 10 Companies In FMCG Sector**

S. NO.	Companies
1.	Hindustan Unilever Ltd.
2.	ITC (Indian Tobacco Company)
3.	Nestlé India
4.	GCMF (AMUL)
5.	Dabur India
6.	Asian Paints (India)
7.	Cadbury India
8.	Britannia Industries
9.	Procter & Gamble Hygiene and Health Care
10.	Marico Industries



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**Major Challenges in FMCG sector****• Managing availability in the complex distribution Set Up**

The Indian FMCG sector has to work with very complex distribution system comprising multiple layers of numerous small retailers between company and end customer. For example a company like, Marico has to ensure reach to 1.6 million retailers spread throughout the country. As the numbers of SKUs (Stock keeping Units) have been increasing exponentially, just ensuring availability at the last stage of distribution has become a nightmare for companies. Standard solutions applicable in developed countries are not suitable for a country like India. Working with smaller pack Sizes Unlike in developed countries ,where companies have been trying to work with large pack sizes (reduction in transportation ,handling and packaging costs for large pack sizes can be passed on as price cuts to price sensitive customers),in India the trend is in the opposite direction. To increase market penetration, Indian companies have realized that they need to reach out to consumers present at the lower end of the economic pyramid. This consumer base can be tapped in to only by offering small pack sizes. However smaller pack sizes mean higher packaging and transportation costs for the companies. Eventually companies will have to find innovative ways of balancing market penetration and logistics cost.

**• Entry of National Players in the Traditional Fresh Products sector**

National players want to market “fresh” products that have been traditionally handled by local players in each region. For example, ITC wants to make inroads in the market for ‘ATTA’ and Nestle for yoghurt. In these items, the freshness of the product is an important requirement from the consumer’s point of view. Traditionally national companies have worked with centralized plants, where they can manage quality and also enjoy big economies of scale. As freshness is one of the most important criteria from the customer’s point of view, national players will have to work with decentralized manufacturing plants. Balancing quality, freshness and cost is a major issue for national players. The following is an important case of AMUL where a local firm has successfully managed the complex tradeoffs by building superior supply chain capabilities.

**• Opportunistic Games played by the Distribution Channel**

It is a common notion in distribution that only 50 percent of the promotion actually reaches the final customer. This is due to the fact that many distributors work unscrupulously. Rather than playing the role of the facilitator, they try to grab a significant part of the promotion budget for themselves. One FMCG company found that it ended up paying significant amounts as rebate to its trade channel because of illegal printing of coupons by some wholesalers and distributors. Some of these distributors also indulge in the illegal movement of goods from one market to another during local promotions. Due to which companies lose control of the sales of their products (the company may want to target a specific market but the distributors might divert the goods to different region). Thus, FMCG companies end up wasting a significant part of their resources on these issues, which do not really add any value to their customers.

**• Infrastructure**

Poor roads and unreliable transport systems have an adverse impact on costs and uncertainties. Non-availability of infrastructure, like cold chains affects certain product categories significantly .even if the cold chain is available, power problems add to the uncertainty. For example in the ice-cream business, if the ice-cream melts even once because of the non-availability of power, the quality in general and the taste in particular, of the icecream are adversely affected. Most Indian cities face power problems in summer and icecream manufacturers have to live with these problems in their distribution network. In general FMCG companies have to take these issues into account while planning their supply chains.

**Conclusion**

Indian market has witnessed outstanding growth over past few years. The liberal and transparent financial policies have steered the economy towards free flow of FMCG products and Indian Market has achieved a sound place in the international arena. Marketers will need to evolve new strategies to connect and communicate with a more aware and unreserved consumer than ever before. The companies whether it is a national or global, give importance to FMCG challenges to enhance the business and to become the competitor as well as leader in the market.

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**TEACHER FREEZING OF SECONDARY SCHOOL TEACHERS**

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Teachers are the torch bearers in creating social cohesion, national integration and a learning society. They not only disseminate knowledge but also create and generate new knowledge. They are responsible for acculturation role of education. Teachers are helping students of whatever age. They are supposed to be teaching to learn and to facilitate learning. It depends upon the capacity of the teacher to help them and the capacity of the students to learn from the teacher. But basically, teachers are not teaching anything for that matter. Teaching provides endless challenges and opportunities for growth every day, teaching tests your interpersonal communications skills, your academic knowledge, on your leadership ability. Few teachers give up for a long laundry list of reasons, but the most common complaints include disrespectful and disruptive student's apathetic or ineffective administrations over whelming stacks of paperwork, lunch room politics, family pressure and pestering organizational climate, occupational stress and mental or emotional exhaustion. Those complaints are valid Teaching is very demanding and difficult work, teachers today suffer from a host of emotional, mental and physical challenges that affect their behavior and ability to teach.

Now a day's standard of education is deteriorating day by day. Although, there may be many other peripheral factors responsible for the deteriorating condition of education but teachers' apathy, indifference and lassitude are considered as a main cause of it. It is well accepted fact that the quality of education is mediated by the teachers and what the teacher does. Teachers have the potential for enhancing the quality of education by bringing life to curriculum and inspiring students for self-directed learning.

**BECOMING A GOOD TEACHER**

Parker Palmer tells that good teaching is akin to weaving a fabric of connectedness between student, teacher and subject. The weaving cannot take place without a loom. The teacher is the loom on which the fabric is woven. The loom itself is a work in progress: to make oneself available, teachers need "inner work". Good teaching is not about good techniques. This doesn't mean that techniques are irrelevant. Techniques should be used to reveal rather than conceal the teacher's identity and integrity demands "inner working." In more than 30 years of trying to understand what good teaching is, Palmer never found a technique that worked across the board. However, what he found to be surprisingly consistent is the ability of the students to perceive the authenticity of the teacher's intents. Students can define very easily "bad teaching". It occurs when a teacher is perceived as a cartoon character talking out into a bubble. Bad teaching occurs when there is a disconnection between the person who speaks and what is being said, that is when there is a lack of authenticity. On the other hand students have more difficulty defining good teaching. A good teacher connects the students to the subject matter. This connection cannot be done without the teacher's full commitment to the process. The weaving of a fabric of connectedness comes in a myriad of ways.

Good teaching demands huge amounts of physical and mental effort; depending on your budget. It may absorb some money as well. If you are single, childless, and unattached, you may choose to devote the bulk of your energies to teaching for some period of time. However, if you are a single mother with three young children and have a close friend or intimate partner, you may not be willing or able to devote the amount of emotional energy that being a super teacher requires. Having children doesn't disqualify you from becoming a super teacher, it simply means that you will need to make sure that your family understands and supports your teaching. Hence good teachers are full of positive attitude, have ample of time for students, boost confidence of students but maintain their balance of mind, motivate students, care and listen to students.

**Challenges of secondary school teachers**

Secondary level of education is transition between primary and higher level. It is considered from class ix to xii, in which the students are adolescents or teenager. "Adolescence is a period of great stress and strain, storm and strife" - **Stanley Hall: Adolescence**. Thus teachers, teaching at secondary level of education keep a great responsibility to provide proper guidance and direction to their pupils. A **Tagore** rightly said that *a lamp can never enlighten another lamp unless it continues to burn his own flame, so until when a teacher is not satisfied with his own personal and professional life, he can't satisfy his students mind*. Thus it is very important for a teacher at secondary level to be stress free and satisfied with his own life, without this, it would be very difficult to use his full potentials in teaching, it may cause teacher freezing.

Teacher plays pivotal role in uplifting the standards of education and improving the quality and excellence in teaching learning process. Basically, In today's fast changing and demanding scenario the teachers are facing

the problem of teacher freezing which is not a function of single behaviour but depends on a variety of other factors. Therefore, In order to teach effectively on, secondary school teachers must feel emotionally and psychologically comfortable as well as they should possess desirable qualities viz. competence, effectiveness, innovativeness and change proneness etc.

### Challenges of teachers after getting married

It is very obvious that after getting married every working person has to keep double responsibilities related to his personal life as well as his professional life, hence they remains effortful to keep their responsibilities. But sometimes, they become fail to complete their job related task properly as well as they can't be able to spend valuable time with their family members and spouse because of other personal and family amenabilities, which may create dissatisfaction in their marital life and in their professional life too. If any teacher's children are well-adjusted, self-motivated, and respectful of him/ her and his /her partner; if the spouse supports his /her career goals; and if the teacher has a high level of energy, then he/ she may be able to handle the stresses involved in teaching and other job related works. But don't beat yourself up if you can't be extraordinary. Being an excellent or good teacher is a true achievement. Teaching is considered as a noblest profession and if a teacher will be supported by the family members, society and his organization then they will enjoy their work, and happily spend their time and energy in job related works, in other words we can say they will be devoted to their occupation. As teaching well sometimes requires a certain amount of unpaid overtime (grading papers, making lesson plans, and supervising field trips), but it is seen that married teachers often put a limit on the amount of overtime they are willing to work. The reason behind it is that they have to keep their responsibilities of their family members too. Married teachers want to save their time for their family. Hence, they don't want to work overtime. They care about their students and do their best to help them-but not at the expense of their own families.

### Teachers Freezing

Teacher freezing is a negative psychological expression or experience of having no interest in teaching and other job related works. Teacher freezing does not means inability but in deeper sense it means that if a teacher have all potentials to teach well but due to some intellectual physical psychological social and moral problems he is unable to use his full potentials. So these unused, underused and stagnated potentials of teachers are termed as teacher freezing. It is and ongoing problem in world wide. Teacher freezing may be the outcome of taking double responsibilities, (of job and home) simultaneously, overloaded work pressure and expectations of society. It pertains to feelings, experiences, and emotions of teacher which affect adversely to their teaching and other related works. ***Teacher freezing refers not only the teacher inability but also means the overall unused, under used and stagnated intellectual psychological, social, physical and moral potentialities of teachers.*** 3Teacher freezing will have negative effect on the quality and standard of teaching as well as it may have serious far reaching consequence. There are 8 operational areas for teacher freezing (Haseen Taj. 1998)



Generally teaching is defined in terms of intellectual qualities of teachers but many researchers have shown that teaching is not only an intellectual phenomena but it also includes psychological as well as emotional qualities of a teachers. Thus, psychological, emotional, social, moral as well as physical well being of teacher is very important for effective teaching.

Taj, Haseen (1999) conducted a study on “De-freezing teachers for revamping school effectiveness”, with the main objective to study the effect of teacher freezing on school effectiveness. The minor objectives of the study were as follows...

- (i) To investigate the causes for teacher freezing
- (ii) To Develop and standardize teacher freezing scale.
- (iii) To identify, whether there is any effect of background and situational variables on teacher-freezing.
- (iv) To identify the extent of relationship between teacher freezing and psycho-social variables.
- (v) To investigate the effect of teacher-freezing on school effectiveness measured by students' academic performance and teacher effectiveness.

The study was conducted on 430 secondary school teachers. The causes for teacher freezing were identified through discussions with teachers. The Teacher Freezing Scale was developed by the researcher and used as a tool to collect the data. The collected data were treated with mean, SD, 't'-test and correlation. Major Findings of the study were (i) The causes for teacher freezing were broadly categorized as psychological causes, educational causes, social causes, and situational causes, (2) Five major dimensions of teacher freezing, viz., Intellectual, Psychological, Social, Physical, and Moral were identified and were distributed over eight operational areas of Teacher-Freezing scale viz., teaching, research, evaluation, resistance, interaction, organization, participation, and moral, (3) Seventy four items were finally retained in the Teacher Freezing Scale after tryout. (4) The Teacher Freezing Scale had a split-half and test-retest reliability of 0.80 and 0.77 respectively. (5) Content validity, cross validity was also established for the scale. (6) The type of school management, teaching experience, educational qualification, age, and subject specialization, type of family and size of school had a significant impact on the secondary school teachers' freezing. (7) Except one psycho-social variable i.e. frustration of teachers freezing, all other variable, viz., leadership effectiveness, high job satisfaction, high morale, higher organizational climate, teachers' participation in school administration, high self-confidence, and pleasant home environment were found to be negatively related to teacher freezing. (8) Boys perceived their teachers to be more frozen as compared to girls. (9) Students belonging to Government schools perceived their counterparts from private aided. And private un-aided schools. (10) Secondary students with English medium, large size of school, and small size of the family and nuclear family backgrounds perceived their teachers to be more frozen than their counterparts. (11) Secondary school students' academic performance was strongly and negatively related to their perception of teacher freezing. (12) There was a negative relationship between teacher freezing and teacher effectiveness. This study explored the concept of teacher freezing by developing and standardizing a Teacher Freezing Scale.

Actually, this was the path breaking study in the field of teaching, teacher effectiveness and their freezing as this study thrown light on the basic concept of Teacher freezing and its real causes. Haseen Taj (1998) assessed the factors which are responsible for teacher freezing are as follows..

1. Family problems
2. Tradition, rituals especially in the case of females
3. Mental or physical illness of teacher.
4. Lack of proper motivation and interest.
5. Low job satisfaction.
6. Negative thinking
7. Too much burden and complexity of task.
8. The conflict of old methods with the new ones.
9. Social environment
10. Poor environment and working condition
11. Low compensation according to their skills.
12. Administration & authorities

#### **REVIEW OF RESEARCHES ON TEACHER FREEZING IN RELATION TO DIFFERENT VARIABLES**

Teacher freezing is a crucial problem. A number of researches have done in this field, showed that teacher freezing is a major problem of teachers. Most of the teachers face this problem but very few of them express it on their behaviour. To know the basic and practical causes of teacher freezing we must go through the researches, done in this field.

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**TEACHER FREEZING DUE TO JOB RELATED REASON**

**Singla, V (2014)** studied difference between teacher freezing, organisational commitment and job satisfaction of male and female secondary school teachers. A sample of 150 teachers (75 male and 75 female) teaching in secondary school teachers of Kurukshetra district of Haryana state was selected by simple random sampling technique. For analysis and interpretation of the selected data 3 standardized tools- teacher freezing scale developed by job satisfaction scale, developed by Meera Dixit (1993) and , organisational commitment scale developed by Hyde & Roy (1992) were used. The results of the study showed that teacher freezing and job satisfaction of secondary school teachers was not significantly different, but there was found a significant difference in organisational commitment of male and female secondary school teachers. Findings of the study suggested that acquiring new knowledge and information should be encouraged for secondary school teachers. They should be motivated to take initiative for organizing orientation programme, refresher courses, seminar, conferences and workshops, etc. for exchanging innovative ideas on secondary school.

**Goswami, M. (2007)** conducted a research to investigate organizational climate of the secondary schools of Kamrup district in relation to teacher freezing and academic performance of students, and the result of the study revealed overall teacher freezing was highest in rural schools and lowest in private schools. It was also found that the level of teacher freezing affected by different types of organizational climate and teacher freezing differed significantly in relation to six types of organizational climate. Findings suggested that closed climate school's teachers were highly freezed as compared to the teachers of open and familiar climate schools. teachers freezingness was found lowest in autonomous climate schools. various dimensions of teacher freezing as group behaviours characteristics disengagement and alienation and leader behaviour humanized thrust were found positively related with teachers freezing, whereas group behaviours characteristics esprit and intimacy, leader behaviours characteristic psycho-physical hindrance, controls, and production emphasis were found negatively related with organizational climate.

**Kumar, Dinesh (2013)** conducted a study focused on the relationship between teacher freezing and job satisfaction of special educators. It also tries to find out the difference between teacher freezing and job satisfaction of male and female special educators. A sample 80 special educators (40 male and 40 female) was drawn through a purposive sampling technique from the secondary school having inclusive education for disabled at secondary stage. The result of the study indicated that there was found no significant relationship teacher freezing and job satisfaction of special educators. Further there was found no significant between teacher freezing and job satisfaction of male and female special educators.

**TEACHER FREEZING DUE TO PERSONALITY RELATED REASON**

**Poonam (2018)** conducted a research regarding teachers freezing among secondary schools teachers in relation to their personality and organizational climate. The objectives of the study were: (i) to find out the relationship between teachers freezing and personality of secondary schools teachers, (ii) ) to find out the relationship between teachers freezing and organizational climate of secondary schools teachers, (iii) ) to find out the difference between teachers freezing of secondary schools teachers when categorised gender wise (male/female), locality wise (rural/urban) and types of school wise (govt/private). A sample of 320 secondary schools teachers of Haryana was selected by using random sampling technique. The result showed that there was found no significant teachers freezing of male and female secondary schools teachers. Urban school teachers were found to be more freezed than urban secondary schools teachers and private school teachers were found to be more freezed than government secondary schools teachers. A negative significant relationship was found between teachers freezing and organizational climate of secondary schools teachers. There was found a significant positive correlation between teachers freezing and neuticism (dimension of personality) among secondary schools teachers and a negative significant correlation was found between teachers freezing and extroversion (dimension of personality) among secondary schools teachers. Personality dimension and organizational climate were found to be significant but weak predictors of teachers freezing among secondary schools teachers.

**TEACHER FREEZING DUE TO SOCIAL REASON**

**Goswami, M. (2007)** conducted a research to investigate organizational climate of the secondary schools of Kamrup district in relation to teacher freezing and academic performance of students, and the result of the study revealed overall teacher freezing was highest in rural schools and lowest in private schools. It was also found that the level of teacher freezing affected by different types of organizational climate and teacher freezing differed significantly in relation to six types of organizational climate. Findings suggested that closed climate school's teachers were highly freezed as compared to the teachers of open and familiar climate schools. teachers freezingness was found lowest in autonomous climate schools. various dimensions of teacher freezing

as group behaviours characteristics disengagement and alienation and leader behaviour humanized thrust were found positively related with teachers freezing, whereas group behaviours characteristics esprit and intimacy, leader behaviours characteristic psycho-physical hindrance, controls, and production emphasis were found negatively related with organizational climate.

### TEACHER FREEZING DUE TO DEMOGRAPHIC VARIABLES

**Musheer,Z. And Dr. Rafiqui,Z.H.(2018)** conducted a study on teacher freezing level of secondary school teachers of Aligarh district U.P. with reference certain demographic variables. A sample of 160 secondary school teachers was selected for the study. Teacher freezing Scale (TFS) developed by Haseen Taj was administered on the sample to access teacher freezing of secondary school teachers. Mean, S.D. and t test were employed to analyse the data. The study revealed an average level of teacher freezing among secondary school teachers. There was found no significant difference in the level of teacher freezing of secondary school teachers on the basis of gender whereas a significant difference exist in the level of teacher freezing of secondary school teachers on the basis of their types of school (govt./ private) and teaching subjects of the teacher (art/science).

### EPILOGUE

A glimpse across the related review literature on Teacher Freezing revealed what it is mostly studied on secondary level of education with respect to different other variables as **Kumar (2006)** studied teacher freezing in relation job satisfaction and experience, **Massey(2010)** and **Kumar & Kamini ( 2013)**conducted a study of and teacher freezing and job satisfaction, while **Goswami (2007)** studied the organizational climate of the secondary schools in relation to teacher freezingness and academic performance of students. **Sexena & Jain (2013)** examined effect of medium of instruction on teacher freezing, while **Poonam (2018)** conducted research work on teacher freezing among secondary school teachers in relation to their personality and organizational climate. etc. In brief, we can say that As a teacher spends around seven hours a day in the school. If he is not happy and comfortable in the work place he won't be able to deliver his duties effectively. To tackle the problem of teacher freezing, efforts should be made like- to provide warm and conducive working conditions which will improve organizational climate. A faculty committee can be formed in each school for raising the healthy interactions for improving interpersonal relations of teachers with the administrators as well as management of the institution and among themselves. The provision of appointment of a psychologist who can act as a counsellor in the schools, on regular basis, can work wonders to maintain healthy organizational climate. Teacher can contribute significantly by attending to teachers personal, academic and social problems by arranging a counselling sessions or the provision may be made for a visiting counsellor who can pay visits in the school weekly or fortnightly. Due to the absence of facilities, it is not possible teachers especially the young ones become less interested in their profession. So efforts should also be made to provide those facilities and latest technology which can make the teaching learning process more effective and less stressful. Apart from pedagogical training which prepares teachers for classroom training, training in communication and management of persons and training for professional growth of the head of the institutions as well as teachers should also be arranged. As the studyof teacher freezing revealed that open and familiar climate decreases teachers freezing, hence, autonomous structure should be provided in schools with necessary and credible guidance wherever required( Poonam ,2018). But practically, due to lack of facilities and resources, this problem remains the same. Hence, the teachers of secondary level of school become fail to create interest in their teaching learning process. So, it is the time when government, administrators, management, policy makers and other teaching and non teaching staff including society should have to take the problem of teacher freezing seriously as the teacher is the pivot of the whole system of education and unless we make them powerful and dynamic ,the system will continue to become weaker and weaker. As Dr. R. P. Bhatnagar (2003) rightly express his views about the importance of a teachers by following lines.....

*Neither gold, nor machines, nor material,*

*Can make the system great and strong,*

*Only teachers,*

*Who for truth and honours sake,*

*Stand fast and suffer long,*

*Make the system great and strong.*

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**A STUDY ON THE ROLE OF CEO's IN THE STRUCTURE OF CORPORATE GOVERNANCE**

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**INTRODUCTION**

Corporate Governance is the popular expression nowadays in the hallways of force, in corporate circles, in financial specialist for in managing an account circles and so on. The partners, the regulars and shockingly the corporate themselves have been discussing corporate administration nowadays. At the point when this expression showed up in the U.S. Corporate writing in the mid nineteen seventies no one would have, in particular the corporate themselves, trusted that it would turn into an issue to figure with in the days to come. Barely two decades later, was it energetically examined by the corporate themselves in U.K.- So much with the goal that they volunteered to subject themselves to certain corporate administration standards in light of a legitimate concern for all partners. India went with the same pattern.

**CONCEPT OF CORPORATE GOVERNANCE**

Corporate Governance is the popular expression nowadays in the hallways of force, in corporate circles, in financial specialist for in managing an account circles and so on. The partners, the regulars and shockingly the corporate themselves have been discussing corporate administration nowadays. At the point when this expression showed up in the U.S. Corporate writing in the mid nineteen seventies no one would have, in particular the corporate themselves, trusted that it would turn into an issue to figure with in the days to come. Barely two decades later, was it energetically examined by the corporate themselves in U.K.- So much with the goal that they volunteered to subject themselves to certain corporate administration standards in light of a legitimate concern for all partners. India went with the same pattern.

Corporate administration changes in India have develop an extensive variety of institutional and corporate activities that incorporate

- Enlightening the working of capital markets;
- Transforming organization board structure and operational frameworks to make the governing body more responsible to the shareholders;
- Guaranteeing more powerful security of minority financial specialists through advancing unrivaled straightforwardness of operations and higher standards of data exposure;
- Transforming administration instruments of monetary organizations.

**CURRENT CORPORATE SENARIO**

The Confederation of Indian Industry turned out with a satisfying corporate administration strategy. At last, the Kumara Mangalam Birla Committee turned out with suggestion on the matter. SEBI again solicited the part from Infosys Mr. N.R. Narayana Murthy to suggest corporate administration – connected activities for Indian Community. These were at last adjusted and forced by SEBI by connecting the stock trade on which corporate required posting of their speculations.

This code, also called proviso - 49 of the Listing Agreement in corporate circles is as a rule intermittently investigated by the controller with regards to the evolving environment. In actuality the most recent change to the said condition 49 was affected on October 29, 2004 which obviously will be material to the current recorded corporate who looks for posting of their securities interestingly the altered statement 49 will be taking effect right now. The change has been somewhat broad and widely inclusive as far as the necessities put on the corporate this has persuaded the partners that the legislature and in addition the controller are not regarding the matter as a passing prevailing fashion. Corporate administration has come to stay in the nation.

**CURRENT STATUS**

There are various advancements in business part at across the nation and worldwide level which assign that a point by point study is necessary in corporate administration range. All the more as of late, in December 2009, the Ministry of Corporate Affairs (MCA) distributed an imaginative set o "" Corporate Governance Voluntary Guidelines 2009", planned to convince organizations to embrace more advantageous practices in the operation of sheets and board advisory groups, the engagement and insurgency of outer reviewers, and making a shriek blowing instrument.



## CEO AND BOARD

The Chief Executive, Executive chiefs and the key administrators of the organization frightened in general dealings of the organization. The panel trusts that the administration ought to complete the accompanying capacities;

- Supporting the board in its choice making hone in appreciation of the organization's methodology, arrangements, set of accepted rules and presentation focuses by giving fundamental inputs.
- Implementing the arrangements and set of principles of the board.
- Managing the everyday issues of the organization to best finish the objectives and objectives set by the board to develop the shareholders esteem.
- Providing suitable, particular, specific and material data, together with money related matters and prohibition, to the board, board-advisory groups and the shareholders.
- Ensuring assention of all regulations and laws.
- Ensuring opportune and effective support of the shareholders and to watch shareholders' rights and hobbies.
- Location up and actualizing a fruitful inward control framework, sufficient with the business prerequisites. Implementing and consent to the Code of Conduct as set around the board.
- Co-working and encouraging skillful working of board advisory groups.

## REVIEW OF LITERATURE

**Mary L. Schapiro**, corporate administration is about keeping up a suitable parity of responsibility between three key players; the partnerships' proprietors, the chiefs whom the proprietors choose, and the administrators whom the executives select. Responsibility requires great straightforwardness as well as a compelling intends to make a move for poor execution or terrible choices".

**Gurbandini Kaur**, The World Bank characterizes corporate administration as `` The mix of law, regulation and proper intentional private part rehearses that empower the company to draw in budgetary and human capital, perform proficiently and in this manner sustain it by producing long haul financial quality for its shareholders, while regarding the enthusiasm of partners and the general public in general".

**Gupta**, examined the corporate administration reporting practices of 30 Indian Companies recorded on the BSE Sensex, removing corporate administration reporting area from the yearly reports. The discoveries showed that however the firm gave data identified with every one of the measurements, there was a significant fluctuation in the degree and nature of exposures made by organizations in the yearly report. Utilizing slightest square relapse technique, the noteworthy determinant of corporate administration revelations are size of the organization, number of free chiefs and supervises posting status.

**Parthasarathy**, investigated the relationship between firm execution, corporate administration and administrative remuneration for Indian firms. It is found that the CEP Compensation is not identified with any of the gainfulness measures. Then again, the firm size is a noteworthy determinant of CEO Compensation. The outcomes likewise recommended that CEO's who are the promoters of their organizations get essentially more pay than their customary partners. What's more, this concentrate additionally demonstrated that CEO's of open area associations are fundamentally come up short on, when contrasted with their partners in private division.

## OBJECTIVES OF THE STUDY

1. To report the corporate administration hones in different gatherings of industry,
2. To inspect the act of the corporate administration for Board of Directors;

### Roles of CEO's

#### N=50 CEO's & EXECUTIVES

	N	Mean	S.D	C.V
CEO has a large deal of power	50	4.6	8.86	192.61
CEO does not take part much in making fundamental decisions pertaining to the company	50	4.3	7.27	169
The Board of Directors makes all the elementary decisions	50	2	5	250
The board of directors acts only as a prescribed decision making body	50	4.5	8.62	191.4

Note- A five point scale ( 1= strongly disagree and 5= strongly agree )

**Responsibilities of Board of Directors****N=50 CEO's & EXECUTIVES**

	<b>N</b>	<b>Mean</b>	<b>S.D</b>	<b>C.V</b>
-Financial news are reviewed	50	4.6	8.86	192.61
-Criteria such as ROA and ROI are recurrently reviewed	50	4.2	7.25	172.58
-ROI are commonly monitored	50	4.1	5.41	132.00
-The board strongly monitors top managements strategic decision making	50	4.1	5.94	145.00
-The board officially evaluates performance of top management in regularity held reaction meeting	50	3.5	3.96	113.17
-The board is actively involved in influential company strategy	50	4.4	7.48	170.00
-The board and top management meet often to converse the company's future strategic choices	50	2.4	3.10	129.37
-Board members give top management sufficient guidance on company strategy	50	4.2	5.88	140.00

Note - A five-point scale ( 1= strongly disagree and 5= strongly agree )

Respondents consider that the fundamental obligations of the governing body is to survey money related news arranged by top administration. Return on resources (ROA) and Return on speculation (ROI) capital are as often as possible explored in executive gatherings. Money streams are frequently talked about in executive gatherings. Return for capital invested of vast individual stores are all the time checked by the load up. The board nearly screens top administration's strategic choice making. The board formally assesses presentation of top administration in consistently held criticism gatherings. The board more often than not concedes to the CEO's judgment on extreme key choices. The board is energetically included in molding organization system. The board and top administration meet frequently to talk about the organization's future considered decisions. Board individuals give top administration adequate advice on organization system. Chiefs give counsel and direction to top administration in arrangements outside executive gatherings. All respondents demonstrate keep up for the parts of directors.

**Findings & Suggestions**

To undertaking for better Corporate Governance the vast majority of the respondents recognized shareholders investment, upgrading the norms of book keeping, audit exposure and leading and distributed corporate governance evaluations. With respect to the control of top managerial staff, most respondents concurred the sheets are enthusiastically included in planning long haul techniques, plays a vital position in selecting, checking, reporting CEO, truly appraisal key official and chief compensation. Ensure the uprightness of the company's monetary reporting, suitably divulgence and action correspondence with shareholders and partners and guarantee the adequacy of different corporate Governance.

**Conclusion**

The conclusion drawn from this study was that great Corporate Governance practices were vital to the dynamic improvement of the association. The present study in anticipated that would serve as a pointer to the Corporate Governance rehearses in Corporate part. This study tosses some light on the present Corporate administration hones in select association furthermore propose for its change on a guide for the Corporate houses for achieving global principles of Governance.

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**RISKS AND FRAUD IN E-COMMERCE**

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**Abstract**

*E-commerce is the buying and selling of goods and services. It's very popular to buy anything and pay online, transmitting funds or data over an electronic network. The success or failure of an e-commerce business depends on security and privacy. E-business fraud is a growing concern and threat to e-businesses. E-businesses will have to continue to increase prices as costs from fraud increase. Businesses are already struggling as the recession is felt by everyone.*

*Keywords: Risk, E-Commerce*

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**Introduction**

Fraud is broadly defined as an intentional deception made for personal gain or to damage another individual. The difficulty of checking identity online, the ease with which fraudsters can redirect browsers to dishonest sites, and the international dimensions of the web, all make internet fraud the fastest growing area of fraud [Wikipedia 2010]. E-businesses, which conduct some or all of their business online, are particularly vulnerable to internet fraud.

Electronic commerce or e-commerce is the buying and selling of goods and services. It's very popular to buy anything and pay online, transmitting funds or data over an electronic network, primarily the internet. These business transactions occurs business-to-business, business-to-consumer, consumer-to-consumer or consumer-to-business. The terms e-commerce and e-business are often used interchangeably. Nowadays people are not going to the shops to buy things but rather checking the details and pictures of the product on a device, then ordering and paying online; after a few days, the seller will deliver that thing to your door. Electronic commerce is a process that enables sale or purchase of goods and services over computer networks with methods designed for this purpose.

Most of the buyers using the internet buy items from around the world using e-commerce, which can be used business-to-business, business-to-consumer, business-to-government, consumer-to-business, consumer-to-consumer, consumer-to-government, government-to-government, government-to-business and government-to-consumer. Business-to-business is the e-commerce relationship between organizations; business-to-customer is the provision of service by a business to a consumer; customer-to-customer is the e-commerce relationship among consumers. Although e-commerce provides a 24/7 unlimited shopping platform, security remains a primary concern for all customers. There are many issues, in fact: anonymity of merchants, misrepresentation of products, consumer fraud and security problems (Niranjanamurthy et al, 2013).

**Objectives of the study**

- To study types of E-business fraud
- To study the advantages of E-Commerce to businesses

**Risks and Security In The Way Of E-Commerce**

The success or failure of an e-commerce business depends on security and privacy (Tripathy and Mishra, 2013). Users' trust is essential to business development (Rane and Meshram, 2012). With the popularization of electronic payment, security issues have become a key problem. Theft of personal data (privacy) and unauthorized access (security) are serious issues in e-commerce for customers and service providers alike. Privacy is the ability of an individual to control the terms under which their personal information is acquired and used (Culnan, 2000). An individual's privacy, as such, is always in an inherent state of tension, since it must be defined in conjunction with the capabilities of others to transact business and even to control their own privacy. Customers are concerned about the risk of reuse of their personal data for unrelated purposes without their consent.

**Types Of E-Business Fraud****System Manipulation**

Some things never change, and for fraudsters system manipulation is one of them. Many of the fraudulent activities that have been used for traditional businesses can be applied to e-businesses as well. False invoices, false inventory adjustments, and cash manipulation are just a few of the activities fraudsters are fond of using.

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This type of fraud is much more technical than using stolen credit cards or returning different items for credit than were shipped; however, it is a serious challenge for e-businesses.

**Stolen Credit Cards**

One type of fraud faced by e-businesses is perpetrated by terrorists and other criminals, with the goal of money laundering or the use of stolen credit cards to acquire goods. Fraud perpetrated by online terrorists is often done by individuals residing in third world countries where governments, laws and business practices provide a wide open arena to commit fraud. Terrorists can easily perpetrate the fraud because the internet removes all time and geographic boundaries and opens a vast new market of opportunities. Recent terrorist use of credit cards shows their vulnerability to misuse in financing illegal activities.

**Friendly Fraud**

There is also a rise in “friendly fraud” by everyday consumers. Friendly fraud describes a consumer who makes an internet purchase with his or her own credit card, receives the goods or services, and then issues a charge back through the card provider. Friendly fraud is committed by the customer as a way to reduce the balance on their credit card but still use or keep the product. Customers accomplish friendly fraud by claiming they never received the product, the product was not what they ordered or not good quality, or they claim they never authorized the order.

**Advantages of E-Commerce to Businesses in India**

There is a rising awareness among the businesses in India about the opportunities offered by e-commerce. Ease of Internet access is the critical factor that will result in rapid adoption of Net commerce. Safe and secure payment modes are fundamental along with the need to invent and popularize innovations such as Mobile Commerce. E-commerce provides a new place for connecting with consumers and conducting transactions. Virtual stores operate 24 hours a day, 7 days a week. Many virtual retailers represent a single company while others, such as Top Online Shopping (toponlineshopping.com), represent a association of companies.

**Conclusion**

Business owners should develop an internal policy to address the potential risks and train your staff on implementing it. E-business fraud is a growing concern and threat to e-businesses. E-businesses will have to continue to increase prices as costs from fraud increase. Businesses are already struggling as the recession is felt by everyone. Customers are cutting back on spending and product costs are soaring. As a result, e-businesses are facing many risks, and without effectively controlling fraud, many will fail to survive this economically difficult time.

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**OPTICAL AND STRUCTURAL PROPERTIES OF  $\text{Eu}_2\text{O}_3$  DOPED ALUMINIUM ZINC BORATE GLASSES****Dilipkumar V. Meshram and Madhav N. Rode**

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**Abstract**

In present work of glasses system  $(x)\text{Eu}_2\text{O}_3-(1-x)\text{Al}_2\text{O}_3\text{-NaO-B}_2\text{O}_3$  with  $x = 0$  (ANB), 0.05 (Eu:ANB) were prepared by melt-quench technique. The amorphous nature of the glass samples has been confirmed using powder X-ray diffraction (XRD) study. The photoluminescence emission spectrum of the prepared results show were used to emission under at 394nm excitation exhibits three emission bands centered at 580, 591 and 615 nm corresponding to  $^5\text{D}_0$  to the  $^7\text{F}_j$  ( $j=0-2$ ) transitions of  $\text{Eu}^{3+}$  ions, respectively. The excitation spectra show a located around 300-450 nm for the emission wavelength fixed at 615 nm.

**Keywords:** Eu: ANB glass; Powder -XRD; photoluminescence properties.

**Introduction**

In past few years, many researcher investigation the optical and luminescent properties of rare earth doped materials are several of scientific applications in fields of laser technology and development of new optical devices, such as light sources, fiber optics, white light-emitting diodes, optical memory devices etc [1-3]. The glasses and crystal which are formed by doping with rare earth ions are found to be optical and luminescent materials as they have high emission efficiencies [4-6]. The glassy materials such as phosphate, borate, fluoroborate and tellurite have been widely investigated with the purpose to know their utility for optical and luminescence applications [7, 8]. There are many papers available in literature about the glasses having good optical studies [3, 5, 9]. Recently, few researchers were investigating the  $\text{Eu}^{3+}$  doped borate glasses study optical and luminescent properties of rare-earth ions. Recently, reported by Ratnakaram et al [3] Luminescence performance of  $\text{Eu}^{3+}$ -doped lead-free zinc phosphate glasses for red emission. The preparation and Red Long-Afterglow Luminescence of Eu and Dy doped  $\text{Y}_2\text{O}_3$  reported by Xie et al [10]. The Structural characterization and luminescent properties of a red phosphor series:  $\text{Y}_{2-x}\text{Eu}_x(\text{MoO}_4)_3$  ( $x=0.4-2.0$ ) reported by Wang et al [11]. The Pechini method using and prepared by luminescence investigation of  $\text{Eu}^{3+}$  ion in the  $\text{RE}_2(\text{WO}_4)_3$  matrix (RE=La and Gd) reported by Kodaira et al [12].

In this paper, the investigations on luminescent properties of pure and  $\text{Eu}^{3+}$  doped aluminum zinc borate glasses prepared by melt-quench technique. The structural properties and photoluminescence of the studied samples pure and  $\text{Eu}^{3+}$  ion doped glasses has been reported in this report.

**Experimental Techniques****2.1 Materials and Synthesis**

Aluminium oxide ( $\text{Al}_2\text{O}_3$ ) was purchased from LOBA Chemi, India. Sodium carbonate ( $\text{Na}_2\text{CO}_3$ ) and europium oxide ( $\text{Eu}_2\text{O}_3$ ) were purchased from Fisher scientific, India. A boric acid crystal ( $\text{H}_3\text{BO}_3$ ) was obtained from sd-Fine Chemicals, India. All the chemicals used were of high purity analytical reagent grade and used as received without further purification.

An alkali borate glass aluminium sodium borate was prepared by the melt-quenching method. The chemicals  $\text{Al}_2\text{O}_3$ ,  $\text{Na}_2\text{CO}_3$ ,  $\text{Eu}_2\text{O}_3$  and  $\text{H}_3\text{BO}_3$  with 99.99% purity used as the starting raw material. Appropriate amounts of the raw materials were crushed in a mortar with the help of pestle to make the homogeneous mixture. Mixtures were then allowed to calcine at  $400^\circ\text{C}$  for 1 hour to remove moisture and then powder sample was melted in a platinum crucible in an electric furnace for 15 minutes at  $1000^\circ\text{C}$ . The obtained glass was cut into  $4 \times 4 \text{ mm}^2$  after optically polished plate for characterization. The Powder X-ray diffraction (XRD) of powder glass samples was recorded using a Rigaku Miniflex-II X-ray diffractometer using  $\text{Cu-K}\alpha$  radiation to check the amorphous state of the prepared glass samples at the scanning rate of  $8 \text{ deg./min}$  and  $2\theta$  varied from  $10-80^\circ$ . Photoluminescence (PL) emission and excitation spectra were measured on fluorescence spectrophotometer (Hitachi F-7000, Japan) at room temperature.

**Result and discussion****Powder XRD study**

Powder XRD patterns were taken to measure the glassy nature for all the glass samples. The typical XRD profile of the  $(x)\text{Eu}_2\text{O}_3-(1-x)\text{Al}_2\text{O}_3\text{-NaO-B}_2\text{O}_3$  glass doped with  $x = 0$  (ANB) and 0.05 (Eu:ANB) is shown in fig. 1. The patterns exhibit a few broad peaks rather than sharp peaks that reflect amorphous nature of the material.

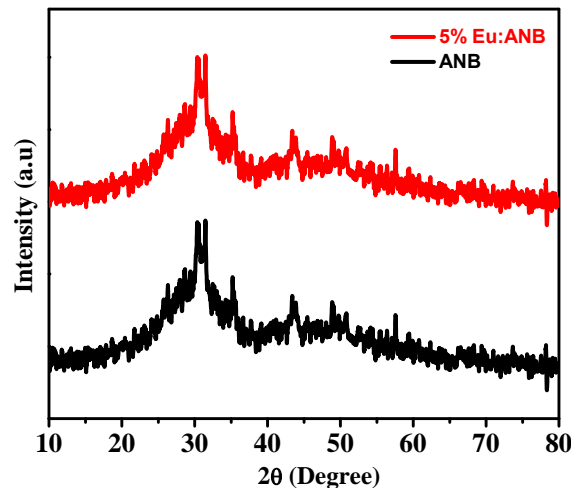


Fig. 1 Powder XRD patterns ANB and Eu:ANBglass.

### PL study

The PL emission spectra of  $\text{Eu}^{3+}$  doped ANB glasses were recorded at an excitation wavelength of  $\lambda_{\text{ex}} = 394$  nm. Fig. 2 shows the room temperature PL emission spectra of  $\text{Eu}^{3+}$ :ANB glasses with  $x = 0.05$  concentrations of  $\text{Eu}^{3+}$  respectively, in the wavelength range 450 to 700 nm. The distinct emission lines lying between 550 and 650 nm are observed due to transitions from excited  $^5\text{D}_0$  to the  $^7\text{F}_j$  ( $j=0-2$ ). The origin of these transitions (electric dipole or magnetic dipole levels of  $\text{Eu}^{3+}$  ions) from emitting levels to terminating levels depends upon the location of  $\text{Eu}^{3+}$  ion in ANB lattice, and the type of transition is determined by selection rules [13]. The weak emission in the vicinity of 590 nm is ascribed to the magnetic dipole transition of  $^5\text{D}_0$  to  $^7\text{F}_1$ . The weak peak near 580 nm is ascribed due to transition from  $^5\text{D}_0$  to  $^7\text{F}_0$  of  $\text{Eu}^{3+}$  ion in the ANB [14]. The excitation spectra have been recorded in spectral range from 200 to 450 nm and output was monitored at  $\lambda_{\text{em}} = 615$  nm as shown in fig. 3.

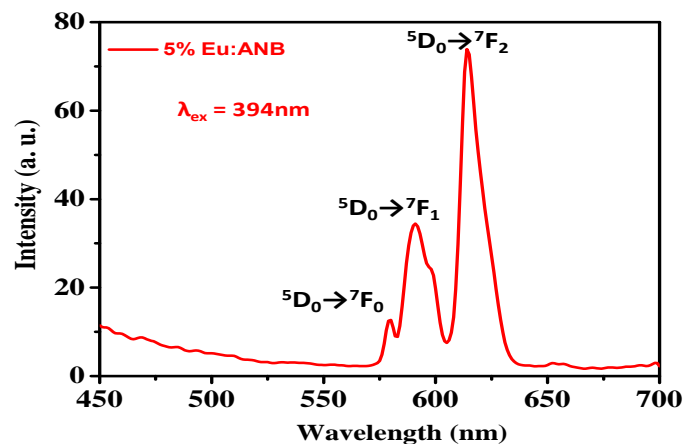


Fig. 2 Emission spectra of Eu:ANB glasses.

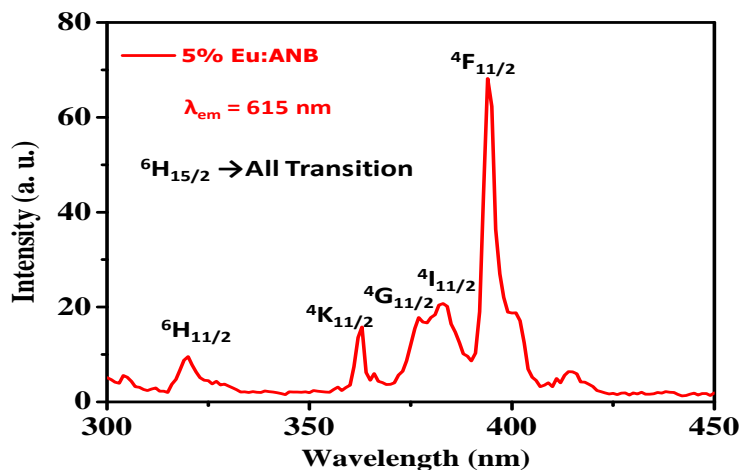


Fig. 3 Excitation spectra of Eu:ANB glasses.

## Conclusion

The ANB and Eu:ANB glasses are successfully synthesized by melt quenching method. The amorphous nature of the glasses was confirmed by XRD technique. The photoluminescence of  $\text{Eu}^{3+}$  ions were studied and related to the host matrix nature. It is clear that there are three emission bands 580, 590 and 615 nm over the excitation wavelength of 394 nm these bands correspond to the electron transitions from the discrete levels  $^5\text{D}_0 \rightarrow ^7\text{F}_0$ ,  $^5\text{D}_0 \rightarrow ^7\text{F}_1$  and  $^5\text{D}_0 \rightarrow ^7\text{F}_2$  transitions respectively for  $\text{Eu}^{3+}$  and which confirmed the presence of trivalent rare-earth ions in the glass matrix. It also provides guidelines for several applications in connection with industrial experience and technological needs.

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**COOLIE: A CRITICAL APPRECIATION OF THEMES IN THE NOVEL****Dr. Asha g. Dhumal**

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**ABSTRACT**

*Indian literature has a huge heritage. There are numerous writers who wrote in their regional languages, in Hindi as well as now translate into English. Right from Rabindranath Tagore to the writers of post modern era i.e. Chetan Bhagat, Mahesh Dattan. In the nineteenth century Jayant Mahapatra, Kamala Das Mulk Raj Anand etc. are known Indian English writers. Mulk Raj Anand was a prominent Indian authors novels, short stories, and critical essays in English language. In India, he is well known for his realistic and sympathetic portrayal of the poor. He is considered as a founder of the English-language of Indian novel. He is one of the founding fathers of Indian English novel, the short-story writer and art critic. Mulk Raj Anand was among the first to use Punjabi and Hindustani idioms into English writings. His works 'Untouchable' (1935) and 'Coolie' (1936) gained him wide popularity. He was highly influenced by the world of Mahatma and his writings reflected the same. As a staunch Marxist, Anand never failed to draw a realistic picture of the poor in India. Anand was the "fiery voice" of those exploited and his analysis of the socio-political situation in his work reflects that spirited fight against social injustice. He was a recipient of the civilian honour of the Padma Bhushan. The aim of the present paper is a critical appreciation of the themes in his novel Coolie.*

*Keywords: Hunger, Starvation, Degradation, Misery, Sufferings, Exploitation, Encounter etc.*

**INTRODUCTION**

Indian literature is well-known for its cultural and literary heritage. Epic, novel, dramas, poetries are the several genres of literature that is in all Indian regional languages as well as Hindi. Even now there are translated and direct English writing. Novels are always the matter of copy to dramas' theme. The novel 'Coolie' is written by Mulk Raj Anand in 1936, this made Anand's position as one of India's leading English authors. The novel is highly criticizing the British rule in India and Indian caste system.

**The Plot of the Novel:** The plot revolves around a Munoo, 14-year-old boy and his plight because of poverty and exploitation becomes more complicated because of the social and political structures. Anand tried to break the traditional way of life. A sort of eye opening part of life is reading novels in Indian English writing written by writers like Mulk Raj Anand is. Coolie is one of those novels which can be categorized in the best and interesting novels written in 1930. This paper comprehends and understands his suffering and exploitation and also critically evaluates various themes in the novel. Anand was awarded the Silver Wedding Fund Scholarship of 300 pounds a year. His student life was disturbed by the coal miners' strike in Great Britain in 1926. The Government adopted the repressive measures to break the General Strike which resulted into the miner's strike.

**Observation of the Violence by Anand:** Anand observed the violence from a close quarter; international Socialism seemed to be the only solution to the problems of the world. Anand observed that the West with all its wealth and its allegiances to democracy was not free from a discreet despotic mind set. After the strike Anand bought a copy of The Communist Manifesto by Marx and Engels and this had a great impact on him. He writes in, Apology for Heroism, that, "a whole new world was opened to me. All the threads of my past reading, which had got tied up in knots, seemed suddenly to straightened out, and I began to see not only the history of India but the whole history of human society in some sort of inter-connection" (1946:67-8).

**The Vice of Suppressed:** Anand became the voice of the oppressed. In India his work has been considered as propaganda. The Marxist-oriented, All India Progressive Writers Association accompanied as a decadent in 1949 as he found evil and cunning both in the poor and in the rich alike. Ideologically influenced by the left Anand was worried about the humanistic values'. He was believer of man's latent goodness. Socialism alone can provide the right climate for man's total development. According to Anand. Anand's humanism was based on Marxism. An individual's development is at the centre of Marxist thought. There is strong evidence of a close relationship between Marxism and Humanism in Anand's work. He wrote extensively on art and stated that art reflects life; but could not be taken as life itself. Anand himself did not belong to the marginalized sections of society provided he the necessary understanding that there was a distance between art and life. His political ideologies therefore have a definite place in the study of his novels. They arise from his concept of literature that reveals life in all its contradictions. To him, a work of art is first a social event and the duty of a novelist is to create but not to determine. His obligation to his fellow men lies in changing the world, making it a better place for each one of us.

**VOICE OF THE EXPLOITED**

The voice of the suppressed and exploited is represented in Coolie. Anand depicts even the lower caste rejects and casts away the Coolies. When Munoo arrives in Bombay and takes refreshing drink, as a Coolie the proprietor tells him to sit on the floor and not on the chairs; he is treated like a leper ““Oh! Look, Mummy! Our coolies are there cried little Circe. Her mother shushed her and asked her to behave. The sights of the creatures were challenges to the complacency of the ladies and gentlemen who had come for tea”(298). Experiences as a servant, a factory worker and a mill worker are Munoo's class identity. As a factory and a mill worker he is of the working class; in each he has a productive role whether as a servant or a worker. His identity as a coolie is reduced to nothing. The two extremes of the wealthy imperialist bourgeoisie and the Coolie serve as objects of hope and fear in class system. Each class emulates and aspires to attain the status of next superior class it also harbors a fear of being de-classed. A product of ideology rather than economics as seen in Anand's introduction of Prabha's past as a Coolie who has risen to the ranks of a Seth is the anxiety in class relations is. Ideological undercurrent that moves in the entire class system is found in the novel. The imperialist bourgeoisie's fear of the 'native' being equal to him both economically and socially infuses in him a sense of insecurity for which he engages in abuse and exploitation in the name of racial superiority.

**TO INTRODUCE THE MARGINALIZED WRITING**

The life of an orphan Munoo despised by society, rejected by his relatives and oppressed by his masters is depicted in the novel. He avails chances of progress but his badluck produces hindrances in his way. The novel on an epic scale follows the tragic odyssey of Munoo as he finds himself in different class of society in different locations- the village, the towns, the big city, the hill station- each is not away from the ideology of exploitation and suppression. In Conversation s in Bloomsbury, Anand writes that, “...our epics have everything Love and War and death and jealousy and utensils and dice and things out of the toilet” (1993:92). Different ideologies such as Capitalism, Imperialism, Industrialism and Communalism to show their influence on the dispossessed and socially oppressed are introduced by him. All the negative aspects of the world are experienced by Munoo. From innocence to experience his journey is mediated through ideologies of suppression and empowerment.

**CRUELTY AND HYPOCRISY IN INDIAN FEUDAL LIFE**

Anand exposes the “cruelty and hypocrisy of Indian feudal life...” (1946: 53). Munoo is full of life, high spirits and has a zest for life. Munoo's life in the village is not romanticized by Anand. Munoo the leader of the village boys was an expert in tree climbing. His life in the village is not a joyful one; the death of his parents haunted his life. A realistic portrayal of Munoo's life in the village which is not free from exploitation is portrayed by Anand. The novel points at the denial of basic necessities of life to a simple and landless peasant boy. We can see that Munoo is aware of his deprivation:

*He had heard of how the landlord had seized his father's five acres of land because the interest on the mortgage*

*“Covering the unpaid rent had not been forthcoming when the rains had been scanty and the harvest bad. And he knew how his father had died a slow death of bitterness and disappointment and left his mother a penniless beggar, to support a young brother-in- law and a child in her arms... the sight of her as she had laid dead on the ground with a horrible and yet sad, set expression on her face had sunk deep into him” (II).*

**BRITISH RULE AND ITS INFLUENCE IN INDIA:**

Anand's conviction that the British Empire not only has exploited India's natural resources, it also degraded and debased the character of the Indians who were serving it is illustrated by the episode. A group of native flatterers who looked up to the English sahibs, cowering before them and becoming easy prey for exploitation in the hands of their masters is created by it. The Indians like Nathoo Ram, Daya Ram had lost their sense of humanity, decency, and self-worth. They are devoid of in the service of the Raj and lose all feeling of affection with their fellow men leave alone their countrymen. The sahibs who visited at their homes. Nathoo Ram's reaction is evidence enough of the way the natives look up to the gore sahibs, after the disaster of the tea party he goes to drop Mr. England and returns with “...tear- filled eyes” (59) Their status in society, their superiority over others defines it. On the contrary we have Dr. Prem Chand, an independent medical practitioner and not subservient to the English. The creation of sycophants is another result. An industrial-capitalist ideology because it was obvious that they were themselves solely concerned with profit was brought to India by Britishers. The direct result of British rule is the plight of Munoo and others of his kind. The question of freedom in a Capitalist society is raised by novel.

**CONTRASTING THE RICH AND THE POOR**

The rich merchants in starched Muslims against the dark Coolies in rags, the impressive bungalows of the English residents looks down on the congested slums of the Coolies is contrasted by Anand. The garish

opulence exists alongside rampant filth, deprivation and poverty. He is overpowered by the confused medley of colours, shapes and sounds of Bombay's strange, hybrid and complex character as soon as Munoo emerges from the station. There are Europeans in immaculate suits, Parsis in frock suits and white trousers, Mohammedans in long tunics, Hindus in Muslim shirts and dhotis; there are Arabs, Persians and Chinese the road swarming with trams, cars and motorcycles. And ever present are the lepers, the beggars, and the Coolies in the dim damp alleys and slums, filled with the groans of the sick, the starving and the dying. The complexity and diversity of the city gradually disappears subsuming the social back ground, ethnic, racial and religious identity one might have and ultimately classifying one either rich or poor. The working conditions in the pickle factory of Daulatpur which is replaced by the Sir George White Cotton Mills are even more grueling and the foreman Jimmie Thomas is more abusive and tyrannical than Ganpat. The world of the poor is one of comradeship surrounded by foul smell, abuse, suffering, torture, exploitation, dust, heat and sweat. The British management offers no security of tenure. Jimmie Thomas rents out dilapidated huts at exorbitant rates. The Mill mechanic, a money-lender and the Sikh merchant exploit the Coolies. The ill-paid, ill-housed, under-nourished, exploited, cheats and bullied Mill worker is beaten body and mind as we find in the case of Hari. Munoo is saved from such a fate by his youthful vitality. In the Mill we have the 'Red Flag Union', a workers union led by the Communist leader Sauda who, ironically, exhorts the poverty stricken workers to go on a strike when all they can think about is where their next meal will come from. The preparation for the proposed strike leads to a bloody Hindu-Muslim communal riot; instigated by the employers to divert the attention of the workers. In the riot some of the workers lose their jobs, their livelihoods and even their lives.

### THE MEMORIES OF VILLAGE

The memories of his village and this section contain one of Anand's best Nature descriptions. As a painter of Nature in all its moods Munoo has a remarkable flair for evoking the smells and colours of the Nature. The steep hills overgrown with rich green foliage, the streams and the waterfalls, the clouds rolling swiftly across the sky, the crisp cool air, all stand in sharp contrast to the heat, the dirt and humidity of Bombay. He responds mentally and emotionally to the beauty of the world around him as well as observes the world of the rich upper classes of society and wishes to belong to this class. Kindness and affection of his Mistress fires his adolescent passion till he is unable to bear his feelings and crumples at her feet in an orgy of tears and kisses. Sexual urges-half expressed and half understood-had tormented Munoo from the very beginning, and like much of his life these feelings were never truly comprehended or realized, as in an adolescent growing up without any guidance. Munoo's feelings from being diverted entirely to the physicality of his sexual awareness rather he describes the effects of his sexual awareness on the emotional aspects of his character are prevented by Anand. When Munoo was unable to understand why he finds himself looking at Sheila's body outlined in her wet garments feels ashamed. Later the warmth of Parbati's body as he nestles against her arouses confused feelings in him. The same confused feeling prevails when he returns to them ill after a night out with Ratan at the local brothel. Hari's wife, who understands the boy's feelings, takes him in her arms and whispers, "*We belong to suffering!*" (247).

### CONCLUSION

The novel draws its strength from Anand's social commitment. Coolie is ideologically loaded for it British imperialism transformed the traditional economy of India into an industrial economy. It considered India as a vast market for its own industrial goods. The Imperialist system is identified with an oppressive capitalist system in which the bourgeois rule the roost. The class system based on capital and industrial productivity replaces Indian aristocracy and the feudal classes are bought over to side with the Empire and the old feudal caste system. India was forced by colonialism into a new economic and social structure with the intention of maximizing profit unmindful of the repercussions it would have on the traditional socio-economic structure of the colony. Coolie is undoubtedly one of the most novels of Anand. It has been translated into more than twenty prominent languages.

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**DISCIPLINE OF PUBLIC ADMINISTRATION IN UNIVERSITIES**

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**ABSTRACT**

*The study of Public Administration has advanced to a rare degree since 1920. Then recognized within the curricula of only some universities, it's now become a staple subject in college and university studies. In 1939 the American Society for Community Management and its review journal 'Public Administration Review' were established. The study of public administration, as a separate academic discipline received a stimulating boost with the establishment of the Indian Institute of Public Administration (IIPA) in 1954 and also the establishment of the Indian School of Public Administration in 1957 within the IIPA. Public Administration, as a discipline, is witnessing dawn of a replacement era in its study. The discipline is reduced to efforts at building specific skills which are required to handle the identified problems without recognizing their socio-economic and political roots. The argument that trails spins around those foremost concerns which remain critical within the framing of syllabus and at school teaching.*

*Keywords: Public administration, skills, teaching, universities, etc.*

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**INTRODUCTION**

Wilson who is acclaimed because the 'founding father' of Public Administration, identified it as a discipline. The study of Public Administration has advanced to a rare degree since 1920. Then recognized within the curricula of only some universities, it's now become a staple subject in college and university studies. Bureaus of presidency research have multiplied across the state. These organisations published an oversized volume of valuable material. From many and varied sources, an unlimited body of writing has taken place within the second half century that now provides an ample base for the study of this field, corresponding works are less abundant in other countries, the study of public administration continues to be primarily American. The evolution and growth of the topic in India also was largely because of the patronage extended by USA. Within the recent decades public administration attracted the eye of the people at large and has registered a powerful growth as a topic of study both from the purpose of view of educational and applied aspects.

While accepting the growing importance of the topic, several social scientists deny the status of an independent discipline to Public Administration on the bottom that it doesn't possess universally acceptable concepts and theories. It's alleged that almost all of the contexts of the topic are American oriented and not many attempts were made to change them to suit the Indian ethos. In India, the study of a number of the important aspects of public administration like local self-government has started within the early decades of the 20th century. Teaching of public administration in India began humbly because it appeared with an optional status at the Master Degree level in politics, History or Economics.

The study of public administration, as a separate academic discipline received an interesting boost with the establishment of the Indian Institute of Public Administration (IIPA) in 1954 and therefore the establishment of the Indian School of Public Administration in 1957 within the IIPA. Subsequently in several universities the departments of Public Administration are established. Research is additionally undertaken within the Public Administration discipline in several universities and institutes throughout the country. Public Administration subject is additionally offered in concert of the optional subjects within the competitive examinations conducted by the Union Public Service Commission in 1987 furthermore as other government recruiting agencies within the country. Public Administration could be a young discipline in India. Yet its advancement over a period has been gradually expanding. At present the topic is taught in additional than 50 universities within the country. Thousands of scholars have obtained their undergraduate and postgraduate degrees publicly Administration. Many scholars have obtained research degree within the discipline and a number of other others have chosen this subject for his or her career. The topic is additionally taught within the training courses for civil servants. The public personnel recruitment agencies also offer this discipline as a component of their educational program for competitive examinations. Thus, it can be alleged that the significance of public administration restraint has been increasing progressively.

**OBJECTIVES OF THE STUDY**

1. To look at the expansion and development of research programme within the discipline of public administration in universities.
2. To look at and classify the research studies into broad and sub areas of specialization.

3. To analyse the research studies and output of the students of the discipline of public administration.
4. To spot and suggest future research studies to be undertaken within the discipline of public administration.

### **METHODOLOGY**

The present research study is only supported secondary source of knowledge. For this purpose the researcher has visited the Central Library, Kakatiya University and stated all the dissertations / thesis's submitted by previous research scholars of the department of Public Administration at Kakatiya University.

### **PUBLIC ADMINISTRATION IN UNIVERSITIES**

Since 1940, Public administration education have been started when the University of Madras started a Diploma Course publically administration and also the University of Allahabad started a diploma course in Local self-government. The University of Nagpur started a two year programme publically administration within the year 1949. Within the year 1955, the University of Nagpur founded a separate Department of Public Administration and also the suit was followed by other universities just like the Punjab University, South Gujarat University, etc. Public administration education got boost with the establishment of Indian Institute of Public Administration within the year 1954 which to act as a forum for the exchange of experience among practitioners and teachers of Public Administration.

To boost such an exchange among civil servants and personal sector managers, the Administrative Staff College of India was established within the year 1960. Public Administration is organized at the post-graduate level as part of instructions given within the politics Departments in some Universities. 56 Universities teach Public Administration at the Master's level in politics courses. Of these,

- 47 Universities have Public Administration is compulsory/elective course.
- 8 Universities teach Public Administration as a compulsory subject, and
- 9 Universities provide Public Administration as an elective subject.

It is also interesting to notice that the majority of the schools provide just one course within the compulsory stream at the MA politics level in Public Administration. However, there are Universities which offer over one paper within the compulsory stream. It's equally interesting to determine that there are some Universities which don't have a compulsory paper in their scheme of teaching politics. Among these are the Jawaharlal Nehru University, Madurai Kamaraj University, and also the University of Mysore.

A number of the schools which have full-fledged courses publically Administration at the post-graduate level, however, organize teaching again in two streams. Some papers are labelled as compulsory papers, whereas the scholars have the liberty to pick optional papers from the assorted groups. Mostly the course study is restricted to eight papers and also the viva-voce examination. The scholars are given the liberty to opt for undertaking a project add lieu of 1 optional paper. The scholars are given the liberty to require one amongst the 2 groups as electives.

- Group I includes Rural Government and Administration.
- Group II contains elective on Planning. Administration and Public, and Rural Development Administration.

### **GROWTH OF PUBLIC ADMINISTRATION EDUCATION IN ANDHRA PRADESH**

The development and progress of public administration teaching at university has initiated with the foundation of Osmania University in October, 1918. This was the primary university in state to supply academic programmes publically Administration in 1956 with a two-year postgraduate diploma in government and personal organisations and became an independent subject in 1961. In 1968 research facilities were offered within the department resulting in a Ph.D degree. The M.Phil. Course was introduced within the department from 1971. A two-year P.G. diploma course publically Personnel Management was started as a night programme at P.G. College, Basheerbagh and converted to MA in 1984. Course in 1987 and now it's offered at Prof. G. Ram Reddy, Centre for Distance Education, Osmania University, and Hyderabad.

### **OSMANIA UNIVERSITY**

At present, a postgraduate course publically Administration is being offered at three colleges affiliated to the Osmania University. They're Arts College, Nizam College and postgraduate college, Secunderabad. The Department of Public Administration at Osmania University had the privilege of getting distinguished academicians. At this time the Osmania University is catering to the upper educational needs of the people of the Hyderabad, Nizamabad, Medak, Ranga Reddy, Nalgonda and Mahaboobnagar in Telangana state. Initially

degree-level admissions were open for B.A. and B.Com, in 1978. Later P.G courses were introduced from the tutorial year 1987-88. An interesting point worth mentioning is that while all other universities offer the postgraduate course publicly Administration for only those candidates who complete their undergraduate course with Public Administration jointly of the coequal optional subjects, this centre offers Post Graduate degree publicly Personnel Management programme to any graduate from any discipline.

### **KAKATIYA UNIVERSITY**

In Kakatiya University, the department of Public Administration was established during the tutorial year 1968-69 as part of the then Osmania University postgraduate centre at Warangal and offered courses of study publicly Administration resulting in B.A., M.A., M.Phil., and Ph. D. degrees publicly Administration. Consequently, the department had become a composite department of government and Public Administration. However, it was subsequently bifurcated into two independent departments the Department of government and Public. In January 1992, so as to professionalise the tutorial programmes of the general public Administration department, a two year M.A., PM&IR was announced. The M.A., PM&IR course was later renamed as M.H.R.M. To further reflect the expanded scope the department, the general public Administration department was rechristened renamed because the department of Public Administration and Human Resource Management in 1993. At this time the Kakatiya University caters to the upper educational needs of the Warangal, Khammam, Karimnagar and Adilabad districts. Since its commencement in 1968, the department has accompanied over 26 national seminars and workshops and ran one UGC-sponsored summer institute for advanced teaching publicly Administration besides organizing dozens of state and native level seminars, symposia and workshops. The department also organised one course publicly Administration and H.R.M to update the competencies of the teacher. So far, it has undertaken 43 research projects, both major and minor, sponsored by national agencies like UGC, ICSSR, the look Commission, the govt. of India and therefore the Government of state. The books authored, co-authored and edited by the faculty number quite 70. The amount of research articles published by the school far exceeds 450. The third panel of the University Grants Commission on the status of Public Administration and government appointed on the eve of the sixth plan has acknowledged the services of the department for the expansion of Public Administration as a discipline with the co-operation of the university. The department has been organizing Prof. P.A. James memorial endowment lectures by inviting eminent academics within the discipline. To date eight such lectures were conducted.

### **RESEARCH IN PUBLIC ADMINISTRATION**

The strength of the discipline of Public Administration depends the maximum amount on teaching as on research. It's for the community of the students publically Administration to interact itself in fruitful and imaginative research so as to develop the discipline in its width and depth, but it depends on the socio-economic and political background of the students publically Administration. The department of Public Administration enjoys a national level reputation and standing for its unique contribution in education, investigation and extension accomplishments related with the restraint.

Since 1981, the department produced 75 M.Phil. Degrees and about 100 Ph.D. degrees within the discipline. The research contribution of the department is beneficial for the policy makers, administrators and academicians. It's with this background to throw light and analyse the research works meted out by research scholars.

### **CONCLUSION**

Public administration education and training is one amongst the critical areas, wherein the seats of upper learning i.e., universities and training institutions play a crucial role in teaching not only in structural and procedural aspects of public administration but also indoctrinating several value extents of the working of the state. The effectiveness of such activities will be enhanced if a concerted effort is created by the countries sharing similar background with relevancy public administration. The countries have exhibited tilt towards the elite generalist government officials, the personnel of which staff the upper echelons of public administration and also play a critical role within the process of policy formulation and implementation. The pattern of examination for the recruitment of public servants is additionally similar where the candidates aiming to enter into public bureaucracy after they complete their graduation and such a scrutiny is showed by a self-governing staffing agency. Last but not the smallest amount, the institution of public administration may be a legacy of the colonial rule, hence a cooperative action aimed toward enhancing the standard and standards of theory (university level education which prepares students for the entry into public services) and practice (training institutions level which impart training to public servants once they're selected through competitive examination) of public administration is feasible if a joint action is launched.

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## ROLE OF ENGLISH LANGUAGE IN HIGHER EDUCATION IN INDIA

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## ABSTRACT

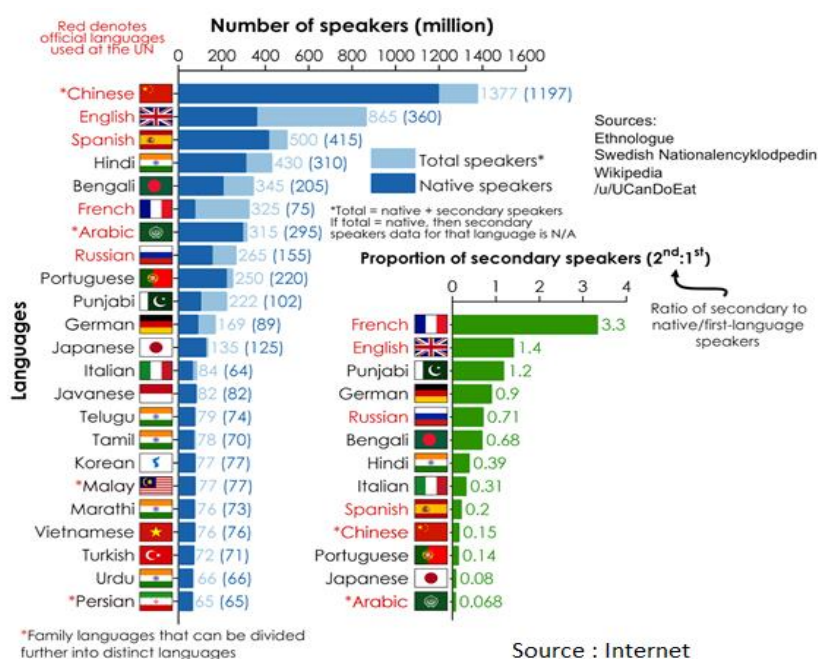
India is not mere a land confined to it's geographical boundary but it is beyond a system of polity and citizenship. It has a unique mix of cultures, finely amalgamated and evolved as a nation with unity in diversity. It has a rich heritage of civilisations. These civilizations have had inclusive social practices and profound intellectual authority. India was once upon a time recognised as "Jagadguru" meaning teacher, preacher and guiding philosopher to whole world. Education was the core competency most of the people known. Such people were spread over the land. They were revered as "sadhak" meaning practitioners aiming at perfection in the art of living. Using various languages since the evolution of the civilisation, they had been sharing their knowledge in various faculties of Science, Arts and social faculties as well. Most dominant language used in such transfer of knowledge has been Sanskrit but sue to frequent invasions the language came nearing extinction thus the dimensions of education. With advent of British rule over modern India, the English Language was introduced as a dominating language and attained irreversible position in the system. The fact remains that English language has secured a place in global communication which cannot change in times to come unless there is some unexpected turn. Hence current work focus on the importance of English language teaching in India at higher level of education.

Keywords: Higher Education, Communication Skill, English, global, etc.

## INTRODUCTION

Education is described as a process in which people share their knowledge and attitude with others and others learn or acquire more than knowledge. It can be in form of values, beliefs, skills, behaviour or even habits. Trow, Martin (1973) stated importance of education in current era as, "Since World War II, developed and many developing countries have increased the participation of the age group who mostly studies higher education from the elite rate, of up to 15 per cent, to the mass rate of 16 to 50 percent"

It can be surely connected with communication where one's ideas, information, thoughts, opinions, are to be shared, exchanged or passed on. True that the communication can be supported by non-verbal techniques and methods but what matters most is use of language. A language mostly used will always be reachable to masses and hence there is immense importance of selecting such a language. By the virtue of being native language of UK which has dominated the world in the pre-industrial revolution era and subsequently of USA which has been hub of all modern developments worldwide, English enjoys the privilege of being second most popular language which is spoken by 865 million people all over the world, where 360 million are native English speakers.



Source : Internet

**IMAGE NUMBER ONE ENGLISH LANGUAGE USERS AT WORLDWIDE**

These figures indicate that the language is used by more non-natives than natives in terms of number are. The proportion of secondary users is also significant as per the statistics being published in public domain as well. The above facts instigate a thought about relevance and importance of its existence and usage, in the field of Education. It further prevails in a researchers mind to further drill to find out its importance in Indian context of higher education. Prima facie, it is observed that on one-hand masses in India are struggling to survive and on the other hand there is a significant class which thrives not only in life-style but also in knowledge and intellectual capacity. It could be correlated with the medium and language of communication and transactions for that matter.

**EDUCATION SYSTEM IN INDIA:**

Present Indian education system includes schools (controlled and funded by three levels: central, state and local which are both public and private schools, Colleges and Universities, which are governed by The University, grants commission. Levels of education are Primary, Secondary and Tertiary, the last being considered as Higher Education. In some colloquial terms at some boards of education 11<sup>th</sup> and 12<sup>th</sup> standards known as Higher Secondary are regarded as Junior College, however, one may not even mistakenly also take it in higher education. In spite of being governed by various authorities and boards the primary and secondary education is yet to reach majority of the young population on India. The country is dressed with great geographic diversities and various cultures. Reach to such interiors is yet difficult attain. The education is imparted to pupil in the language local to the region though the CBSE is still trying hard to compensate the gap.

**ENGLISH LANGUAGE IN INDIA**

**English language was introduced in India in three phases.**

- a. **Phase One:** The first phase can be referred as missionary phase, where the efforts of the Christian missionaries who came to Indian subcontinent to purposefully persuade Indian native.
- b. **Phase Two:** The second phase was of the reformist Indians who were keen on acquiring English studies. Raja Ram Mohan Roy (1772-1833) was one of those who made efforts to persuade the officials of East India company for Western scientific education in part replacement of Sanskrit and Arabic.
- c. **Phase Three:** The third and most important phase is that of bilingualism (B.Kachru 1983:7) It was in this phase when the implementation of Lord Macaulay's "Minute on Indian Education (1835)" educational policies for instruction in English.

English attained the respect as language of prestige, and succeeded in completely replacing Persian and the other Indian languages. Since 1928 English has been regarded and used as the language of the elite, of the administration, and of journalism. English is still popular language in India and is an additional official language for government work along with Hindi. The language in its originality was brought in by the British but as usual it has adopted many words from the subcontinent and continued to evolve still as a lingua-franca. It has taken a new form in India which is known as Hinglish or Indian English which is its new identity in the region and also in the global context where Indians and Indian life-style has reached. The reason for adopting native Indian words is that the English culture may not find concepts like "Yoga" and "Ashram" etc. to mention as token.

There is a significant increase in number of English speaking people in India and over the years the trend has apparently increased. Although there is lot of awareness being created for functioning in local languages but the impact is not as per expectations. Overall the picture is indicative of growing popularity of the language and irreversible changes in the intellectual thought process.

**OBJECTIVES OF TEACHING ENGLISH IN INDIA:**

Teaching of any language generally aims at developing, in the learner, the required communication skills, which enables him or her to use such language skills in real life situations. Thus, it is necessary to impart enough practice to learners in listening, speaking, reading and writing- the four basic skills essential to acquire a language. This can be considered as the primary objective of Teaching English in India.

Keeping in view the multi-lingual situation of India a number of Commissions on Education and Study Groups constituted after gaining Independence from the British in 1947, have stressed the need for teaching English. The Radhakrishnan Commission (1948), first of its kind, felt the need to teach English to keep in touch with the living Stream of ever-growing knowledge. The Official Language Commission (1956) recommended that English should be taught as:

“A language of comprehension rather than a listening language so as to develop in the student learning it a faculty of comprehending writing in the English language.”

Kothari Commission (1964) emphasized the role of English as a library language. And according to Jain (1974), several imperatives have, since Independence, dictated why English should be taught and learnt in India- the status imperative, the commercial imperative, the cultural imperative and the academic imperative.

### **INTRODUCTION OF ENGLISH IN SCHOOLS**

In the system of education at Free Indian schools, the formal introduction to languages was given a second seat as the authorities then gave more importance to skills and subjects more relevant to the contemporary need of manpower to industrialise the economy. However, in the beginning of the secondary education, at standard 6<sup>th</sup> at most of the SSC boards, the language is introduced. The main reason of the defeatist view about the language is that the teachers are not able to create an affinity for the language. The foiba then is carried over till the student approaches the college where mostly the medium of instructions is English.

### **HIGHER EDUCATION AND ENGLISH**

For ease of understanding higher education in India can be viewed as in following light. The qualified higher secondary certificate holders are eligible for admission to courses of higher education. These entries are mostly subjected to screening through either specific or common entrance examinations. These examinations are conducted in predominantly in English and seldom in local languages. Basically, this practice is adopted as a toll to filter out candidates who are not academically fit for taking up or adapting themselves to standards of education intended. All the streams follow the same route as the material available for studies universally is in English language. It is most desirable for all the established institutions to have pupils comfortable with the language.

The research in all faculties is also subjected to English language only, specially in India where despite many attempts to keep Sanskrit alive, which has most of the ancient reference material and scriptures. Even if Sanskrit is referred as source of much rich knowledge, the use is limited to interpretation only. The research has to get exposure in academic pivots of the world. This again calls for English as the medium of communication.

The basic purpose of education is to make people capable of facing the situations in life effectively for benefit of the mankind. This purpose is only served if proper engagement for a suitable workforce is provided. The Human resources scene in the country is also looking at a job ready manpower. For this reason all corporates, business houses and also organisations of public sector or undertaking, are keen on finding candidates comfortable in English language. All the competitive examinations have a compulsory testing of candidates linguistic skills in English.

All the trainings of defence services at cadre of officers are in English. Even as on date, English is regarded as essential language of communication in the circle of defence officers.

### **CONCLUSION**

Higher education should be able to not only build character in the students but it should also guide people to a much bright and rich way of living. In given circumstances the English language is mostly regarded and respected as authoritative and respectful. In light of the above facts and scenario, an undying need of education in English is strongly felt. It seems to be prominently prevailing in the present environment of education in India. In near future as well, there would be no replacement for the language in the scope of present study.

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**MANAGING A REMOTE WORKFORCE**

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**ABSTRACT**

*The recent study aims to find out the idea about the Managing a Remote Workforce in Organizations. There are so many factors which make out very effective skills. The paper explores the different principles of Managing a Remote Workforce in Organizations which are basic for the improvement of the existing quality of knowledge in the work in the light of the development of organization. Awareness about this managing a Remote Workforce in Organizations Individuals and Groups at Work is very necessary. There are different type of theories which can be used for Motivating Individuals and Groups at Work like: leadership styles virtual communication, physical distance for the growth of organization. The principles are a set of underlying things about how to secure the individuals, groups and its relation to organization. All organizations can have more or less systematic, integrated and proactive approaches to deal with the Managing a Remote Workforce. There are so many challenges which cannot simply be implemented on the basis of the existing theories, management structures and systems. It may require the detailing of work, the definition of roles, the design of structures, the motivating of new skills by employees and the reorientation of organizational goals. There are many students which are unaware about effective Managing a Remote Workforce hence the researcher feels to study on the awareness of Managing a Remote Workforce in Organizations.*

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**1.0 INTRODUCTION**

There are so many different factors of Managing a Remote Work force in Organizations. There are many challenges one individual have to face because of new strategies, new patterns for the growth of organization. Current study aims to study on the awareness of different theories, challenges. For an instance, the Managing a Remote Work force in Organizations gives idea to improve relationship between employees and organization, which are two interrelated factors that are important.

There are hundreds, if not thousands, of articles, books, blogs, and Websites crammed with advice about the way to manage remote workers (or telecommuters, or work shifters, or distributed teams While those slogans do point within the right direction, they have a tendency to be stated as universal truths albeit the important world is filled with complexity and ranging contexts. Worse, they don't begin to affect why and the way companies prefer to embrace workforce mobility. And an organization's motivations and experiences make an enormous difference in what works and what doesn't). However, most of that advice amounts to broad generalizations or "bumper-sticker"-like slogans that are well-meant but rather shallow: "Pay attention to your staff's personal life," "Measure what they produce, not what proportion time they spend," "Hold regular conference calls," "Check in together with your subordinates on a daily basis." Therefore, with Citrix On line's support and encouragement, we began to supply a

Different quite understanding about the challenges surrounding the management of remote workers. Most significantly, we studied the real-world experiences of leading edge organizations so as to spot what really works, and under what conditions. Most organizations today are already practicing some quite distributed work management. In most cases, however, there's either no formal policy, or it's being done ad hoc and during a highly inconsistent manner. Typically, some employees in some departments are understanding of the office once during a

While because it's more convenient for them, or an emergency reception has made it temporarily necessary, or they only needed a quiet place to urge a special report completed. We've come to call this type of informal/implicit program "Don't ask, don't tell," because it's unofficial, is usually not known about in other parts of the corporate, or is tolerated for certain individuals primarily because they're highly competent and have threatened to leave the corporate if they can't work flexibly. However, these sorts of unplanned efforts often get out of control. Either they grow too large with none thought to their consequences, or other employees get jealous and even resentful at being unable to require advantage of what they see as a highly desirable "perk".

Thus, the organizations we've spoken thereupon have moved beyond DAD and unplanned distributed work have usually done. There are often different definitions or words which will express an equivalent idea. Remote work definition are often also searched in other terms like Telecommuting or maybe homeworking. The thought behind is to stay doing the tasks that are given wherever the worker wants. ACAS, an organization within the

UK, define work from home as: Work from house is an appointment during which employees perform their usual job related tasks reception instead of during a central workplace, and do so for a daily portion of their work schedule, using electronic media to speak with others both inside and out of doors the organization.

## 2.0 THE MAIN OBJECTIVES FOR MANAGING A REMOTE WORKFORCE:

- To make a uniform and skillful system involving all the Managing a Remote Workforce in Organizations across the country in the country.
- To improve the basics & deep knowledge with quality procedures across the country in the country.
- To minimize the efforts and improving the skills for organization of Managing a Remote Work force theories.
- To replace a lot of other patterns to reduce efforts of organization
- To detailing of most of the theories of Managing a Remote Workforce for individual and group at work.
- To improve the effect of the theories of Managing a Remote Work force for the improvement of each and every area.
- To improve the competitiveness of the workers, organization.
- To ensure the availability of knowledge for the improvement.
- To reduce the complications in the system and organization
- To decrease the unhealthy competition among the organization due to unawareness of Information Privacy in Organizations.
- To reducing the management problems to avoid further issues.
- To simplify the process of selection of the good persons for the organization.

Thus, there are many good and beneficial aims and objectives of Managing a Remote Workforce in Organizations:

## WHAT IS MANAGING A REMOTE WORKFORCE?

Small group of people or individual can work remotely organization having multiple team members with different locations autonomy about information. To be different from other organization privacy is very much need to keep information confidential and adopting different privacy policies is the main thing for the security of organization. Organization can seek virtual communication for the growth of their bonding .As the advancement in technology may used for the team building in organization and may be helpful because of the technologies include internet, printing press, different type of apps like twitter, Face book can feed the information which is private. As day by day competition level increase in the organizations so it is must to have virtual leadership .As there are so many factors are present who can take information so it is much needed to have Managing a Remote Workforce.



Image-1.1: Managing a Remote Workforce in Organizations.

There are different types of skills which can be used for Managing a Remote Workforce in Organizations. Skills for the growth of organization is very much important are studied and explained below:

### THE ABILITY TO CONNECT TEAM

- The ability to influence behavior of other employees
- To connect team by virtual communication
- To achieve specific goals team members should work together.
- Leader should give specific structure, goal, and safety of work.

### IMPORTANT MANAGING SKILL

- Important communication skills such as listening, reading, writing
- Presenting effectively ,oral communication
- Physical communication and virtual communication is far different
- Goal settings ,coaching, effective use of technology
- For the achievements and by means of team building leader can set the goal
- Webinar coaching is the important effective skill of virtual leader
- Effective use of technology like webinar ,communication apps for the team building

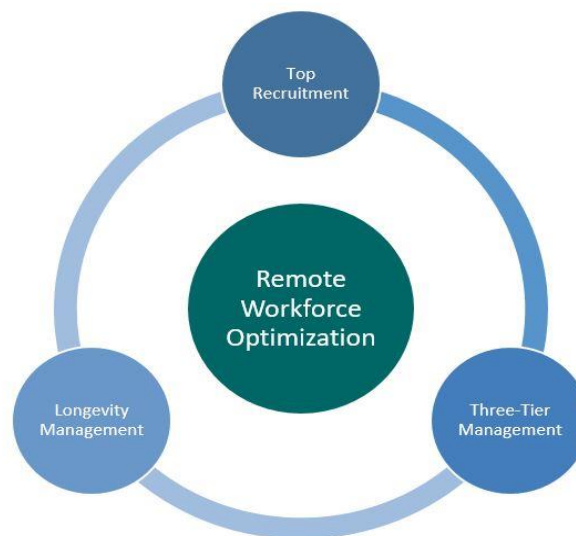


Image-1.2: Remote workforce optimization

**Tools used for managing Remote Workforce:** You almost certainly considered hiring someone who would work outside of your office, a minimum of for a part-time role. And it's completely understandable, as there are many perks to hiring outside of your town or maybe your continent.

Since remote work is simply getting to become more popular because the time goes by, we decided to make an ultimate guide for any company that desires to use its benefits.

Remote teams, made from people in several locations round the world, are on the increase. A recent survey found that 34% of the business leaders said that quite half their company's full-time workforce would be working remotely by 2020. The appeal of forming virtual teams is obvious. Working remotely increases productivity, reduces stress and is less expensive than performing from an office.

**Asana:** Asana may be a project management tool that a lot of remote teams use to trace their tasks. a tremendous thing about Asana is that it's free and very easy to use.

**When I Work:** Remote teams are confronted with some specific problems that differ from those which will be found during a "standard" workplace. And one among them is accurately tracking time spent on tasks and scheduling with remote workers. And that's when once I Work comes into the image. It makes managers' job easier by enabling them to schedule work for workers and track their time period.

**Adobe Sign:** Signing a document with Adobe Sign are going to be over in no time. And what's more awesome is that you simply don't really need an Adobe account to sign the documents. It's compatible with all browsers and mobile device OS.



**Jell:** Managers skills hard it's to arrange workers, especially the remote ones working in several time zones. And that's where Jell comes in. Let your team answer three core questions. You'll get an honest overview of every team member's status.

**Awesome Boss:** Don't lose the "human" touch. a nasty thing about remote workers are often the sensation of distance, and that's why the Awesome Boss app will offer you an increased insight into your teams, like individual birthdays, work anniversaries, likes, and reward activities.

**Workamajig:** This app causes you to keep all of your work-related data in one web-accessible system. Get updates, and summary of outstanding project tasks, and organize team member availability effortlessly.

**Vacation Tracker:** Last but not least is Vacation Tracker. It'll make tracking your team's day off easier than ever before. You'll also try a free demo, by signing up right [HERE](#). Our employee attendance tracking system is made directly in Slack so it's a snap to set-up and configure, and your team can request vacations directly in Slack without having to recollect another login or website.

**Brief:** Brief may be a team collaboration tool enabling team members to prioritize and specialize in important tasks while minimizing distractions. Brief may be a productivity app that helps you focus your day to realize more professionally and personally. You'll convert messages into tasks and type your projects around "hubs" of conversation. To not be outdone by other project management apps, Brief also offers video conferencing. Brief may be a chat and task management tool for businesses. Brief provides teams with a central place to talk about current projects, share files, brainstorm, and conduct video conferences. The app removes the necessity for drafting emails, as your team is beat one place, making real-time communication feasible and faster.

## CONCLUSION

There are several cases within which organization, employee themselves are confused about Managing a Remote Workforce, responsibility of it. Therefore, everyone knew solely that there are some of theories required for the Managing a Remote Workforce to individual or group at organization. What's precisely some of important theories and its applications only a few of apprehend. It's not straightforward and simple to apply theories, styles so the idea of Managing a Remote Workforce to individual or group at organization is very much necessary for the improvement. There is negative approach and views of scholars concerning qualities, skills which will defiantly be a disadvantage. Also lack of facilities is additionally one in every of the foremost reasons to form students, employees unaware concerning of theories. Therefore the detailed and simpler way of information privacy to individual or group at work is necessary for positive approach of the employees. So that it will get easier and fully acquired by the employees who will help them overcome the phobia of the skills or motivation to individual or group at work. Motivating information theories in organization.

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**NEW DIRECTION IN MANAGEMENT ACCOUNTING**

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**ABSTRACT**

*The current study aims to find out the scenario of New direction in Management accounting and its features and awareness about new direction in Management accounting and its perspectives in different accounting, finance. It includes active economy of a day to day activities to improve organization satisfaction and gain an advantage over other competitors. New direction in Management accounting is done by several features. For the organization record with the help of this term it can be manipulated for the accounting To view the profit or net income with the help of Innovative strategies, but management will have to face some stress for this. There are many Innovative features analysis for the things like capital management, funding and responsibility these strategies are considered in different organization. New direction in Management accounting is an energetic, interesting process that relies on manipulation link -- from customers to organization and many more -- to function smoothly.*

*There are many students that are unaware about the new direction in Management accounting and its significant perspectives and often innovate them with strategies. Hence, the researcher feels to study on the awareness of the new direction in Management accounting and its significant perspectives & terminology.*

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**INTRODUCTION**

There is concept of the innovation of organization and management for the growth & manipulation of it according and for proper investment and prepossessing and function each entities in the most streamlined and cost-effective way possible. In this emerging market there are a lot of challenges that are being introduced due to growing rivalries, outsourcing, etc.

Current study aims to study on the awareness about New direction in Management accounting and perspective. There are many challenges one individual have to face because of new strategies, new patterns for the growth of economics. It gives idea to improve relationship between employees and organization, which are two interrelated factors that are important.

Management accounting may be defined as a procedure of serving monetary data and capitals to the managers in determining. Management accounting is merely employed by the interior team of the organization, and this is often the sole thing which makes it different from financial accounting. During this process, financial information and reports like invoice, financial balance statement is shared by finance administration with the management team of the corporate. Aim of management accounting is to utilise this numerical data and yield a far improved and precise verdict, regulating the initiative, commercial doings, and growth.

Financial accounting is that the recording and presentation of data for the advantage of the varied stakeholders of a corporation. Management accounting, on the opposite hand, is that the presentation of monetary data and business activities for the interior management of the organization. During this article, we'll learn what's management accounting and its functions. One of the definitions of Management accounting says that it's the appliance of professional skills and knowledge within the preparation of monetary and accounting information during a manner during which it'll assist the interior management within the formulation of policies, planning, and control of the operations of the firm. The basic function of management accounting is to assist the management make decisions. There's no fixed structure or format for it. The only need for management accounting is that the info should serve its purpose, which helps the management take important business decisions.

**ADVANTAGES AND OBJECTIVES OF MANAGEMENT ACCOUNTING**

There are many objectives of but the prime objective is to help the management team of a corporation in improving the standard of their decisions. Purpose of management accounting is to assist the managerial team with financial information in order that they will execute business operations and activities more efficiently. Following is that the list of all benefits of management accounting:

- Decision Making
- Planning
- Controlling business operations

- Organizing
- Understanding financial data
- Identifying business problem areas
- Strategic Management
- Decision Making

This is the foremost important advantage of the method of management accounting. In fact, it's the most purpose of it. During this sort of accounting, we use techniques from all fields like costing, economics, statistics, etc. It provides us with charts, tables, forecasts and various such analysis that creates the method of deciding easier and more justified.

**Planning:** Managerial accounting doesn't have any strict timelines like financial accounting. It is, in fact, endless and ongoing process. So monetary and other info is offered to the administration at consistent periodic intermissions. Henceforth managers can utilise this investigation and information to plan the actions of the union. For instance, if the recent data shows a dip within the sales for a particular region, then the sales manager can advise his team and plan some action to rectify things.

**Identifying Business Problem Areas:** If some product isn't performing well, or some department is running into unexpected losses, etc. decision-making accounting can aid us recognise the fundamental root. Actually, if the management is diligent and their data and reports are frequent, they will identify the matter very early. This may allow the management to urge before the matter.

**Strategic Management:** Concept of management accounting isn't mandatory by any law. So it can have its own structure consistent with the company's requirements. So if the corporate feels certain areas need more in-depth analysis or investigation it can do so freely. This allows them to specialise in some core areas. The knowledge presented to them allows them to form strategic management decisions. Like if the corporate wishes to launch a replacement line, or discontinue an existing one, management accounting will play an enormous part during this strategy.

**Limitations of Management Accounting:** Following are some limitations of Management Accounting:

**Data supported Financial accounting:** Decisions taken by the management team are supported the info provided by Financial Accounting

**Lake of knowledge:** Administration has inadequate knowledge of finances, data, etc.

**Outdated data:** Management team receives historical data, which can change eventually when management is taking the choices.

**Expensive:** The fixing a management accounting requires tons of investment.

**The main objectives new direction in Management accounting:**

- a. To make a uniform Accounting and its significant perspectives procedures across the country in the country.
- b. To improve a lot of innovation
- c. To replace a lot of other starter management to comprehend with most of the techniques.
- d. To ensure the cascading effect of manipulation will be eliminated.
- e. To improve the competitiveness of the original new direction in Management accounting and its significant perspectives.
- f. To ensure the availability of input for the growth of accounting.
- g. To reduce the complications in accounting.

**Factors which are considered for management accounting.**

- Planning
- Decision making
- Controlling

- Organizing
- leading



Image-1: New direction in Management accounting

#### What is the main principle of New direction in Management accounting?

The principles, practices and procedures under which costs and revenues are classified. To get good clear result or targeted result there should be clear defined the Responsibility and authority is the main principle of new direction in Management accounting. According to persons responsible for incurring the costs For each and every center within organization there is Involvement of planning, controlling, organizing and leading and assisting in planning and controlling of organization responsibility center is New direction in Management accounting.

#### What is the important purpose of a new direction in Management accounting system?

How well all the departments can collect all the information and give it to management for the evaluation is the main principle of New direction in Management accounting. in the organization management of expenses and controlling of cost or management of cost is the main fundamental of New direction in Management accounting.

#### What are the types of responsibility centers?

There are 3 main types of responsibility centers

- Expense or cost centers
- Profit centers
- Investment centers.

#### The following advantages of New direction in Management accounting-

- (1) The one of the main advantage of distribution or assigning of Responsibility properly.
- (2) There is always Improvement of Performance.
- (3) For the Cost Planning it is very helpful.
- (4) The one of the main advantage is controlling and Delegation.
- (5) For the Decision-Making New direction in Management accounting is very helpful.

#### Features of New direction in Management accounting system

- The main feature of New direction in Management accounting is whatever will be the Input &Output or it will be Costs and Revenues.

- The one of the main Feature of New direction in Management accounting is already Planning and real or existed Information or Use of Budget
- The one of the main feature of new direction in Management accounting is Identify Responsibility Centers.
- The one of the main feature of New direction in Management accounting is to give Relationship between Organization Structure and New direction in Management accounting System.

### **CONCLUSION**

Thus, there is always a problem when a new approach or new method is introduced in any sector. Even it is experienced that there is no one who can understand any innovation with fully desired expectation. Even not of those who are working in the legal and finance professions such as Lawyers, Chartered Accountants, Company Secretaries, etc. if such a scenario is there for any innovation, how one can expect that New direction in Management accounting and its significant perspectives at initial stage should be understood by common people who are the users of product and manipulating these strategies for those positions of company which they require for their finance. Innovation for investors and its significant perspectives which manipulated against all previous consumers will take time to understand.

It is not as hard as to understand. Strategies there were different innovation of investors which were divided as per users. As new direction in Management accounting and its significant perspectives is by rules, it will take some time to understand by the consumers about its system, pattern benefits and application. They will be aware about it when will start to use it by practically through fields. It needs only proper counseling.

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## FACTORS INFLUENCING INVESTORS DECISION IN OPENING DEMAT ACCOUNT

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**ABSTRACT**

*The paper attempted to identify the factors influencing investors decision in opening DEMAT Account. The study is descriptive in nature which are concerned with describing the characteristics of a particular individual. Purpose The select sample for the study is 71 respondents using convenience sampling. In the study we have used primary source of data through followed by questionnaire method from the investors who are having DEMAT Account. The study found that the factors such as safety, account maintenance charge, transferability, reliability, transaction cost are considered while opening DEMAT account. It is found that most of the investors are not finding time to convert the shares certificates into electronically. It is suggested that the Institution can approach the investors at their door step to automatize the trading records.*

**INTRODUCTION**

The trading activities in stock use to take place through open outcry system and it was time consuming and inefficient. This imposed limits on trading volumes and efficiency. In order to provide efficiency, liquidity, transparency, NSE introduced a nationwide online fully automated screen based trading system where a member can punch into the computer quantities of securities and the prices at which he likes to transact and the transaction is executed as soon as it finds a matching sale or buy order from a counter party. Screen based electronic system electronically matches orders on a strict price/time priority and hence cut down on time, cost and risk of error as well as on fraud resulting in improved operational efficiency. It allows faster incorporation of price sensitive information into prevailing prices, thus increasing the informational efficiency of markets. It enables market participants irrespective of their geographical locations, to trade with one another simultaneously improving the depth and liquidity of the market. It provides fully anonymity by accepting orders whether big or small from members without revealing their identity thus providing equal access to everybody. It also provides a perfect audit trail, which helps to resolve disputes by logging in the trade execution process entirely. The sucked liquidity from the others exchanges and in the very first year of its operation, NSE became the leading stock exchange in the country, impacting the fortunes of other exchanges and forcing to adopt SBTS also. Today India can boast that almost 100% trading take place through electronic order matching.

Now dematerialization of shares has introduced a new concept which converts paper based physical trading into electronic trading. It is a safe and convenient way to hold securities. Screen based trading system helps in faster transfer of securities and no stamp duty is required on transfer of securities. The trading system operates on a strict price time priority. All orders received on the system are sorted with the best priced order getting the first priority for matching that is the best buy order match with the best sell order. Orders are matched automatically by the computer keeping the system transparent, objective and fair. The trading system provides tremendous flexibility to the users in terms of kinds of orders that can be placed on a system. The trading system also provides market information online.

In order to promote dematerialization of securities, NSE joined hands with leading financial institutions to establish the national securities depository limited (NSDL), the first depository in the country with the objective of enhancing the efficiency in settlement systems as also to reduce the menace of fake/forged and stolen securities. This has ushered in an era of dematerialization of trading and settlement. SEBI automated settlement of share's through dematerialize and thus bringing about an increasing in proportion of shares delivered in dematerialized format.

**LITERATURE REVIEW**

**Kaushal A. Bhatt & Kinjal Bhatt (2012)** evaluated the financial stability and profitability of NSDL and CDSL and to analyze the operating income of select depositories by using various accounting techniques for five financial years. Statistical tools and techniques such as mean, standard deviation, coefficient of variation and ANOVA were used. It was found that there was a significant difference between operating income to total income of both the depositories during the study period. The study concluded that the progress of NSDL and CDSL in economic terms clearly revealed that depositories have shown remarkable progress in terms of DEMAT account, DEMAT services and depository participants has been going smoothly.

**B. Venu Gopal & Ch. Rama Prasada Rao (2012)** has made an attempt to achieve the objective to analyze and understand the attitude of depository participants towards the depository system in Indian Capital Market.

Primary data has been collected through questionnaire and detailed discussion regarding problem. Secondary data has been collected through various magazines, journals, books. Introduction of depositories has improved the market efficiency by taking criteria for describing scripts depository eligibility. The relationship between depository participant and depository is governed by an agreement made between the two under the DP act. It is suggested to SEBI that it should take steps to minimize the frauds of capital market intermediaries by stringent regulations and supervisory norms so that it will improve the confidence of investors and promote the growth of the capital market.

**Krishnan, Rama. A. (2013)** in this study the objectives are to determine investors' perception towards DP services, to check growth trends, increasing popularity and awareness of DP services. They have taken data from bank brochures, journals, magazines, depository accounts, record of the delivery instructions. A Major portion of the chart is showing that investors are maintaining multiple accounts with multiple banks and they have chosen that bank on the basis of better services, low maintenance charges, easy accessibility, multiple reasons. Investors have taken 1 to 2 days to open DEMAT account and majority of investors does not face any problem while opening DEMAT account. Most of the investor prefer for accessibility followed by safety as the attributes for opening DEMAT account. The study suggests that services should be more transparent, systematic and fast so that investors can freely access. Option for trading the securities in physical form should be abolished and it is mandatory to have securities through trading account.

**Ramesh On Kareppa Olekar & Chanabasappa (2013)** has identified the objectives as to study the awareness level as well as advantages of DEMAT and online trading. In this study they have taken secondary data from different websites, journals, company reports. Trading in DEMAT segment reduces the risk of bad deliveries. If the volume increases continuously, DP will be in a position to decrease the charges for opening and maintenance of DEMAT account. There are some other banks which charge less services charges for DEMAT services other than security companies. From the study it is concluded that online is considered as innovative study.

**Shubham Bansal and Ajay Jain (2013)** has identified the objectives to know the awareness level about DEMAT account among youth in special reference to Punjab state using a close ended structured questionnaire with a sample of 200 respondents. The study concluded that majority of the people are not aware about DEMAT account and they know about bank provided facility of DEMAT account.

**Kiran Chaudary and Ramesh Kumar (2014)** attempt to identify problems of Indian Depository system and suggest the management of depositories using a questionnaire and secondary data through the websites like NSDL and CDSL. The study suggested that depository participants has to make awareness to investors about the rules and services provided to the investors. More efforts are to be made to improve the electronic based service. The depository system should make linked up with international financial markets in order to provide easy access of the investors around the globe.

**Surendar. G (2015)** attempt to identify the need and procedure of dematerialization of shares and understanding on dematerialization of shares among retail investors. The study is based on primary data with well-structured questionnaire. The data has been collected from investors through 5 major cities Hyderabad, Chennai, Bangalore, Mumbai and Warangal. Secondary data is also used from the sources like SEBI, RBI, BSE, NSE, magazines, journals etc. They have used simple statistical tools like averages, mean deviation. Pie charts and bar charts are also used to present the data where ever required. In the study reveals that 96.6% of investors have DEMAT account and 3.4% people do not have DEMAT account. 88.8% investors had all shares in DEMAT form where as 7.8% of investors had at least some shares in physical form and remaining 3.4% shareholders have DEMAT account. The reasons for not having DEMAT account are high maintenance charges. The problems faced during dematerialization of shares by the investors are signature difference and fake certificate and 10.2% of investors faced third party claims. From the study it is concluded that most of the investors are having DEMAT account and the problems faced by the investors are maintenance charges.

**Sukhwinder Kaur Dhnada, Mandeep Singh, Kamna Chawla (2015)** has explained about the objectives to analyze the trends in dematerialization process in the Indian capital market. To compare the charges of CDSL and NSDL and to find out the depository charges are reasonable. Sample size is around is 50 respondents and sampling area is Chandigarh, primary data has been collected through personal contacts and telephonic interviews and secondary data has been collected through websites of NSDL & CDSL. From the study it is concluded that dematerialization increases volume trade and provides liquidity. More and more institutional players are participating in a bigger way in post DEMAT period in the market indicating increased level of

confidence in the Indian stock market. It plays a positive role in further modernization of Indian capital market by providing higher liquidity, higher returns and lower volatility.

**Hari Babu, Surya Prakash Rao, B. Srinivas (2016)** has identified the objectives in the study that to know the role of NSDL and CDSL in Indian Capital Market. To know the features of Indian Depository system. The study is based on secondary data from the websites that is NSDL, SEBI, CDSL, NSE and official publications. From the study it is known that companies available for DEMAT in NSDL continuously increased and companies available for CDSL are also increasing from 2002 to 2015. The average growth of NSDL is higher than CDSL. Quantity of DEMAT shares in NSDL has been increasing from 37.21 billion to 110.20 billion and number of shares in CDSL has been increased from 1.89 billion to 227.55 billion. The annual growth rate of CDSL is greater than NSDL. From the study it is concluded that number of companies available for DEMAT services, quantity of DEMAT shares has positive annual growth rate in Indian Capital Market.

**Rajinikanth Kumar (2016)** have taken various measures in the depository system to ensure safety of the investor holdings. To observe the services provided by the NSDL in the depository system. Research design is analytical. The study is based upon secondary data collected from various websites that is NSDL, SEBI, CDSL, NSE and official publications. Companies available for dematerialized with NSDL during the period of 2000 to 2001 were 2786 and in the period of 2014 to 2015 were 13992. The DEMAT custody in NSDL there was average annual growth rate shows that there is an increase of 35.43% during the period it is a positive indication. Quantity of DEMAT shares of average annual growth rate is 26.26% which is a positive indication. From the study it is concluded that after dematerialization investors has been increased. DEMAT trading has brought in transparency in Indian Capital Market.

**Molay Ghosal (2016)** has identified the objective of the study is to check the awareness level of DEMAT account, to collect the real information about the preference level of investors towards DEMAT account. In this study they have taken both primary data and secondary data and through primary data they have collected information through surveys, with secondary data they have collected information through internet, magazines. From the study it is known that 70% customers are aware about DEMAT account, 75% of investors invest in mutual fund. 72% investors are aware about online trading. From the study it is concluded that people are not much aware about commodity market and company should organize seminar to enhance the knowledge of stock markets

**Kumar, Saravana & Ganesan, M. (2017)** identified that specific objectives were set to identify the factors inspiring investors to open DEMAT account. They have taken from primary data by taking 100 sample respondents by using convenience sampling technique. From the study we found that transferable speed, service of security and safety, service account maintaining charges, service reliability, service provided by D/P brokers, account transparency, periodical statement of handlings, reliability, processing time, payment in case of sale of shares, no stamp duty on transfer of shares, compulsory DEMAT account, transaction cost. It is concluded that system has eliminated all the risks and inconvenience related to physical certificate system.

**Melbha D (2017)** explained about the objectives to study about DEMAT account, to analyze the investor's perception towards DEMAT account as well as to analyze the importance of DEMAT account. The sample has been taken from Thiruvananthapuram district through selected stock blocker office. The primary data has been collected through questionnaire method by email invitation and 100 respondents for data collection. Secondary data with the help of google scholar website. Percentage, hypothesis is used for data analysis. From the study it is observed that with the help of DEMAT account they can communicate each other, reduces the fraud, paper less trading, better portfolio.

**Shree Bhagwat & Ritesh More (2018)** has made a comparative analysis of annual reports of NSDL and CDSL in India over a period of time and to make suggestions with regard to working of depositories of India. The main source of data is secondary data of annual reports of both NSDL and CDSL. Tools and techniques used in the financial performance are accounting techniques in this technique for the financial analysis of stock exchanges are analysis using time series, correlation and regression analysis, ratio analysis. Statistical techniques are used to provide a more accurate and scientific measurability of profitability analysis and which are suitable for financial analysis of stock exchanges are measures of central tendency, measures of dispersion, index numbers, non-parametric tests, parametric tests, t tests. Mathematical techniques such as project evaluation review technique (PERT), critical path method, linear programming etc. From the study it is concluded that measurement of performance through financial statement analysis provides good knowledge about financial variables for measuring the performance of different units in industry.

**OBJECTIVES OF THE STUDY**

- To study the factors influencing investors decision in opening DEMAT Account.

**RESEARCH METHODOLOGY**

The study is descriptive in nature which are concerned with describing the characteristics of a particular individual. Purposive Sampling method has been used as a sampling technique. Overall the sample involved in the study consisted of 71 respondents. In the study we have used primary source of data through followed by questionnaire method. In questionnaire method we have collected the respondents from the investors who are having DEMAT Account. The minimum age of the respondent is 18 years.

The variables that are taken in the study are safety, transferable speed, requirements of formalities, account maintenance charges, service provided by brokers, account transparency, periodical statements of holdings, reliability, processing time, payment in case of sale of shares, eliminate bad delivery & theft, compulsory DEMAT Account, eliminate fake charges, transaction cost to identify the factors for selecting a particular DEMAT account.. The excel software is used to analyze and interpret the data.

**DISCURSION & RESULTS**

The paper is organized systematically, presenting results in accurate manner. It is designed on the basis of objectives of the study. It deals with the demographic factors of the investors and followed by factors Influencing Investors decision towards opening a DEMAT Account with a particular brokerage house.

**Demographic Factors:** The demographics such as age, gender, income, employment, education is discussed below:

**Age:** The graph 4.1 shows the age of 70 respondents for this particular study. 76% of respondents were in the age group of 18-24 followed by the 20% and 4% respondents in the age group of 25-34, 35-44 years respectively. Majority of the respondents were young and were in the nascent stage of career.

**Table 1: Demographic Factors**

<b>Age</b>	18-24 years (75.7%)	<b>Income</b>	<3 Lakh (66.7%)
	25-34 Years (20%)		4-6 Lakh (26.1%)
	35-44 Years (4.3%)		7 -10 Lakh (5.8%)
			Above 10 Lakh (1.4%)
<b>Gender</b>	Male (51.4%)	<b>Occupation</b>	Government Employee (52.1%)
	Female (48.6%)		Corporate Employee (35.2%)
			Self Employed (8.5%)
			Others (4.2%)
<b>Marital Status</b>	Married (14.18%)	<b>Educational</b>	Undergraduate (31.5 %)
	Unmarried (85.9%)		Post Graduate (68.0%)

**Gender:** Gender of customers is also a prime factor to decide the factors influencing investors towards DEMAT Account. The male and female differences among the customers classify to know their potentiality, knowledge and accomplishment. The Table 1: shows the gender of 70 respondents for this particular study. 48.60% were belongs to female and 51% were belongs to male.

**Qualification:** Educational status of the customers is also a significant factor to decide the level of awareness and level of satisfaction towards DEMAT Account. It influences customers to learn regarding DEMAT Account. Therefore, education is considered as necessary one to decide the level of satisfaction of customers towards DEMAT Account. For the purpose of the study we have classified into 4 categories that is 10<sup>th</sup>, intermediate, graduation and post-graduation. The application on the responses collected from the customers clearly brought the following results. The Table 1 shows the qualification of 70 respondents for this particular study. 68.60% of respondents are post graduates, 28.60% respondents belong to graduation 31.5%.

**Income:** Among the various factors which are influencing the customer towards DEMAT Account, level of income is most significant one. The income level varies with age, family members, educational status, occupation etc. Therefore, it is considered this impact plays a major role in the present study. So, we decided to use this demographic factor in the study. The Table 1 shows the income of 69 respondents for this particular study. 66.70% respondents are belonged to less than 3 lakhs, 26.10% respondents are belonging to 4-6 lakhs, 5.80%, respondents belong to 7-10 lakhs, 1.40% respondents belong to above 10 lakhs.



**Employment:** Employment status among customers is different in nature. The nature of employment has its own impact in factors influencing investors towards DEMAT Account. Therefore, in the view of its impact the employment status has been taken in the study for deciding their level of satisfaction on DEMAT Account. The responses of the customers clearly revealed the following results. The Table 1 shows 52.1% belongs to students, 8.5% belongs to self-employed, 35.2% belongs to private employees, 4.2% belongs to government employees.

**Marital Status:** Marital status of the customers is leading to unpredicted diversity in the financial needs. Customer decision patterns will become more complex. So, the marital status of the customers is influencing their Factors Influencing Investors Towards DEMAT Account. Therefore, marital status consisting of two groups namely married and unmarried is taken for the study. The application of marital status composition brought the results shown below. From the Table 1 from 71 respondents, 85.9% respondents are unmarried, 14.1% respondents are married.

**Number of DEMAT Account in AMC:** From 63 responses, from fig 4.12, 58.40% respondents are from KARVY, 6.4% respondents are from J Marathon, 6.4% respondents are from yes bank, 4.80% respondents are from share khan, 3.2% respondents are from up Stox, 3.2% respondents are from angel broking, 3.2% respondents are from edelweiss, % respondents are from Zerodha, 1.6% respondents are from GGI, 1.6% respondents are from India bulls, 1.6% respondents are from SBI, 1.6% respondents are from ICICI, 1.6% respondents are from hedge, 1.6% respondents are from HDFC.

### Factors Influencing Investors for Choosing a Specific DEMAT Account

**Safety:** From the below histogram, it is clear that most of the respondents are giving more importance to safety in D-mat account. Since the transactions are transparency, and accounting information can be furnished whenever it is required. From the table it is known that from 71 respondents, 10 members strongly disagree, 1 member disagree, 13 members are neutral, 21 members are agree, 26 members are strongly agree regarding safety.

**Table 2: Factors Influencing Investors Decision in Opening Demat Account**

Factor	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Safety	10	1	13	21	26
Transferable speed	6	5	11	29	20
Requirements/formalities	5	3	19	27	20
Account maintenance charges	7	9	22	24	9
Service provided by DP	6	4	23	24	14
Account transparency	5	5	16	27	18
Periodic holding statements	4	4	17	13	16
Reliability	4	6	17	26	18
Processing time	4	5	18	29	15
Payment in case of sale of share	4	6	21	24	16
Eliminate bad delivery and theft	7	8	17	24	15
Eliminate fake charges	5	7	13	24	22
Transaction cost	5	8	16	24	18

Source: Primary Data

**Transferable Speed:** Transferable speed related to DEMAT Account means shares which are in physical form needs to convert into electronic mode and it requires only 2 to 3 days to convert so most of the respondents agreed regarding transferable speed as it is taking less time. From the 71 respondents, 6 members strongly disagree, 5 members disagree, 11 members are neutral, 29 members are agreed, 20 members are strongly agreed regarding transferable speed.

**Requirements Of Formalities:** Requirements of formalities in DEMAT Account means it requires bank account statement, address proof, passport size photo to open the account and it acts as evidence to open the account. In the study most of the respondents agree for requirement of formalities. From the 71 respondents, 5 members strongly disagree, 3 members disagree, 19 members are neutral, 27 members agreed, 20 members strongly agreed regarding requirements of formalities.

**Account Maintenance charges:** It means that customer needs to pay fee for every year, usually there are no charges for basic DEMAT Account with a balance up to 50000 rupees. Those with holdings worth 50001- 2 lakhs rupees would have to pay 100 to 750 rupees depending on number of transactions you have made. From the study most of the respondents agreed for account maintaining charges. From 71 respondents, 7 members

strongly disagree, 9 members disagree, 22 members are neutral, 24 members are agreed, 9 members strongly agree regarding account maintenance charges.

**Service provided by DP brokers:** Depository participant is an organization which holds securities (shares, debentures, bonds, mutual funds) of investors in electronic form at the request of the investors through a registered depository participant. It also provides services related to transactions in securities. From the study most of the respondents agree regarding the service provided by the DP's/brokers. From the 71 respondents, 6 members strongly disagree, 4 members disagree, 23 members are neutral, 24 members are agreed and 14 members agreed regarding services provided by DP brokers.

**Account Transparency:** Account Transparency means that investors have ready access to required financial information such as company stock value, market depth. Transparency reduce price volatility because all the market participants can base decisions of value of same data. Company also have strong motivation to provide disclosure because transparency is rewarded by the stock performance. From the study most of the respondents agreed for account transparency. From the 71 respondents, 5 members strongly disagree while 5 members disagree, 16 members are neutral, 27 members agree and 18 members strongly agree regarding account transparency.

**Periodic Holding Statements:** Periodic Holding Statements means a holding statement lists your shareholdings in various companies in your DEMAT Account as of particular date. A transaction statements gives details of all share inflows (credits) and outflows (debits) that take place in your DEMAT Account during a particular period. From the study most of the respondents accepts periodic holding statements. From 71 respondents, 4 members strongly disagree, 4 members disagree, 17 members are neutral, 30 members are agreed and 16 members strongly agreed regarding periodic holding statements.

**Reliability:** Reliability means the quality of being trustworthy or performing consistently well. It is one of the important factors to influence investors for choosing DEMAT Account. From the study most of the respondents are reliable towards DEMAT Account. From the 71 respondents, 4 members strongly disagree, 6 members disagree, 17 members are neutral, 26 agree, 18 members strongly agree regarding reliability.

**Processing Time:** Processing Time means how much time it is required to open the account. However, it will not take too much time to open the account, it will take one week to activate the account. Most of the respondents agreed towards DEMAT Account. From the 71 respondents, 4 members strongly disagree, 5 members disagree, 18 members are neutral, 29 members agree, 15 members strongly agree regarding processing time.

**Payment in case of sale of shares:** It means the investor will give delivery instruction to the DP to debit his account and credit the broker's account. Such instruction should reach the DP office at least 24 hours before the pay in as otherwise DP will accept the instruction only at the investor's risk. From the study most of the investors agree for payment in case of sale of shares. From the 71 respondents, 4 members strongly disagree, 6 members disagree, 21 members are neutral, 24 members agreed and 16 members strongly agreed regarding payment in case of sale of shares.

**Eliminate Bad Delivery & Theft:** In DEMAT Account shares are converted into electronic form so there is no possibility of bad delivery & theft that take place in dematerialization of shares. From 71 respondents, 7 members strongly disagree, 8 members disagree, 17 members are neutral, 24 members agreed, 15 members strongly agreed regarding eliminate bad delivery and theft.

**Eliminate fake charges:** DEMAT collects Brokerage charges, Transaction charges etc. which Client has to pay. There are no hidden charges to open DMAT account. From the study it is known that most of the respondents agreed for eliminating for fake charges. From 71 respondents, 5 members strongly disagree, 7 members disagreed, 13 members are neutral, 24 members agreed, 22 members strongly agreed regarding eliminate fake charges.

**Transaction Cost:** Some of the DP charge levy a charge either based on number of transactions you made or a flat rate for an entire month. Though such charges vary too, some DP tend to charge roughly 1.5 rupees for each share you trade. With the help of broker, we will not face too many problems to trade the shares. From the study most of the respondents agreed for transaction cost to eliminate risk. From 71 respondents, 5 members strongly disagree, 8 members disagree, 16 members are neutral, 24 members agreed, 18 members strongly agree regarding transaction cost.

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**CONCLUSION**

The study found that the factors such as safety, account maintenance charge, transferability, reliability, transaction cost are considered while opening DEMAT account. It is found that most of the investors are not finding time to convert the shares certificates into electronically. It is suggested that the Institution can approach the investors at their door step to automatize the trading records. The investor should convert their shares in electronic mode because to eliminate bad delivery & theft and we will not face any problem regarding signature in electronic mode.

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**A STUDY ON UNDERSTANDING POTENTIAL OF E-BIKES**

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**ABSTRACT**

*The study is to determine the potential of e-bikes in campuses which are spread over a large area like educational institutions and corporate offices in Hyderabad. Primary data will be collected to know the level of awareness and the willingness of employees and students to use these bikes in their campuses. Depending on the data collected and analysed, the company will look forward to tie up with those campuses and provide their e-bikes. The main motive behind this is that the students or employees can use these e-bikes to move from one place to other inside the campus that is spread over a large area and also for their personal use. The e-bikes will be provided on a monthly subscription basis with different plans. These bikes are eco-friendly and run completely with the help of electricity with zero to minimal running costs.*

*Keywords: E-Bikes, Eco-Friendly, Intent to Subscribe , Perceived Advantages*

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**INTRODUCTION**

In developing countries like India, there is a huge scope for electric vehicles which are eco-friendly and run purely with the help of electricity. As these e-bikes do not need any fuel to run them, the carbon and nitrogen emissions can be eliminated.

**The major reasons for selecting students and employees as the target audience are:**

- Their awareness about the need for pollution control and also about saving the most precious non-renewable resources.
- To serve their underlying and unidentified mobility needs.

The e-bikes can be charged using both AC and DC currents. Installation of DC current charging stations is slowly increasing across Hyderabad and also across India as the government and private bodies are coming forward to increase the usage of green transportation. Also, these bikes can be charged normally with the help of regular household power sockets. The time taken for charging the battery and the maximum distance covered depends on the type of the model selected. The increasing fuel rates will also be a major concern for the target market for considering an electric bike over a regular conventional bike. The government of India is also promoting and encouraging the use of electric vehicles and trying to change the future transportation in the coming years.

**LITERATURE REVIEW**

E-bikes were originated in Japan in early 1980's but the technological and cost limitations reduced the market attractiveness until early 2000's. Later, the improved battery and motor technologies have proved that E-bikes can travel for a longer distance, with faster speeds and are affordable too. The E-bike market has been growing rapidly since the past decade in various countries with a good market penetration. But the knowledge about E-bikes among the citizens is not up to the mark, so government agencies have to come forward to spread awareness that how these bikes may have an impact on health, emissions and safety.[ Fishman & Christopher, 2016]

The present scenario of electric vehicles shows that financial incentives to EV buyers and investments to improve infrastructure can help increase the share of EVs in India in the short to medium term by 2030. This would also be an opportunity for India to develop domestic EV industry and create a charging infrastructure, which can increase EVs. The policies to shift to electric vehicles will result in decreasing pollution rapidly in the growing cities in India. As public transport is widely used in a country like India, a higher share of investments can be used for purchasing electric buses. EVs market share in India is still small. The policies and incentives announced by the Government of India, can help EV 2-wheelers to be competitive by 2020; but for EV 4-wheelers, these may not be sufficient. The size of 2-wheeler market in the coming days is going to be much larger than the 10 Million two-wheelers sold in 2010. For EV 4-wheelers the incentives will help to bring the difference only by 2030, when there is a global decline in battery costs further, which brings down the costs. [Subash, Minal& Priyadarshi,2017]

India has the capacity to emerge as the world leader in the electric mobility. Firstly, a comprehensive policy may help the global automotive manufacturers in decision making and also making them to invest. Not only the electric vehicle but a whole ecosystem and infrastructure has to be developed that can support the plan.

Batteries are becoming the main building blocks in the transport and the energy sector. The industry will experience a significant growth and this is just the beginning. A regulatory push from the government and creating awareness among the consumers is very important for the market growth. Hence India needs to think out of the box, to welcome the trend of electric vehicles and adapt latest technologies. [Arora, 2018]

Developing countries need to introduce EVs which are appropriate to the electrical power structures in their countries. Innovating the necessary technology to reduce the cost of EV production and increasing the establishment of charging infrastructures are the two main methods that should be used to promote development of the EV industry in developing countries. Secondly, air pollutants should be strictly controlled during the power production process. Commercialization of the EV industry in developing countries is expected to directly and increase the demand for power in the future and may also possibly result in substantially increased emission of air pollutants. Although CO<sub>2</sub> emission reduction in developing EV industries exerts a positive environmental effect, the emission of various other air pollutants has a negative effect on the environment. Therefore, the total environmental benefits are likely to be negative. Therefore, the developing countries have to pay more attention to the control of pollutant emission in power generation in the short term so as to expand the EV industry in the future. [Ya Wu & Zhang, 2017]

In the coming future, as the battery technology becomes cheaper, fossil fuels becomes costlier, electric vehicle technology becomes cost effective, and the government will come forward to give subsidies and tax benefits for EVs. The charging stations will become widespread, and due to GHG emission law being more stringent, it is a natural expectation that the vehicle to home (V2H) methodology will become popular and economically viable. This can happen only by bridging the cost margin between the existing commercial vehicles, which are driven by fuel and the EVs. A very recent initiative by the Indian government under the Faster Adoption and Manufacturing of Hybrid and Electric Vehicle (FAME) scheme 2015, is to provide subsidies for electric vehicle purchase, due to this the cost difference between electric vehicle and conventional diesel vehicle is bridged to an extent. [Kumart, Anmol & Akhil, 2015]

## DATA ANALYSIS AND INTERPRETATION

### Regression between perceived advantages and intent to subscribe an e-bike

**Null Hypothesis (H<sub>0</sub>):** As the perceived advantages of e-bikes increase, the intent to subscribe an e-bike is not increasing.

**Alternate Hypothesis (H<sub>1</sub>):** As the perceived advantages of e-bikes increase, the intent to subscribe an e-bike is increasing.

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.507 <sup>a</sup>	.257	.252	1.094

Coefficients <sup>a</sup>						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-2.774	.623		-4.454	.000
	Perceived Advantages	1.219	.170	.507	7.162	.000

### Interpretation

From the above table, we can formulate the regression equation  $Y = a + bX$  as follows

$$Y = -2.774 + 1.219X$$

Hence, we can say that advantages influence subscription behaviour by 1.21%

Also, from R square value, which is 0.257, we can say that the relation between advantages and subscription behaviour is explained 25% accurately.

From the table, we can analyse that the P value is less than the level of significance, therefore, we have to reject the null hypothesis and accept alternative hypothesis. It means that we have to accept the hypothesis that, as the perceived advantages of e-bikes increase, the intent to subscribe an e-bike is increasing.

**Correlation between preference of attributes and intent to subscribe an e-bike**

		Speed	Mileage	Appearance	Brand name
Intent to Subscribe	Pearson Correlation	.547**	.625**	.095	.088
	Sig. (2-tailed)	.000	.000	.246	.285
	N	150	150	150	150

		Price	Resale value	Body type	Availability of spare parts
Intent to Subscribe	Pearson Correlation	.577**	.293**	.101	.119
	Sig. (2-tailed)	.000	.000	.217	.149
	N	150	150	150	150

**Interpretation**

From the above tables, we can analyse that mileage, speed and price are having a strong positive correlation with the subscription behaviour. Hence, we can say that majority of the people who have an intent to subscribe an e-bike would prefer mileage, speeds and price with top priority.

**Regression for preference of attributes and the subscription behaviour**

**Null Hypothesis (H<sub>0</sub>):** Majority of the people who have an intent to subscribe an e-bike don't prefer mileage, speeds and price with top priority.

**Alternate Hypothesis (H<sub>1</sub>):** Majority of the people who have an intent to subscribe an e-bike prefer mileage, speeds and price with top priority.

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.746 <sup>a</sup>	.557	.548	.851

Coefficients <sup>a</sup>						
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	-2.076	.302		-6.864	.000
	Speed	.282	.078	.234	3.617	.000
	Mileage	.529	.088	.386	5.991	.000
	Price	.294	.056	.326	5.207	.000

**Interpretation**

From the above table, we can formulate the regression equation  $Y = a + bX$  for speed, mileage and price respectively as follows:

$$Y = -2.076 + 0.282X_1 + 0.529X_2 + 0.294X_3$$

Here, we can say that speed, mileage and price influence subscription behaviour by 0.28%, 0.59% and 0.29% respectively.

Also, from R square value, which is 0.557, we can say that the relation between the listed attributes of electric bikes and subscription behaviour is explained 55% accurately.

From the table, we can analyse that the P value is less than the level of significance, therefore, we have to reject the null hypothesis and accept alternative hypothesis. It means that we have to accept the hypothesis that, majority of the people who have an intent to subscribe an e-bike prefer mileage, speeds and price with top priority.

**FINDINGS**

- From the study it is clearly visible that females are more interested in using electric bikes when compared to males.
- It is found that, students are more enthusiastic to use electric bikes when compared to that of the corporate employees. This might be because of the reason that employees are already provided free transportation from the company side. Also, many of the students stay in a certain geographical location for a specific period of time, they might feel more flexibility in opting for an electric bike on subscription basis.

- It is found that, majority of the respondents who have undergone the survey fall under the income level of 0-2.5 lakhs, this is because of the fact that half of the respondents were college students who don't have any source of income.
- It is found that, though the awareness about e-bikes among the customers is very high, their willingness to use these bikes is less.
- It is found that, the respondents have firmly accepted that electric bikes are eco-friendly, light in weight and have low running costs.
- Out of the given list of attributes, we found that speed, mileage and price are the top three attributes the consumers prefer while opting for an electric bike.
- From the study, it is clearly understood that as the perceived advantages of electric bikes increase, the intent to subscribe an e-bike will increase.
- It is found that, majority of the people opting for an electric bike subscription prefer mileage, speeds and price with top priority.

### **RECOMMENDATIONS**

- From the study we found that mileage is one of the main concerns to choose an electric bike over a normal bike, so the company shall think about partnering with other companies to setup fast charging stations at different geographic areas.
- Negative perception towards e-bikes over normal bikes among people might be a drawback for opting an e-bike, which can be eliminated by following promotional strategies that highlights the advantages of these bikes and explains the immediate need of adopting electric bikes over conventional bikes to reduce the growing pollution rates.
- Corporate employees are found to be less interested to use electric bikes. Hence, eternal green can think about providing extra corporate offers to attract this segment.
- The company is currently planning to launch three variants. Increasing the number of variants might grab the attention of a larger chunk of customers.
- The company can also think about selling electric bikes rather than only providing them on monthly subscriptions.
- Few respondents expressed an opinion that the monthly subscription rates are higher, so the company should think about revising them.

### **CONCLUSION**

The frequency distribution of respondents showed that most of the respondents in the survey are men. Majority of the respondents who are interested to opt for e-bike subscription fall under the age group of 16-25 years and an income level of 0-2.5 lakhs per annum. The awareness of electric bikes among the respondents is high, very few respondents were unaware about these bikes. Though the awareness is high, most of the respondents said that they have never used electric bikes. Responses about perceived advantages and preference of various attributes of e-bikes were collected through a 5-point Likert Scale and an in-depth analysis was performed using statistical techniques like correlation and regression.

Females are more interested in using electric bikes than that of males, so the company can introduce variants which attract males. The company should focus on developing advertising campaigns which will communicate the need and importance of using electric bikes. Increasing pollution rates and fluctuating fuel prices stand as the top concerns which strengthens the need for immediate adaption of e-bikes. The latest plans and schemes by the government of India brings in a lot of scope for e-bike subscriptions and sales in the coming few years.

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**ANALYTICAL APPROACHES TO PERFORMANCE EVALUATION**

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**ABSTRACT**

*Today almost all the top-performing organizations in the world tend to apply analytics. Analytics empowers managers with better decision making capabilities in the areas where human interference can effect judgements and use of data can lead to better outcomes.*

*The measurement of employee performance being one of the most critical area in the field of human resource management suffers bias in the performance judgements of the employees. Hence a more sophisticated and robust tool of measurement needs to be established.*

*This paper attempts to suggest few simple yet robust analytical approaches that HR practitioners could utilize for reducing the bias caused due to human interference in performance evaluations.*

*Keywords: HR Analytics, Human Resource Management, Employee Performance, Employee Performance Evaluation, Bias in Performance Evaluation.*

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**INTRODUCTION**

The success of organization depends on employee performance. Employee performance is generally stated as the accomplishments made and outcomes achieved by the personnel at work (Gomez-Mejia, Balkin, & Cardy, 2005). Thus measuring the performance to both evaluate the accomplishments and also control the discrepancies are vital for the organizational wellbeing and success.

But, in the real scenario, evaluating performance has been a source of dissatisfaction for most of the practitioners (R. L. Cardy, 2015; R. L. Cardy & Munjal, 2016). HR Managers and workforces alike have frustrations with the evaluation system (R. L. Cardy, 2015). Performance evaluations are prone to bias due to subjectivity in the judgements made by the appraisers in the process of evaluation. (R. L. Cardy & Munjal, 2016).

Thus, developing a robust and healthy performance evaluation mechanism is not only necessary but also vital for organizational success. Emergence of new technologies like analytics have opened up new doors in this area. Using existing data for analyzing employee performance and applying statistical techniques to make decisions is called performance analytics. Performance analytics not only helps in limiting the impreciseness of performance evaluation mechanisms but also equips HR managers to make evidence based decisions (Marler & Boudreau, 2017).

However, HR managers are still behind other functional area managers in embracing analytics (Lawler III, Levenson, & Boudreau, 2004). One of the reasons for such delay is the lack of understanding of HR managers on analytical concepts and lack of awareness of HR practices to the analytic teams (Lawler III et al., 2004). There is an immense need for the HR practitioners to understand the importance of addressing the HR issues and make better decisions by adapting to the changing environment.

This article tries highlights few analytical concepts that could be used in developing better performance evaluation system in the organizations.

**LITERATURE REVIEW**

The organizations these days have acknowledged their employees as the most prized possessions. The employees are no longer associated with costs and problems but are treated as most valued resources. However, owing to cut throat competition and cognizant workforce retaining the skilled personnel has become the most critical challenge to the organizations these days (Griffeth & Hom, 2001; Murphy & Cleveland, 1991).

Employees today demand admiration, accountability and reward (Anshu Sharma, 2017) from organizations for offering their skills and services. A competent employee who is treated well develops commitment and loyalty towards organization (Curtis & Wright, 2001). Thus understanding the employee performance is a critical task for the organizations.

In practice, the value of an employee is assessed through performance evaluation (Arberry, 2015). Performance evaluation is considered as the heart of performance management (R. L. B. Cardy, 2014).

Performance evaluation is a formal and productive procedure to measure an employee's work and results based on their job responsibilities. It is used to gauge the amount of value added by an employee in terms of increased business revenue, in comparison to industry standards and overall employee return on investment (ROI) (Griffeth & Hom, 2001; Ittner & Larcker, 1998).

Performance evaluations grade the employees on the basis of which, they are either promoted or suitable distribution of salary raise is offered or they are sent for an appropriate training or they might be even punished or be terminated from the employment (Anshu Sharma, 2017). Thus, performance evaluation is the most critical area in the field of human resource management for identifying and retaining competent employees in the organizations (Anshu Sharma, 2017; Lowe, Levitt, & Wilson, 2008).

Healthy performance evaluation methods enhances trust (Mayer & Davis, 1999), enable goal achievement (Cleveland, Murphy, & Williams, 1989), develop employee satisfaction (Boswell & Boudreau, 2000) and cultivate stronger organizational culture (Cleveland et al., 1989).

Although enormous research exists in the area of performance measurement, it still remains the area of interests by researchers and practitioners alike (Anshu Sharma, 2017; Ittner & Larcker, 1998). Bias in performance reviews play an important role in their inquisitiveness (Arberry, 2015). Bias can ensue in performance appraisals due to human interference in evaluation (Anshu Sharma, 2017) or due to inadequate information about the employee (Tavis, 2016). Therefore a more better, robust and accurate way of measurement is sought by the practitioners that can benefit the organizations and employees equally (John & Eeckhout, 2018).

Innovative technologies, such as analytics have opened up new boundaries for the managers today (Angrave, Charlwood, Kirkpatrick, Lawrence, & Stuart, 2016; Marler & Boudreau, 2017). HR managers can adapt to these techniques to develop robust and bias free appraisal systems that assesses employee (Anshu Sharma, 2017).

Analytical approaches like regression to mean, deducing an adequate sample and sample impartiality can substantially reduce the bias in performance evaluations and therefore enable in creating a robust mechanism to measure performance.

## **APPROACHES USED TO REDUCE BIAS IN PERFORMANCE EVALUATION**

### **Regression to the Mean**

Regression to the Mean or RTM is a phenomenon of getting closer to the mean from the repeated observations on a particular subject by reducing the random error caused due to bias in observations (Barnett, Van Der Pols, & Dobson, 2004). It is an analytical technique used for data that is repetitive in nature (Barnett et al., 2004; Bland & Altman, 1994). This concept can be applied in various fields of work where data on a particular subject can be measured on a repetitive basis (Bland & Altman, 1994; Harrison & Bazerman, 1995).

Performance evaluation is periodic measurement of employee performance in the organizations. Therefore as the nature of performance data is periodic, RTM could be applied in performance evaluation.

Regression to the mean reduces the random error caused due to bias in observations (Barnett et al., 2004), thus application of this technique can substantially reduce the bias (error) in performance measurements.

In this technique, the data of an individual employee is collected over considerably long period of time and the mean values of the data are calculated. As the mean values are calculated from huge data set, the extremities in the data caused generally caused due to bias can be neutralized minimizing the bias in the evaluation (Massey & Thaler, 2013).

### **Deducing Sample Size**

The size of the sample is the utmost significant factor considered in any analytical study. The inferences made about a population are generated from the ability of the sample to represent the population (Krejcie & Morgan, 1970). Also, the crux of the central limit theorem states that the average of sample means will represent the population mean when the sample size is considerably large (Ferguson, 2017). Moreover the precision of the measurement depends on the quality and size of the sample selected. (Israel, 1992b).

But then again, in practice the size of the sample is usually determined based on the cost, time, or convenience of collecting the data. This laxity in data collection leads to erroneous outcomes (Israel, 1992a, 1992b; Krejcie & Morgan, 1970).

Performance evaluation is a process of measuring employee performance from the data collected about the employee. Generally, in organizations performance data is collected from the supervisors of the employee

(Chrymko, 1991) or from the client, peer group, subordinates of the employee (Maurer, Raju, & Collins, 1998) or from the employee himself at the end of appraisal period (Roberts, 2003).

As the data is collected from limited sources and in limited intervals, the data could lead to erroneous results (bias). This can be addressed by collecting ample employee information from all the sources possible. The data from log sheets, attendance reports, leave records, records of man-hours, additional efforts taken for the organization, client satisfaction records, awards and recognitions etc. This data can be collected throughout the performance period and could be used during performance measurement. Multiple sources and continuous track of information diminishes the biases in performance evaluation process.

### **Sample Impartiality**

The analytical concept of sample impartiality or independence enunciates the importance of data to be independent of any pre conceived notions or viewpoints that can influence the judgement of the assessor.

The concept of sample impartiality or independence suggests that when a particular matter is discussed amongst the group, the decision of the group would be influenced by one or few dominating viewpoints in the group and thus the decisions made would be partial leading to erroneous decisions. To avoid such situations, the data from each source has to be free of any influence or bias. The opinions of the group from which data is collected must be must be uncorrelated to each other (Galton, 1907).

This notion has been applied and proven to be correct in many areas of research where a sample was collected to deduce certain inferences about the population (Bassamboo, Cui, & Moreno, 2015; Lorenz, Rauhut, Schweitzer, & Helbing, 2011; Mannes, Larrick, & Soll, 2012; Marbach et al., 2012; Solomon, 2006; Welinder, Branson, Perona, & Belongie, 2010).

Thus concept of sample impartiality or independence can also be applied in performance evaluation (Bassamboo et al., 2015). The performance evaluation decisions are often based on the data collected from the stakeholders associated with the employee at work (R. L. B. Cardy, 2014). Thus care must be taken that no individual opinion would influence the final appraisal of the employee. Moreover all the impartial and uncorrelated opinions must be collected and used for making the final performance judgements. Thus the appraiser has to develop proper measures to collect unbiased and impartial information about the employee during the performance evaluation.

### **CONCLUSION**

The measurement of employee performance is the most critical area in the field of human resource management. A robust employee performance evaluation system improves employee confidence (Mayer & Davis, 1999), ensures employee job performance (Boswell & Boudreau, 2000) and develops resilient organizational culture (Cleveland et al., 1989). Thus developing robust and accurate mechanisms to measure performance is an essential for healthy existence of the organization.

However, despite rigorous efforts of practitioners and academicians over the years to bring in a better and reliable system, the incidence of bias is still a major problem in performance evaluations.

Nevertheless, the emergence of new technologies like analytics in the field of management have brought in several modifications in the traditional ways. Today, managers are able to make better decisions that can be buoyed by substantial evidence developed from the data available with the organization (Marler & Boudreau, 2017; Sharma & Bhatnagar, 2017). Analytics has been found to be very worthwhile in the areas where the human interferences cloud the judgements made and there is a high scope of bias in final outcomes (Marler & Boudreau, 2017; Sharma & Bhatnagar, 2017).

Analytics in these areas uses the data available with the organizations to make decisions and reduces the human element in decision making (Van Den Heuvel & Bondarouk, 2016).

As performance evaluation decisions has always been subjected to human interference, analytics in this area could help the managers to reduce the bias in the performance judgements of its employees.

The approaches like RTM, deducing the sample size and sample impartiality or independence are time tested in various domains and can thus be applied in performance measurement also. This techniques are simple and can be applied by the HR managers with no much technical expertise and costs involved and yet developing a reliable performance measurement system.

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**A STUDY ON OPTION PRICING MODEL IN DERIVATIVES**

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**ABSTRACT**

*Capital market is a market where buying and selling of securities is done. Investment into capital markets is considered as risky by investors. In spite of risk being involved many studies proved that young generation shows more interest into capital market investment specifically Derivative segment without any adequate knowledge though sometimes they take help of brokers, friends. In derivative market the most commonly traded derivatives are options in order to evaluate the options they are two methods available to calculate the premium charges 1) Binomial option pricing model and 2) Black and Scholes model. Present study deals with calculate the option premium charges using of Black and scholes model and it is also suggested how to take decision while comparing relationship between the theoretical price and the market price of the underlying asset.*

*Keywords: Premium charges, hedging, theoretical price intrinsic value*

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**INTRODUCTION**

The materialization of the marketplace for derivatives instruments like forwards, futures and options, can be traced back to the keenness of investors who are not ready to face risk. Derivatives are *financial instruments*, whose value is derived from an value of underlying asset. In this market participants are hedgers, speculators and arbitragers. Prices in market shows the sensitivity of market participants about the futures instrument

Many studies on the results of futures and options listing on the underlying cash market instability have been done in the developed markets. In cash market the profit/loss of the investor relates on the market price of the underlying asset. The investors may either loose or gain while investing into derivative market if he is investing without proper knowledge on how to invest into derivative segment though he sometimes gain huge profits with limited But in derivatives segment the *investor enjoys huge profits with limited shortcoming*. Derivatives are preferably for hedging not for investment . In order to increase the derivatives market in India, SEBI has brought many changes in regulations though it should concentrate in the area of contract size, encouraging participation of FII in the derivatives market. Investors are also expected to take wise decision before investment into options market.

**NEED FOR THE STUDY**

For investors many investment sources are there in market. One of the most important investment opportunity is Capital market. To minimize risk into capital markets they can adopt certain strategies by entering into derivative contracts in regulated and unregulated market. The investor should compare the risk and expected yields on various instruments taking advisers suggestions before taking investment decision. The objective here is to make the investor aware of the functioning of the derivatives.

Derivative act as a risk hedging tool. In case of options market parties get right by paying premium charges which is considered as intrinsic value of instrument. The need felt to advice

to arrive at proper decision how to calculate theoretical price of premium charges and how to go ahead in options market by using Black and schools model.. Before the investor is purchasing call premium it is advised to find intrinsic value of call.

**OBJECTIVES OF STUDY**

1. To study the operations of futures and options.
2. To analyze options in derivatives market.
3. To calculate intrinsic value of option premium by Black& Scholes model.
4. To know when to buy or sell options with the help of intrinsic value of call premium.

**SCOPE OF THE STUDY**

The article explains the derivatives market and its instruments with special reference to options in Indian context. This study extends to the trading of derivatives done in the National Stock Market. It also includes calculation of call option premium and put option premium by using *The Blacks and Scholes Model* only in Indian market.

## RESEARCH METHODOLOGY

## Method of data collection

The primary data for the purpose of study is collected from the online source. Like NSE website. And secondary data is collected from various sources. Books, Journals, Articles, Internet Source.

For the purpose of calculation of call or put premium according to Black and Scholes model interest rate and standard deviation is assumed to be constant.

## LITERATURE REVIEW

Chan(2015)his paper examined the **informational content** of **options trading** on **acquirer announcement** returns. They show that implied volatility spread forecasts absolutely on the cumulative abnormal **return** (CAR), and implied volatility skew predicts depressingly on the CAR. Hayunga, D. K., & Lung, P. P. (2014). In their article investigated option market being good investment avenue for investors. The results demonstrate that **options** investors' trade in the correct direction of the upcoming revision approximately 3 days prior to the announcement. We find this behavior in option-implied prices, implied volatilities, and **options trading** volume. Tests confirm that the **options market** leads the stock **market** before the **financial analysts'** revision. Moreover, using all firms with outstanding **options**, an out-of-sample **analysis** produces a profitable zero-cost **trading** strategy net of transaction costs based on the relative valuations between the synthetic and the underlying equity security. Ragozzino, r., reuer, j. J., & trigeorgis, l. (2016). Real options in strategy and finance: current gaps and future linkages. Two main academic areas that have devoted their attention to the study of **real options** are financial economics and **strategy**. Mugwagwa, t., Ramiah, v., & Moosa, i. (2015). Short-selling restrictions limit investors' opportunities to profit from **contrarian strategies** in equity markets. They examine the proposition that incorporating options into **contrarian strategies** constitute a viable alternative to investors when short-selling restrictions are in place. In particular, they combined equities with the call and put options traded on the Australian Stock Exchange to investigate the **profitability** of **contrarian strategies** in the hybrid market and options market alone. Ghose, S., & Rath, A. (2016). Explained Short-selling restrictions limit investors' opportunities to profit from **contrarian strategies** in equity markets. Ncube, M., & Satchell, S. (1995). In this paper the authors develop a **bias-adjusted Black and Scholes option pricing model** using arguments based on Jensen's Inequality. The properties of the **Black and Scholes option** price are analyzed. Some calculations from simulation that resembles UK data on the FT-SE 100 index European options are presented.

Brooks, R., & Chance, D. (2014) The article discusses a study regarding the **subtle** points of **option pricing** and the aspects of **option pricing** theory. Topics include the e of the Black-Scholes-Merton **option pricing** model to demonstrate the relationship of the **option** price and its inputs, the increase of an **option's** value due to volatility, and requiring the acceptance of assumptions for the development of an **option pricing** model. Chaturvedula, C. (2016). The study investigates the **impact** of **derivatives listing** on stock prices in the **Indian** capital markets. Significant positive abnormal return around derivative **listing** is found lending support to the **market** completion hypothesis. The results support the evidence obtained in the US, the UK and other developed countries that introduction of **derivatives** increases the opportunity set to invest in the markets and improves the overall efficiency of the capital markets

Chaturvedula, V. C., & Kamaiah, B. (2008). This study looks at the **impact** of **derivatives** listings on returns of the underlying assets. Aditya Mohan, J., & Venkata Chaturvedula, C. (2008) explained At present, India's economy looks upbeat with an increase in investment in the **stock market**. At the same time, it is also seen that the **market** fluctuations are very high. Such high levels of fluctuations or volatility make it difficult to predict the future expected values of the **market** and make investment decisions. **Option-implied pdfs, the Black-Scholes model and implied volatility smiles.** (2004). *Bank of England Quarterly Bulletin*, 44(4), 450. The article reports on options **implied pdfs**. The assumption that asset price levels are log normally distributed is frequently used in the pricing of **option** contracts Mitra, S.K.(2008) focused on The Black and Scholes **option pricing formula** exhibits certain biases on several parameters used in the model. It has been observed that the implied volatilities are high for 'in-the-money' **options** and low for 'out-of-the-money' **options** indicating that the Black-Scholes model under prices 'in-the-money' **options** and overprices 'out-of-the-money' **options**. Further, implied volatility also varies with maturity. In addition to the problems of changing implied volatility across moneyless and maturity, **Nifty options** also suffer from 'cost-of-carry' bias, as future prices of **Nifty options** are usually less than **Nifty** spot prices plus interest element. Coelho, F.R., & Reddy, Y . V . (2017).



**Explained Option pricing** is very important in the **options** market. Black-Scholes (BS) model is one of the most preferred and used model for calculation of premium. In this paper, an attempt is made to study the relevance of BS model and **Black's** model in Indian derivative market with specific reference to the banking stock **options** from the **Nifty** bank index.

### **Derivatives Market – History & Evolution**

History of Derivatives may be mapped back to the several centuries. Some of the specific milestones in evolution of Derivatives Market Worldwide are given below:

12th Century- In European trade fairs, sellers signed contracts promising future delivery of the items they sold.

13th Century- There are many examples of contracts entered into by English Cistercian Monasteries, who frequently sold their wool up to 20 years in advance, to foreign merchants.

1634-1637 - Tulip Mania in Holland: Fortunes were lost in after a speculative boom in tulip futures burst.

Late 17th Century - In Japan at Dojima, near Osaka, a futures market in rice was developed to protect rice producers from bad weather or warfare.

In 1848, The Chicago Board of Trade (CBOT) facilitated trading of forward contracts on various commodities.

In 1865, the CBOT went a step further and listed the first ‘exchange traded’ derivative contract in the US. These contracts were called ‘futures contracts’.

In 1919, Chicago Butter and Egg Board, a spin-off of CBOT, was reorganised to allow futures trading. Later its name was changed to Chicago Mercantile Exchange (CME).

In 1972, Chicago Mercantile Exchange introduced International Monetary Market (IMM), which allowed trading in currency futures.

In 1973, Chicago Board Options Exchange (CBOE) became the first marketplace for trading listed options.

In 1975, CBOT introduced Treasury bill futures contract. It was the first successful pure interest rate futures.

In 1977, CBOT introduced T-bond futures contract.

In 1982, CME introduced Eurodollar futures contract.

In 1982, Kansas City Board of Trade launched the first stock index futures.

In 1983, Chicago Board Options Exchange (CBOE) introduced option on stock indexes with the S&P 100® (OEX) and S&P 500® (SPXSM) Indexes.

Products in Derivatives Market:

There are 4 products in derivative market Forwards, futures, options and swaps

### **INTRODUCTION TO OPTIONS**

An option is a contract, which gives the buyer the right, but not the obligation, to buy or sell specified quantity of the underlying assets, at a specific price on or before a specified time

### **FACTORS AFFECTING OPTION PREMIUM**

**Price of the underlying asset: (s) , Strike price: (k), Time until expiration: (t), Volatility:**

**Interest rate: (R1)**

### **Calculation of option premium based on binomial option pricing model:**

The binomial option pricing model was developed by William Sharpe in 1978 and later proposed by Ross and Rubinstein in the year 1979. It has proved over time to be the most flexible, intuitive and popular approach to option pricing.

### **CALCULATION OF OPTION PREMIUM BASED ON THE BLACK & SCHOLES MODEL**

In 1973 introduced Black and schools model continue to be chosen model for option valuation. However, the deviation of experiential market prices for options from the hypothetical results given by the Black-Scholes formula has produced both academics and practitioners, alike. Black and scholes model helps in finding intrinsic value of contract with the help of five variables stock price, strike price, volatility, time to expiry, interest rate with following assumptions.

### Assumptions

1. Returns are normal”.
2. R and standard deviation is constant.
3. There are no taxes and no transaction cost and no restriction on the short sales.
4. The underlying asset has no dividends & coupon payments
5. Options is applied for European options.

### Black and Scholes model and implied volatility:

The assumption that asset price levels (or simple proportional changes in asset prices) are log normally distributed is frequently used in the pricing of option contracts. For example, the black and schools (1973) model, a bench mark model for option pricing, is consistent with this assumption. One of the reasons it is a useful benchmark for option pricing is because the logarithmic growth rate of asset prices in the black- scholes model is normally distributed. In practice, however, the implied pdf's that we observe offend deviate from that implied by the Black – scholes model.

### Call option premium:

$$C = SN(d_1) - N(d_2)Ke^{-rt}$$

C = Call premium

S = Current stock price

t = Time until option exercise

K = Option striking price

r = Risk-free interest rate

N = Cumulative standard normal distribution

e = Exponential term

s = St. Deviation

ln = Natural Log

$$d_1 = \frac{\ln\left(\frac{S}{K}\right) + \left(r + \frac{s^2}{2}\right)t}{s \cdot \sqrt{t}}$$

$$d_2 = d_1 - s \cdot \sqrt{t}$$

### Put option premium

$$P = (C-S)+X*e^{-rt}$$

Where,

S = Current price of the security

X = Exercise price of option

R = Risk free rate of interest

T = Time to expiry of the option content

= Volatility of the underlying asset

N(x) = Cumulative probability function for a standardized normal variable. In other

Words, it is the probability that a variable with a standard normal distribution

(0,1) will be less than x.

### DATA ANALYSIS AND INTERPRETATION

TableNo. 1 Computation of lognormal returns and annual returns of HDFC:

Symbol	Date	Expiry	Option Type	Close	ln(cl/opn)
HDFC	20-Mar-17	30-Mar-17	CE	5.6	
HDFC	20-Mar-17	30-Mar-17	CE	168.65	3.405058964
HDFC	20-Mar-17	30-Mar-17	CE	0.3	-6.331798366
HDFC	20-Mar-17	30-Mar-17	CE	2.9	2.268683541

HDFC	20-Mar-17	30-Mar-17	CE	2.35	-0.210295409
HDFC	20-Mar-17	30-Mar-17	CE	1.85	-0.239229689
HDFC	20-Mar-17	30-Mar-17	CE	31	2.818801565
HDFC	20-Mar-17	30-Mar-17	CE	18.55	-0.513517415
HDFC	20-Mar-17	30-Mar-17	CE	10.45	-0.573867811
HDFC	20-Mar-17	30-Mar-17	CE	5.2	-0.697943353
HDFC	20-Mar-17	30-Mar-17	CE	2.3	-0.815749503
HDFC	21-Mar-17	30-Mar-17	CE	30.1	2.571616049
HDFC	21-Mar-17	30-Mar-17	CE	17.9	-0.519724459
HDFC	21-Mar-17	30-Mar-17	CE	9.75	-0.607533428
HDFC	21-Mar-17	30-Mar-17	CE	4.6	-0.751210982
HDFC	21-Mar-17	30-Mar-17	CE	2.25	-0.715126087
HDFC	21-Mar-17	30-Mar-17	CE	1.2	-0.628608659
HDFC	21-Mar-17	30-Mar-17	CE	117	4.579852378
HDFC	21-Mar-17	30-Mar-17	CE	165	0.343771539
HDFC	21-Mar-17	30-Mar-17	CE	132	-0.223143551
HDFC	21-Mar-17	30-Mar-17	CE	121	-0.087011377
HDFC	21-Mar-17	30-Mar-17	CE	92.25	-0.271288263
HDFC	22-Mar-17	30-Mar-17	CE	5.6	-2.801735685
HDFC	22-Mar-17	30-Mar-17	CE	146	3.260840024
HDFC	22-Mar-17	30-Mar-17	CE	132	-0.100804699
HDFC	22-Mar-17	30-Mar-17	CE	121	-0.087011377
HDFC	22-Mar-17	30-Mar-17	CE	92.25	-0.271288263
HDFC	22-Mar-17	30-Mar-17	CE	75.7	-0.197724122
HDFC	22-Mar-17	30-Mar-17	CE	45	-0.520115671
HDFC	22-Mar-17	30-Mar-17	CE	27.75	-0.48342665

(Source: www.nseindia.com)

	1635.2
Strike Price	1600
Time to maturity	0.03561
Rate of return	0.000178
LTP	53.15
S.D	0.173505
Mean	0.044086

For the purpose of calculation of option premium stock price, strike price , time to maturity is taken from NSE, risk free rate of return is taken from RBI , market trends. Calculated standard deviation for HDFC is 17%, return of stock of company is 4.4%. Hence, all the variables are taken to compute value of call option.

Market value of premium is observed to be 53.15

**Table no.2 Showing calculation of theoretical value of call and put option**

D1	0.038326	N(d1)= 0.515286
D2	0.005584	N(d2)= 0.502228
Call premium	39.03632	
Put premium	3.846465	

### Call Option Premium

$$CP = S_0(N(D_1) - X.e^{-rt}(N(D_2))$$

Where,  $D_1 =$

$$= \frac{\ln\left(\frac{S}{K}\right) + \left(r + \frac{s^2}{2}\right)t}{s \cdot \sqrt{t}}$$

$$[\ln(1635.2/1600) + (0.000178 + (0.173505^2/2)) * 0.03561] / 0.173505 * \sqrt{0.03561}$$

$$= 0.038326$$

$$\text{Where, } D_2 = \frac{d_1 - s \cdot \sqrt{t}}{\sigma \cdot \sqrt{t}}$$

$$= 0.038326 - 0.173505 \cdot \text{Sqrt}(0.03561)$$

$$= 0.005584$$

$$ND_1 = \text{NORMSDIST}(0.038326)$$

$$= 0.515286$$

$$ND_2 = \text{NORMSDIST}(0.005584)$$

$$= 0.502228$$

$$\text{Now, CP} = 1635.2(0.515286) - 1600 \cdot e^{0.000178 \cdot 0.03561} (0.502228)$$

$$= 39.03632$$

### Put option Premium

$$P = C - S + E/e^{-rt}$$

$$= 39.036 - 1635 + 1600/\exp(-0.00178 \cdot 0.03561)$$

$$= 3.846$$

### Interpretation

Here both the premiums call and put theoretical price is less than the market price. The theoretical price of call premium is 39.03632 and the market premium price is 53.15. So the stock is overvalued, that means the stock is showing more value than the original price. So instead of purchasing with high value it's better to sell the stock.

Symbol	Date	Expiry	Option Type	Close	ln
INFY	20-Mar-17	30-Mar-17	CE	0.3	
INFY	20-Mar-17	30-Mar-17	CE	0.25	-0.18232
INFY	20-Mar-17	30-Mar-17	CE	0.25	0
INFY	20-Mar-17	30-Mar-17	CE	0.25	0
INFY	20-Mar-17	30-Mar-17	CE	2.15	2.151762
INFY	20-Mar-17	30-Mar-17	CE	1.5	-0.36
INFY	20-Mar-17	30-Mar-17	CE	1.05	-0.35667
INFY	20-Mar-17	30-Mar-17	CE	0.7	-0.40547
INFY	20-Mar-17	30-Mar-17	CE	15.35	3.08779
INFY	20-Mar-17	30-Mar-17	CE	7.7	-0.6899
INFY	20-Mar-17	30-Mar-17	CE	3.6	-0.76029
INFY	21-Mar-17	30-Mar-17	CE	20.35	1.732147
INFY	21-Mar-17	30-Mar-17	CE	9.95	-0.71551
INFY	21-Mar-17	30-Mar-17	CE	4.1	-0.88659
INFY	21-Mar-17	30-Mar-17	CE	1.6	-0.94098
INFY	21-Mar-17	30-Mar-17	CE	0.85	-0.63252
INFY	21-Mar-17	30-Mar-17	CE	0.55	-0.43532
INFY	21-Mar-17	30-Mar-17	CE	149.5	5.605133
INFY	21-Mar-17	30-Mar-17	CE	131.85	-0.12563
INFY	21-Mar-17	30-Mar-17	CE	117.65	-0.11395
INFY	21-Mar-17	30-Mar-17	CE	115	-0.02278
INFY	22-Mar-17	30-Mar-17	CE	1.6	-4.27493
INFY	22-Mar-17	30-Mar-17	CE	1	-0.47
INFY	22-Mar-17	30-Mar-17	CE	0.5	-0.69315

**Table no.5 Showing calculation of theoretical value of call and put option.**

So	937
Strike Price	940
Time to maturity	0.0356
Rate of return	0.065

LTP	49.5
S.D	0.171263
Mean	0.001066

For the purpose of calculation of option premium stock price, strike price , time to maturity is taken from NSE, risk free rate of return is taken from RBI , market trends. Calculated standard deviation for HDFC is 17%, return of stock of company is 0.1%. Hence, all the variables are taken to compute value of call option.

Market value of premium is observed to be 53.15

**Table no.4 Showing calculation of theoretical value of call and put option.**

D1	0.084571	N(d1)= 0.533698579
D2	0.052257	N(d2)= 0.520837913
Call Premium	11.61953	
Put Premium	14.62549	

### Call Option Premium:

$$CP = S_0(ND_1) - X.e^{-rt}(ND_2)$$

Where,  $D_1 =$

$$\frac{\ln\left(\frac{S}{K}\right) + \left(r + \frac{s^2}{2}\right)t}{s \cdot \sqrt{t}}$$

$$= [\ln(937/940) + (0.065 + (0.171263^2/2)) * 0.0356] / (0.171263 * \sqrt{0.0356})$$

$$= 0.084571$$

Where,  $D_2 =$

$$d_1 - s \cdot \sqrt{t}$$

$$= 0.084571 - 0.171263 * \sqrt{0.0356}$$

$$= 0.052257$$

$$ND_1 = \text{NORMSDIST}(0.084571)$$

$$= 0.533698579$$

$$ND_2 = \text{NORMSDIST}(0.052257)$$

$$= 0.520837913$$

$$\text{Now, CP} = 937(0.53369) - 940 * e^{0.065 * 0.0356}(0.52083)$$

$$= 11.61953$$

### Put Option Premium

$$\text{Put P} = C - S + E/e^{-rt}$$

$$= 11.61 - 937 + 940 / \exp(-0.00178 * 0.03561) = 14.625$$

### Interpretation

Here both the premiums call and put theoretical price is less than the market price. The theoretical price of call premium is 11.619 and the market premium price is 49.5. So the stock is overvalued, that means the stock is showing more value than the original price. So instead of purchasing with high value it's better to sell the stock.

- Standard deviation for HDFC is 17%, return of stock of company is 4.4% . Hence, all the variables are taken to compute value of call option.
- Theoretical price of call premium is 39.03632 and the market premium price is 53.15.

- HDFC and INFY stock is overvalued, that means the stock is showing more value than the original price. So instead of purchasing with high value it's better to sell the stock.
- The market premium for the stock is more than the theoretical premium obtained from the model so it is recommended to sell the derivative in both the cases.

### CONCLUSION

- Derivatives market is an innovation to cash market.
- In the cash market the investor may incur huge profits or he may incur huge loss. But in derivatives market the investor enjoys huge profits with limited downside but on proper advice
- In cash market the investor has to pay the total money, but in derivatives the investors are expected to deposit margins in case of futures market and premium charges in case of options market.
- Derivatives are mostly used for hedging purpose.
- In derivative segment the profit/loss of the option writer is purely depend on the fluctuations of the underlying asset.

### RECOMMENDATIONS

- Though investors know importance of stock markets still investors are not having knowledge much on derivatives so SEBI has to take steps to create awareness among the investors about the derivative segment.
- Keeping in view small investors and make them active in participation of derivative market contract size should be minimized .
- So the stock is overvalued, that means the stock is showing more value than the original price. So instead of purchasing with high value it's better to sell the stock.
- It is options which is safer investment compared to futures market because investors have back out option from the contract if there is adverse condition for them.
- Should have proper knowledge on application of options market.

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## POST RECESSION – LEVERAGING THE HR STRATEGIES

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**ABSTRACT**

*This study primarily concentrates on the impact of various aspects of recession in business and influencing the dynamics of business landscape. Post recession, organizations are redesign, restructure and reshaping themselves to cope up future challenges. A clear picture of the way companies differ in adopting the strategies and formulating HR practices to cope up with recession needs to be examined, as it explains how companies perceive themselves in the shadow of recession. Recession is not always a bane, sometimes it can become boon also, provided companies in a right position to forecast well and make a right choice. The emerging role of HRM is vital in leveraging HR strengths.*

*Keywords: Capabilities, Human Resource, Recession,*

**INTRODUCTION**

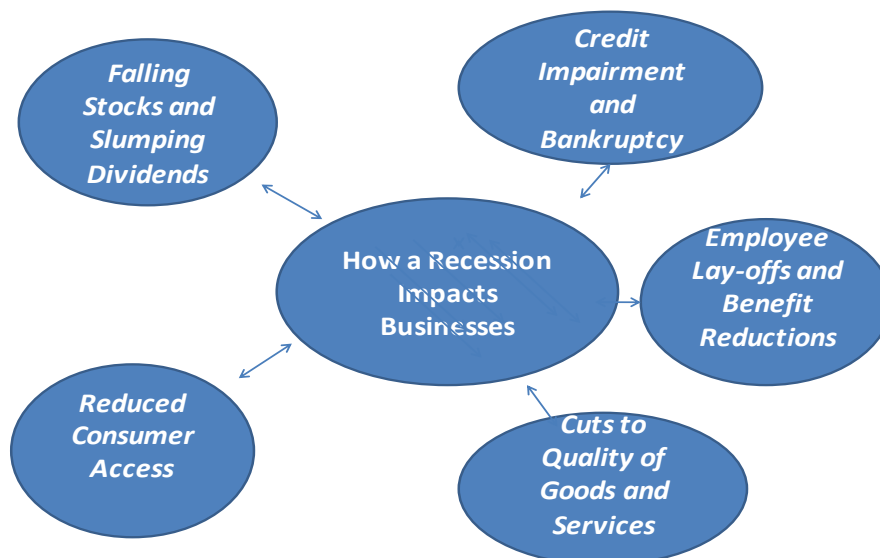
Recession - a buzzword has been influencing in shaping the business landscape in domestic as well as global arena. We cannot deny it because we are in global village. We sit in seashore and draw even strong and lengthy lines, a strong wind within no time will erase it. As economic recovery heats up the competitive landscape, companies must hold onto top talent – and keep talent engaged in the pursuit of organizational goals. The lessons from recession leads organizations to reassessing employee skills, researching and exploring opportunities to value add to the business and put on their thinking caps and make the best of it.

**WHAT IS RECESSION?**

Economists officially define a recession as two consecutive quarters of negative growth in gross domestic product (GDP). The National Bureau of Economic Research cites "a significant decline in economic activity spread across the economy, lasting more than a few months" as the hallmark of a recession. As a contraction phase of the business cycle, the consequences are a loss of jobs, a decline in real income, a slowdown in industrial production and manufacturing and a slump in consumer spending - that drives more than two-thirds of the U.S. Economy.

**HOW THE RECESSION IMPACTS BUSINESSES**

As sales revenues and profits decline, the manufacturer will cut back on hiring new employees, or freeze hiring entirely. In an effort to cut costs and improve the bottom line, the manufacturer may stop buying new equipment, curtail research and development and stop new product rollouts (a factor in the growth of revenue and market share). Expenditures for marketing and advertising may also be reduced. These cost-cutting efforts will impact other businesses, both big and small, which provide the goods and services used by the big manufacturer.

**Figure.1**



Small and big business corporate houses are greatly impacted by the Macro Economic conditions, especially in this globalized world, where due to recession; there is a reduced consumer access to good and services, which is result of credit impairment and Bankruptcy of many business and lack of ability to retain employees and pay salaries. This will lead to employee layoffs and benefits reduction.

Companies in order to survive this impact will shrink their business activities especially there is reduction on expenditure for maintaining the quality of good and services because the many companies will experience falling stocks and slumping dividends. In order to encounter the adverse affects of recession, companies must concentrate on cost reduction and this has great implications on the HR practices being followed.

### **IMPACT OF RECESSION IN INDIA**

The ripples of crumbling USA market can be witnessed all over the world. Whatever happens in America, its impact can be felt way beyond the United States. Indian economy is no exception to this rule. World over, companies are biting dust including lions of financial world like, Lehman Brothers, Bear Sterns, AIG, Merrill Lynch etc. It has been an unprecedented collapse of financial giants of American economy. The effects of American crisis can be seen in European and Japanese companies. Many banks are almost on the verge of collapse and frantic steps are undertaken by respective governments to prop them up.

#### **1. Global recession**

A global recession is a period of global economic slowdown. The reasons may be Over-leveraging; credit default swaps and collateralized debt obligations. Another probable cause of the crisis -- and a factor that unquestionably amplified its magnitude -- was widespread miscalculation by banks and investors of the level of risk inherent in the unregulated Collateralized debt obligation and Credit Default Swap markets. In the globalized market scenario, the impact of recession at one place/ industry/ sector percolate down to all the linked industry and this can be truly interpreted from the current market situation which is faced by the world. The badly hit sector at present is the financial sector, and major issue being the "**Liquidity crises**" in the market.

#### **2. US sneezes, the world catches a cold**

America is the most effected country due to global recession, which threatens India. India has most outsourcing deals from the US. Even our exports to US have increased over the years. Exports have declined gradually. Recessions are the result of reduction in the demand of products in the global market. Recession can also be associated with falling prices known as deflation due to lack of demand of products. Again, it could be the result of inflation or a combination of increasing prices and stagnant economic growth in the west.

#### **3. The nature of Indian financial system**

Indian financial system has very little exposure to foreign assets and their derivative products and that's the prime reason India won't be as adversely affected as other major countries. Revival of world economy will take a long time. Though, India will be affected in certain aspects like, low investments by foreign companies. It is true that Indian economy is still not much dependent on export. It is still driven by domestic consumption.

#### **4. Blessing in disguise**

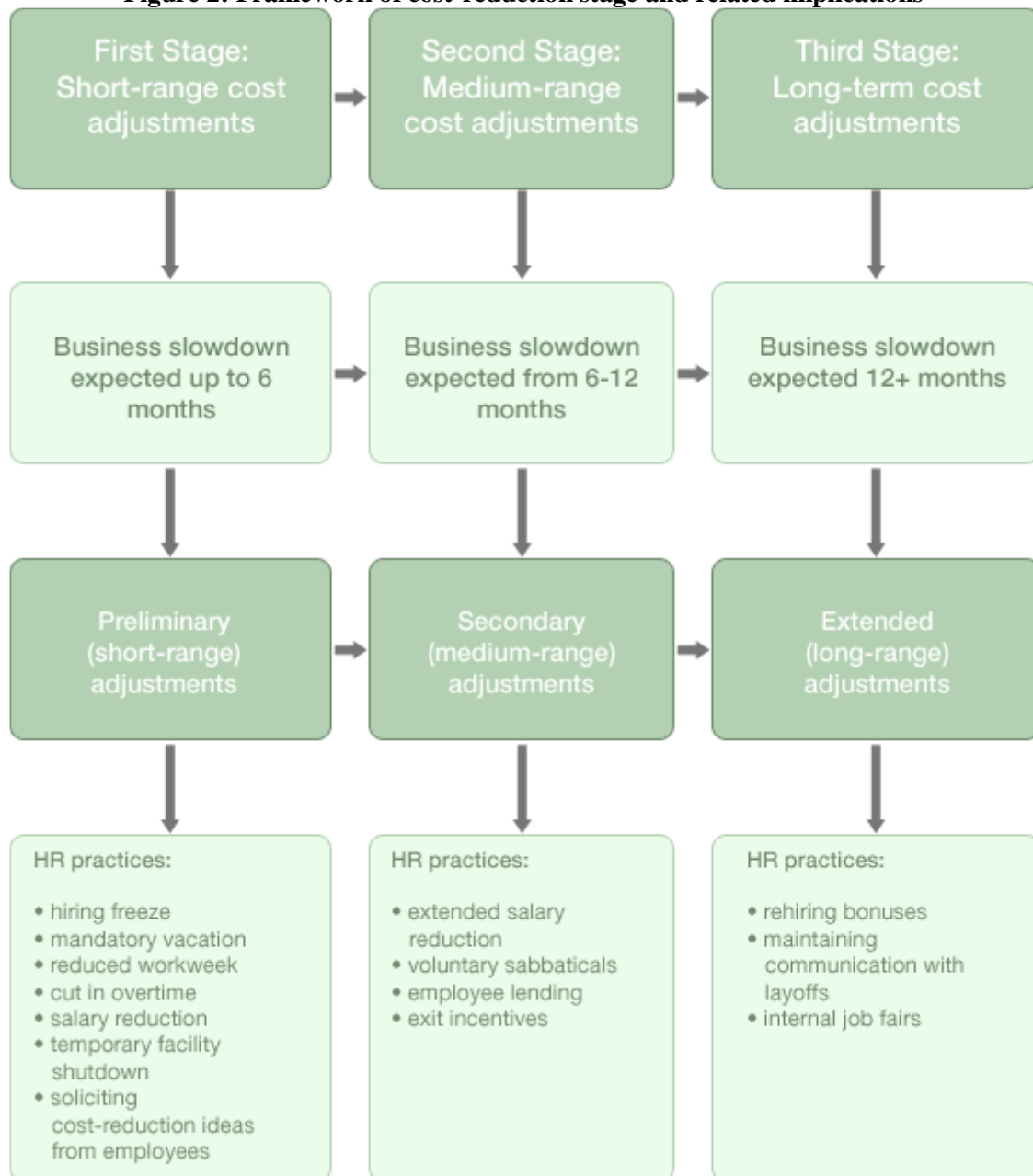
Many factors are responsible for relatively less negative impact on Indian economy. The slow pace of financial reforms taking place in India, cautious approach towards permitting foreign investments in Indian business sectors, numerous bureaucratic hurdles and regulatory constraints have turned out to be advantageous for India. India has always been criticized for its slow speed in economic growth but in hindsight it's that very turtle speed has proved to be a blessing in disguise.

#### **5. India's cautious approach towards integrating with world economy**

Another impact would be seen in financial reforms taking place in India. India's cautious approach towards integrating with world economy has paid off and now even more caution would be taken in de-regularization of the financial sector considering conditions of market based economies. More regulations are expected to come into force so that India does not have to face similar worst conditions as faced by ASEAN counties in 1997-98 crisis and recession of 2008.

#### **6. Stock markets**

The economy and the stock market are closely related. The stock markets reflect the buoyancy of the economy. In the US, a recession is yet to be declared by the Bureau of Economic Analysis, but investors are a worried lot. The Indian stock markets also crashed due to a slowdown in the US economy. The Sensex crashed by nearly 13 per cent in just two trading sessions in January. The markets bounced back after the US Fed cut interest rates. However, stock prices are now at low ebb in India with little cheer coming to investors.

**Figure 2: Framework of cost-reduction stage and related implications**

Source: adapted from Vernon (2003) and George (2004)

From the above diagram one can see that the post recession HR practices puts more emphasis on rehiring bonuses to motivate, maintaining communication with layoffs in order to rehire the lost talent and internal job fairs to attract right talent, the basic motive is not only to attract the right talent and retain the best talent of the company which may be lost to the competitors, but also have a proactive approach to restructure and redesign the entire HR strategy in order to meet the changed business conditions as there are a greater chances of sudden growth in the economy in the post recession market and finding and retaining right talent in order to cater to the needs of the market may turn very out to be a difficult task.

#### HOW COMPANIES LEVERAGING THEIR STRENGTHS?

This **shift in focus** invites us to take a look backward – to the **pre-recession** era of 2007, for example, when talent management was at the top of the corporate agenda and the key questions from CEOs were not about cost-containment but about workforce dynamics. Now organizations are learning lessons from pre-recession and coping strategies for rightsizing themselves, right shaping and right skilling in order to face the future challenges

A common expression heard around Toyota is “We do not just build cars, we build people.” Every new product development program, every prototype, every quality defect in the factory, and every kaizen activity is an

opportunity to develop people. Every manager at Toyota is a teacher. Developing exceptional people is their number one priority. This has become ingrained in the Toyota Way as a cultural value throughout the company. Toyota leaders truly believe that their only source of competitive differentiation is the exceptional people they develop and that are always their top priority. And this starts on the shop floor where the value is being added when building cars each and every day. Toyota's stand is clearly gives us the seeds of talent and we will plant them, tend the soil, water and nurture the seedlings, and eventually harvest the fruits of our labor.

Principles of Toyota are Base management decisions on a long-term philosophy even at the expense of short-term financial goals, Standardized processes are the foundation for continuous improvement, Grow leaders who thoroughly understand the work, live the philosophy and teach it to others, Develop exceptional people and teams who follow your company's philosophy, Respect your suppliers by challenging them and helping them improve, Become a learning organization through relentless reflection and continuous improvement.

Capgemini is focusing on improving and diversifying the skills of employees. This is a time to invest into people and right skill across levels by implementing effective learning initiatives. Capgemini is leveraging their global Learning infrastructure and organization to impart training and re-skilling to their employees. One always has to prioritize investments, and learning is definitely one of the important ones. These are times for organizations to implement high employee engagement initiatives, invest in right skilling, and also communicate extensively with all employees.

HR plays a very critical role in recessionary times. It's an opportunity for HR as a function to lead and provide direction to the business. In these times HR should lead with well defined engagement initiatives, ensure fair practices are implemented, and provide opportunity to employees to reach out and voice their concerns - communicate as often as you can. This is the time to make sure all HR processes are robust, especially performance management etc. They look at a person's aptitude, flexibility, and desire to learn and grow. In the process they want to be fair to people and make sure they are just employer. This is indeed time to introspect and evaluate ones capabilities and skills, make sure they are honest about shortcomings, need to learn and re skill and be ready for the growth times.

Recession is a time of enormous creativity and break through business launches. it is the time for companies to look into value innovation. Innovation is the key to strengthen organization culture and is fundamental to Google's success that people feel the freedom to act and take action and do things on their own. Any body at Google can use 20 percent of their time – one day a week, a week every five weeks – however they choose to define it, for them to work on what they want to work on.

Google has a 70/20/10 Model, which is 70 percent of efforts are to be focused on core business, 20 percent should be focused on related but new areas that they are developing off of that and 10 percent deserve for crazy ideas, some of which may turn into great advancement. In the words of Dave Girouard, President, Enterprise of Google, "Google is just as appealing to the novice as it is was on day one "

Post recession, organizations are going to redesign, restructure and reshaping themselves to cope up challenges in 2010. Organizations emphasizes on Work force costs, high potential employees, critical skills, employee engagements, development of workforce contingency plans, internal analytics , use of workforce segmentation, external benchmarking.

Organizations can leverage themselves such a way to optimize output from the workforce, initiating group development activities , focusing on culture development, branding, better linkage of strategy and employee goals, improving the quality of performance reviews , strengthening the internal communication systems etc.

## **CONCLUSION**

Whenever we hear recession, usually we afraid for drastic results. When, we cannot change the external factors, like recession, better to identify opportunities for safe landing of business and wise strategic moves. May be a loss in the short term however an opportunity to tighten up and rebuild the foundation for a very robust business for the future. Let us wish a safe voyage as we ride the waves of this recession....

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## SUCCESSION PLANNING MODEL FOR ACADEMIA: A CONCEPTUAL STUDY

**Mr. R. Ramanjana Reddy<sup>1</sup> and Mr. Mohd Khaja Qutubuddin<sup>2</sup>**Assistant Professor<sup>1</sup>, ICBM, SBEAssociate Professor<sup>2</sup>, ICBM, SBE**ABSTRACT**

*Identifying, engaging and retaining top performances and high potentials are important for all kinds of Organizations. Planning for the Succession of key executives, managers and other employees is an important part of HR development. Succession Planning is a process of identifying a longer-term plan for the orderly replacement of key employees. The Organizations that recognize the importance of human resources in efficiently handling its activities adopt method of Succession planning. In sustaining competitive edge, for Educational Institutions too Succession planning is considered as one of the most critical factors. Sound Succession planning helps an Organization to handle disruption that is caused due to cost of hiring and the time consuming process. The absence of Succession Planning in academia may lead to poor Human resources planning. The present study is initiated to propose a model of Succession planning in Academia based on the primary and secondary sources of data. Observation method is used as the primary source, where as books, journals, newspapers, research articles and websites are used as secondary sources. The study of various models of Succession Planning from literature review has laid down a foundation for the Analysis, which resulted in proposing a model on Succession planning in Academia.*

*Keywords: Succession planning, Competitive edge, Performance, Academia.*

**1. INTRODUCTION**

Succession planning was first introduced by Henri Fayol, who believed if Succession Planning (SP) needs were ignored, the Organizations would not be prepared to make necessary transactions. According to Balskey (2002) SP allows an Organization to prepare for the absence, departure, death, retirement or termination of an individual. It provides for continuity and the evolution of necessary skills. In the earlier research it was found that the Organizations that had a specific Successor in its mind tended to be significantly more profitable than firms which did not have. In today's more flexible and rapidly changing Organizations, the scope of formal succession planning may be limited, as they could be outdated as they are made. In these circumstances the Organizations can use latest techniques of Talent management and databases, keeping in view the critical factors like Strategic HR plans, Investment, employee commitment, accountability of management and long term need of the organization that ensure the success of Succession Planning while building the long lasting model of Succession Planning.

**2. THEORETICAL AND LITERARY REFLECTIONS:**

Planning for the succession of key executives, managers, and other employees is an important part of HR development. It is a process of identifying a longer-term plan for the orderly replacement of key employees (Mathis & Jackson, 2003). Succession planning is to identify, develop and make the people ready to occupy higher level jobs as and when they fell vacant. It is defined as "a deliberate and systematic effort by an organization to ensure critical personnel continuity in key positions and encourage individual advancement (Rothwell, 2010).

In any kind of Organization, the need to replace key employers results from promotions, transfers, retirements, deaths, disability, departures or others reasons. Succession planning allows an Organization to prepare for the absence, departure, death, retirement or termination of an individual. It provides for continuity of culture and the evolution of necessary skills (Balskey, 2002). Even the educational institutions try to focus on top management such as ensuring the key position. Limiting succession planning just to top executive jobs is one of the greatest mistakes made (Scott T. Fleischmann, 2000).

Succession planning recognizes that some jobs are lifeblood of the organization and are too critical to be left vacant or filled by any but the best qualified persons. Succession planning is critical to success when effectively done, and creates an effective process for recognizing, developing and retaining top leadership talent (Seema Sanghi, 2011).

Best development methods for succession planning include 360-degree feedback, executive coaching, mentoring, networking, job assignments and action learning (Groves, 2007). Succession planning as a career management technique is critical for creating perception of career success and satisfaction of promotion process among employees. New career concepts

like protean career and boundary-less career put the responsibility for career development on the shoulders of individuals; but systems like Succession Planning cannot be abandoned and still play an active role in instilling positive attitudes and emotions to employees alongside with managing risk and ensuring continuity of performance of the firms ( Farashah et. al, 2011).

Succession planning is about more than filling the top spots. It is a smart talent management strategy that can drive retention of talent throughout the organization – and make sure that the organization has the skills it needs in place, or on hand, to respond to the rapidly shifting sands that make up today’s business environment. The five key strategies are: aligning succession planning with business strategy; assessing leadership potential using the 3Cs; involving the talent in the planning; mixing development: experience/coaching/training; and casting a wider net for succession (Angela Hills, 2008).

The Seven-Pointed Star Model is a famous model developed to achieve the systematic succession planning and management. Seven steps in this model are: Make the commitment, assess the present work/people requirements, appraise individual performance, assess the future work/people requirements, assess individual potential, close the development gap, and evaluate the succession planning and management program ( Rothwell , 2005). Succession management practices should emphasize employee Self-improvement by promoting cross-functional and cross-sector job assignments, executive coaching and mentoring (Kim, 2003). Organization that scored high in executive succession planning scored high in organizational learning. Specifically, executive succession plans have significant and positive correlation with the organizational learning capacity ( Hunte D. E, 2004). Once high potentials are selected, their development plan needs to include a job rotation program, a formal mentoring/coaching program, utilizing 360 feedback tools and receiving the appropriate reward for performance ( Krauss J. A, 2007). some indicator for that succession planning include: identifying new leaders; developing new leaders; delivering financial success; fostering a positive organizational culture; maintaining long-term viability; sustaining core competencies; initiating change management ( Mandi A. R, 2008.).

Some strategies for implementing deliberate and systemic succession plans in the academic environment via a research in higher education institutes. These strategies include: “securing executive champions; aligning the succession plan to institutional culture, mission, vision and goals; taking an approach not unlike strategic planning; carefully constructing communication plans to embrace talent development without inferring entitlement; and a continuous evaluation of both the people and processes involved in succession planning” (Cheryl R, 2009)

There are many models and approaches in succession planning and management. The point of view is that among these models and approaches, managers have to find the best model which can fit best for their organizations. Those that already have a succession planning and management program in place must focus on overcome their exclusive obstructions to a best practice system and those who do not presently invest in succession planning and management should perhaps consider its value and try to implement it (Shadi Ebrahimi Mehrabani<sup>1</sup>, Noor Azmi Mohamad , 2011). A great deal of education will be necessary to make people understand that inclusion “is not so much about treating everyone the same as it is about preventing their differences from being an unfair hindrance” (Bridges et.al, 2008 ). Institutions of higher education need to become more sophisticated so that they can recognize good leadership when they see it. This will require courage, imagination and training. It is easy to find leaders in the usual places. To find leaders in places where they are likely to be overlooked by the casual observer can only be done through a deliberate, thoughtful and sustained process of succession planning (Cristina González, 2010).

### **3. NEED FOR THE STUDY**

The Academia need sound Succession planning not because they are entirely HR dependent but because they play a prominent role in developing students into leaders with global perspective. The absence of Succession planning in Academia lead to a situation where in key positions continue to face frequent and unpredictable turnover and the decisions makers of the organization may complain that the talent pool and internal recruitment do not have adequate levels of competence. Unfortunately due attention to Succession planning is not given in Academia. So the present study is initiated keeping in view the previous discussion.

### **4. OBJECTIVES OF THE STUDY**

The present study has been carried on with the following objectives.

1. To study the factors governing Succession planning in the Academia.
2. To develop a model proposing Succession planning for Academia.

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**5. METHODOLOGY**

To propose a model for Succession planning in Academia, the present study has used texts, journals, magazines, news papers and websites as secondary sources of data. Observation method has been adopted as the primary source of data. The analysis of the is based on the understanding the various governing factors and strategies of successful Succession Planning from literature review.

**6. SCOPE OF THE STUDY**

The present study has been carried on by keeping only the higher educational institutions in view. More over secondary data has been used extensively to propose the model of Succession planning. The factors governing Succession planning might be different when carried an empirical study.

**7. ANALYSIS**

The assumption for the study is that there exist three levels of management in Academia that can be considered for Succession planning. They are 1. Top Management and administration 2. Teaching staff and 3. Non-teaching staff. For the present study, the Strategic HR plans, Competency gap analysis and talent management process are considered as the governing factors for the Succession planning in Academia. Fig-1 depicts the Model proposed for Succession planning in Academia. The proposed model explains the process of Succession planning, which includes seven key steps. They are described as follows:

1. Aligning the Succession planning goals with Strategic HR plans: The scope of Succession planning will be more when the there is a perfect alignment of Succession planning with HR plans and this has to be carried out by keeping investment decision in consideration.
2. Determining the Succession planning: Here the Organization has to address the vacancies that will be available by anticipating the future work requirements at all the level of the management. Data base software will be of use for effectively handling the work.
3. Identifying the Competencies required for each position available: Once the key positions are identified for succession planning, the Organization has to determine the essential competencies (Qualities and qualifications) that required for each position available.
4. Checking the availability of Competencies: The two interdependent activities i) Developing the replacement charts and ii) Assessment of current capabilities of current employees play a vital role in the supply forecast of the personnel required to occupy the vacant positions available. The replacement charts identifies the employees who could fill the vacancy. Ignoring the assessment of current capabilities of current employees may result in employees complaining of nepotism and favoritism as the key position will be filled up by inefficient individuals.
5. Conducting the Competency Gap Analysis: The Organization has to analyze the difference (if any) between the required and current competencies of the current employees. If gap is identified the management has to decide the management has two alternatives available i) It can recruit an external personnel who is competent enough to occupy the key position and who is ready to adopt the existing Organization's culture ii) Conducting Talent management and career development programmes for the internal personnel by first conducting individual assessment to identify the need and then developing the essential capabilities. If no gap has been identified it can proceed to 6<sup>th</sup> step in the process.
6. Proceeding towards the staffing function: Placing the right person on the right job may be from internal employees or external. When Succession is from internal employees the Career interests of the competent employees are needed to be considered while going for the staffing function.

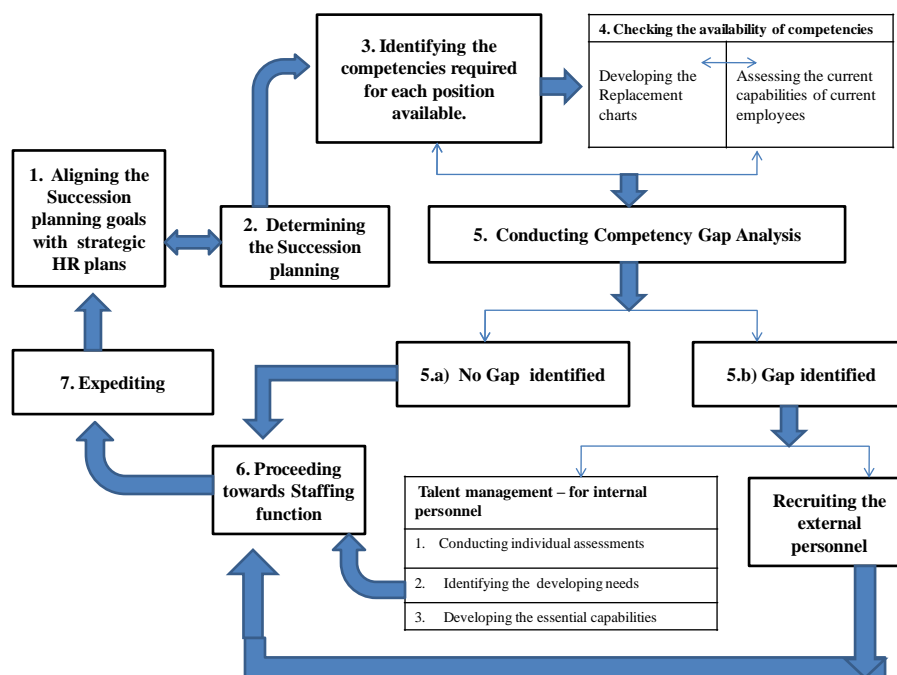


Fig-1: Model on Succession planning in Academia

7. Expediting: Finally to ensure the best outcome of planning efforts, the Organization has to carry out periodic review and reassessment of the organizational and individual future needs.

Whatever may be the key position either line or staff that is created vacant, the Organization has to give due importance the seven steps included in the model.

## CONCLUSION

In order to survive and prosper in the current challenging environment there is an absolute need to have sound Succession planning. There may not be perfect model that is suitable for all kinds of Academia, as they differ in so many aspects. From the present study it can be concluded that, even in Academia Succession planning plays a significant role in determining the future leaders of the Organization. When deciding the investment in Succession planning the organization has to pay at most importance to the Strategic HR plans, Competency Gap analysis, Talent management and Career development programs and finally the staffing and follow-up functions to ensure the best outcome from the Succession planning.

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**UNDERSTANDING THE VARIOUS COMPONENTS THAT AFFECT THE CUSTOMER BEHAVIOUR AND RELATIONSHIP IN SELECT BUDGET HOTEL INDUSTRY**

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**ABSTRACT**

*The paper takes into consideration the various components which are influencing the behaviour and relationship with customer. The customer is seeking for quality in relationship even after the purchase of services. Service industry like hotels, tours & travels are making the mark these days due to growing importance of the tourism. This industry has a requirement of maintaining the quality of services along with regular relationship activities to retain and make a loyal customer. This study helps in knowing the components which influence to maintain an effective relationship with the customers and to know the trends in the customer behaviour. The hotels can concentrate on the components to decrease the brand shifting and also increase the word of mouth through recommendations.*

*Keywords: consumer behaviour, relationship management, service, service marketing*

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**INTRODUCTION**

Consumer behaviour has attained a major scope with the changing trends in the market. The tastes and preferences of the consumer have shown various trends from past studies. Customer opt for products like market segmentation, customizing products and services, obtaining higher quality products, gaining access to information and employee satisfaction. In addition, that service organizations for their intrinsic characteristics of the production and consumption are inseparable elements necessary to build relationships with customers. The findings state that the consumers do not churn as a result of the price, but they churn due to poor customer care services. It acts as a differentiation point - in the current market place where competition is very high. In the area where you have a competitor offering a similar product, customers will go for that company that offers great customer experience and have environs which ensure that satisfaction is high. Maintaining customer relation helps in stimulating loyalty function and repurchase.

**LITERATURE REVIEW**

Leticia Suarez Alvarez (2007), highlights that trust in e-commerce is based on the consumer's confidence in the processes. Good customer service can make all the difference between retail travel agencies, hoteliers to attract new consumers. Rebecca Larson (2009), research reliably underpins that organizations that actualize association wide arrangements and activities that are altogether associated can accomplish expanded client reliability and more prominent productivity and income age. Irene Samanta (2009), the study imply that the managers are not conscious about the changes in the technology which is acting as a drawback thus, the hotels should change accordingly to the changing environment to attain the benefits of implementing e-marketing techniques. Maja Cosic (2010), explained about the "bucket system of marketing" in which loyal customers are very important in the service industry where excellent delivery of promises increases loyalty, in turn, increases brand loyalty as a whole. In his study he discussed three approaches which include financial benefits, social benefits and combination of the both in building relationship between the company and customer.

**OBJECTIVES**

1. To study the factors of consumer behaviour and factors influencing the relationship with customers with respect to budget hotel industry.
2. To recognize the relevance of relationship management in service sector.

**LIMITATIONS OF THE STUDY**

1. The sample size was small and limited.
2. Time was a restriction.
3. Some customers are bias and not ready to give the data.
4. The geographical location was limited to the area of Hyderabad city in Telangana state.
5. The researcher's bias is also a limitation to this study.

## RESEARCH METHODOLOGY

The present research study is designed in the qualitative models it includes survey and fact findings through questionnaire methodology to collect the data of survey. The variables are dynamic and subjective in nature. The size of sample extends to 150 respondents which included customers who are booking hotel rooms using online aggregators. Convenient random sampling method is used in collecting data. A well-structured questionnaire was used as instrument to collect the data from the respondents. The questionnaire has three sections. The first section deals with the demographic questions followed by the Likert scale and the last section understands the repurchase and recommending the hotel to others. The statistical package, SPSS version 20 has been used to analyses the data. Further the tool factor analysis has been used which is a multi-variant analysis. Kaiser-Meyer-Oklín has been used to check the reliability of the data.

## DATA ANALYSIS: FACTOR ANALYSIS

- 24 varieties used for the survey

Rating is based on the 1-5 Likert scale where 1 indicates 'Highly Unimportant' and 5 indicates 'Highly Important'.

### Factor 1

Table 1	Variables	Loading	% of variance explained	Reliability
Customer service	Customer feedback facility	.754	20.014	.907
	Price	.680		
	Easy online booking systems	.665		
	Delivering services as per the promise	.661		
	Security to information of guest	.647		
	Promotional offers & discounts	.592		
	Hotel brand image Refreshment services	.561		

### Factor 2

Table 2	Variables	Loading	% of variance explained	Reliability
Additional benefits	Provision for benefits like Pickups, cab facilities	.806	18.036	.892
	Wakeup Service	.785		
	Access to hotel information	.735		
	Reward points for repeat customers	.727		

### Factor 3

Table 3	Variables	Loading	% of variance explained	Reliability
Basic amenities	Bed Comfortability	.822	16.9921	.887
	Flexible check in and check out	.767		
	Hotel Ambience	.748		
	Complimentary breakfast	.616		

### Factor 4

Table 4	Variables	Loading	% of variance explained	Reliability
Service Efficiency	Hotel staff behavior	.684	16.090	.898
	Customer follow ups	.662		
	Inhouse restaurant	.631		
	Quick response to calls & complaints	.596		
	Bulk booking service	.574		
	Accepting cancellation of reservation	.559		
	Payment modes	.515		

**REGRESSION ANALYSIS****Model Summary<sup>b</sup>**

Model	R	R Square	Adjusted Square	R	Std. Error of the Estimate	Durbin-Watson
1	.260 <sup>a</sup>	.067	.042		.88299	2.349

- a. Predictors: (Constant), REGR factor score 4 for analysis 1, REGR factor score 3 for analysis 1, REGR factor score 2 for analysis 1, REGR factor score 1 for analysis 1

Dependent Variable: CustomerRelationship

**Coefficient**

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
	B	Std. Error	Beta			Lower Bound	Upper Bound
(Constant)	4.010	.072		55.620	.000	3.868	4.152
Customer Service	.235	.072	.150	1.872	.063	-.008	.278
Value added benefits	.355	.072	.072	2.140	.034	.012	.298
Basic amenities	.021	.072	.023	.292	.771	-.122	.164
Service efficiency	.210	.072	.122	1.525	.129	-.033	.253

**FINDINGS**

- Cronbach's Alpha reliability test resulted in 0.945 and Kaiser-Meyer-Olkin Measure of Sampling resulted as 0.904. From this study, four major factors are obtained through factor analysis.
- The study shows that the most important factor “Customer Service” is customer feedback facility (0.754) and affordable price(0.680).
- In the factor “Additional benefits” the most important feature was the provision for cab facilities (0.806) and the wake-up services(0.785).
- In the factor “Basic amenities” the most important features are bed comfortability (0.822) and Flexibility check-in and check-out(0.767).
- The factor “Compliance of standard” has the features like quick response to calls & handling complaints (0.595) and bulk booking service (0.574) have an impact on the relationship with customers.
- The regression model shows that the customer relationship is sufficiently explained by factors extracted from the factor analysis. The result in which the 2<sup>nd</sup> factor is sufficient to explain the dependent variable as the correlation value is above 0.3 and the remaining factors are not sufficient to explain the dependent variable that is customer relationship.
- 81% of the respondents are male which shows that the number of bookings for the hotel is through the male.
- The age group who book the hotel rooms are above 40 accounting for 25% who are salaried where the respondents are 66%.
- 32% of the respondents prefer booking 3-star hotels followed by 5-star (30%) and 4- star(23%).
- 42% of the respondents are booking through online portal via internet which show that the internet is used as the medium to book 3-star, 4-star and 5-star.
- 46% of the respondents' book 0-5 rooms in a month.
- 41% of the total respondents believe that service quality influence the relationship with the customers which helps in retain them. The believe that service quality is the main factor that makes the to stick with the same company.

**SUGGESTIONS**

- In the study, few variables showed influence on the customers like customer service, additional benefits, basic amenities and the service efficiency. The company can concentrate on these factors to retain customers.

- The customer service has the factor “customer feedback facility” which makes the customer feel great and brings positivity in continuing the relationship. So, the company can implement better feedback system by collecting the opinion and show the response by implementing the suggestions from feedback.
- In the factor of additional benefits, the provision for cab services and wakeup services has the highest impact. The company should exceed the needs as the customers are willing to shift to the best additional providers.
- The company continuously work to reach the expectations and fulfill the promises. The company has to give response to the queries. This helps in building the relationship with the customers.
- The company should provide additional benefits like cab facilities, wakeup services and reward points to satisfy the customers.
- The study completely define that the company has to concentrate on improving the service quality. The service quality acts as the main bases for a customer to maintain the relationship which helps in retaining the customer and influence repurchase.

### CONCLUSION

- The research helped in developing the factors that helps in understanding consumer behaviour which helps in increasing relationship. The four factors that are yielded helps in building the relationship with customers in a hotel industry. The four factors customer service, additional benefits, Basic amenities, Compliance to standards are yielded in the study resulting in factor analysis. These factors can be taken as reference for implementing the future decisions by any Hotel industry or any service sector. These results can be taken as the reference for improving of the industry as well as for achieving the competitive advantage through delivering the favourable customer experience.
- The four factors obtained can be taken into consideration for improving the quality of service. The main factor Additional benefits brings the competitive advantage when provided with services when the are above expectations. The customer service is the core factor when treating a customer in the service industry, this builds the brand image. The customer expects few basic services which has to be delivered to provide basic satisfaction to the customers. Compliances with standards is very important to any firm because it reveals the ethics of the firm.
- The <sup>2nd</sup> factor which is superior response has a very large impact on the customer relationship. So, the firm should aim at dealing with the customer with superior quality in providing the additional benefits. They should constantly innovate in order to retain the customer and also to attract new customers.

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**FASD (THERAPEUTIC PHLEBOTOMY) – AN IMPORTANT TOOL OF TREATMENT OF UNANI SYSTEM OF MEDICINE****Nuzhat Akhtar**

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**ABSTRACT**

*Venesection (Fasd), now a days known as Phlebotomy, one of the most important procedure of treatment in Unani system of medicine mentioned under Ilaj Bit Tadbeer (Regimenal Therapy). Fasd is an act of drawing blood from the circulatory system through an incision or puncture for the purpose of evacuation of morbid material, treatment for blood disorders and analysis. Fasd (Venesection) historically also known as bloodletting. It is a long lasting medical procedure with a history spanning at least three thousand years. The father of medical science Hippocrates (460 BC-370 BC) has been strongly advocated the phlebotomy in content of the theory of four basic Humour of the body. According to him, disease is a condition when there is imbalance in quality and quantity of basic body fluids (Ikhlāt-e-Arba). Therefore treatment consisted removing an amount of the excessive body Humour by different means such as bloodletting, purging diuresis and so on. By the first century bloodletting was already a common treatment, but Jalinoos (129-200 AD) declared blood as the most dominant Humour, the practice of venesection gained even greater importance.*

*Keywords: Fasd, Venesection, Phlebotomy, Unani Medicine, Lancet.*

**INTRODUCTION**

*Ilaj Bit Tadbeer* is one of the most practicing method of treatment, practiced by Unani tabeeds since antiquity. Literally “*Ilaj*” means “treatment” and “*Tadbeer*” means “Regimen”, “Therapy” or “systemic plan”. Thus *Ilaj Bit Tadbeer* means treatment through special regimen. It is a method, through which maintenance of general health and care of a diseased person are attained through modulation and modification in *Asbab-e-Sitta Zarooriya*. *Ilaj Bit Tadbeer* mustur Hijamah (Cupping), Dalak (Massage), *Riyazat* (Exercise), *Fasd* (Venesection), *Taleeq* (Leeching), *Amal-e-Kai* (Cauterization) and so on. Amongst of various types of *Ilaj Bit Tadbeer*, Fasad is of great importance in the management of different diseases. [1] Venesection is an Arabic word which means “to open”. Venesection, now a days recognized as Phlebotomy, is the act of drawing blood from the circulatory system through an incision or puncture for the purpose of analysis, treatment for blood disorders and evacuation of morbid material. Actually it is a procedure in which an incision is given to any of the superficial vessels and blood, containing *Madda-e-Fasida* (waste material) is allowed to flow.[2] By removing blood volume via Venesection, the level of iron in the blood is reduced.

**HISTORY OF VENESECTION**

Venesection, historically also known as bloodletting is a long-lasting medical procedure with a history spanning at least three thousand years. It was frequently practiced by practitioners around the globe until the 19th century. The practice of phlebotomy go about 3000 years ago with the Egyptians, then continued with the Greek and Romans, the Arabs and Asians, then propagate through Europe during the Middle ages and the Renaissance, holded out its back in Europe in the 19th century, but afterwards declined today in western medicine is used only for a few select conditions.[3] To cherish the rationale for bloodletting, one must first understand the paradigm of disease 2300 years ago in the time of Hippocrates (460 BC-370BC).[3] He believed that existence was represented by the four basic elements – Earth, air, fire and water, which in humans were related to the four basic humours: Blood, Phlegm, Black Bile, Yellow Bile.[3], [4] Each human was centered in a peculiar organ: Brain, lung, spleen and gall bladder[5] and related to a particular Mizaj (personality type): Damwi (sanguine), Balghami (phlegmatic), Safrawi (choleric) and Saudavi (Melancholic).[4], [5]. Being diseased means having an imbalance of the four humour (Ikhlāt-e-Arba). Therefore treatment consisted removing an amount of the excessive body humour by different means such as bloodletting, purging, diuresis and so on. By the first century bloodletting was already a common treatment, but when Jalinoos (129-200AD) declared blood as the most dominant humour, the practice of Venesection gained even greater importance.[5]

In unani system of medicine, Venesection was broadly discussed by the eminent Unani scholars. Kitab ul Fasad of Jalinoos, Kitab ul Fasad of Qusta Bin Luqa, Jawam-e-Kitab ul Fasad Al Jalinoos of sabit Bin Qura, Maqala Fil Fasad of Abubakr Zakariya Razi, Kitab ul Fasad of Ishaq Bin Imran, Istemal-e-Fasad of Ibn-e-Haitham, Kitab ul Fasad Wal Hijamah of Yoohanna Bin Masooya, Dastoorul Fasad of Mohammad Sharif Khan and Risala Fil Urooq ul Mafsooda Wal Masmāt ul Ghayat ul Uqad Fi Ilm ul Fasad of Ibn-e-Sina[6] are very important books in which importance of *Fasd* and numbers of Venesection vessels are discussed briefly.

According to Ibn-e-Hubal Baghdadi “*Fasd* is a type of total evacuation (Istafragh-e-Kulli) which draws blood and prominent body humours mixed in blood from vessels”. According to Ibn-Ul-Qaf Maseehi “*Fasd* is a type of Tafarruq-e-Ittesal which is drawn intentionally in veins which the help of an instrument”. According to Allama Qarshi “*Fasd* is removal of blood from human body either by a sharp instrument or by a blade”. [7] Now a days, therapeutic phlebotomy is the preferred treatment for blood disorders in which the drawing of red blood cells or serum iron is the most effective method to manage the symptoms and complications. Therapeutic phlebotomy is currently indicated for the polycythemia vera, porphyria cutaneatarda, sickle cell disease and nonalcoholic fatty liver disease with hyperferretineamia.[8]

In ancient period the main instruments for Venesection were called lancets and Fleams.[9] Thumb lancets were small, sharp, pointed, two edged instruments often with an ivory or tortoise shell case that the physician could carry in his pocket. Fleams were usually devices with multiple, of variable sized blades that folded into a case like a pocket knife. Venesection was the most common procedure and usually involved the median cubital vein at the elbow, but many different veins could be used. [9]

Therefore, popularity was begin to declined and almost end, although in some parts of America it was continued till 1920s. Now a days, it is used in hemochromatosis, a genetic condition, in which the body stores too much iron. This disease affecting 6,00,000-10,00,000 Americans. This is the method to treat this by drain some of iron rich blood periodically, which restores a proper balance.[1]

### OBJECTIVES OF PHLEBOTOMY

1. To maintain blood volume.
2. To maintain iron in blood.
3. To modulate body humours.
4. To restore the health of people, who are prone or predisposed to developed amraz-E-damwiya.
5. To stimulate istehala (Metabolism).
6. To remove morbid material from blood.
7. To restore the health of Sanguinous people (Damvi).[1], [7],[10]

### Preparation for Venesection:

- i. A phlebotomist first introduce himself/ herself to the patient, properly identify the patient.
- ii. Wash their hands.
- iii. Put on gloves.
- iv. Applies a tourniquet to the slightly upper to slow blood flow.
- v. An alcohol swab is used to disinfect a small area near the inside of the elbow/site of Venesection chosen.
- vi. The phlebotomist than locate a vein and inserts the needle/lancet, release tourniquet before removing the needle/lancet.
- vii. After removing the needle/lancet, dispose of needle/lancet immediately in a biohazard container.
- viii. The phlebotomist must wash their hands after removing gloves.
- ix. The phlebotomist must observe strict safety protocols to avoid direct contact with the blood. Many infectious diseases including hepatitis and HIV, can be transmitted through blood contact. Even the slight distraction may lead to a “needle stick” injury and possible infection.
- x. Phlebotomist must be extremely accurate and careful.
- xi. Some patients experiences a fainting episode during the procedure. So, must take history of patient.
- xii. Patient’s blood pressure and other observations should be taken before the Venesection.[11]

### After the Procedure

1. Blood pressure and general conditions should be checked. When blood pressure is stable patient is able to discharge.
2. Prior to discharge, remove cannula and cover the puncture site.[11]

**What to Expect**

1. The procedure should be safe and without side effects.
2. Patient may feel a little lethargic for a couple of days.
3. Patient is advised to keep hydrated and drink at least two litres of fluid daily for 48 to 72 hours following the Venesection.
4. Patient should be resume all normal activity after the procedure.[11]

**What to Avoid**

After Venesection it is important for the patient to avoid.

1. Drinking alcohol for 72 hrs.
2. Strenuous exercise.
3. Heavy lifting for 24 hrs.
4. No coitus for 24 hrs.
5. Don't have bath.[11]

**When Contact to Physician**

If any of the following occur after discharge:

- A. Bleeding.
- B. Fever.
- C. Redness at Venesection site.
- D. Smelly discharge from Venesection site.
- E. If feel insignificantly unwell in any way.[11]

**Indications**

1. Polycythemia vera.
2. Hemocromatosis
3. In those conditions when there is excess of blood in the body.
4. Sanguinous Sciatica.
5. Rheumatism.
6. Gout.
7. Hysteria.
8. Melaneholia.
9. Bleeding piles.
10. Amenorrhoea.
11. In Saudavi conditions.[1]

**Contraindications**

1. Excessive cold temperament.
2. Extremely cold climate.
3. After coitus.
4. In anemic persons.
5. In elderly persons.
6. In children under 16 years of age.
7. In full stomach.
8. After a period of prolonged disease, where the removal of a large quantity of blood is not proper.



9. Colic.
10. During pregnancy.
11. During menstruation.
12. Acute infective fever [1], 12]

**WORK FLOW****Before Phlebotomy**

1. Physician written order for Venesection.
2. Hands washed (before and after phlebotomy site palpation inserting or dressing the phlebotomy site).
3. Prepare patient physically and psychologically for Venesection.
4. The environment of therapy center should be checked for cleanliness, ventilations, adequate lighting.
5. Equipments should be ready to face any emergency condition.
6. The patient and attendants should be received a brief explanation about the patient's position and phlebotomy procedure.
7. A verbal and written consent should be obtained.
8. Patient should be assessed before the phlebotomy for history of skin allergy to alcohol, betadine and adhesive tape.
9. Medical history should be taken for arterio-venous shunt, neurovascular injury, cellulitis, thrombosis / thrombophlebitis.
10. History of prescribed medicine should be taken such as, oral anticoagulant and platelet inhibitors taken.
11. The needed equipment assembled to the bedside.[11]

**Phlebotomy Site Prepared Through**

- a) Techniques used for vein dilatation eg. Use of tourniquet.
- b) The skin disinfected with alcohol 70% followed by betadine 10%.
- c) The antiseptic solution was allowed to remain on the insertion site for 1 to 3 minutes before phlebotomy for minimum effective action.
- d) A local anesthetic can be given.[11]

**During Phlebotomy**

1. Follow strict aseptic techniques.
2. Barrier precautions during Venesection and care should be followed through latex or non-latex gloves were worn during the procedure & changing the dressing of the Venesection site.
3. The needle bend directed up during the procedure when the diameter of vessel is larger than the used needle shaft diameter.
4. The needle bend directed down during the procedure when the used needle shaft diameter was larger than the vein diameter.
5. Venesection technique can be standardized two hands technique using 15 to 30 degrees angle.[11]

**After the Procedure**

1. Dressing should be applied after Venesection.
2. The used supplies should be disposed under the covering of medical bio-waste.
3. The Venesection site should be assessed and evaluated at least every shift from 2 to 4 hours for evidence of phlebotomy related complications. This done through gentle palpation of the puncture site through the intact dressing.[11]

**Phlebotomists at Risk**

By its nature phlebotomy has the potential to expose phlebotomist and patient to blood from other people, putting them at risk from blood borne pathogens.

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These pathogens include:

- Human immunodeficiency virus (HIV).
- Hepatitis B virus (HBV).
- Hepatitis C virus (HCV).
- Pathogens those causing viral hemorrhagic fevers.[11]

**Patient at Risk**

Although serious events related to Venesection are rare, but

1. Hemolysis
2. Loss of consciousness with tonic clonic seizures.

Less severe events may include:

- Pain at the site of venipuncture.
- Anxiety
- Fainting attacks
- Bruising
- Hematoma
- Injury to anatomical structures near the needle entry.[11]

**HOW TO MINIMIZE RISK**

- i. When doing Venesection, a phlebotomist should wear well fitting, sterile gloves and should carry out hand hygiene before and after each patient procedure, before putting on gloves and after removing them.
- ii. The procedure should be done in a dedicated location that ensures patient comfort and privacy.
- iii. Phobia about Venesection is common. Asking for consent and giving information about the procedure should do and can reduce anxiety and phobia.
- iv. To remove the risk of environmental contamination procedure room must be disinfected and clean.
- v. A patient information leaflet or poster that explains the Venesection in simple terms is helpful.
- vi. Being well prepared, having all materials available, and working in a suitable environment increase fluency.
- vii. Patient preparation procedure is very important. Fasting and patient rest are common preparation procedures.
- viii. Always try to avoid needle stick injury [11].

**Methods for Venesection**

- i. Syringe method.
- ii. Vacuum tube method.
- iii. Butterfly method.

**Equipments**

1. Sterile single use needle/lancet.
2. Tourniquets.
3. Tape.
4. Sterilized gauze piece.
5. Sterilized gloves of different size.
6. Mask.
7. Decently of using sharp containers.

8. Antiseptic solution – Alcohol 70%.

Povidone Iodine 10%.

9. Sterile cotton.

### **Suitable Position**

*Fasd* should be carried out in supine position. This prevents fainting. [1]

### **Size of Puncture**

A small incision is generally best during summer. [4]

A large wide incision is recommended when the object of Venesection is prophylactic and the subject is well muscular. It is also to be preferred during winter as it prevents blood from clotting. [1]

### **Recommended Amount**

Varies person to person according to disease.

### **How to do Venesection**

In Venesection, vessel should be selected first. Phlebotomy site must be cleaned with material mentioned. Veins are to be made prominent with a tourniquet so as to prevent them from slipping under the lancet/needle. [1] Venesection site should be massaged up and down with fingers briskly. In order to let the vessel fill up properly, vessel should be compressed with one finger and massaged with the other. The tip of the lancet/needle should be pushed to the requisite distance but not so deeply to prevent damage to arteries and nerves. The lancet/needle should be held at the middle to obtain a firm grip.

Sometimes, vein tends to slip, it should be kept in position with pressure from the opposite side and a longitudinal incision made. The pressure from tourniquet should be regulated according to the thickness and firmness of the skin and site. The tourniquet should be applied closed to the site of puncture. Needle/Lancet should be used in a guided and experienced manner to prevent to injure the neighbouring structures.

If the vein fails to become prominent skin should be inside and the vessel should be picked up with a pair of forceps. The whole area is then dressed and bandaged. Vessel should be opened gently with a proper lancet/needle and without forcible entry or rough cutting [1].

### **Vessels for Venesection**

Venesection is generally carried out from the following six veins [1]:

- i. Cephalic.
- ii. Median Cubital.
- iii. Basilic.
- iv. Accessory Cephalic.
- v. Third dorsal Metacarpal.
- vi. Axillary.

### **Complications**

Complications are rare, but the procedure is drawn roughly some conditions may develop.

1. Unnecessary pain and swelling as a result to cut failure of cut the vessel due to blunt lancet.
2. If the tip of lancet broken and left behind in the vessel may cause some severe damage.
3. Haematoma
4. Sometimes fainting can occur
5. Cellulitis
6. Phlebitis
7. Petechial haemorrhage
8. Air embolism
9. Constipation

10. Pulmonary thrombosis

11. Disturbance in Ikhlal

**Other Vessels for Venesection are:**

S. No.	Site	Indications
1.	Median cubital vein	Diseases of the head and neck like melancholia, headache.
2.	Basilic vein	Pain in the stomach and liver, endometritis.
3.	Third dorsal metacarpal vein	Right third dorsal metacarpal – liver disorders. Left third dorsal metacarpal – cardiac and splenic disorders.
4.	External saphenous vein	Sciatic pain, gout, varicose vein, elephantiasis.
5.	Internal saphenous vein	Obstructed bleeding piles, menstruation.
6.	Popliteal vein	Obstructed bleeding piles, menstruation.
7.	Frontal vein	Heaviness of the head and eyes, chronic headaches.
8.	Nasal branches of facial vein	Chloasma, discoloration of face, piles, boils and itching of nose.
9.	Veins beneath the mastoid	Chronic headache.
10.	Median cubital vein	Hemochromatosis, polycythemia vera.

**Conclusion:** *Fasd* is a traditional method of treatment for various diseases. It is found very use full mode of treatment it should be the topic of research that how it is help full in treatment of deferent types of ailments. Further research is the need of hour, which must be evaluated.

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## A STUDY ON THE HR PROBLEMS THAT ARE FACED BY THE REAL ESTATE INDUSTRY IN BENGALURU

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### ABSTRACT

*The current examines the industry size and growth of the construction industry in India. It also analyses the Human Resource skill requirement of the real estate industry in Bengaluru and accesses the future Human Resource Skill requirements in the real estate industry in Bengaluru. The study provides valuable information related to the value chain of activities in construction, and suggest suitable measures for HR Skill Requirements in Construction Industry with special reference to Real Estate Sector in Bengaluru City. The study also provides an overview of the current employment pattern across various functional and educational levels and Profile of people employed. The study provided that the construction industry in Bangalore is facing challenges such as oversupply of unskilled labor which heeds to be trained to meet the increasing demand for skilled staff in the construction industry.*

*Keywords: Construction, Human resource, Skill, Labor, Industry*

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### 1. INTRODUCTION

The construction industry in India forms an integral part of the economy and highly contributes to its growth and development. It is expected that the construction industry will grow at an accelerated rate and surpass China's construction industry growth rate by 2030. As per the survey conducted by Global Construction 2030, it was found that the volume of the construction industry is projected to increase by 85% and reach \$15.5 trillion globally by the end of the year 2030. It includes the contribution of the construction industry of three major countries such as India, China, and the United States (**Robinson, 2019**). While focusing on the size and growth of the construction industry in India, it recorded a compound annual growth rate (CAGR) of 6% in the year 2019. The construction industry in India includes public and private sector companies that contributed 1.99 trillion valued projects in the year 2019. About 33 projects valued at 3.49 billion USD were initiated during 2016-17, and infrastructure projects valued at 3.86 billion USD in collaboration with Malaysian companies were initiated in the year 2017.

While focusing on industry segmentation, it includes the active involvement of different private construction companies such as Larsen & Turbo, Tata Projects, IRCON International, Jaypee Group, Punj Llyod, Essar Group, Hindustan Construction Company, IVRCL, and Gammon India Ltd. KEC International. The public sector companies such as Engineers India Limited (EIL), Indian Railways Construction Limited (IRCON), National Buildings Construction Corporation (NBCC), and Rail India Transportation and Engineering Services (RITES) also contribute towards the construction industry in India. The sector contributes 5% towards the Gross Domestic Product (GDP) and 78% towards Gross Capital Formation. As a result, the Planning Commission in India proposed to invest US\$320 billion for the infrastructure projects during the eleventh Five Year Plan so that the construction industry grows and expands exponentially. While focusing on the real estate sector, infrastructure, it contributes 6.5% to 7% to the GDP and generates millions of working opportunities. It is predicted that real estate sector contributions will reach USD 180 billion by the end of the year 2020 and the market size is projected to rise by 11.2%. The real sector has been classified into four parts which are housing, commercial, hospitality, and retail which helps in developing infrastructure base in India. However, the construction industry faces challenges such as shortage of labor, lack of technology, lack of contractor experience, poor health and safety measures that impede its growth and progress. Additionally, challenges such as inadequate finances, lack of technical knowledge, project complexity, high cost of production, and non-availability of land within cities are additional challenges that are faced by the construction industry (Laskar & Murty, 2004). The current study examines the industry size and growth of the construction industry; industry segmentation; real estate sector; infrastructure; key risk factors for the construction industry. The study also provides an employment pattern, value chain activities, and emerging trends in skill requirements.

### The objectives are as follows:

- To analyze the Human Resource skill requirement of the Real Estate industry in Bengaluru.
- Access the future Human Resource Skill requirements in the Real Estate industry in Bengaluru.

- To suggest suitable measures for HR Skill Requirements in Construction Industry with special reference to the Real Estate Sector in Bengaluru City.

## 2. LITERATURE REVIEW

### 2.1 Current employment pattern across various functional and educational levels

According to **Nagaraj, (2016)** there was a significant increase in employment opportunities in the construction sector in India with an annual growth rate of 9.3% in the year 2000. As per the Census 2011, the employment pattern in the construction industry showed rural-urban migration since 2012 by occupying 15 million workers in which 26% of workers belonged to the urban sector and remaining to the rural sector. Presently the sector employs more than 30 million individuals by creating an asset of \$200 billion. However, due to the increasing demand for labor and expansion of the construction industry, there was the creation of a gap between the construction industry requirement and supply of laborers as the workers are illiterate and unskilled. the construction industry is facing extreme competition and to get an edge in the competitive market, the construction company is focusing on retaining and attracting human resources that are intellectual assets of the firm. Therefore, the human resource (HR) managers are adopting analytical, decision-making, problem-solving, and coordinating attitude to hiring, choosing, training, and positioning workers. It not only helps to meet the construction company goals and objectives but also gains an edge over rivals. **Shivakumar, Sheng & Weber, (1991)** analyzed that the HR managers in the Bengaluru construction industry are facing employee retention issues, delays in work completion, and teamwork coordination issues which is negatively impacting the industry growth. Therefore, it is essential to introduce training, education, and skill development program to increase the employability factors in the construction industry in Bengaluru.

### 2.2. Value Chain of activities in Construction

According to **Virtanen, Hyypä, Ståhle, Kalliokoski, Kähkönen, Ahlavo & Achour, (2016)** the value chain activities in the construction industry in India include several activities through which internal inputs of the firm are transformed into outputs. **Santoni & Taglioni, (2015)** examined that the value chain in construction is mainly associated with implementing a network approach, technological advancements, capacity building, and adopting of adequate supply chain process. **Porter & Kramer, (2011)** examined that the construction industry is facing several challenges because of the shortage of labor and inadequate technology. Therefore, the adoption of new technologies such as additive manufacturing (AM), augmented reality (AR), and multi-sided platforms (MSPs) will help to enhance the value chain system. **Campbell, Bourell, and Gibson (2012)** examined that AM will help to enhance functionality, customizing, reducing the cost of parts, and standardizing the construction process. **Behzadar & Kamat, (2005)** analyzed that AR technology also enhances the value, quality, and capacity of the construction industry. It includes 3D design and model which increases the capacity and proficiency of architects and industrial designers to provide technically sound and accurate construction projects. **Weill and Woerner, (2015)** analyzed that MSP is also used by the contractors to digitalize the entire construction process and synchronize the supply chain procedure. Thus, it can be said that the adoption of different value creation activities such as AM, MSP, the working of the construction industry is enhanced.

### 2.3. Profile of people employed

The workers that are employed in the construction industry are classified into contracting, sub-contracting, and contract laborers. While focusing on contracting terminology in the construction industry, it is defined as the contract that a contractor establishes with the client regarding the completion of the construction task. It includes all the details of the work that the contractor is required to accomplish. On the other hand, sub-contractors work under contractors and are not provided with specified tasks that they are required to accomplish. It includes hiring specific services from big/small firms to complete a particular task which may be in the form of labor supply or technological services. Additionally, the entry and exit of laborers are also different for contracting and non-contracting laborers. For example, in the Bengaluru construction industry, the demand for skilled and unskilled workers highly depends upon the extent and exposures of construction work. The entry of laborer is defined by working under the guidance of the experienced maistry or direct recruitment into the construction company. After entry into the construction industry, the laborers are transferred from one site to accomplish the construction tasks in different locations. Thus, it can be said that the profile of people employed in the construction sector includes rural migrants, skilled labor, and unskilled labor.

### 2.4. Skill requirements and skill gaps

Construction industry is a labor-oriented industry in which laborers, employees, HR managers, and other staff are required to have specific skills to sustain in the competitive market. The workers must have critical reasoning skills, cooperation, and organization so that construction work is carried out effectively. Due to critical thinking skills, the employees think cautiously which prevents accidents at the job. Cooperation

increases coordination at the workplace because of which there is the adoption of organized work culture and delivery of quality work. Construction is a physically and mentally challenging workplace where the workers are required to be physically and mentally alert to accomplish the task. The construction workers must have communication skills, physical skills, office skills, management skills, designing and planning skills, and learning about codes and regulations so that construction work is performed adequately. During 1978-2012, there has been 11% increase rural male construction workers, 6% increase in female rural construction workers, 7% increase in urban male construction workers and 2% increase in female urban construction workers. However, the training and development have not been provided most of the laborers which have created a skill gap in the construction industry.

### 2.5. Emerging trends in skill requirements

The construction industry is experiencing a boost and transforming its working by adopting digital means of construction. The offsite method of construction that was adopted by the construction unit and contractor is replaced by modern technologies like digital designing and logistics. Thus, the workers that are employed in the construction industry are also required to enhance their skills and capabilities to survive and sustain in the competitive market. The workers such as design engineers, construction managers, project architect, and construction engineers are required to develop communication skills so that they could interact with the clients properly. Effective communication between the client, designers, and contractor will help in propagating the work accordingly without making any mistakes. The construction workers also require developing leadership and management skills so that they could work coordinately with other staff. Additionally, the workers must also develop skills such as MS Office Suite, MS Office tools, email, and digital tools such as 3D, augmented reality, and virtual reality so that technical proficiency is enhanced. The use of these skills will help the workers to accomplish the construction tasks effectively.

### 2.6. Profile of Investments and Projected Industry Size

Construction industry in India huge and expanding an alarming rate to meet the increasing demand for infrastructure in the country. As per the survey conducted by the Department for Promotion of Industry and Internal Trade (DPIIT), it was found that the real state has grown significantly and reached US\$ 25.37 billion in the year 2019. On the other hand, as per the survey conducted by India Brand Equity Foundation 2020, it was found that the construction industry in Indian requires an investment of INR 50 trillion by the end of the year 2022 to meet the infrastructure requirements in the country. Therefore, to meet the increasing demand for construction and the real sector, several projects (metro project) have been initiated by the governing body of India. It includes investing US\$ 1.4 trillion on different infrastructure projects in the coming 5 years. Additionally, the National Highways Authority of India (NHAI) has proposed initiatives such as toll and amenities so that US\$ 14.31 billion revenue is collected and infrastructure activities are promoted extensively. The Union Budget 2020-2021 by the governing body has also allocated US\$ 24.27 billion funds for the development of transport infrastructure in the country. Thus, it can be said several measures and budget allocations have been executed by the governing body to promote construction work in India.

### 2.7. Projected Human Resource Requirements

The human resource department plays an important role in the construction industry and responsible for carrying out different activities such as hiring, recruiting, training, deploying, training, and retaining employees. Labor and staff are the strength of the construction industry and it becomes an essential task for the HR managers to retain them within the company for the efficient conduction of work. **Hooker (2014)** examined that the construction sector in Bangalore is suffering from certain issues of decreasing margins and increasing oversupply of unskilled labor. Therefore, it has become necessary for HR managers to adopt analytical, decision-making skills, and problem-solving, and coordinating attitudes to handle the labor in the industry. The managers also use evaluative skills to assess the efficacy of workers so that they contribute efficiently as per project requirements. HR managers used ethical and professional practices in the Bengaluru construction industry to reduce negative aspects that have been prevailing in the industry.

## 3. FINDINGS

As per the above-discussed facts, it was found that the construction industry is a labor-intensive industry that forms an integral part of the Indian economy. Human resource plays a major role in performing work, operations, and functionalities in the construction firm. The study examined that the workers and laborers in the construction industry are required to have specific technical and management skills to carry out different work responsibilities. It was found that the construction industry in Bangalore is facing with challenges such as oversupply of unskilled labor which needs to be trained to meet the increasing demand of skilled staff in the construction industry (**LJ Hooker (2014)**). The study also identified that human resources play important in

managing and handling workers in the construction industry. As a result, due to the introduction of the training and education program by the HR managers, the competencies and skills of the workers so that they perform construction work efficiently.

#### **4. CONCLUSION**

As per the above discussion, the study examined the industry size and growth of the construction industry in India and analyzed the industry segmentation. It was found that the construction industry is growing at the CAGR of 6% in the year 2019. It is majorly occupied by private and public sector companies that contribute 1.99 trillion to the construction industry. It can be concluded that human resource is an integral part of the construction industry that is responsible for hiring, selecting, training and deploying workers in the workplace. HR plays a mitigating role in meeting the expectations of workers from the construction firm and propagating the expectations of the firm to the workers. As a result, there is the development of an adequate platform through which the performances of the employees are assessed and the skill gaps are met. Thus, it can be said that to increase the growth and progress of the construction industry in India is highly dependent upon the capabilities of human resources which needs to be enhanced as per the current industry requirements.

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## A STUDY ON INSIGHTS OF URBAN CO-OPERATIVE BANKS IN KARNATAKA

K. S. Mahadeva<sup>1</sup> and Dr. T. Aswatha Narayana<sup>2</sup>Research Scholar<sup>1</sup> and Research Guide<sup>2</sup>, Tumkur University, Tumkur**ABSTRACT**

*Urban co-operative banks (UCBs) have by and large been ruining the poor credit offtake for quite some time. Ditto commercial banks. The latter have been pruning the rate of interest on demand deposits like savings deposits and time deposits like fixed deposits. This has led some well-informed retail depositors to switch their allegiance to healthy UCBs since they offer a higher rate of interest on demand and time deposits. In the normal course, healthy UCBs would have welcomed such addition to their deposit base but given the slack in demand for retail credit, they are scrambling to find lucrative ways of investing such deposits – lucrative enough to cover at least the servicing cost associated with the said deposits. But the question is whether the UCBs are equipped to strategize and plan towards this end. The researcher analysed the performance of the Nehrunagar Co-operative Bank Ltd, Seshadripuram, Bangalore, a UCB, to ascertain whether the UCB had strategized and planned appropriately for the purpose. Towards this end, the researcher vetted the financials of the UCB for the period FY 2011-15. He found that the UCB had not grown its current accounts and saving accounts (CASA) base consistently. The UCB's bottom-line too mimicked the trend. The correlation between the UCB's net profit and CASA base registered a negative 20 percent! The sheer anomaly of this outcome testified to the inefficient exploitation of the cheap CASA base by the UCB. In the normal course, one would expect the net profit to rise whenever the CASA base rose! The UCB was found wanting in ensuring a consistent growth in respect of its overall deposit base too. The ratio of the CASA base of the UCB to its overall deposit base had fluctuated, rather wildly.*

*Keywords: Allegiance; anomaly; bottom-line; CASA; ditto; lucrative; rue; scramble; UCB*

**1.1 INTRODUCTION**

India has been a capital starved country and in the hunt for capital, small entrepreneurs, agriculturists and people who can offer no collateral like artisans, petty traders, women and rural folks, typically lose out (Anand, 2016). Cooperative banks were conceptualized to cater to these very segments. These segments represented the largest section of people who were untouched by commercial banks since these banks could not venture into the remotest corners of the country and remain viable there. In short, co-operative banks were envisioned as the original financial inclusion tool. They were expected to encourage savings at the grass roots level and make credit available to those unserved by traditional banks. Being local in nature, they were also supposed to know the local business environment better and thus assist in the economic development of the community. However, the co-operative banking sector stands at a crossroads today. On the one hand, they have grown tremendously, albeit not in the desired fashion; they have grown a substantial deposit and credit base, and are, as a group, a force to contend with, in about half a dozen states. On the other hand, as a class, co-operative banks are structurally weak. Multiple collapses have been bringing management inefficiencies to the fore frequently; most co-operative banks are run like family-owned businesses with a shabby corporate governance record. Political interference and influence are rife, and the regulatory framework within which they operate does not allow for effective supervision by RBI.

The structure of cooperative network in India can be viewed at two levels, namely the urban cooperative banks and rural cooperatives. Urban Cooperatives can be further divided into scheduled and non-scheduled. Both the categories are further divided into multi-state and single state. Most of these banks fall in the non-scheduled and single-state category. Banking activities of urban cooperative banks are monitored by RBI. Registration and management activities are on the turf of the Registrar of Cooperative Societies (RCS) concerned. These RCS operate in a single state and Central RCS (CRCS) operate in multiple states.

**1.2 STATEMENT OF THE PROBLEM**

The operational efficiency and the profitability of the urban co-operative banks are influenced by several factors. While some factors may apply to all the banks, in some cases the factors may be specific to a bank or banks. While some may boast of inherent advantages in their area of operations, some may boast of inherent advantages in the profitability space. Some may have an upper hand in both the spaces and yet some may be weak in both the spaces. These can be traced, in turn, to several micro-level factors in respect of which the bank concerned may or may not have paid adequate attention for a variety of reasons either out of ignorance or out of intention. To identify these problems, an analysis of the growth of the banks as revealed by important metrics is necessary. Lending being one of the major activities of the bank, such analysis must begin with an

analysis of the advances portfolio of the banks. The factors that have a bearing on the operational efficiency and profitability of the banks will have to be identified and examined. Since in the process the banks may be exposed to credit risk, measures to de-risk the bank will have to be ascertained too.

### 1.3 REVIEW OF LITERATURE

1. The Reserve Bank of India intends to constitute an “umbrella organisation” for urban cooperative banks (UCBs) (Gayatri, 2019). This will raise their operational and financial health to global levels. The measure will render the UCB sector financially resilient and raise the depositors’ faith in UCBs, asserts the RBI, citing that such an umbrella organisation is in operation in many countries. Apart from extending liquidity and capital support, the central bank would establish the information and technology infrastructure. This would help the banks to broad-base their services at a relatively low cost. It may also offer fund management and other consultancy services. The structure, size, lack of avenues for raising capital funds and the limited area of operation of urban cooperative banks escalate their financial vulnerabilities. This has also prompted the RBI to constitute the umbrella organisation.
2. The urban co-operative banks (UCBs) are annoyed with the Reserve Bank of India’s draft guidelines on appointment of members to the Board of Management. The guidelines warrant appointment of professionals or people with exposure to functional areas like accountancy, economics, finance and information technology to the Board. According to the guidelines, only such Boards can seek regulatory approval for expanding the area of operations of the bank and for opening new branches (Ram, 2018). It is believed that the mandate could hobble the growth of smaller UCBs since they may not afford to put in place such a Board. With almost 69 per cent of the banks in the urban co-operative banking sector qualifying as Tier I banks (or banks with less than INR 100 crores in deposits), veteran bankers from the sector feel the constitution of such a Board of Management (BoM) will add to their costs given that they have to pay allowance / sitting fee to the members. There were 1,562 UCBs in the country as at March-end 2017. Not that these banks do not pay allowance / sitting fee now – they do, but only to the board of directors (BoD). But it may prove too costly to appoint professionals or people with exposure to functional areas like accountancy, economics, finance and information technology to the BoM of banks operating in smaller towns. According to *Sahakar Bharati*, an umbrella body of co-operative banks and societies in the country, the mandate is unfair to many UCBs which are by and large professionally managed. It cites that the RBI admits in its *Report on Trend and Progress of Banking in India* that UCBs have outperformed the commercial banks on many health parameters, including bad debts and gross NPAs.
3. The Reserve Bank of India raised the cash reserve ratio (CRR) for non-scheduled urban co-operative banks (UCBs) by 100 basis points to four percent. (100 bps refers to one percent) (indiainfoline, 2017). This rise will come into effect from July 12. According to RBI, it had decided to raise the CRR for non-scheduled primary (urban) cooperative banks by 100 basis points from three percent to four percent of their total demand and time liabilities, on par with scheduled primary (urban) co-operative banks.
4. The importance of urban co-operative banks could be gauged from the fact that joint stock banks were not interested in providing credit on personal security to the urban middle class (M. Muthumeena, 2017). They felt that it was not advantageous for them to issue small loans given the cost associated with the disbursement of such loans. So, the urban co-operative banks were opened mainly for accepting deposits of various sizes from people in urban and semi-urban areas and for providing them banking services like issuing loans on personal security, discounting and collecting bills, issuing drafts, etc. These banks focused on serving the communities and workplace groups in various localities. Their primary intention was to lend to small borrowers and businesses. As a result, their scope of operations extended greatly. Because of this, UCBs grew in terms of numbers and business volumes over the years. However, their business growth has not been commensurate with the growth of the banking sector.
5. Karnataka occupies a special place in the Indian cooperative sector because it is one of the first states to have initiated the cooperative movement in India. An Urban cooperative bank (UCB), as the name suggests, is a bank that operates in urban pockets on the basis of cooperative principles (KSCUBF, 2017). According to the Banking Regulation Act 1949, an urban cooperative bank is a primary non-agricultural credit society. It is a society registered under the Act and doing the business of banking, as defined in clause (b) of section 5 of the Banking Regulation Act 1949. The UCBs are generally viewed as the common man’s bank because their objective is to promote thrift and cooperation in the lower and middle strata of the society. UCBs have made their mark in the cooperative space.

#### 1.4 RESEARCH GAP

The reviewed literature has done well to imply that the UCBs have not exploited their potential to achieve financial inclusion and clock a more broad-based growth. They need to be reformed in terms of how they are regulated and in terms of other parameters that can impact their bottom lines. However, the absence of focus on their operational efficiency and profitability stands out in the reviewed literature. Operational efficiency and profitability are determined, among other things, by the level of exploitation of the resources they have on hand and the seriousness with which they pursue their operational efficiency. It is these gaps that the present study proposes to plug.

#### 1.5 SCOPE OF THE PRESENT STUDY

The study confines itself to the Nehrunagar Co-operative Bank Ltd, Seshadripuram, Bangalore city.

#### 1.6 OBJECTIVES OF THE STUDY

The objective of the study is to examine the advances portfolio of the Nehrunagar Co-operative Bank Ltd, Seshadripuram, Bangalore city in the light of the oft-raised complaint that credit offtake from the UCBs has been poor. The researcher seeks to attempt the examination by:

1. Examining the ratio of short-term loans to demand deposits of the respondent banks
2. Examining the ratio of net profit to all loans
3. Analysing the growth of gold loans, unsecured loans and mortgage loans vis-à-vis the net profit of the banks.

#### 1.7 RESEARCH DESIGN

##### 1.7.1 Research methodology

The study is descriptive in nature and has used the 'fact-finding' survey method

##### 1.7.2 Sources of data

Data required for the research has been collected from the secondary sources alone, namely, the Annual Reports of the respondent bank. In addition, the researcher interacted extensively with other stakeholders associated with the country's UCBs.

##### 1.7.3 Data processing and analysis plan

Data has been processed and analysed by using statistical tools like correlation coefficient and compounded annual growth rate (CAGR).

#### 1.8 GROWTH OF NEHRUNAGAR CO-OPERATIVE BANK LTD ON VARIOUS METRICS

In the following paragraphs, the growth of the Nehrunagar Co-operative Bank Ltd, Seshadripuram, Bangalore, is analysed on various metrics.

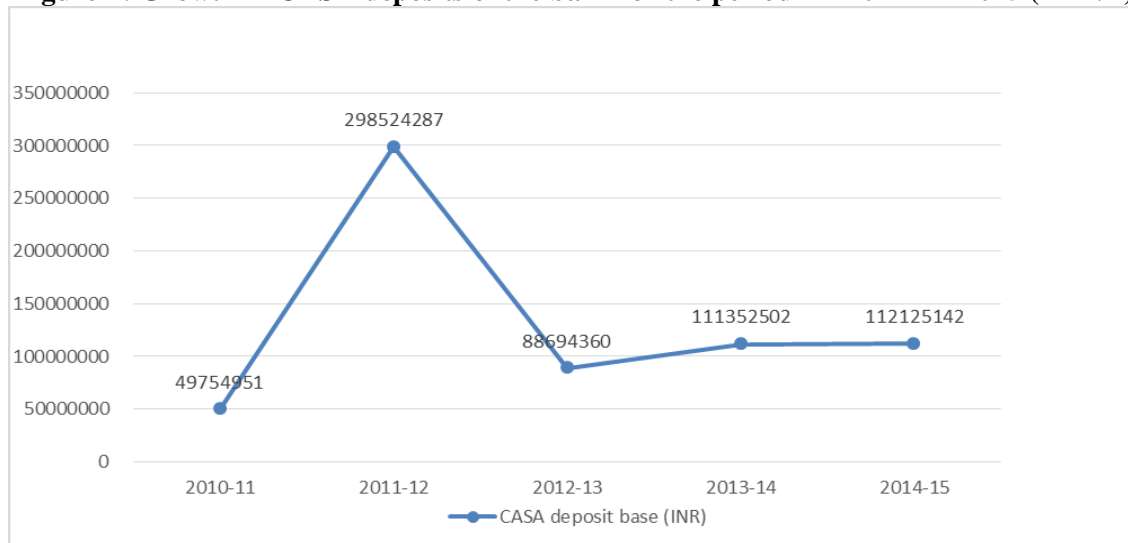
##### 1.8.1 Growth in CASA deposits of the bank for the period FY 2011-FY 2015

Current accounts and savings accounts (CASA) represent the cheapest source of working capital for a bank. After all, the interest paid by the bank on savings deposits is nominal and the bank pays no interest at all on current accounts. On the other hand, the bank levies services charges on current accounts and thus earns an income from the current accounts. Hence the bank's CASA growth is an important metric. The following Table and Figure compute the growth of the bank's CASA deposits.

**Table-1: Growth in CASA deposits of the bank for the period FY 2011-FY 2015 (in INR)**

Year	CASA deposit base (INR)	Year-on-Year (YoY) growth (%)
2010-11	4,97,54,951.00	
2011-12	29,85,24,287.00	499.99
2012-13	8,86,94,360.17	-70.29
2013-14	11,13,52,502.47	25.55
2014-15	11,21,25,141.72	0.69
CAGR (%)		22.52

(Source: Annual Reports of the bank)

**Figure-1: Growth in CASA deposits of the bank for the period FY 2011-FY 2015 (in INR)**


(Source: Annual Reports of the bank)

During the period under review, the CASA deposits of the bank grew at a compounded annual growth rate (CAGR) of 22.52 percent. This is no mulish growth but the fluctuating YoY growth of the bank (at annual intervals) is not something the bank can flaunt. From a YoY of 499.99 percent or 500 percent during a year and a negative 70.29 percent the very next year is unfathomable to say the least. This does not augur well for the bank.

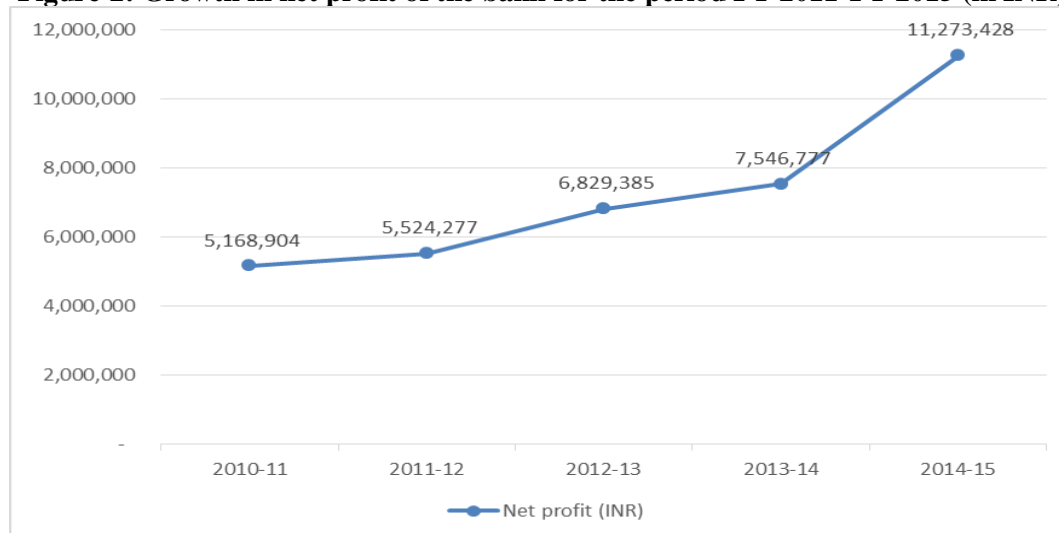
### 1.8.2 Growth in net profit of the bank for the period FY 2011-FY 2015

Like any business entity, the bank too should strive to maximise the wealth of its shareholders. One way to go about it is through generation of net profit in a consistent and sustained manner. The following Table and Figure trace the growth of the bank's net profit

**Table-2: Growth in net profit of the bank for the period FY 2011-FY 2015 (in INR)**

Year	Net profit (INR)	Year-on-Year (YoY) growth (%)
2010-11	51,68,904.36	
2011-12	55,24,277.06	6.88
2012-13	68,29,385.11	23.62
2013-14	75,46,776.54	10.50
2014-15	1,12,73,428.45	49.38
CAGR (%)		21.52

(Source: Annual Reports of the bank)

**Figure-2: Growth in net profit of the bank for the period FY 2011-FY 2015 (in INR)**


(Source: Annual Reports of the bank)

During the period under review, the net profit of the bank grew at a compounded annual growth rate (CAGR) of 21.52 percent. However, the YoY growth in net profit saw a setback between FY 2013 and FY 2014. During the very next year, the bank registered a quantum jump in net profit at 49.38 percent, thereby redeeming the situation somewhat.

### 1.8.3 Correlation between the CASA deposits and the net profit of the bank for the period FY 2011-FY 2015

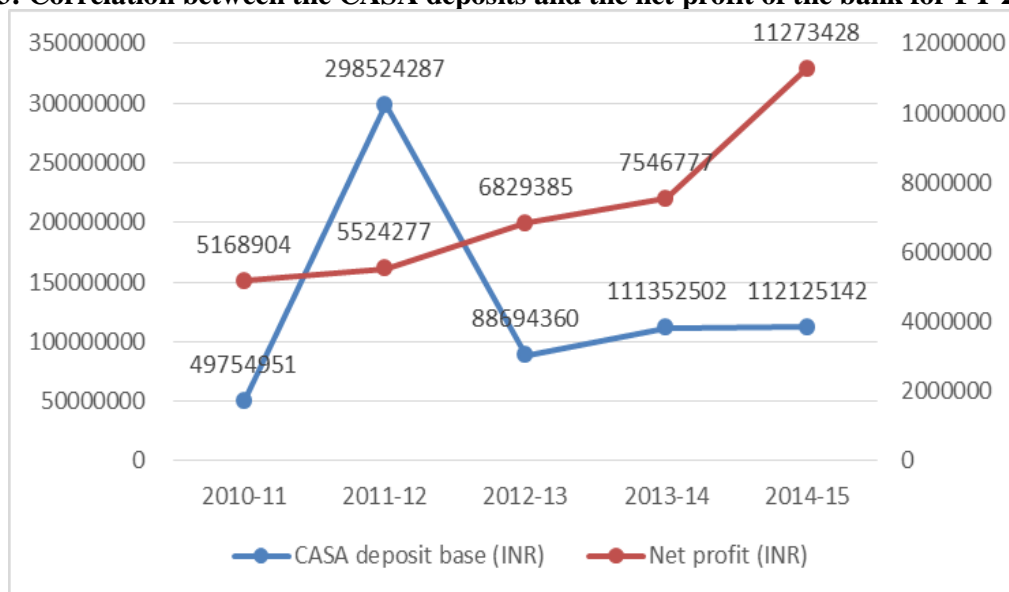
One would expect the growth in CASA deposits of a bank and its net profit to be positively correlated. After all, CASA deposits represent the cheapest source of working capital for the bank. The bank is expected exploit this advantage to improve its bottom line. Hence it is worth examining whether the respondent bank has conformed to the trend or bucked the trend. The following Table and Figure attempt the correlation.

**Table-3: Correlation between the CASA deposits and the net profit of the bank for the period FY 2011-FY 2015 (in INR)**

Year	Net profit (INR)	CASA deposit base (INR)
2010-11	51,68,904.36	4,97,54,951.00
2011-12	55,24,277.06	29,85,24,287.00
2012-13	68,29,385.11	8,86,94,360.17
2013-14	75,46,776.54	11,13,52,502.47
2014-15	1,12,73,428.45	11,21,25,141.72
Correlation coefficient		-0.20

(Source: Annual Reports of the bank)

**Figure-3: Correlation between the CASA deposits and the net profit of the bank for FY 2011-2015**



(Source: Annual Reports of the bank)

During the period under review, the net profit of the bank and the CASA deposits of the bank have not moved unidirectionally. Between FY 2012 and FY 2013, the net profit moved from INR 55,24,277.06 to INR 68,29,385.11 representing a rise of approximately 25 percent. Unbelievably, the CASA base fell from INR 29,85,24,287.00 to INR 8,86,94,360.17. In the circumstances, the correlation coefficient of -0.20 between net profit and CASA base does not come as a surprise.

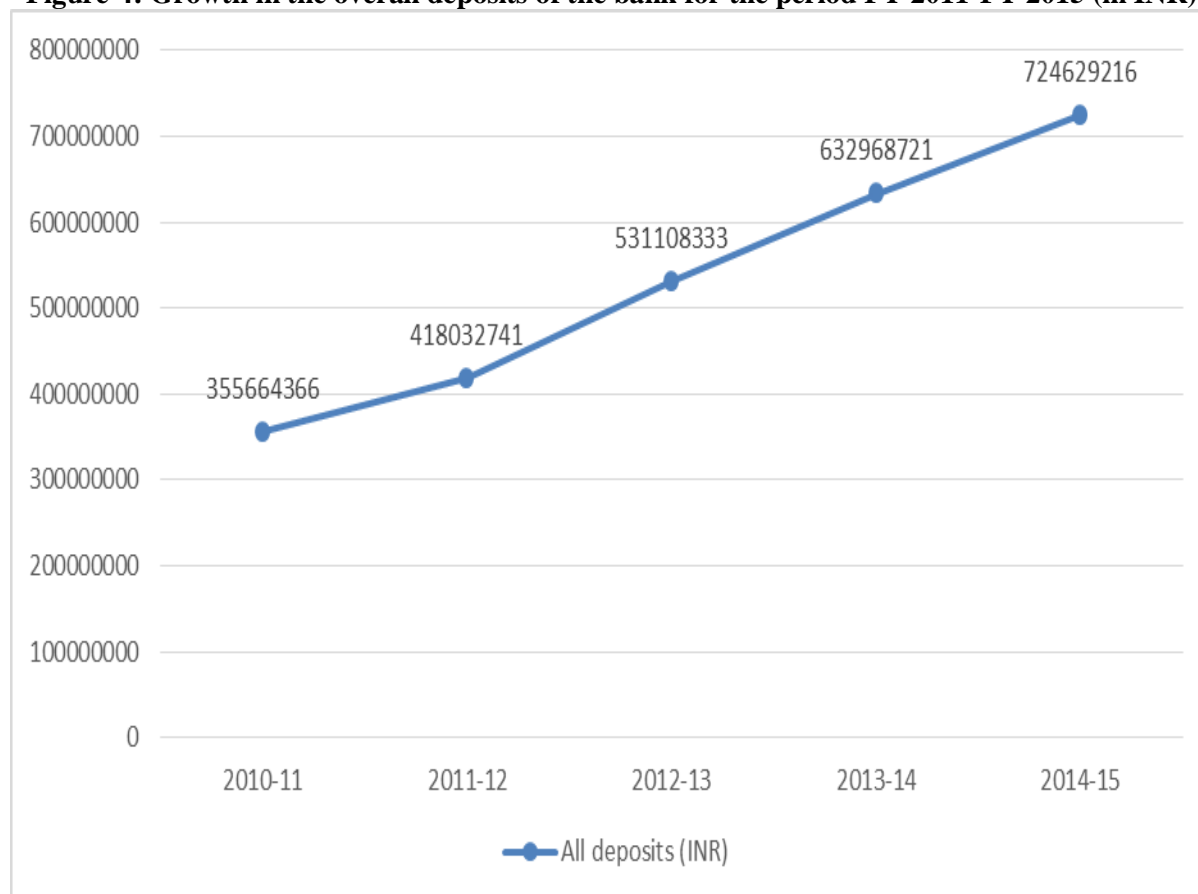
### 1.8.4 Growth in the overall deposits of the bank for the period FY 2011-FY 2015

Over and above the CASA deposits of the bank, one should examine the overall deposits of the bank since deposits provide the much-needed working capital for the banks at a relatively low cost. Term deposits or time deposits also represent a source of cheap working capital for the bank though they are not as cheap as the CASA deposits. It is noteworthy that although term deposits are relatively costly for the bank since the latter has to pay a higher rate of interest on them, the interest paid on them is tax-deductible and hence can mitigate the interest burden for the bank. Hence it is worth examining whether the overall deposits of the bank have grown at a healthy pace. The following Table and Figure attempt such an examination.

**Table-4: Growth in the overall deposits of the bank for the period FY 2011-FY 2015 (in INR)**

Year	All deposits (INR)	YoY growth (%)
2010-11	355664366	
2011-12	418032741	17.54
2012-13	531108333	27.05
2013-14	632968721	19.18
2014-15	724629216	14.48
CAGR (%)		19.47

(Source: Annual Reports of the bank)

**Figure-4: Growth in the overall deposits of the bank for the period FY 2011-FY 2015 (in INR)**

(Source: Annual Reports of the bank)

The overall growth of deposits of the bank has grown at a CAGR of 19.47 percent. The YoY growth has been less inconsistent, so to speak. Hopefully, the YoY growth of the overall deposits will not plateau off.

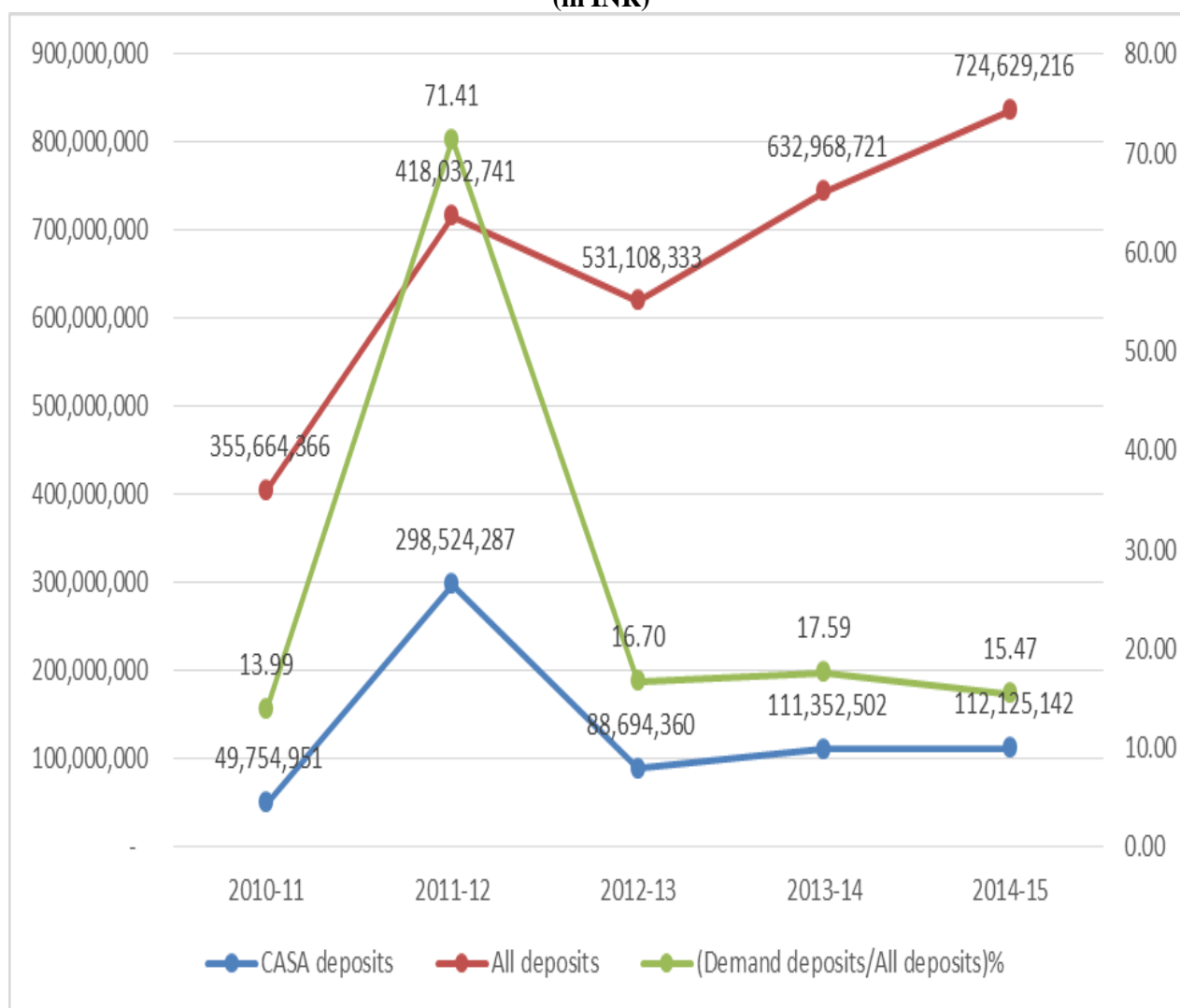
#### 1.8.5 CASA deposits as a proportion of the overall deposits of the bank for the period FY 2011-FY 2015

As explained in a previous paragraph, banks should mobilise as much of CASA deposits as possible in order to improve their bottom line. Higher the proportion of CASA deposits in the overall deposits, higher its below-the-line figures. Hence it is worth examining this metric. The following Table and Figure attempt such an examination.

**Table-5: CASA deposits as a proportion of overall deposits of the bank for the period FY 2011-FY 2015 (in INR)**

Year	CASA deposits	All deposits	(CASA deposits/All deposits) %
2010-11	4,97,54,951	35,56,64,366	13.99
2011-12	29,85,24,287	41,80,32,741	71.41
2012-13	8,86,94,360	53,11,08,333	16.70
2013-14	11,13,52,502	63,29,68,721	17.59
2014-15	11,21,25,142	72,46,29,216	15.47

(Source: Annual Reports of the bank)

**Figure-5: CASA deposits as a proportion of overall deposits of the bank for the period FY 2011-FY 2015 (in INR)**

(Source: Annual Reports of the bank)

The proportion of CASA deposits has hovered in the range of 13% - 15% save for FY 2012 when it registered 71.41 percent. This can be ignored since it is a one-off event. Overall, this range is simply not good enough for the bank to raise its profit margin. One would expect the proportion to be at least 25 percent. The bank had better focus on raising the CASA component in their overall deposit portfolio.

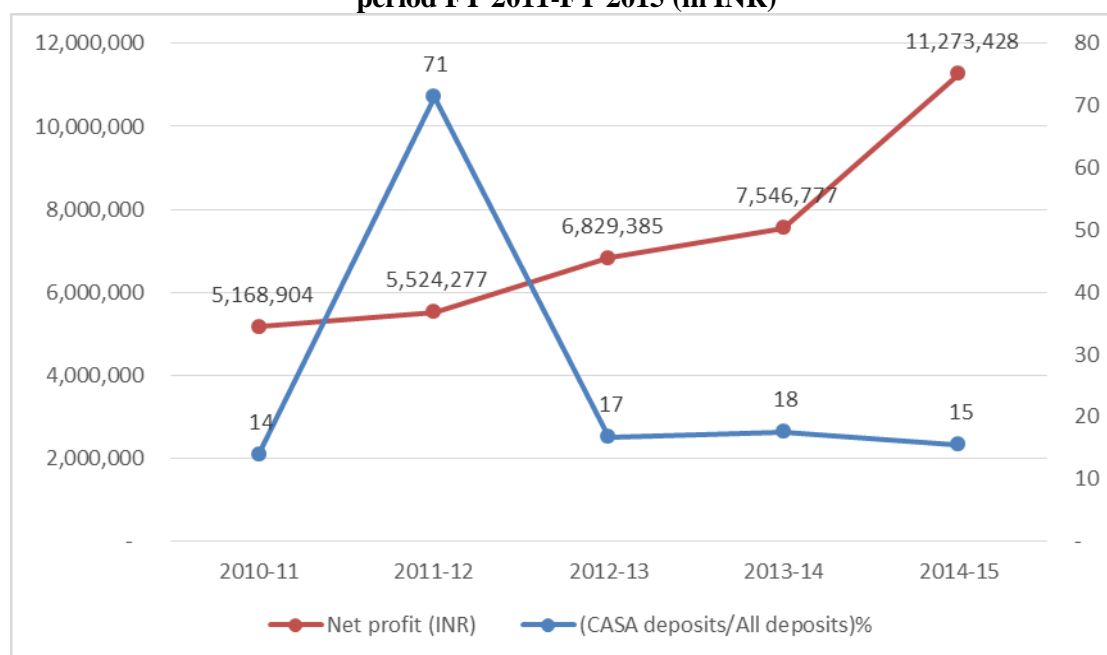
#### 1.8.6 Correlation between the proportion of CASA deposits and the net profit of the bank for the period FY 2011-FY 2015

One would expect the net profit of the bank to improve as the proportion of CASA deposits in the total deposit base of the bank improves. Hence it is worth examining this metric. The following Table and Figure attempt such an examination.

**Table-6: Correlation between the proportion of CASA deposits and the net profit of the bank for the period FY 2011-FY 2015 (in INR)**

Year	(CASA deposits/All deposits) %	Net profit (INR)
2010-11	14	5168904.36
2011-12	71	5524277.06
2012-13	17	6829385.11
2013-14	18	7546776.54
2014-15	15	11273428.45
<b>Correlation coefficient</b>		-0.38975825

(Source: Annual Reports of the bank)

**Figure-6: Correlation between the proportion of CASA deposits and the net profit of the bank for the period FY 2011-FY 2015 (in INR)**

(Source: Annual Reports of the bank)

The proportion of CASA deposits has hovered in the range of 13% - 15% save for FY 2012 when it registered 71.41 percent. This can be ignored since it is a one-off event. The net profit in FY 2012 has risen by only INR 3,55,000 (5524277.06-5168904.36) approximately. Clearly this has come about on account of window-dressing on the part of the bank or on account of serendipitous developments. Even this has not helped the bank raise the net profit – it has only depressed the rise in net profit, a skewed outcome. As a matter of fact, when the proportion of CASA deposits was much lower than 71 percent in the other years, the rise in net profit has been at least INR 7,00,000!

### 1.9 SUMMARY OF FINDINGS

In the following paragraphs, a summarised version of the findings arrived at in respect of the three categories of respondents is furnished:

1. During the period under review, the CASA deposits of the bank grew at a compounded annual growth rate (CAGR) of 22.52 percent. This is no mulish growth but the fluctuating YoY growth of the bank (at annual intervals) is not something the bank can flaunt. From a YoY of 499.99 percent or 500 percent during a year and a negative 70.29 percent the very next year is unfathomable to say the least. This does not augur well for the bank.
2. During the period under review, the net profit of the bank grew at a compounded annual growth rate (CAGR) of 21.52 percent. However, the YoY growth in net profit saw a setback between FY 2013 and FY 2014. During the very next year, the bank registered a quantum jump in net profit at 49.38 percent, thereby redeeming the situation somewhat.
3. During the period under review, the net profit of the bank and the CASA deposits of the bank have not moved unidirectionally. Between FY 2012 and FY 2013, the net profit moved from INR 55,24,277.06 to INR 68,29,385.11 representing a rise of approximately 25 percent. Unbelievably, the CASA base fell from INR 29,85,24,287.00 to INR 8,86,94,360.17. In the circumstances, the correlation coefficient of -0.20 between net profit and CASA base does not come as a surprise.
4. The overall growth of deposits of the bank has grown at a CAGR of 19.47 percent. The YoY growth has been less inconsistent, so to speak. Hopefully, the YoY growth of the overall deposits will not plateau off.
5. The proportion of CASA deposits has hovered in the range of 13% - 15% save for FY 2012 when it registered 71.41 percent. This can be ignored since it is a one-off event. Overall, this range is simply not good enough for the bank to raise its profit margin. One would expect the proportion to be at least 25 percent. The bank had better focus on raising the CASA component in their overall deposit portfolio.



6. The proportion of CASA deposits has hovered in the range of 13% - 15% save for FY 2012 when it registered 71.41 percent. This can be ignored since it is a one-off event. The net profit in FY 2012 has risen by only INR 3,55,000 (5524277.06-5168904.36) approximately. Clearly this has come about on account of window-dressing on the part of the bank or on account of serendipitous developments. Even this has not helped the bank raise the net profit – it has only depressed the rise in net profit, a skewed outcome. As a matter of fact, when the proportion of CASA deposits was much lower than 71 percent in the other years, the rise in net profit has been at least INR 7,00,000!

#### 1.10 Researcher's recommendations

1. The bank should chase a secular rise in the growth of its CASA base. Presently its growth is rather erratic, suggestive of attempts at window-dressing or ever-greening. If the bank did follow such a strategy, it is time the bank corrected itself. After all, the depositor requires interest on the money she / he has parked and hence if the bank is unable to redeploy the mobilised deposits in its advances portfolio, it will not be able to service the debt (which in this case is the deposit) . The strategy will backfire and eat into the bottom-line of the bank.
2. Ditto the net profit of the bank. A quantum jump in net profit to 49.38 percent in FY 2015 smacks of undesirable practices on the part of the bank to rectify the setback it witnessed in the net profit zone in the previous year, namely, FY 2014. These strategies may work in the short term but in the medium term, they will rebound on the bank in the very next year thereby letting the cat out of the bag. The rebound could be so bad as to turn the situation from bad to worse.
3. It is rather surprising that the net profit of the bank and the CASA base of the bank have not moved unidirectionally. This only implies that the bank has not exploited its CASA base to the hilt. CASA funds represent the cheapest source of working capital for the bank and if this advantage is not leveraged by the bank, it smacks of inefficient exploitation of working capital on the part of the bank. A distinct possibility is that the bank has not been able to deploy its CASA funds in its lucrative advances portfolio for want of viable loan proposals or creditworthy borrowers. If this is the case, the bank should take steps to retard the growth of its CASA base. The suggestion may sound perverse, but the bank cannot afford to bite off more than what it can chew. The bank can reduce the interest it pays on its savings accounts to a level it is operationally and financially comfortable with. A rupee saved is more than a rupee earned, in value terms because the earned rupee is subject to tax. The members of the UCB can also be persuaded to acquiesce in this strategy given the backdrop against which such interest rate reduction is sought and the consequences that could follow if the interest rate reduction is not given effect to.
4. The overall deposits of the bank have grown at a CAGR of 19.47 percent. The YoY growth has been less inconsistent, so to speak. Hopefully, the YoY growth of the overall deposits will not plateau off. As a matter of fact, the deposits overall should grow steadily and not in fits and starts. For example, deposits have grown at 27.05 percent in FY 2013 only to fall to 19.18 percent the next year and to 14.48 percent the year next. There has been an inexplicable fall in FY 2015 too. Such volatility in the growth of the deposit base does not augur well for the bank, given that it will make it difficult for the bank to project its advances figures for the short term and medium term. Hence the bank should focus on steadying the pace at which its deposit grows.
5. The of CASA deposit base hovering between 13% and 15% is not good news. In a bank where the savings deposits are mostly held by retail customers one would expect the percentage to be at least 25. However, save for the FY 2012 percentage which was 71.41, the percentages for the rest of the period have hovered at the sub-15 level. UCB's retail customers are from the lower income class, middle income class and to a certain extent, from the upper middle class. Most of them are not capital market savvy and hence do not invest in securities like stocks and bonds. They find it more comfortable to park their funds with banks and it is thus surprising that the proportion of CASA deposits of the UCB has ruled at sub-25 percent levels. It is time the UCB focussed on improving its CASA base by promoting its savings deposits rather aggressively. A focused campaign must be launched for the purpose, highlighting the advantages the retail savers can reap, by parking their investible surplus in the bank's savings accounts. After all, most of these banks have gone hi-tech, implemented the core banking solution (CBS) and installed ATMs, stand-alone as well as on-branch. Their retail customers are a motley crowd – from college students to corporate and public sector executives, bureaucrats, professional and self-employed people, retail traders and transport operators. Additionally, many UCBs offer online banking facilities, financial and insurance products, making sure that almost all the services are provided under the same roof. These are carrots good enough

to lure potential investors in savings accounts. It is time the bank took up this exercise seriously and promptly.

6. The proportion of CASA deposits has hovered in the range of 13% - 15% save for FY 2012 when it registered 71.41 percent. This can be ignored since it is a one-off event. The net profit in FY 2012 has risen by only INR 3,55,000 (5524277.06-5168904.36) approximately. Clearly this has come about on account of window-dressing on the part of the bank or on account of serendipitous developments. Even this has not helped the bank raise the net profit – it has only depressed the rise in net profit, a skewed outcome. As a matter of fact, when the proportion of CASA deposits was much lower than 71 percent in the other years, the rise in net profit has been at least INR 7,00,000! Window-dressing or evergreening (in the case of advances) will not help the UCB improve its bottom-line. Instead, the bank should chase a steady and incremental growth in all departments, including deposits, advances and other financial / insurance services and products.

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**ANALYSIS OF PROFITABILITY AND SOLVENCY DETERMINANTS OF PUBLIC NON-LIFE INSURERS**

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**ABSTRACT**

*Soon after deregulation in the key sectors of the economy, Indian insurance sector was opened up for one of the major known reform in the country. Lured by the low insurance presence and low per capita expenditure on the insurance, major world giants of the industry entered Indian insurance with possible joint ventures with local players. This led to competition and chase to have more market share and exploit the untouched market by the entrants resulting in major underwriting losses for the companies. The study aims at analyzing the profitability of major public sector players in the non-life sector and simultaneously the factors effecting solvency of these players.*

*Keywords Solvency, Combined ratio, Expense ratio, Claim ratio, Underwriting losses, Operating margin, Investment income*

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**INTRODUCTION**

Insurance industry of India has witnessed drastic change since liberalization of the sector, the market in the pre-liberalisation era was regulated and monopolized by the public sector companies resulting in fair demand for the products because of sheltered market and regulated price regime. However since nationalization, there were complaints about poor customer service, operational inefficiency and deteriorating image associated with the rapid expansion of insurance companies. **Rohit & Manjit, (2009)**. The scenario did change and it was felt that industry can contribute significantly to economic growth and good risk transfer mechanism, however the industry need to be organized and fairly competitive to infuse trust in the policyholders and investors. Fairly competitive insurance markets offer individual and corporate business houses better value and greater choices than various alternative approaches. **Skipper Jr. & Klein, (2000)**. Reforms in the banking sector initiated following **Malhotra Committee Report (1993)** did yield successful results and reforms were aimed at crafting competitive and efficient financial system suiting country's economic requirements. Consequently insurance sector of the country was liberalized in January 2000 with the objective to have better product offers to the public, deep service penetration, promote fair competition and encourage foreign investment in the sector through joint ventures with local players aimed at creation of economic activity, customer centric approach and improved efficiency of the existing public sector companies.

Year 1999 witnessed a major structural reform in the insurance industry, IRDA bill was passed and government monopoly ended by opening up of the market to the private players and foreign players were allowed to enter market (26% of foreign ownership). The stagnant penetration and density ratios rose to record nearly 1% of GDP (0.93) and 18 by the end of year 2017 for non-life and 2.76 and 55 for life segment. Soon after opening up of the sector, considerable changes were witnessed, market witnessed a visible shift from buyers' market to sellers' market, better service quality, advanced technology, competitive business environment and efficient management of business strategies. **Rohit & Manjit, (2009)**. Industry shifted from monopoly to oligopoly, entry barriers were lowered, tailored products, innovative delivery channels like internet, corporate agents and bancassurance were a step towards exploiting untapped insurance market of the country.

In the economic literature, deregulation and privatization has been researched extensively and received ample attention of researchers both nationally and internationally. Research in this field revealed that liberalization effects positively on performance of firm and economic growth (**Dollar, 1992; Chennappa, 2006; Sinha, 2006; Oetzel & Banerjee, 2008; Bodla et al. (2017); Pal, V.; and Malik, N.S. (2007)**). Numerous studies tried to figure out the determinants and factors affecting solvency of the firms. Present study is an attempt to determine the profitability and possible factors affecting solvency of public sector insurance companies. **IMF (2005)** proposed CAMEL model for the financial assessment of insurance industry representing capital adequacy, asset quality, reinsurance and actuarial issues, management soundness, earnings and liquidity.

**OBJECTIVES OF THE STUDY****Study is of the following objectives**

1. Comparative analysis of profitability of Indian public non-life insurers with respect to CAMEL profitability parameters

2. Determine the factors affecting solvency of Indian public non-life insurance companies (Regression analysis).

### LITERATURE REVIEW

Studies have revealed liberalization has positive effect on economic growth and performance of firm (*Dollar, 1992; Chennappa, 2006; Sinha, 2006; Oetzel & Banerjee, 2008*). However positive effect should reflect in the operational efficiency and profitability of the firms, *Chennappa, D. (2006)*. Since price deregulation in year 2007, firms are at operational freedom to set prices for their products, *Roa (2007a)*, regulator IRDA expected firms having major market share demonstrate underwriting discipline, however, companies experienced underwriting losses attribute to price pressure and natural catastrophes (*IRDA 2017*).

*DraganaIkonc, et.al (2011)* assessed financial performance of Serbian insurance companies using CAMEL model and concluded that profitability is determined by capital. *Ghimire & Kumar (2014)* assessed financial performance of insurance companies of Nepalian insurers using same model and concluded earnings ratio be improved. *Kumari and Dorthy (2014)* used CAMEL model for Bancassurance to conclude liquidity strain with the firms. Similarly, *Sinha (2013)* attempted the model on life insurance sector sees liquidity stress with the private insurers, *Ansari and Fola (2014)* see significant difference in public and private life insurers in terms of performance. *Rejda, (2002)* sees combined ratio as main parameter to gauge underwriting performance and, *Browne & Hoyt, (1995)* conclude increasing trend in this ratio is positively correlated with insolvencies. *Kim, Anderson, Amburgey, & Hickman, (1995)* conclude investment performance and insolvency is negatively correlated whereas *Lee & Urrutia, (1996)* found liquidity is an important measure of firm solvency, stable liquidity contributes positively to firm's solvency, *Dambolena & Khoury, (1980)*. *Kramer, (1996)* sees operating margin and insolvency is negatively correlated. *BarNiv & Hershbarger, (1990; Cummins, Harrington, & Klein, 1995)* found smaller players are more prone to insolvencies.

### RESEARCH METHODOLOGY

IMF (2006) proposed Earnings and profitability parameter is being used to gauge the profitability analysis of public sector insurance companies. The key ratios include claims ratio (loss ratio), expense ratio, combined ratio, investment income to net premium ratio and return on equity ratios. Loss ratio is the percentage of claims incurred to net premium, expense ratio is expenses incurred to underwrite business and combined ratio is the sum of claims and expense ratio. Minimum the better, claims, expense and combined ratios are seen as a basic parameter of underwriting efficiency. Section 40 (c) of the insurance act restricts expense ratio to 20% of the net written premium, similarly combined ratio of less than 100% means possibility of underwriting profitability for the insurance business. For rest of the two ratios, the maximum the ratio, better it is for firms.

**Table 1: Comparative position of earnings and profitability of Public sector insurers**

Companies	Ratios	2012-13	2013-14	2014-15	2015-16	2016-17
National	A	85.57	81.18	77.54	95.28	97.25
	B	27.55	32.67	37.70	38.74	33.48
	C	113.12	114.18	115.54	134.28	130.73
	D	12.21	11.24	11.30	10.38	9.98
	E	19	19	31.5	16	(18)
New India	A	86.16	83.78	84.02	87.84	91.26
	B	34.04	33.47	32.60	32.38	28.63
	C	120.20	117.25	116.62	119.84	119.89
	D	13.02	13.08	12.10	11.03	9.72
	E	(10)	0.30	1.9	3.5	(4)
Oriental	A	81.54	85.84	81.89	83.71	112.11
	B	38.12	36.003	42.40	43.59	38.87
	C	119.66	121.84	124.29	127.30	150.98
	D	14.05	14.09	14.03	13.01	11.40
	E	0.7	16	7	2.9	(15)
United India	A	84.61	82.56	84.42	87.81	107.06
	B	31.59	33.772	36.00	34.12	29.90
	C	116.46	116.33	120.42	121.93	136.96
	D	13.02	13.54	13.32	12.25	11.30
	E	1.7	(8.5)	1.5	5.5	(8)

Calculated and compiled from various issues of IRDA annual reports

**NOTE**

A. *Claims Ratio* = (Net Claims/Net Premiums)

B. *Expense Ratio* = (Expenses/Net Premiums)

C. *Combined Ratio* = *claims Ratio* + *Expense Ratio*

D. *Ratio of Investment Income to Net Premium*

E. *Return on Equity (ROE)*

**Earnings and profitability analysis**

Higher claims ratio indicate higher drain of inflows, National has been low in claims payout in 2014-15, it saw a decreasing trend in the initial years of study, however as the study period progresses, increasing trend to the tune of 97.25 is observed. New India is lowest in year 2013-14 in the ratio amounting to 83.78, afterwards similar pattern is observed and it surges up to 91.26 in year 2016-17. No much variance is seen in the initial years of Oriental payouts, however later it mounts to the tune of 112.11 in 2016-17. United follows the same trend and sees higher surge in year 2016-17 to 107.06.

Section 40(c) of insurance act restricts expenses to 20% of premium, higher expenses ratio means higher percentage of inflows is being expended. Ratio indicates none of the PSU's seem to be adhering to the norm. Among the PSU's, expense ratio of Oriental rises to the tune of 43.59 in 2015-16 which reflects operational inefficiency of all the PSU's in general and Oriental in particular.

Combined ratio of less than 100 reflects underwriting profitability possibilities to the tune the ratio is less by 100. However, the ratio above 100 means inflows in the shape of premium is being drained fully along with part of non-operational income. No underwriting profitability signs are seen for any of the four PSU's, the ratio is 150, highest for Oriental in year 2016-17 reflecting pure case of adverse selection on part of companies.

Apart from income from operations (underwriting), insurance companies invest part of the available funds in investments. Not much of variance is seen in the income from investments of the companies under study. There is a steady decrease however for all the companies in the ratio, as the study advances to the later years which clearly signals that for survival some investments are being sold.

Return on equity is an important indicator of profitability of a company, since it pertains to shareholders, higher the profitability higher will be dividend payout during the period. National & Oriental insurance companies show positive ratios in the initial years, however in the last year of the study negative ratio is reported by all the companies under study.

**Regression analysis**

This section of the study is dedicated to the factors affecting solvency of the PSU's. Seven hypothesis are tested to see the possible outcome against the expected effect with the help of multiple regression. Available solvency (IRDA annual reports, various issues) margin is taken as dependent variable for the specified period of study.

**Table 2: Hypothesis**

Hypothesis	Expected Effect	Description
Claims Ratio	-	Claims incurred to earned premium
Expense ratio	-	Expenses incurred to earned premium
Combined Ratio	-	sum of claims and expense ratio
Underwriting Profitability	+	Operational profit
Business underwritten	+	Gross written premium
Return on Investment	+	ROI to net premium
Operating Margin	+	Total income as %age of outgo

*Solvency (available solvency margin) (Y) =  $\alpha_0 + \alpha_1(\text{claims ratio}) + \alpha_2(\text{expense ratio}) + \alpha_3(\text{combined ratio}) + \alpha_4(\text{underwriting profitability}) + \alpha_5(\text{business underwritten}) + \alpha_6(\text{return on investment}) + \alpha_7(\text{operating margin}) + \epsilon$*

Table 3

Model	Unstandardized Coefficient Beta	Std error	t	p>t
Y intercept	2.5243	0.29238	2.2371	<0.0001
claims ratio	-0.03921*	0.012546	-2.21243	<0.0001
expense ratio	0.00521	0.00329	1.2205	0.0224
combined ratio	-0.00324*	0.00213	-4.26854	<0.0001
underwriting profitability	0.00251	0.00112	1.23802	<0.0001
business underwritten	0.00528	0.00192	2.3632	0.03222
return on investment	0.00423	0.00023	0.0022	0.0410
operating margin	0.00211	0.00301	0.1520	0.0329
R square		0.21598		
Adjusted R square		0.20459		
Observations 20				

*At 1% level of significance*

### Solvency analysis

On the basis of results in table 3, some of expected results are inferred, claims ratio, combined ratio and underwriting profitability are reported to affect solvency of the non-life PSU insurers. Higher *t* value of combined ratio indicates strong bearing on the solvency. Similarly, claims ratio, which again is significant, indicates it affects solvency of the companies under study. Higher the underwriting profits, lesser are the chances of insolvencies, underwriting profit means profit from operations, analysis indicates that it effects solvency of the companies significantly.

On the contrary, insignificant variable (claims ratio, business underwritten, operating margin and return on investment) do not effect the solvency of the companies under study.

### CONCLUSION

Analysis of profitability and earnings ratios of the PSU's indicate gross underwriting indiscipline. Risk selection and spending on account of commission and operating expenses indicate mere market share chase by the companies which is validated by the ratio of steadily decreasing underwriting profitability. After price deregulation in the sector, underwriting was predicted to be profitable in the post price deregulated period, however underwriting losses incurred reveal improper pricing, adverse selection and disproportionate spending for market share gain. Similarly some traces indicate investments made in the pre-liberalised era seem to be sold to compensate underwriting losses by some of the companies under study. The first three ratios are considered as underwriting profitability drivers, strict financial discipline in terms of capping for higher claims and expense ratios is required to achieve underwriting discipline by the companies. Regulator need to make underwriting result benchmark which in the long run will help companies reposition strategies from mere market share chase to underwriting discipline. Penalties may be imposed to violators and strong adherence may be ensured by watchdog for smooth functioning of the industry.

Multiple regression analysis conclude that proper risk selection mechanism may be devised and underwriting discipline may be strictly monitored by the watchdog. Cheaper and economic delivery mechanism may be devised to reach customers to cut costs, expense on account of commission and operating expenses may be streamlined and in true sense as is the slogan of IRDA, "insurance is the subject matter of solicitation", the financial product need not to be sold as an ordinary commodity, the contract need to be understood and requested suiting the need and requirement of a customer,

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**A BRIEF REVIEW ON THE BOTANICAL ASPECTS OF PHYLLANTHUS AMARUS COLLECTED FROM PATNA, BIHAR, INDIA**

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**ABSTRACT**

*Phyllanthus amarus* is a wild plant and found in tropical and sub tropical region of the world. It is also found in Patna district as a weed in cultivated land and also other places as weed. It is approx 50 cm in height. It is herb and also found in road side, railway track side. *Phyllanthus amarus* have many important phytochemicals and traditionally used in medicinal systems of India. Phytochemicals found in *Phyllanthus amarus* responsible for several pharmacological activities. In this study noted the *Phyllanthus amarus* distribution, habit, growth, morphological characters etc.

**Keywords:** *Phyllanthus amarus*, habit, climate, phytochemical, therapeutic.

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**INTRODUCTION**

*Phyllanthus amarus* is a wild plant belong to family Euphorbiaceae (Phyllanthaceae). The genus *Phyllanthus* is a consists approximately 1000 species, large and widely distributed in the tropical and subtropical zone <sup>1/2</sup>. In the India plant is widely distributed as wild plant. The climate of tropical and subtropical zones are suitable for growth of *Phyllanthus amarus*. The climate of Patna is also suitable for the growth of *Phyllanthus amarus*. The ethnic tribes of India used the herbs of *Phyllanthus* species as traditional home remedies. *Phyllanthus amarus* is used for the treatment of jaundice, gastropathy, diarrhea, dysentery, fevers, menorrhagia, scabies, genital infections, ulcers, and wounds<sup>3</sup>. *Phyllanthus* means "Leaf and flower" and named so because of its appearance where flower, fruit and leaf appears fused<sup>4</sup>. *Phyllanthus amarus* plant is 30-60cm high and branching annual glabrous herb. *Phyllanthus amarus* leaf bearing branchlets, subsessile elliptic-oblong obtuse and rounded base. The flowers of *Phyllanthus amarus* are yellowish, whitish or greenish axillary, males flowers in groups of 1-3 where as females are solitary. Fruits of *Phyllanthus amarus* are depressed globose like smooth capsules present under neath the branches and seeds are trigonous pale brown with longitudinal parallel ribs on the back.

Botanical classification of *Phyllanthus amarus* Schum. & Thonn.

Kingdom	- Plantae
Subkingdom	- Viridiplantae
Infrakingdom	- Streptophyta
Superdivison	- Embryophyta
Division	- Tracheophyta
Subdivision	- Spermatophytina
Class	- Magnoliopsida
Superorder	- Rosanae
Order	- Malpighiales
Family	- Phyllanthaceae
Genus	- <i>Phyllanthus</i>
Species	- <i>amarus</i>

**MATERIALS AND METHODS**

In this study, the study area was selected the Patna district. Patna is located at southern bank of Ganga River and its confluence of other three rivers in its vicinity-Sone, Gandak and Punpun in Middle Ganga Plain<sup>5</sup>. The climate of Patna is favorable for growth of *Phyllanthus amarus*. Plant samples were collected by extensive field trips in various parts of Patna district. Plant samples collected from road side, bank of river and waste land. All the observations and field data were noted out. With the help of book, Indian Medicinal Plants by Kiritkar and Basu<sup>6</sup>, the identification was conformed. Voucher specimen of each plant sample was dry-mounted, photographed and preserved for future reference.



The general character of the genus *Phyllanthus* is herbs in habit. Leaves of genus *Phyllanthus* is small, alternate and distichous. Other characters of leaves is resembling pinnate with stipules narrow, very small flower without petals, monoecious, in axillary clusters, bracteates, clusters or solitary, bracteates. The floral characters of genus *Phyllanthus* is disk in male flowers and annular in female flowers with large glands, Lobes are 5-6 imbricated, Stamens are three of which more or less free or the filaments combined in a column, the others oblong, didynamous, dehiscing vertically or transversely, Ovary is three of celled, styles 3, free or connate at base, Fruit is capsule with crustaceous or thin 2-valved cocci. The seed of genus *Phyllanthus* is trigonal and rounded at back<sup>4</sup>.



Fig: *Phyllanthus amarus* as a wild plant.



Fig: Upper parts of *Phyllanthus amarus*.

## RESULT AND DISCUSSION

*Phyllanthus amarus* collected from Patna district presence as a wild plant and distributed on road side, railway track side, as a weed in cultivated land.

Following morphological characters observed in collected *Phyllanthus amarus* from Patna district.

(a)Habit: Plant nature is a wild type in rural area of Patna district and bearing characters of herb and approximate 50cm in height.

(b)Root: Root of collected *Phyllanthus amarus* is stout and woody.

- (c)Stem: The collected *Phyllanthus amarus* stem is rounded, woody at base, smooth and greenish.
- (d)Leaves: The collected *Phyllanthus amarus* leaves bearing branchlets, distichous subsessile with elliptic-oblong obtuse, rounded base leaves.
- (e)Flowers: Flowers of the collected *Phyllanthus amarus* are axillary and yellowish, whitish or greenish, and males flowers are in group of 1-3 whereas females are solitary.
- (f) Fruits: The collected *Phyllanthus amarus* fruits are depressed, globose like smooth capsules present underneath the branches.
- (g)Seeds: The seeds of collected *Phyllanthus amarus* are triangular, pale brown, 1mm long with 5-6 longitudinal parallel ribs on the back. The capsules of *Phyllanthus amarus* are on stalks are 1mm-2mm long, round and smooth.

*Phyllanthus amarus* is commonly known as Bhui Amala by the rural people. Medicinal plant contains important phytochemicals and phytochemical present in medicinal plant shows therapeutic potency<sup>7</sup>. *Phyllanthus* species reported the occurrence of terpenoid, alkaloids, glycosides, flavonoids, tannins and saponins. The chemical compound found in *Phyllanthus amarus* shows the medicinal important. Local peoples of Patna district used this plant for treatment of many diseases. *Phyllanthus amarus* is used as a traditional medicine for the treatment of jaundice, gastropathy, diarrhoea, dysentery, fevers, menorrhagia, scabies, genital infections, ulcers, and wounds. The whole plant extract is used in urinary problems & swelling of liver. The juice of roots of *Phyllanthus amarus* are used for treating of jaundice<sup>8</sup>.



Fig: Mature stem of *Phyllanthus amarus*.



Fig: *Phyllanthus amarus* bearing fruits.

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**CONCLUSION**

*Phyllanthus amarus* is herb and commonly found in Patna district as a wild plant. The climate of Patna is suitable for growing of *Phyllanthus amarus*. The morphological characters of *Phyllanthus amarus* are almost similar to other places collected plant samples by other researchers. The Plant growth is approx 50 cm. *Phyllanthus amarus* is also used as traditional medicine. Rural people of Patna district also used for the treatment of jaundice, gastropathy, diarrhea, dysentery, fevers, scabies, ulcers, and wounds. *Phyllanthus amarus* plant have many therapeutic properties.

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**A RELEVANCE OF AMBEDKAR'S JOURNALISM IN TODAY'S CONTEXT**

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**ABSTRACT**

*Dr. Ambedkar was a good reporter, and his article offered a voice for social revolution. It should be remembered that in 1933 Gandhi began Harijan to spread the cause of the untouchables. Only after the Poona pact did he start. The Indian media that admires Gandhi's attempts to open a newspaper for the untouchables never touches upon the work of Ambedkar who operates four newspapers for his citizens. Ambedkar's sacrifices and his philosophy requested the newspaper, a mouthpiece when the pro-Congress media fail to talk about the poor citizens. Ambedkar firmly claimed that the lives of the millions of poor people could improve in newspapers. The Marathi newspapers Dr. Ambedkar declared new strategies and ethics and foresaw a fair social order. The press was active in creating a country and educating the masses in the independence struggle. B.R. at the same moment. Via his journal Janata Ambedkar began to propagate a different view of the Dalithood, which stresses the distinction between Dalit and the mainstream "nation." Instead of dipping Dalit into the Gandhian programme of creating a consistent homogenous nation-space, Ambedkar requested a separate Dalit space. Bhaskarrao Kadrekar was the publisher of the weekly Janata. This study is the analytical point of view of Ambedkar's journalism in today's scenario.*

*Keywords: Ambedkar, Ambedkar's journalism.*

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**INTRODUCTION**

Ambedkar is a pioneer in the world. But as a Dalit king, he is projected (Jyoti, 2006) [7]. In shaping social identity, the media play a significant role. Ambedkar is still remembered as a Dalit icon and a little more. Ambedkar gained less coverage from the Indian media from his fight for social justice before his 100th birthday. In the Indian media, Ambedkar found his opinions marginalised.

In the Indian media too, it takes its signals from the Brahminism temple, until it projects anyone to the highest place as an acceptable man or woman. The Indian press despised Ambedkar. [1, 2, 3]

By analysing the placement, the space and use of the language of the material, we may define viewpoint, partiality, and partiality of the newspaper to every problem. By using the above variables, we look through the news regarding Ambedkar, such newspapers did not apply to him.

The stereotypes of Swadeshmitran journal were criticised by an editorial published in the 17th issue of Samathuvam, a Dalit publication. He claimed that the Tamil newspaper had made huge attempts to advertise representatives of the Congress and their trips to Madras. Yet Dr. Ambedkar's visit was not of concern to them. They didn't even print his whole speech (Samathuvam). There was very little opportunity for Ambedkar's voice, and it is therefore inferred that his popularity in the newspapers is not sufficient.

Ambedkar's reaction from the colonial and postcolonial national press recalls one of the bad representation of White Press by prominent Black American spokesman Booker T. Washington. Washington regretted that it would have relegated to the last page and made a place to his popular addresses before huge audiences, which would generally have been entitled to attract coverage. Instead, a big story about a Black individual engaged in a trivial crime will still appear on the front page (Wilson & Guteirrez, 1985).

The media were by then in no way beside the struggles of Ambedkar. They did not openly and critically cover his hardships. At the Round Table Meeting, as Ambedkar advocated democratic freedom for his constituents, the newspapers depicted him as a traitor. This was not related to poor people's issues. They declined to examine the situation from the viewpoint of the exploited citizens. From the upper caste viewpoint, the news was decided. The Hindu caste mentality was expressly reflected. This is reminiscent of American civil strife. In the 1967 Kerner Civil Disorder Commission denounced that the press "has too long basked in a white world looking out of it if at all with white men's eyes and a white perspective" The Kerner Committee on American Civil Disorders [4,8].

In coping with Ambedkar, the vernacular press imitated the English press. Ambedkar was condemned by the government, the press and the nationalists as it resulted in securing separate and double votes in the oppressed groups. Ambedkar's involvement in the Round Table Conference was criticised by the Tamil press. Ambedkar has been cursed by an editorial in Vikatan. It accused Ambedkar of having ruined the Round Table Meeting. It

also added that the plurality is betrayed by Ambedkar. Ambedkar has also criticised the fact that Gandhi is the strongest enemy for the untouchable [5].

In the same topic, Sethjamnawal published an article titled 'Kadhambam.' It said Ambedkar grabbed the untouchables for a new well. It was not to get a bath but to sink the untouchables to the back. The name of the well is actual voters (Jeganathan, 2006) [6]. Ambedkar was regarded as a demon, a liar and an employee. In the words of the Bombay Chronicle, the key goal of the award was to make the Hindu national majority a minority (Keer, 1954). It mirrored Gandhi's vision of Mahatma. On the eve of the Bombay Meeting, B.G. Horniman wrote a furious article in the Bombay Chronicle saying that the doctor must count his fellow countrymen and must therefore not cling to his upper aloofness as though he were able to dictate his country (Keer, 1954)[9].

Ambedkar objected to Gandhi's funding for the entry of the temple immediately after the Poona Pact. In his speech, Ambedkar stated that the Untouchables were not likely to endorse it since the Bill is based on the majority theory and does not deem untouchability a Sin. While the majority agrees on untouchability, Ambedkar claimed that without considering it should be abolished. Gandhi responded he was unwilling to be in his camp since he felt Varnashram was an important part of Hinduism.

"What was the reaction of the Press to Ambedkar's statement? Infuriated at the statement of bitter facts made by Ambedkar, the whole hierarchy of the national press relapsed into a campaign of hatred against Ambedkar, and some of them described him as Bhimasur, a devil. A Bombay Marathi daily painted him as a Brahmadveshta" (Keer, 1954)[9].

A 1946-48 U.P Report by the Federation of Scheduled Castes and Dalit Politics shows that Ambedkar required the scheduled castes to create a third country in 1946, when the nation was looking forward to separation. Ambedkar sponsored the Muslim League's separate nation's appeal. Ambedkar's speech was refused by U.P newspapers. Ambedkar's speech was described in the editorial in Vartman as "reactionary and against the idea of Indian nationalism."

In the newspapers, Congress was a sign of democracy and national solidarity, and editors understood what was nationalism, and thus "Indian" politics and what was "anti-national" or "communal" action. In spite of the fact that it did never lift the SCF's demands for a separate electorate, Ambedkar's scheme was still a bane for the nationalist. For the Scheduled Caste Union, Ambedkar suggested Satyagraha. Ambedkar's Satyagraha is criticised in the same newspaper admiring Satyagraha of Gandhi (Vartman, Hindi daily, 22 July 1946)[10, 11]. The editorial of Vartman claimed that Satyagraha Gandhian was employed to legitimise a national farce and to fulfil Dr Ambedkar's personal ambitions (Rawat). They never took the peaceful protests of Ambedkar as Satyagraha. The war against the Mahad and the entrances of the Nasik temple which Ambedkar led was not seen by the media as Satyagraha.

It reflects the humiliation Ambedkar faces from the media in his fight, and that the vocabulary and tone used to characterise Ambedkar were not substantive[13, 14].

And after his fiftieth year, the media have not shifted. The guy who drew up India's constitution also faces media prejudice. One that struggled for the prime slogan of achieving equity and social fairness against all kinds of oppression always wants media justice. This study highlights the significance of Ambedkar's journalism in today context.

### **REPRESENTATION OF AMBEDKAR IN INDIAN MEDIA**

His journalism was restoration and reconstruction journalism that unleashed the exploited and uplifted the excluded. The titles of the journals he founded bear witness to his zeal and ardour for social justice and restoration journalism. His vision and content were taken forth by his acts, which sought to gradually change social life, in such titles as the Mook Nayak (leaders of the Dumb), the Bahishkrit Bharat (excluding India), Samata (Equality) and the Prabuddha Bharat (Enlightened India) and Janata.

He was the newspaper's goal for addressing the problems of democratic change, which claimed that caste and social differences would be perpetuated based on immediate identity and the position of individuals and not on citizenship principles.

It is useful to remember that in the very first Mook Nayak topic in 1926, Dr. Ambedkar banned the topic of injustice and underlined that hercules would be necessary to liberated citizens with social and economic issues in the Indian community, which is the home to inequalities, according to him.

A journalism for social justice championed by Dr Ambedkar is important at a time when the counter-social movement in India is spreading nowadays and is unfortunately celebrated also by those who are holding influential roles. His writings and acts remained consistently in the sense of rule and law.

Indeed, his writing was collective thinking journalism. He reasoned well and established his credibility as a great communicator on the basis of reasoning, claims, analysis and the unravelling of concepts and evidence at a period when culture barely accepted the explanations based on the oppressed segments. For India of the 21st century, Dr Ambedkar is a catastrophe witness in electronic media of din and cacophony that rejects the culture of contact founded on argument and reasoning. The aim of social justice becomes blurred as mainstream media is called a medium of infotainment, and journalistic ideology is guided by predatory trade considerations.

#### **AMBEDKAR'S JOURNALISM AND ITS SIGNIFICANCE IN TODAY'S LIFE**

The incisive editorial statements of Ambedkar in Mooknayak, Bahishkrit Bharat and Samta can be seen as indicative of his struggle with the Indian social structure. Ambedkar was not happily becoming a neutral spectator. He was an interventionist and tried to change the status quo. Though he intensively probed the contradictions of faith and caste and varna structure, he often closely scrutinised the social framework under which they worked. That is why his assessment of the caste-varna method is so reliable and trustworthy. It is valuable because it takes into account the whole ambience under which the caste system operates and addresses all relevant problems. Ambedkar's writings are as important and inspirational today as they were in his days. Ambedkar's journalism tells us that we can sincerely aim to make society conscious of the exploitative existence of the caste, varna, age, gender and regional distinctions and attempt to liberate it from the prejudices they create. Simultaneously, we should also sensitise community towards Dalit problems like the likes of forwarding Press, Budhan, Samyak Bharat, Dalit Dastak, Adivasi Satta and YuddharatAamAadmi are doing today.

The credit for bringing the idea of Dalit literature in Hindi goes to Rajendra Yadav, just as the credit for laying the base of Chayavaad in Hindi poetry goes to Indu (1909) (1909). Madhuri (1921) popularised Chayavaad. Similarly, NayiKavita (editors Jagdish Gupta, Ramswaroop Chaturvedi and Vijaydevnarayan Sahi), released in 1954, is credited with playing the main role in the creation of the NayiKavita movement. The credit for the birth of the NayiKahani campaign goes to magazines Kahani and NayiKahani and of SamanantarKahani to Sarika. On the same lines, it is Rajendra Yadav who deserves the credit for taking women's debate centre stage. He started editing Hans in 1986 and many a Dalit writer got a reputation by publishing in it. It is Forward Press after Hans has clarified the idea of Bahujan in a comprehensive and detailed manner in every magazine. The New Delhi publication started in 2009 with forwarding Press. It managed to publish in print until June 2016, when it was distributed online. The two-language magazine focused on Phule and Ambedkar concepts. Among Bahujans, the printing magazine was famous. The intellectuals in numerous Indian languages, who advocated social justice, have been given a shared voice. Forward Press has played an integral part in establishing the 'theoretical basis of the debate' of the OBC in the sense of sociology and political science and in developing the idea of OBC literature with editor-in-chief Ivan Kostka and editor Pramod Ranjan. Justice News has since launched a website, close to forwarding Press. The People's Media Activism and Study Centre were set up, and a version of Dalit Media Watch was released in 2007 by a collective of Dalit scholars, senior journalists and social activists. Now the Justice News was called. His newsletter covered Dalits massacres widely throughout the region. The outlets are numerous newspapers, and the centre gathers reliable details. The newsletter is distributed regularly in Hindi and English and is read in India and abroad by lakhs of readers. The news alerts have been issued in addition to State governments from the National Scheduled Castes Board, the National Scheduled Tribes Commission and the National Human Rights Commission.

These Bahujan newspapers have, of course, failed to overlook India's shameful events. They have the duty to resist a pattern which destroys the sensibilities of human beings. In this unique editorial, Ambedkar posed the following points:

- (1) The future Indian State would not but would be governed by members of the people, be authoritarian or Republican. For Swaraj, extending the right to vote and granting caste representation is therefore essential.
- (2) Certain castes have been designated to be middle, higher and lower and polluting in the Hindu faith. Lower caste citizens who have little self-esteem see the high castes as deserving of adoration, while the dishonest members of the high castes see the lower castes as miserable.
- (3) The upper caste voters would not vote for a Dalit candidate who found him to be weaker, but the non-Brahmin and outcasts were swift to collapse at the footsteps of Brahmin candidates who took this as a golden chance for Brahmin servers.



- (4) The electoral system shall ensure caste representation on the basis of the proportion of any caste within the population in the case of the introduction of a universal franchise.
- (5) All castes should be active in self-governance as Swaraj is added to it so that Swaraj does not become Brahmin Raj.

In the current scenario, all the comments of Ambedkar are highly motivated

### **ANTI-DALIT VIOLENCE**

The problems of a caste divided society were frequently expressed through critique of the Hindu religion, its scriptures and society in the writings of the Mooknayak and Bahishkrut Bharat. The papers criticised the Congress and Hindu nationalists of the right strongly for their indifference to the caste issue.

In Mooknayak Ambedkar argued that a national consciousness could not be developed by the social divisions arrogantly ignored. He compared the Hindu community to a multi-story tower without stairs to the next floor. The caste-afflicted Hindu society represented the tower here and every floor was a single caste. He argued that a community that prevents individuals from mixing up with another lot is detrimental to national unity. This would only spread indifference, hierarchy and violence by such a society and would not leave any scope for genuine national unity.

For the Dalit movement, the twenties were radically transforming. In this decade, the major characteristics of Dalit mass politics were the interpretation of the complaints of Dalits into an effective political and organisational language. The 1927 Mahad agitation unfolded in Western India the rise of assertive mass politics. Ambedkar started to argue, following violence, that the Dalits should be identified separately from the Hindu community during the Mahad agitation. He noted that because of Dalits' constant privacy of access to common public spaces and their constant subjugation to high caste violence, the Hindus "untouchable" and upper caste have had no social cohesion. He argued in another Bahishkrut publishing house in Bharat that Hindu society could not realise basic social standards of mix-ups and fellowships. The absence of social affinity led to caste violence, he argued.

The topic of violence became one of the important areas of emphasis for not only Bahishkrut Bharat but also for the later periodicals like Janata and Prabuddha Bharat. They published numerous news reports and testimonies about violence in West India against Dalits. In mobilising opinion against caste violence in the late 20's, Bahishkrut Bharat played a very important role. There is a number of evidences illustrating the importance of the publications written in the Dalit gatherings by Ambedkar in the Bahishkrut Bharat. He demonstrated his abilities as a publisher and an effective communicator. In defining the Dalits plight, Ambedkar's emphasis on structural violence helped mobilise Dalits in West India.

### **CONCLUSION**

Dr Ambedkar was a true democrat and the stronger his contribution to protecting the neediest. He demonstrated that democracy needs the marginalised communities like Dalits to be writers of their own fate and not rely on philanthropy or the kindness of the affluent or the goodness of the devoted. He was the creator, through institutions which he and no other individual managed, of the concept that the deposed must advance on the basis of their claims to rights. Dalits have equal rights, basic human rights and will not rely on other people's gifts, leadership or patronage. This experience is now being taught over 60 years by foreign development politicians. Dr Ambedkar has taken up the so-called rights-based growth strategy. Oppressed and oppressed communities all over the world do not seek charity, nor the realisation of their rights – health, education, fair care and peace. The maker of such trustworthy statements was Babasaheb. And what's at the root? It's quite obvious to Babasaheb. "The want and poverty that has been their lot is nothing for them compared to the offence and indignity that they have to bear as a result of a vicious social order." He talks for the world's homeless citizens as he informs us they don't want merely social change. They don't want bread but respect." And only by the restructuring of the social structure will the honour desired to be attained. Dr. Ambedkar has embarked on this even more than I do by any way: democratic, legal, institutional, theological. His opposition was at each move, as his plain, but a strong conception of the human right of the downtrodden and the fractured was radical. In the end, I found that it was important to steer behaviour against the values of the social structure (its code). Through the excruciating tests of his numerous acts was born the understanding by Babasaheb Ambedkar of the need to convert and the correctness of Buddhism. Yet that was never a distinction from other individuals in culture, but a common nature and a universal group. Thus his journalism, his ethical views, his fights for Dalits are significant even in today's life.

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**WOMEN AND VICTORIAN MORALITY, OBSESSION WITH CLASS REPUTATION, SOCIAL RESTRICTIONS AND GENDER DISCRIMINATION: A STUDY OF PORTRAYAL OF WOMEN CHARACTERS IN JANE AUSTIN'S *PRIDE AND PREJUDICE***

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**ABSTRACT**

*Jane Austen's novel Pride and Prejudice (1813) deal with women's position and social expectations, most of which apply to marriage. Pride is a prominent feature in the characters of Pride and Prejudice. The leading characters of this novel are a special reaction to the demands which they have anticipated. Women had little options for their prospects in the 19th century in England. If women are educated enough then they can either become get wedded or governesses. Their life was largely formed by their relatives who tried to find a husband who would sustain them. The heroines Elizabeth, Jane and many others of Jane Austen are unorthodox independent women who marry their beloved lovable friends. They are unusual. Many protagonists, including Lydia and Ms. Bennet, are women whose main aim in life is marriage. Charlotte Lucas represents couples who are usually dating. Thus, they are all women who respond to social expectations and to their own position in society. Because women are not legal owners of any kind of material property, only a marriage with a man of high social standing will lead to a respectable status in society. This paper takes the example in the novel as a basis to illustrate how a man considered a good match between women of the 19th century and their daughters' marriages. In this view, the culture of then England and contemporary anxieties related to marriage were successfully described by Jane Austen through her novel Pride and Prejudice. Descriptive method is used as research tool for the study of this research. The researcher has noticed that the role of the woman is not only to enjoy special privileges of a high social status, rather women's feelings prove to play an important role for the society based on the study of women and Victorian morality; obsession with class reputation, social restrictions and gender discrimination. The researcher concludes saying that the role of the woman is not only to be by the side of a wealthy man's; her feeling such as love, morality, class, whims and fancies alongside social restrictions play an important role.*

**Keywords:** Gender Discrimination, Social Restrictions, Marriage, Class, obsession

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*Pride and Prejudice* of Jane Austen is a novel published in 1813. It does not depict romantic elements in its typical form. Rather, the manner and design prefigure the upcoming Victorian era. This reflects the social conventions of the time, as Victorian novels often do. This is widely understood that Britain was nothing like today of the nineteenth century: class distinctions were more apparent, nationalism respected even more, and most notably women's social standing was decided in accordance with their families and husbands' status. So, they had to marry the best suitable man, who was even forced upon them by their families often. Although they could choose who they would marry, there was less opportunity they could marry a man they loved only if he was also wealthy and incline to marry her. This paper is based on how Austen examines to explain the argument that marriage is the only way that women will justify their social status because of their subordinate position. So, it was not typically a love-based institution but rather a social class institution. This will focus on the role of women and their means of achieving acceptable social status, as described in the novel.

***An Overview of the Role and Position of Women in England in the 19th Century***

The Regency is an era that started in 1811, when the Regency Act had been passed with George the Prince of Wales, became Prince Regent. During these years several women became influential authors. During this time, the death of George III ended. One of them was Jane Austen, who during the Regency ruled to show traditional female roles. At that time, it was difficult to be a female writer, in particular a feminist. The writing style of women was perceived as less than that of men. Women writers likely to ignore at that time, it is visible in his fiction and evident from his biography. *A Memoir*, whose protagonist James Edward Austen-Leigh, the nephew of Austen, expresses his anxiety about the writing of his aunt writing, who is worried that the letters of his aunt's aunts are seen as too gossipy and verbose. It is manifest that women were mislead, abused, and maltreated by men. Flaw became an equivalent for women, even when it came to their writing mode. So, it is not unanticipated that women led subservient lives and they had to tolerate.

Women were arranged marriages in mostly the same social class; even parents in the middle class wanted their children to be same classes, when it was time for chose husband to decide for themselves, love was not important at all. Women had not much choice, even unmarried and older than twenty women were considered of

women. In Austin women thought they could do nothing but what they had expected. Women were controlled by men. Therefore, women were not independent: liberty was connected to evil. It was obvious that only through her husband's death could a woman gain riches and freedom. But even then, it was not secured because, as the daughters of well-to-do parents were the prey of the wealthy men.

Assemblies were the ideal venue for social change and match-making. Through this event young single ladies get chance to familiar themselves to society. It was an incredible chance for them to meet people and find a suitable match; however, as these activities were taking place, codes of conduct were formed for young females. The public balls were not really frequented by good society except country towns.

### ***Class and Society in the Early Nineteenth Century and in the Novel***

*Pride and Prejudice* is often viewed as a Victorian novel because it is very factual of English society at the start of the 19th century. At the time, British inequality existed, even if major change in the class structure was triggered by the Industrial Revolution. This division is clarified in "Class and Money" by Julia Prewitt Brown who said that three classes – top, middle and bottom – have been divided further. The upper class is essential. The upper class can be divided into three parts as – elite, gentry and squirarchy or class of gentlemen who had not to work.

Most of the characters of Austen are upper class citizens. When she opens the book, she tells us that one of the principal characters, Fitzwilliam Darcy, received £10,000 a year. Despite his large annual income and heritage, he was not legally an aristocrat due to the absence of the title a true aristocrat should have. The Bennets and most of the people who live in and around Meryton are gentry citizens. Most earn about £10,000 a year, but some £2,000 or £ 5,000. On the other hand, Mr. Bingley could be called a gentleman. In Jane Austen's novels a gentleman may be a younger son of the Gentlemen, who has not acquired an estate and has issued holy instructions or he may be the son of a merchant who is well-off (Mr. Bingley, with his pride and prejudice). As he comes to the vicinity, because of its wealth, Bingley is automatically seen as one of the daughters of Bennet's attractive future husband. The concern for the society at that time in the novel *Pride and Prejudice* we can see as Jane Austen's characters involve modesty, upbringing, and compassion, all the components of what we call behavior. The idea that Austen places her characters in realistic circumstances helps us learn more about her society's real expectations. Her characters must behave according to their social class and their satire is directed at those who are still so little distancing themselves from social expectations. Those who violate unwritten rules generally face some difficulties and disdain; these are particularly characteristic of women, as suggested by Lydia Bennet's character who runs away from Wickham. Further, Lydia is jeopardizing the integrity of the whole family rather than merely ruining its own image because of their ruthlessness and damaging other sisters' chances of marriage.

As the title suggests, pride and prejudice, but also arrogance are the biggest defects in the upper-class society. The wealthy are all too proud of their own wealth and patrimony, so that the less well-off are gone and ignored. You never consider the individual qualities of a human, but view him or her only as part of his family and class. In other words, both sides experience the racism of the rich against the poor as often as feelings and individual qualities are ignored. Mary's observations about the distinction between vanity and pride demonstrate the obsessed absorption's deficiency. Vanity and pride are concepts that are separate, while terms often used synonymously. Without vanity, a person can be proud. Pride is more about our own thoughts, pride, about the thought of others. In fact, Darcy says: "Indeed, pride is indeed vulnerability. Nonetheless, orgy — when the intellect really is supreme, orgy will always be subject to good regulation ". Obviously, both of these functions are totally opposite. Although pride may have both negative and positive effects, arrogance can only have negative results, depending on the person's character.

### ***Female Characters Portrayal in the Pride and Prejudices Of Jane Austen***

The book *Pride and Prejudice* discusses the lives of Bennet's sisters. The main character in the story is Elizabeth's life. The family of Bennet was part of the middle class. No male heir is Mr. Bennet very few people today have a right to comprehend the meaning of a property – it is, or was, a statute that only a male heir could actually be able to bring the property down. If there was no male heir direct as in the case of Bennets, Mr. Bennets' distant cousin Mr. Collins will inherit the next male collateral descendant from the person who initially produced it. Frightened that after the death of their father, daughters will be destitute because all property transfer to their cousin, Elizabeth's mother, Mrs. Bennet, is very much anxiety for that reason. So the business of her life was to marry her daughters. Mrs. Bennet's a single young woman, with beautiful income, who has just recently moved to his daughters; she then pressures Bennet to bring his daughters to Mr. Binley: 'If I can only see a daughter living comfortably in Netherfield (a position where Mr. Bingley lives), I have nothing to wish for, and all the others as happily off (Austen, *Pride and Prejudice*). But sometimes her maternal devotion is

overwhelmed by her competition for her children. For example, she takes Jane to Netherfield Park for horseback, because she knows it's going to rain and Jane has to stay there. Mrs. Bennet doesn't think too much when Jane gets sick. Then, she is very pleased and satisfied that her daughter has to live there longer and next to Mr. Bingley" (Florentino Oliviera). In fact, Mrs. Bingley is a lady with a gossip and inadequate social behavior. His intellect was less difficult to develop he was not described as a very clever person. She was a lady without meaning; no intelligence and confusion. Mrs. Bennet is a very vocal adult who even when insensitive, shares her opinion. She speaks with Lady Lucas in a crowded room "nothing other than her hope that Jane will marry Mr. Bingley soon. – The subject was animating and Mrs. Bennet seemed devoid of weariness as she described the benefits of the match "(Austen, *Pride and Prejudice* 111). Mrs. Bennet does not realize why her conduct has an effect on the life of her daughter. Mr. Bingley is going to be removed from Jane by Lady Lucas. Friend of Mr. Bingley, Mr. Darcy, and his sisters note that 'the daughter of Bennet is not lucky to marry the wealthy with such a father, mother and poor relationship' (Austen, *Pride and Prejudice* 40). It is then clear how much a woman's life and future, a future that can only secure by marriage, depend on social relationships and the reputation of a family.

The second daughter of Bennets is Elizabeth "Lizzy". She is twenty years old and is portrayed as having "a vibrant and cheerful mood that loves something ridiculous". She is one of the most famous literary characters of all time, because of her perception and observation: "We are seeing for the first-time heroines who are realistic and with intellect, with the ability to think for themselves with determination and with wit in English literature beyond Shakespeare. She's the favorite child of Mr. Bennet. Mr. Bennet says of his daughters that "they are all stupid and ignorant as other children, but Lizzy is quicker than her brothers". She's the last one to close to her parents because "she's not so stunning as Jane and she's not like Lydia. However, in her manner and understanding of life, Elizabeth transcends her family members. She is "blushed and blushed again with guilt and vexation" because of the actions she is doing in other activities. In fact, Elizabeth clearly shares her opinion and has a sharp vocabulary that often surprises people who think that women cannot enjoy such independence. She answers with many questions, but reservations and expresses her opinion on social norms during her talk with Lady Catherine who is a very powerful woman: Yet Ma'am, I still think it would be very hard for younger sisters not to indulge in culture and fun because the elderly may not have the means or the ability to marry early, the latter-born is as entitled to youth enjoyment as the first. -- I don't think sisterly love or openness of the spirit could very definitely be encouraged. Lady Catherine is shocked that Elizabeth has publicly questioned social norms surrounding the behavior of women. Once Lady Catherine figures out that the five girls have been born without a governess, she is saddened that young women are not learning the skills necessary, such as drawing and playing an instrument. It seems unimportant to Elizabeth by saying: "I understand that we have been with some friends, but those of us who wanted to learn never had the equipment. We have always been encouraged to read and have all the requisite teachers. The idlers are certain to be willing. That is to add, reading is what nurtures the intelligence and other qualities that are needless for women to learn.

It is the common-sense commodity, not societal norms, of Elizabeth's opinion. Elizabeth: "suspects of being the first being ever fought to triple with a dignified impertinence," and she proves to be a modern woman who doesn't care about status or level. However, she also has a different attitude about marriage. She wants to marry for love, not only to be financially secure. Their personal ideals contradict the social values. Mr. Collins proposes Elizabeth the man who is going to inherit Mr. Bennet's estate after he died and she does not consider his proposal. He thinks it's unreachable and Elizabeth says: She's unreachable. I tell you, I'm not one of the young women who are so bold to sacrifice their freedom by being asked a second time (if there are such young ladies). I'm completely serious about denying it.—I'm sure that you can't make me happy, and that I'm the last woman in the world to make you like that. Elizabeth knows what the real purpose of marriage is, which neither his mother nor his sisters do. Her mother is angry because she refuses Mr. Collins as "the society demands that all women accept the marriage proposed to her". Even because she finds him to be an unethical and evil man, she refuses the first suggestion of Mr. Darcy. He is very wealthy, wealthier than Mr. Bingley, but it doesn't mean anything to them, because "Elizabeth sees that a loss of her personality in the name of security is worse than [being a] penniless spinster". (Reena, 130) The way she speaks to Charlotte, her dearest friend, shows how she knows why Charlotte accepted the proposal of Mr. Collins. "Charlotte, Mr. Collins' wife, was the most humiliating image," says Elizabeth. "The distressing belief was that it was difficult for a friend to be tolerable content in the lot selected" led to a pang of a friend who disgraced himself and drowned in her respect. She's sad for her sister because she realizes she's never going to love each other with her future husband. Elizabeth's decisions, however, are sometimes irrational and blinded by her ego, but she's willing to admit she is mistaken if this is the case. If she discovers that Wickham has tricked her and lied to her about the existence of Darcy, that Darcy really is an outstanding man, she "will be totally disappointed. – Without thinking that she was ignorant,

incomplete, prejudiced, ridiculous, she might speak of either Darcy or Wickham ". She's trying to be fair to all, and she acts like she's done Darcy wrong. Then, Elizabeth revealed that Elizabeth was not scared of her, when she approached her and she thought that Elizabeth and Darcy would get married. Lady Catherine says their wedding is the most improper match; Elizabeth, however, does not share the opinion: "I must not find myself leaving this realm when marrying your nephew. He is a gentleman; I am the daughter of gentlemen until now we're close. This means that Elizabeth has no pride in money and doesn't think of Mister Darcy as her superior; she feels it is equal in value. Therefore, when she tells Lady Catherine to refuse Darcy, Elizabeth refuses the request: You misunderstood my character a lot, if you believe that I can operate on such convictions. I can't tell how much your nephew would tolerate your involvement with his life, but you definitely have no right to worry about myself. So, I must hope that no further on this matter is introduced.

Elizabeth isn't a woman who can't fear someone and she's doing what she wants – Mr. Darcy and the love of her. Once, Elizabeth proves to be an articulate and independent woman, who has nothing to do with other people's opinions; she does what she thinks is best. The eldest daughter in the household is Jane Bennet. She is 23 years and she says that she is old enough to marry her. It's more important to meet her. She is the most beautiful girl in the city, indeed Mr. Bingley claims. If people ask him who he feels is the most beautiful woman alive, he replies "Wow! Without any doubt, the oldest Miss Bennet, two views on this issue can't exist "(Austen, *Pride and Prejudice* 20). She is nice and always thinks better of men, which in some situations makes her innocent. For starters, Elizabeth describes her mind when she hears of Wickham's true nature: "What a stroke for poor Jane is that! Who would have been through the world of joy without thinking there was so much unrighteousness in the human race as was here gathered in one person (Austen, *Pride and Prejudice* 249). In fact, it has the best opinion of the sisters of Mr. Bingley and claims that they support it. That is not the case, though. They do not treat her as a match for their friends, and take him away from the Netherfield. When Jane leaves, she is shattered, but she doesn't get depressed. "He may survive as the friendliest person in my life in my mind, but that is all. Either I have nothing to expect, nothing to dread, nothing to reproach him. Thank goodness! Thank God. I don't have this pressure. So, a little time. —I'm going to definitely try to make things easier ". Jane reveals that she's a confident woman who decides to hide her pain. She doesn't care for Mr. Bingley's fortune, she likes him very well: 'Mr. Bingley respects and admires him not for his yearly allotment, but for his person and character. Therefore, Jane Austen reveals that only social status impresses Bennet's eldest sister". Such emotions don't change as time passes.

She always loved Bingley with great affection. After never having fancy herself before with affection, she had a warm look of first attachments, and from her age and temperament, she always boasted of greater stability than the first attachments; and so fervently she enjoyed the reminder of his memory, that she preferred every other man to test for the indulgence of his friends with a strong sense of good sense and focus. In love Jane is similar to Elizabeth; she loves financial security rather than money and unlike her mother and family. It should be listed Charlotte Lucas since she portrays conventional women who do not want to marry out of love. She "sees herself with little feedback and even less marital prospects". It is twenty-seven years old, a spinner. She acknowledges the suggestion from Mr. Collin: "The only noble arrangement for well-trained young women, so uncertain they could have offered pleasure, would be their most good conservator from want". Their only rationale was to think very well of men and weddings, marriages had always been the focus of their life. She doesn't like him, but she does not believe she can do better than him. She only thinks about her position as soon as she's married, I'm not sentimental. I never was. I never was. Given the nature, relations and circumstances of Mr. Collins in life, I am convinced that my chance of good fortune with him is as equal as most men would rejoice in joining the woman's union ". Her economic motives do not make Charlotte mindful of her lack of opportunity to be happily married and emotionally attached to her boyfriend. She eventually pays the price for her decision, as he becomes the same low-lying guy. The novel in Austin thus shows clearly that dependent women have no chance to live a fulfilled life, according to the societal standards of the time. In the Bennet family, Lydia and Kitty are the eldest children. Lydia is fifteen and 17 Kitty. They 're not as clever and behave as most young people do. Mr. Bennet calls them "two of the country's silliest children" (Austen, *Pride and Prejudice* 116). Balls and the military are all about their life: "Each day something applied to their understanding of the names and contacts of the officers ... Their residences were no mystery and the officers themselves were known for some time "(Austen, *Pride and Prejudice* 116). They are false and concerned in nothing except the troops. They are not. She has the high animal spirits and the natural self-effects, a kind of self-confidence that the affection of the officers for whom the fine meal and the simple manners of their uncles recommended her improved (Lydia is much worse than Kitty. Her free mind leads to the most reprehensible act of everyone. She flees with Mr. Wickham and thus jeopardizes her sisters' place on the marriage market because none of them would be wedded if they learned of their escape. Nevertheless, Lydia doesn't care: she is happy to be a married woman.

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Women in England had relatively fewer rights than they have today in the 19th century, they had not their own property and because they did not want to abandon their social status and their way of life, the only way of maintaining that was through the marriage of a man of a higher or equal social status. In this manner they may retain their rank and their prestige at birth. For these reasons, marriage has been an important social concern and has often been articulated not for affection, but for economic reasons, as shown in *Pride and Prejudice* by various examples. In this novel Jane Austen tried to portray the culture of the time as accurately as she could, and considering that she is a woman, one can say she understood better the position of women than any other man's book. So, no wonder that she explicitly states on multiple occasions through the narrator's voice that marriage is above all a place through which women have been able to find stability and love. It was enough for them to stand up to the chosen man to give birth to their descendants and perhaps to learn to love him one day. This was the dream they have of prosperity socially created. The researcher gracefully concludes laying emphasis on the social differences and inequalities between men and women, and how women are placed in a much inferior, less advantageous position amidst Victorian morality, obsession with class reputation, social restrictions and gender discrimination.

“Men have had every advantage of us in telling their own story” – Jane Austen

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**ANALYSING THE ROLE OF TOURISM DEVELOPMENT AUTHORITIES IN ACHIEVING THE GOALS OF SUSTAINABLE TOURISM DEVELOPMENT THROUGH LOCAL GOVERNANCE IN KASHMIR DIVISION****Dr. Aijaz Ahmad Khaki**Assistant Professor (Travel & Hospitality Management), Department of Management Studies, University of Kashmir

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**ABSTRACT**

*Mountain Tourism has become one of the significant activity undertaken by the tourists both in developed as well as developing countries. The glacial and alpine areas are well placed for attracting the tourists from all over the world. But mountain areas have their own limitations when coming to tourist activities given their fragile environment. It therefore becomes imperative on behalf of the authorities to develop tourism on sustainable basis especially in mountain areas. The tourism activities in mountain areas have contributed to the economic condition of marginalized communities on one hand but it has led to negative impacts on the local economy, environment and society. It has led to economic leakages, degradation of fragile environment, and social injustice. However, the development of tourism in mountain areas on the basis of effective regulations of tourist activities, proper diversification on the basis of seasonal and geographic variety, and with appropriate zoning can safeguard the resources on sustainable tourism. The approach of sustainable tourism development in the management and implementation of tourism activities in mountains can prove as an effective management approach in achieving these goals. This can be achieved through visioning in tourism organizations responsible for the formation of plans for mountain areas. The present study aims to analyze the management of tourism activities in the mountain region of Kashmir Himalayan region and to measure gaps thereof if any. The study concludes with recommendation of a framework for management of tourism activities in mountain region of Kashmir Himalayas to the concerned authorities which can prove beneficial to mitigate negative impacts and maximize the positive impacts on the local communities. The major finding of the study is that tourism activities are concentrated to only few areas without the involvement of local communities which in turn has led tremendous pressure on the fragile resources of these areas.*

*Keywords: Sustainable tourism, mountain adventure, community involvement, Tourism directorate.*

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Sustainable development is a framework which aims at creating opportunities for better life for present as well as future generations. The concept of sustainability has got evolved over the years from sustainable development and is strictly connected with managing and controlling of both natural and built environment, mainly in mountain areas, and people associated economically and socially to those environment (Mc Cool, et. al. 2001). The application of sustainability framework can be traced to the Romans who had a vision of developing their cities and settlements with an objective of conducting future expansions (Swarbrooke, 2000). The apparent environmental crises and worldwide reaction in the 1960's and 1970's was the beginning of the present idea of sustainable development (Murphy, 1985; Alipour, 1996; Southgate & Sharpley, 2002). Murphy, 1998 argued that the resources of earth were limited and the development across the globe will face serious challenges if the necessary steps were not taken upfront.

The concept of sustainability was formalised in the year 1987, in the report "Our Common Future" published by World Commission on Environment and Development". Presently, sustainable development has evolved from an environmental concept into a framework which focuses on equal access to economic, social and environmental resources. In this context Hunter, 1997 rightly stated that "equal accesses to the world resources" implies to satisfying basic needs of world population both present and future. One of the most accepted definitions on sustainable tourism was developed by United Nations World Tourism Organisation in the year 1998 which states sustainable tourism as a development that meet the current needs of the stakeholders associated with tourism directly or indirectly and in the meantime safeguarding the world resources for the use of future generations. Sustainable Tourism needs to recognise principles of sustainable development to achieve the economic, environmental, and social sustainability on long term basis (Hunter, 1995). Development of tourism on sustainable basis is utmost important to touristic activity in mountain areas as it largely depends on natural assets and cultural heritage (Murphy, 1998).

The sustainability was seen as a solution to the economic disparity and degradation of environment due to industrialisation and rapid urbanisation. But in recent times it has incorporated social justice in its domain for inclusive growth and management. Meethan (2001) argued communities and their culture have now gradually become a product for the purpose of tourism and therefore it becomes rational for the authorities to consider it

as resource which need to be taken care from the perspective of sustainable development. The three dimensions which contribute towards achieving sustainable tourism development are environment conservation, economic equality, social justice (Swarbrooke, 2000).

### RATIONALE OF THE STUDY

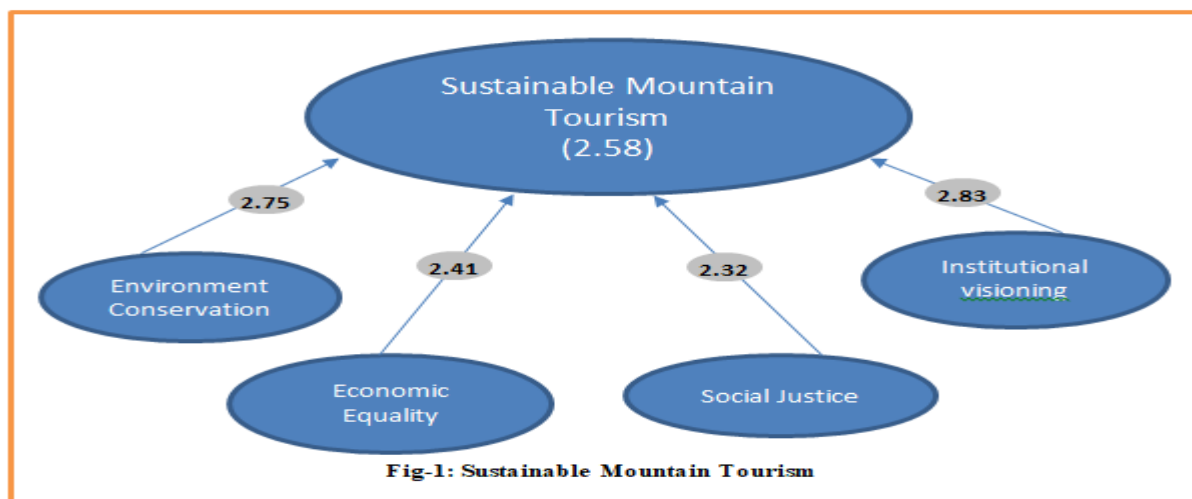
The review highlights importance of applying sustainable tourism developmental approach in developing tourism in mountain regions. It further discusses about the inclusive growth of all the three variables of sustainability in tourism planning process. The authorities need to consider three basic pillars consisting of environmental, social and economic sustainability. It is very imperative for the state government to balance their planning and developmental acts in achieving these goals. While formulating the policies and plans due consideration needs to be given to all the three dimensions of sustainable development. The studies in the past have indicated that the government is focusing only on the economic dimension and hence neglecting other two equally important dimensions during tourism development in the mountain regions. This has led to serious implication not on the equal distribution of economic wealth but has led to the negative impacts on society and environment of these regions. Therefore, for successful tourism development of tourism in mountain areas it becomes imperative to investigate and evaluate tourism activities in mountain regions on the patterns of sustainable development. There is abundance of literature available where authors have highlighted contribution of mountain tourism towards the economy of these regions in Kashmir Division but simultaneously very little research efforts have been laid for creating and evaluating a model which will facilitate in achieving social and environmental sustainability to achieve the goals of sustainable tourism development. It is in that context that the present study aims to evaluate the scenario of tourism planning and development in mountain regions of Kashmir Division by analysing three pillars of sustainability (economic, environmental and social) through institutional dimension.

### METHODOLOGY

The four mountainous area in Kashmir Division in the state of Jammu and Kashmir were taken as a study area for the present study. These includes Pahalgam, Sonamarg, Gulmarg and Srinagar. The total number of questionnaires distributed among various respondents was 800, out of which 753 were useable. The procedure adopted for the collection of primary data was stratified sampling keeping in fact different categories of respondents. The following section discuss the analysis and interpretation of data collected from the four regions of Kashmir Division. There were three categories of respondents directly or indirectly having the role in Kashmir tourism, which includes host population, local tour operators, and officials from directorate of tourism. Five Point Likert scale was used and response to each item was scored in such a method that response indicating most favourable was given highest score and vice versa (strongly disagree = 1, strongly agree = 5). The overall reliability of the questionnaire measured as a whole was 0.58, well below the prescribed cut-off point (Nunnally, 1978).

### RESULTS

Fig-1 depicts the information collected and analysed from the data collected among the stakeholders with regard to the incorporation of a mechanism by state authorities leading to the achievement of economic, environmental, institutional and social sustainability in the policies and plans of state government with regard to mountain tourism in the state in general and Kashmir Division in particular.



(Source: Survey data collected for the present study)

It is evident from the data below that mechanism adopted by the authorities needs to be revisited and accordingly corrected in tune with the sustainable tourism development in mountain areas (a mean score of 2.58 or a percentage mean score of > 50%). There appears a gap between actual mechanism required and the mechanism being adopted and carried out for tourism development in mountain tourism activities of Kashmir Division.

To measure the sustainable mountain tourism, the variables under study were environmental conservation, economic equity, social justice, and institutional visioning in realising the goals of sustainability. The sustainable mountain tourism dimension calls for planning with sustainable approach where focus by the state authorities needs to be laid on environmental conservation of mountain areas with economic viability and social equity. This can be achieved with a proper and scientific vision in developing policies backed by effective planning and implementation thereof.

**Table-1: Sustainable Mountain Tourism as perceived by respondents**

<b>Institutional Sustainability</b>	<b>Mean Score</b>	<b>Std. Deviation</b>	<b>%age of Mean Score</b>	<b>Range</b>	<b>Rank</b>
<i>Environmental Conservation</i>	2.75	0.793	55.00	Moderate	2 <sup>nd</sup>
<i>Economic Viability</i>	2.41	0.212	48.20	Moderate	3 <sup>rd</sup>
<i>Social Equity</i>	2.32	0.332	46.40	Moderate	4 <sup>th</sup>
<i>Institutional Visioning</i>	2.83	0.849	56.60	Moderate	1 <sup>st</sup>
<b>Sustainable Mountain Tourism Overall mean score</b>	<b>2.58</b>	<b>0.250</b>	<b>51.60</b>	-	-

(Source: Survey data collected for the present study)

The 'Sustainable Mountain Tourism' variable received an overall mean score of 2.58 with a standard deviation of 0.250 (table-1), falling within the moderate range (> 50%). The four sub-variables used to measure sustainable mountain tourism are environmental conservation, economic equity, social justice and institutional visioning. The comprehensive analytical outcomes of these sub-dimensions of sustainable mountain tourism variable are followed by the table.

### 1. Environmental Conservation

Sustainable tourism activity is mainly dependent on conservation natural and cultural resources of host mountain destinations. This needs to be taken care by the concerned authorities during the development of tourism activities in mountain areas given their fragile and sensitive nature. The environmental resources need not only to be used judiciously but at the same time steps should be taken to safeguard these resources for future use. Here tourism plans and their implementation demands for cohesive and all-inclusive approach in mountain regions. The tourism attractions/products need not only to be diversified but there should be enough scope in the planning to consider the conservation given the varied and fragile nature of these regions. The conservation approach need to be applied on the basis of scientific and rational basis rather on unplanned and haphazard growth of tourism activities in mountain regions.

**Table-2: Environment Conservation as perceived by respondents**

<b>Environment Conservation</b>	<b>Mean Score</b>	<b>Std. Deviation</b>	<b>%age of Mean Score</b>	<b>Range</b>	<b>Rank</b>
<i>Tourist traffic to mountains is effectively regulated.</i>	3.87	1.387	77.40	High	1 <sup>st</sup>
<i>Tourism development leads to the conservation of environment.</i>	2.10	1.194	42.00	Poor	5 <sup>th</sup>
<i>Tourist are educated beforehand with regard to fragility of environment.</i>	2.13	1.113	42.60	Poor	4 <sup>th</sup>
<i>Tourism plans are formulated with an objective of environmental conservation.</i>	2.02	1.275	40.40	Poor	6 <sup>th</sup>



<i>The locals have easy access to basic resources for sustenance of life.</i>	3.48	1.389	69.60	High	2 <sup>nd</sup>
<i>Tourism activities are monitored on regular basis to avoid any harm to environment.</i>	2.87	1.456	57.40	Moderate	3 <sup>rd</sup>
<b>Environment Conservation</b>	<b>2.75</b>	<b>0.793</b>		-	-
<b>Overall mean score</b>			<b>55.00</b>		

(Source: Survey data collected for the present study)

The conservation of environmental resources of mountains need to be planned based on the principles of sustainable development. This can be used as a tool to conserve the tourism resources for present as well as future generations, enhancing visitor satisfaction and improving the living standards of local population. Environmental conservation being one of the important component in sustainable mountain tourism received a mean score of 2.75 with a standard deviation of 0.793 (table-2). It can be summarized from the results that majority of the respondents were of the opinion that tourism activities in mountain areas are not planned according to the principles of sustainable development. The total of the six statements were employed to measure it and an item wise analysis of these items depicts that three items got poor mean score. This indicates the fact that the authorities need to incorporate conservation practices while developing tourism in mountain areas.

## 2. Economic Viability

Tourism planning is a continuous process and its success largely depends bringing economic equality among local population. The tourism based on sound planning can create more employment opportunities in the tourist areas especially in the mountains, but this development should not be at the cost of traditional economic activities of an area.

**Table-3: Economic Viability as perceived by respondents**

<b>Economic Viability</b>	<b>Mean Score</b>	<b>Std. Deviation</b>	<b>%age of Mean Score</b>	<b>Range</b>	<b>Rank</b>
<i>The tourism plans focus on maximising economic gains to the local population.</i>	2.36	0.531	47.20	Poor	4 <sup>th</sup>
<i>The tourism has created demand for local products.</i>	2.72	0.984	54.40	Moderate	1 <sup>st</sup>
<i>Tourism has improved economic status of people in mountain areas..</i>	2.54	0.654	50.80	Moderate	2 <sup>nd</sup>
<i>Tourism has created employment opportunities for locals..</i>	2.43	0.367	48.60	Poor	3 <sup>rd</sup>
<i>Locals are being educated and trained for number of jobs created through tourism.</i>	2.27	0.483	45.40	Poor	5 <sup>th</sup>
<i>Tourism has been successful in generating funds for infrastructure development in mountain areas..</i>	2.11	0.648	42.20	Poor	6 <sup>th</sup>
<b>Monitoring</b>					
<b>Overall mean score</b>	<b>2.41</b>	<b>0.212</b>	<b>48.20</b>	-	-

(Source: Survey data collected for the present study)

Tourism in mountain areas should rather provide economic cushion for other economic activities by way of creating demand for local products and resources. Therefore, tourism activities need sound mechanism of measuring and ensuring to understand any negative change in economic conditions of host destinations and accordingly plans should be modified in order to have maximum benefits to the local population. Choi and Sirikaya (2006) referred to economic viability where economic growth is optimized with manageable level having consideration of limitations of environment of a particular destination. A number of existing studies have indicated the importance of economic viability as one of determining dimension for achieving sustainable development in tourist areas (Lawson, 2001; Miller, 2001; Timur & Getz, 2009).

The 'economic equity' being significant component in achieving sustainable mountain tourism, measured an overall mean score of 2.41 with a standard deviation of 0.212 (table-3). Further, item wise analysis shows that

the mean score of all the statements is skewed towards the left of 5-point scale. Nevertheless, there is lot of scope of improving activities aimed at distribution of economic gains among local population in mountain areas of Kashmir. The table-3 shows that except two all the other four statements on the scale received poor %age mean score of 47.20 %, 48.60, 45.40 and 42.20% respectively. Therefore, for the betterment of tourism in Kashmir, the plans formulated need to be monitored continuously and rigorously by the authorities.

### 3. Social Justice

The 'Social Justice' is a sub-dimension of sustainable mountain tourism which aims to know the extent of expression of the need for communication, information and experience exchange between the tourism planners and residents in tourism development.

**Table-4: Collaboration as perceived by respondents**

Collaboration	Mean Score	Std. Deviation	%age of Mean Score	Range	Rank
<i>Feedback from local community is sought out to develop tourism in mountain areas.</i>	2.64	1.093	52.80	Moderate	1 <sup>st</sup>
<i>The local bodies like village panchayat is involved in designing and developing community tourism projects.</i>	2.39	0.297	47.80	Poor	3 <sup>rd</sup>
<i>The feedback of local tourism operators is considered throughout the development..</i>	2.16	0.056	43.20	Poor	4 <sup>th</sup>
<i>The tourism is not developed at the cost of requirements of local community.</i>	2.58	0.923	51.60	Moderate	2 <sup>nd</sup>
<i>Host population is empowered to influence decisions on tourism development.</i>	1.83	1.027	36.60	Poor	5 <sup>th</sup>
<b>Collaboration Overall mean score</b>	<b>2.32</b>	<b>0.332</b>	<b>46.40</b>	-	-

(Source: Survey data collected by the scholar for the present study)

The respondents perceived that 'Social Justice' variable need to be encouraged in the tourism management process, which is quite evident from the moderate mean score of 2.32 (< 50%), with a standard deviation of 0.332 (table-4). The data indicates that the concerned authorities hardly consider the perception and attitudes of local population in the planning and development of tourism activities in mountain areas. Probing further into the statements, only two out of five statements scored moderate % age mean score of 52.80 and 51.60 respectively (table 4).

### 4. Institutional Visioning

Institutional Visioning can be applied by governments where a balance is created among the three pillars of sustainable tourism development. This institutional visioning with regard to sustainability needs to be more realistic, vibrant and practicable in terms of compliance and capable of being enforced.

**Table-5: Institutional Visioning as perceived by respondents**

Institutional Visioning	Mean Score	Std. Deviation	%age of Mean Score	Range	Rank
<i>The development of tourism infrastructure is done on sustainable basis.</i>	2.56	1.053	51.20	Moderate	6 <sup>th</sup>
<i>Tourism plans envision scope for collaboration and cooperation among other agencies.</i>	2.81	0.974	56.20	Moderate	4 <sup>th</sup>
<i>Tourism plans focus on creating demand for the local products.</i>	3.24	0.574	64.80	High	2 <sup>nd</sup>
<i>Strong mechanism is in place to check any misconduct and</i>					

<i>exploitation of hosts by the tourist.</i>	3.15	1.024	63.00	High	3 <sup>rd</sup>
<i>Tourism plans ensure environmental protection.</i>	2.63	1.013	52.60	Moderate	5 <sup>th</sup>
<i>Tourism authorities ensures protection of community rights in planning process.</i>	2.12	1.026	42.40	Poor	7 <sup>th</sup>
<i>Issuing licensing to tourism operators is based their adoption of environmental benchmarking.</i>	3.27	1.031	65.40	High	1 <sup>st</sup>
<b>Institutional Visioning Overall mean score</b>	<b>2.83</b>	<b>0.849</b>	<b>56.60</b>	-	-

(Source: Survey data collected for the present study)

A sound approach for any institution to frame any plan should permit and support the sustainable management of tourism and should provide right to act. It is mandatory for institutions to have plans to be flawless and applicable supported by achieving goals for providing economic benefits, social security and environmental protection to local communities in a mountain area. The plans should be based on minimum standards but important, seeking to raise the sustainability performance of tourism operations of private whether at public or private level. The 'Intutional Visioning' variable scored mean score of 2.83 (> 50 %) with a standard deviation of 0.849 (table-5). While making item wise analysis, the three items each are skewed to the right and centre of 5-point scale respectively, depicting the fact that authorities responsible for managing and developing tourism activities in mountain areas of Kashmir Division have been somewhat successful in introducing a sustainable oriented planning approach for guiding tourism development.

## FINDINGS

The development of sustainable tourism in mountain areas has many challenges and therefore authorities need to be extra cautions in it development. It becomes very significant especially in case of Kashmir Division which is located in the Himalayan mountain region and has bestowed with unique but fragile environmental and social assets. This fragile nature of environment and social fabric in these regions makes it extremely sensitive to any human intervention. Hence development carried in these regions should consider and at the same time need to balance three basic elements of sustainable development (economic, environment and Social). The findings based on the above analysis is indicative of the fact that there exists an extensive fissure in the implementation of plans at the ground level, even though authorities need to improve the scenario of planning by having and balancing the three components of sustainable mountain tourism.

- The plans formulated need to be given due consideration for achieving vision of sustainability by giving due weightage to its basic elements. The tourism development is to be coordinated, monitored, efficiently supervised, and integrated into the overall scope of economic, environmental, and social planning.
- The lack of coordination among the various agencies involved in the development of tourism has been felt in order to address its fragility of mountain areas. The inputs from the key stakeholders are neither considered to formulate effective and efficient tourism plans nor are they involved during the process of its development.
- There have been almost negligible efforts to measure the issues like profitability of tourism industry in the state and its impacts on the society, and environment.
- The development and diversification of tourism activity is least considered in the mountain areas to ease out the pressure on existing destinations.
- The sheer ignorance of authorities towards sustainable development principles have resulted in lack of ordinances or laws that would have normally served as framework for the development and enforcement of sustainable principles and practices.

## RECOMMENDATIONS

The following recommendations are suggested to achieve the goals of sustainable tourism in mountain areas in the state of Jammu & Kashmir.

1. The plans and decisions thereof lacks appropriate track in terms of developing sustainable development. These plans formulated must be definitely supported with tourism policy having vision of striking balance between three objectives i.e., economic viability, social justice, and environment protection by realising

these through institutional visioning for sustainability. Hence, without wasting any time authorities need to come up with the well documented policy in general but for mountain regions in particular. The policy should be governed by goals and objectives with a good scope for translating sustainability ideas into actions so as to achieve economic, environment, and social sustainability.

2. The authorities should create awareness and sensitize tourism operators about the sustainable tourism guidelines.
3. There is great need for devising a mechanism which allow local operators to coordinate and work together with authorities in a harmonious and effective manner. To address the issue of fragmented nature of tourism industry, interdisciplinary approach should be adopted in sustainable tourism where synergies between different agencies are produced in a more holistic manner. This interdisciplinary approach will assist in the development of more viable body of theory, techniques, beliefs and attitudes among operators and practitioners.
4. There is also need to overcome the lack of interest, unprofessional, and ad hoc approach that act major deterrent to the growth of tourism. The approach need to be focused, integrated and result oriented not only by way of effective implementation but also through regular evaluation and follow-up in order to correct any deviations.
5. The plans that best fits the local community should be devised and developed.
6. The planning system and implementation should follow strict environmental guidelines in order to protect fragile environment in mountain areas.
7. The tourism development in mountain areas should create more economic opportunities for locals. The authorities need to educate and train local youths and should be involved in providing services to the visiting tourist.
8. The tourism activities in mountain areas should provide boost to the demand for local products. The supplies required by the tourist should be met from the adjoining areas.
9. There must be enough scope for recreational opportunities of locals. This will help to develop a positive attitude towards tourism development in mountain area.
10. Proper steps are needed to be taken to ensure and boost the self-esteem of the local communities. Strict laws should be introduced to deal with the operators and tourist who will attempt to exploit the emotions of local community.

The problems highlighted in the above sub-section can have countless and wide-ranging solutions but all these problems can be appropriately and effectively solved when concerned authorities will take relevant decisions along with timely and proper implement. These decisions when implemented need constant monitoring and evaluation to correct any deviations.

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**AN EMPIRICAL STUDY ON THE PERCEPTION OF CMMI APPRAISAL IN A MID SIZED IT SERVICES ORGANIZATION IN INDIA**

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**ABSTRACT**

*It is a well-known fact that appraisals and certifications are necessary for organizations to achieve required level of maturity in intensely competitive IT Services sector in India. IT Services sector is one of the key drivers of economic development. Over the past years, CMMI model and helped take the service delivery to the next level. It has helped strengthen the process and bring in more predictability and sustainability. Organizations had a strong belief that adapting to CMMI model would help them in gaining customer loyalty through better quality deliverables. The overall understanding was implementation of CMMI over a period will help in strengthening of Quality Management System and its outcome. This can further lead to optimizing the outcome from these practices. There are three models in CMMI: CMMI for development, Services & Acquisition. It has been claimed from that any organization can benefit from CMMI practices. Organizations can choose the more relevant model that suits their needs. This article helps in understanding the level of perception of CMMI practices among practitioners in a mid-sized IT Services organization in India. It helps to determine any myths about CMMI practices among employees. The data were collected using survey questionnaire and analyzed statistically.*

*Keywords: CMMI; IT Services; Assessment; Appraisal;*

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**INTRODUCTION**

Sustainable growth of an organization is contingent on its ability to quickly adapt to proven relevant standards or models. Capability Maturity Model Integration (CMMI) is a widely implemented process improvement model which has been in relevance across the IT industry for many years. This model is used for development of Product and Services. This model has two kinds of representation: (1) Continuous representation (2) Staged representation. In continuous representation, summary components are the process areas. In case of Staged representation, maturity levels form the summary components.

In the Staged representation, there are five maturity levels:

- 1) Initial – Maturity Level 1
- 2) Managed – Maturity Level 2
- 3) Defined – Maturity Level 3
- 4) Quantitatively Managed – Maturity Level 4
- 5) Optimized– Maturity Level

Each of these Maturity levels has a set of process areas. Each process areas have a set of Specific goals and practices. The investigator was interested to know to what level CMMI practices are accepted and how are they perceived by practitioners in the IT services organization. This study gains even more significance since over a period, the practitioners may of may not feel the need for such models and may prefer a different way of working.

**OBJECTIVE OF THE STUDY**

Considering the importance of studying these aspects, the present study was undertaken with the following objectives:

- 1) Do the practitioners feel the need for CMMI?
- 2) Are the practitioners willing to be part of CMMI journey?
- 3) Do the practitioners thing the weakness in current project can be overcome by CMMI?

**RESEARCH METHOD**

The research is out through a survey based questionnaire. The target respondents were IT practitioners from mid sized IT services organization in India. In this article, “mid sized” term is referred for IT services organizations with headcount between 8000 to 12000.

## CHARACTERISTICS OF THE RESPONDENTS

**Table 1. Distribution of respondents according to experience level**

Experience	No. of employees	Percentage (%)
1-3 years	62	21.16
3-6 years	107	36.52
6-10 years	44	15.02
Above 10 years	80	27.30
<b>Total</b>	<b>293</b>	

**Table 2. Distribution of respondents based on designation**

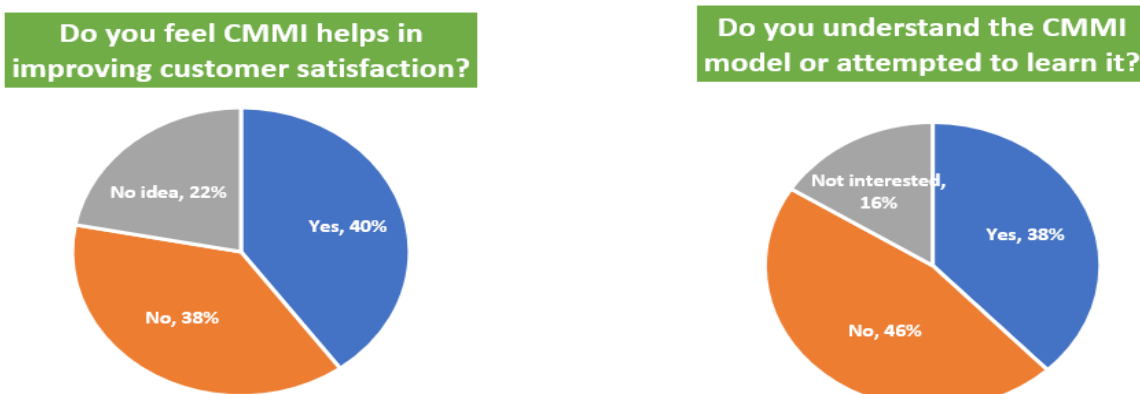
Designation	No. of employees	Percentage (%)
Software Engineer	40	13.65
Senior Software Engineer	20	6.83
Technical Lead	109	37.20
Senior Technical Lead	57	19.45
Project Manager	28	9.56
Principle Systems Engineer	20	6.83
Senior Program Manager	19	6.48
<b>Total</b>	<b>293</b>	

## SURVEY RESULTS

The responses were received from 293 employees through surveys conducted online and face to face discussions. The respondents have been very open and clear about their preception about CMMI. Respondance have also shared their opinion about their belief about CMMI practices and its value add to both organization and its clients.

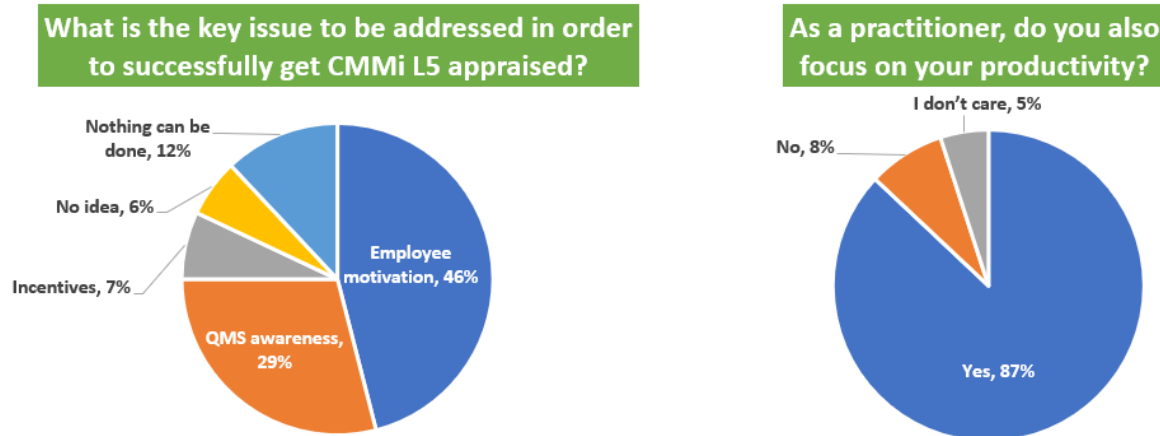


During the survey, it was found that interestingly 62% of population were willing to be part of the CMMI journey in the organization. It was a concern to know the remaining population either did not want to be part of the journey or they were un ware of what CMMI appraisal means. This is a major concern that the Management needs to address if at all they must successfully get appraised for CMMI. A large chunk of respondent view believe they need to be part of CMMI journey since it is park of their KRA. This is a clear indication that the Management needs to understand whether employees are really aligned to organization's vision and objectives.



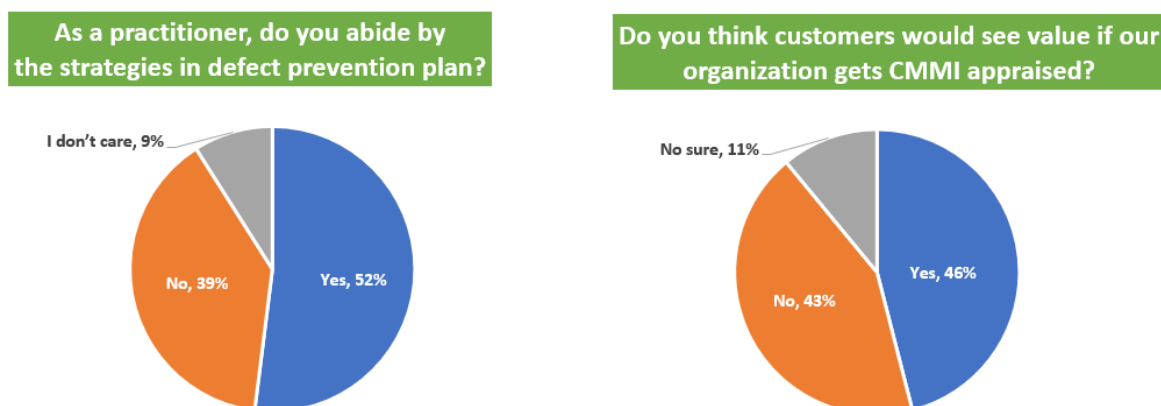
One of the positive outcomes from the survey is 40% of respondents feel CMMI processes and practices are helping the organization in improving its customer satisfaction rating. This is a key aspect for the organization since it also a key indication of the level of meeting customer expectations.

While we understand from the initial survey questions that respondents want to be part of CMMI journey due to various reasons, a significant portion of respondents claim they have not even attempted to understand the CMMI standard. This is precisely where organization needs to invest on training people on CMMI standard and practices.



Respondents believe the key success criteria for completing CMMI is employee motivation and QMS awareness. Organization needs to identify ways to engage with employees and keep them motivated through various initiatives. Organization also needs to invest in training the employees on QMS awareness.

One of the positive factors that has emerged from this study is large chunk of employees (87%) focus on productivity. This correlates to the emerging trend across the IT industry wherein organization is more focusing on employee productivity.



Defect Prevention planning is one of the key aspects as part of the Causal Analysis and Resolution (CAR) process areas in CMMI. It reflects the organization's ability to minimize the defect injection at the early phase of Software development lifecycle.

46% of employee consider CMMI practices provide value to their clients. However, it is very alarming for the organization to see 43% believing that CMMI practices do not add any value to their clients. Organization need to further analyze this and check for areas of improvement.

## CONCLUSION

Based on the survey analysis, it can be concluded that practitioners indeed are interested in implementing CMMI in the organization. There is a significant chunk of employees who would want to implement CMMI practices with the objective of organizational improvement and skill development. The survey results indicate a strong belief that CMMI helps guide the organization to continually improve. It also indicates that more mature the organization becomes, adapting to CMMI practices, the higher is the competitiveness achieved through optimization & Quality.



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**INDO-US RELATIONS: AREAS OF CO-OPERATION AND CONFRONTATION**

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**ABSTRACT**

*India's relation with America remained pernicious in the initial stage specially during the period of cold war between USA and USSR. Several factors, such as, Americas support to India's arch rival Pakistan on Kashmir issue and refusal of India in joining US led military alliance against USSR in which Pakistan was also a member, reluctance of India to denounce Soviet intervention in Hungary, according recognition to Communist government in China by India and signing the Peace, Friendship and Cooperation treaty with USSR in 1971 and Americas support to Pakistan in an open conflict with India contributed to plummet relationship between the two world's largest democracies.*

*After the end of cold war relationship between the two countries started to blossom in right direction as soon as the Indian Finance Minister Dr. Manmohan Singh declared liberalisation policy in country's national budget and introduced liberal economic reforms tilted to the interest of America. Relationship further improved between the two countries in view of Osama Bin Laden led terrorist attack on World Trade Center in America and Americas declaration on curbing global terrorism and obliteration of terrorist outfits in Pakistan. Several agreements, treaties and defence pacts were signed between the two countries. In recent time America seeks to intercept growing spiralling influence of China in South East Asian region and that is the reason America wants to involve with India in defence collaboration and joint naval exercises.*

*Keywords: Pernicious, plummet, curbing, terrorist outfits, defence pact.*

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Eminent leaders of India's freedom movement had friendly relations with the United States of America. After the exodus of British rulers from India in 1947, India sought to forge more intimate relations with America. The two countries succeeded in establishing efficacious trade and economic links but their political relations remained thorny.

Several factors contributed to have strained relations between the two world's largest democracies. After independence, considering the grave problem of socio-economic backwardness of the country, Indian leaders gave utmost importance to Nation building and did not want to get entangled in any war or war like situation. That is why India decided to remain neutral in the prevailing cold war and refused to align either with the USA or erstwhile USSR, because it would have diverted her attention away from the Nation building and also restricted her freedom of action. In 1955 India enunciated policy of "non-alignment" based on the principle of extending friendly relations with all the countries and judging each international issue on the basis of its merits only. America was not enamoured of this nonchalant attitude of India, considering this as an unfriendly act towards her. Here it is interesting to note that American top leaders advocated that those who are not with us are against us. The unwillingness of India to join the military alliances sponsored by the USA and the different stand taken by India on numerous international issues like India's recognition to the People's Republic of China in 1949, and grant of independence to Indonesia, its stand on Korea and Indo-China antagonised the USA.

Immediately after independence when India brought the Kashmir issue to the attention of the United Nation's for securing a peaceful settlement of the dispute, India expected that America shall support the legal accession of Kashmir to India. But contrary to India's expectation America extended support to India's arch rival Pakistan on the Kashmir issue. The America's support to Pakistan on the Kashmir issue was resented by India since it had direct impact on the country's secular credentials and unity. In 1951 again Indo-US relation was dismal on account of refusal of India to attend the San Francisco Conference convened to finalise the peace treaty between the USA and Japan. India lambasted America for not inviting the Soviet Union and Communist China to the conference. All these caused tension in Indo-US relations.

The American strategy of containment of Communist China and Soviet Union in the mid-fifties through military alliances also did not find approval with India. India came closer to Soviet Union in the 1950's which further soured already staggered relations between India and America. America contemplated India's growing friendship with the Soviet Union as a major threat to its policy of containment of communism. Despite remarkable differences in the political sphere, the relation between India and USA continued to thrive in the cultural, economic, and educational spheres. US aid to India began in 1952; the PL 480 was enacted in 1954. It also made available to India huge quantities of food grains to overcome the problem of food shortage facing the country.

Common stand on Suez crisis in 1956 improved their staggering relationship. But the reluctance of India to denounce Soviet Union's intervention in Hungary and the opposition to the American involvement in Lebanon (Middle East) gave a setback in their relations. America also refused to provide necessary help for laying the foundation stone of steel plant in the public sector at Bokaro. However, despite differences in the political sphere, the economic relations between the two countries improved considerably. America sanctioned financial assistance for the completion of various multipurpose projects and health projects. America was also instrumental in setting up of an Atomic Power Plant at Tarapur.

But the decision of the American administration to sell sophisticated weapons and other modern defence equipment to India's arch rival Pakistan sparked off strong protest and created stress and strain in Indo-US relations. Other factors like denial of critically needed nuclear fuel for Tarapur Atomic Power Station on the plea that despite repeated persuasion India had not signed the Non-Proliferation Treaty (NPT), growing military presence of USA in the Indian Ocean and the Indian demand for dismantling of the U.S base in Diego Garcia and its return to Mauritius, India's advocacy of New International Economic Order, presence of feeling in India that America is clandestinely trying to disrupt India's unity, integrity, and stability by inciting agitations in Assam, Punjab etc.

In 1959, Dwight Eisenhower was the first American President to visit India to strengthen the staggering ties between the two nations. The Kennedy administration extended its much-required support to India, during the 1962 Sino-Indian war. The American Air Force flew in arms; ammunition and clothing supplies to the Indian troops and the USA Navy even sent the USS Kitty Hawk aircraft carrier from the Pacific Ocean to protect India from the Chinese aggression. President Kennedy's assassination in 1963 gave a setback in fledging Indo-US relations. Relations then hit an all-time low under the Nixon administration in the early 1970s. He weaved intimate relationship with Pakistan, aiding it militarily and economically. New administration in India, under the leadership of Indira Gandhi, started leaning towards the Soviet Union for support and collaboration. During the 1971 Indo-Pakistan war, America supported Pakistan and deployed its aircraft carrier. In 1974 India conducted its first nuclear test, Smiling Buddha, which was sharply castigated by America as a major threat to international peace and security.

In 1985, Indian Prime Minister, Rajiv Gandhi visited America to heal the badly strained relations of the two countries. The American administration welcomed Indian Prime Minister Rajiv Gandhi and agreed to the transfer of high technology, including the sale of high-speed computers and promised to provide advance military technology. But on the issue of Afghanistan, sharp differences prevailed between the two countries. While India supported Najibullah Government and wanted to forge diplomatic contacts with that Government, American aid was being given to the Mujahideens which India regarded as interference in the internal affairs of Afghanistan.

Thus, despite numerous bids by the leaders of the two countries relations between India and USA could not remain that cordial. In fact, as a result of US decision to invoke super 301 law against India and branding of India as an unfair trade partner, further tension was ensued in their relations.

Relations in 1990s: The end of the cold war and dismantling of the Soviet Union obliged India to cultivate intimate relations with the America. But USA continued to exert pressure on India to sign the Non-Proliferation Treaty. On the other hand, India expressed her discontent over growing American control on the United Nations and pleaded for the democratisation of the international organisation. But despite differences, the two countries held joint Naval exercises in the Indian Ocean in May, 1992.

Announcement of the policy of economic liberalisation and market economy in the domestic budget by the Indian Finance Minister Dr. Manmohan Singh in 1992 facilitated the development of closer relations with the USA. The US welcomed India's economic reforms and American investment in the Indian market enhanced to a great extent. The leaders of two of the greatest democracies in the world pledged to promote stability, democracy, rule of law, human freedom, opposition to Islamic Fundamentalism, trade and investment, prosperity and peace throughout the world. The 1998 saw the downhill in Indo-US relations owing to the conduction of nuclear explosions by India, despite repeated warnings and persuasion by the US administration. America condemning the nuclear explosions proceeded to impose sanction against India.

American President Clinton's visit to India in March 2000 helped in bringing the two countries closer. The two countries agreed to carry on joint research to eradicate lethal diseases like AIDS, Malaria and Tuberculosis. President Clinton's South Asia Policy had a distinct India-friendly focus. Indo-US relation further improved after Osama Bin Laden led terrorist carnage on the World Trade Center on 11 September, 2001 and declaration of war on global terrorism by the American administration. India persuaded USA to exert pressure on Pakistan

to extirpate terrorist outfits base in Pakistan. However, America only paid lip-service to India's demand for action against Pakistan sponsored terrorism in Kashmir. On the contrary, America was obsessed with liquidation of Osama Bin Laden and his terrorist networks.

During the tenure of George Bush administration, relations between India and the United States were blossomed, primarily over common concerns regarding Islamic extremism, energy security and climate change. President Bush also announced the withdrawal of the sanctions imposed on India in the wake of her nuclear tests. Due to lifting of these sanctions the way was cleared for the procurement of variety of equipment's including radars and integrated command and control system. In December, 2001 the two countries held talks to augment co-operation between the military establishments of two countries in fighting and combating terrorism and proliferation of weapons of mass destruction.

In September, 2002, American President Bush and the Indian Prime Minister Vajpayee discussed the prospects of greater co-operation in five key areas, namely, space research, high technology, civilian nuclear technology, economic and defence co-operation, and regional and global issues. After the December 2004 devastating tsunami, the American and the Indian Navies jointly co-operated in search and rescue operation and in the reconstruction of affected areas.

In September 2004 President Bush and Indian Prime Minister Manmohan Singh held talks that covered bilateral as well as international issues. Bush appreciated India's concern over cross-border terrorism and proliferation of nuclear weapons. The conclusion of a successful Open Skies Agreement between India and America has added further momentum in bilateral relations. Open Skies Agreement is expected to lead to more flights, lower fares and stronger economic ties between the two countries. The Indo-US Civil Nuclear Agreement gives India access to Civilian Nuclear Technology which was denied to India for almost three decades. The US has offered a defence co-operation agreement with India that includes joint production. Analysts point out that such a provision is provided only to close allies of the US like South Korea, Turkey and Israel. This is seen as an unprecedented development in Indo-US ties.

The armed forces of the two countries have held a number of joint military exercises aimed at enhancing interoperability of all the services. During President Bush's visit to India in March 2006, the two countries agreed to the conclusion of a Maritime Co-operation Framework to enhance security in the maritime domain, to prevent piracy and other transnational crimes at sea, carry out search and rescue operations, combat marine pollution, respond to natural disasters, address emergent threats and enhance co-operative capabilities including through logistics support. For US and India, this agreement was vital in securing seal lanes in and around Indian Ocean and the adjoining seas. After hurricane Katrina hit US, India donated 5 million to the American Red Cross and sent to planeloads of relief supplies and materials to help. In terms of economic relations, Indo-US bilateral trade grew from US 13.49 billion in 2001 to US 31.917 billion in 2006. India's major export products include gems and jewelry, textiles, organic chemicals and engineering goods. Main imports from the US are machinery, precious stones and metals, organic chemicals, optical and medical instruments, aircraft and aviation machinery. The US is one of the largest foreign direct investors in India. India and the America have also agreed to enhance joint activities in space co-operation including space navigation and in the commercial space arena. There is a US-India Joint Working Group (JWG) on civilian space co-operation that discusses joint activities. The India-United States Civil Nuclear Agreement also referred to as the "123 Agreement", signed on 10<sup>th</sup> October 2008 is a bilateral agreement for peaceful nuclear co-operation which governs civil nuclear trade between America and the Indian firms to participate in each other's civil nuclear energy sector.

Indo-US relation further reached to new height when Indian Prime Minister Dr. Manmohan Singh undertook a four day visit to America in November 2009. The visit was followed by high level talks on strengthening co-operation in counter-terrorism, counter-intelligence to ward off Mumbai-type attacks, implementation of the Indo-US civil nuclear deal, US-India financial and economic partnerships and strengthening and reforming global economic and financial architecture in the G-20 and the World Bank. India and the US also agreed to expand trade and investment in sectors such as infrastructure, informatics and communication technologies. Manmohan Singh expressed India's willingness for a strong and sustained engagement between India and the US. American President Barak Obama acclaimed India as an "indispensable partner". Further American President assured India that the US-China Joint Statement on the Indo-Pak dialogue does not mean involvement of a "third power" in the bilateral intercourse.

The US Secretary of state Hilary Clinton visited India in 2009. This was her first visit to India after assuming charge as the US Secretary of State. Three Hi-Tech Agreements were finalised during her visits, namely, End User Monitoring Agreement, [EUMA], Technology Safeguards Agreement [T.S.A] and Defence Co-operation

Agreement. The two sides also concluded a Science and Technology Endowment Agreement. Two sides further agreed to form Working Groups to focus on new areas of common interest such as Nano-technology, Civil Nuclear Technology, Civil aviation and licensing issues in defence, Strategic and Civil Nuclear Trade.

The US Secretary of State Hilary Clinton highlighted five pillars that would constitute part of the new architecture of strategic dialogue with India as follows: [1] Strategic co-operation. [2] Energy and climate change. [3] Education and development. [4] Trade and agriculture. [5] Science and technology. Strategic dialogue requires to be conducted by five working groups, Strategic Co-operation Working Groups-address non-proliferation, counter terrorism and military co-operation. Energy and Climate Working Groups-continue the energy dialogue and initiate discussion on action to address climate change. Education and Development Working Groups-mainly seek to enhance co-operation in education and initiate discussions on women's empowerment. Trade and Agriculture Working Groups –continue discussions on business, trade and food security. Science and Technology Working Groups- need to explore new areas for co-operation in leading technologies and in addressing health challenges.

During the Nuclear Security Summit in Washington on April 11, 2010, Indian Prime Minister Manmohan Singh met President Barak Obama once again and discussed the key concerns of both the countries, including America's favorable policies towards Pakistan and Afghanistan' as well as other bilateral matters. Manmohan Singh conveyed India's concern about the military aid made available to Pakistan by America and expressed serious apprehensions of their usage against India's national interest. Among the other issues, got priority in the discussion were Afghanistan, Civil Nuclear Liability Bill (then caught in a political battle between the government and the opposition), and David Coleman Headley, the chief plotter of Mumbai terror attack and surreptitious activities of Lashkar-e-Taiba.

The Indo-US Strategic Dialogue took place on June 3, 2010 when Indian Foreign Minister S.M. Krishna visited the United States. The serious issues discussed there included the situation in Afghanistan-Pak region and expansion of co-operation in a wide range of key areas such as defence, security, nuclear energy, climate change, education and agriculture. The two sides agreed to an effort to introduce necessary reforms of the international economic and security architecture including the UNSC. Recognising India as a "rising global power", the US Secretary of State, Hilary Clinton declared that the USA today was definitely committed "to consider India's bid for a permanent seat in the UNSC." The two countries also pledged to deepen people to people contact, business to business and government to government linkages for the mutual benefit of both the countries and also for the promotion of global peace and stability, economic growth and prosperity.

In November 2010, American President Barack Obama visited India and addressed a joint session of the Indian Parliament. In his address to Indian Parliament, he staunchly supported and backed India's bid for a permanent seat on the United Nation's Security Council. But according to some analysts, Indo-US relations have been strained over Obama administration's friendly approach to Pakistan and the handling of the Taliban insurgency in Afghanistan. India and USA have also differed on a numerous regional issue ranging from India's cordial relations with Iran and Russia to foreign policy disagreements relating to Sri Lanka, Maldives, Myanmar and Bangladesh.

In 2011-13 the US exported 21.50 billion worth of goods to India, and imported 36.15 billion worth of Indian goods. Major items imported from India include information technology services, textiles, machinery, gems and diamonds, chemicals, iron and steel products, edible food products. Major American items imported by India include aircraft, fertilisers, computer hardware, scrap metals and medicine equipment's.

But the Indo-US relations saw downhill in December, 2013, when the arrest, strip search and temporary detention of an Indian diplomat in New York following a domestic labour dispute caused uproar in India. Devyani Khobragade was arrested by the American Police on allegations of visa-fraud and handed over to the US Marshals for detention. Indian former Prime Minister Dr. Manmohan Singh described the treatment of female consular official which included repeated handcuffing, stripping and cavity searches, DNA swabbing and placement in a hold-up alongside common criminal's and drug offenders as "deplorable."

In June 2015, US defence Secretary Ashton Carter visited India and became the first American defence secretary to visit an Indian military command. In December of the same year, Manohar Parrikar became the first Indian defence minister to visit the US Pacific Command. In March 2016, India has rejected a proposal by the USA to join naval patrols in the South China Sea alongside Japan and Australia. New administration in America under the President Donald Trump has viewed Indo-US relationship as critically important and has embraced the Major Defence Partner Status. Trump administration seeks to provide the most advanced technology and capability while jointly exploring opportunities to further expand military-to-military co-

operation. Approval of the historic sale of twenty-two Sea Guardian drones to India-marking the first-time approval for a Missile Technology Control Regime [MTCR] category 1 capability outside of an allied partnership-is proof that this administration greatly values the India relationship and has used this approval as evidence of embracing the Major Defence Partner Status.

The recent visit to India by US Secretary of State Rex Tillerson also reinforces the importance of India to the US. It opened up yet another opportunity to message the importance of this relationship with regard to business opportunities. Rex Tillerson confirmed his advocacy for the F 16 and F 18 aircraft for India, recognised the need to further define the Major Defence Partner status, and was pleased with his ability to deliver the historic Sea Guardian decision earlier this summer. Overall, he is very bullish on the opportunities for the US industries in India and is doing his part to support these efforts.

American President Donald Trump recently released his first National Security Strategy describing India as a “leading global power” and placed emphasis on deepening US strategic partnership with New Delhi and supports its leadership role in maintaining security in the Indo-Pacific region. Donald Trump’s daughter and presidential advisor Ivanka Trump led the US delegation to the Global Entrepreneurship Summit in Hyderabad that was co-hosted by India and the US. In December 2017, Donald Trump led American administration sharply denounced the decision of Pakistan government to release Hafiz Saeed, leader of Lashkar-e-Taiba, from house arrest. He was the mastermind of the Mumbai terrorist attack. Donald Trump warned Pakistan about his release and exerted pressure on Pakistan to have taken Hafiz Saeed into custody and to find out an amicable solution with India on Hafiz Saeed issue. This was appreciated by India. On the whole, under Donald Trump administration Indo-US co-operations on several fronts is blooming.

Concluding observation: The various aspects of Indo US relations compel us to ponder over that despite the presence of liberal democratic governments in both the countries, the relations between the two world’s largest democracies could not thrive along intimate lines on account of different foreign policy perceptions in the initial phases of their relationship. India’s reluctance to join the US sponsored military pacts and adoption of the policy of non-alignment in the international sphere and India’s recognition of the Communist China invited the wrath of America. The Indian stand on Korean issue, reluctance to criticise Soviet intervention in Hungary and signing of Peace Friendship and Co-operation Treaty with Russia in 1971 ruffled the feather of America. On the other hand, India was greatly annoyed over US support to its arch-rival Pakistan on Kashmir issue, anti-Indian stand on the issue of Goa, open hostility towards India during Indo-Pak skirmishes of 1971, induction of highly sophisticated weapons in Pakistan. Above all the intimate relationship between India and Soviet Union and India’s firm stand on CTBT (Comprehensive Test Ban Treaty) which was at complete variance with the US stand also greatly hampered and derailed the development of co-operative relations between the two countries. Adoption of the policy of protectionism and restriction of H1-B Visa that would consider to be given pink slip to Indian MNC employees under Donald Trump administration also constituted the grey area in their relationships. Despite these irritants in their mutual intercourse, the two countries continued to co-operate with each other in economic, military and cultural spheres. Relations in these spheres improved considerably after the dismantling of the USSR and adoption of the policy of market liberalisation by India in 1991. At the international level the ambition of China to expand its influence in the Asia-Pacific region and beyond also obliged the USA to forge intimate relations with India which alone can be a balancing factor in the Asian politics.

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## A NEW METHOD TO SOLVE TRANSPORTATION PROBLEMS WITH THE MAX MIN TOTAL OPPORTUNITY COST

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### ABSTRACT

*In this paper, we are trying to find the optimum solution of a transportation problem to minimize the cost. The current new algorithmic technique to solve the transportation problem is based upon the Total Opportunity Cost (TOC) of a transportation table (TT) and maximum minimum penalty technique. The most attractive feature of this method is that it requires very simple arithmetical and logical calculation, which compared to the existing method an optimal solution and illustrated with numerical example.*

*Keyword: Transportation, Minimization costs, Sources, Supply, Demand, TOC, Current Method.*

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### 1. INTRODUCTION

A transportation problem has been widely studied in computer science and Operation Research. It is one of the fundamental problems of network flow problem which is usually use to minimize the transportation cost for industries with number of destination while satisfying the supply limit and earliest and most important applications of linear programming problem. A balanced condition (total demand is equal to total supply) is assumed. Then finding an optimal schedule of shipment of the commodity with the satisfaction of demands at each destination is the main goal of the problems. The first stage the (IBFS) was obtained by opting any of the available methods such as North West Corner Rule, Matrix Minima Method or LCM, and Vogel's Approximation Method. Then in the next and last stage MODI method was adopted to get an optimal solution, it's a much easier approach to propose for finding an optimal solution and very easy computations.

In last few year Abdual Quddoos et.al [3] and Sudhaker et.al [6] proposed two different method in 2012 respectively, for finding an optimal solution. Prof. Reena G. Patel et. al [4] and A. Amaravathy et.al [2] developed the method is very helpful as having less computations and also required the short time of period for getting the optimal solution.

Besides the covenantal methods many researchers has provide many method a better of a transportation problem. Some of the important related works the current research has deal with are:. 'Transportation Problem using Stepping Stone Method and its Application'[5]by Prof. Urvashikumari D. Patel et.al Hence the another method consider averages of total cost along each row and each column which is totally new concept.[7] In general we try to minimize total transportation cost for the commodities transporting from source to destination.

In this paper we introduce Method for solving transportation problem which is very simple, easy to understand and helpful for decision making and it gives minimum solution of transportation problem. The method developed here ensures a solution which is very closer to the optimal solution.

### 2. ALGORITHM OF CURRENT METHOD

Step 1:- Examine whether the transportation problem is balanced or not. If it is balanced then go to next step.

Step 2:- Subtract the smallest entry from each of the element of every row of the TT and place them on the right-top of corresponding element

Step 3:- Apply the same operation on each of the columns and place them on the right-bottom of the corresponding element.

Step 4:- Adding the opportunity cost in each cell along each row and the opportunity cost in each cell along each column and putting the summation value in the corresponding cell.

Step 5:- Find the difference between maximum and minimum in each row and each column which is called as row penalty and as column penalty and write it in the side and bottom.

Step 6:- From that select the maximum value. From the selected row/column we need to allocate the minimum of supply/demand in the minimum element of the row or column. Eliminate by deleting the columns or rows corresponding to where the supply or demand is satisfied.

Step 7:- If obtained condition in step 6 is contrary, that is if there is tie in maximum value select that value which has least element. If there is tie in the least element then allocate the least element which has minimum supply/ demand.

Step 8:- Repeating the step 5 to step 7 until satisfaction of all the supply and demand is met.

Step 9:-Now total minimum cost is calculated as sum of the product of cost and corresponding allocate value of supply/demand

### 3. NUMERICAL EXAMPLE

**Example 3.1.** Illustrate

**Table 1**

	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	Supply
S <sub>1</sub>	9	8	5	7	12
S <sub>2</sub>	4	6	8	7	14
S <sub>3</sub>	5	8	9	5	16
Demand	8	18	13	3	

Solution: since  $\sum a_i = \sum b_j = 42$

The given transportation problem is balanced; therefore exist a basic feasible solution to Current Method problem.

Step:- 2 and 3 The row differences and column differences are:

**Table 2**

	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	Supply
S <sub>1</sub>	4 9 5	3 8 2	0 5 0	2 7 2	12
S <sub>2</sub>	0 4 0	2 6 0	4 8 3	3 7 2	14
S <sub>3</sub>	0 5 1	3 8 2	4 9 4	0 5 0	16
Demand	8	18	13	3	

Step:- 4 The Total Opportunity Cost table is

**Table 3**

	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	Supply
S <sub>1</sub>	9	5	0	4	12
S <sub>2</sub>	0	2	7	5	14
S <sub>3</sub>	1	5	8	0	16
Demand	8	18	13	3	

Step: - 5 The difference between maximum and minimum in each row and each column

**Table 4**

	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	Supply	Row Penalty
S <sub>1</sub>	9	5	12 0	4	12	(9) (9) - -
S <sub>2</sub>	8 0	6 2	7	5	14 , 6	(7) (5) (5) (5)
S <sub>3</sub>	1	12 5	1 8	3 0	16 , 13	(8) (8) (8) (3)
Demand	8	18 12	13 1	3		
Column Penalty	(9) - - -	(3) (3) (3) (3)	(8) (8) (1) (1)	(5) (5) (5) -		



Therefore, the allocation in the original TT is

Table 5

	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	Supply
S <sub>1</sub>	9	8	12 5	7	12
S <sub>2</sub>	8 4	6 6	8	7	14
S <sub>3</sub>	5	12 8	1 9	3 5	16
Demand	8	18	13	3	

The transportation cost is:  $Z = 12*5 + 8*4 + 6*6 + 12*8 + 1*9 + 3*5 = 248/-$

**Example 3.2.** Illustrate

Table 6

	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	Supply
S <sub>1</sub>	3	3	5	9
S <sub>2</sub>	6	5	4	8
S <sub>3</sub>	6	10	7	10
Demand	7	12	8	

Solution: since  $\sum a_i = \sum b_j = 27$

The given transportation problem is balanced; therefore exist a basic feasible solution to Current Method problem.

Step:- 2 and 3 The row differences and column differences are::

Table 7

	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	Supply
S <sub>1</sub>	0 3 0	0 3 0	2 5 1	9
S <sub>2</sub>	2 6 3	1 5 2	0 4 0	8
S <sub>3</sub>	0 6 3	4 10 7	1 7 3	10
Demand	7	12	8	

Step:- 4 The Total Opportunity Cost table is

Table 8

	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	Supply
S <sub>1</sub>	0	0	3	9
S <sub>2</sub>	5	3	0	8
S <sub>3</sub>	3	11	4	10
Demand	7	12	8	

Step :- 5 The difference between maximum and minimum in each row and each column

Table 9

	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	Supply	Row Penalty
S <sub>1</sub>	0 9	0 3	3	9	(3) -
S <sub>2</sub>	5 3	3 5	0	8, 5	(5) (5) (5)
S <sub>3</sub>	7	3	3	10	(8) (8) (1)

	3	11	4		
Demand	7	12	8		
		3	3		
Column Penalty	(5)	(11)	(4)		
	(2)	(8)	(4)		
	(2)	-	(4)		

Therefore, the allocation in the original TT are

**Table 10**

	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	Supply
S <sub>1</sub>		9		9
	3	3	5	
S <sub>2</sub>		3	5	8
	6	5	4	
S <sub>3</sub>	7		3	10
	6	10	7	
Demand	7	12	8	

The transportation cost is:  $Z = 9*3 + 3*5 + 5*4 + 7*6 + 3*7 = 125/-$

### Comparison of the numerical results:-

Comparison of the numerical results which are obtain from the example is shown in the following table

**Table 11**

Method	Example 3.1	Example 3.2
Current Method	248	125
North West Corner Rule	320	143
Matrix Minima Method	248	159
VAM	248	143
MODI- Method	240	125

## 4. CONCLUSION

The current method is very simple, easy to calculate and understand. It gives result exactly or even lesser to VAM method. The solution obtained by the current method is near to Modi method

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**DR. B. R AMBEDKAR AND RESERVATION POLICY: ANALYSIS AT PRESENT SCENARIO**

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**ABSTRACT**

*Dr. BR Ambedkar, widely recognized as Dr. Babasaheb Bhimrao Ramji Ambedkar, was a versatile figure, an academic, a physician, a philosopher, a Dalit leader, a social reformer, a thinker. He was the first monetary economist in India who prudently analyzed the problems of the Indian Rupee. He played a key role in industrial modernization and advocated industrialization on the basis of the ecological model, along with Gandhian cultural core democratic principles. He advocated growth of expertise, land reforms and the upgrade of technology. B.R. Ambedkar has always tried to raise our societies backwards and lower. He claims Hindus have an inherent, inveterate nationalism and a faith that is inconsistent with democracy, tolerance and brotherhood. I would like to emphasize that if the Ambedkarite idea of reserve for betterment and to uplift of our society's weaker population is to be initiated and incorporated, those weak people need to be included in and benefit from the reservation system regardless of caste and faith. But in practice, the weaker people of higher classes find it unreal and unjust. The reservation is burning subject matter in India. It is in existence more than eighty years. Included in the Indian Constitution are arbitration clauses with the purpose of defending marginalized communities. The Indian Culture has silenced from decades to years, politically and socially. Untouchable groups include Scheduled Castes and Tribes as designated in the Indian Constitution. It is a tragedy that nobody has efforts have been made to stop caste system non-scientific activities. The majority of people in India, however, have confidence in the dated practice and the caste system unscientific. This article tries to delineate how Ambedkar's reservation policy is commonly important in the country like India.*

*Keywords: Constitution Maker, Emancipation, Inequalities, Reservation*

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**1. INTRODUCTION**

In order to enable equal participation in and protect against social, injustice and exploitation, the package of the 'Reservation' aims to remove socio-legal discord in certain groups. The purpose of the reservation is to bring about inequality on the equal level to achieve the constitutional mandate of the equal society. However, even today the oppressed sectors of our society have been there five hundred years ago, this objective itself could not be achieved after the lapse of four decades. The causes are, by and wide, monopolized by the wealthy, the fixities of reservation. The constitutional architects have expected that social justice will be provided by reservation to scheduled caste and scheduled tribes for many years and that attempts would also be made to lift those groups in order to participate on equal terms with others. However, due to electoral politics, we did not achieve our goals. Therefore, a 'reservation scheme' must be lasting and limited to those who warrant it. Reservations are one of the security discrimination structures enshrined in the constitution in the civil policy of the State. In order to ensure that the traditionally neglected part of society participates, it is necessary to establish quotas in the legislative bodies, in educational establishments and in public works.

In India, the reservation system is an action for reserving some per cent of seats for a class (maximum 50%), such as Scheduled Castes, Scheduled Tribes, Backward Classes etc. in govt schools, governmental positions etc. The origins have been extended from ancient times where in civilization there were dominants in the traditions of intangibility and caste system. The Hindu society in ancient times has been broken down on the principle of Varna, and they were the Brahmen, Kshatriyas, the Vaisyas, and the Shudra, the descendants of their social hierarchy. There was another class "untouchables" or "avarna" class people, who don't have a school. These avarna were considered as socially impure and excluded from the social system. They had to live outside the village without any claim to society. While their shadow has been cast into the upper classes in some parts of the country like South India, they have been considered unclean. They had stringent limits on social gatherings and social activity and were harshly disciplined and often even killed if they defied certain social standards. The division in society between touchable and untouchable is a very competitive mechanism and it has negative result on the advancement as well progress. Epics like Mahabharata list as well several times on which a warrior such as Karna could not show his talent merely because he was a shudra. His caste always called him 'Shudra Putra' and embarrassed him. A big factor for the introduction and implementation of the Indian Reserving Scheme was the then prevalent caste system. Due to the widespread atrocities against a certain class of the individuals, the idea of making reservations came about. The motives for the implementation of the Indian reservation policy is to provide them with equal rights, dignity in employment, social advancement, parity with other sectors of society and, even, growth in the lower strata of society.

### 2.1.1 Various aspects of Reservation Policy in India:

There are various aspects of Reservation policy has been initiated in India before Independent and after Independent. Although there is variation regarding reservation policy but all these policies main issues for the exalting deprive people from their low level livelihood and ensure equal status.

### 2.1.2 Reservation Policy in Pre- Independence Era:

The legal origins of Indian Reservation Policy started by establishing the Government of India Act of 1919 while the 1st World War. The 1919 Act initiated not only numerous changes in the Indian government but also dealt with other minority problems, including ethnic electorate instruction. The system was, however, strongly opposed by Montague-Chelmsford. The questionable Simon Commission get into existence in 1927, following the 1919 Act, to examine the reforms of Montague-Chelmsford. His leaders, having toured the entire Indian Provinces, suggested merging separate votes and seats for marginalized communities with demands for a broad license as these marginalized classes can't enable to vote properly in terms of cultural, education and community. In London in 1931 a Round Table Conference was congregated to cast and examine the Simon Commission's report, it was initiated and how it could be incorporated into the new body constitution. Indian various representative persons were present. In the meeting calls for a individual balloters from B.R. Ambedkar, but the demand for a separate representation for the oppressed classes was firmly rejected and the minority issue lasted pending in the meeting due to the strong opponent from both Mahatma Gandhi and the Congress. After this, it was established the Community Award and the Poona Pact of 1932 when Premier Macdonald announced that he was awarding the communal award, in which distinct delegates were to take place for the Muslims, Indian Christians, Sikhs, Anglo-Indians, Dalits, and Europeans depressed classes. Mahatma Gandhi's critique was expressed but Dr. BR Ambedkar and other minorities firmly backed the prize. For this, Mahatma Gandhi's hunger strike and the popular uprising against the reward led to the Poona Pact of 1932 getting together with the squares of British India and the new National Legislatures a single general electorate. In 1935, where reserve seats for the downcast class was granted, the provisions of the Poona Pact of 1932 were stamped. It was the case leading to India's independence.

### 2.1.3 Reservation policy after post independence:

The picture modified after independence, now policy became on reservations robust than before. Dr B.R Ambedkar presided the Constituent Assembly with this documents in the Indian constitution were devoted to reservation policy.

#### Section 15(4) – Disadvantaged Status Development Special Clause

Article 15(4) is a derogation from Article 15(1) and has been amended in the context of a decision in Madras c. Champakam Dorairajan [1] by Constitution (1st amendment ) Act 1951. In this instance, in different communities, the government of Madras had in various proportions for religion, caste and race seats reserved to state medical and engineering colleges. The Supreme Court of India ruled that the law was unconstitutional as applicants were graded by caste and religion regardless of their qualifications. Article 15 being changed by the Constitution (1st Amendment) Act, 1951 through the changing the effect of the rulings. The State has the power to provide for the establishment socially as well as educationally retroactive civilian groups or for the Scheduled Castes and Schedule Tribes in compliance with this provision. In the Following the amendment, the State was able to establish a Harijan Colony to support the welfare of the backward classes.

Constitution (93rd Amendment) Act 2006: Inferior, SC and ST status reservation requirements in private schools (section 15(5))

#### Public residential reservation of positions of employment (Article 16(3))[6]

Article 16(3) is exclusion to Article 16(2) that prohibits elimination on the basis of residency. Article 16(3) There can, however, be good reasons only for reserving people for certain positions in Society. This Article enables Parliament to govern by law the degree to which a State may deviate from the principle above. Government job history reservation (Article 16(4)) [7] The second exclusion to the common rule contained in Article 16(1) and (2) is Article 16(4). Article 16 (4)..

### 2.1.4 Other Indian Constitution other Articles addressing the reservation policy:

Article 17 speaks of abolishing untouchability and if its practice to be crime which is penal by law in any way.

Under Article 39-A, the social security charter of the Principles of State Policy Directive directs the State to provide the economically Backward Class with equal justice and free legal assistance.

**3.1 Reservation policy in current scenario in India:**

The policy of reservations played an important role in improving the Dalits' access to education and jobs. Education is an area that frequently argues against reservation policy: it allows one student to receive preferential admission and ignores the other student who is deserving and meritorious. A study published in the American Economic Review clearly rejects the common belief that the reservation policy places recipients in academics for which they may not be prepared. An important finding of the study was that the reservation policy could increase the recipients' or disadvantaged groups, i.e. the Dalits', college enrolment rates. There is often debate as to whether affirmative action works in this way. The study concludes that it works as intended. The extent of reservation quota system was considerable in India, with 15 percent reservations for SCs, 5 percent reservation for STs, 7 percent reservation for Backward Classes A and D, and 10 percent reserve reservations for BC-B and 1 percent reservations for BC-Cs, in most States. The number of students attending colleges is still lower than the population of colleges, although reservations increase their admission to colleges. As can be seen in the number of students who do not study at colleges and who make reservations amongst the SC and STs is significantly higher. About 85 % of women and 74% of men in the STs and 51% of men and 74% of women in the SC would not have been present in college if they did not do so. In 1983, after adivasis, Dalits achieved the lowest levels of learning. Education inequalities were evident between the upper and dalits castles. ST often reside in inaccessible rural regions. Looking at the percentage of STs enjoyed through reserve policy, not only the urban Dalits but also the rural Dalits are developing through reservation in education. Most Dalits who have not historically had access to education were able to fill in the reserved number of high school seats. In addition to entering universities of higher education, affirmative measures also help to increase the rank of students in entrance examinations, which is linked to student achievement in terms of grades<sup>17</sup>. The affirmatory action by means of reservations policy not only has given them admissions but also encourages students to put more efforts in their preschool as it would guarantee that they will be able to attend. In the absence of any reservation, the pre-college efforts would be much less. The effect of the reservations policy was that, due to improving positions, the disadvantaged groups were successful in the schools in gaining admissions<sup>18</sup>, which would essentially represent a step in the development of the Dalits in education. Access to education reservation policy was designed to reduce social inequalities by mainstreaming Dalits, as it has so far worked as intended, ensuring that many Dalits receive training. The arguments have, however, been raised against such reservations because the education gaps between upper casts and dalits at elementary level are improved by the Dalits who cost the people who do not have reservations.

**3.1.1 Importance of reservation in India:**

The reservation concept was introduced in the fight against long-standing discrimination and conventional practices within the caste rural Hindu communities and others. Some castes have been classified as higher, the others are small, and the former often elimination against the latter. From a legal viewpoint and social-cultural context, the need for reservation should be looked at from one angle.

**4.1.2 Juridical Sense:**

The discrimination of those marginalized groups showed that those classes were constantly oppressed, and were seen to be of 'higher' class. Constitutional leaders felt that these classes had to be part of the legislative process and special provisions had to be given to them in order to integrate them into the process. It was meant as an upheaval for the said backward classes to mitigate most of their oppression during the casteist era. They were granted equal rights, opportunities and special reservations in order to ensure their participation in the country's legal framework.

**4.1.3 Intuition for Socio-Culture :**

We need a clearly defined varna structure in the Hindu religion, which originally consists of the Brahmins, the Kshatriyas and the Vaishyas, in order to explore further the social and cultural history of casteism and reservation. There was also a fourth sect called Shudras, which existed as cleansers, to assist the three "supreme" sects. Besides sects, are not known as 'Dalits' or untouchables under the varna system. It was supposed to pollute their existence. They were charged to execute "impure" tasks like cremation, etc. This practice has over time always gone hand-in-hand with other religions such as Christianity and Islam that differentiate against people who are considered to be "lowly born." In the Indian society and culture, that created a related reservation to prevent further oppression of these oppressed communities and encourage their development and education and thus lead to the constitute of the reservation policy.

**5.1. Controversy on reservation policy:**

Although the reservation has long been a part of the Indian legal system, its existence has been questioned in recent times. Though citizens are not opposed to the general concept reservation, the existence of caste quotas is

contentious. It is often argued that the backward classes, in large part both economically and socially, were encouraged after more than 70 years of quotas. As such, it is not required to reserve seats, but rather to save such seats for economically weaker sections of the population. They further strengthen their argument because the creamy layer system exists, where even well-off backwards classes have the same reserved seats as those held by other class members. The problem is also answered from a different point of view, however, not through the blame on minority quotas, but on the lack of job opportunities.

### **6.1 Solution and suggestions:**

It is recognized that the problems referred to by those who do not reserve are true if a solution to that debate is to be considered. Caste-funded reservation has grown excessive now a days and is taking possibilities away from those who are economically disadvantaged. Furthermore, the reservation system only splits society which leads to discrimination and disputes between various sectors as it is oppressive and has no basis in casteism. In fact, reserve benefits should be limited to no more than two kiddies per family, irrespective of their number of children, and would help to regulate the population of OBCs that would after all the result in a decline in their illustration, thus it gives the way of the leading equality. In rural areas, a member of the general category that economically suffer as well as an OBC member, but only a person from the OBC will have a reservation at an educational institution or government job under the reservation criterion.

### **7.1. Is reservation sufficient to ensure the development of the community?**

Reservations are living culture developing highest quality of living, and in addition, when a reservation is stated in its conventional sense, it is negative rather than pleasant. When societies and people's opportunities are divided on a caste-to-class basis, a division is created between these classes that prevent communal semblance and progress. At the same time if reservation policies were withdrawn to ensure seats to economically weaker potions of society, it would make a sense of general education that the financially would afford favourable situation.

### **CONCLUSION:**

According to Dr. B.R. Ambedkar, reservation entirely essential for depressed classes. So this could represent his community in the making of laws, educational institutions and public services. He requested for the reservation of Security Forces. The economic and social condition wasn't really good of Depressed Classes. That is why they can't contest with higher caste Hindus until and unless the reservation make sure to them and give all types of opportunities are made which they have been deprived since thousands of years . The most impressive key outcome of such a provision would be the reservation of seats the leaders of Depressed Classes will definitely be packed in and they could do something for the group safeguarding and improving the interests of their fellow higher levels of awareness and life. You could receive them Professional and technical education to obtain good jobs for them, they will eventually earn general respect and equal status. As a participant active community they could raise their voices to the legislature and the executive how they had lived in this situation for centuries and centuries. Dr. B.R. Ambedkar has failed to see the Depressed class leaders who speak about their grandiose people were lying about their progress. He stresses that it would be there be the special Employment Exchange in the middle and states ensure postal reservation for Scheduled Castes. He recommended the establishment of a Commission for independent minorities who have the authority over these transfers of jobs to ensure that reservation is conducted correctly. In other words, he stressed that it is necessary to ensure the correct Central and Provincial Agencies Reservation arrangements have been diligently applied. Dr. B.R. Ambedkar encouraged the students to be discouraged Classified as a distinct religion, the Hindu is entirely different. He requested "22 out of the 140 seats in Depressed Classes. Dr. Ambedkar has also produced a case for seat reservations to ensure that the safeguards work properly In the province and the centre. Dr. Ambedkar established and built into social justice a foundational faith Humanists plans to raise the weak Scheduled Castes rates and Tribes must ensure that society is effective on a fair basis. Dr. Ambedkar delivered his last speech to the Constituent Assembly. A precaution and forecast that has not to be interpreted, but has come home to explain the citizenship code system and the appeal for a casteless culture. Therefore, Dr. Ambedkar reservation policy very much important in the present scenario of the nation and it always have boon for country like India.

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**AN ENDEVOUR TO THEORETICAL ANALYSIS ON MOVEMENT OF MODERN WOMEN FOR LIBERTY AND FUTURE SOCIETY**

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**ABSTRACT**

*Our society is a structure built on our cultural confluences. Men Women diverse natures and thoughts contribute to the cultural aspect in our society. Advancements of countries in various fields, the influence of technology and open economy has made marked changes in today's woman; and has brought in an openness and transparency in their thoughts and expressions. For the greater freedom they are now venturing out territories uncharted before. As a result, the previously considered women centric work of raising children and doing domestic household chores are also getting changed, as more of the women today are a working class. It can be said that economic and technological advancements of modern societies has shifted direction, so has women empowerment and liberalization taken this path. The revolution of Feminism in 1970's can be said as "New wave Feminism", before the 70's mainly their demands and rights were just heard and seldom discussed or elaborated on a broader context.*

*Women's liberation empowerment has a greater role in our society ahead and of course it has to be gauged very carefully. I am not against empowerment or liberalization ideas, but rather would like to focus on those feminist who strongly advocate that the future society will be adversely affected by empowerment of women, which neither vocalist of the same can ignore.*

*There are many facts to support Feminism and also against it, but here I shall try to explore the psychological emotional and moral consequences of Women's empowerment and its impact on our society in future.*

*Keywords :- Technological Advancements-Change of Demand-Problems-Dangers of Society.*

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**INTRODUCTION**

Modern feminist argue that men and women in a society are equal in all aspects, they are not inferior on the basis of sex and shouldn't be identified so. The identity itself is they are human's, hence forth the very basic biological and sexual differences between man and woman and their natures are immaterial in deciding rights of woman. Traditionally in our society man and woman are treated differently, and man always treated as superior which is unjust. Feminist argue & boldly speak to end this discrimination, but the question is how? How to truly end this discrimination and inequality where in not only their diversity is acknowledged but also their rights and stature. What exactly are the rights and thoughts that need to be addressed? Feminist although claim various ways of achieving this, and each roadmap being different from the other, although the goal remains the same and hence it becomes a much debated topic.

Mother of Feminist Movement was Marry Wollstone Craft (1759-1797), in her book 'Vindication of the Rights of Woman' she described women's empowerment; which is the first ever book, on women's empowerment movement and often compared to the 'Declaration of Independence of United States', as it is declaration of woman's liberation. Soon after the publication Mary was receiving praises from her supporters and well wishers, but was also criticized by the conservatives. In the 13<sup>th</sup> part of the chapter is the most glaring statement "Woman are Humans, with Intellect, and not just Objects of Sexual desire" and should be treated with respect and equality. 1. After this first feminist movement by Mary, numerous avenues on Woman's empowerment movement and liberalization took shape in various avenues in different forms and approach, and they were different in fundamental approach from each other, most notable are Liberal Feminism, Radical Feminism, Marxist Feminism, Modern Feminism, Post Modern Feminism and Eco Feminism. Similarly antagonistic views against women's liberalization also came to light, but before proceeding let me share some light on my chosen topic and the theoretical aspects for a better understanding.

As I mentioned that our society is interwoven with cultural values of both men and women. Differentiation on the basis of sexuality can't diminish the role of woman in our society. With the advancement of technology, and changing global socio economic scenario, women have to spend less time for household chores. As a result it has become very much possible for the modern woman to venture out work and earn. It is also directly related to inflation and prices of essentials going up the roof, as the incremental value of money declines, so does the pressure to maintain day to day life increases, and hence a majority of women today are a work force. So we can say that technology, need for more human resources and inflation has been instrumental in driving women to work, a domain largely controlled and dominated by men until recently. Hence the demands are not only



equality in jobs, pay and social status but much beyond. The changes in socio economic structure driven by technology modern society have taken along feminism and women's empowerment forward to a large extent. Never the less associated with empowerment is the future of our society, although we can't quite predict the outcomes of liberalizations as yet. But precisely equal rights as men is the agenda, that has echoed from various movements and advocates of feminism more than anything, and truly denying a woman any rights a man enjoys, because of sexuality can never be just and fair.

Advocates of women's empowerment have scaled up their voices to an extent that we really need to introspect some controversial aspects in relation to today's society and the future, and perhaps the possible consequences. But from the second part of twentieth century we can find this movement has shaped the thinking, agendas and inner desires of the woman of the next generation. The concerns are grave to an extent, that even other feminist can't ignore them either.

#### **METHODS AND MATERIALS :-**

This research paper is mainly literary survey based research article, based on prevailing conditions in our society, research articles, books, newspaper articles and my personal views of current socio economic conditions. Based on these I am presenting my article.

#### **REVIEW OF LITERATURE :-**

Although I shall give a detailed list of books and articles used in references section, still in accordance to publishing an article of this nature I am giving a brief account here. Books on Feminism and empowerment often didn't coincide with each other's ideas, rather contradicted and rejected the other's view. Even so when confronted with their own ideologies and statements, they chose to retract what they said earlier. The very bases of Feminism laid by G. Plekhanov and Sheila Rowbotham were rejected by the Post Modern Feminist Scholars like J.L. Mackie. The very structure of G.Plekhanov and Sheila Rowbotham were based on Marxist dialectical ideologies, and were strictly opposed by post modern feminist.

J.L. Mackie tried to approach on this by finding a balance between man and woman based on logic; on the other hand Carol Gilligan rejected the ideas of Simone de Beauvoir and the theory of Sigmund Freud. She projected that there is no exit from the core issues of human life, in a society but one can voice their concerns and objections. Francoise de Eaubonne said either man or woman isn't self-dependent rather interdependent on each other; and being dependent creates a harmony in relationships.

#### **DEMAND AND RESULT :-**

Thoughts of Radical Feminism can be found in the works of Simone de Beauvoir, Millet and Greer and many others, but it's more seen in Ti-Grace Atkinson's work and in Shulamith's Fire Stone. Unlike liberal thinkers the radical approach is different and doesn't agree that the problem is political social or of unequal rights, rather it goes a step ahead and doesn't even agree like the Marxist that social hierarchy and differences are responsible for this inequality towards woman. Rather they say the fact is more biological in nature and woman gets dominated and oppressed, more so often, because only she can give birth to a new child. They say that family is a biological entity, and it's a result of biological inference. Extreme thinkers even go on to say that to sustain humans, marriage and family giving birth to child are not a necessity or obligation of a woman. Advancement in medical science now can liberate the child from a woman's womb and rather than giving birth, a child can be brought to this world using modern science. Marriage and family aren't necessity institution at all and these very should be abolished. Science can take up the role of fulfilling a woman's work they advocate. There are strong reasons raised above and we should gauge them carefully as the consequences are far reaching.

#### **First :-**

The right to terminate a marriage is not only a man's right so it's a woman's. For just and equal reasons it has been accepted, but this has not rooted out the problem rather created a complex situation and an imbalance. For all practical social reasons a woman bears the brunt of a broken marriage more, because after a certain age the chances of a woman's remarriage are less compared to a man, more so ever it becomes unbearable for a woman to desert her child from a previous marriage and definitely takes a huge psychological toll. The thoughts of Carol Gilligan's exit strategy comes to play, and reminds that core human values and issues have no clear exit doors, unlike markets, rather one can voice their concerns and objections. 2. More so if a woman out of wedlock has to take care of her child and if she is not financially independent, it becomes a catastrophic situation for a single mother in every possible aspect. On the other hand if the woman is financially independent, then our society seem to look away from her. Whatever might be the reasons for a broken marriage woman have to suffer mentally psychologically more and the hardships and after effects faced are still challenges which prominent feminist's haven't been able to solve.

**Second:-**

Broken marriage necessarily doesn't mean that the duties of parents towards the child are over. The child unconditionally deserves love affection from both, and parents should respect this feeling of the child. In such cases the real problem starts with the custody battle for the child; where in they face courtrooms and live in constant turmoil and uncertainty. 3. The child is devastated in such a situation, wherein he faces a conflict within himself at the thought of choosing a parent to live with leaving the other. Feminist leaders how so ever vocal and strong haven't been able to come up with a solution for such a situation.

**Third :-**

A woman without a child is considered barren, and it's a shame and disgrace for her. But a certain section of modern women and feminists don't want to bear a child willingly. It's because they think a child will be hindrance in their career graphs, liberty and freedom. A prominent feminist from Newyork said "If not a fool a woman doesn't want to bear a child". 4.

**Fourth:-**

The union of marriage blooms after the arrival of the child in the family, but modern feminist argues that the very institution of marriage is a hindrance in freedom of woman. Their interpretation is quite different, and they don't believe in marriage and family, but what they seem they seem to suggest is a man and a woman can stay as long as they feel and need each other's company and move away from each other, if adverse conditions arise. Noteworthy to mention here, that Mother of modern feminism, Marry Wollstone Craft lived with her businessman partner, Gilbert Imlay for three years and when Fanny Imlay was born, Gilbert left them and went off. Mary pleaded with Gilbert to stay back, because it was true love Mary had for Gilbert. But the sad plight was Gilbert abandoned both Mary and her child, but Mary being the feminist she was never left her daughter.

**Fifth :-**

The Radical approach is starkly different. Advances in technology will destroy families, which they consider a biological entity, and medical and biological advancements in future will remove the individual roles of man and woman and how they function. They consider that when the family institution will not be in existence, so the desire for conjugal relationship will diminish. So will sexuality evolve, and man or woman can choose their own ways of gratifying their urge by choosing their own partners, be it a man chooses a man or a woman chooses a woman and it will not be a taboo in society anymore. Liberals Feminist argue that homosexuality is nothing short of venom, and according Marxist ideology this is a direct result of malady of capitalism but Radicals advocate homosexuality as normal.

As our society has advanced and kept pace with changing technological advancements, traditional families have retained their core family values, held for generations. With advanced medical science today, may be the need for a human to give birth has diminished to a great extent, but for proper psychological mental and physical growth a child needs love, affection and warmth a congenial family atmosphere, which is only possible in a family. We need to mention that advocates of feminism differ in their views of family. It can be well understood from the writings in 1975 of Betty Friedan and Simone de Beauvoir, although Betty is more supportive towards the institution of family, but Simone had opposite views.

**Sixth :-**

The very bases of a family are warmth, love and respect and affection, but the extreme views don't agree to this. Children are the reflection of their parents, and even due to the love and bonding between siblings and parents great sacrifices are often viewed with utter respect and content. The radical views rather concentrate on self centered accomplishments and fulfillment of a person, rather than core values of family bonding between members. Needless to say this self centric attitude towards greater self rather than a shared view of warmth respect and love among family members leads to self isolation at later stage of life, which is quite evident from the western world today. Values virtues and morals learnt in a family develop an individual being, so one can't bluntly ignore the institution of family and the society will incur huge loss if this very institution is questioned.

**THEORETICAL PERSPECTIVE :-**

Radical feminist probably had an inclination of the consequences and the outcomes of their demands, as expressed by French Philosopher Rousseau. Concerns about the perennial existence of society, with families as smaller institutions in it, were voiced by John Ruskin. Rabindra Nath Tagore in His early years expressed his concerns about the dangers of cultural values of civilizations in our society. His early writings were versioned on Sigmund Freud's Psychological theory, as he called for chaining up and curtailing liberties of women. He presented numerous views about keeping women at home and with his reasons from various aspects.

It can be said that John Stuart Mill was biggest supporter of woman's empowerment movement, but the revolutions in those times were quite different from what is seen now in this modern era.

Rousseau on the other hand advocated equality, but his total views were based after excluding woman. In his ideology equality was meant for man and not woman. In his book "Law Novel Allowise" he stated that woman are meant to become mother's, take care of children and do household chores, where as men are meant to venture to the outside world; hence giving equality to both sexes is a foolish idea. Rousseau goes on to state that man and woman should rather complement each other, else if not marriage will be a disaster, and the society as whole will be at peril.<sup>5</sup>

Unlike Rousseau, John Ruskin was also concerned about social stability, so Ruskin too never believed in woman's rights. Ruskin was a strong vocalist of education for both men and women but with a different view point. He believed that education for a man is for self development and where as for a woman it is for self esteem. Ruskin wanted to project his ideas that "Both Man and woman complement each other" and so he advocates education for woman which is rather an eye washing attitude. Ruskin projected his 'Separated Spheres Theory' in such a way ornamenting his Complementary theory, that he never wanted woman to go out for her rights, but rather he wanted to make them care givers to the society, more so the men. <sup>6</sup>

Interestingly in Rabindra Nath Tagore we find a duality, and a mix in his speech and writings. One before the age of 75 we can find him more profound, when he mastered the concepts and ideologies of western and Indian women. He became very vocal about 'The Separated Spheres Theory' their natural differences and the inequality that existed between man and woman. On the other hand, at the age of 29 his writing point out that women's empowerment movement is a unheeded commotion, ominous and a curse. Upon his return from England, he became strong voice against women's movement. To stop the pace of modern women's empowerment movement, He perhaps used the most scientific argument, which may be compared to Newton's theory of Solar system and the forces they exert.

He used two synonymous, yet contrasting words Centripetal and Centrifugal to define roles of man and woman in our society. He said woman's world is her home and family and a man's world is outside, a woman should make her home beautiful and attractive, and if her man is not attracted towards it than it can be safely said that she has failed in her duties. And in this way he blamed woman for the loss of cultural values and ethics in our society. <sup>7</sup>

According to Rabindra Nath Tagore's 'Packing' theory all women who want success and freedom are perverted, in a sense that outwards they are females sexually, but their inner core is of a man's. And strangely Sigmund Freud's theory seems to coincide with R.N.Tagore's where he said "Perverted woman want establishment and recognition in outer world". Why do woman need empowerment and liberalization? The direction can be found in Packing theory. <sup>8</sup>

He described those vocalists of woman's empowerment and their zeal to break free from male chauvinism as deranged. But in 1936 October at a meeting in NikhilBanga, He addressed the Women Workers, and he talked about empowerment, he said woman should come out fight for their equal rights. So at the age of 75 Rabindranath agreed that change is not only inevitable and necessity but constant. Very antagonistic views he held at his young age though. We ought to think why at 75 he saw woman in a new perception? Was it because of advancements in society and technological improvements? The transformed views of Rabindranath were to empower woman and manifest their roles and ideologies in modern society. Rabindranath wanted to empower women and utilize their intellects for a balance in future society and culture, and bring in parity between man and woman's rights. He didn't forget to mention that woman gives birth to child, and that's why he gave woman the universal title of "Mother" who can give birth and be savior of all Men. <sup>9</sup>

According to John Stuart Mill, marriage of a woman is predestined by social norms and men think of women as mother and wife, but Mill doesn't agree that this ideology is true for ever. Mill says that in current social norms it is not possible to exactly say how woman like to represent or be seen themselves, and in which role. May be they don't want to be seen as wife and mother and somehow they dislike to be seen so, but due to predestined social norms and rules they are bound to play these roles or forced to do so. And as this is the case there's no reason to think that they are doing so willingly. <sup>10</sup>

In his book 'The Subjection of women' Mill pointed that in modern society family is an autocracy, and Mill criticized patriarchal family. Mill said that under law man and woman enjoyed equal rights, and in a family (11) structure no single one will be superior and the other inferior, husband and wife will be equal in a family.

‘Women are under Men’ the very idea was opposed by Mill and it was not only for empowerment and betterment of woman, but rather for the whole humanity.

Shulamith’s Firestone put her inequality ideas in a different way, as she said if the reasons for inequality is because woman bear child has to take care of them, then they should reject the idea of bearing child and giving birth altogether. 12.

Simone De Beauvoir said that bearing a child is an inferior work and brutal too, it’s a biological curse. And due to this curse, woman are not only inferior and unequal compared to man, but are locked up in house and its perimeters forever and there seems to be nothing that can liberate them. Just for humanity to exist and generations to come again, women are forever locked up for the sole reason, as they can only give birth. 13.

Let’s discuss the theories and perspectives of various Feminism’s, and their opposing ideologies to each other:-

#### **Liberal Feminism Vs Radical Feminism :-**

Liberal feminism is considered to be the foremost women’s empowerment movement. The main ideology here is not to change the existing social norms and traditions rather infuse the new ideas with the prevailing mainstream. Father of Modern Western Philosophy, Dwarkanath’s metaphysics states that on the basis of proper justifications and arguments equality can be achieved and changes can be incorporated. There shouldn’t be any specific sex identity or gender identity. Logical and intelligent arguments put forth are the only way to change the course ahead and establish equal rights for both. Liberal thinkers blame improper principles and judgments in prevailing sexual differences and unequal rights.

In the year 1966 in United States of America and organization called NOW (National Organization for Women) was formed and the next year a few members split out from it and later went to criticize the liberal ideologies of feminism and their perspective is what we know today as Extreme Feminism. Unlike liberal methods of inclusion into existing social structure, the radical view is starkly contrasting. They call for a total rearrangement of existing rules and norms. Though there can be some improvements through implementing new law, but the core problem will remain unsolved, they blame self interest, sexual difference and flatulence. Whereas liberals view man as an atomic self, but radical view them as hyphenated self, which radicals say that if an individual is dependent on another individual then there’s no scope of flatulence or superiority, and they want both man and woman to co-operate. 14.

#### **Modern Feminism Vs Post-Modern Feminism :-**

Modern feminist say that if a woman is part of a large organization they can wield power, and will be empowered where as post modern feminist say that being part of any institution can’t empower woman. Its argued that it might give power to a few and on the other hand will create a vacuum for many. Women, who have ventured out to work leaving their family, might be well off financially and apparently seem independent, but at every step she has to be conscious of her rights and liberties. Post modern feminist say that even if a woman affiliated to any organization gains some powers, the changes won’t be reflected in her thoughts and her life. The difference of some with liberties and power and some without will clearly be there amongst women just as it exists between man and woman.

Post modern feminist say that the thoughts of woman should change. ‘Laws of Thoughts’ should change, and there should be a revolution on the conscience level of woman. They say that, modern feminist have accepted Aristotle’s second law “Law of excluded middle’ and so how come modern feminist argue? As they only represent two aspects if one is good the other’s bad, if one is superior the other inferior and there’s no third aspect, which post modern feminist don’t agree to. So post modern feminist say that modern feminist are just the torch bearers of man’s rights rather than woman’s.

Post modern feminist’s rejected the feminist ideology arranged on Marxist dialectics by Sheila Rowbotham. Famous Marxist Plekhanov showed how ‘Dialectical Materialism’ – A law of contradiction works, (15) Sheila Rowbotham used the ideologies of Marxist materialism and said “Women will find themselves forgotten, if they forget to think of themselves” when she found no mention of women in The Communist Manifesto. 16.

#### **Ethics of Mackie :-**

Taking into account the challenges of modern life style desolation and frustrations and carefree existence Mackie proposed a right based ideology, which could well be more balanced and have a far greater dependency in the long run to solve social problems. Mackie said every human has the right to life, and humans live with their individual desires and thoughts. Everyone have their own interests, but the sympathy towards others is limited. Humans focus primarily on self interests and goals of near and dear ones; and tend to neglect interests of the greater mass or fellow humans. Even so when there’s a conflict of interest, humans don’t agree to each

other's views. (17) In this context whatever might be the differences between man and woman's thoughts and rights, Mackie tried to logically put forth his views in a balancing manner. 18.

**Ethics of Carol Gilligan :-**

Educationist at Harvard University Carol Gilligan rejected the ideas of French Philosopher Simone de Beauvoir. Simone's views on gender neutral nature in discussing women's problems were not accepted by Carol. She states that Simone's adaptation of 'Jean Paul Sartre's' "Being and Nothingness", theory was not on women's empowerment rather contrary, on the other hand 'Sigmund Freud's' theory of expressions of disrespect towards woman were built on male chauvinism and dominance ideology, which were also rejected by Carol. Gilligan highlighted 'Care - based ethics Theory' rather than 'Justice - based ethics' by John Rawls and goes on to state that we live life, and learn from our experiences in life and it can't be denied. In patriarchy experiences of man and woman are different though, Gilligan in 'Exit Voice' Dilemmas in adolescent development essays discusses exit and voice can be effectively used to reject the ideologies of institutions. Gilligan points out that man are more inclined towards exit ideology, whereas woman are likely to use voice ideology to raise their concern and grievances and still stay knitted in family and try to solve their problems and demands, through dialogue. Gilligan points that the ease with which one can exit from market related economy; it's much tougher to make an exit from moral responsibilities of life. (19) So it can be said that 'Justice based Ethics' and 'Care based Ethics' are quite different and amalgamation of these ideologies are not possible. 20

**Eco-Feminism :-**

The word Eco Feminism was first used by Francoise de Eaubonne in his book 'Le Feminism on La Mort' in 1984. The word translates to morals in context to the future society. Eco feminist think that either man or woman isn't complete by themselves. Interdependency and trust amongst each other brings out their individual personality. They agree that there are differences between the sexes, but they don't adhere to separatism, their aim is to diversify the concentration of powers and make the relationship between man woman more harmonious and amicable. The values they mostly promote are Love, care faith co-operation and give and take etc. They believe there can be social reforms and changes of ideology, but society and family can't ever be denied.

**Future Society :-**

We are not quite sure how our future society will be, but the demands laid down by radical feminist take us to a state of Utopia and rather scary. Their absurd advocacy to abolish marriage, family for go sexual desires, a society where a child can be produced outside a womb, without a woman and without being in wedlock. Again to combat isolation woman can seek company of their child according to their wish, and whenever she feels she can put her child in a care giving home, when she opts to for whatever reasons. Foundations of radical thinking rely on technological advancements, they say technology makes one consumerist and indulgent and doesn't teach to sacrifice. Technology one day will set humans free from pleasures of nature. They say in such a society there won't be any place for love there won't be any desires and cravings and hence no conjugal relations. R.N. Tagore was apprehensive about this future society, and so after his return from Europe in 1930, he warned 'Relationships shouldn't be for pleasure and gratification of needs rather it should run deep and there should be emotional attachment and bonding of souls. Self manifestation and expression are vital in shaping the future of societies, and He noted that otherwise there are serious consequences to be faced by our society.

**CONCLUSION :-**

Women's Liberalization Movement is a vital aspect in shaping our future society. Unlike other mass movements, women's empowerment and demands will get accreditation in coming future. Perhaps it's getting hard to accommodate new ideologies into existing and long standing norms of our society. Vocalists of feminism have demanded equality in various aspects which can't be trashed, rather has to be accepted. But the radical views needs to be gauged very carefully, keeping in mind our future and society ahead. Few radical views and implications are hard to ignore, and even their advocates haven't come up with clear answers, neither some of their other arguments can be ignored completely. The radical views of freedom have deeper meaning than what's projected rather multiple meanings. Doubts about leaders of feminism who are so vocal also is a concern and whether they truly represent the ideologies they speak off, because the extreme views are not accepted by majority of women in our society. To steer clear of any crisis in future society, we can't see man and woman as competitors, neither we can talk of equality and rights and shelve them in our thoughts, neither to dissect personality shall yield any good, rather a more creative approach should be adopted. Both man and woman need to cooperate and should complement each other if not there are huge costs to be paid. If both act independently and in utilitarianism fashion then surely there are great dangers ahead. Radical leader's minds

need to be questioned on practical and logical fronts for future outcomes, a movement where the greater good and benefit plays more important role than the self that movement is sure to flourish.

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**WOMEN'S SAFETY AND SECURITY**

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**ABSTRACT**

*Women in India as a better half of Indian society and culture, today, are turning into the most helpless as far as their safety and security is concerned. At this point when we turn the pages of a paper, we run over numerous title texts revealing instances of rape, attack, inappropriate behavior, assaults, dealing, abuse of women in houses, brutality against women in remote regions and so forth. What does this point out? This unquestionably infers that there has been an expanding pattern of such sexual overdrives in new generation. Indian Constitution has conceived a dream of genuine social, financial and political majority rules system which ensures the rich best standards of equality for our citizen yet this has not yet been completely figured it out. Still citizen of Indian women are insecure and unsafe towards the perception of liberty and freedom. It's agonizing to envision the predicament of women who are victims of such crimes. But we don't think who is liable for this? Is it just lack by judicial system of our country and the arrangement of our nation of the police where such occurrence happens or the Indian society in general. We by and large generally refuse to accept responsibility for the issues and have not reached to find out its actual roots. - Although many systems are now accessible in our society yet need constructive modern framework is required to give more security and safety of our women. Expanding number of violence and crime rate against women in India will set numerous unanswered questions to government and the general public with respect to women security. The proposed work intended to investigate the different types of violence and dangers against women by utilizing web based life information. This research will be supportive to safeguard the women from viciousness against them in the general public.*

*Key words:-Women's Safety, Violence, Fear, Social Network Sites, Android mobile app, Microcontroller device, etc.*

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**1. INTRODUCTION**

This new field of study has been opened up by the expansion of urbanization arriving around the whole world, drawing connections between political economy, international affairs, security and societies. In addition to this flow of modernization, there is an inflow of isolation and increasing burden of separation of community that have generally been draw back due to their migrant status, class, gender, or sexual adjustment. And insecurity is visible, when communities either refused entry or unable to entry what city has to offer. Impacting on their standard livelihood that forces them to manage their journeys at urban places even though facing encounter stresses differently. Gender holds a key role between the several points of inequality and exclusion. There are several causes that act as significant role in deciding the ingress of women to urban places. Women's security and safety and gender inclusive communities are wide and broad terms, but with this research emphasis should be on women's right to engage in community life, and specially about more directly violence and harassment experienced by women and as they carry out their daily activities. This wide direction of this research is to establish safety and holding issues within a wider discourse of urban progress and administration, as well as comprehensive realization of oppression against women. This method helps one to comprehensively examine as well as appreciate the different aspects of defense, and communicating with them. Gender based violence exists at different stages , beginning with segregation at birth, continuing to be perpetuated by inequality in schooling, housing ,jobs, salaries and direct / indirect incidents of sexual assault. Many solutions to combating gender based violence have been established, including programs, policy and structural frameworks. Women's protests has been lively in the 1970s and 1980s, their main issues for protest are for dowry related abuse, harassment and sexual assault. This period was notable because it reflected shattering the taboo around violence against women that contributed to many legislative changes including Prevention of Domestic Violence Act. Currently pending for an Act on the Prohibition of Sexual Harassment at Workplace, The Indian Penal Code also includes many provisions grappling with sexual assault.

**2. UNDERSTANDING WOMEN'S SAFETY**

Women's safety encompasses various approaches, activities, and initiatives that aimed at minimizing gender based harassment (or violence against women), security for women includes open safe spaces. It can also build a feeling of protection and warmth, which can help to discourage violence, so various policies and planning regarding safety should consider women. Security for women implies liberation from poverty, it requires clean

access to sanitation, security of maintenance and access of bathroom facilities in informal communities, slum improvements, community planning, accessible car parks, shopping malls and public transportation. Security for women implies financial stability and certainty. Community wealth plays a important function in preventing battering. Accumulation and allocation of money is a key method for addressing dysfunctional marriages. Similarly, economic prosperity for women decreases their exposure to abusive condition when they are less reliant on others moreover they don't depend and able to make his/her own choices. Safety for women insist upon self worth. Women must have rightful claim to important themselves in clean and tidy places and societies, they must be encouraged, to have accepted, to have autonomous, to have their interests protected, must be supported, and must have equivalency with other persons of the family, culture and to have recognized as same inhabitant of society. Various procedures and strategies that take action to stop before abuse women. It could be accomplished by enhancing consciousness and character relating to the principle of domestic or sexual abuse, like conformity to social norms that enhance violence. In addition involvement of women and girls in civic life needs to be facilitated, collaborations need to be sought with various community organizations and city municipalities, and a complete integration of women and girls needs to be promoted. Security for women implies a better, happier society for everyone. This is a participatory mechanism that works on improving cultural standards, social contact habits, beliefs, practices and traditions in ways that would dramatically change the quality of life for all of its participants in a community, it is a inevitable byproduct of attempts to address problems such as social divisions, marriages, education, sexism or stopping sexual abuse. Everybody's task is to create a stable, secure community.

### **3.1. Causes to lack of safety**

Generally speaking, various men groups in the country like India have scattered like parks, remote locations, underground or desert streets as particularly unknown sites in which women fear being robbed or raped. According to HDR (Human Development Report) participants reported that they felt happier in their own community on an entirely familiar basis. Because of their experience in the region, they felt comfortable and secure in the immediate vicinity of their homes (i.e. the local parks or the places of the market) where they thought they would be able to address every problem. For example, women observed that a group of men, especially women and girls, would generally avoid it when they used the public park to play cards. Likewise, women would see the hostile place if gangster stick around in the area. At the same time, the place that is more convenient and easily accessible, usually filled with a range of women activities and working throughout the. There was greater concern in empty areas where men do evil activities regarding women assault, they also using the crowd to harass women physically in crowded spaces as well. Almost everyone feels that the nation does not help women who suffers. We claimed it was the utter apathy of the community and the lack of response to public violence that acted an important role in maintaining the crime process.

#### **3.1.1 Socio-economic status**

The HRD data from house workers and homeless women expressed that they have necessity rooms and that in their own community they feel relaxed, but elsewhere they feel less comfortable. Women felt threatened, particularly those who were affected by alcohol or near-alcohol shops. They also mentioned feeling dissatisfied with public urinating people. Fear of sexual assault increases the vulnerability of women and children who are homeless. The lack of basic amenities such as safe and clean toilets. Women are particularly at risk at many levels of government and police structural support, violence frequently occur in the community and are even pushed into the hands of proxies and smugglers. Although there are homeless shelters do exist, their position itself is an adverse factor and a major factor in the decision to use them. People are not prepared to go to areas which may feel remote or which are not within a sufficient distance of the room they need every day connection. We often have packed public spaces such as mosques, trains or bus stations where many citizens are find safety.

#### **3.1.2 Travelling in the urban area**

Traveling in the city the public transport is the one encounter that is similar to all women in the city. The possibility of abuse, or even rape, is associated with public transport – especially buses – and is among the most vulnerable places in which sexual harassment is apparently a common feature for women. For public transport the bus is the most commonly used in town, in addition to the subway system, car rickshaws, rickshaws and taxis. Women from the medium and the large classes are able to understand because of the options available to them. For instance, many high-class women may skip buses when they can afford to travel in cars or taxis. Some people also noticed that there is now an unacceptable crowding in the metro systems which had been protected previously and that there is also a chance of sexual harassment. Women were questioned or harassed while working or riding in vehicles. Unanimously, the HRD participants announced that they felt unsafe in all public transport and that they expected abuse or even rape in isolated areas. To the cities offer many advantages



to young women, but with fear of violence and vulnerability. Students shared stories of how strangers sometimes slow down on cars and motorcycles, make remarks and harass women after questioning where they stay or living. This causes a sense of fear amongst girls who often attempt to manage the situation, particularly after darkness, by avoiding those spaces. Even on campus, for example, women students can't access libraries or labs equally because of the fear of sexual harassment or abuse. Another obstacle for their movement is the lack of sufficient illumination in some areas.

### **3.1.3. Police outlook**

Police attitude according to FDG usually seemed to distrust police, believing that when they reported cases of gender-based violence, it was they who were found guilty of the situation or accused. In certain instances (male and female) participants reported in police custody more brutality, including sexual abuse. Participants of the FGD also stated that a complaint with the police is very complicated to prosecute and the suspect is often released without trial. In that scenario the participants reported that the offenders persisted and the abuse escalated, motivated by the fact that the appeal did not go in favor of the plaintiff, and the problem was indeed about to get worse.

### **3.1.4 Community attitude**

Such issues are faced by women in various forms. Some agree that many of the issues must be dealt with at the community and social rates as a culture. We expressed a feeling that we need to challenge the notion of women themselves as responsible for sexual abuse or attacks when they see violence in the sight of their eyes and individuals who need to raise their voices. In view of the situation, i.e. that the public is deaf and ignorant of acts of violence, the harassers move around freely, concealing themselves that they can. We have to organize and accountabilize for this.

### **3.1.5 Women's discrimination**

Different forms of discrimination in the area impact young women and students from India's northeast states. Men have preconceived ideas about northeastern women that they are "simple" and "accessible" for sexual gain. In the last few years, violence against women in the northeast has been documented on many other incidents involving focus group discussions with workers at the call centers. A young woman from Delhi University, who went with a girl friend to a bar in the late evening, was recently raped. In a recent case in 2009, a young woman was stalked and then killed by a man she had underestimated.

"We can't trust anybody on the side of the street, no man; also because somebody hasn't come to help. No one, including manager, men and women, did something about me when threatened with bus harassment – including brushing – and lifted my voice. ( FGD with women from north east India).

Disabled people find it difficult to accept individuals in general, and therefore hesitate to receive assistance from outsiders. Sometimes they are confronted with "uncomfortable situations" where people try unfairly to reach them on the grounds of their support. The lack of public access and inadequate maintenance of public property represents yet another threat to women with disabilities. Transgender people are another community who, whether it's the public or the police, feels completely marginalised, ridiculed and exposed to violence from almost any direction. In culture, they stated that they are ostracized. Furthermore, the police are threatening them; they may receive little or no protection from the police.

"And since we come from our neighborhood house people send us filthy looks and label us whores."

"When five boys met up with us in the night at 11:00, we all went to a spot, had sex with him, leaving him nude. It was a lucky night that none in this state saw him, that he went to his friend's house. Yet we didn't dare go to the police because they might just harass my wife.

### **3.1.6. Suggestion**

People may not agree that they are being secured by the police, but many assume that the police play an important role. On the basis of the North Eastern Group discussion, it was suggested that the alternative for women to file a complaint electronically was given. This would save them from contacting the police station, sometimes leading to secondary people being raped. The monitors suggested should be in the Community Department as well as more city patrol vehicles to make policemen and officers liable. Police should be more attentive and cooperative. Procedures need to be streamlined to make it easier for people to file grievances. Regulations must be laid down with strict supervision to keep out the fleeing police and staff. Several proposals regarding infrastructure improvement and the use of public spaces were also brought out. Proper lighting and regular maintenance are essential to safeguard public spaces. One issue of concern was the need to improve the safety and efficiency of public transport. The recommendations cover the number of women's busses and trains,

particularly on the routes used by various female travelers. It is a good idea to declare destination names in the bus which can benefit visually impaired people considerably. Working with bus drivers and passengers and attracting more people to these jobs are important policy steps that can go a long way towards addressing the issue of protection in public transport.

#### **4. Modern system and technology used for women security**

There are many systems available now a days and it could be accessible to detect accurately-

##### **4.1 Android mobile apps**

The GPS module tracks the longitude and latitude of a device to find out the warning messages to the contact numbers enlisted. The recording of audio begins as evidence. Even if there is Network problem, the message is in queue. The consumer can also access and make a call using voice-based communication. Another application is called IPROB, which gives women protection even in situations like an assault by oppressors or a natural disaster. The voice continues to check for and validate the dangerous circumstances of IPROB where it lifts the alarm and consumer fails to respond before the warning is sent to the register. The next feature is a double-module (Spy Camera Identification and Women Rape Rescue System) SCIWARS software. A first module functions as an intelligent alerting device, which detects the infrared rays that are generated from each hidden Night-Vision cameras in modified quarters, hotel rooms and so on. The second module is triggered by pressing repeatedly each key to shield an individual from physical assault in dangerous circumstances. This sends an emergency notification location to register contacts. This program can also transform smart phone receivers. In two separate cases, the fourth Android application provides the following protection. The First Module protects Women in Emergencies and provides Save Our Souls (SOS) software for women traveling alone or at night to provide protection with a single click of the SOS button. Do not open this tool, it automatically turns on the application to operate in the background to deliver the emergency alert, including the address to the recorded contacts in latitude and longitude by simply pressing the power button. The second element offers an android-based home protection program that provides safety to the user's household properties and senior citizens. Since the health of senior citizens is always a problem for the increasing number of theft incidents. The program alerts the customer with a notification regarding an attack attempt at home and an SMS response activates an alert at home. Another device is suggested to deliver a notification to the guardian number of the place or audio video call through a single SOS button. Tap the address in the notification at the receiver to display it on Google Map. It also offers different support services, such as first aid, fake call assistance and video calling. The First Aid device offers help with various health problems that occur in an unexpected or emergency situation during the night. The first treatment is: asleep, not moving, sweating, heavy bleeding, wounds, heart attack, diabetes and so on. Fake call helps to avoid joining others at a time when women tend to feel nervous and say "I should leave this place if someone calls me." False calls are the same sound as the usual call echo, which ends when the contact has been acknowledged. It helps False Hang Up solution too. The guardian contacts for this device are normal, but they can search for officers, firemen, medical contacts in your locality. It sends the recording (audio-video) of the user's emergency via E-mail, where the user is unable to explain or to state the condition.

##### **4.2. Microcontroller devices**

A highly efficient, integrated women's security system consisting of wearable sensors. It contains GSM, advanced sensors, and ATMEGA8 microcontrollers with an ARDUINO device, which keeps users continuously under surveillance. The monitoring of body temperature, heart beat, and vibration by sensors is an annoyance check. In this scenario, the GPS module will be able to track the position and the cable camera to record the photographs sent to the receiver control room via GSM modules. The laptop as a belt triggered automatically by passing over the threshold pressures gap. Each two minutes a GPS module tracks the site and sends urgent signals to three contacts as emergency via the GSM. It also triggers a screaming warning using a siren to request help and creates an electric shock to help the perpetrator recover from the attacker's self-defense issue. The device also enables Most of the machine consists of a microcontroller that is designed using ARDUINO's programming language on the ATMEGA328 surface. Another device the "Suraksha" safety device for women, a simple to use tool. You will switch this system on by voice command, by hitting a button and shock (i.e. a force sensor that is used to toggle it on when the unit is violently thrown). In case of an emergency, the alarm is sent by the transmitter module and the reported numbers to the authorities, plus immediate position via a GSM. Now, development is remain to incorporate it in jewellery, mobile devices, etc. In the proposed projects, it can play a key part in linking all police stations and exchanging criminal records, incidents etc. There is another device provides a wide-ranging vehicle tracking system based on GPS, also using a safety button mounted under the vehicle seat utilizing GSM. Most businesses develop their company in a nation with growing pace of economic development in the vicinity of cities. As it is the company's responsibility to guarantee the protection of women's private transport. In the uncertain environment, an employee will switch on to turn on the

Teltonika-FM1100. It permits the android device to take pictures inside GPS and vehicle. The warning request is submitted to the company's special unit and nearest police department by way of a GSM SIM. A response may be sent. The police team and the business manager are liable for dealing with this situation afterwards. Use GPS and Google Earth geo-fertilizing tools to define a vehicle's area zone as a virtual barrier can further boost network Security. A program tool is used by an administrator to sense geographical limits when a car approaches or exits a custom geo-inhibited area and to restrict the driver from vulnerable regions to driving. The manager will show the monitor of the vehicle's location, rpm, ignition level, travel level and notify the driver inside the car on the speaker phone. [Note: GSM SIM slot is required for sending and receiving messages on Teltonika-FM1100 network where a GSM Sim is mounted. Throughout the vehicle's android system, another GSM SIM card is positioned to share photos via notifications or e-mail warnings. The GPS ignition device supplies the location of the car for starting-stop and after a set time period even monitors the direction of the engine.

## CONCLUSION

It can be concluded that the various system which help to promote equality between women and men by providing women in society with a safe environment and enabling them to work. Everyone is stopped when they commit a crime against women which tends to reduce the crime rate against women. These technology can provide useful information and able to capture audio-video incidences that can serve as evidence. In the case of senior citizens, disabled persons or women leaving alone, the proposed system offers the method for intrusion detection in the home; protective measures are needed upon identification for protection. The proposed system offers the tools for identifying the spy camera in the house, changing room and user type, while ensuring safety in taking aggressive photographs or videos. It is necessary to standardize these structures and gain government approval for the courts to accept the evidence. In today's world, the safety of women is a vital and social problem. With the aid of the actual programs implementation of the proposed model the abuse (molestations, theft, sexual assault, rape, domestic violence) against the female can be brought to an end. Despite persistent crimes against women and young girls, India still does not have a comprehensive database on sex offenders. In recent 20 years, identification of sex offenders and warning systems around the world have been developed. Since 1994 18 more nations have passed some form of registry law on sex offenders. By enhancing their representativeness and meaningful participation in displaced group and camp management committees, in decision and settlement processes, by increasing their access to and control of services and resources, and by promoting their rights and leadership skills, we can improve leadership of women. We will enhance the ability of women and girls to access quality education, inclusive high school, in a healthy school environment and to improve food security, livelihoods, free movement and financial independence.

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**AMBEDKAR'S THOUGHTS ON DALIT AND WOMEN'S EDUCATION**

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**ABSTRACT**

*The education system of ancient India started its journey through the Gurukul education system and later took on an institutional form. In this education system, the upper castes and elites of the society usually had a place. There was no public place. In the early days of Vedic society, upper caste women had the opportunity to participate in education and other social activities, but their rights were curtailed from the time of Manu. As a result, Shudras and women are deprived of their right to education and other social rights. Deprived of the right to education, they are plunged into the darkness of ignorance. As a result, they accept the injustice done to them by the upper castes as their destiny. As the right to education is in the hands of the upper castes only, the social and political power has always remained in the hands of these privileged classes. On the other hand, backward class and marginalized people and women have gone to the very bottom of society and state power. This plight of the Dalit class and women caused deep pain in Ambedkar's mind and immense affection for those people. His life vow was to overcome this inequality in society. Ambedkar realized that education was the key to achieving this goal. So he has been trying all his life to reform the social and educational system. The purpose of this paper is to explore the role and thinking of Dr. Babasaheb Ambedkar in the education of Dalit and women.*

*Keyword: Education system, Gurukul, Vedic society, Manu, Dalit*

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**INTRODUCTION**

Since ancient time, the ruling class has always provided education to the upper-middle class and deprived the lower strata of society of their right to education. One thing that has always been felt by the ruling class is that the right to education belongs only to the privileged class. In this reason, social and political power has always remained in the hands of these privileged classes. On the other hand, backward class and marginalized people and women have gone to the very bottom of society and state power. This plight of the Dalit class and women caused deep pain in Ambedkar's mind and immense affection for those people. His life vow was to overcome this inequality in society. Ambedkar realized that education was the key to achieving this goal.

Ambedkar believed that education was the most important means of raising the people's standard of living. His slogan was "Educate, unite, struggle". "Educate" is the first word of his famous slogan. The reason is education's undeniable role in the building of human character and consciousness. Only an educated person can understand his class interests and bring about class unity. Education propels a person on the path of struggle. Dr Ambedkar said, "Education is what makes a person fearless, teaches him the lesson of unity, makes him aware of his rights and inspires him to struggle for his rights." He believed that education is a movement. If it does not fulfill its objectives, it is useless. Dr Ambedkar unambiguously stated that an education that does not make a person capable, that does not teach him equality and morality, is not true education. True education cradles humanity, generates sources of livelihood, imparts wisdom and imbues us with egalitarianism. True education makes society alive.

**OBJECTIVES, METHOD AND MATERIALS**

The objective of this paper is to discuss Dr. Ambedkar's viewpoint on the shortcomings of the Indian education system and to make Dalits and women aware of their right to education. Information has been collected from the Indian Constitution, internet, published papers and various books. Historical and analytical methods have been used to write the paper.

**DISCUSSION**

The civilization and culture of ancient India was centered on religion. The Aryan sages realized that although the Paramatma was immortal, the living soul was mortal. At the time education was deeply connected with religion. The Aryan sages believed that self-knowledge and self-realization were the ultimate goal of education. According to Hindu philosophy and Brahmanical teachings, the goal of education is self-realization and self-development. According to them, education leads people to salvation.

The place of women in Vedic society was high. There was no difference between men and women in education. In those days girls used to recite Vedas, girls used to go to Upanayan and they used to go to Gurugriha and perform brahmacharya. In that era women's education was recognized, in that era many educated girls were identified. Many of them taught, wrote books, many fought. Apart from the conventional curriculum, the girls

also acquired skills in dance, song, musical instruments, embroidery, poetry, composition, garland composition, beauty etc.

The fact that the Vedic society and the subsequent Hindu society were particularly aware of the importance of education is evident from the various sayings of the ancient sages. The sage of the Rikveda says that a man who is superior to another is not because of his extra hands or eyes, but because his mind has been improved by education. That is, the demand for superiority in Vedic society was not innate. Education can establish people in the seat of honor in society; this was the belief of the ancient Vedic sages. They believed that only education could motivate them to be free from everything and move forward at an unstoppable goal in life. According to them, education teaches people to seek liberation. Similar ideas about the importance of education were prevalent in later Vedic eras or epic eras. It is said in the Mahabharata that education gives sight to man and following the truth is the ultimate austerity of life. Knowledge is the third eye of man, with the help of this vision we can penetrate deeper into everything, so education is absolutely necessary for man to develop his humanity. Thus the ultimate goal of ancient Indian education was to develop self-knowledge and self-realization.

But since the time of Manu, a patriarchal society ruled by a handful of privileged upper caste people has deceived, coerced and maneuvered the majority of the people i.e. Dalits, untouchables, poor, backward and marginalized people and women in the society of their right to education. The right to education goes only to the elites and the upper castes of the society. The general public would not have a place there. The acquisition of knowledge by the Shudras was forbidden because if they always kept a watchful eye on their own interests. Shudras and women were deprived of the right to Vedic education. In Manusmriti, the Shudra who recites the Vedas or listens to the Vedas is given a severe punishment such as cutting off his tongue and pouring hot lead on his ears.

Shudras and women were deprived of their right to education and plunged into the deep darkness of their ignorance. As a result, the patriarchal society ruled by the upper caste was easily able to control and manage them. They accepted the injustice done to them as a result of being deprived of their right to education. As a result, upper caste people are easily able to establish social dominance and lower caste shudras are deprived of all social status, resulting in social inequality. Depriving women of their right to education also enabled them to be confined within the confines of their homes, which was considered to be an important strategy to building the caste system.

Since ancient times the right to education has been vested only in the upper caste privileged class and social and political power has always remained in the hands of these privileged classes. On the other hand, lower caste people have come to the very bottom of the society and state power. For this reason they now have to depend on the upper class of society. This plight of the lower castes and women of the society caused deep pain in Ambedkar's mind and deep affection for all these people. The vow of his life was to eliminate this inequality in the society. Education is what is needed to reach this goal. He realized that from his own life experience.

That is why he has struggled all his life to give worthy status to the marginalized people in the society. He rightly understood that in order to win this struggle, in order to give due respect and dignity to the disenfranchised, they must first be brought into the field of education. The enlightenment of education will lead them to the desired goal. Babasaheb has struggled all his life for their education.

The seeds of inequality that are hidden in the Varna system and caste system are unjust; the women of India are the victims of that discrimination. Therefore, according to Babasaheb, the problem of women should not be looked at separately, it should be seen in conjunction with the underlying problems of the larger Hindu society because the problem of women is not a gender based problem, it is a humanitarian problem, a problem of existence. Brahmanical religion and society have oppressed the women and Shudras of the society with the help of caste system and other means. This oppression is not only inhumane, it is also against nature. Shudras and women did not have the right to read scriptures. Illiteracy and ignorance have bound them in various ways for ages. So first of all we need to free them from bondage. This requires the development of their education. Because advance free education can bring the urge to break the chain. Ambedkar has repeatedly emphasized the importance of educating Dalit women. Because as Dalits and as uneducated they are constantly exploited in this society. In 1924, Ambedkar's efforts led to the formation of a central organization called the 'Bahiskrit Hitakarini Sabha'. Ambedkar's 'Bahiskrit Hitakarini Sabha' is particularly noteworthy so that Dalit women also participate in social movements and become educated in real education. Through this association, from the beginning of 1925, Ambedkar undertook some educational and socio-economic initiatives to help the Dalit community. For example, on January 4, 1925, a hostel was set up in Solapur for the student of neglected class.

A magazine called “Saraswati Bilas” was published. A free reading room is set up. He started two newspapers called “Mook Nayak” in 1920 and “Bahishkrit Bharat” in 1927 and there he propagated on women’s liberation and dire need of women’s education. He used these two newspapers for the upgradation of their social status. It helped him to motivate them to participate in social reform movements against social evils. These printing media worked as a platform for their demand of their socio-economic rights.

In a speech to the Bombay Legislative Assembly on 12 March 1927, Ambedkar noted that then Primary Education Act was flawed. At that time the government took several separate steps for the education of Muslims. But as there was no overall vision in this move, there was no significant thinking for all caste. So Ambedkar said that “I think there is equal urgency for special inspecting staff to look after the education of the depressed class ..... I feel ..... That this council, in transferring education to the local bodies, has practically postponed the spread of education among the masses sine die and, in doing so, has gravely erred ..... the people who are the greatest sufferers by this wrong are the depressed classes.”

According to him, untouchable people will be liberated only when they get proper education. Because social, political and economic liberation of people is not possible without proper education. That’s why he formed the “Depress class Education Society” in 1928. The main aim of this society was to provide free education to the underprivileged class boys as well as girls from the hostel.

In April 1929, Dr. Ambedkar presided over a conference of the oppressed class held at Chiplun in Ratnagiri district. There, too, he said, slavery was to be eradicated by one’s own efforts. Gaining self-esteem is also to be achieved by oneself. No one else pleases these. There is a lot to pay for this. In order to live with human rights, one has to sacrifice own life. In order to be free from the irrational behavior of caste Hindus, untouchable people should become real people. This requires education.

In 1929 the Bombay government formed the “Starte Committee”. Ambedkar was one of the members of this committee. In March 1930 the committee submitted a report. In the effort of Ambedkar, the report mentions increasing the educational opportunities of untouchable boys and girls in schools, increasing the amount of scholarships and providing opportunities for technical education, to set up more hostels for the children of oppressed class. The committee also recommended that suitable opportunities for engineering education abroad should be created for the meritorious students of the oppressed class and for that appropriate government scholarships should be provided. The report further said that a special officer should also be appointed to see that the development work of the Dalit class is being done properly.

In 1942 he joined the Viceroy’s Executive Council as the in-charge of labour affairs. In 1943, Ambedkar appealed to Viceroy Lord Linlithgow to i) increase the number of Dalits in government service, ii) introduce the Ruling Act of 1934 to give jobs to Dalits in proportion to the population, iii) create a special fund for Dalit education, iv) seats are reserved for Dalit students to study in Delhi v) the number of Dalit representatives in the Central Council is increased and at least one Dalit Minister is included in the cabinet.

On April 5, 1946, Ambedkar submitted a memorandum to the ‘Cabinet Mission’ on behalf of the ‘All India Scheduled Caste Federation’ to protect the interests of the Dalit class. His demands were (i) to provide adequate representation for Scheduled Caste in all legislatures and administrations at the central and provincial levels, (ii) elections must be held by a separate electoral system, (iii) Adequate financial allocation should be made for the improvement of Scheduled Caste Higher Education in the budget planning at the provincial and central levels.

In order to promote education among untouchables Dr. B.R. Ambedkar set up hostels for untouchable students at different places like Panvel, Pune, Nasik, Sholapur, Thane and Dharwad with donations and grant from district and local authorities. Having free facility of boarding to the hostel inmates, these were open to untouchables students, apart from financial constraints social and cultural stigma also affected full development of their personality in the Hindu dominated colleges. Therefore, Dr. B.R. Ambedkar wanted to set up number of separate educational institutions for the untouchables on his own initiative since 1945. He established the ‘People’s Education Society at Bombay, on 8 July, 1945. The main Objectives were to:

- 1) Search after the trust
- 2) Start, establish and conduct educational institutions or give aid to such institutions.

He repeatedly emphasized the need to explode the myth created by Hindu orthodoxy that the untouchables were incapable of learning

He founded the 'Siddharth College of Arts and Science' at Bombay in 1946; 'Siddharth Night School' in 1947; 'Milind Mahavidhyalaya' in 1950; 'Siddharth College of Commerce and Economics' in 1953; 'Milind Multipurpose High School' in 1955 and 'Siddharth College of Law' in 1956.

As the main architect of the constitution of India, Ambedkar has included in the Constitution some provisions on the right to education for Dalits and women. Those are

**Article 29 (2)** state that no citizen shall be denied admission into any educational institution maintained by the State or receiving aid out of State funds on grounds only of religion, race, caste, language or any of them.

**Article 45** state that every citizen is entitled to free primary education and the State shall endeavour to provide, within a period of ten years from the commencement of this Constitution, for free and compulsory education for all children until they complete the age of fourteen years.

**Article 46** state that the State shall promote with special care the educational and economic interests of weaker sections of the people, especially Scheduled Castes and the Scheduled Tribes, and shall protect them from social injustice and all forms of exploitation.

Ambedkar placed equal importance on Dalit education as well as women's education. Because she realized that the overall development of the society is never possible unless women are brought into the field of education. Because we know that a child's education begins with his mother. If the mother is educated then the child is bound to be educated. Babasaheb realized the importance of women's education from his childhood. So women's education is as necessary for women as it is for building an educated nation. When he was studying in New York, he wrote in a letter to his father's friend that "we shall see better days soon and our progress will be greatly accelerated if male education is persuaded side by side with female education."

Ambedkar emphasized women's education for the betterment of the society and the nation as well as for the betterment of women in their own world. At a meeting of Dalit women on 18 July 1927, he said that "I measure the progress of community by the degree of progress which women had achieved ..... Never regard yourself as untouchables ..... send your children to school. Education is necessary for females as it is for males ....."

## **CONCLUSION**

According to Ambedkar, education is a medicine that can break down social barriers and suppress the economic dominance of male members in a patriarchal society. Social justice can be established only through the development of education. Education from all sides can lead to the empowerment of Dalits and women. In the case of Dalits and women, education is the only weapon to empower them. For centuries, these marginalized people and women have been deprived of the right to education in Indian society. As a result, the overall development of the Indian social system was not possible. Ambedkar could feel it. So he has tried all his life to ensure the right to education of Dalits and women. The vow of his life was to present the opportunity of education equally to all.

Ambedkar understood that not only social and economic rights, but also political power could not be usurped without education and he tried his best to convince the Dalits all his life. Education is one of the keys to the Dalit and women's liberation movement. Babasaheb Ambedkar wanted to establish social, economic and political equality by using education as a tool. His main slogan in the Dalit liberation movement was "educate, agitate, struggle".

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**SOCIAL JUSTICE AND THE DALIT CLASS: AMBEDKAR'S PERSPECTIVE**

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**ABSTRACT**

*Social inequality and injustice have been born in India from the closed structure that Hindu society has built since ancient times. This orthodox existence of Hindu society is the main obstacle to the establishment of social justice. Social justice has been shattered under the pressure of caste system and untouchability. In order to establish social justice in the interest of the Dalit class, Ambedkar formed various social organizations and tried to establish social justice through various social movements. According to him, social justice can be established in the presence of liberty, equality and fraternity, which is absent in Hindu society. And the main reason for this is the caste system, so he wanted to completely destroy the caste system from the society. Because he believed that liberty, equality and fraternity could be established in the society only through the complete destruction of the caste system, that is, social justice could be established. He has struggled all his life to establish social justice in the interest of the Dalit class. The purpose of this paper is to explore Ambedkar's point of view on what social justice is and his contribution to the establishment of social justice in the interest of the Dalit class.*

*Keywords: Social inequality, untouchability, liberty, equality, fraternity, caste system, Dalit*

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**INTRODUCTION:**

From ancient times, especially from the time of Manu, caste differences were very evident in the society. The 'Chaturvarna system' and untouchability of Hinduism polluted the society. The upper caste Hindus deprived the untouchable backward people of their right to life. It was forbidden to associate with all of them, to take water from the pond, to visit the temple, etc. An emerging law to keep a class completely isolated and untouched in society was introduced in Hindu society, which is contrary to the principle of social justice. Ambedkar has long fought against such inequalities in Hindu society to establish equality and justice, that is, to establish social justice. He has worked hard for the establishment of social freedom of the untouchables in the society. He was the pioneer of the movement for the establishment of social justice. According to him, the source of various social injustices is the caste system of India. That is why he has been relentlessly agitating all his life against the various injustices inherent in the caste system of India. According to him, the establishment of social justice is possible only through the complete abolition of the caste system. He was instrumental in establishing social justice by improving the backward classes in the face of contemporary political, social and economic conditions. He not only presented the movement for the establishment of social justice for the oppressed, deprived people of India in a theoretical form, but also tried to implement it successfully. According to him, social justice can be established through the establishment of liberty, equality and fraternity.

**OBJECTIVES, METHOD AND MATERIALS**

The objective of this paper is to discuss Dr. Ambedkar's viewpoint of social justice and his contribution to the establishment of social justice in the interest of the Dalit class. Information has been collected from the Indian Constitution, internet, published papers and various books. Historical and analytical methods have been used to write the paper.

**DISCUSSION****SOCIAL JUSTICE:**

The concept of social justice is not easy to articulate. There are many conflicting theories about what social justice is and how social justice can be established within the state. Although many people talk about social justice in their daily life, there is confusion about what social justice really is. Many are in favor of distributing or redistributing wealth as social justice. Many again spoke of equality of opportunity. But differences exist in human beings due to innate qualitative qualifications or possibilities. So there is a difference in the need for facilities. For this reason, ideas about social justice are confusing.

Social justice is an ideal concept. According to this concept, it is about the overall welfare of the people and the establishment and development of a just social system for this purpose. J. C. Johari in his book titled 'Contemporary Political Theory' commented that "..... the ideal social justice envisages to promote the welfare of the people by securing and developing a just social order." According to the concept of social justice, there is talk of establishing a balance between the rights of the individual and social control. In this way it will be possible to satisfy the legal needs of individuals within the existing law and social system. On the other

hand, the welfare of the individual will be ensured and in case of violation of rights, measures will be taken to remedy and protect it. According to the concept of social justice, there is a need to relinquish some of the rights of the individual in the public interest. In the broadest sense, social justice is about reconciling the interests of the individual and the interests of the community as a whole. However, if there is a conflict between these two interest, then the overall and greater interest of the community will be established above the personal interest. The overall welfare of society depends on cooperation and harmonious coexistence between personal interests and the overall interests of the community. In this context J. C. Johari said that “..... the rights of an individual should be reasonably restricted in the wider interests of his community so that the ends of social justice are properly achieved.”

There is no denying the existence of social facilities for the full development of the personality of all human beings. The existence of certain social conditions is essential for the development of everyone's personality. No one can be deprived of all these social facilities. In the interest of social justice, it is necessary to end the exploitation of people in the society. The concept of social justice is related to social equality and social rights. Social justice cannot be established in a discriminatory society. For this reason, the concept of social justice is generally accompanied by the concept of political and economic justice. All the material and moral facilities of social life need to reach everyone. All these benefits of social schemes should not be limited to a handful of beneficiaries, but should be within the reach of the general public. For this purpose the arrangement of the social system may be required. In the broadest sense, social justice speaks of a coexistence of liberty, equality and fraternity.

Just as social justice refers to the protection of the interests of minorities; it also refers to the eradication of illiteracy and poverty. Equality in the eyes of the law, equal protection of the law, independence of the judiciary, etc. includes social justice. Special emphasis is placed on this notion of social justice in western liberal democracies. On the other hand, in the developing countries of the East, social justice means the end of unemployment, poverty, starvation, ill health, backwardness, etc. Judging from this, the existence of social justice is observed in the end of many socio-economic problems and crises. Social justice in the backward countries of the world refers to the improvement of the condition of the poor, weak and backward sections of the society. And according to the demands of social justice, this responsibility falls on the state.

### **AMBEDKAR'S CONCEPT OF SOCIAL JUSTICE**

Dr. Ambedkar's concept of social justice is the unity and equality of all human beings, independently of considerations of class, caste, gender and caste, with respect to respect, rights, benevolence, mutual love, sympathy, tolerance and charity towards fellow beings, the dignity of all citizens, the abolition of caste-distinction, education and property for all, good will and gentleness. Dr. Ambedkar insisted on social justice because it includes all kinds of justice, namely, legal, economic, political, divine, religious, natural, distributive, administrative as also welfare of children and women. His concept of social justice was based on human values such as liberty, equality and fraternity.

According to Dr. Ambedkar, liberty shapes the human finds expression in his action. Through liberty the hidden talents of the individual are expressed. It enables man to make his destiny. Equality binds men together through reciprocities, co-operation and social sympathy. Fraternity creates an atmosphere that is conducive to the enjoyment of liberty and equality. According to Dr. Ambedkar, “Fraternity means a sense of common brotherhood of all Indians, all Indians being one people. It is the principle, which gives unity and solidarity to social life.”

But Ambedkar has shown that the principles of liberty, equality and fraternity have been absent in Hindu society since ancient time, especially from the time of Manu. He has shown that Hinduism does not accept equality. According to Ambedkar, although Manu is not responsible for the emergence of the caste system, he is responsible for the hierarchical arrangement of the caste system. Dr. Ambedkar wrote, “In the scheme of Manu, the Brahman is placed at the first in rank, below him Kshatriya, Vaishya and Shudra and below Shudra is the untouchable. This system of rank and gradation is simply another way of enunciating the principle of inequality. So it may be truly said that Hinduism does not recognize equality. This inequality is a permanent social relationship among the classes to be observed, to be enforced at all times in all places and for all purposes. In every phase of life Manu has introduced and made inequality, the vital force of life”.

Ambedkar has shown that the principle of liberty has not been accepted in the Hindu religious social system. The concept of liberty is associated with social justice, economic security and the availability of knowledge. The Hindu religious system does not recognize social justice. No person can independently take any livelihood of his choice. Because according to Hinduism, a person's right to work is determined by his birth. That is, the

person in the caste in which he will be born, he has to take the prescribed occupation for that caste, he does not have the right to determine his own occupation. According to Hindu scriptures, the shudras at the lowest strata of the Varna system have no right to acquire wealth. Thus we see that in the Hindu religious system the Shudras do not have the right to live as they wish, the right to be financially independent and the right to economic security. In other words, the principle of equality and liberty was not recognized in the Hindu religious system. That means social justice is missing here.

Ambedkar further showed that the principle of fraternity is absent in Hindu religious society. There are more than three thousand castes and sub-castes and these castes are in a hierarchical hierarchy and have no relation to one another. Hindu religion does not give permission to inter-caste and exogamous marriages. Even eating together is forbidden. As a result, a sense of brotherhood did not develop in the Hindu social system. So we see that liberty, equality and fraternity have not been developed in the Hindu religious system since ancient time.

According to Ambedkar, the main reason for the absence of social justice in the Hindu religious system is the caste system. Due to caste system, social inequality has developed in the Hindu religious system. According to Ambedkar, one of the main reasons for the emergence of the caste system was the introduction of endogamy. This practice has taken a rigid shape since the time of Manu. Originally, Manu gave religious recognition to this practice and this practice was considered, as a sin against the divine will. The Shastra will severely punish those who break this practice. They will be fined and excommunicated from the main caste and society. These excommunicated people were forced to form their own independent group. The rule of endogamy was also functioning within these groups.

According to Ambedkar, the caste system was developed for the selfish mentality of the Brahmins and it has become more irresistible with the help of Manusmriti. He further tries to show that there is no sense of brotherhood here. It has only developed for the self-centered, selfish minded Brahmins for their own self-interest.

Ambedkar strongly protested against the caste system because it was developed in accordance with the hierarchical principle. In this system, Brahmins are at the highest level of society and Shudras are at the lowest level. Here the upper castes of the society enjoy all kinds of social, religious and economic facilities and the lower castes i. e. the Shudras are deprived of all kinds of facilities. Here the work is fixed on the basis of birth and even if there are certain skills and qualifications, the low caste people i.e. the Shudras cannot change their occupation i.e. there is no change in their status. That means there is no place for social mobility here.

According to Ambedkar, the emergence of the caste system in India has not only created a division of labour but also a division of labourers. Because here no person has the right to determine his own occupation. They have to make a certain livelihood at birth, there is no value in skills and qualifications. As a result, the principle of equality and fraternity is not exists here. Social justice could not be established in India as a result of caste system, social inequality exists here.

According to Ambedkar, the caste system has created untouchability in the society, which has created discrimination among the people. One class of people thinks of themselves as superior to another class of people, they hate and neglect the so-called lower castes. Their touch and even the shadows are considered unclean to them. So, the feeling of brotherhood is missing here.

In Ambedkar's view, the emergence of caste system in the Hindu religious social system of India resulted in a lack of liberty, equality and fraternity. Inequality exists in society. Therefore, in order to establish social justice, caste system must be completely eradicated from the society. Therefore, he has struggled all his life to establish social justice in the interest of the Dalits by removing social inequality from the society.

#### **AMBEDKAR'S STRUGGLE FOR SOCIAL JUSTICE:**

There is a lack of social justice in the Indian social system. He realized this in his own life experience from an early age. In his younger days Bhimrao Ambedkar, because of his birth in the 'untouchable' Mahar community, suffered from terrible experiences of upper caste atrocities on him. He was not allowed to sit in his classroom along with his upper caste classmates. He had to sit outside the classroom. He did not have the right to take water from the water tank. Peon gives them water from certain distances. If the peon did not come, they would not get water. So Ambedkar said that 'no peon no water'. He could never enter into any temple of his locality. Nor was he allowed entry into any restaurant, hotel or saloon. He was virtually kicked out from each and every place of his neighborhood. On the pretext of untouchability, he was deprived of the opportunity to study Sanskrit as a second language. As a child, Bhimrao was once going to visit his father in Gurgaon with his elder brother Anandarao. But as they were untouchable; no driver did not agree to take them in their bullock cart

from Padali station to Gurgaon. After much effort, a driver finally agreed to take them for double the fare. Even in college, he had to endure the torture of caste and untouchability. The canteen manager of the college was Brahmin and he also did not give tea or water to him. After acquiring higher education from abroad in 1917, Ambedkar returned to the country to work as a military secretary in Baroda State as per the agreement but here too he felt victim to untouchability. Despite the order of Baroda Raja, no one came to the railway station to greet him. Everybody in his office refused to cooperate with this audacious Mahar. His office boy would not serve him a glass of water; the office peons would throw files to this 'untouchable' from a 'no-touch' distance. Being untouchable, he did not find a place in any Hindu hotel in Baroda and forced to hide his identity to take refuge in a Persian hotel. But even there he had to be humiliated. A group of Persian people found out his real identity (untouchable) and kicked him out of the hotel. The Military Secretary of the powerful Baroda ruler had to pass an awful night under a tree "tired, hungry and fagged out bursting into a flood of tears". Bhimrao was forced to quit his job due to untouchability. After undergoing such experiences, he resolved not to run after any job any more but to join the independent legal profession and that too exclusively for the benefit of the 'untouchables'. But this legal profession did not last long due to untouchability. In 1918 he became a professor at Sydenham College, where he also became a victim of untouchability. At first, the caste-Hindu students did not want to do his class because he is an untouchable. Later, fascinated by Ambedkar's qualities, the students started doing his classes. But fellow caste Hindu professors did not drink water from the same jug with him.

Ambedkar was wounded in the experience of endless humiliation of his life and inhuman torture on billions of people for ages. He involved himself in the struggle to establish social justice for the deprived and humiliated people. He dedicated his entire life to establishing social justice for the Dalits.

Ambedkar's struggle for social justice began in 1919 with a demand for Dalits rights in the Southborough Committee. There he made it clear that there should be separate reserved seats for the oppressed. On January 31, 1920, he published a fortnightly news paper called 'Mooknayak'. In this paper, he highlighted the injustice, oppression, inequality and discrimination against the Dalits by the upper caste Hindu. For the purpose of removing the restrictions imposed on the untouchables, he formed Bahishkrit Hitkarmi Sabha in 1924. Through Ambedkar's efforts, some educational and socio-economic initiatives to help the Dalit community have been undertaken through this association since the beginning of the year 1925. For example, on 4th January, 1925, a hostel was set up in Sholapur for the students of the neglected class. A magazine called 'Saraswati Bilas' was published and a free reading room is set up. Untouchables are also encouraged in sports and formed a 'Mahar Hockey Club'. With these measures Ambedkar wanted to establish social justice for Dalits.

In 1923 the "Bole Resolution" was passed in the Bombay provincial Legislature. According to this proposal, the rights of untouchables are recognized in wells, ponds, bathing ghats, hospices, schools, etc., which are used by the public. But despite this, the upper castes deprive the untouchables of this right, which is contrary to the principle of social equality. So in the year 1927, Dr. Babasaheb launched 'Mahad Satyagrahas' movement against the untouchability. Thousands of Dalit accompanied him in this historic march to assert their rights to take water from Chawdar tank at Mahad. From time immemorial, Ambedkar wanted to build a movement against the Religious Scriptures, especially the Manusmriti, which bounded Dalits in bondage for the sake of religion. That is why we see that on December 25, 1927, Ambedkar burnt a copy of the Manusmriti in public.

Shudras have been deprived of the right to education since ancient times, especially since the time of Manu. In Manusmriti, the Shudra who recites the Vedas or listens to the Vedas is given a severe punishment such as cutting off his tongue and pouring hot lead on his ears, which is against the principle of social justice. According to him, it is not possible to establish social justice without the right of education of Shudras. He therefore placed greater emphasis on the right of education of Shudras in order to establish social justice. Ambedkar realized that no political, social and economic emancipation of the untouchable people was really possible without the education of this people. He formed the 'Depress class Education Society' in 1928 for the purpose of educating the untouchable community. The main aim of this society was to provide free education to the underprivileged class boys as well as girls from the hostel. In 1928, in the interest of the Dalit community, he demanded from the Simon Commission, on behalf of his 'Bahiskrit Hitakarini Sabha' a separate electoral system for reserved seats and separate seats for the oppressed class.

Ambedkar took some initiatives in the interest of the untouchables in 1929 as a member of the "Starte Committee" of the Bombay Government to establish social justice by eliminating inequality and discrimination against Dalits. In his efforts to protect the interest of the untouchable community, the committee submitted a report in 1930. According to the report, since the Hindus of the untouchable community are deprived of proper respect in spite of observing all the rituals of the Hindu religion, they are deprived of access to the temple and are treated like slaves, so this practice is said to be repealed. There was talk to increase the educational

opportunities of untouchable children in schools, to increase the amount of scholarships and provide facilities for vocational education, to set up more hostels for the children of oppressed class and appointing a special officer to look after the development work of the oppressed class. There was also talk of keeping representatives of the untouchables in the societies for lending money in rural areas and keeping untouchables in the police and military departments. In urban areas, untouchable workers were told to build houses at government expense and distribute forest and fallen land among Dalit farmers. All this was possible by Ambedkar's efforts.

Dalits were not allowed to enter the temple which is against the principle of equality and freedom. Ambedkar began a struggle for the right of untouchable to enter in Hindu temples. In 1930 he launched Kalaram Temple movement. The movement was non violent and was for human dignity and self-respect.

At the First Round Table Conference held in November 1930, Dr. Ambedkar made some demands for the Dalit community for their protection against the tyranny and oppression of the caste Hindus. The demands were equal citizenship, fundamental rights, free enjoyments of equal rights, punishment for boycotting of Dalits, their protection against discrimination, adequate representation in the Legislatures and cabinet adequate representation in the services, special departmental care, etc. Through these demands he tried to ensure the rights of the Dalits and establish social justice in the society.

According to Ambedkar, in order to establish social justice, political rights for Dalits must be well-established. At the Second Round Table conference held in 1931, Dr. Ambedkar demanded a separate minority status with right for separate electorate for the depressed class to ensure the political rights of the Dalits. The British Prime Minister, Ramsay MacDonald readily accepted the demand of Dr. Ambedkar and announced it in the Communal Award in 14th August, 1932. But Mahatma Gandhi started fast-unto-death to demand the withdrawal of this communal award. When Gandhi's physical condition deteriorated, Ambedkar was forced to come to a compromise. This settlement between Gandhi and Dr. Ambedkar is known in history as the 'Poona Pact'. As a result of the 'Poona Pact', the number of seats for the oppressed class was increased to 148 instead of 78, but their second suffrage was taken away, through which the Dalits could easily influence the general election.

In 1935, Ambedkar gave up all hope of establishing social justice through Hindu religious reform. He advised the people of his community to renounce Hinduism in the Depressed Classes meeting held on at Yeola in Nasik, on 13 October, 1935. In May 1936, he called a conference of Mahars to discuss the issue of giving up Hinduism and workout an alternative religious setup, where liberty, equality and fraternity are present. In 1935, he publicly proclaimed, "I was born a Hindu because I had no control over this but, I shall not die a Hindu." In his book 'The Annihilation of Caste', published in 1936, Ambedkar spoke of the complete destruction of the caste system in Hindu society. Here he showed that the religious scriptures are the main reason for maintaining untouchability so he spoke of denying the religious scriptures and he expressed his desire to renounce Hinduism.

Ambedkar founded the 'Independent Labor Party' in 1936 to establish the social justice of the untouchable, oppressed and working class of society. He sought the support of the industrial and agricultural labourers who had common interests with the Dalits.

In 1942, Ambedkar formed the 'All India Scheduled Castes Federation' to establish social justice by ensuring the rights of the Dalit class. Session of the 'All India Scheduled Castes Federation' held at Kanpur in March, 1944, he said: "Attempts to uplift my community rather than win the Swaraj for the nation is my goal". Later, he categorically declared: "It is my solemn vow to die in the service and cause of those downtrodden people among whom I was born, I was brought up and I am living". In 1942 he joined the Viceroy's Executive Council as the in-charge of labour affairs. There also he asked for the safeguards and protective discrimination for the Dalits in services and scholarship in education. It is thus evident that Dr. Ambedkar always tried to avail every possible opportunity for gaining rights for

Dalits whenever and from wherever they came.

On April 5, 1946, Ambedkar submitted a memorandum to the 'Cabinet Mission' on behalf of the 'All India Scheduled Caste Federation' to protect the interests of the Dalit class and establish the social justice in society. His demands were (i) to provide adequate representation for Scheduled Caste in all legislatures and administrations at the central and provincial levels, (ii) elections must be held by a separate electoral system, (iii) Adequate financial allocation should be made for the improvement of Scheduled Caste Higher Education in the budget planning at the provincial and central levels.

Ambedkar has long fought for social equality and justice. And as the embodiment of the Indian constitution, he has reflected his struggle in the preamble of the constitution and its different articles. The social, economic and political justice for Dalits, liberty of thought, expression, belief, faith and worship for Dalits, equality and fraternity were ensured in the preamble of the constitution.

The articles of the Indian constitution that play an important role in establishing the rights and social justice of Dalits are discussed below:

**Article 14:** According to Article 14, The State shall not deny to any person equality before the law or the equal protection of the laws within the territory of India.

**Article 15(1)** state that the State shall not discriminate against any citizen on grounds of religion, race, *caste*, sex or place of birth.

**Article 15 (4)** provides for making special provisions for the advancement of any socially and educationally backward classes of citizens or for the scheduled castes and scheduled tribes.

**Article 16** states that there shall be equality of opportunity for all citizens in matters of employment under the State.

**Article 17** state that ‘Untouchability’ is abolished and its practice in any form is forbidden. The enforcement of any disability arising out of ‘Untouchability’ shall be an offence punishable in accordance with law.

**Article 19 (5)** state that the right to freedom of movement and the right to reside anywhere in India may be restricted by the State in the interest of Scheduled Tribes.

**Article 29 (2 )** state that no citizen shall be denied admission into any educational institution maintained by the State or receiving aid out of State funds on grounds only of religion, race, caste, language or any of them.

**Article 23(1)** prohibits of traffic in human beings and forced labour.

**Article 46** state that the State shall promote with special care the educational and economic interests of weaker sections of the people, especially Scheduled Castes and the Scheduled Tribes, and shall protect them from social injustice and all forms of exploitation.

**Article 164 (1)** state that the state of Chhattisgarh, Jharkhand, Madhya Pradesh and Orissa, there shall be a minister in charge of tribal welfare who may in addition be in charge of the welfare of scheduled castes and backward classes or any other work

**Article 330** provides for reservation of seats for Scheduled Castes and Scheduled Tribes in the House of the People.

**Article 332** provides for reservation of seats in state assemblies for Scheduled Castes and Scheduled Tribes.

Article 338 provides for a Special Officer for the Scheduled Castes and Scheduled Tribes to be appointed by the President, whose duty is to investigate all matters relating to the safeguards for the Scheduled Castes and Scheduled Tribes and to report to the President. For the purpose of Article 338, reference to Scheduled Castes and Scheduled Tribes are to be construed as including references to such other backward classes as may be specified by the President on receipt of a report from a commission which may be appointed under Article 340 (1).

**Article 339(1)** state that The President shall appoint a Commission to report on the administration of Scheduled Areas and the welfare of Scheduled tribes in the States.

**Article 341 and 342** provides for identification of Scheduled Castes and Scheduled Tribes so that parliament may by law include or exclude from the list of Scheduled Castes and Scheduled Tribes.

The ‘Hindu Code Bill’ is a shining example of Ambedkar’s establishment of social justice. Ambedkar introduced the Hindu Code Bill in the Legislative Assembly on 11th April 1947. The main objective of this bill was to expand the field of personal law and individual freedom and to ensure the question of equality of men and women in the Hindu social system. But he failed to pass the bill due to opposition from Hindu conservatives, and he resigned from the cabinet in protest.

With long experience he realized that it was never possible to establish social justice within the Hindu religious structure. So at the end of his life, he took the Scheduled Castes with him on the path of conversion. In 1956, he converted to Buddhism with millions of Scheduled Castes, because in Buddhism, liberty, equality and fraternity

exist. So he thought that it was possible to get real social justice under the umbrella of Buddhism. After his conversion Ambedkar said – “By discarding my ancient religion which stood for inequality and oppression today I am reborn.” Thus he has been agitating till the last day of his life for the establishment of social rights and social justice of the untouchables.

### CONCLUSION

Dr. B.R. Ambedkar has fought against caste system and social inequality all his life. He openly campaigned against Brahmanical Hindu ideology as well as against caste system and untouchability. He has struggled all his life to establish social justice in the interest of the Dalits. He has formed various organizations to provide political consciousness among the untouchable Dalit class. His struggle against social injustice continued in the post-independence period. As the main architect of the constitution of India, he has made arrangements for the establishment of social justice through various articles of the Constitution.

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**NATURAL RESOURCE UTILIZATION AND MANAGEMENT PRACTICES AND ASSOCIATED  
RURAL LIVELIHOOD PATTERNS IN THE HILL TERRAIN OF CENTRAL HIMALAYA**

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**ABSTRACT**

*Natural resources are the measuring scale of any region's socio-economic development. The management of natural resources in the mountain environments has emerged as one of the most significant challenges to human understanding and organizational ability in this century. Negative impacts on agricultural productivity and loss in the quality and quantity of land, water and forest resources have, therefore, direct implications for well-being of the rural households who depend on these primary resources for their sustenance. This paper aims to evaluate the present conditions of natural resources viz. land, water and forest in seven micro-watersheds of Western Ramganga River in the Central sector of Himalaya. Rural inhabitants of the study area are directly dependent on natural resources and environment as the mainstay of their livelihood is agriculture, livestock and forestry, or a combination of these. This region provides an excellent example of how misplaced priorities for short term gain and ill conceived development plans result in natural as well as socio-economic problems undermining the sustainability of natural resources, pushing the inhabitants into practices which trigger off processes that catalyze environmental degradations and deplete natural resources. Thus the purpose of this study is to understand how the landscapes have been changing in the region with the changing natural and cultural environment and how human behavior is also changing under shifting socio-economic and environmental conditions.*

*Key words: Central Himalaya, Micro-watershed, Natural resource,, Environmental degradation, Rural livelihood*

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**INTRODUCTION**

Himalayan Mountainous terrains are vulnerable to climate change and variability because of their young and fragile nature coupled with sharp gradients. The rapid change of the ecosystem, driven by both natural and anthropogenic determinants poses unprecedented threat not only to the livelihood of the local people, wildlife and culture, but also to the billions living in the downstream and ultimately to the global environment. Himalayas are geologically young and the environment is fragile. The natural resources in such fragile mountain ecosystem are under severe strain for the past few decades due to their over exploitation for meeting the ever increasing demands for livelihood. Humans have been exploiting the natural resources from the day life originated on earth. They have always overburdened the nature in order to fulfill their ever-increasing demands. All such activities greatly affect the regeneration capacity of any natural system. Land, water and vegetation are the most vital resources for the survival of man and are needed to be managed efficiently. This can best be achieved by employing the concept of watershed management that aims at integrated use of all the available resources including human and livestock on a sustained basis. The creation of database of mountain at watershed level is therefore essential so that proper planning strategies can be made that would contribute to the sustainable development of the area.

This paper is the presentation of a study carried out in seven micro-watersheds of middle valley of Western Ramganga river in the Uttarakhand -a north India state. The present study discusses the resources available in the region and presents the socio-economic conditions of the region. The study clearly shows that in Western Ramganga micro-watersheds, the resource utilization and distribution pattern are responsible for the degradation of the natural resources available in the area. The area has been passing through a very fast process of environmental change caused by various geophysical phenomena and by human actions taken out of ignorance and need. Agriculture and its allied practices (including horticulture, herb production, rearing of animals) are the main occupation of the people. For local people agriculture is the main land use activity and is strongly linked to the forests in providing sustainability. Forest is the second most important resource after land, which provides large quantities of firewood and fodder resources to households.

**MATERIAL AND METHODS**

The study is mainly based upon the collection of primary and secondary data related with the natural resources available and socio-economic status of the study area. At the initial stage two processes have been taken up. First the preparations of GIS map layers and the other a detailed field survey with information gathered at the primary level. All the information collected was subsequently cross-checked by taking personal observations during the field experiments. Simultaneously satellite data has been obtained from the National Remote Sensing



Centre Hyderabad for analysis. Satellite image have been geometrically corrected and LISS III and PAN data sets were merged for better interpretation of resource information. The remote sensing and GIS data correlated with primary level data obtained from the surveys. Base maps including contour, drainage network, micro-watershed boundary and sample village location have been generated in Arc GIS 9.2 with UTM projection and further rectified with satellite image and Survey of India topographical sheet no 53O/5 of the area at scale 1:50000, using the knowledge-based rules for defining the boundaries. Besides, the necessary data and information required for the study have also been collected from the forest maps, cadastral maps and other records. Field data is most important part in this study. Detailed questionnaire for village and household studies has been prepared considering the related information of resources, like natural, human and livestock resources, quality and quantity of resources, distance to collecting resources, awareness of watershed functions, natural resource management, water discharge, quality, supply & consumption, community participation and the future planning etc.

### STUDY AREA

The study area constitutes an important part of the catchment area of the middle valley of Ramganga river in Kumaun Lesser Himalayan range and forms a part of Almora district. It lies between  $29^{\circ} 45' N$  to  $29^{\circ} 53' N$  latitudes and  $79^{\circ} 15' E$  to  $79^{\circ} 23' E$  longitudes covering an area of  $\approx 106 \text{ km}^2$  (Figure 1). In altitude the study area varies from 850 m in the valleys to 1800m in the ridges above sea level. The study area covered 64 villages falling within seven micro-watersheds namely Kanoli, Gagas, Jalali, Chausar, Dhanar, Barjui-Sudhari, and Lamabagar of the middle valley of the Western Ramganga River in Bhikiasain tehsil of district Almora, Uttarakhand. The geographic location and topographic configuration of the micro-watersheds has been selected because of the difficult morphology of this region where most of the monsoon rainfall did not reach due to the rain shadow effect of the mountains. The average annual rainfall experienced in the area is about 800mm. Micro-watersheds has been used as the unit for effective soil and water and forest conservation planning and management. The northern slope is mostly weathered and covered by thick vegetation as compared to the southern slope. The slope plays a great role in the loss of soil and water from the study area and influences its land use capability. Together with the nature and texture of soil, it also determines the erodibility of the soil in the area. The soils of the micro-watersheds are characteristically weathered rocks. The soils vary from shallow to deep. These are loamy to sandy loam and dark gray in colour with moderate to high concentration of pebbles. It has an important bearing on the life and well being of the people of this region.

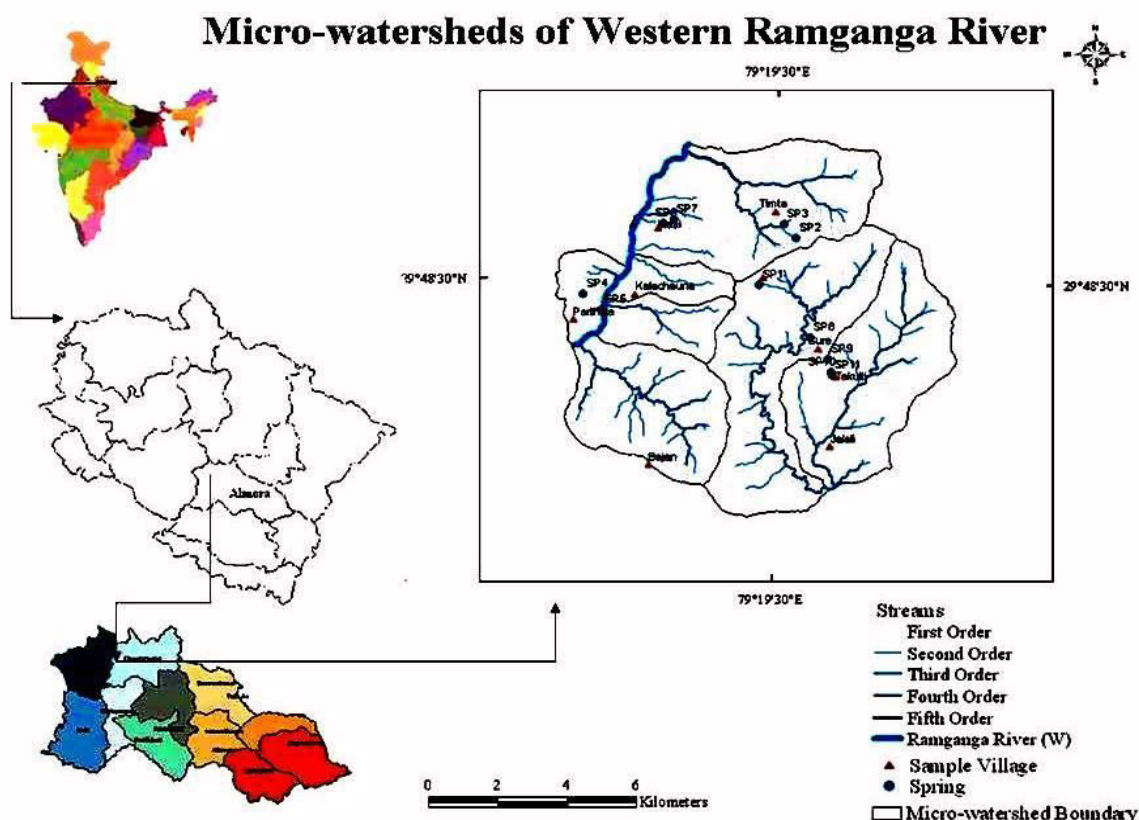


Figure 1: Location map of the study area

The terrain of Ramganga presents a number of geomorphological features of great interest. High relief, fluvial deposits, and interlocking spurs are the important features of the physiography of the Ramganga micro watersheds. The topography has greatly influenced the culture, trade, agriculture and methods of cultivation, irrigation and communication of the hill inhabitants. Dry farming is prevailing on these flat topped ridges.

The watershed enjoys a humid type of sub-tropical to temperate climate often subjected to extremes of weather conditions and experiences moderate to heavy rainfall during monsoon period. The terrain complexity and altitudinal variability supports various temperate, subtropical and tropical species. Chir-pine (*Pinus roxburghii*) is a dominant species in subtropical region largely confined to lower reaches of the micro-watersheds and south facing slopes. Sal (*Shorea robusta*) has a characteristic presence in the lower hills adjacent to the valley area. Because of human and biotic interference, vegetation is poor and far below the desired density of the area in the hill region. All the seven micro-watersheds of study area are endowed with sparse vegetation.

The socio-economic condition of the area is not so good and people are mostly dependent on agriculture. Being a hilly terrain the villages are scattered all around the area in small clusters. The villages lack basic infrastructure facilities and due to this the overall development of the area is hindered. The houses are scattered due to the hilly terrain and without a proper connectivity. A significant number of the villages are inaccessible due to poor connectivity of the roads.

## RESULTS AND DISCUSSION

### Resource Utilization Pattern

A micro-watershed is the smallest natural unit for water conservation and environmental restoration. The study shows that resource utilization pattern in most of the villages is almost same. It is well known fact that the natural rates of soil erosion in mountains especially Himalayas are very high in comparison to those in most other parts of the world (Rawat and Rawat, 1994), due to steep slopes, soil types, land use condition, landslides, earthquakes and other extreme climatic events. Land available for agriculture is in the form of small terraced fields and occupied about 20% of the geographical area. The low return from land has been due to rainfed agriculture, high erosion of top soil from steep slopes, low moisture presence in the soil, marginal landholdings with fragmented and scattered individual fields, migration of male from area, heavy burden of work on women, poor quality of agro inputs especially seeds, lack of knowledge of proper composting and a nonexistent market for small agricultural surpluses. Except for ploughing women do all the jobs in crop production, but they are not entrepreneurs as they can not incur costs or take investment decisions. In the existing farming system food grain production is the main activity and livestock is an important component of farm level enterprises. It was found that some farmers had done very well with organic farming.

The remote sensing data obtained for the micro watersheds from the IRS showed more than 25% of the entire area as barren land with no natural or planted vegetation. Almost half of the barren area has the potential for restoration plantation. Scrub land constituted about 50% of total land. Forest vegetation in pure stands occupies only 7 % of the geographical area. The forest has been degraded and invaded mainly by twisted *Chir Pine* (*Pinus roxburghii*) trees. The pine is mainly responsible for recurring forest fires, caused acidic soil formation and gave little scope for other species to grow. The reduced forest cover, increase in pine trees and frequent forest fires has led to decreased availability of fodder fuelwood, timber, other forest produce and water. Most of the villages are highly dependent on forests for their daily requirements of fodder and fuel, including other secondary forest products like resins etc. The overall socio-economic condition of the villagers is heavily dependent on the nearby forest.

Water availability is a major concern according to local people as well as the results obtained from the long-term observations in all the seven micro-watersheds (from 2002-till now). There are no signs of increasing water availability to date. The reasons for this scarcity are the natural settings as well as inadequate management of the resources in the area. The nature of the Ramganga river has also been changed drastically over the past few decades. The upper catchment area of the river starts from the Dudhatoli forest range. Much of this catchment area is denuded, overgrazed and deforested. This makes the present condition of the whole Ramganga river catchment very critical. The micro watersheds selected for the study are naturally disadvantaged as they lay in a local rain shadow area with an annual rainfall of 800 mm. Although mean annual rainfall quantities remain unaltered, a significant change in precipitation has been observed in the entire study area. A steady decline in the number of rainy days has been observed in major meteorological sites viz. Bhikiasain, Naula, Kedar and Chaukhutia they have experienced more heavy downpours of short duration in recent monsoons. A direct impact of the reduced number of rainy days is the reduced recharge of groundwater. As a result, spring sources are not restored fully during the monsoon and are drying out earlier than in the past.

The recommended national consumption of water per head is about 40 litres as against 140 litres internationally. Against this the highest consumption figure in the micro-watershed is just 25 litres per head. This low availability for consumption could be traced to inadequate conservation, protection and development of water resources, high runoffs, breakdown of the traditional water systems of the area etc. Too much and too little, both issues in terms of water resources are experienced in the study area on an annual basis during the monsoon and the dry seasons, respectively. While villagers have learned to cope with seasonality of water availability in the past, new pressure on water resources with decreasing water availability have threaten livelihoods, particularly in the upland villages. The root causes of this crisis can be attributed both to human and natural factors. Insufficient water for irrigation has been cited as the main problem, closely followed by drinking water shortages. Singh and Pande (1989) also report water scarcity due to drying up and decreasing yields of springs in the Kumaun Himalayas. They mainly held the degradation of the natural oak forests responsible for this process. Negi and Joshi (2002) identified drinking water as a major problem in the Central Himalayan region. Potable water is a very urgent need of every village in all the seven micro-watersheds of the study area. Water is generally scarcer in the ridge villages which have fewer water sources.

In the entire study area the impact of environmental degradation has been found in the worsening condition of the soil, low agricultural productivity, vulnerability to crop failure, out migration of male members in search of jobs, growth in women headed households and in the added burden on women of domestic and farm work to maintain the household. In addition the traditional responsibilities of women to fetch fuel wood, fodder, and water has also taking more time having an impact on the care they could give to their families. In this context the challenge is first to mobilize and organize the people in all 64 villages, situated in the seven micro watersheds.

The isolated and small clustered settlements of the area often compelled people to live in extreme isolation. They faced drudgery, poverty, and underdevelopment which further increased with depletion of natural resources on which the life of the people depended and created tough competition for survival of each and every individual. In the study area natural resources degradation, drudgery and poverty has been linked together through many strands that emerge out of and flowed into each other. These together impacted on land, water and forest and affected the lives of people living among them. The external manifestations in the area are;-

1. Decreased availability of forest resource.
2. Scarcity of water.
3. Low returns from land and inadequate livelihood support.
4. Poor availability of fodder.
5. Poor protection and conservation of natural resources due to increased frequency of forest fires, grazing, grass cutting and also problems of ownership and accountability.
6. Inability of local people to manage natural resources sustainability.

The interrelationship of natural resources with human resources affected the quality of life as well as the quality and sustainability of natural resources in the region. In the seven micro-watersheds of the study area the human resource situation has been characterized by;-

1. Disintegration of families.
2. Competition for survival on natural resources.
3. Conflicts-clashes and quarrels over use of natural resources.

#### **NATURAL RESOURCE RESTORATION AND MANAGEMENT**

The environmental issues and concerns noticed related primarily to the three main determinants of the immediate environment of the study area i.e. land water and forest. All the micro-watersheds have been degraded by erosion of the top soil thus reducing capacity to hold soil moisture and regenerate the bio diversity of the area. The soil of the agricultural terraces also yielded little. For improvement of the land it is necessary to check soil erosion through contour trenching, slope improvement, bunding, physical and bio engineering measures as well as various kinds of plantation (Fig.2). Staggered contour trenches can help to check the velocity of water, aided percolation and also trapped precious fertile top soil which washed away during the rains. The layout of the staggered contour trenches enabling trapping of silt across the slope. Plantation of grasses can be done on and around the staggered contour trenches to minimise soil erosion. Bio engineering measures comprising plantation of grasses, shrubs and bushes as well as promotion of natural regeneration are

recommended across the micro-watershed areas especially in the most denuded and eroded areas after careful selection and planning (Fig.3).

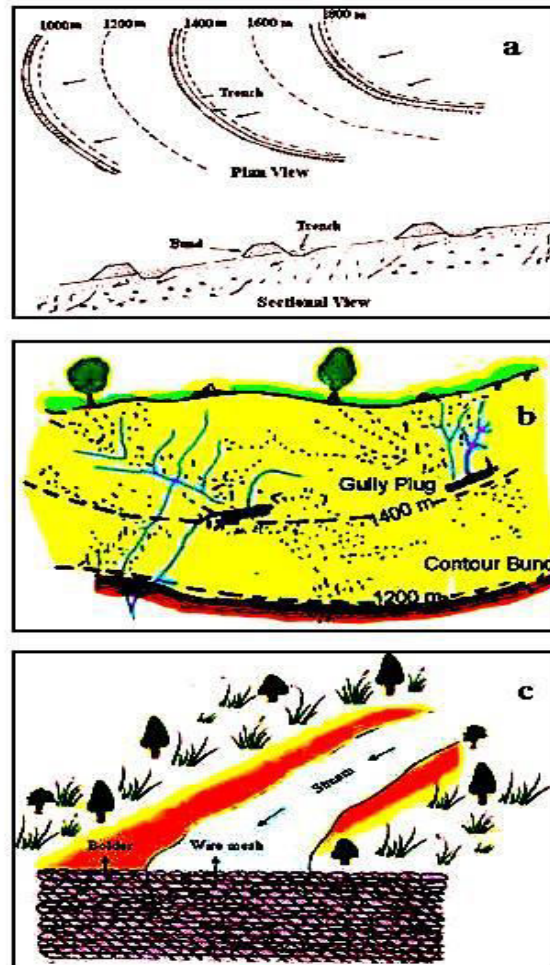


Figure: 2 Natural resource management practices a. Schematics of contour trenches and bunds b. Gully plugs and contour bunds c. Gabion structures



Figure: 3 Water recharge structures constructed in the study area (check dams and contour trenches)

The forest in the micro watersheds falling within the study area consisted of genetically poor, degraded and twisted pine. Some measures can be practiced to improve the forest condition on private lands and community lands which consisting thinning of the pine through trimmings, this can be done for three major reasons : to control fire, to control acidity of the soil, and to allow sunlight for undergrowth shrubs and grasses. Mixed indigenous species of trees preferred by the village people can be planted by the villagers themselves and protected through village community decisions



Ridge to valley approach can be adopted for soil and water conservation as well as afforestation programme. Great efforts are needed to identify well-adapted land use systems that do not degrade the natural resources and that provide a basis for the livelihood of people. To overcome these problems, rehabilitation of degraded lands or wastelands in the area is one of the potential options for natural resources conservation and management. Experiences in ecological restoration of degraded community lands in the region are limited and the ongoing alterations in the human and natural environment urgently demand the generation of effective land and water management options with people's participation as a prerequisite (Kothyari et al. 1991; Ramakrishnan et al. 1992; Kothyari et al. 1996).



Figure: 4 Water percolation and storage structures-Khal (a-Kalachauna,c-Parthola), Pond (b-Bajan), Tank (d-Dangarkhola) built by INHERE under Gramya scheme

For water conservation, earth trenching and bunding, repair and renewal of old water harvesting structures, construction of new structures, and plantation in micro-watersheds could be taken up with the help of people in the big way in the micro-watersheds. Rain water harvesting tanks could be made on a household basis for high altitude ridge villages where water scarcity is very high during peak summer days and hence which faced a bigger problem of drinking water. Water flowing with great velocity over the steep slopes and terraced fields needed to be checked first. The check on the velocity of the water began from the ridge areas. Near the top, the small drains and rills can be checked at every step by constructing simple stone check bunds and gabion structures placed closely or spaced out as per need dictated by the slope of the land. Staggered contour trenches, percolation and earthen storage structures can be constructed on the suitable locale for temporarily storing of the water for seeping purpose and allowing soil to consume as much water as possible. These measures (Fig.4) have been practiced in the area by a non-governmental organization INHERE (The Institute Of Himalayan Environmental Research And Education) under the project for environmental restoration and water conservation in Central Himalayan region in the partnership with ICEF (India Canada Environmental Facility). During the project implementation the total amount of water conserved through the collective measures accounted for 852.21 lac litres in each rain. Excess water has been diverted to the earthen percolation as well as storage tanks. These physical measures alone brought fast changes in the area by allowing the biomass to regenerate faster. Across the side of the hills, staggered contour trenches which broke the flow of water and trapped soil at every step can be dug. Plantation of a variety of endogenous species across the hillsides can be done to check both water and soil. At the next level loose boulder check bunds gave way to stronger wood and stone structures to contain the momentum the water is gathering on its way down. The material used for the construction of such innovative checks available at hand viz. the wood of densely growing stunted chir pine trees on site. These checks ofcourse have a short life. As the rills widen into streams and the streams get broader, the check bunds have to be made stronger and are reinforced with stone and cement masonry only.

## MITIGATION STRATEGIES

It has been well accepted that the mountains can be sustainably managed through approaches that recognize the linkages between ecosystem and societal processes (Butt and Price 1999). The inhabitants of the area which uses the natural resources has the biggest stake in its conservation and management for sustained use over

generations. The villagers need to be empowered with a vision, mission, structure and system for sustainable management of their natural resources. The major cause at the present time for the miss management of the natural resources is the unorganized nature of the community living in isolated and scattered settlements and competing with each other for survival. Poor resource utilization is also the result of lack of opportunities for productive and paying on form or off form activities and alternate income generation options. The sectoral problems of the area have been visualized during the study. Coping with multiple geo-environmental induced stresses requires both long-term planning and short-term adaptive measures. There are number of factors, which have been damaging the forests and agro-ecosystem and subsequently degrading the total ecological processes. There is a need to make people aware of their negligence towards forest fires. They should be made aware of the deadly consequences of degradation of the forests. The deforestation of slopes impairs the water regime in the surface layers and thus contributes in slope failure and landslides. In the Central Himalayan region, the failure of afforestation and reforestation efforts on degraded land, is attributed to wrong policies, which ignore people's essential needs and hence leads to their non-cooperation. Success or failure of soil and water conservation measures or land management practices in a wider context does not only depend on technical appropriateness and applicability. It has been particularly useful to organise farmers' exposure visits to areas with some successful experience in collective action, effective byelaws, and adoption of natural resource management technologies. It has been found that this process has been very useful not only for exposing farmers to innovative natural resource management technologies, but also for building their confidence and capacity to engage in policy dialogue with other stakeholders. Families with limited access to livelihood options and directly dependent on natural resources are more vulnerable than others. If farming livelihoods are to be protected, then alternative farming practices are urgently needed that help to conserve water, soil, and fertility in this marginal and fragile environment. Technologies are available but many farmers have not adopted them in spite of their demonstrated effectiveness in reducing runoff, controlling erosion and improving soil fertility. Nevertheless, farmers are not unaware of the problems they face. The key element to successful development is the participation of farmers at all the various stages of technology development. This involves finding ways of bringing together farmers' local knowledge and practices with the scientists' knowledge and findings to develop appropriate land, forest and water management practices.

## CONCLUSION

In the search for natural resource management solutions and improvements, consideration needs to be given to the fact that the conditions are not static; therefore this search is a continuous process that needs continuous adaptations to the changing environment. It is concluded that as the highland region is prone to environmental disasters, human activities need to be controlled, also there is a need of community participation in natural resource management. This is a process that needs continuous commitment of development institutions and research. Thus durable solutions need to be flexible and adaptable. Though there is no fool-proof approach to address these inherent challenges of mountain people, an approach built on both local knowledge and modern scientific findings would probably offer the best answer. Community-based geo-environmental adaptation planning is one such approach that identifies local knowledge and skills relevant to address climate- induced challenges and seeks to supplement the knowledge with contemporary scientific information and tools.

## ACKNOWLEDGEMENT

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**USE OF MATHEMATICAL SOFTWARE FOR TEACHING: A CASE STUDY OF DISTANCE LEARNERS OF UNIVERSITY OF MUMBAI**

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**ABSTRACT**

*The free and open-source software (FOSS) in Mathematics like LaTeX, Geogebra, Scilab are very useful in communicating various concepts to the learners in a very simple and yet effective way. They facilitate experiential learning and allow learners to explore the mathematical concepts in an innovative way. Mathematics educators have been exploring the use of various mathematical software at undergraduate and postgraduate levels. This study is focussed on use of FOSS like Geogebra, Scilab and LaTeX for undergraduate learners of Information Technology program and postgraduate Mathematics learners of the Institute of Distance and Open Learning, University of Mumbai. The thought behind this paper is to highlight the advantages of introducing mathematical software to the learners from mathematical education perspective. The paper highlights the challenges faced in implementation and the success stories post implementation.*

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**INTRODUCTION**

In the past two decades, mathematical softwares has made the mathematics education interesting and engaging. Teachers are being trained to use these softwares for classroom teaching as well as for laboratory experiments giving learners a first-hand experience to learn various mathematical concepts, which otherwise would have been quite difficult to visualise. From basic calculator to scientific calculator and 2D graph plotters to 3D dynamic softwares and mobile based applications, a lot has been added to mathematical pedagogy. The abstract concepts of higher mathematics, algebraic and graphical view of many concepts, deep learning, creativity, and participative learning are few outcomes of such exposure to learning with softwares. Technological tools like MATLAB, GeoGebra, SciLab, Wolfram Alpha, and others evolve every day to provide better content, power and efficiency at the time of plotting or manipulating mathematical content [2]. In India, this blend of technology with classroom teaching has been very slow as compared to western countries. Most of the elite institutions, colleges and universities could afford proprietary softwares. With the advent of Free and Open Source Softwares, it broadened the spectrum of use of such softwares in teaching-learning of mathematics. Here we see an experiment of bringing two such softwares into curriculum as a part on innovative step for internal assessment of postgraduate distance learners of University of Mumbai.

**BACKGROUND OF THE EXPERIMENT**

The Institute of Distance and Open Learning (IDOL), University of Mumbai has been offering MSc (Mathematics) program for past more than three decades. Being a rigorous science program of the university and syllabus, assessment equivalent to the regular learners, the distance learners used to find it difficult to successfully complete. As the university entered credit system in 2015-16, internal assessment was introduced for regular learners. At the IDOL, deliberations started on whether to go for internal assessment or not, due to huge number of enrolments in all postgraduate programs. The Science faculty head, took this as an opportunity to introduce internal assessments to give some added benefit to the distance learners. Simultaneously, it was thought to make this innovative. The author of this paper, thus by formally taking permissions from authorities concerned, introduced GeoGebra and LaTeX as a part of internal assessment. It was quite difficult initially to convince the authorities and the learners about this implementation. But sooner it was appreciated by all, and outcomes are a part of this paper now.

**ABOUT GEOGEBRA & LATEX**

The underlying concepts and proofs of many mathematical concepts involve difficult and abstract ideas that present a mountainous obstacle to many students [3]. A simple thing like exploring a function and building its graph is found difficult using a graph paper for many learners. But making them do the same, say using a graphing calculator, gives undeniably positive effects [4].

Geogebra, a combination of **Geometry** and **Algebra**, is a dynamic mathematical software. It has a web-based site as well it is available as a mobile application working on Android and iOS operating systems. This makes it reachable to all type of learners. Geogebra can be used for all levels of learners, right from school to undergraduate to postgraduate learners. Various concepts from mathematical areas like abstract algebra, geometry, statistics (using spreadsheets), 2D/3D graphing, calculus, complex analysis can be easily visualised and demonstrated using Geogebra. The dynamic nature of the software makes it powerful tool for demonstration and illustration of mathematical concepts. Learners can create applets of Geogebra and dynamically showcase



concepts. A few such can be seen on the Geogebra website itself as tutorials. Being a FOSS, the Geogebra has a very vibrant and active community, making it easy for learners to understand and grasp the technical aspects of using Geogebra.

LaTeX, is a mathematical typesetting software which also comes from FOSS family. It is used for mathematical technical and scientific writing. Typing mathematical symbols, equations in MS Word is quite tiresome work for math educators as well as research students. All the formatting work and the mathematical symbols, equations, footnotes, bibliography, indexing, hyper-referencing, becomes very easy to type and moreover the font looks aesthetically good as compared to MS Word.

IIT-Bombay's spoken-tutorial project hosts more than dozen video tutorials explaining the basics of use of Geogebra and LaTeX like softwares. These tutorials were used to train the learners for use of both the softwares.

### INTRODUCING GEOGEBRA AS INTERNAL ASSESSMENT

Every year, in the beginning of the academic year, IDOL organises an induction meeting of the learners to introduce them to the working of distance education, counselling sessions, syllabus and examination scheme. For the 2016-17 batch of MSc (Mathematics) learners, in addition to routine announcements, was the announcement of internal assessment of 20 marks. It was communicated that two mathematical softwares Geogebra and LaTeX, will be introduced and projects based on these two softwares will be counted as internal assessment. Initially there was a resentment from the learners, but gradually it was accepted and successfully implemented.

Most of the distance learners are high school teachers, who pursue their higher education for enhancing their career opportunities. This was one of the reasons of the gradual acceptance. Out of 98 feedback responses, a huge majority of 76 learners accepted that learning Geogebra was useful for them as it enhanced their learning of mathematical concepts indirectly. The following was introduced in the Geogebra tutorials:

1. Lines, conics, polygon, angles
2. Slider, image, text addition, radio button
3. Probability distribution, spreadsheets
4. CAS
5. Calculus

For the training purposes, IIT-Bombay's spoken tutorial web-based project was used. Learners were asked to register on the website and learn through the video tutorials about the various features of the software. Learners could learn the basics in a self-paced manner and explore, experiment individually as well as in groups in a comfortable manner.

The learners were given tasks to create Geogebra applets based on the above five areas. As a part of final evaluation, 5 marks for applet and 5 marks for theory MCQs was decided. 74 out of 98 scored more than 75% in the internal assessment of Geogebra. Feedback was taken from the learners on completion of the assessment.

Some of the important applets which were demonstrated on Geogebra were are follows:

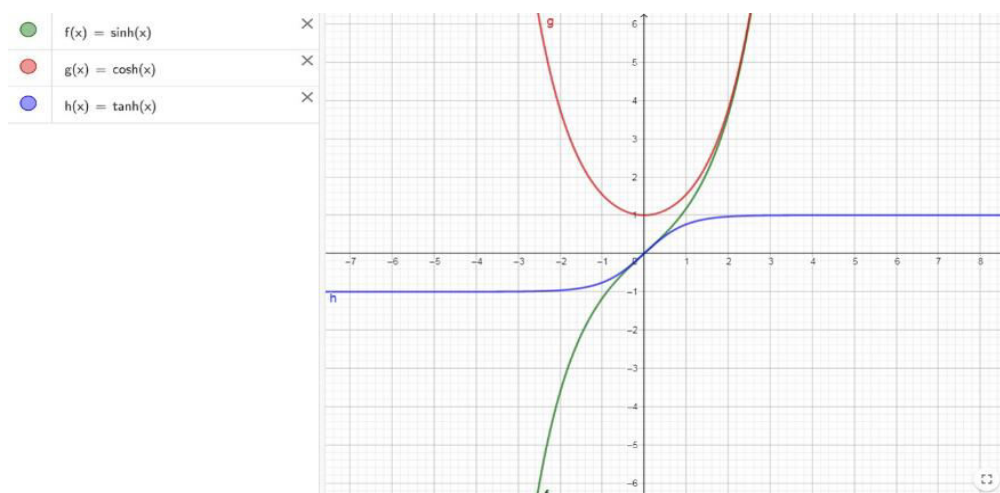


Fig 1: Hyperbolic trigonometric functions

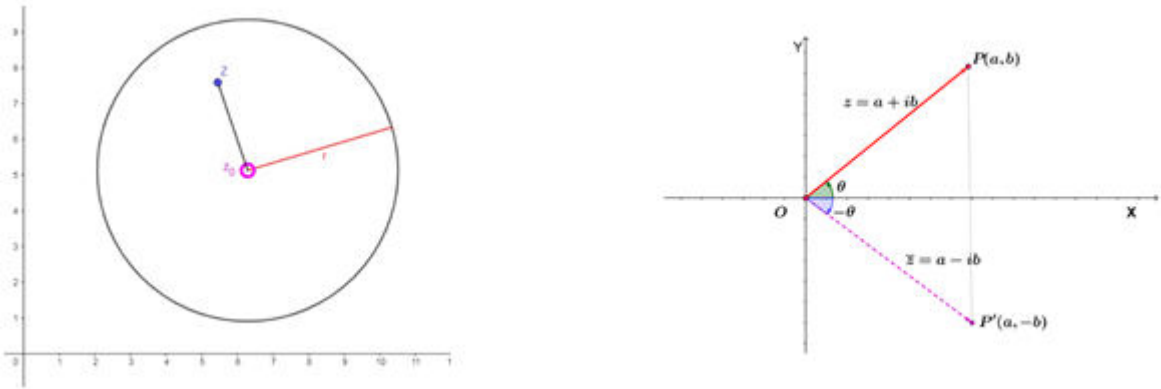


Fig 2 : Complex Numbers

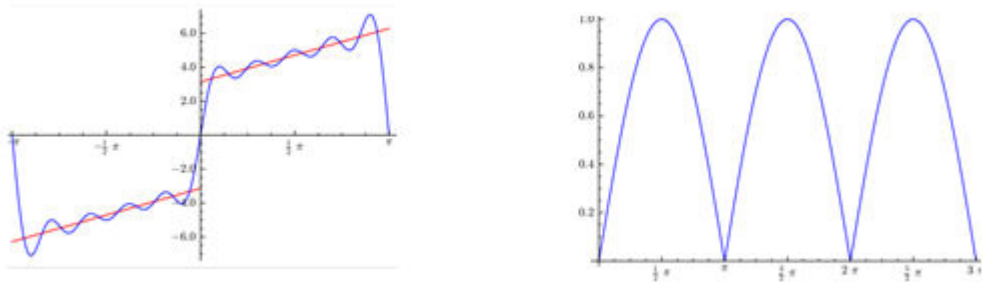


Fig 3: Fourier Analysis

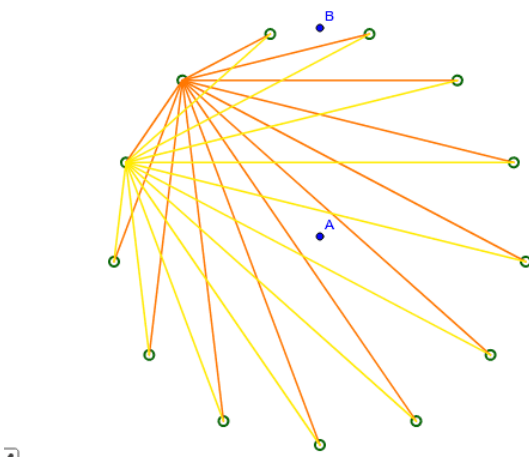


Fig 4: Combinatorial Problems

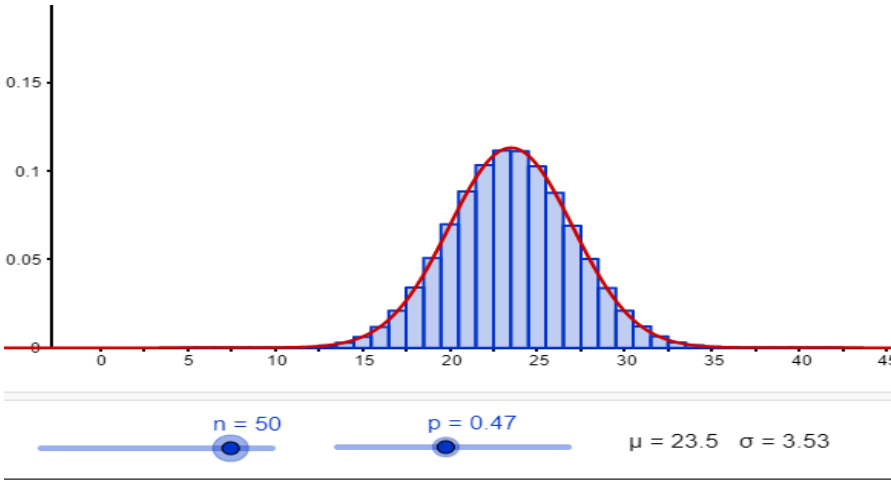


Fig 5: Probability Distributions using slider

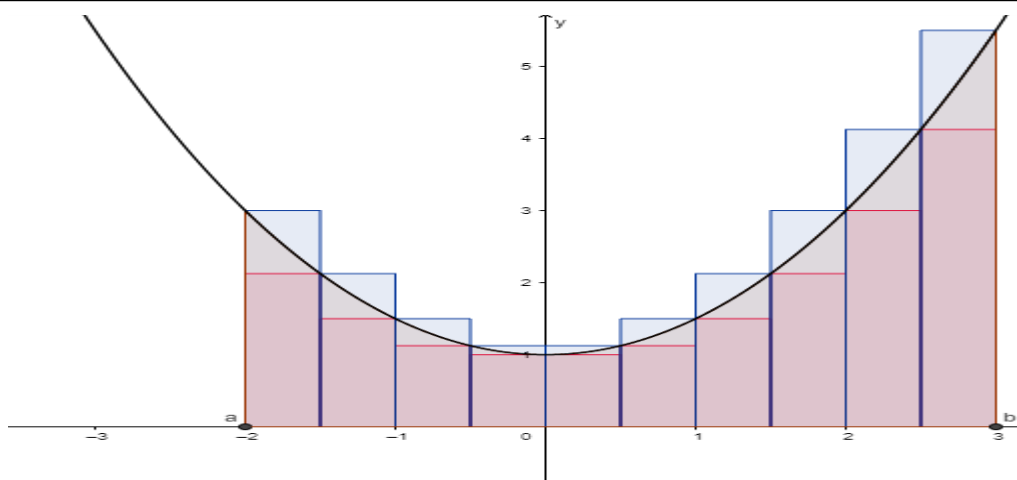


Fig 6: Real Analysis

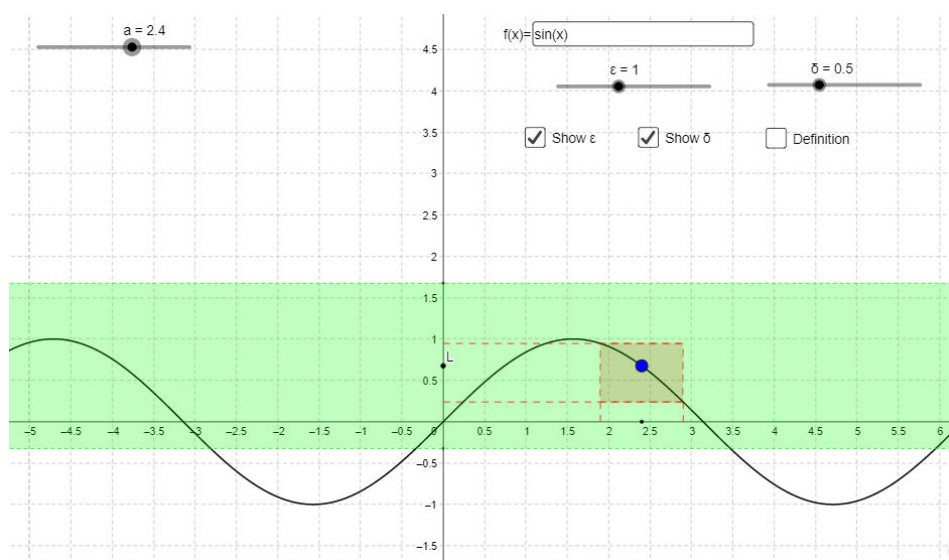


Fig 7: Epsilon-Delta definition of Limit

An open-ended question enquiring about benefits from the introduction of Geogebra software received the following summarised responses:

1. Helped understand concepts like limits, continuity in calculus easily.
2. Helped exploration of concepts.
3. Enjoyed the animation using slider feature.
4. Useful for demonstration of concepts through dynamic environment.
5. Self-paced learning supplemented by spoken tutorials.
6. Simple and robust interface making learning interesting.
7. Drawing graphs has become easy and animations on graphs by changing variable values makes the concepts clear.
8. Increased the participation of learners in my maths class.
9. A few of the learners with math phobia gained interest in learning maths.

The learners were also asked about the limitations they experienced on making this software a mandatory internal assessment component. Following are the summarized responses:

1. Approximately 12 % of the total responses i.e. 11 learners responded lack of desktop/laptop as major limitation to complete the tasks given.
2. Not comfortable with technology was recorded by 14% of learners.

3. Non-availability of time to complete the tasks was recorded by 11% of learners. The distance learners are basically employed people. Hence 11% was a satisfying number.

4. Hands-on training would have been more helpful was reported by approximately 22% of the learners.

### **CHALLENGES AND OPPORTUNITIES FURTHER**

Looking back at the experience which we had in implementing this innovative thought of integrating mathematical softwares in the curriculum as a part of internal assessment, the following challenges were observed:

1. Giving hands-on training to all the learners in a lab environment physically.
2. Ensuring availability of infrastructure and hardware requirements at the learner's end.
3. Convincing the administration and learners about the utility of integrating mathematical softwares as a mandatory component.

This experiment also eliminated one of the major hurdle in public universities regarding use of technology and softwares for mathematics teaching-learning i.e the proprietary softwares. Since we used softwares falling under the FOSS category, getting permissions from the higher authorities to purchase costly softwares was not required. Moreover, FOSSs are easily accessible and enjoys a huge online community for all kind assistance. The opportunity here is that all such FOSSs can be introduced in the mathematics curriculum to optimise the learning experience of the learners. Teacher's training would be an added advantage to institutionalise the use of mathematical softwares in not only distance education but also for regular mode learners. Blended learning is the near future. Hence, use of FOSSs as a pedagogical tool should be encouraged to make learning mathematics interesting, engaging, and joyful.

Based on experience gained from this innovative experiment, it is recommended that mathematical softwares, in general and FOSS like GeoGebra, LaTeX, SciLab should be introduced formally in undergraduate and postgraduate curriculum of mathematics. Research on the impact of mathematical softwares, education technology pedagogy in mathematics, performance enhancement analysis should be done to scientifically test the importance and usefulness of such softwares in teaching-learning of Mathematics.

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**REPRESENTATION OF ADIVASIS IN BOLLYWOOD: A MYTH OR A REALITY ?**

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**ABSTRACT**

*Films have a great power in moulding our views and opinions especially in a short period of time. Today when Bollywood is accessible to even a person living in remote part of India, as television becomes a daily part of life, it is important to analyse how Adivasis are being shown in popular movies. This paper tries to analyse and find some common patterns in most mainstream movies that have characters belonging to the Adivasi community.*

**Keywords:** Tribal, Adivasi, Bollywood, Indian Cinema, Orientalism

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**1. INTRODUCTION:**

The present times can be called an age of media because of the amount of power media has in changing and forming powerful narratives in society. Earlier, print and television media were doing this but with the advent of the internet, access to content has become a lot easier than before. In such times, it is impossible to ignore the effect that cinema would have on forming a certain image about the manner in which they portray different sections of our Population. In the case of India, Bollywood has a very strong presence and it occupies a very intimate and consistent presence in the lives of Indians.

This presence gives Bollywood great power over the minds of people. Therefore, in this context one can look at how the Indigenous people of India have been represented through decades. Representation in media is an ongoing exercise that builds people's ideas, beliefs, values and images. Upon a deeper analysis of films, it starts to become somewhat apparent that there is a pattern in most films made in Bollywood. It turns out to be the torchbearer of this entrenched stereotyping, sometimes intentional and at other times, even with good intentions, they end up stereotyping or marginalizing Tribal voices in the entertainment sphere.

This paper aims at analyzing some selected movies in Bollywood with Tribal characters and finding out films create an image of ethnic minorities like the Tribal people in India.

**2. RESEARCH DESIGN:**

**Aim:** This paper aims to showcase how Tribals in India have been continuously misrepresented in Bollywood through stereotyping or vilifying through ill-written characters or the plot of the movie.

**RESEARCH OBJECTIVE:**

1. To point out the pattern in mainstream Bollywood Movies and lack of authentic representation of tribals.
2. To understand the background of the tribal Identity and their presence in India
3. To analyse how the conventional understanding of good, bad and beautiful affect tribal representation in Bollywood
4. To look at how the tribal identity has been dealt with in movies like Chak de India, 3 Idiots, Baahubali, Raavan, Mary Kom and examine whether Orientalism is at work here.

**RESEARCH METHODOLOGY**

The paper uses a qualitative methodology and adopts a content analysis approach to reach its objectives. The use of secondary sources such as journals, articles and movies has been done.

**3. WHO ARE THE TRIBAL PEOPLE OF INDIA?**

The word Tribal was coined by the Britishers when they colonized India. They used this term for all those tribes in South Asia which has a remote habitation and a 'backward' way of living life. The term Adivasi is used as a synonym to tribe and comes from two words – 'adi' meaning primitive and 'vasi' meaning living in an area from before the arrival of the Britishers. There are certain features of tribes such as a social group having a fixed territory, having no special functions and ruled by a hereditary tribal man from among the clan, and having one common language, traditions and belief systems. They have a common name and also follow some taboos around concepts of marriage and professions to be practiced.

The term 'tribal' was used by the colonizers in such a way that it absorbed all the communities that these colonizers thought were the same just because they appeared uncivilized or primitive to the eyes of the colonizers. After Independence, the constitution of India gave them a new name. They were now known as

Scheduled tribe(ST). This became an administrative term and was to be used for ‘administering’ various privileges, protection and benefits that the constitution envisaged for them. At present almost 8.6% of the population consists of STs as per the 2011 Census.

Today, the reality of the tribal people of India is not being represented with truth in Bollywood. Despite several efforts, movies still shy away from delving deep on the tribal question. This is indeed sad especially because its been more than 100 years now since Bollywood was born. Let’s look at some examples that show how through movies the tribal end up being marginalized again.

#### **4. THE TRIBAL IMAGERY BY BOLLYWOOD AND ITS UNDERLYING STEREOTYPES:**

There is a rigid view of Bollywood that we have as consumers and it is hard to accept unconventional movies. The commercial Cinema that Bollywood produces knows this and feasts on it to gain crores in profit. Therefore, what is often seen is that a level of exploration required to reach critical and analytical portrayal of Adivasis does not happen in Bollywood often. Even though popular Bollywood Cinema has unparalleled influence in India, the representation of Adivasis is bordered on the lines of typecasting and stereotyping.

The 1972 Dev Anand and Sharmila Tagore starrer ‘Yeh Gulista Hamara’ portrays Adivasis in a ridiculous manner as a savage community to make the audience laugh. Similarly, in the movie ‘Khushnaseeb’ starring Padmini Kolhapuri in the role of a tribal woman, shows them hunting and wearing clothes that just conform to the mainstream view of tribals as savage beings. In more recent times, we can take the example of ‘Baahubali’ (2015) which showed the tribal clan as an evil group of people and made them villains. There are movies which place tribal characters in the modern times but yet again fail at showing a realistic portrayal of them or giving their character barely any substance. The effect of post colonial and orientalist mindset keeps showing up in the way these characters are written.

In ‘Chak de India!’(2007) there are four Adivasi characters namely, Mary Ralte, Molly Zimik, Rani Kispotta, and Soimoi Kerketta. They are shown as not being able to speak proper Hindi and are on the side lines of the movie. Considering the fact two of these characters are shown to hail from Jharkhand, its funny that they are shown unable to speak Hindi just because they belong to the Adivasi community. Then we have the classic case of outsider view to Adivasi world in ‘Mary Kom’ when instead of casting someone from the community, they show Priyanka Chopra instead. In ‘3 Idiots’ we come across the character of Phunsuk Wangdu who is based on the life of real life tribal from Ladakh called Sonam Wangchuk. However, the makers don’t even attempt to focus on his tribal identity and it is conveniently white washed in the image of commercial Bollywood cinema.

There are innumerable instances of movies where Adivasis are painted with the same work out stereotypical features for example, having dark skin, being unable to communicate well or comprehend social rules, having loose ideas of decency and hygiene. Such movies harm the image of Adivasis because they either depict the tribal people as illiterate, irrational beings or end up reducing them as exotic beings, sometimes even to an extent that fetishizes Adivasi women as wearing barely any clothes and just being a prey in the hands of powerful villains who rape them.

Upon a deeper analysis of movies it can be seen that the Adivasis are shown in popular Hindi cinema as a separate ‘Other’. This kind of sentiment robs Adivasis of a respected and valuable place in society. The Adivasi image and the narrative that surrounds them is dominated by people who do not belong to their community, thus keeping it limited to an outsider’s perspective. When an entire section of the population is either rendered invisible or romanticized to the extent that reality gets subdued, it harms the social development of Adivasis too. Phrases like ‘Jhingalala Hur hur’ coupled with the made up dance and rituals harms the image of Adivasis. Due to decades of such picturisation, the general public has internalized such an image of Adivasis and therefore when they come across citizens who belong to the ST community, they are discriminated against.

#### **5. CONCLUSION**

Whilst analyzing this one needs to remember the warning of Nigerian writer Chimamanda Adichie in her TED Talk ‘Dangers of a Single Story’. She says: ‘The single story creates stereotypes, and the problem with stereotypes is not that they are untrue, but that they are incomplete. They make one story become the only story. . . The consequence of the single story is this: It robs people of dignity. It makes our recognition of our equal humanity difficult. It emphasizes how we are different rather than how we are similar.’

Representing Adivasis authentically is important not just for their own well being but also for the rest of the population that watches such movies. Forming stereotypes helps none and when it exists for too long, it often seeps into policymaking as well. It shows up in the government trying to ‘humanize’ the tribes, thereby robbing them of their unique identity. Keeping Adivasis on the fringes by such abysmal lack of representation in

popular media makes us gain nothing and we end up missing out on the intellectual and cultural vibrance that they might have to offer. Therefore, it is extremely important for movie makers, especially the ones in Bollywood to not be blind to these issues.

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**STUDY OF TARGET MARKET STRATEGY OF TELECOM SERVICE PROVIDERS FOR RURAL MARKET**

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**ABSTRACT**

*Indian telecom industry has been contributing to India's GDP at large. This is evident from the fact that India added 225.02 million new customers in 2011. The India's cellular growth is 37 % in 2011 with average of 6 million customers added every month. Telephone service providers are translating into 771.82 million mobile, accounting for a tele-density of around 84% by 2014. The telecom sector has generated revenues worth US\$ 52 billion in 2012-13. Telecom industry in India started in a phased approach. Privatization was gradually introduced, first in value-added services, followed by cellular and basic services. Against this background, the present research paper analyses the target strategy used by Telecom Service Providers in rural markets in India.*

**Keywords:** Rural marketing, cellular, telecom, distribution.

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**INTRODUCTION**

There are three forces--**Telecommunication, Information and Globalization**--are restructuring every aspect of business and society. Telecom professional is the key players in this transformation. They play a crucial role as leaders in the changing dynamics of global communications, internet working, e-commerce, mobile & wireless communication strategy.

In the modern age of convergence and fusion for telecommunications, telecommunications, broadcasting and information technology has resulted in amazing discoveries. Voice over IP, television web casting over Internet and video on demand is a reality. Telecommunications is a key to modern economy infrastructure. Telecommunications link with computer provide Information Technology, which is the most dominating technology of today as it influences the entire spectrum of the economy. Telecommunications is significant for economic development since 1% increase in telephone density leads to a 3% increase in the GDP, bolstering economic activity.

Today the networks and companies will no longer be categorized on the basis of only voice, data or video services they provide. They have to become info-communications companies providing a bundle of services. The benchmark for any country's communications infrastructure is not teledensity anymore; it has been replaced by *per capita bandwidth*. This is relevant to today's scenario for India as it wants to capture a sizable global market share within businesses which manage knowledge and information including offshore call centers, medical transcription and transmission, back office operations providers and others.

**LITERATURE REVIEW**

**Cygnus Business Consulting & Research Pvt. Ltd. (2008)**, in its "Quarterly Performance Analysis of Companies (April-June 2008)" has analyzed the Indian telecom industry in the wake of recent global recession and its overall impact on the Indian economy. The analysis is done in the background of wake of global recession and rising inflation. Cygnus estimates, the Indian telecom industry is expected to maintain the growth trajectory in the next quarter as well. With almost 5-6M subscribers are being added every month, and the country is witnessing wild momentum in the telecom industry.

**Bhattacharya (2000)** constructs a vision of the Indian telecommunication sector for the year 2020. The paper aims at isolating agents of change based on international experiences and situates India in the development continuum. The agents of change have been broadly categorized into economic structure, competition policy and technology.

**Vrmani (2000)** estimates the contribution of telecommunication (or telecom) services to aggregate economic growth in India. Estimated contribution is distinguished between public and private sectors to highlight the impact of telecom privatization on economic growth. Knowledge of policy determinants of demand of telecom services is shown to be essential to enhance growth contribution of telecom services.

**Dey (2004)**, in her article talks about the discussions between the Federal Communications Commission (FCC) and communications policy makers and regulators in other countries and how they have gleaned several clusters of issues where further research would directly benefit them. Recently, there have been two notable shifts. First, as the acceptance of the competition model over the monopoly model for telecommunications markets takes



deep effect in regulators all over the world, questions regarding process and procedure for regulation are becoming ever more urgent.

**Mr. Banka (2006)** gives an overview of the mergers and acquisitions in the telecommunication industry. According to him Governments decision to raise the foreign investment limit to 74% in 2005 is expected to spur fresh rounds of mergers and takeovers in India. He foresees a sector that represents humongous opportunity waiting to be tapped by Indian and foreign conglomerates.

#### OBJECTIVES OF THE STUDY:

1. Find out various **product development** strategies.
2. Find out various **pricing strategies** adopted by telecom service provider.
3. Find out **distribution models** used by various telecom companies.
4. Analyze **sales promotion schemes** adopted within telecom sector.
5. Analyze **advertising tools** used within telecom sector.

#### SCOPE OF RESEARCH:

1. This research provides a guideline to all the players working in telecom sector.
2. Rural market is very complex in India sometimes improper targeting might hamper the business of particular organization. My research is providing them a direction what are the major factors must keep in the mind when any telecom service provider companies entering in to rural market.

#### RESEARCH DESIGN:

This research is a descriptive research, describing the characteristics of the rural target market within the sample selected for the survey.

#### SOURCES OF DATA:

Primary Data

#### DATA ANALYSIS:

MS Office Excel.

#### SAMPLE SIZE:

5 companies are selected for the target marketing. The basis of the selection is the major market covered by companies in terms of subscriber base. These 5 companies have maximum market share in service provider companies of Indian Telecom Industry.

#### LIMITATION:

1. Less available time some time obstruct us to justify the project.
2. We researchers are having limited skill to perform such research.
3. Respondent some time very careless while responding the answer.
4. Companies hesitate to provide its some of the data's.
5. Some time research performed in current scenario might not be effective in future perspective.

#### HYPOTHESIS AND ANALYSIS

##### 1. Which types of service facility in rural market?

Facilities	No. of response	Percentage (%)
Other	20	40
SMS	10	20
Talk time	20	40
Total	50	100

##### 2. Tick mark most demanded facilities in rural market?

Most Demanded facilities	No. Of Response	Percentage (%)
Caller tune	10	20
Low call rate scheme	20	40
SMS facilities	20	40
Total	50	100

**3. Tick mark most provided facilities in rural market?**

Most Provided facilities	No. of response	Percentage (%)
Internet	10	20
Low call rate scheme	20	40
SMS facilities	20	40
Total	50	100

**4. Which types of services are more demanded in rural market?**

Demanded Services	No. of response	Percentage (%)
2G	40	80
3G	10	20
Total	50	100

**Hypothesis Testing:**

Z test-population proportion

$H_0$ : 3G is more demanded than 2G in rural market.

$H_1$ : 3G is not more demanded than 2G in rural market.

$$Z = \frac{\hat{p} - p}{\sqrt{\frac{p \cdot q}{n}}}$$

$$\hat{p} = \frac{x}{n} = \frac{10}{50} = 0.20$$

$$p = 0.20$$

$$q = 0.80$$

$$n = 50$$

$$\alpha = 0.05$$

$$Z_{cal.} = \frac{0.20 - 0.50}{\sqrt{\frac{0.80 \cdot 0.20}{50}}} = -4.24$$

$$Z_{0.05, 50} = \pm 1.96$$

It is concluded that the null hypothesis would be rejected, because critical value is less than calculated value.

3G is not more demanded than 2G in rural market.

**5. What is call rate providing in rural market?**

Call rate	No. of response	Percentage (%)
Higher	10	20
Medium	10	20
Lower	30	60
Total	50	100

**6. How much is the call rate charge to customer in rural market?**

Call rate charges	No. of response	Percentage (%)
0.10	10	20
0.20	20	40
0.50	10	20
0.60	10	20
Total	50	100

**7. What is call rate preferable plan to rural market?**

Preferable plan	No. of response	Percentage (%)
Per second	30	60
Per minute	20	40
Total	50	100

**8. Are rural target marketing strategies mainly based on price?**

Strategies based on price	No. of response	Percentage (%)
Yes	30	60
No	20	40
Total	50	100

**9. Which type of customers is difficult to convince?**

Difficult to convince	No. of Response	Percentage (%)
Rural	50	100
Total	50	100

**10. Are target marketing strategies same for rural & urban market?**

Marketing strategies same	No. of response	Percentage (%)
Yes	20	40
No	30	60
Total	50	100

**11. Which type of distribution channel for rural & urban market?**

For Rural:-

Distribution Channel	No. of Response	Percentage (%)
2- level	30	60
3-level	20	40
Total	50	100

**(A) For Urban:-**

Distribution Channel	No. of response	Percentage (%)
1-level	20	40
2-level	20	40
3-level	10	20
Total	50	100

**Hypothesis Testing:**

Z-Test: Two Samples for Means:

$H_0$ : There is significance difference between distribution channel of rural & urban market.

$H_1$ : There is no significance difference between distribution channel of rural & urban market.

Significance Level:  $\alpha = 0.05$

Distribution Channel	Rural market	Urban market
1-level	-	20
2-level	30	20
3-level	20	10
Total	50	50

**Calculation:**

z-Test: Two Sample for Means		
	Rural market	Urban market
Particular	Variable 1	Variable 2
Mean	25	16.6666667

Known Variance	50	33.33
Observations	2	3
Hypothesized Mean Difference	8.33	
Z	0.000554709	
z Critical two-tail	1.959963985	

Null hypothesis will be accepted, because critical value is greater than calculated value. So, the rural market distribution channel is better than urban market.

#### FINDINGS:

1. The size of the rural target market is larger than the urban target market and provides a larger opportunity for market share for service providers of telecommunication providers.
2. The rural target market is more difficult to penetrate than urban target market, and, thus requires marketing professionals to strategize and plan the marketing for telecommunications providers and other companies.
3. Within the rural target market people are demanding of a lower call rate and SMS facilities, and, preferably a tariff which is based on charging by the second. Service provider companies are currently offering the low call rate scheme to their customer at the rate of 0.20 Indian rupees per minute (equivalent to **0.0025 EUR per minute**).
4. Within the rural target market, the majority of customers are satisfied with 2G.
5. 60% of the companies surveyed are developing new marketing strategies based on a competitive price.
6. Multi-channel advertisement directly influences to the rural target market, with TV and newspapers being the most commonly used advertising channels.
7. Companies are giving more advertisement by means TV and News paper for covering more rural target market.
8. In rural target market service provider companies focus selling efforts narrowly to the age group of 20-30 years. Its ratio is 80%, which indicates that other age groups are not given sufficient attention by marketing agents, as is desirable of professional marketing, with a wide view to promote electronic communications to all age groups, using adequate advertising and information targeted towards the age group.

#### CONCLUSION:

1. In this scenario all service provider companies will focus on the rural target market. Because of we are known about the rural market will more developing and it is wide market so it's through companies are getting more customers and gaining more market share.
2. Whenever company provide scheme for the rural target market, the company increases market share increase, sales and revenue. Schemes in use within the Indian telecommunications market include internet, night calling, caller tune, SMS schemes, and others.
3. When service providers avail from schemes that are specific to rural markets, the market share tends to increase, resulting in increased sales revenue. Typical service offerings include provision of Internet, lower-priced night tariffs, options for customized caller tunes, segregated SMS schemes, and, others might be available.
4. Companies should attempt to maintain a balanced marketing mix in their marketing strategy plans for rural and urban markets, which is not discriminatory as it may be misleading to readers of the advertisement.
5. None of the companies surveyed used a most direct 1-level distribution channel for the rural market, and therefore having a single level of distribution increases the possibility of expediently reaching the market and understand problems more efficiently with a view to resolve them professionally.
6. Service providers can reach out to more customers within the rural market through public relations and events promoting the products and services on a personal level.

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**EFFECT OF BULK AND CONCENTRATED (OIL CAKES) ORGANIC MANURES AND INORGANIC FERTILIZER ON VEGETATIVE GROWTH ATTRIBUTES OF BABY CORN****S. Mullaimaran and Haripriya. K**Department Of Horticulture, Faculty of Agriculture, Annamalai University, Annamalai Nagar – 608002  
Tamilnadu**ABSTRACT**

*Baby corn is a finger like corn which is harvested before pollination or two to three days after silk emergence. Comparison of the effect of bulk and concentrated (oil cakes) organic manures and inorganic fertilizer information is limited in baby corn and needs field investigation. Hence, the field experiment were conducted at farmers field of sendarappatti village in Salem district. during Feb – March, 2010. The experiment was laid out in a randomized block design with 14 treatments in 3 replications. The treatment schedule included various levels of bulk (25 and 75 % N) and concentrated organic manures (25 and 75 % N), inorganic fertilizers along with an absolute control. The bulky organic manures used were FYM and vermicompost and the concentrated manures used were neem cake and castor cake. The nutrient content of bulky and concentrated organic manures used in the study were FYM (0.80, 0.41 and 0.74 % NPK), vermicompost (1.60, 2.20 and 0.67 % NPK), poultry manure (3.47, 1.33 and 3.1 NPK), neem cake (5.2, 1.0 and 1.4 % NPK) and castor cake (4.1, 1.9 and 1.4 % NPK). Quantity of organic manures required was computed on the basis of nitrogen equivalent to substitute the recommended dose of chemical fertilizer (150:75:40 kg NPK ha<sup>-1</sup>) in baby corn. Among the various levels and sources of organic manures and inorganic fertilizers tried, inorganic fertilizers recorded the maximum growth characters and highest nutrient uptake. Among the organic manures and concentrated oil cakes applied, 75 per cent N supplied through vermicompost @ 10.03 t ha<sup>-1</sup> along with 25 per cent N supplied through neem cake @ 0.73 t ha<sup>-1</sup> followed by poultry manure @ 2.16 t ha<sup>-1</sup> neem cake @ 0.73 t ha<sup>-1</sup> was identified as the best treatment in baby corn. The maximum availability of nitrogen, phosphorus and potassium in post harvest soil was recorded in plots incorporated with the application of 75 per cent N supplied through vermicompost @ along with 25 per cent N supplied through neem cake followed by the application of 75 per cent N supplied through poultry manure along with 25 per cent N supplied through neem cake in baby corn.*

*Keywords: Baby corn, FYM, Vermicompost, Poultry Manure, Neem cake, Castor cake and Physico-Chemical Properties*

**INTRODUCTION**

Baby corn (*Zea Mays* L) refers to the young, fresh corn ear just before or within two to three days after silking but prior to pollination and fertilization, which open dehusking is used as vegetables. Baby corn ears light yellow in colour with regular row arrangement 10-12cm are prefer in the market. It is high nutritive crop. Among the various technologies to boost the productivity and quality of the crops, nutrient management assumes greater significance. Organic manures have a number of agronomic and environmental advantages over chemical fertilizers (Chandrasekaran et al., 2010). Organic manures consist of 30-40 elements in high concentration whereas the chemical fertilizers contain only 5-6 elements in high concentration. Besides, organic manures contain micro-nutrients too. Further, an improvement in soil physical and chemical properties involving soil structure, water holding capacity, and drainage and check over soil erosion are achieved through application of organic manures. Also, application of the organic manures helps the soil microorganism to produce polysaccharides, leading to better soil structure. N fixation and P solubilisation occurs due to improved microbial activity in the organically amended soil (Ismail, 1997). Organic manures act as a binder between soil particles and hence improve soil water retention. Organic manures have long-term positive effect on soil fertility which is the real basis of a productive soil. Since it has more residual effect, the manure lasts for successive crops. They increase the availability of nutrients to the plants due to the presence of high humus content. This humus content supports the growth and multiplication of beneficial soil microorganisms like nitrogen fixers, phosphate solubilises and phosphate mobilizes. Thus organically grown plants become naturally healthy and hence disease resistant so that the application of pesticides could be avoided (Atiyeh et al., 2002).

**MATERIALS AND METHODS**

The experimental field was carried out in such a manner to leave minimal disturbance to the land. The seeds of baby corn cv.CoBc1 were dibbled singly at a spacing of 45 x 30 cm apart. The first irrigation was given immediately after sowing followed by life saving irrigation and subsequent irrigations were given once in a week. Incidence of sucking pests were managed by spraying with Neem seed kernel extract at 5%. Weeding was done where and when found necessary. Quantity of organic manures required was computed on the

nitrogen equivalent basis. Recommended dose of N ( $150 \text{ kg ha}^{-1}$ ) was supplied in two different combinations like supply of 25% and 75% N through Bulky and 25% and 75% N through concentrated organic manures. The bulky organic manures used were FYM, Poultry Manure and vermicompost (VC) and the concentrated manures used were neem cake (NC) and castor cake (GC). 25 and 75 per cent N was calculated as  $3.5$  and  $10.5 \text{ t ha}^{-1}$  of FYM;  $3.34$  and  $10.03 \text{ t ha}^{-1}$  of VC;  $0.72$  and  $2.16 \text{ t ha}^{-1}$  of poultry manure;  $2.18$ , and  $0.73 \text{ t ha}^{-1}$  of NC;  $2.0$  and  $0.65 \text{ t ha}^{-1}$  of CC to substitute the recommended dose of N ( $150 \text{ kg ha}^{-1}$ ). Bulky organic manures were applied as basal and concentrated cakes were top dressed in 2 split doses. First application was done at 20 days after sowing. The second was applied on 45<sup>th</sup> day of sowing. Recommended dose of inorganic fertilizers were applied only in the conventional farming treatment.

### Experimental Design and Treatments

The experiment was laid out in a randomized block design with three replications and thirteen treatments, viz.,

T <sub>1</sub>	-	Control
T <sub>2</sub>	-	Inorganic fertilizers ( $150:75:40 \text{ kg NPK ha}^{-1}$ )
T <sub>3</sub>	-	25 % N as Farm Yard Manure ( $3.50 \text{ t ha}^{-1}$ ) + 75 % N as Neem cake ( $2.18 \text{ t ha}^{-1}$ )
T <sub>4</sub>	-	75 % N as Farm Yard Manure FYM ( $10.50 \text{ t ha}^{-1}$ ) + 25 % N as Neem cake ( $0.73 \text{ t ha}^{-1}$ )
T <sub>5</sub>	-	25 % N as Farm Yard Manure ( $3.50 \text{ t ha}^{-1}$ ) + 75 % N as Castor cake ( $2.00 \text{ t ha}^{-1}$ )
T <sub>6</sub>	-	75 % N as Farm Yard Manure ( $10.50 \text{ t ha}^{-1}$ ) + 25 % N as Castor cake ( $0.65 \text{ t ha}^{-1}$ )
T <sub>7</sub>	-	25 % N as Vermicompost ( $3.34 \text{ t ha}^{-1}$ ) + 75 % N as Neem cake ( $2.18 \text{ t ha}^{-1}$ )
T <sub>8</sub>	-	75 % N as Vermicompost ( $10.03 \text{ t ha}^{-1}$ ) + 25 % N as Neem cake ( $0.73 \text{ t ha}^{-1}$ )
T <sub>9</sub>	-	25 % N as Vermicompost ( $3.34 \text{ t ha}^{-1}$ ) + 75 % N as Castor cake ( $2.00 \text{ t ha}^{-1}$ )
T <sub>10</sub>	-	75 % N as Vermicompost ( $10.03 \text{ t ha}^{-1}$ ) + 25 % N as Castor cake ( $0.65 \text{ t ha}^{-1}$ )
T <sub>11</sub>	-	25 % N as Poultry manure ( $0.72 \text{ t ha}^{-1}$ ) + 75 % N as Neem cake ( $2.18 \text{ t ha}^{-1}$ )
T <sub>12</sub>	-	75 % N as Poultry manure ( $2.16 \text{ t ha}^{-1}$ ) + 25 % N as Neem cake ( $0.73 \text{ t ha}^{-1}$ )
T <sub>13</sub>	-	25 % N as Poultry manure ( $0.72 \text{ t ha}^{-1}$ ) + 75 % N as Castor cake ( $2.00 \text{ t ha}^{-1}$ )
T <sub>14</sub>	-	75 % N as Poultry manure ( $2.16 \text{ t ha}^{-1}$ ) + 25 % N as Castor cake ( $0.65 \text{ t ha}^{-1}$ )

### Growth attributes

#### Plant Height at 25 DAS

The observations recorded on plant height are presented in Table.32. All the treatments exerted significant influence over plant height when compared to control. The maximum plant height ( $155.28 \text{ cm}$ ) was recorded in T<sub>2</sub> which was followed by T<sub>8</sub> ( $139.49 \text{ cm}$ ). The treatments T<sub>4</sub> and T<sub>3</sub> however were on par with each other. The least plant height ( $35.42 \text{ cm}$ ) was recorded in the untreated control (T<sub>1</sub>).

#### Plant Height at Harvest

The highest plant height ( $185.29 \text{ cm}$ ) was observed in T<sub>2</sub>. This was closely followed by T<sub>8</sub>. The treatments T<sub>4</sub> and T<sub>3</sub> were on par with each other. The lowest plant height ( $65.13 \text{ cm}$ ) was found in untreated control T<sub>1</sub> as shown in table.1.

#### Number of Leaves per Plant

The data recorded on the mean number of leaves per plant are presented in table.1. Significant differences among all the treatments were exhibited for this trait. The highest number of leaves was recorded in T<sub>2</sub> ( $15.60$ ). This was followed by T<sub>8</sub> and T<sub>12</sub> in order. The treatments T<sub>4</sub> and T<sub>3</sub> were on par with each other.

#### Leaf Area Index

The data computed on leaf area index are presented in table.1. For this trait, significant differences were noticed among the treatments. T<sub>2</sub> ( $6.97$ ) recorded the highest value for leaf area index. The next best treatment was T<sub>8</sub> ( $6.52$ ). The treatments T<sub>4</sub> and T<sub>3</sub> were on par with each other. The least value of  $3.21$  recorded in control (T<sub>1</sub>).

**Table.1.** Effect of bulky and concentrated organic manures on plant height at 25 DAS and at harvest number of leaves, leaf area index and dry matter production in baby corn

Treatments	Plant height (cm)		No of leaves per plant	Leaf area index	Dry matter production
	at 25 DAS	harvest			
T <sub>1</sub> - Control	35.42	65.13	3.80	3.21	2.85
T <sub>2</sub> - Inorganic fertilizers ( $150:100:50$ )	155.28	185.29	15.60	6.97	12.14

NPK kg ha <sup>-1</sup> )					
T <sub>3</sub> - FYM @ 10 t ha <sup>-1</sup> + NC @ 2.25 t ha <sup>-1</sup>	74.76	102.75	6.02	4.40	4.01
T <sub>4</sub> - FYM @ 15 t ha <sup>-1</sup> + NC @ 1.50 t ha <sup>-1</sup>	73.01	103.01	6.09	4.51	4.19
T <sub>5</sub> - FYM @ 10 t ha <sup>-1</sup> + CC @ 2.0 t ha <sup>-1</sup>	41.72	71.73	4.00	3.62	3.11
T <sub>6</sub> - FYM @ 15 t ha <sup>-1</sup> + CC @ 1.50 t ha <sup>-1</sup>	52.75	82.13	4.99	4.01	3.66
T <sub>7</sub> - VC @ 5 t ha <sup>-1</sup> + NC @ 2.25 t ha <sup>-1</sup>	125.15	154.46	11.05	6.35	8.87
T <sub>8</sub> - VC @ 7.5 t ha <sup>-1</sup> + NC @ 1.50 t ha <sup>-1</sup>	139.49	169.59	13.55	6.52	11.75
T <sub>9</sub> - VC @ 5 t ha <sup>-1</sup> + NC @ 2.0 t ha <sup>-1</sup>	100.02	130.09	9.94	6.21	7.30
T <sub>10</sub> - VC @ 7.5 t ha <sup>-1</sup> + NC @ 1.5 t ha <sup>-1</sup>	108.87	138.87	10.54	6.25	8.23
T <sub>11</sub> - PM @ 7.5 t ha <sup>-1</sup> + NC 2.25 t ha <sup>-1</sup>	117.73	147.73	10.69	6.26	8.26
T <sub>12</sub> - PM @ 10 t ha <sup>-1</sup> + NC 1.5 t ha <sup>-1</sup>	130.42	160.43	12.07	6.42	10.40
T <sub>13</sub> - PM @ 7.5 t ha <sup>-1</sup> + NC 2.0 t ha <sup>-1</sup>	82.14	112.13	8.01	5.23	4.69
T <sub>14</sub> - PM @ 10 t ha <sup>-1</sup> + NC 1.5 t ha <sup>-1</sup>	90.25	120.23	9.06	5.73	5.03
<b>S.ED</b>	<b>2.78</b>	<b>3.25</b>	<b>0.32</b>	<b>0.18</b>	<b>0.35</b>
<b>CD (P=0.05)</b>	<b>5.46</b>	<b>6.50</b>	<b>0.63</b>	<b>0.37</b>	<b>0.30</b>

### Dry Matter Production

Significant variation was exhibited by all treatments when compared to control. (Table .1). The treatment T<sub>2</sub> resulted in the highest dry matter production of 12.14 t ha<sup>-1</sup>. This was followed by T<sub>8</sub>, However, the treatment T<sub>4</sub> and T<sub>3</sub> were on par with each other.

### DISCUSSION

FYM is considered as a repository of plant nutrients. It is the best source for maintenance of soil organic matter. Application of FYM had resulted in increased organic carbon content apart from N, P and K build up (Gupta, 2005). Vermicompost a stabilized organic material produced by interaction between earthworms and microorganisms, through a non-thermophilic process, have been reported to enhance plant germination, growth and yield in many crops (Narkhede et al., 2011). Vermicompost contains major and minor nutrients in available forms along with enzymes, antibiotics, vitamins, growth hormones and beneficial microorganisms and have definite advantage over the other organic manures in respect to quality and shelf life of produce (Taleshi et al., 2011). Neem cake is a rich source of nitrogen, phosphorus, potassium and micronutrients. It has the unique property as fertilizer and pest repellent. It starts decomposing immediately after its incorporation and liberates nutrients for the use of crop plants, readily and gradually. In India, castor cake is used as organic manure for vegetable crops as it is considered as the richest source of nutrients among the available oil cakes (Chandrasekaran et al., 2010). Though the uses of such source by farmers exist in practice, a scientific documentation on use of exact quantity for specific crop sequence of the region is established in the present study.

Growth parameters such as the plant height and number of branches at flowering and harvest were the highest with the application of inorganic fertilizers in tomato, garden bean and baby corn. This might be due to appropriate supply of N, P and K at the right proportion and at the right time. This corroborates the findings of Siddeswaran and Shanmugam (2013) in baby corn. Among the various bulky and concentrated organic manures tried, the treatment involving 75 per cent of N supplied through vermicompost @ 10.73 t ha<sup>-1</sup> and 25 per cent N supplied through neem cake @ 0.5 t ha<sup>-1</sup> increased the plant height and number of branches at flowering and harvest phenomenally when compared to control. Increased plant height might be due to increased uptake of nitrogen which is the constituent of protein and protoplasm and vigorously induced the vegetative development of the plants as reported by Flores et al. (2005). The increased plant height may also be due to the supplementation of organic nitrogen, phosphorus and potassium along with micro nutrients besides the growth promotory effect of vermicompost. Mackay (1982) confirmed the effects of vermicompost in increasing the availability of phosphorus and IAA in the plant system and thereby would have increased the plant growth. Similar findings were made by Sree devi et al., (2012) in tomato. Application of vermicompost increases the activities of N fixing bacteria and the rate of humification. Humic acid in vermicompost enhances the availability of both native and added micronutrients in the soil as reported by Teleshi et al. (2000). Besides, application of organic manures would have helped in the plant metabolism through the supply of important micronutrients such as Zinc, iron, copper, manganese etc., in an optimum level, in the early growth phase which



might have encouraged the vigorous growth. This is in accordance with Barani and Anburani (2004). The favourable response in plant height obtained in the present study could be attributed to the catalytic action of vermicompost in the soil which might have improved the soil physical conditions facilitating better aeration leading to deeper penetration of roots and higher nutrient extraction. Renuka and Ravi Shankar et al.(1998) in tomato reported similar favourable effect on plant height due to the application of vermicompost. According to Sadanandam and Hamza (2002), available soil nutrients were found to be higher due to application of neem cake when compared to other oil cakes such as ground nut cake and sesame oil cake and cotton cake and the nutrients in neem cake are readily available to the crop thereby resulted in increased plant height. Regarding the highest number of branches in the same treatment, more availability and uptake of nutrients, particularly N, P, K, micronutrients, water and production of growth promoting substances through the integration of vermicompost and the ready availability of nutrients from the neem cake might have contributed for the highest number of branches. These findings are in consonance with Srinivasan et al.(2014) in baby corn.

## CONCLUSION

. In the experiment, with baby corn among the various levels and sources of organic manures and inorganic fertilizers tried, inorganic fertilizers recorded the maximum plant height, maximum number of leaves and shorter duration for leaf area index were recorded in the same treatment. Among the treatments comprising organic manures and concentrated oil cakes, 75 per cent N supplied through vermicompost 10.03 t ha<sup>-1</sup> along with 25 per cent N supplied through neem cake @ 0.73 t ha<sup>-1</sup> rank best. This was followed by poultry manure @ 2.16 t ha<sup>-1</sup> (75%N) and 25 per cent N supplied through neem cake @ 0.73 t ha<sup>-1</sup> recorded the next best values for growth attributes.

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**EFFECT OF SOIL SOLARIZATION WITH ORGANIC AMENDMENTS AS A ORGANIC METHOD OF ROOT-KNOT NEMATODE CONTROL AND TOMATO NURSERY MANAGEMENT**

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**ABSTRACT**

*A field experiment was conducted at farmers field during may 2012 in Salem district to study the effect of soil solarization with organic amendments as a method of root-knot nematode and weed management in tomato nursery bed. Solarization of nursery beds using 300 gauge transparent polyethylene sheets was carried out with various amendments to study the performance of tomato seedlings. The experiment was laid out in randomized block design with 11 treatments replicated thrice. The treatments included, solarization for four weeks with four different amendments viz., vermicompost, poultry manure, Farm Yard Manure (FYM), neem cake and castor cake along with non solarized control and solarization without amendment. In four treatments, Azospirillum was inoculated two days after the polythene sheet removal. The study was carried out during May, 2016. The results of the experiment revealed that solarization treatment with vermicompost followed by solarization with poultry manure and neem cake were found to be effective in increasing the soil temperature in all depths and on all days of observation. Similarly, the least values for root knot nematode population was recorded in the solarization treatment with neem cake. The performance of tomato seedlings was superior under solarization with vermicompost along with Azospirillum treatment followed by solarization with vermicompost alone. This was comparable with solarization with neem cake along with Azospirillum. Solarized seedlings with vermicompost and Azospirillum inoculation attained the transplanting stage 15 days earlier when compared to control.*

*Keywords: Solarization, Root-knot nematode, Tomato seedlings, weed management, vermi compost and neem cake.*

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**INTRODUCTION**

Indiscriminate use of chemical fertilizers, pesticides and herbicides has led to the deterioration of soil health, ground water quality, soil microbial population, atmospheric constituents, quality of the agricultural produce and thereby the health of animals and humans. Soil organic matter is a vital component of the soil that controls the physical, chemical and biological properties to a large extent. Hence now the emphasis is given for the use of organic resources and non-chemical management practices to maintain the soil quality and environmental health in order to produce high quality produce. The global scenario also currently directs the scientists to produce residue free farm produce and hence there is an emerging awareness among public on the use of high quality food materials which are free from chemical toxicants. This has paved the way for organic farming. Organic farming aims at harmony with nature and achieving production without harming the environment. It is a management system that enhances biodiversity, biological cycles and soil biological activity to produce healthy plants and animals and foster human and environmental health. Organic agriculture dramatically reduces external inputs obtained by reframing chemo-synthetic fertilizer and pesticides. With an increasing demand for organic products especially in Europe, USA and Japan, many countries are making an onset in the development of organic farming as a potential avenue to make a mark in the international market. Organic food contains less of bad stuff, such as pesticides, heavy metals etc., and more of good stuff, such as vitamins and minerals. Several studies have shown that organically grown crops contain higher level of nutrients such as vitamin-C and iron, besides, secondary metabolites (e.g., phenolic metabolites) that are believed to have anticancer properties (Azadi et al., 2011). Hence, now-a-days, the produce through organic cultivation are fetching higher price, which ultimately increase the income of farmers. Organic farming can be taken up for high value crops like chillies, bengal gram and baby corn. On-farm generation of organic source and possibility of getting high premium price for organically grown crops will commensurate the net return in addition to maintenance of soil ecological equilibrium. (Siddeswaran and Shanmugam, 2013).

**MATERIAL AND METHODS**

The nursery trial was conducted during May 2012 to study the effect of solarization with amendments on the performance of tomato seedlings. The soil was well ploughed to break the clods and plant debris which might interfere with uniform conduction of heat and biogases that may protect some pathogenic organisms to escape. The amendments chosen were among available materials in Salem district. The dosage of amendment used was 1 kg m<sup>-2</sup>. The organic amendments were incorporated thoroughly into the soil according to the respective

treatments. After incorporation of the organic amendments, raised nursery beds of size 3m x 1m were formed. Then the beds were irrigated to field capacity to encourage exothermic fermentation process. After irrigation, the beds were covered with the high density poly ethylene sheet of 300 gauge thickness and the sides were tucked into the soil. These beds thus done were solarized for a period of four weeks and monitored carefully. After the solarization period was over, the polyethylene sheets were removed. Azospirillum was applied in the respective treatments both to seeds and as band application for respective treatments after 2 days of sheet removal. The seeds of tomato cv.Kashi Sarath were sown in the nursery beds. Mulching was done with paddy straw and the beds were watered using rose can. Germination and growth of the seedlings were monitored until transplantation. The experiment was laid out in Randomized Block Design with 11 treatments replicated thrice. The treatments include combination of solarization for four weeks with four different amendments viz., Vermicompost, Poultry Manure, Castor Cake and neem cake along with non-solarized control and solarization without amendment. At the end of treatment period, inoculation with Azospirillum was done for specific treatments.

#### Treatment Details

T <sub>1</sub>	-	Non solarized control
T <sub>2</sub>	-	Solarization without amendments
T <sub>3</sub>	-	Solarization with Castor cake
T <sub>4</sub>	-	Solarization with Neem cake
T <sub>5</sub>	-	Solarization with vermicompost
T <sub>6</sub>	-	Solarization with poultry manure
T <sub>7</sub>	-	Solarization with Castor cake + Azospirillum
T <sub>8</sub>	-	Solarization with Neem cake + Azospirillum
T <sub>9</sub>	-	Solarization with vermicompost + Azospirillum
T <sub>10</sub>	-	Solarization with poultry manure + Azospirillum
T <sub>11</sub>	-	Solarization without amendments + Azospirillum

Simultaneously main field solarization was carried out with same set of treatments during April-May 2016.

#### Nematode Population

In experiment I soil samples were collected from non-solarized and solarized plots treated for 20, 30 and 40 days. Analysis for nematode population in 100g of soil was carried out following the method suggested by Cook and Baker (1983).

#### Biometric Observations

##### Germination Percentage

The per cent germination was worked out based on the number of seeds germinated in a fixed period of time out of the total number of seeds sown.

##### Shoot Length

The length of shoot from the collar region to shoot apex was measured for twenty five seedlings in each treatment and the average was expressed in cm.

##### Root Length

The root lengths were measured for twenty five seedlings in each treatment and the mean was expressed in cm.

## RESULTS

#### Soil Nematode Population

As per the data presented in Table 1 the microbial and nematode population differed significantly due to solarization with various amendments. The least number of larvae of nematodes (13.11) were recorded in the treatments which received solarization with neem cake (T<sub>4</sub>). This was on par with the treatment T<sub>5</sub> which recorded the same value for number of nematode population (14.14) whereas highest population of nematodes (20.37) was recorded in T<sub>1</sub> (control). The treatment, T<sub>2</sub> recorded a nematodes population of 19.32 for nematodes. This was lower than control and higher than solarization with amendments. The percentage reduction over control for nematodes under treatment T<sub>4</sub> varied from 46.10 per cent for Xiphinema sp. and 38.33 per cent for Hoplolaimus sp. This was comparable with T<sub>4</sub> as shown in Table2.

### Germination Percentage

The mean for germination percentage in solarized and non-solarized plots varied significantly. Among the various treatments, the highest germination percentage was recorded in T<sub>9</sub> (96.08) followed by T<sub>5</sub> (94.07), which was on par with T<sub>8</sub> (93.99) as presented in Table 3.

### Shoot Length

The highest shoot length was registered in the treatment T<sub>9</sub> (22.82 cm) and was followed by T<sub>5</sub> (21.79 cm). This was on par with T<sub>4</sub> (20.92 cm). Treatment T<sub>11</sub> had registered a shoot length of 18.27 cm which was significantly superior to T<sub>2</sub> which recorded a shoot length of 17.45 cm. Though these treatments recorded comparably higher values for shoot length than control (16.21cm), the recorded values were lesser than the other treatments incorporated with amendments. Table3 (fig.1)

### Root Length

The observations recorded on root length after statistical analysis is presented in Table3 (fig.1) 1). All the treatments exerted significant influence over root length when compared to control. The maximum root length (6.78 cm) was recorded in T<sub>9</sub> followed by T<sub>5</sub> (6.46 cm). This was on par with T<sub>8</sub> (6.45cm). Among the two treatments which were not incorporated with amendments, T<sub>11</sub> recorded the maximum root length (5.16 cm) when compared to T<sub>2</sub> (4.83 cm).

Both the treatments were significantly superior to control (4.28 cm), but the recorded values were lesser than the solarization treatments with various amendments.

### DISCUSSION

Soil solarization is a hydrothermal disinfestation method based on covering the water saturated soil with transparent polyethylene sheet and thus, increasing the soil temperature by the solar energy. The recent string in solarization is combining it with organic amendments like animal waste and plant residues that are capable of producing toxic volatiles. During the process of solarization with amendments, bio toxic volatile compounds are released when organic matter is heated (Stapleton, 1997). This process has been shown to improve the efficacy of solarization with the improved control of soil borne plant pathogen, nematodes and weeds. Such a treatment was reported to result in certain physical, chemical and biological changes that favour plant health and growth while producing deleterious effect on weeds, pathogens and pests. Soil borne diseases such as damping off, plant parasitic nematodes and weeds are often inoculated in transplants and nursery stocks (Umamaheswari,2009). Healthy transplants will be produced from healthy nursery soil. Therefore investigations were undertaken to study the effect of soil solarization on seedling growth of tomato.

### SUMMARY

Implementing solarization along with organic amendments significantly changed the microbiota of the soil. The analysis revealed that there was a reduction in nematode population. The least values for was recorded in the solarization treatments with neem cake and vermicompost. Both the treatments increased the germination percentage, root and shoot length uniformly.

**Table 1.**Effect of nursery solarization with amendments on soil microbial population as observed on 28<sup>th</sup> day after solarisation

Treatments	Nematodes (No of larval per 10 ml of suspension)
T <sub>1</sub> - non solarized control	20.37
T <sub>2</sub> - solarization with no amendments	19.32
T <sub>3</sub> - solarization with Caster cake	18.20
T <sub>4</sub> - solarization with Neem cake	13.11
T <sub>5</sub> - solarization with Vermicompost	14.14
T <sub>6</sub> - solarization with poultry manure	14.61
SED	0.51
CD (P=0.05)	1.03

**Table 2.** Effect of nursery solarization with amendments on soil nematode population

Nematodes	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>	T <sub>5</sub>	T <sub>6</sub>
Hoplolaimus sp.	4.80	3.67 (23.54)	3.53 (26.45)	2.96 (38.33)	3.05 (36.45)	3.30 (31.25)
Tylenchulus sp.	7.42	6.10	5.74	4.64	4.81	5.37

		(17.78)	(22.64)	(37.46)	(35.17)	(27.62)
Heterodera sp.	6.23	5.11 (17.97)	4.98 (20.06)	3.79 (39.16)	4.25 (31.78)	4.53 (27.28)
Xiphinema sp.	4.49	3.40 (24.27)	3.31 (26.28)	2.42 (46.10)	2.86 (36.30)	3.09 (31.18)
Rotylenchus sp.	5.33	4.20 (21.20)	4.07 (23.63)	3.30 (38.08)	3.64 (31.70)	3.82 (28.33)

Values in parenthesis indicate percentage reduction in population over control.

**Table 3.** Effect of nursery solarization with amendments on germination percentage, shoot length and root length of tomato seedlings

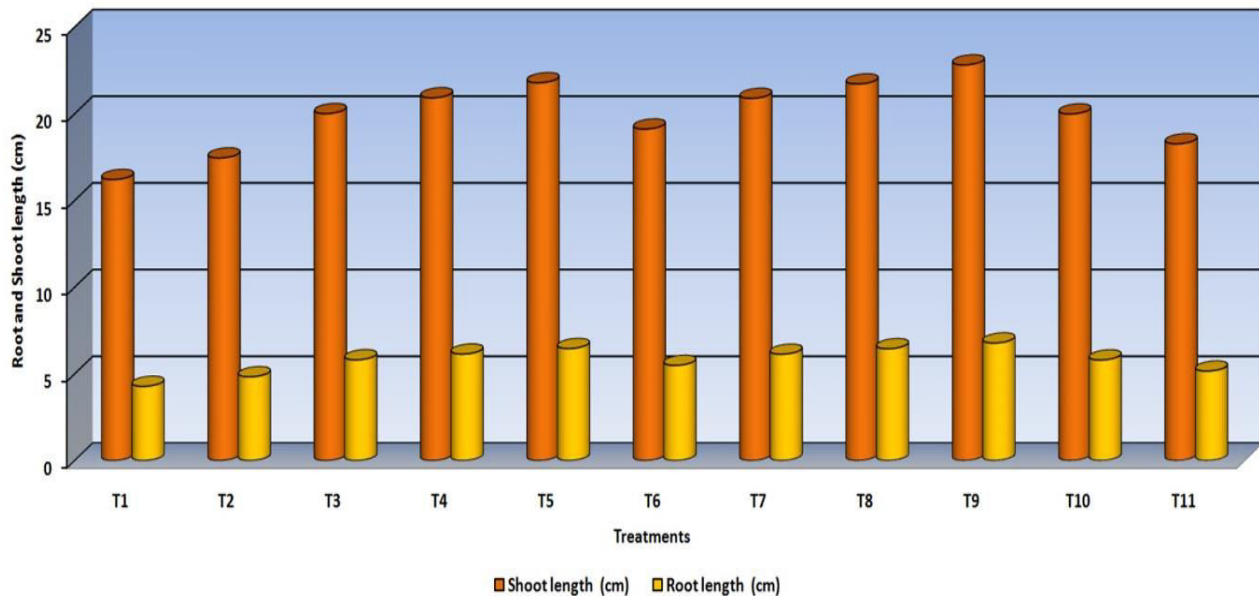
Treatments	Germination (%)	Shoot length (cm)	Root length (cm)
T <sub>1</sub> - non solarized control	64.42 (79.98)	16.21	4.28
T <sub>2</sub> - solarization without amendments	66.73 (83.10)	17.45	4.83
T <sub>3</sub> - solarization with Castor cake	72.32 (89.74)	20.01	5.81
T <sub>4</sub> - solarization with Neem cake	74.45 (91.89)	20.92	6.14
T <sub>5</sub> - solarization with Vermicompost	76.91 (94.07)	21.79	6.46
T <sub>6</sub> - solarization with poultry manure	70.14 (87.32)	19.12	5.49
T <sub>7</sub> - solarization with Castor cake + Azospirillum	74.40 (91.84)	20.89	6.13
T <sub>8</sub> - solarization with Neem cake+ Azospirillum	76.81 (93.99)	21.72	6.45
T <sub>9</sub> - solarization with Vermicompost+ Azospirillum	79.59 (96.08)	22.82	6.78
T <sub>10</sub> - solarization with poultry manure + Azospirillum	72.21 (89.62)	19.99	5.80
T <sub>11</sub> - solarization without amendments+ Azospirillum	68.21 (85.00)	18.27	5.16
<b>S. ED</b>	0.96	0.39	0.15
<b>CD (P=0.05)</b>	1.92	0.79	0.30

Figures in parentheses indicates original value

Data are arc sin transformed values

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**Fig.1. Effect of nursery solarization with amendments on shoot and root length of tomato seedlings**

T<sub>1</sub>- non solarized control, T<sub>2</sub>- solarization without amendments, T<sub>3</sub>- solarization with Castor cake, T<sub>4</sub>- solarization with Neem cake, T<sub>5</sub>- solarization with Vermicompost, T<sub>6</sub>- solarization with poultry manure, T<sub>7</sub>- solarization with Castor cake + *Azospirillum*, T<sub>8</sub>- solarization with Neem cake+ *Azospirillum*, T<sub>9</sub>- solarization with Vermicompost+ *Azospirillum*, T<sub>10</sub>- solarization with poultry manure + *Azospirillum*, T<sub>11</sub>- solarization without amendments+ *Azospirillum*

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**FARMERS' SUICIDE IN INDIA WITH SPECIAL REFERENCE TO MAHARASHTRA: A CRITICAL SOCIOLOGICAL ANALYSIS**

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**ABSTRACT**

*This research paper offers a critical sociological analysis of farmers' suicides in India, with a particular focus on the state of Maharashtra. Farmers' suicides have emerged as a distressing social phenomenon in India, highlighting the challenges faced by agricultural communities. Maharashtra has witnessed a significant number of farmer suicides, making it a pertinent case study to understand the underlying sociological factors contributing to this issue. This paper aims to explore the sociological dimensions of farmers' suicides in Maharashtra, examining factors such as agrarian distress, social structures, power relations, and institutional failures. By employing a critical sociological lens, it seeks to provide insights into the root causes of farmers' suicides and propose potential solutions to address this complex societal problem.*

*This research paper offers a critical sociological analysis of farmers' suicides in Maharashtra, providing a comprehensive understanding of the sociocultural, economic, and institutional factors that contribute to this grave issue. By highlighting the complexities of agrarian distress and the sociological dynamics at play, it aims to inform policymakers, researchers, and stakeholders about the urgent need for comprehensive interventions that address the multifaceted nature of farmers' suicides in Maharashtra and beyond.*

**Keywords:** *Farmers' suicide, India, Maharashtra, sociological analysis, agrarian distress, social structures, power relations, institutional failures, socioeconomic factors, social and cultural factors, coping strategies, community resilience, policy recommendations, intervention strategies.*

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**INTRODUCTION**

The introduction provides an overview of the farmers' suicide issue in India, with a specific focus on Maharashtra. It highlights the significance of agriculture in India's economy and the challenges faced by farmers, leading to distress and suicide incidents. The introduction also discusses the relevance of conducting a sociological analysis to understand the underlying factors contributing to farmers' suicides.

**RESEARCH OBJECTIVES**

The research objectives outline the specific goals of the study. These may include exploring the sociological dimensions of farmers' suicides in Maharashtra, identifying the key factors contributing to the issue, examining the role of social structures and institutional failures, and proposing policy recommendations to address the problem effectively.

**The Sociological Perspective on Farmers' Suicides:**

**1. Understanding the Sociological Approach:** This section delves into the sociological approach to studying farmers' suicides. It provides an overview of the key concepts, theories, and methodologies used in sociological analysis. It explains how sociologists examine social phenomena, such as farmers' suicides, through the lens of social structures, institutions, and cultural factors.

**2 Farmers' Suicides as a Social Phenomenon:** This subsection explores farmers' suicides as a social phenomenon rather than an individual act. It highlights the importance of examining the broader social context, including economic, political, and cultural factors, to understand why farmers are disproportionately affected by suicide. It emphasizes the need to move beyond individual-level explanations and consider the social dimensions of the issue.

**3 Role of Social Structures and Power Relations:** This subsection focuses on the role of social structures and power relations in farmers' suicides. It explores how social structures, such as agricultural systems, land ownership patterns, and market forces, shape farmers' experiences and vulnerabilities. It also examines power relations within agricultural communities, including relations with government institutions, financial institutions, and other stakeholders, and their influence on farmers' well-being and access to resources.

By adopting a sociological perspective, this section aims to highlight the importance of understanding farmers' suicides as a social phenomenon influenced by social structures, power dynamics, and institutional

arrangements. It sets the stage for further analysis of these factors in the context of Maharashtra's farmers' suicides.

### **Agrarian Distress and Farmers' Suicides:**

**1. Agrarian Crisis in India:** This section examines the agrarian crisis in India, focusing on the factors that contribute to agricultural distress. It discusses issues such as declining agricultural productivity, fluctuating crop prices, inadequate infrastructure, and lack of market integration. The section also explores the consequences of the agrarian crisis, including its impact on farmers' livelihoods and well-being.

**2. Impact of Globalization and Market Forces:** This subsection investigates the influence of globalization and market forces on agricultural practices and farmer distress. It explores how liberalization policies, trade agreements, and market fluctuations affect farmers' income, access to resources, and agricultural practices. It analyzes the role of market forces in exacerbating farmers' vulnerabilities and their potential contribution to suicides.

**3. Land Ownership and Tenure Issues:** This subsection focuses on land ownership and tenure issues as significant factors contributing to farmers' distress. It examines the challenges faced by small and marginal farmers in accessing and retaining land. It discusses issues such as land fragmentation, land disputes, land acquisition for industrial projects, and the impact of these issues on farmers' economic stability and mental well-being.

By exploring the agrarian crisis, the impact of globalization and market forces, and land ownership and tenure issues, this section highlights the structural and systemic factors that contribute to farmers' distress and ultimately, farmers' suicides. Understanding these factors is crucial for formulating effective interventions and policies to address the root causes of the problem.

### **1. Socioeconomic Factors Contributing to Farmers' Suicides:**

**1. Indebtedness and Financial Burden:** This section examines the role of indebtedness and financial burden as significant socioeconomic factors leading to farmers' suicides. It explores the reasons behind farmers accumulating debt, including factors such as crop failure, input costs, and inadequate income. It analyzes the consequences of mounting debt on farmers' mental health and the desperate situations that can push them towards suicide.

**2. Rural Poverty and Disparities:** This subsection focuses on rural poverty and disparities as contributing factors to farmers' suicides. It explores the socio-economic conditions prevalent in rural areas, such as lack of basic amenities, inadequate infrastructure, and limited employment opportunities. It discusses how these conditions, coupled with agrarian distress, perpetuate poverty and increase the risk of suicide among farmers.

**3. Lack of Access to Credit and Institutional Support:** This subsection highlights the significance of access to credit and institutional support in preventing farmers' suicides. It examines the challenges faced by farmers in obtaining credit for agricultural activities, such as high interest rates, bureaucratic processes, and lack of collateral. It also explores the role of institutional support systems, such as agricultural extension services, insurance schemes, and farmer welfare programs, in mitigating farmers' distress and reducing suicide rates.

By analyzing the socioeconomic factors of indebtedness, financial burden, rural poverty, disparities, and lack of access to credit and institutional support, this section sheds light on the systemic challenges faced by farmers. Understanding these factors is essential for devising comprehensive strategies that address farmers' economic vulnerabilities and provide them with the necessary support to overcome financial hardships, ultimately reducing the incidence of suicides in the farming community.

### **Social and Cultural Factors:**

**1. Gender Dynamics and Women in Agriculture:** This section explores the gender dynamics and the role of women in agriculture as significant social factors impacting farmers' suicides. It discusses the challenges faced by women farmers, including unequal access to resources, limited decision-making power, and discrimination. The section also examines the intersection of gender, agrarian distress, and mental health, highlighting the specific vulnerabilities and experiences of women farmers.

**2. Caste and Social Hierarchies in Rural Communities:** This subsection focuses on the influence of caste and social hierarchies in rural communities on farmers' suicides. It examines how caste-based discrimination, social inequalities, and power dynamics affect farmers' access to resources, land ownership, and social support



systems. It discusses how these factors contribute to the distress experienced by marginalized and lower-caste farmers, influencing their mental well-being and risk of suicide.

**3. Stigma and Mental Health Perspectives:** This subsection addresses the stigma associated with mental health and its impact on farmers' well-being. It discusses the prevailing societal attitudes and perceptions towards mental health issues, which often discourage farmers from seeking help or expressing their emotional distress. The section also highlights the need to destigmatize mental health concerns and emphasizes the importance of providing mental health support and awareness programs tailored to the unique challenges faced by farmers.

#### **Institutional Failures and Policy Gaps:**

**1. Agricultural Policies and Implementation Challenges:** This section examines the role of agricultural policies and the challenges faced in their implementation as contributing factors to farmers' suicides. It analyzes the effectiveness of existing policies in addressing agrarian distress and supporting farmers. It also discusses the shortcomings and gaps in policy design, implementation, and monitoring, which hinder their ability to alleviate farmers' hardships and prevent suicides.

**2. Inadequate Support Systems for Farmers:** This subsection focuses on the inadequacy of support systems for farmers as an institutional failure contributing to farmers' suicides. It discusses the limited access to healthcare, mental health services, and counseling facilities in rural areas. It also examines the shortcomings in the provision of financial assistance, crop insurance, and other support mechanisms that could help farmers cope with agrarian distress and prevent them from resorting to suicide.

**3. Political Dynamics and Farmer Movements:** This subsection explores the political dynamics and farmer movements as important aspects of institutional failures and policy gaps. It discusses the influence of political factors on agricultural policies and their implementation. It also examines the role of farmer movements and protests in highlighting the issues faced by farmers and advocating for policy changes. The section analyzes the impact of political factors and the need for effective governance to address farmers' concerns and prevent suicides.

#### **Coping Strategies and Community Resilience:**

**1. Role of Social Networks and Support Systems:** This section examines the role of social networks and support systems in facilitating coping strategies and fostering community resilience among farmers. It explores how social support from family, friends, and community networks can provide emotional, financial, and informational assistance to farmers in times of distress. The section also discusses the importance of strengthening existing support systems and creating new avenues for social support to enhance farmers' resilience.

**2. Collective Action and Farmer Movements:** This subsection focuses on the significance of collective action and farmer movements in coping with agrarian distress and advocating for their rights and interests. It explores how farmers coming together to address common challenges can provide a platform for sharing experiences, resources, and strategies. It discusses the role of farmer movements in raising awareness about farmers' issues, influencing policy changes, and promoting solidarity among farming communities.

**3. Innovative Approaches for Sustainable Agriculture:** This subsection highlights the importance of innovative approaches and sustainable agricultural practices in building resilience among farmers. It discusses initiatives such as organic farming, agroecology, water conservation, and diversification of crops. It explores how these approaches can reduce dependency on external factors, enhance productivity, improve soil health, and contribute to the long-term sustainability of farming practices.

#### **Policy Recommendations and Intervention Strategies:**

**1. Strengthening Social Safety Nets:** This section focuses on policy recommendations aimed at strengthening social safety nets for farmers. It discusses measures such as improving access to credit, insurance, and other financial support mechanisms. It also explores the need to enhance social welfare programs, including income support, healthcare facilities, and educational opportunities for farmers and their families. The section emphasizes the importance of targeted interventions that address the specific needs of vulnerable groups within the farming community.

**2. Promoting Sustainable Agriculture Practices:** This subsection highlights policy recommendations and intervention strategies to promote sustainable agriculture practices. It discusses the importance of investing in

research and development for climate-resilient crops, promoting organic farming, and encouraging water conservation and efficient irrigation techniques. It also explores the need for capacity building and training programs to equip farmers with the knowledge and skills to adopt sustainable practices.

**3. Enhancing Mental Health Support Services:** This subsection focuses on policy recommendations and intervention strategies to enhance mental health support services for farmers. It emphasizes the importance of destigmatizing mental health issues and raising awareness about the importance of seeking help. It calls for the integration of mental health services into primary healthcare systems in rural areas, the provision of counseling services, and the establishment of helplines and support networks specifically tailored to the needs of farmers.

#### **Ethical Considerations and Stakeholder Engagement:**

**1. Ethics of Agricultural Practices and Market Forces:** This section explores the ethical considerations surrounding agricultural practices and market forces. It examines the impact of intensive farming practices, excessive use of chemical inputs, and monocropping on the environment, biodiversity, and farmer livelihoods. It discusses the need for sustainable and ethical agricultural practices that prioritize environmental stewardship, biodiversity conservation, and the well-being of farmers.

**2. Engaging Farmers and Local Communities:** This subsection emphasizes the importance of engaging farmers and local communities in decision-making processes and policy formulation. It discusses the significance of participatory approaches that involve farmers, agricultural cooperatives, and local community organizations in shaping agricultural policies, resource allocation, and implementation strategies. It highlights the need to empower farmers and ensure their active participation in designing interventions that address their specific needs and challenges.

**3. Collaborative Approaches for Policy Implementation:** This subsection focuses on collaborative approaches for policy implementation. It emphasizes the importance of multi-stakeholder engagement involving government agencies, agricultural institutions, NGOs, researchers, and farmer organizations. It explores the benefits of collaborative efforts in sharing knowledge, expertise, and resources, and in coordinating actions to effectively implement policies and interventions aimed at addressing farmers' distress and reducing suicide rates.

**Implications for Policy and Practice:** This subsection discusses the implications of the research findings for policy and practice. It emphasizes the need for comprehensive policies that address the structural and systemic factors contributing to farmers' distress and suicides. It highlights the importance of strengthening social safety nets, promoting sustainable agriculture practices, enhancing mental health support services, and incorporating ethical considerations in agricultural policies. It also underscores the significance of stakeholder engagement, community participation, and collaborative approaches in policy formulation and implementation.

**Future Directions for Research:** This subsection suggests potential future directions for research on farmers' suicides in India. It identifies areas that warrant further investigation, such as the long-term impacts of policy interventions, the effectiveness of mental health support services, and the role of technology and innovation in addressing agrarian distress. It also encourages interdisciplinary research that combines sociological perspectives with other disciplines, such as economics, psychology, and environmental studies, to gain a more comprehensive understanding of the issue.

#### **CONCLUSION**

This section provides a summary of the sociological analysis conducted throughout the research paper on farmers' suicides in India, with special reference to Maharashtra. It highlights the key findings and insights gained from examining the sociological perspective, agrarian distress, socioeconomic factors, social and cultural factors, institutional failures, coping strategies, and policy recommendations. It emphasizes the interconnectedness of these factors and their contributions to the issue of farmers' suicides.

In conclusion, this research paper provides a critical sociological analysis of farmers' suicides in India, with a special focus on Maharashtra. It highlights the multifaceted nature of the problem, encompassing socioeconomic, cultural, institutional, and policy-related factors. The paper underscores the importance of addressing these factors holistically through evidence-based policy interventions, stakeholder engagement, and the promotion of sustainable and ethical agricultural practices. By taking these steps, we can work towards creating a more inclusive and supportive environment for farmers and reduce the incidence of farmers' suicides in India.

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**THE EFFECT OF DEMOGRAPHIC CHARACTERISTICS ON PSYCHOLOGY OF RISK OF MUTUAL FUND INVESTORS**

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**ABSTRACT**

*This study examines the relationship between personal characteristics of investors and investment behaviour, and the psychology of risk attributed by them in decision making process of mutual fund investment. Personal characteristics investigated included the investors' age, education, investment experience, and the extent to which they use financial herd. The data were collected by survey using questionnaires based on investor's comprehension of the risk in decision of investment through the analysis of variable viz. risk attitude, herding, asset allocation, predictive ability, cognitive dissonance and effect theory. It was found that investors psychology of risk predominately and significantly related to the investment's choices rather than rational criteria of decision. The other characteristics exhibited varying degrees of relationships for the investors.*

*Keywords: Psychology, Risk, Investors, Behaviour, Bias, MFs*

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**INTRODUCTION**

Given investors' emotional behavior in the investment market, this paper explores the relationship between investor psychology and behavior while investing into mutual funds. In behavioral finance, it is assumed that financial participants are not perfectly rational and self-controlled but rather psychologically bias in their investment behaviour. The behavioral finance theories and concepts that influence an individual's perception of risk for financial investment are heuristics, overconfidence, prospect theory, loss aversion, representativeness, framing, anchoring, familiarity bias, Illusion of control, mental accounting and affect theory. Paul Slovic, study of "Psychological Study of Human Judgment: Implications for Investment Decision Making" in 1972, discovered that an investor have an tendency to look for the returns generated by the equity shares of reputed companies before making any investment decisions. There is always a concern that what factors affect the decision making and is there any association between personal characteristics and psychology of investors behaviour. This is evident in study of Kiran and Rao (2005), indicated strong relationship between risk taking attitude and demographic and psychographic variables through study; Identifying Investor Group Segments Based on Demographic and Psychographic Characteristics, examined whether demographic and psychographic variables were effective on risk-bearing capacity of Indian investors by conducting a sampling survey.

**LITERATURE REVIEW:**

The academic foundation related to the psychology of risk perception studies in behavioral finance, accounting, and economics developed from the sociology and psychology branch of academia. Hirshleifer (2001) argues that many or most familiar psychological biases can be viewed as outgrowths of heuristic simplification, self-deception, and emotion-based judgments. Study done by Kent, Hirshleifer and Subramanyan (2001) found the evidence for systematic cognitive errors made by investors and these biases affect prices. In reality, however, according to Shiller (1999) investors do not think and behave rationally. To the contrary, it is driven by greed and fear and psychological bias. Investors mislead by extreme of emotions, subjective thinking and whims of crowd, psychology of mass consistently form irrational expectation for the future performance of values and follow a somewhat predictable path. Much of basic theories of behavioural finance concerns with a series of new concepts under the general heading (Herbert, Simon, 1947, 1983), this relates to cognitive limitations on decision making.

Whether Investor carries unsuccessful stock in their portfolio or not that is always a point of discussion to understand behaviour of individual investors. Shefrin and Statman (1985) used the study of Schlarbum and gave the first formal analysis to disposition effect in behavioural science. They challenged the above argument of outperformance of mutual fund manager an investor who exhibits herd instinct generally overeat toward the same or similar investments as others. While Weber and Camerer (1998) carried a laboratory experiment of the disposition effect that involves buying and selling six hypothetical stocks in trading rounds. They found that investors are about 50% more likely to realize gains compared to losses. Their result is in confirmation result of obtained with field data. For some investors, the tendency to hold losers may be driven on a more basic level than probabilities of gains and losses. People live in a world in which most decisions are judged ex post and most people find it psychologically painful to acknowledge their mistakes" (Barber, lee, liu and Odean, 2007). Ganzach (2001) stated, people judge stocks that they perceive as "good" to have low risks and high returns and judge stocks that they perceive as "bad" to have low returns and high risk.

Confirmation bias is when investors have a bias toward accepting information that confirms their already-held belief in an investment. If information surfaces, investors accept it readily to confirm that they're correct about their investment decision—even if the information is flawed otherwise, it will create the cognitive dissonance. Investor ability to predict the future performance or their perception about the predictive ability is the question of discussion. Hilary and Menzly (2006) found that stock analysts, who are the most successful at predicting returns in one year, had performed poor in subsequent years. Author said it is consistent with self-attribution bias and leads to overconfidence. It may be interpreted that they perceive that they can predict the performance which satisfies their self-attribution bias only.

There are innumerable social and economic situations in which we are influenced in our decision making by what others are doing. Banerjee (1992) analyzed the sequential decision model in which each decision maker looks at the decision made by previous decision makers in taking their own decision. Whether there is any link between the personality type, gender and behavioural bias. Michael et. al. studied a sample of '100 individual' investors to examine behavioural biases for each one of 16 personality types delineated by the MBTI (Myers-Briggs Type Indicators). They found that many personality types and both genders are differently disposed to numerous behavioural finance biases. They observed that different personality types exhibit different overconfidence and optimism. (Michel and John, 2004). This research study is an attempt to examine the association of demographic factors and psychology of risk and bias amongst mutual fund investors.

### METHODOLOGY AND DATA ANALYSIS

The data were collected by survey of 1182 mutual fund investors using questionnaires based on investor's comprehension of the risk in decision of investment. Variables considered to assess the psychology of risk are viz. predictive ability, risk attitude, Asset allocation, herding, snake bite effect, cognitive dissonance. Analysis and result of the given variables are as under. Following hypothesis are tested to assess the relationship of personal characteristic and risk psychology.

**H<sub>1</sub>:** There is no association between interpretation of risk and occupation of investors.

**H<sub>2</sub>:** There is no association between risk attitude and education of investors.

**H<sub>3</sub>:** There is no association between risk attitude and income of investors.

**H<sub>4</sub>:** There is no association between interpretation of risk and proportion of savings to mutual funds.

**H<sub>5</sub>:** There is no association between interpretation of risk and allocation to Equity: debt allocation

### PSYCHOLOGY OF RISK OF INVESTORS

The respondents were asked to confirm their understanding of uncertain return and risk in investments, results are as given under:

**Table- 1 Risk attitude of mutual fund investors**

Risk	Frequency	Percentage
Loss	310	26.23
Uncertainty of returns	475	40.19
Opportunity	314	26.57
Thrill	83	7.02
N	1,182	100.00

It is observed that for 26.23% of respondents considered risk is equivalent to loss. 40.19% considered risk as uncertainty of return, 26.57% considered risk opportunity, and 7% consider it as thrill. It can be derived from this, 26% of respondent are risk averse, 40.19 % are moderately risk takers, and 33.6% are risk takers or aggressive investors. It is observed from this data that only 40% investors understand the risk perse in rational decision criteria others represent the psychological bias in their behavior. To understand, what factors attribute to the level of risk attitude, some hypothesis test was applied, as given below:

**Table –2: Distribution of respondents according to their interpretation of risk and occupation**

Occupation	Interpretation of risk				Total
	Loss	Uncertainty of returns	Opportunity	Thrill	
House Wife	8	14	7	1	30
	26.70%	46.70%	23.30%	3.30%	100.00%
Self Employed	121	164	104	38	427



	28.30%	38.40%	24.40%	8.90%	100.00%
Employed in Govt.	51	66	42	5	164
	31.10%	40.20%	25.60%	3.00%	100.00%
Pvt Employee	103	170	105	25	403
	25.60%	42.20%	26.10%	6.20%	100.00%
Professional	14	19	13	6	52
	26.90%	36.50%	25.00%	11.50%	100.00%
Broker, Financial advisor	13	42	43	8	106
	12.30%	39.60%	40.60%	7.50%	100.00%
Total	310	475	314	83	1182
	26.20%	40.20%	26.60%	7.00%	100.00%

It can be observed from the above data major investors who are brokers and finance advisors and about 25% of professionals and private employees, are considering the risk is an opportunity which shows psychology about risk. About 30% of government employees consider that risk is a loss. To check if there is any association between interpretations done by respondents about risk and their occupation, Pearson's Chi-square test was applied. P-value was 0.018 which was less than 0.05. It can be inferred that there is significant association between interpretation of risk done by respondent and their occupation. It can be interpreted that their risk perception is associated with the personal characteristic, occupations.

**Table-3 Chi-square analysis for association between risk attitude and occupation of investors.**

Chi-Square Tests			
	Value	Df	p-value
Pearson Chi-Square	28.615	15	0.018
Likelihood Ratio	30.134	15	0.011
Linear-by-Linear Association	6.595	1	0.010
No. of Valid Cases	1,182		

Data in given table explains the risk attitude of investors and its association with their occupation. It is depicted in the above table p-value  $0.018 < 0.05$ , means association is statistically significant among this variable. This led to rejection of null hypothesis for association of risk attitude and occupation, which means there exists a statistical significance association between risk attitude and occupation. Therefore, it can be concluded that they fail to understand the risk in rational way, so it is influenced by the profession of investors and psychological trait associated with it.

**Table –4: Association between risk attitude and education of respondents**

Education	Interpretation of risk				Total
	Loss	Uncertainty of returns	Opportunity	Thrill	
HSC or less	17	27	22	7	73
	23.30%	37.00%	30.10%	9.60%	100.00%
Less than Graduate	40	59	52	11	162
	24.70%	36.40%	32.10%	6.80%	100.00%
Graduate	127	187	136	42	492
	25.80%	38.00%	27.60%	8.50%	100.00%
Post Graduate	88	147	81	17	333
	26.40%	44.10%	24.30%	5.10%	100.00%
Professional	13	20	9	3	45
	28.90%	44.40%	20.00%	6.70%	100.00%
Management	25	35	14	3	77
	32.50%	45.50%	18.20%	3.90%	100.00%
Total	310	475	314	83	1182
	26.20%	40.20%	26.60%	7.00%	100.00%

It is observed from the data that of respondents consider risk means uncertainty of returns. 30% respondents who are less educational qualification felt that risk is an opportunity and about 28 to 30% respondents who were professionals or are in management felt that risk is a loss. To sum up this it can be stated that majority of investors are affected by their education in interpreting the risk and not independent of their demographic variable. The association between interpretations of risk of investors and their education, Pearson's Chi-square test is applied, result is as mentioned below.

**Table-5 Chi square analysis of association between risk attitude and education**

Chi-Square Tests			
	Value	Df	p-value
Pearson Chi-Square	16.016	15	0.381
Likelihood Ratio	16.335	15	0.360
Linear-by-Linear Association	9.098	1	0.003
No. of Valid Cases	1,182		

Observed P-value in given table is 0.381, greater than 0.05, null hypothesis cannot be rejected for this association. It can be inferred that there is no statistically significant association between interpretation of risk done by respondent and their education.

**Table-6: Distribution of respondents according to their risk attitude and income**

Income	Interpretation of risk				Total
	Loss	Uncertainty of returns	Opportunity	Thrill	
<=15000	60	66	63	25	214
	28.00%	30.80%	29.40%	11.70%	100.00%
15,001-30,000	141	211	110	33	495
	28.50%	42.60%	22.20%	6.70%	100.00%
30,001-50,000	76	122	99	17	314
	24.20%	38.90%	31.50%	5.40%	100.00%
50,001-1,00,000	23	60	30	4	117
	19.70%	51.30%	25.60%	3.40%	100.00%
>1,00,000	10	16	12	4	42
	23.80%	38.10%	28.60%	9.50%	100.00%
Total	310	475	314	83	1,182
	26.20%	40.20%	26.60%	7.00%	100.00%

The above table indicates the cross relationship between risk attitude and income factors of respondents. It is observed that investors in group of income of INR.15,000-30,000 per month consider risk as uncertainty of return, followed by risk as loss. Those whose income is between INR.30,000-50,000 p.m. considered risk as uncertainty of return, followed by risk as opportunity. Similar results were found for the group of income of INR.50,000 per month and above. To test the influence of income on risk attitude of respondents (investors), Chi-square test has been applied as given in following table.

**Table- 7 Chi-square results for risk attitude and income of respondents**

Chi-Square Tests			
	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	30.486 <sup>a</sup>	12	0.002
Likelihood Ratio	30.240	12	0.003
Linear-by-Linear Association	0.005	1	0.944
No. of Valid Cases	1,182.000		

Result in table-7, clearly indicates the relationship of risk attitude and income of respondents. As P-value is  $0.002 < 0.05$ , Null hypothesis is rejected, which means, there exists statistically significant association between risk attitude and income level of respondents. The observed result suggests that income is one of the most significant factors that affect risk bearing capacity of investors. Therefore, it can be judged that investors risk attitude is dependent on their income and they fail to judge the risk in rational terms.

**Allocation of funds to mutual fund investments to diversify the risk:****Table –8: Proportion of saving invested in MFs v/s risk attitude**

Proportion of saving	Interpretation of risk				Total
	Loss	Uncertainty of returns	Opportunity	Thrill	
<5%	66	67	34	13	180
	36.70%	37.20%	18.90%	7.20%	100.00%
5-10%	135	178	115	30	458
	29.50%	38.90%	25.10%	6.60%	100.00%
10-25%	90	193	137	32	452
	19.90%	42.70%	30.30%	7.10%	100.00%
>25%	19	37	28	8	92
	20.70%	40.20%	30.40%	8.70%	100.00%
Total	310	475	314	83	1182
	26.20%	40.20%	26.60%	7.00%	100.00%

It is observed that the allocation of saving funds to mutual fund investments, it can be inferred that major respondents allocate their funds up to 5% to 25% to mutual fund investments. Those who consider risk as uncertainty of return or opportunity, invest higher amount of their savings to mutual funds as compared to those who consider risk as loss or thrill. It can be concluded that majority respondents are moderate risk takers or risk averse investors.

**Table-9: Chi-square analysis for association between risk attitude and allocation of savings to MFs**

Chi-Square Tests			
	Value	df	p-value
Pearson Chi-Square	26.377	9	0.002
Likelihood Ratio	26.495	9	0.002
Linear-by-Linear Association	15.823	1	0.000
No. of Valid Cases	1,182.000		

It is observed from the data in table-9, that indicates the relationship of risk attitude and allocation of savings to mutual funds investment. The observed p-value is  $0.002 < 0.05$ , null hypothesis is rejected, is indication of statistical significant association between risk attitude and allocation of funds to mutual funds investment of respondents. Therefore it can be understood that their risk attitude is dependent on psychology of risk in the asset allocation decision.

**Allocation of funds in equity and debt category of funds for risk avoidance:**

Here data was gathered to understand the allocation of total funds into two basic categories of investments i. e. Equity and Debt category. Sometimes return of overall investment can be attributes to how investors allocate their total investment into these two basic categories. Following table depicts the descriptive statistics of allocation of savings into Equity category.

**Table- 10: Distribution of respondents according to fund allocation to equity category of investments**

Allocation of Saving to Equity schemes	Frequency	Percentage
0- 25%	217.00	18.36
25% - 50%	461.00	39.00
50%	322.00	27.24
50%- 75%	145.00	12.27
75%- 100%	37.00	3.13
Total	1,182.00	100.00

It is observed that majority 39% of investors allocated 25-50% to equity category, followed by 27% of investors who allocated 50% to equity category of mutual fund schemes. However, 18% of respondents invest up to 25% into equity, followed by 15% who allocated more than 50% to equity category of mutual fund investments. Following table shows the association of allocation to equity category and risk attitude of investors (respondents). It is interpreted from the above decision that they invest more into equity, riskier category of investment even preceding data shows that they are risk averse.

**Table –11 Appropriate allocation between Equity MFs and Debt MFs v/s risk attitude**

Appropriate allocation	Interpretation of risk				Total
	Loss	Uncertainty of returns	Opportunity	Thrill	
0-25%	78	75	53	11	217
	35.90%	34.60%	24.40%	5.10%	100%
25-50%	128	192	107	34	461
	27.80%	41.60%	23.20%	7.40%	100%
50-50%	75	128	93	26	322
	23.30%	39.80%	28.90%	8.10%	100%
50-75%	25	65	46	9	145
	17.20%	44.80%	31.70%	6.20%	100%
75-100%	4	15	15	3	37
	10.80%	40.50%	40.50%	8.10%	100%
Total	310	475	314	83	1182
	26.20%	40.20%	26.60%	7.00%	100%

It can be interpreted from the analysis of relationship of risk attitude of investors and allocation of funds to equity-debt category of investments, highest amount to equity categories; they consider risk as uncertainty of return or opportunity. While those who invest 50% to equity, they consider risk as uncertainty of return or loss. This result is same for those who invest up to 25% and 75% to equity, and investors in group of less amount of money to equity category, they consider risk as loss.

**Table- 12: Chi-square analysis for association between risk attitude and allocation of funds into Equity: Debt category of MF investments.**

Chi-Square Tests			
	Value	df	p-value
Pearson Chi-Square	28.970	12	0.004
Likelihood Ratio	29.544	12	0.003
Linear-by-Linear Association	17.137	1	0.000
No. of Valid Cases	1,182		

It is found from Chi-square test of risk attitude and its association to debt equity allocation of investment. The calculated p-value 0.004 < 0.05, it indicates rejection of hypothesis, indicated the significant association between risk attitude and debt equity allocation.

#### **Prediction/ forecasting ability of respondents to minimize the risk:**

The behavioural finance state that the investors are over rating their capability of judging and predicting the future performance and market state of affairs which shows their psychological bias of self-attribution. Here, respondents were asked to predict the level of inflation in the next year. It was asked to understand whether it will be double digit or not, what probability of double-digit inflation rate in next year, to understand their attitude towards future forecasting. It is observed that they fail to incorporate the probability in their decision making which also shoes their behavior in line with the overconfidence bias given in behavior finance theory. Following table gives the descriptive statistics for the same.

**Table- 13 Distribution of respondents according to their probability judgment about inflation**

Probability % of double-digit inflation in next year	Frequency	percentage
0- 25%	144.00	12.18
25% - 50%	455.00	38.49
50%	395.00	33.42
50%- 75%	163.00	13.79
75%- 100%	25.00	2.12
Total	1,182.00	100.00

It is observed from the table that the distribution of respondents according to their probability judgment of double-digit inflation in next year, majority of respondents had opinion that there is 25%-50% chances that

there will be double digit inflation in next year, followed by 33% of respondents who said that there 50 % probability of double-digit inflation in next year. In reality prediction of inflation is not considered easy. Therefore, it can be concluded that there are psychological bias and their prediction is behavioural traits of overconfidence not rationality

### Herding Behavior of Investors

It is stated that investors would be exhibiting herding behavior when they rely on others validation or recommendation. To assess the herding bias in investment behavior, investors were asked about the decision of buying on friend's recommendation. Observations are as; that the availability heuristics, where investors undertake their decisions on friend recommendation etc. it is observed that they show the preference towards purchasing stock on some recommendation, 37% of investors wanted to research first and then take decision of buying, while 63% of respondents validate buying directly or indirectly. This observation supports the herding bias in investment behavior, as they want to be a part of a group decision. It is observed that investors by following the herd feel safe and less risky, shows their psychology of risk in irrational manner.

In theory of cognitive dissonance and shadow of past or house money effect, as human beings, investors are likely to be blessed with different levels of self-esteem and ego. It is natural that investors would always want to make the right decisions. Cognitive dissonance is a bias, which is said to have occurred, when investor's beliefs are seems to be consistent with their past decisions. To assess the cognitive dissonance bias respondents were asked to confirm their reaction to market news, results are as under:

### Change in decision of investors due to market news to avoid risk.

It is observed that investors provided the evidence of cognitive dissonance in decision making process of investors. The data indicates that, majority 60.3 % of investors are of opinion that they will not react to market bad news, while 25% said they will sell it due to market news. This result indicates that 60% of respondents depicted either under-reaction to market news or they are not ready to accept that they had made wrong choice or a wrong decision, because this will create mental disturbance, cognitive dissonance. The investors can also experience discomfort when they acquire new information that conflicts with preexisting understandings, which is another symptom of the bias. It can be concluded that they are slow in updating their information, or in reversing their own decision, as it creates mental conflicts. So, major 60% of respondents had shown attitude of no-reaction to market news. Investors are said to be subject to cognitive dissonance bias if they exhibit the tendency to avoid new and conflicting information. Therefore, it can be concluded that respondents are susceptible to the cognitive dissonance bias and depart from the theory of rationality of standard finance.

There is other psychological or behavioural bias; shadow of past, where investors are unable to change their past beliefs or experience. To assess 'shadow of past' bias respondents were provided with a decision situation, results are as under.

**Table-14 Decision of investors to invest in funds, in which they incurred loss in past**

Will you invest in?	Frequency	Percent
Definitely invest	263	22.30
Not invest	342	28.90
May invest	325	27.50
See response and invest	252	21.30
Total	1,182	100.00

It is observed through a given decision situation, and ask to state their opinion of action in changed market circumstances, like if new fund offer is coming with fundamentally diversified, and blue-chip companies, from one of the mutual fund houses with whom they had worst experience earlier. It is indicative that majority investors ,50% demonstrate slow response or negative attitude towards these investments, supports the shadow of past effect bias in their behavior. Therefore, it can be interpreted that they are not independent of their behavioural and psychological bias in investment decision.

### CONCLUSION

Behavioural finance has changed the perspective how investor process the information and undertake the decisions irrationally. It is theories that the effect of investors' emotional behavior in the investment market. This study explores the relationship between investor psychology and behavior while investing into mutual funds. In behavioral finance, it is assumed that financial participants are not perfectly rational and self-

controlled but rather psychologically bias in their investment behaviour. It is observed that the psychological biases affect investor behavior and, therefore, their investment choices from large mutual funds alternatives. It was found that investors psychology of risk predominately and significantly related to the investment's choices rather than rational criteria of decision. The other characteristics exhibited varying degrees of relationships for the investors. Therefore, it can be concluded that demographic characteristic of investors are significantly associated with their psychology of risk and behavioural bias evident from their decision of investment examined.

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**LIQUID-LIQUID EXTRACTION DIRECT SPECTROPHOTOMETRIC DETERMINATION OF RUTHENIUM FROM SUCCINATE MEDIA USING O-METHYL PHENYL THIOUREA: ANALYSIS OF RUTHENIUM CATALYST, BINARY AND TERNARY SYNTHETIC MIXTURES**

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**ABSTRACT**

The liquid liquid extraction direct spectrophotometric determination method is developed for ruthenium(III) using *O*-methylphenyl thiourea (OMPT) from succinate media. The developed method is based on extraction of ruthenium present in  $1.2 \text{ Mol L}^{-1}$  succinate media after shaking time of 06 minutes, further determined spectrophotometrically at 585 nm. The absorbance of green colored chloroform layer containing ruthenium(III)-OMPT complex was measured at 585 nm. The developed method is sensitive and has molar absorptivity and sandell's sensitivity  $4.287 \times 10^4 \text{ L mol}^{-1} \text{ cm}^{-1}$  and  $0.00235 \mu\text{g cm}^{-2}$  respectively. The stoichiometry of ruthenium(III):OMPT complex was studied using slope mole ratio method and job's continuous variation method and found to be 1:2. The ruthenium(III)-OMPT complex in chloroform obeys beer's law up to  $6.0 \mu\text{g ml}^{-1}$  and from ringbom's plot the optimum concentration range is 1.0 to  $6.0 \mu\text{g ml}^{-1}$ . The stability of complex was more than 14 hrs. The developed method is simple and sensitive, studied for interfering effect of various cations and anions which shows the method is suitable for extraction spectrophotometric determination of ruthenium(III) in presence of different cations and anions. The method has good applicability for determination of ruthenium(III) from ruthenium catalyst, binary and ternary synthetic mixtures. The statistical study was carried out and checked by relative standard deviation (R.S.D) for ten determinations which was 0.586 %.

**Keywords:** Ruthenium(III), Liquid-Liquid Extraction Spectrophotometry, Ruthenium Catalyst, Synthetic Mixtures

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**1. INTRODUCTION**

Ruthenium is a rare metal and the member of platinum group metals. It occurs in nature together with platinum group metals. It has wide range of applications due to its unique property of resistance to various chemicals, good electrical properties, and use in jewelry. One important use of ruthenium is it acts as the effective hardner in high density alloys. Catalytic applications of ruthenium are famous and well known for the removal of  $\text{NO}_x$  from air stream [1]. The ruthenium complexes are stable and have biological importance in detection of amino acids [2], vitamin A [4], chlorophenaramine [5] and many more. Ruthenium is also used as anticancer drugs [6]. Considering the inert property, catalytic use, biological applications and use as anticancer drugs, it demands the need for analysis of ruthenium(III) by its extraction and determination at trace level from various samples with simple easy and selective method for its determination.

Many techniques and methods are reported for determination of ruthenium like atomic absorption spectrometry, inductively coupled plasma mass spectrometry, voltametry, X-ray fluorescence, spectrofluorimetry, spectrophotometry, mass spectrometry, inductively coupled plasma atomic emission spectrometry, high performance liquid chromatography, neutron activation analysis, and all this techniques for ruthenium determination are been reviewed [6]. Determination of ruthenium is reported using microwave radiations [7]. The interaction of ruthenium with naturally occurring flavanoids is used for its determination [8]. Along with all this different methods for analysis of ruthenium(III), solvent extraction technique is the extraction technique which helps for quantitative recovery and along with liquid liquid extraction the use of spectrophotometer for immediate determination of ruthenium after extraction is the merit of extraction spectrophotometric determination. Various reagents are reported for spectrophotometric determination of ruthenium by sandell and marckzenko [9,10,11] also many other reagents are reported. The determination of ruthenium by thiourea reported by sandell's and markzenko is sensitive and easy but suffers from some drawbacks like need of higher hydrochloric acid concentration, requirement of 10 min heating time or one hour standing, interferences from other platinum group metals. Spectrophotometric determination of ruthenium is also carried out by many reagents and derivatives [12, 13,14,15,16,17,18].

Determination of ruthenium is carried out by the use of its catalytic property [19,20,21]. Spectrophotometric determination methods for ruthenium(III) have been investigated based on its kinetic catalytic effect [22,23,24,25,26,27,28]. Ruthenium(III) is determined using flow injection catalytic kinetic spectrophotometric determination [29,30,31,32]. These various reported methods for spectrophotometric determination of

ruthenium(III) are based on use of colored dye, have restricted applications, small range for beer's range, need of critical temperature controlled oxidation condition and are reported with time consuming tedious procedures, this demerits reflect the need for determination of ruthenium(III) with easy steps for extraction and determination, minimum drawbacks and cost effective quantitative determination at trace level using readily available reagents. In current manuscript the o-methylphenyl thiourea (OMPT) the thiourea derivative is reported for extraction spectrophotometric determination of ruthenium(III) from succinate media.

The author have previously developed extraction spectrophotometric determination of ruthenium (III) from mineral acid media the hydrochloric acid media [33] using OMPT and in present communication as a part of further extension of work OMPT is used for extraction spectrophotometric determination of ruthenium from organic acid media the succinate media. The developed method in organic acid media has merits and good spectral and physico-chemical characteristics [Table 1].

## 2. Experimental

### Apparatus

The Elico make digital spectrophotometer model SL-159 with 1 cm quartz cells was used for absorbance measurements. Digital weighing balance of Contech make model CA -123 was used for weighing purpose. Clean and dry glasswares were used

### Standard ruthenium(III) solution

The stock solution of ruthenium(III) was prepared from ruthenium(III) chloride (Johnson Matthey, London) after dissolving 1 g ruthenium(III) chloride in 20 mL, 1.0 mol L<sup>-1</sup> hydrochloric acid and diluted up to 250 mL, the stock was standardized by reported method [34]. The working standard solution (40 µg mL<sup>-1</sup>) was prepared after further dilutions using double distilled water.

### O-Methylphenyl thiourea solution

The reagent O-Methylphenyl thiourea (OMPT) was synthesized as per method reported by Frank and Smith [35]. The organic phase containing OMPT was prepared in chloroform, the 10 ml organic phase of chloroform 0.20 mol L<sup>-1</sup> in OMPT was used for each single extraction.

### Solutions of foreign ions

Different cations and anions used for interference study were prepared and standardized by reported methods. The weighed quantities of salts of the cations were dissolved in water or dilute hydrochloric acid and made for respective concentrations using calibrated volumetric flask. The solutions of anions were prepared using their alkaline metal salts and prepared after dissolving in water and diluted in the calibrated volumetric flask. Definite compositions of various synthetic mixtures were prepared, mixed with ruthenium(III) solution and developed method applied for synthetic mixtures study.

### Recommended procedure

The extraction spectrophotometric determination of ruthenium(III) was studied at trace level of 20 µg ruthenium(III) and extracted from 1.2 Mol L<sup>-1</sup> succinate media. An aliquot of solution containing 20 µg of ruthenium(III) was transferred to 25 ml calibrated volumetric flask and sodium succinate added to make succinate concentration 1.2 Mol L<sup>-1</sup> after 25 ml volume. This solution was transferred into 125 mL separatory funnel and equilibrated for 06 minutes with chloroform containing 0.20 Mol L<sup>-1</sup> OMPT. After 06 minutes equilibration time the green colored ruthenium(III)-OMPT complex was extracted into organic phase. The chloroform layer containing ruthenium(III)-OMPT complex was dried over 1 gm anhydrous sodium sulphate, transferred in to 10 mL calibrated volumetric flask and made up to mark with chloroform. The absorbance measurements were done at 585 nm against reagent blank. Percentage extraction (%E) and distribution ratio (D) were calculated using below equations

$$\% E = \frac{[M]_{\text{org}}}{[M]_{\text{aq. init}}} \times 100 \quad D = \frac{[V_a / V_o] \times \% E}{100 - \% E}$$

Here [M]<sub>org</sub> and [M]<sub>aq. init</sub> represents the ruthenium(III) concentration in organic phase after equilibrium and initial concentration before equilibrium in the aqueous phase. The V<sub>o</sub> and V<sub>a</sub> represents the volume of organic phase and aqueous phase respectively.



### 3. RESULTS AND DISCUSSION

#### *Absorption spectra*

The ruthenium(III)-OMPT complex in  $1.2 \text{ mol L}^{-1}$  succinate media shows maximum absorption at 585 nm (Figure 01). All further spectral measurements were done at 585 nm wavelength.

#### *Effect of succinate media*

The sodium succinate concentration has direct effect on extraction spectrophotometric study of ruthenium(III). The molar concentration of succinate was studied from 0.1 to  $2.0 \text{ Mol L}^{-1}$  succinate for  $20 \mu\text{g}$  ruthenium(III) and the recommended procedure followed. The amount of extraction was complete and the absorbance value was maximum from  $1.2$  to  $2.0 \text{ Mol L}^{-1}$  succinate concentration (Figure 02) The aqueous phase as  $1.2 \text{ mol L}^{-1}$  succinate media was fixed for quantitative extraction of ruthenium (III).

#### *Effect of OMPT concentration*

The reagent OMPT concentration was varied from 0.10 to  $0.25 \text{ mol L}^{-1}$  sodium succinate. The absorbance increases with OMPT concentration and maximum absorbance is obtained from  $0.19$  to  $0.25 \text{ mol L}^{-1}$  reagent (Figure 03). The OMPT reagent concentration of  $0.20 \text{ mol L}^{-1}$  was fixed for all further studies.

#### *Choice of extraction solvent*

Different extraction solvents were studied for ruthenium(III)-OMPT complex. Quantitative extraction with clear and transparent organic phase containing green ruthenium(III) complex was seen in chloroform. Compared to other organic phases used for extraction study of ruthenium(III)-OMPT complex chloroform gave quantitative extraction in chloroform with maximum absorbance. The 03 times repeated extraction study was performed using fresh chloroform layer containing OMPT  $0.2 \text{ mol L}^{-1}$  on aqueous phase left behind after first extraction, shown absence of ruthenium(III) and no complexation which confirmed complete quantitative extraction of ruthenium(III) after first single extraction with shaking time 06 minutes. The percentage extraction (% E) values increases in the order as isoamyl alcohol (30.12) < n-butyl acetate (60.11) < 1,2 dichloroethane (61.45) < MIBK (72.24) < chloroform (99.99) [Table 02]. In the organic solvents xylene, benzene, toluene, and carbon tetrachloride the ruthenium(III)-OMPT complex shows no extraction.

#### *Equilibration time variation*

The equilibration time was a crucial parameter in extraction spectrophotometric study of ruthenium(III). Initially for extraction time from few seconds to minutes there was no extraction and no complexation upto 5.0 minutes after 5.0 minutes the complexation was initiated and complete extraction of ruthenium(III)-OMPT complex occurs after shaking time of 5.8 minutes which shows quantitative extraction checked up to 20 minutes. Hence the shaking time of 6.0 minutes was fixed for all further studies.

#### *Effect of color stability of the complex*

The ruthenium(III)-OMPT complex was stable studied at room temperature checked by absorbance measurements at regular time intervals of 30 minutes each. The ruthenium(III)-OMPT complex was stable up to 14 hours after it the absorbance values starts decreasing notify the ruthenium(III)-OMPT complex stability decreases after 14 hours standing time.

#### *Beer's law and sensitivity*

The Beer's law was studied and found to be obeyed up to  $6.0 \mu\text{g mL}^{-1}$  (Figure 04). Ringbom's plot [36] was sigmoid shape with a linear segment at absorbance values of  $1.0$  to  $6.0 \mu\text{g mL}^{-1}$  (Figure 05). The sandell's sensitivity was  $0.0236 \mu\text{g cm}^{-2}$  and the molar absorptivity was  $4.28 \times 10^4 \text{ L mol}^{-1} \text{ cm}^{-1}$ . The correlation coefficient values of ruthenium(III)-OMPT complex with an independent variable as concentration in  $\mu\text{g mL}^{-1}$  and dependent variable as absorbance was found to be 0.99. The relative standard deviation calculated from 10 determinations was 0.58%.

#### *Stoichiometry of the complex*

The stoichiometry of Ruthenium:OMPT complex was ascertained by mole ratio method (Figure 06) and job's continuous variation method (Figure 07). From mole ratio method and jobs variation method the stoichiometry of Ruthenium:OMPT is found as 1:2. The reagent OMPT is a multidentate ligand, with sulphur from thio group ( $-\text{C}=\text{S}$ ) and amine group nitrogen ( $-\text{NH}_2$ ) coordinates with ruthenium to form a 1:2 (ruthenium(III):OMPT) complex (Figure 08).

#### *Effect of Interfering ions*

The extraction spectrophotometric determination method for ruthenium(III) ( $20\mu\text{g}$ ) was checked in presence of many other associated and other cations and anions. The developed method has good selectivity in presence of different cations and anions (Table 3). The deviation not more than + 2 % in the absorbance of green colored

ruthenium(III)-OMPT complex was fixed. Suitable masking agents was used to mask the cations causing interferences. Gallium, indium, thallium, copper, cobalt, nickel, tin and cerium interferes the determination of ruthenium by OMPT in succinate media.

#### 4. APPLICATIONS OF THE DEVELOPED METHOD

##### *Analysis of ruthenium catalyst*

The developed method was studied for its application to ruthenium catalyst. The ruthenium catalyst (Lancaster make) (5 % on carbon, 10 % on carbon, 5 % on alumina) was analyzed by proposed method. A 0.1 gm ruthenium catalyst was taken and added 10.0 mL aqua-regia to it, followed by evaporation up to moist dryness, to the mixture the concentrated 5.0 mL hydrochloric acid was added and evaporated up to moist dryness. Further again distilled water added and evaporated to moist dryness to ensure complete removal of nitric acid and hydrochloric acid. The moist residue was cooled and dissolved in water. The mixture filtered through whatman filter paper No.1 and made up to mark with water in 100 mL volumetric flask. The sample withdrawn from diluted solution and recommended procedure applied, the ruthenium(III)-OMPT complex extracted into chloroform layer, further determined spectrophotometrically at 585 nm. Obtained results were checked against atomic absorption spectrometer and found to be in good agreement with the certified values (Table 4).

##### *Determination of ruthenium(III) from binary mixtures*

The developed method for extraction spectrophotometric determination of ruthenium(III) was applied for separation of ruthenium(III) from associated cations, termed as the binary separation and spectrophotometric determination of ruthenium(III). The developed method was applied for separation and determination of ruthenium(III) from the metal ions like, iron, manganese, molybdenum, tungsten, antimony and gold. As per recommended procedure the ruthenium(III) and the metal ions of binary separation was added and made in succinate media  $0.2 \text{ Mol L}^{-1}$ , further the recommended procedure followed and ruthenium(III) separated from added metal ions used for binary separation and determined quantitatively. The aqueous phase left behind in the separating funnel after ruthenium extraction by OMPT in chloroform layer was evaporated to moist dryness the 3.0 mL concentrated hydrochloric acid treatment given and again evaporated to moist dryness, residue obtained was cooled and dissolved in water. The quantity of added metal ions were determined spectrophotometrically by reported method [11] (Table. 5).

##### *Determination of ruthenium(III) from ternary mixtures*

The separation and spectrophotometric determination of ruthenium from ternary synthetic mixtures containing different compositions of associated metal ions and fixed ruthenium(III) content ( $20 \mu\text{g}$ ) was transferred in to 25 mL calibrated volumetric and the recommended procedure was followed and ruthenium(III) extracted and determined spectrophotometrically, the results were in good agreement with the amount of ruthenium(III) present (Table 6).

#### 5. CONCLUSION

The developed method using reagent *O*-methylphenyl thiourea (OMPT) for extraction spectrophotometric determination of ruthenium(III) has been proved as highly sensitive and selective method for determination of ruthenium. Good molar absorptivity, combined method of extraction and direct spectrophotometric determination with single step is the merit of developed method. It was successfully applied for the determination of ruthenium (III) from ruthenium catalyst, binary and ternary synthetic mixtures with satisfactory results proves the applicability of the method for determination of ruthenium(III).

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**Table 1. Spectral and physico-chemical characteristics along with precision data of ruthenium(III)-OMPT complex**

Spectral characteristics and precision	Parameters
Succinate	1.2 mol l <sup>-1</sup>
extraction solvent	chloroform
reagent concentration	0.2 mol l <sup>-1</sup>
equilibration time	6.0 minutes
$\lambda_{\max}$	585 nm
molar absorptivity	$4.287 \times 10^4 \text{ L mol}^{-1} \text{ cm}^{-1}$
sandell's sensitivity	0.0235 $\mu\text{g cm}^{-2}$
Beer's law range	up to 6.0 $\mu\text{g ml}^{-1}$
ringbom's optimum range	1.0 to 6.0 $\mu\text{g ml}^{-1}$
relative standard deviation	0.58 %
stoichiometry of the complex	1:2 (Ru(III):OMPT)
stability of complex	> 14 hours
correlation coefficient	0.99

**Table 2 : Effect of solvent on extraction of ruthenium(III)-OMPT complex**

Solvent	Dielectric constant	Percentage extraction <sup>a</sup> (%E)	Distribution ratio (D)
Isoamyl alcohol	13.9	30.12	1.077
n-butyl acetate	5.0	60.11	3.767
1,2-dichloroethane	10.4	61.45	3.985
MIBK	13.1	72.24	6.505
chloroform	4.4	99.9	2497.5

<sup>a</sup> average of six determinations**Table 3 : Effect of Interfering ions**

Foreign Ions	Added as	Tolerance limit (mg)
Mn(II)	MnCl <sub>2</sub> .6H <sub>2</sub> O	9.00
Cd(II)	CdCl <sub>2</sub> .2H <sub>2</sub> O	18.0
Fe(III)	(NH <sub>4</sub> )Fe(SO <sub>4</sub> ) <sub>2</sub> .12H <sub>2</sub> O	8.00
Hg(II)	HgCl <sub>2</sub>	12.00
Bi(III)	BiCl <sub>3</sub>	14.0
Al(III)	AlCl <sub>3</sub> .6H <sub>2</sub> O	9.00
Cr(III)	CrCl <sub>3</sub>	15.0
Zn(II)	ZnSO <sub>4</sub> .7H <sub>2</sub> O	16.0
Se(IV)	SeO <sub>2</sub>	5.00
La(III)	LaCl <sub>3</sub> .7H <sub>2</sub> O	4.00
Li(I)	LiCl	13.0
Ti(III)	(Ti <sub>2</sub> SO <sub>4</sub> ) <sub>3</sub>	8.00
Mg(II)	MgCl <sub>2</sub> .6H <sub>2</sub> O	22.0
Au(III)	HAuClO <sub>4</sub> .H <sub>2</sub> O	0.50
Mo(VI)	(NH <sub>4</sub> ) <sub>6</sub> MO <sub>7</sub> O <sub>24</sub> .2H <sub>2</sub> O	8.00
Sb(III)	Sb <sub>2</sub> O <sub>3</sub>	2.00
Be(II)	BeSO <sub>4</sub> .4H <sub>2</sub> O	11.0
W(VI)	Na <sub>2</sub> WO <sub>4</sub> .2H <sub>2</sub> O	9.50
V(V)	V <sub>2</sub> O <sub>5</sub>	15.0

Pb(II)	PbCl <sub>2</sub>	8.00
Zr(IV)	ZrOCl <sub>2</sub> .8H <sub>2</sub> O	20.0
U(VI)	UO <sub>2</sub> (CH <sub>3</sub> COO) <sub>2</sub> .2H <sub>2</sub> O	25.0
Ba(II)	BaCl <sub>2</sub> .6H <sub>2</sub> O	50.0
Ca(II)	CaCl <sub>2</sub> .2H <sub>2</sub> O	50.0
Sr(III)	SrCl <sub>3</sub> .6H <sub>2</sub> O	50.0
Fluoride	NaF	500
Phosphate	Na <sub>3</sub> PO <sub>4</sub>	500
Sulphate	K <sub>2</sub> SO <sub>4</sub>	500
Citrate	C <sub>6</sub> H <sub>8</sub> O <sub>7</sub> .H <sub>2</sub> O	500
Malonate	CH <sub>2</sub> (COONa) <sub>2</sub>	500
Tartrate	(CHOH:COOH) <sub>2</sub>	500
Acetate	CH <sub>3</sub> COONa.3H <sub>2</sub> O	500
Oxalate	Na <sub>2</sub> C <sub>2</sub> O <sub>4</sub> .2H <sub>2</sub> O	500
E.D.T.A.	Na <sub>2</sub> EDTA	500

**Table 4 : Analysis of ruthenium catalyst S**

Ruthenium catalyst (Lancaster make)	Certified value of ruthenium taken (µg)	Ruthenium found by AAS (%)	Ruthenium found by proposed method <sup>a</sup> ( % )	R.S.D (%)
5 % on carbon	20	99.52	99.40	0.36
10 % on carbon	20	99.68	99.54	0.32
5 % on alumina	20	99.85	99.70	0.16

<sup>a</sup> average of six determinations**Table 5 : Separation of ruthenium(III) from binary mixtures**

Metal ions	Amount taken (µg)	Recovery <sup>a</sup> (%)	RSD (%)	Chromogenic Ligand used	Ref
Ru(III)	20	99.6	0.19	OMPT	-----
Cr(III)	500	99.7	0.21	DMG	11
Ru(III)	20	99.4	0.18	OMPT	-----
Cd(II)	500	99.7	0.20	thiocyanate	11
Ru(III)	20	99.8	0.26	OMPT	-----
Fe(III)	500	99.7	0.24	1,10-phenanthroline	11
Ru(III)	20	99.8	0.22	OMPT	-----
Mn(II)	500	99.7	0.12	permanganate	11
Ru(III)	20	99.7	0.28	OMPT	-----
Mo(VI)	500	99.6	0.35	thiocyanate-	11
Ru(III)	20	99.8	0.41	SnCl <sub>2</sub>	-----
Zn(II)	500	99.7	0.32	OMPT	11
Ru(III)	20	99.8	0.23	dithizone	-----
W(VI)	500	98.7	0.18	OMPT	11
Ru(III)	20	99.8	0.16	thiocyanate	-----

Sb(III)	500	99.2	0.76	OMPT iodide	11
Ru(III)	20	99.8	0.21		-----
Mo(VI)	500	99.5	0.38		11
				OMPT Sncl <sub>2</sub>	

<sup>a</sup> average of six determinations

Table 6 : Separation of ruthenium(III) from ternary synthetic mixtures

Composition (µg)	Recovery (%) <sup>a</sup>	RSD (%)
Ru(III) 20; Cr(III)100; W(VI) 100	99.5	0.36
Ru(III) 20; Mn(II)100; W(VI) 100	99.4	0.39
Ru(III) 20; Au(III)100; Fe(II) 100	99.4	0.34
Ru(III) 20; Fe(III)100; Mn(II) 100	99.5	0.29
Ru(III) 20; Mn(II)100; Mo(II) 100	99.5	0.28
Ru(III) 20; Cd(II)100; Mo(II) 100	99.6	0.34
Ru(III) 20; Mo(II) 100; W(VI) 100	99.4	0.28
Ru(III) 20; W(VI) 100; Sb(III) 100	99.4	0.34
Ru(III) 20; Sb(III)100; Au(III) 100	99.7	0.22

<sup>a</sup>average of six determinations

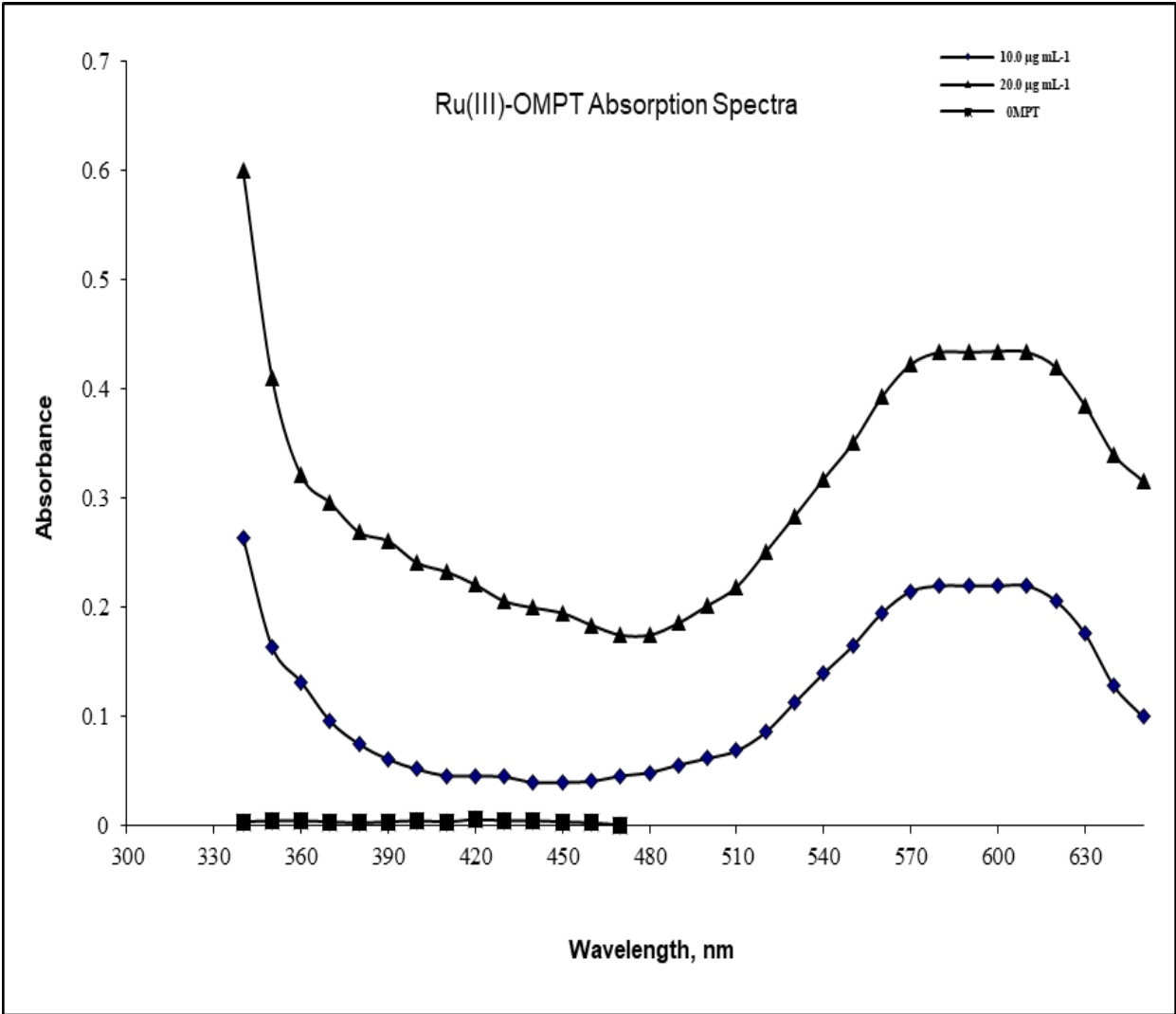
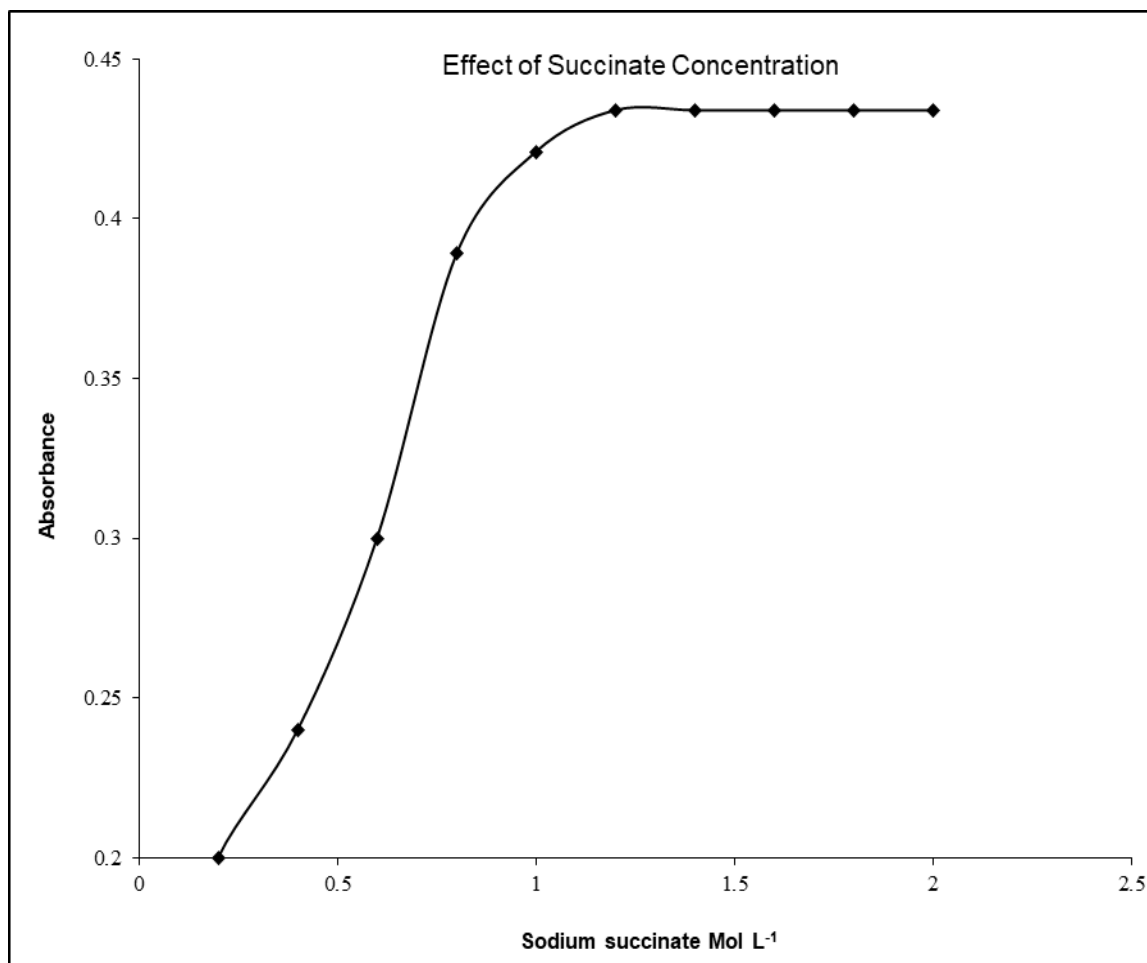
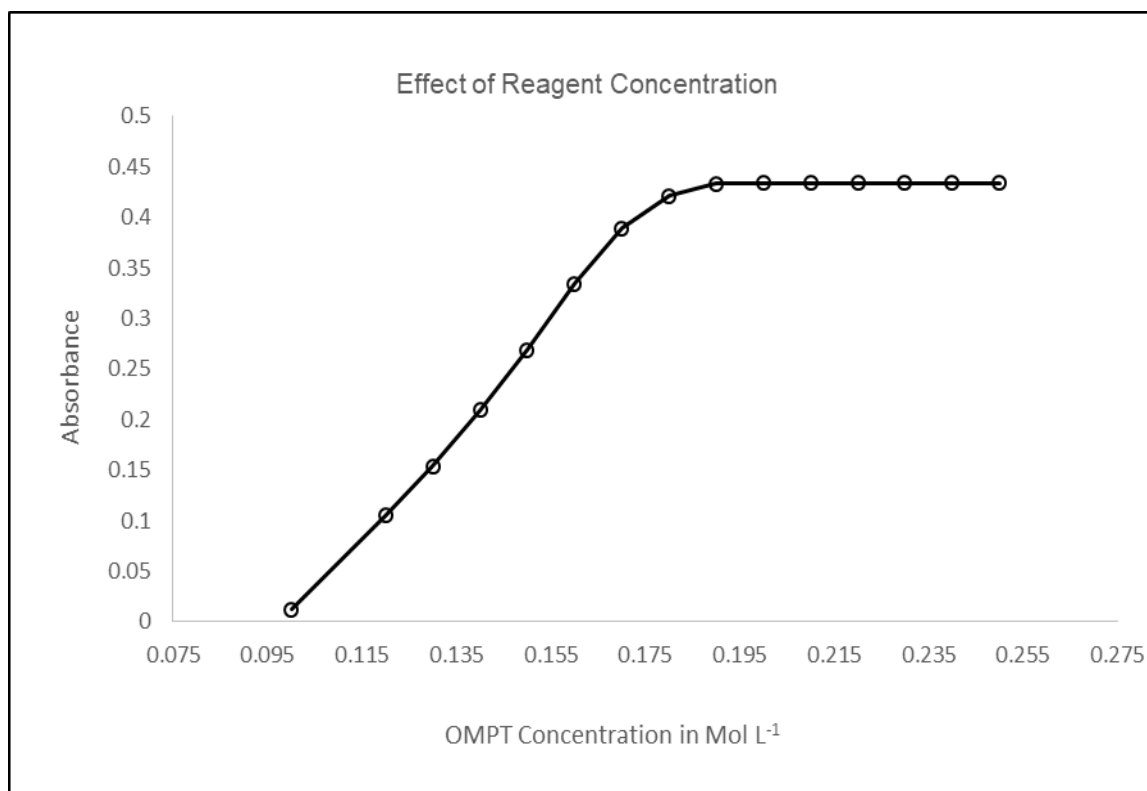


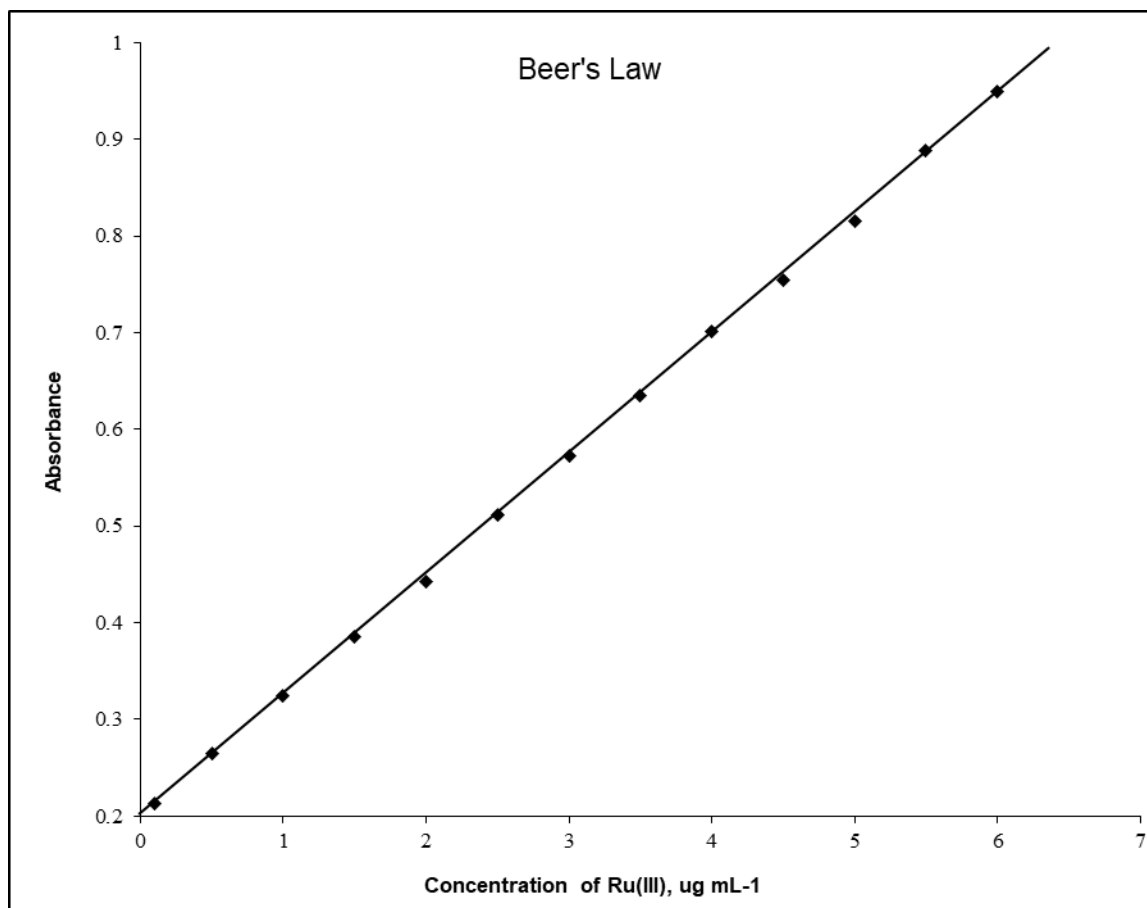
Fig. 1. Absorption spectra: Ru(III) = 10.0 µg mL<sup>-1</sup>; 20.0 µg mL<sup>-1</sup>, OMPT = 0.20 Mol L<sup>-1</sup>, Sodium Succinate = 1.2 mol L<sup>-1</sup>; shaking time = 6.0 min, λ<sub>max</sub> = 585 nm.



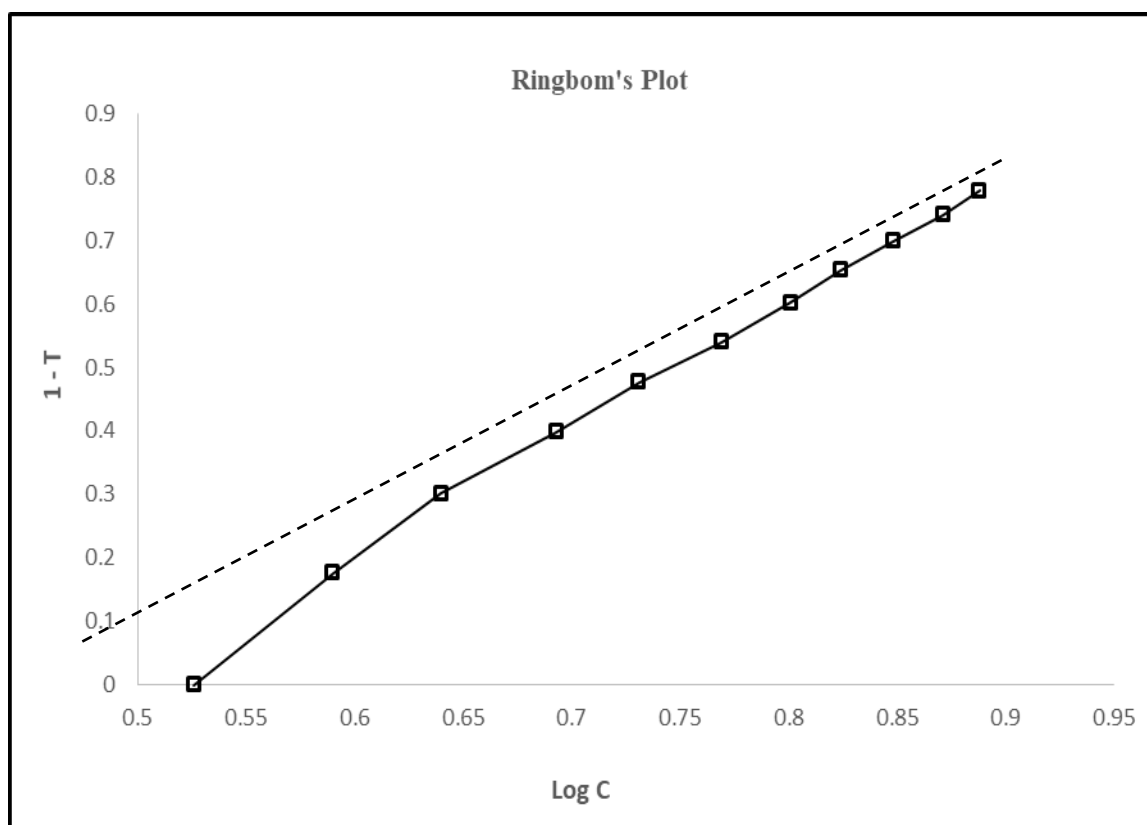
**Fig. 2.** Effect of Succinate Media : Ru(III) = 20.0  $\mu\text{g mL}^{-1}$ ; OMPT = 0.20 Mol L<sup>-1</sup>, Sodium Succinate = 0.1 to 2.5 mol L<sup>-1</sup>; shaking time = 6.0 min,  $\lambda_{\text{max}}$  = 585 nm.



**Fig. 3.** Effect of OMPT reagent concentration: Ru(III) = 20.0  $\mu\text{g mL}^{-1}$ ; OMPT = 0.1 to 2.5 mol L<sup>-1</sup>, Sodium Succinate = 1.2 mol L<sup>-1</sup>; shaking time = 6.0 min,  $\lambda_{\text{max}}$  = 585 nm.

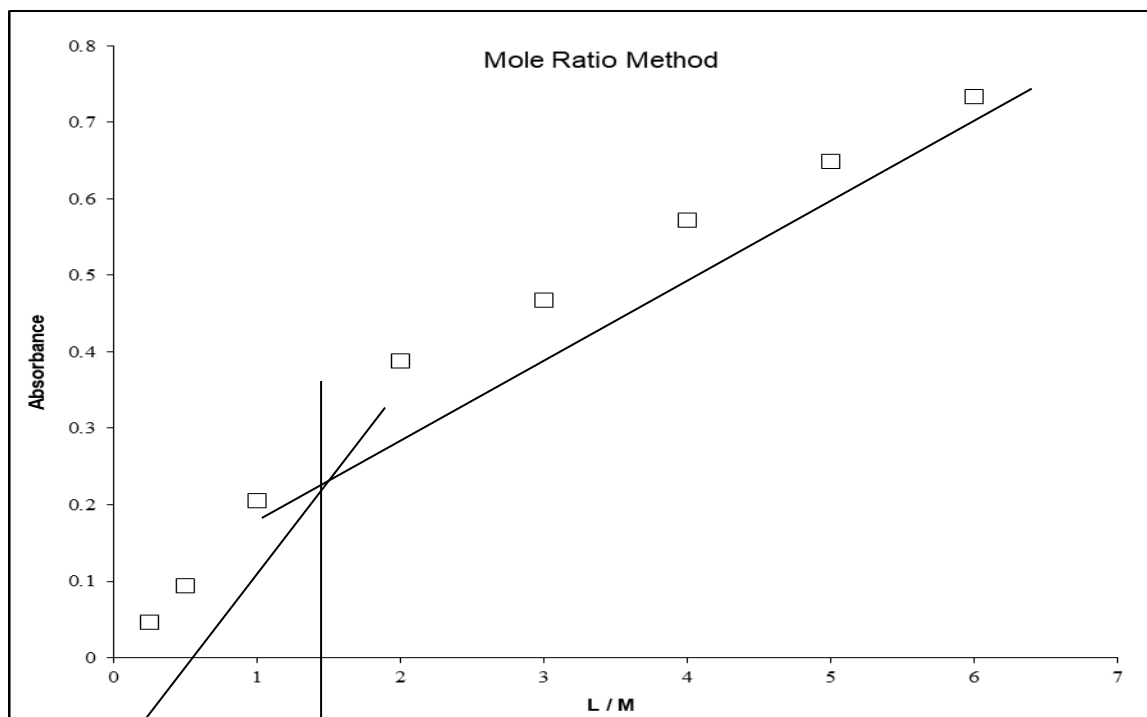


**Fig. 4.** Validity of Beer's Law: Ru(III) = 0.1 to 6.0  $\mu\text{g mL}^{-1}$ ; OMPT = 0.2 mol  $\text{L}^{-1}$ , Sodium Succinate = 1.2 mol  $\text{L}^{-1}$ ; shaking time = 6.0 min,  $\lambda_{\text{max}}$  = 585 nm.

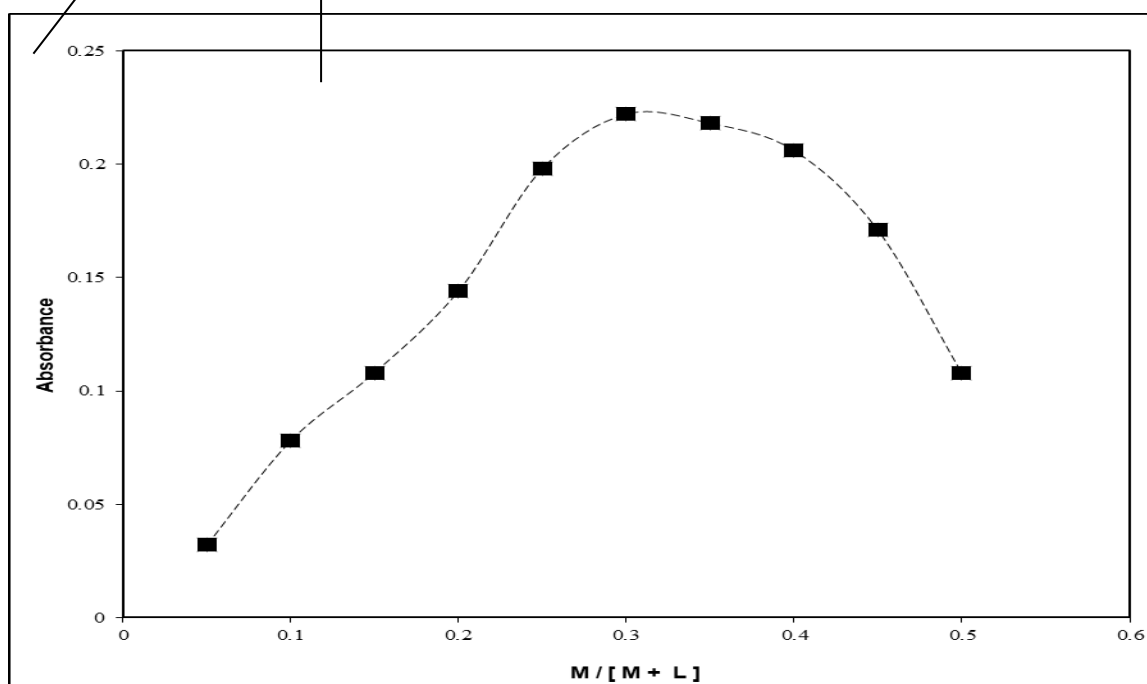


**Fig. 5.** Ringbom's plot for optimum concentration of Ru(III)-OMPT Complex: Ru(III) = 0.1 to 6.0  $\mu\text{g mL}^{-1}$ ; OMPT = 0.2 mol  $\text{L}^{-1}$ , Sodium Succinate = 1.2 mol  $\text{L}^{-1}$ ; shaking time = 6.0 min,  $\lambda_{\text{max}}$  = 585 nm.

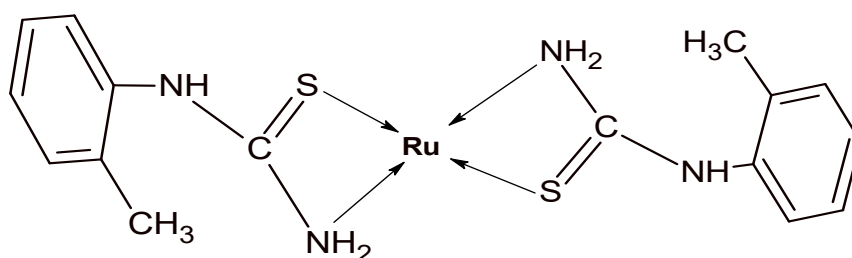




**Fig. 7.** Mole ratio method: Ru(III) = OMPT= 0.001978 mol L<sup>-1</sup>; Sodium Succinate = 1.2 mol L<sup>-1</sup>; shaking time = 6.0 min,  $\lambda_{\text{max}}$  = 585 nm.



**Fig. 8.** Job's continuous variation method: Ru(III) = OMPT= 0.001978 mol L<sup>-1</sup>, Sodium Succinate = 1.2 mol L<sup>-1</sup>; shaking time = 6.0 min,  $\lambda_{\text{max}}$  = 585 nm.



**Fig. 9.** Probable structure of ruthenium(III)-OMPT complex

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**TITANIUM DIOXIDE NANOPARTICLES SYNTHESIZED BY SOL-GEL METHOD AND ITS CHARACTERIZATION**

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**ABSTRACT**

*Sol-gel synthesis technique was employed to successfully synthesize titanium dioxide (TiO<sub>2</sub>) nanoparticles and a variety of analytical techniques have been utilized to characterize the produced nanoparticles. X-ray diffraction (XRD) study of the TiO<sub>2</sub> nanoparticles revealed their crystalline structure and the presence of the brookite phase. Scherrer's relation was used to calculate the average particle size, yielding a size of 4 nm. UV-Visible spectroscopy demonstrated electronic transitions within the TiO<sub>2</sub> sample, with a prominent absorption peak at 350 nm. Photoluminescence (PL) spectra indicated multiple emission peaks, providing insights into charge carrier behavior. Additionally, the average particle size as shown by transmission electron microscopy (TEM), supporting the XRD results. The findings highlight that the TiO<sub>2</sub> nanoparticles were successfully prepared and characterized with potential applications in numerous fields.*

*Keywords: Sol-gel technique, UV-Visible spectroscopy, Photoluminescence, XRD, TEM*

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**1. INTRODUCTION**

In recent years, nanoparticles have found increasingly broad applications across a range of fields, including optoelectronics, catalysis, medicine, and sensor devices [1]. Attributes such as their structural characteristics, size, and elemental composition hold significant importance, alongside the quantum size phenomena exhibited by nanoscale materials, which contribute to their potential utility. Among different types of metal oxide nanostructures Titanium dioxide (TiO<sub>2</sub>) has long been recognized for its exceptional properties, making it a versatile material with wide-ranging applications. In recent years, the demand for TiO<sub>2</sub> nanoparticles has surged because of their distinct features, including large surface area, lower cost, non-toxicity, exceptional photocatalytic activity, high chemical durability, excellent transparency and optical characteristics [2]. These nanoparticles have found applications in various fields, including solar cells, distinct electrode types, cell imaging, drug delivery and biological sensors [3, 4]. The growing importance of TiO<sub>2</sub> nanoparticles synthesis mainly because these nanoparticles are more reactive than their bulk counterparts. Titanium dioxide primarily found in three distinct phases: anatase, brookite and rutile. These phases exhibit variations in their physical characteristics.

A number of methods have been used to synthesized TiO<sub>2</sub> nanoparticles, including chemical precipitation method, thermal plasma, chemical vapor deposition, hydrothermal method, laser ablation, spray pyrolysis, ball-milling, sol-gel method and vacuum arc deposition [5-13]. Among the various methods for synthesizing TiO<sub>2</sub> nanoparticles, the sol-gel technique is notable for its ability to produce nanoparticles with precise control over size and morphology. This is attributed to its cost-effectiveness, ease of setup and the ability to adjust the reaction temperature as needed. The sol-gel method encompasses the sequential stages of hydrolysis, polymerization, evaporation, and condensation of the precursor of metal salt, ultimately resulting in a colloidal suspension formation [14]. TiO<sub>2</sub> nanoparticles' structural and optical characteristics are of paramount importance for their successful utilization in diverse applications. The characterization of these nanoparticles plays a pivotal role in understanding their behavior at the nanoscale.

The objective of this study is to synthesizing TiO<sub>2</sub> nanoparticles using the sol-gel technique and comprehensively characterized them through various analytical methods. In the present work we describe the TiO<sub>2</sub> nanoparticles' crystalline structure, average crystallite size, optical characteristics and photoluminescence behavior. The findings of this study hold significance for researchers and engineers involved in developing advanced materials and applications using TiO<sub>2</sub> nanoparticles.

**2. EXPERIMENTAL*****Apparatus***

Various methods were utilized to characterize the TiO<sub>2</sub> sample. X-ray diffraction analysis (utilizing Bruker D8 Advanced XRD with Cu K $\alpha$  radiation, having a wavelength of 1.54 Å) was employed for both

crystalline phase identification and the determination of the average crystallite size. The Perkin-Elmer Lambda 950 spectrophotometer was used to record the optical absorption spectra of the sample. Photoluminescence measurement was carried out using the Hitachi F-7000 spectrophotometer system. The TEM analysis was conducted utilizing the FEI Techni 20 G2 instrument.

### Synthesis of TiO<sub>2</sub> Nanoparticles

Sol-gel synthesis technique have been used to produce TiO<sub>2</sub> nanoparticles. Firstly, we have prepared the solution of ethanol and methanol then we added titanium tetraisopropoxide (TTIP) in the solution with continuous stirring. By adding drops of HCl, the solution's pH was maintained within the range of 2 to 3, and it was subsequently stirred using a magnetic stirrer for duration of 2 hours. The reaction was then stopped by adding water and the resulting mixture was subsequently stirred using a magnetic stirrer for an additional duration of 1 to 2 hours. After leaving the sample to age at room temperature for three days, it underwent drying at 85 °C on a hot plate and was then subjected to grinding for 30 minutes. Finally, the prepared powder underwent annealing at temperatures of 300°C for a duration of 2 hours.

## 3. RESULTS AND DISCUSSION

### XRD studies

X-ray diffraction (XRD) spectra of TiO<sub>2</sub> nanoparticles are shown in Fig. 1 that has been calcinated at a temperature of 300 °C. In this XRD pattern peaks are observed at 25.26°, 30.47°, 37.54°, 47.52°, 52.54°, 60.41°, 65.97°, 70.82°, 76.97°, 86.28° and 95.21°. These angles correspond to the crystal planes (120), (121), (131), (231), (240), (123), (161), (332), (024), (044) and (521) of the TiO<sub>2</sub> brookite phase, which possesses an orthorhombic structure as identified by JCPDS no. 29 – 1360.

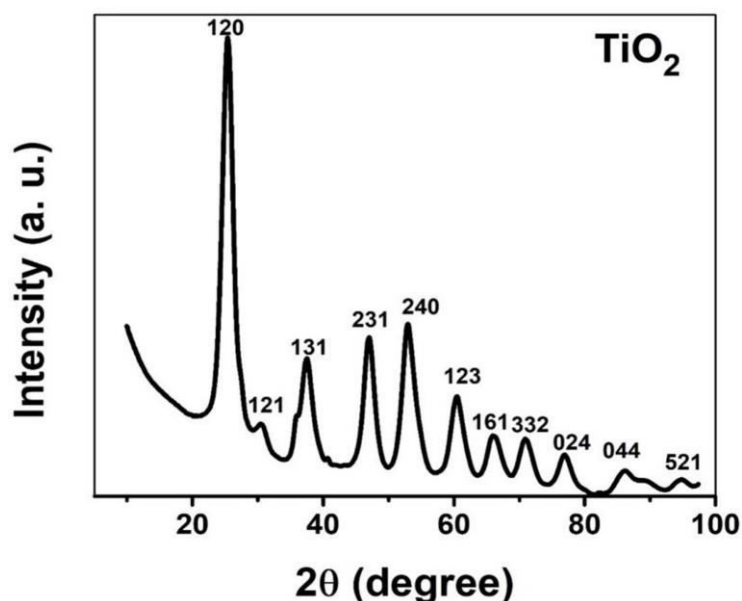


Fig. 1: X-ray diffraction spectra of TiO<sub>2</sub> nanoparticles

Table 1 provides the summary of the TiO<sub>2</sub> nanoparticles' XRD peak positions, related d-values, peak intensities, Miller indices, lattice parameter and particle size. The average crystallite size of TiO<sub>2</sub> nanoparticles was calculated using Scherrer's relation [15, 16], which is expressed as  $D = k\lambda/\beta\cos\theta$ . In this equation, D represents the crystallite size, with a fixed constant  $k = 0.9$ ,  $\beta$  denotes the full width at half maximum (FWHM) of the diffraction peak,  $\lambda$  stands for the wavelength of X-ray, and  $\theta$  represents the Bragg angle. The average crystallite size of TiO<sub>2</sub> nanoparticles has been determined to be approximately 4 nm.

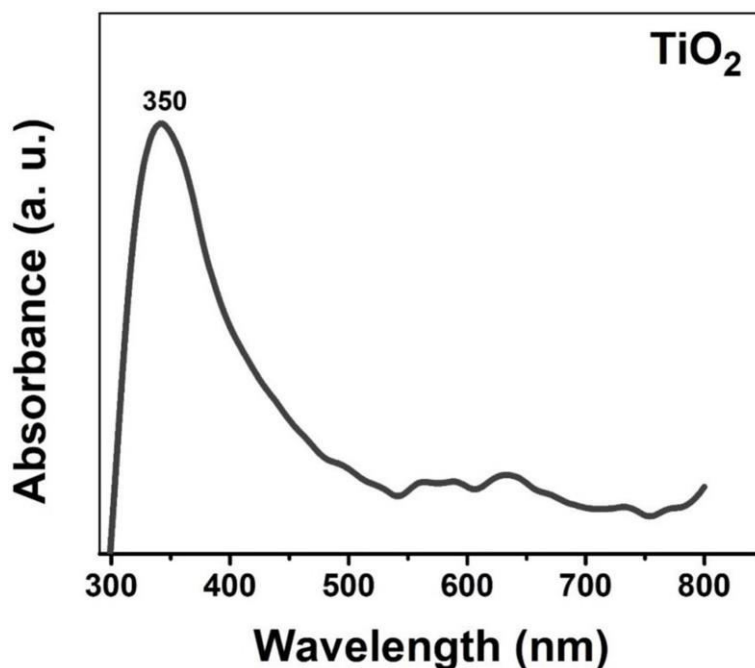
### UV-Visible study:

The absorption of high-energy light by atoms or molecules, leading to electronic excitation, was explored using UV-visible spectroscopy. Fig. 2 displays UV-visible spectra of TiO<sub>2</sub> nanoparticles, recorded within the range of wavelength of 200 to 800 nm. The spectrum exhibits a prominent absorption peak at approximately 350 nm, which results of electronic transition occurring from the 2p region of the O<sub>2</sub><sup>-</sup>

valence band to the 3d region of the  $\text{Ti}^{3+}$  conduction band [17]. This phenomenon signifies the absorption of high-energy light by the  $\text{TiO}_2$  sample, which causes electronic excitation. The electronic transitions responsible for this peak are of particular interest due to their implications for the materials electronic structure and its potential applications in various fields [3,4].

**Table 1: XRD data of the  $\text{TiO}_2$  nanoparticles**

Sample	$2\theta$ (°)	d-values (Å)		Intensity		Miller indices ( <i>hkl</i> )	Lattice parameter (Å)	Particle Size (nm)
		Obs.	Std.	Obs.	Std.			
$\text{TiO}_2$	25.26	3.52	3.51	100	100	(120) [Orthorhombic]	6.09	4
	30.47	2.93	2.90	24	90	(121) [Orthorhombic]		
	37.54	2.39	2.37	37	6	(131) [Orthorhombic]		
	47.52	1.91	1.89	40	30	(231) [Orthorhombic]		
	52.54	1.74	1.75	42	3	(240) [Orthorhombic]		
	60.41	1.53	1.54	29	7	(123) [Orthorhombic]		
	65.97	1.41	1.41	21	9	(161) [Orthorhombic]		
	70.82	1.32	1.33	20	8	(332) [Orthorhombic]		
	76.97	1.23	1.23	17	10	(024) [Orthorhombic]		
	86.28	1.12	1.12	14	4	(044) [Orthorhombic]		
	95.21	1.04	1.03	12	3	(521) [Orthorhombic]		



**Fig. 2: UV absorption spectra of  $\text{TiO}_2$  nanoparticles**

#### **Photoluminescence spectra:**

The capacity of trapping, moving, transferring, and separating charge carriers in a material can be revealed by examining the PL emission spectra. Furthermore, it provides valuable insights into the fate of electrons and holes generated through photons. This is because the PL emission arises from the recombination process of free carriers within the material [18].

The TiO<sub>2</sub> nanoparticles' Photoluminescence (PL) spectra acquired at room temperature using a 300 nm excitation wavelength are depicted in Fig 3. PL spectra of pure TiO<sub>2</sub> exhibit several notable emission peaks at 397 nm, 412 nm, 451 nm, and 469 nm. The observed peak at 397 nm is attributed to the emission of light energy resulting from the band gap transition. [19]. Similarly, the recorded peak at 412 nm is caused by the band gap transition indicating electron-hole recombination events within the material [20]. The peaks at 451 and 469 nm correspond to the charge carrier transition [21, 22]. These peaks provide insight into the migration and separation of photo-generated charge carriers within TiO<sub>2</sub>.

### TEM Analysis

The TEM image of TiO<sub>2</sub> nanoparticle is illustrated in Fig 4(A). From this image, the average crystalline size and size distribution were determined. Fig. 4(B) illustrates the particle distribution histogram of TiO<sub>2</sub> nanoparticles. The average size of the TiO<sub>2</sub> nanoparticles was measured to be 2.7 nm from the TEM image. The particle size determined through TEM corresponds closely to the average particle size approximated by XRD.

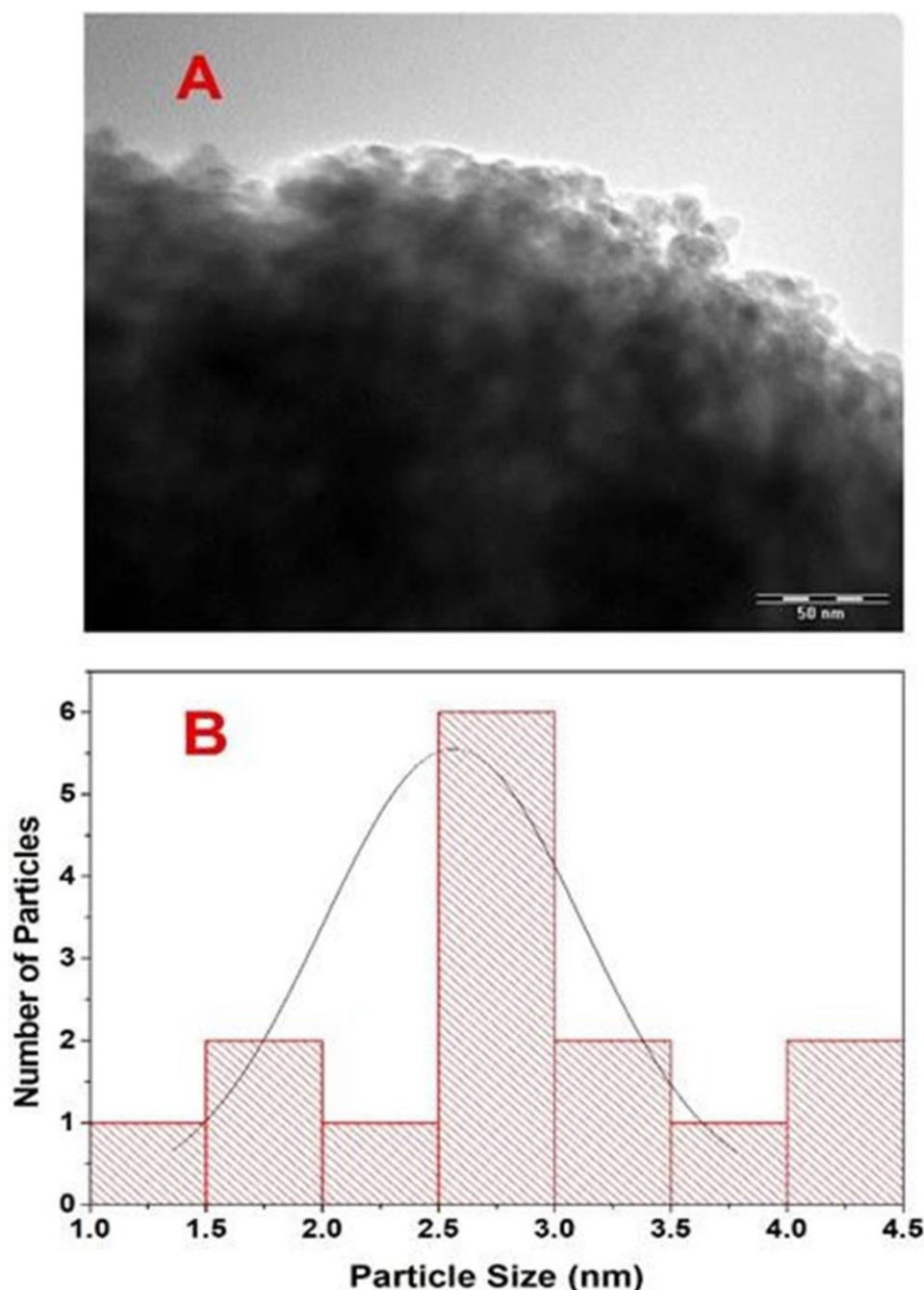


Fig. 4: (A) TEM image of TiO<sub>2</sub> nanoparticles and, (B) The particle distribution histogram for TiO<sub>2</sub> nanoparticles

#### 4. CONCLUSION

In conclusion, sol-gel synthesis technique was employed to successfully synthesize titanium dioxide nanoparticles and comprehensively characterized. XRD analysis confirmed the brookite phase with an average particle size of 4 nm. UV-Visible spectroscopy demonstrated electronic transitions, and the photoluminescence spectra provided insights into charge carrier behavior. TEM analysis supported the average particle size calculated through XRD. These findings contribute to a better understanding of TiO<sub>2</sub> nanoparticles properties and open avenues for their applications in various technological fields.

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**FRONTIERS IN AIR QUALITY RESEARCH: INNOVATIONS, CHALLENGES, AND FUTURE DIRECTIONS**

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**N. Chandra Shekar<sup>1</sup> and T. Chandra Shekar<sup>2</sup>**<sup>1</sup>Assistant Professor, Department of CSE, RGUKT RK Valley<sup>2</sup>Assistant Professor, Department of CSE, RGUKT RK Valley**ABSTRACT**

*This review provides a comprehensive perspective on recent advancements in air quality research, focusing on key developments over the past decade. It highlights current and emerging challenges, as well as research priorities in selected areas of significance for both scientific progress and policy implications. While not an exhaustive review of all air quality research topics, this work identifies critical areas that require further attention. Following a brief historical overview, the review examines improvements in characterizing pollution sources and emissions, advancements in air quality observations and instrumentation, progress in predictive modelling and forecasting, interactions between air quality, meteorology, and climate, exposure and health assessments, and air quality management strategies. The primary objectives of this review are to explore recent developments that are driving air quality research forward, identify key knowledge gaps, and provide recommendations to guide future research directions. The discussions presented in this paper originated at the International Conference on Air Quality 2020 (held online from May 18–26, 2020, due to COVID-19 restrictions) but incorporate a broader landscape of contemporary research findings. Key challenges identified include the need to reduce uncertainties in emissions from diffuse sources, particulate matter chemical components, and shipping emissions, while also addressing both indoor and outdoor pollution sources. There is an increasing demand for integrated air pollution monitoring using both ground-based and satellite observations, with a particular emphasis on the potential of low-cost sensors while ensuring adherence to quality control standards. Air quality modelling continues to face challenges in resolving pollution gradients at local scales while accounting for long-range transport and the influence of climate change. Earth system modelling presents a promising avenue by providing a unified framework for studying interactions among aerosols, atmospheric chemistry, and meteorology. Exposure assessment strategies must evolve to consider both indoor and outdoor air pollution sources while leveraging advanced dynamic modelling techniques for more accurate pollutant concentration predictions. Given the significant health impacts of particulate matter, there is an urgent need to refine emission inventories and develop high-resolution models to better understand the role of particle number and chemical composition in health effects. The review also examines the need for adaptive air quality management strategies in response to these emerging challenges and briefly reflects on the implications of the COVID-19 pandemic for air pollution trends. Finally, key recommendations are provided to support future research efforts and inform evidence-based air quality policies.*

**1. INTRODUCTION**

Air pollution continues to be one of the most significant environmental threats to human health and well-being. According to the World Health Organization (WHO, 2016), over 90% of the global population is exposed to air quality levels that do not meet WHO guidelines. Furthermore, Shaddick et al. (2020) reported that between 2010 and 2016, PM<sub>2.5</sub> concentrations increased for 55% of the world's population, with significant regional disparities. While North America and Europe experienced decreasing trends in annual average population-weighted PM<sub>2.5</sub> concentrations, central and southern Asia faced increasing exposure levels. WHO (2016) also estimated that air pollution, originating from both outdoor and indoor anthropogenic emissions, contributed to approximately 7 million premature deaths in 2012. In response to these alarming statistics, the WHO updated its air quality guidelines (WHO, 2021), reinforcing the urgency of reducing air pollution emissions and improving air quality on a global scale.

Over the past decade, air quality research has seen substantial advancements, including improved characterization of pollution sources and emissions, the development of new measurement technologies such as low-cost sensors, advances in air quality prediction and forecasting, deeper insights into interactions between air pollution, meteorology, and climate, and enhanced exposure assessment and management strategies. Despite these developments, there remains a need for a comprehensive review that synthesizes the latest progress and identifies emerging research challenges. This gap was acknowledged during the last International Conference on Air Quality – Science and Application, which took place online from May 18–26, 2020, due to COVID-19 restrictions. While the initial concept for this review was inspired by discussions and presentations at the conference, the scope of this article has been expanded to incorporate a broader analysis of recent research literature, particularly focusing on advancements from the past decade. By consolidating key findings and



highlighting critical research gaps, this review aims to facilitate further progress in air quality science and policy. It also seeks to provide recommendations for guiding future research directions within the broader scientific community. Although designed to be accessible to readers from diverse scientific and policy backgrounds, this paper does not serve as an introductory guide to air quality science. For those less familiar with the field, an introductory lecture focused on air quality in megacities has been published by Molina (2021). Additionally, other recent reviews, such as Manisalidis et al. (2020) on health impacts and Fowler et al. (2020) on air quality developments, offer further insights into specific aspects of air pollution research.

This section begins with a brief historical overview of air quality research before outlining the rationale for the key areas explored in this review.

### 1.1 Historical Context of Air Quality Research

To provide a foundational understanding of the topics covered in this review, this section briefly outlines key developments in air quality research over the past century. For a more detailed historical survey, readers are referred to Fowler et al. (2020). Throughout the 20th century, several landmark air pollution events brought the issue of air quality into greater prominence, particularly in relation to its adverse health effects. The link between cold weather and increased mortality has been recognized since the early 1900s (e.g., Russell, 1926). A major turning point in the perception of air pollution's health impact came during the Meuse Valley pollution episode in Belgium (December 1–5, 1930). During this event, stagnant, foggy atmospheric conditions led to a sharp increase in acute respiratory symptoms among the local population, with severe effects on individuals with pre-existing cardiorespiratory conditions (Firket, 1936; Nemery et al., 2001; Anderson, 2009). A similar episode occurred in Donora, Pennsylvania, USA, in October 1948, further highlighting the serious health risks posed by industrial air pollution (Schrenk, 1949). Until then, air pollution was generally seen as a nuisance rather than a major health hazard, but these two events heightened awareness of the direct consequences of air pollution on human health. Both incidents were caused by the accumulation of industrial emissions under cold-weather thermal inversions, which trapped pollutants near the surface.

The "Great London Smog" of December 5–9, 1952, remains one of the most well-documented air pollution disasters in history. A combination of stagnant atmospheric conditions and widespread burning of sulfur-rich coal for home heating led to severe air pollution, resulting in an estimated 4,000 to 12,000 premature deaths (Stone, 2002; Anderson, 2009). This event further underscored the urgent need for air quality regulation. Since these historical episodes, the primary sources of air pollution have shifted from industrial and residential heating emissions to vehicular traffic, making air pollution a global public health concern. Over the past decades, trends in air pollution emissions have varied significantly across different regions, leading to persistent disparities in air quality (Sokhi, 2012). Recent assessments, such as those by the Health Effects Institute (HEI, 2020), indicate that some of the highest population-weighted PM<sub>2.5</sub> concentrations are now observed in parts of Asia, Africa, and Latin America. This growing recognition of poor air quality has increased the demand for enhanced monitoring and modeling capabilities to assess pollutant levels.

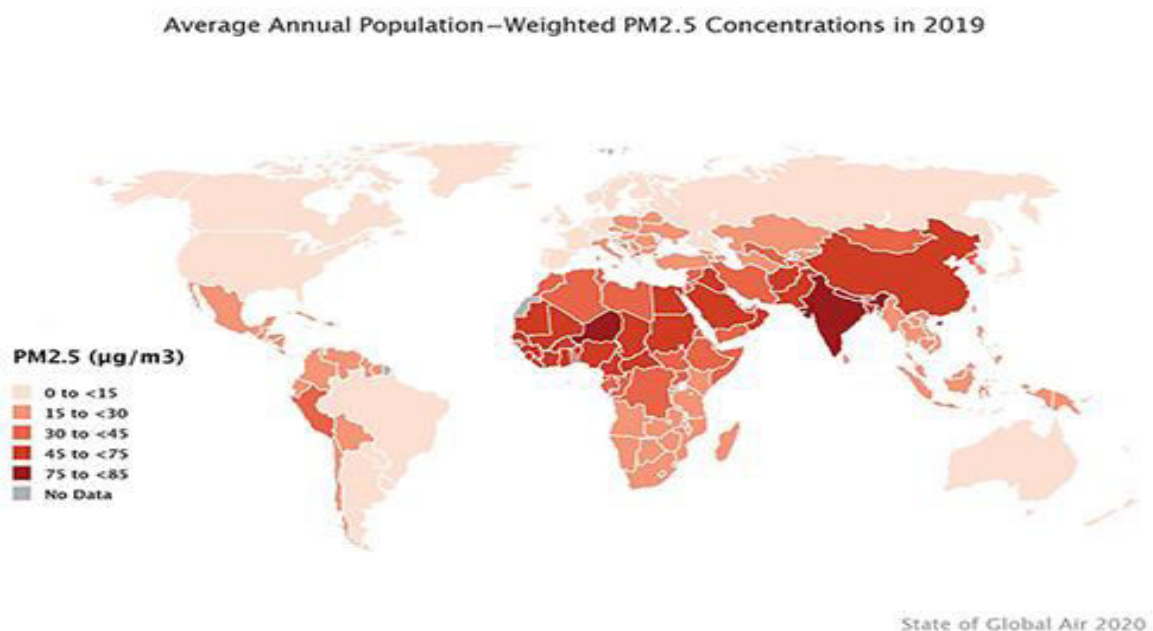


Figure - 1



Historically, while air pollution levels were already a concern before World War I (WWI), the initial advancements in transport and dispersion (T&D) modeling were driven by military applications. The widespread use of chemical weapons during and after WWI spurred the development of fundamental theoretical models by fluid dynamicists such as Lewis Fry Richardson and George Keith Batchelor. The earliest models were analytical approaches, including Gaussian and K-theory models, designed to simulate surface boundary layer pollutant dispersion.

With the advent of nuclear weapons in World War II (WWII), new research efforts focused on plume rise and dispersion modeling of large-scale thermal explosions. This necessitated the expansion of air quality models to incorporate full tropospheric and stratospheric dynamics. Later, in the 1980s, research on the atmospheric consequences of a hypothetical nuclear war led to the development of the "nuclear winter" concept, first introduced by Paul Crutzen (Crutzen and Birks, 1982) and further explored by Aleksandrov and Stenchikov (1983) and Turco et al. (1983). These studies demonstrated how massive emissions of particulates could induce global-scale climatic effects, a concept that was later revisited using modern climate models (Robock et al., 2007; Toon et al., 2019).

The need to understand pollutant deposition—both wet and dry—became a significant concern for radiological substances, particularly in the context of accidental nuclear power plant emissions. In response to increasing environmental concerns, regulatory frameworks such as the U.S. Clean Air Act of the 1970s were introduced, followed by similar legislation in other countries. Initially, air quality modeling efforts focused on T&D models for industrial emissions, particularly fossil fuel power plants. Early applied models used analytical plume rise and Gaussian dispersion techniques, which were later integrated into computer-based simulation tools capable of providing hourly air pollution estimates across multiple spatial locations. These historical developments laid the groundwork for modern air quality research, influencing current approaches to pollution monitoring, predictive modeling, and regulatory policies.

## 1.2 Key Sources and Emissions of Air Pollutants

Air pollution arises from a diverse array of sources, both natural and anthropogenic, with significant implications for human health and environmental quality. The most concerning emissions include particulate matter (PM<sub>2.5</sub> and PM<sub>10</sub>) and gaseous pollutants such as nitrogen dioxide (NO<sub>2</sub>) and ozone (O<sub>3</sub>), particularly in densely populated urban areas. Primary sources of pollution include vehicular traffic, industrial activities, residential heating, and abrasive processes, all of which contribute significantly to local air quality deterioration. Secondary particulate matter, formed through atmospheric chemical reactions involving precursors like volatile organic compounds (VOCs), nitrogen oxides (NO<sub>x</sub>), sulfur dioxide (SO<sub>2</sub>), and ammonia (NH<sub>3</sub>), also plays a critical role in regional air pollution. Key sources of these precursors include transportation (NO<sub>x</sub>, VOCs), agriculture (NH<sub>3</sub>), industrial and power generation activities (NO<sub>x</sub>, SO<sub>2</sub>), biomass burning, and natural emissions from forests and oceans. Additionally, resuspended dust from arid regions and agricultural activities contributes substantially to particulate matter levels.

While many regions, particularly in Europe, have seen a decline in anthropogenic emissions since 1990 due to stricter regulations, climate change poses new challenges. Increased drought and desertification are expected to exacerbate dust emissions and wildfire occurrences, while rising temperatures may lead to higher emissions of biogenic VOCs in regions such as the Arctic and China (Kramshøj et al., 2016; Liu et al., 2019). Urban vegetation also contributes to VOC emissions, particularly in cities (Churkina et al., 2017). Efforts to standardize and refine emission inventories have been undertaken through initiatives such as the European Union's reporting framework (IPR of EU Air Quality Directive, 2008/50/EC) and global projects like Copernicus and ECCAD, which provide consistent gridded emission datasets for air quality modeling. Despite these advancements, inconsistencies in national reporting methodologies highlight the need for continued refinement of emission inventories and greater stakeholder involvement in air quality assessments. Research on emissions has also emphasized the necessity of developing more precise models to quantify the impact of various pollution sources on urban air quality and guide effective mitigation strategies (Borge et al., 2014).

A growing area of concern is emissions from shipping, which significantly affect air quality in coastal cities and port areas. High-resolution emission inventories for maritime pollution have been developed, capturing pollutants such as SO<sub>2</sub>, NO<sub>x</sub>, PM, carbon monoxide (CO), and VOCs (Jalkanen et al., 2009, 2012, 2016). However, uncertainties remain regarding emissions from incomplete combustion products, such as black carbon and certain VOCs, which depend on ship maintenance history and fuel quality. Studies have estimated that shipping contributes up to 30% of regional air pollution, with even higher contributions to NO<sub>2</sub> concentrations in harbor cities (Ramacher et al., 2019, 2020). The effects of in-plume chemical processes, such as NO<sub>x</sub> removal and secondary aerosol formation, remain insufficiently captured in large-scale air pollution models (Prank et al.,

2016). Addressing these challenges requires improved emissions monitoring, enhanced modeling techniques, and integrated policy measures. A multidisciplinary approach involving policymakers, scientists, and industry stakeholders is essential for developing effective strategies to mitigate emissions and improve air quality on both local and global scales.

## 2. SCOPE AND STRUCTURE OF THE REVIEW

This review primarily focuses on advancements in air quality research that have emerged over the past decade. While older references are occasionally cited, they serve to provide historical context, support ongoing research developments, or fill gaps where recent literature is unavailable. The key areas of air quality research explored in this review include:

1. **Air pollution sources and emissions** – Examining primary and secondary pollutant sources, emission inventories, and emerging challenges in emission estimation.
2. **Air quality observations and instrumentation** – Highlighting advancements in monitoring technologies, including remote sensing, low-cost sensors, crowdsourcing, and data-driven approaches.
3. **Air quality modeling from local to regional scales** – Evaluating improvements in atmospheric transport and dispersion models, chemical transport models (CTMs), and real-time air quality forecasting.
4. **Interactions between air quality, meteorology, and climate** – Exploring how atmospheric processes influence pollutant dispersion, transformation, and feedback mechanisms.
5. **Air quality exposure and health** – Investigating the health impacts of air pollution, exposure assessment methods, and the role of particulate matter in public health.
6. **Air quality management and policy development** – Discussing regulatory frameworks, mitigation strategies, and policy challenges in improving air quality.

Each section begins with a brief overview, followed by an analysis of the current status, key challenges, and emerging research priorities. In discussing climate-related aspects, the review focuses on the interactions between air quality, meteorology, and climate rather than on climate change itself. The section on air quality observations emphasizes the latest technological innovations, such as remote sensing, low-cost sensor networks, crowdsourced data collection, and modern data mining techniques. Traditional measurement methodologies, while essential, are covered in other specialized sources (e.g., Foken, 2021). Finally, the **Discussion** section synthesizes key insights from the various research themes and explores their broader implications for policymakers, ensuring that scientific progress translates into actionable strategies for air quality management.

## 3. AIR POLLUTION SOURCES AND EMISSIONS

### 3.1 Overview

Effective air quality management requires a deep understanding of pollutant sources, their chemical characteristics, spatial distribution, and atmospheric processing. Air pollution arises from both primary emissions (directly released pollutants) and secondary formation (chemical transformations in the atmosphere). This section highlights key emission sources, focusing on major contributors such as road transport, shipping, agriculture, and indoor pollution.

### 3.2 Emission Inventories and Challenges

Over the past three decades, emissions of major pollutants like SO<sub>2</sub>, CO, NO<sub>x</sub>, and VOCs have significantly decreased in many regions, particularly in the EU, due to stringent regulations. However, challenges persist in accurately estimating emissions from smaller, diffuse sources such as household heating, non-exhaust traffic emissions, and industrial activities. Recent advances in modeling and stakeholder-driven inventory development have improved emissions assessment, particularly for road transport and residential combustion sources.

### 3.3 Road Transport Emissions

Traffic emissions, particularly NO<sub>x</sub> and ultra-fine particles (UFPs), remain a dominant urban air pollution source. While vehicle emission standards have led to significant reductions, uncertainties persist in estimating real-world emissions, especially for non-regulated pollutants and aging vehicle fleets. Advanced modeling techniques and on-road monitoring systems, such as on-board fuel consumption measurement (OBFCM), are improving emission estimates and regulatory compliance assessments.

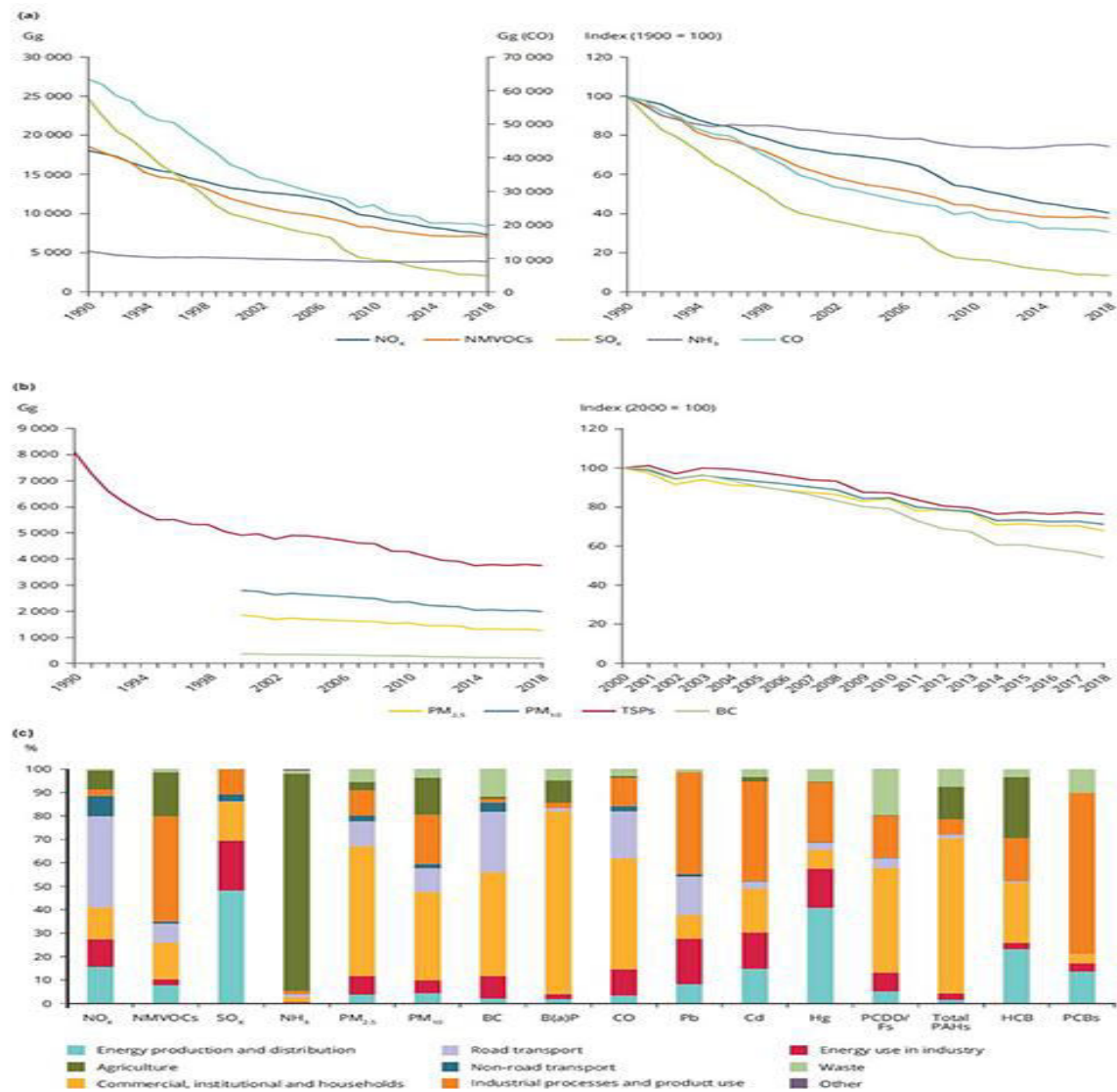


Figure – 2

3.4 Shipping Emissions

Maritime transport is a major contributor to global NO<sub>x</sub> and SO<sub>x</sub> emissions, impacting air quality in coastal and port cities. The introduction of low-sulfur fuel regulations and emission control areas (ECAs) has reduced sulfur emissions, but uncertainties remain in quantifying pollutants like black carbon and VOCs. AIS-based ship emission inventories now provide high-resolution data, allowing for better pollution management and forecasting.

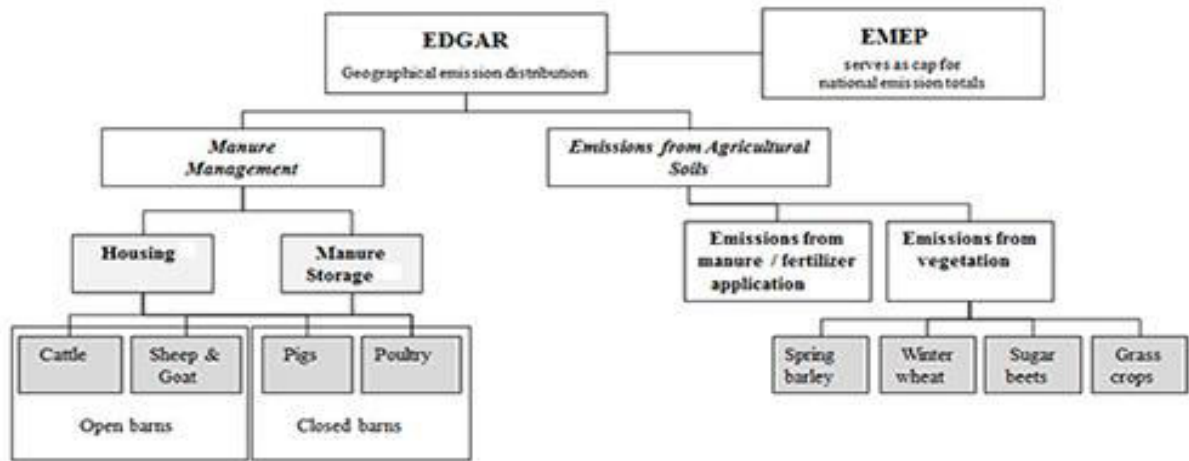


Figure - 3

### 3.5 Indoor Emissions

Indoor air pollution, primarily from cooking, heating, and household products, is gaining attention due to its significant impact on individual exposure levels. Sources include combustion appliances, gas stoves, smoking, and consumer products releasing VOCs and particulate matter. Emerging research highlights the need for improved ventilation strategies and emission reduction technologies to mitigate indoor pollution.

### 3.6 Source Apportionment Methods

Understanding the contribution of different sources to ambient air pollution is crucial for effective mitigation. Various source apportionment techniques, including receptor modeling (e.g., PMF, CMB) and source-oriented modeling (e.g., tagged species method, inverse modeling), help attribute pollution to specific sources. Advances in these techniques are improving the accuracy of air quality models and emission inventories.

By integrating advanced emissions inventories, refined modeling approaches, and real-world monitoring, policymakers and researchers can develop more targeted air pollution mitigation strategies.

## 3.2 Emerging Challenges in Emission Estimation and Source Apportionment

### 3.2.1 Emission Inventories and Preprocessors

Despite advancements, emission inventories still contain significant uncertainties, particularly in diffuse sources such as industrial and traffic-related abrasion, residential wood combustion, and agricultural emissions. With the decline of exhaust gas emissions and the rise of electric vehicles, non-exhaust emissions from tyre and brake wear are becoming a dominant concern. Additionally, emerging fuels and new exhaust technologies introduce variability in the chemical composition of emissions, requiring advanced characterization techniques.

The integration of real-time big data sources, such as mobile traffic data and air quality sensor networks, has the potential to refine emission inventories. However, challenges remain in data availability, processing capacity, and privacy regulations. Future efforts should focus on harmonizing emissions reporting for both air pollutants and greenhouse gases to enable integrated climate and air quality policy assessments.

### 3.2.2 Road Emissions

While exhaust emissions from road transport are steadily decreasing due to advanced filters and vehicle electrification, non-exhaust emissions from road, tyre, and brake wear remain unregulated and are expected to rise. The composition of non-methane organic gases (NMOGs) is also evolving with new fuels and lubricants, complicating estimates of secondary organic aerosol formation. Additionally, current emission models may not fully capture the impact of traffic patterns, urban policies, and driving behaviors, necessitating improvements in microscopic emission models like PHEM.

### 3.2.3 Shipping Emissions

The decarbonization of shipping is advancing, but emission estimates remain uncertain due to variations in fuel composition, exhaust treatment technologies, and poorly characterized VOC emissions. The introduction of low-sulfur fuels has altered ship emissions, but their secondary effects on ozone and particulate formation remain largely unquantified. Further research is needed to assess the combined atmospheric and marine environmental impacts of shipping emissions, particularly from scrubber discharges and port activities, which contribute significantly to local air pollution.

### 3.2.4 Indoor Air Pollution

Despite people spending over 80% of their time indoors, systematic knowledge of indoor air quality remains limited. Key gaps include the quantification of emissions from building materials, consumer products, and human activities, as well as understanding outdoor-to-indoor pollutant transfer. The development of improved indoor air quality models that account for ventilation dynamics, surface interactions, and heterogeneous environments is necessary to better assess indoor pollution exposure.

### 3.2.5 Source Apportionment

Accurate source apportionment remains a challenge, particularly with rapidly changing emission profiles due to new technologies and fuels. High-resolution, real-time apportionment methods are needed to leverage emerging online measurement instruments and sensor networks. Additionally, existing emission profiles for pollutants like NMVOCs and PAHs are outdated, requiring updates to reflect modern vehicle technologies and industrial processes. Inverse modeling techniques hold promise for refining emission inventories but require further validation and intercomparison studies to enhance reliability.

Addressing these emerging challenges will require a multidisciplinary approach, integrating improved measurement techniques, advanced modeling, and real-time data analytics to better characterize emissions and their impact on air quality.

## 4 AIR POLLUTION SOURCES AND EMISSIONS

### 4.1 Overview

Understanding emission sources is essential for air pollution control, requiring knowledge of their strength, chemical composition, spatial distribution, and temporal variation. Since ambient air pollution results from multiple sources, source apportionment is necessary to design effective reduction strategies. This section focuses on emission inventories and pre-processing, source apportionment methods, and major emission sectors, including road transport, shipping, and indoor sources.

### 4.2 Current Status and Challenges

#### 4.2.1 Emission Inventories

In the EU, SO<sub>2</sub> and CO emissions have dropped significantly over 30 years, while NO<sub>x</sub> and NMVOC emissions declined by around 50%. However, NH<sub>3</sub> and PM emissions remain relatively stable. Recent advancements in emission modeling incorporate activity-based data, including traffic patterns and household heating. For shipping and aviation, AIS transponder data improves spatial resolution, aiding emission estimates for harbor and airport areas.

#### 4.2.2 Preprocessing Emission Data for Air Quality Models

Emission inventories provide annual data, but air quality models require hourly, spatially distributed emissions. Preprocessing methods estimate emission height, chemical breakdown, and hourly variations using land-use data, traffic flow models, and meteorological inputs. Advanced tools such as HERMES and CEDS integrate real-time data, improving air quality forecasting.

#### 4.2.3 Road Transport Emissions

Road transport remains a major source of NO<sub>x</sub> and PM<sub>10</sub>. Ultra-fine particles (UFPs) are particularly concerning for health. Emission standards like Euro 6d and Euro 7 are reducing exhaust pollutants, but non-exhaust emissions from brakes, tyres, and road wear are increasing. Challenges include delays in emission factor updates for new vehicle technologies, limited data on non-regulated pollutants, and difficulties in capturing extreme driving conditions.

#### 4.2.4 Shipping Emissions

Ships contribute significantly to global NO<sub>x</sub> and SO<sub>x</sub> emissions. The IMO 2020 sulfur cap has reduced SO<sub>2</sub> emissions, preventing thousands of premature deaths annually. However, uncertainties remain regarding VOC emissions, the environmental impact of sulfur scrubbers, and the long-term effects of alternative fuels like LNG, methanol, and ammonia.

#### 4.2.5 Indoor Emissions

Indoor pollution is a key factor in exposure assessments. Major sources include combustion (wood stoves, gas appliances, candles), consumer products (cleaning agents, furniture, 3D printers), and human activities (vacuuming, dust resuspension). Improved ventilation and HEPA filters can help reduce concentrations of indoor PM.

#### 4.2.6 Source Apportionment Methods

Source apportionment techniques identify contributions of various sources to pollution. Receptor models (PMF, CMB) analyze ambient samples, while source-oriented models (Gaussian, Lagrangian) use emission inventories and atmospheric transport modeling. Inverse modeling helps refine emission estimates by comparing observed and predicted pollutant levels.

### 4.3 Emerging Challenges

#### 4.3.1 Uncertainties in Emission Inventories

Many gaps exist in PM emissions from diffuse sources, such as tyre and brake wear, industrial abrasion, and residential combustion. Natural emissions like dust, marine VOCs, and wildfire pollutants also need better quantification. The use of real-time monitoring and big data, such as mobile traffic data, could improve inventory accuracy.

#### 4.3.2 Road Transport Challenges

While exhaust emissions are declining, non-exhaust sources remain poorly understood. The chemical composition of non-methane organic gases (NMOGs) is evolving with new fuels and lubricants. Current emission models do not fully capture real-time driving behaviors, limiting their predictive accuracy.

#### 4.3.3 Shipping Challenges

The transition to low-carbon shipping fuels remains uncertain due to a lack of emission factor data. VOC emissions from ships are poorly characterized, complicating their role in air quality modeling. Port emissions also pose significant concerns, particularly in urban areas where exposure is high.

#### 4.3.4 Indoor Air Pollution Research Needs

There is limited systematic knowledge on indoor air pollution sources, particularly from building materials, consumer products, and human activities. Indoor-to-outdoor pollutant exchange remains poorly quantified. Stricter regulations and improved monitoring of indoor air pollutants could help mitigate exposure risks.

#### 4.3.5 Source Apportionment Gaps

Emission profiles for VOCs, PAHs, and organic aerosols require updates to reflect new technologies and fuel types. High-resolution pollution tracking remains a challenge, as receptor models struggle with rapidly changing emissions. Inverse modeling techniques need refinement for improved emission inventories.

### CONCLUSION AND FUTURE DIRECTIONS

This review has examined key developments in air quality research over the past decade, covering pollution sources, emission inventories, monitoring techniques, air quality modeling, health impacts, and policy strategies. The field has evolved significantly, but several emerging challenges remain. One of the most critical areas is improving emission inventories, particularly for non-exhaust emissions from transport, diffuse sources, and indoor air pollution. The integration of real-time data and big data analytics could improve emission tracking and forecasting. Advances in low-cost sensors, remote sensing, and machine learning are revolutionizing air quality monitoring, enabling higher spatial and temporal resolution. Air quality models now incorporate multi-scale interactions, linking local and regional pollution with meteorology and climate. However, improving model accuracy, particularly in predicting secondary pollutants and exposure levels, remains a challenge. The role of secondary pollutants like ozone and aerosols in urban environments needs further research, especially as primary emissions decrease.

Exposure-based health impact assessments are gaining prominence, shifting focus from outdoor concentrations to actual inhaled pollutants. Indoor pollution, which contributes significantly to personal exposure, requires better quantification and control measures. Research on exposure-response relationships and health risks from emerging pollutants is essential. Policy development must integrate air quality and climate strategies, as many air pollution control measures also reduce greenhouse gas emissions. Cost-benefit analyses and impact pathway assessments should consider both domains to maximize environmental and public health benefits. Policies should also address new challenges, such as non-exhaust emissions, indoor air pollution, and pollution from alternative fuels. Future research should focus on refining emission inventories, improving exposure models, integrating machine learning into monitoring and forecasting, and strengthening policy frameworks for air quality and climate co-benefits. Advancing these areas will be crucial in designing effective air quality management strategies for the coming decades.

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